LEWINGROUP®
Part of OptumServe

Comprehensive End-Stage Renal Disease Care (CEC) Model

Performance Year 4 Annual Evaluation Report

Contract #: HHSM-500-2014-00033I
Task Order No. HHSM-500-T0001

Prepared for:

Centers for Medicare & Medicaid Services

Submitted by:

The Lewin Group, Inc.

February 2021

Comprehensive End-Stage Renal Disease Care (CEC) Model

Performance Year 4 Annual Evaluation Report

February 2021

The Lewin Group

Authors:

Grecia Marrufo, Brighita Negrusa, Darin Ullman, Richard Hirth,[1] Claudia Dahlerus,[1] Jennifer Wiens, Ariana Ackerman, Jessica Nelson, Naya Lindsey, Daniel Gregory, Jonathon Segal[1], Shoou-Yih Daniel Lee[1], Tammie Nahra,[1] Amy Jiao,[1] Joseph Gunden[1], Kathryn Sleeman[1], Joe Messana[1], Daniel Strubler, Peter Weidner, Katherine B. McKeithen,[2] Kelsey Bacon and Rebecca Braun

Lewin's address:

3160 Fairview Park Dr., Suite 600, Falls Church, VA 22042

Federal Project Officer:

Gregory Boyer, PhD
Division of Data, Research, and Analytic Methods (DRAM)
Research and Rapid Cycle Evaluation Group (RREG),
Center for Medicare & Medicaid Innovation (CMMI),
Centers for Medicare & Medicaid Services (CMS)

[1] University of Michigan, Kidney Epidemiology and Cost Center (KECC)
[2] Independent Contractor

Table of Contents

GLOSSARY OF TERMS **1**

EXECUTIVE SUMMARY **4**

A. Introduction 4

B. Overview of Findings 5

1. Who Participates in the CEC Model? *6*

2. How Have Structural Features of the Wave 2 ESCOs Changed Over Time? *7*

3. How Has Care Redesign Evolved Under Wave 2 ESCOs? *8*

4. What Were Beneficiaries' Perceptions of the CEC Model? *9*

5. What Were the Impacts of the CEC Model? *9*

6. What Were the Differences in Performance Between the CEC and Primary Care-Based ACO Models? *17*

7. Were There Unintended Consequences of the CEC Model? *17*

C. Discussion 17

I. INTRODUCTION **20**

Research Questions 20

1. Who Participates in the CEC Model? *22*

2. How Have Structural Features of the Wave 2 ESCOs Changed Over Time? *22*

3. How Has Care Redesign Evolved Under Wave 2 ESCOs? *22*

4. What Were Beneficiaries' Perceptions of the CEC Model? *23*

5. What Were the Impacts of the CEC Model? *23*

6. What Were the Differences in Performance between the CEC and Primary Care-Based ACO Models? *24*

7. Were There Unintended Consequences of the CEC Model? *24*

II. WHAT SHIFTS HAVE OCCURRED IN ESCO PARTICIPATION? **25**

A. Key Findings 26

B. Methods 26

C. Results 26

1. What Changes Have Occurred Among Participating Facilities? *26*

2. What Changes Have Occurred in the Characteristics of the Markets in which ESCOs Participate? *30*

3. How Has the Participation of Owner Nephrologists Changed? *33*

D. Discussion 35

III. HOW HAVE STRUCTURAL FEATURES OF THE WAVE 2 ESCOS CHANGED OVER TIME? **37**

A. Key Findings 37

B. Methods 37

C. Results 38
1. To What Extent Have Wave 2 ESCOs Modified Staffing? *38*
2. How Have Partnerships with Non-Dialysis Providers Changed? *40*
3. What Investments Were Made in Information Technology? *44*
4. What is the Status of CEC Model Waiver Use among Wave 2 ESCOs? *44*
D. Discussion 46

IV. HOW HAS CARE REDESIGN EVOLVED UNDER WAVE 2 ESCOS? 47
A. Key Findings 47
B. Methods 47
C. Results 47
1. Extended Standard of Care Beyond ESCO Patients and Facilities *48*
2. Refined Risk Stratification and Use of Interdisciplinary Teams *48*
3. Promoted Patient and Caregiver Engagement and Empowerment *49*
4. Improved Person-Centered Care *50*
5. Increased Focus on Palliative Care *51*
D. Discussion 52

V. WHAT WERE BENEFICIARIES' PERCEPTIONS OF THE CEC MODEL? 53
A. Key Findings 53
B. Methods 53
C. Results 54
1. What Did Beneficiaries Know about the CEC Model? *54*
2. What Changes Did Beneficiaries Notice Since their Facility's Participation in the ESCO Began? *54*
D. Discussion 56

VI. WHAT WERE THE IMPACTS OF THE CEC MODEL? 57
A. Key Findings 57
B. Methods 57
C. Results 61
1. What Was the Impact of CEC on Dialysis Care? *62*
2. What Was the Impact of CEC on the Coordination of Care beyond Dialysis? *73*
3. What Was the Impact of CEC on Hospitalizations and Emergency Department Visits? *82*
4. What Was the Impact of the CEC Model on Mortality? *96*
5. What Was the Impact of CEC on Medicare Payments across the Continuum of Care? *98*
6. What Was the Impact of CEC on Medicare Beneficiary Subpopulations? *107*
D. Discussion 107

VII. WHAT WERE THE DIFFERENCES IN PERFORMANCE BETWEEN THE CEC AND PRIMARY CARE-BASED ACO MODELS? 110

A. Key Findings 111

B. Methods 111

C. Results 114

D. Discussion 117

VIII. DID THE CEC MODEL HAVE UNINTENDED CONSEQUENCES? 118

A. Key Findings 120

B. Methods 120

C. Results 122

1. What Was the Impact of CEC on Medicare Part D Drug Costs? 122

2. Was there Evidence of Adverse Selection within CEC Facilities? 124

3. What Was the CEC Model's Impact on Transplant Waiting List Activity? 125

D. Discussion 128

IX. WHAT WERE WAVE 2 ESCOS' PERCEPTIONS OF MODEL SCALABILITY AND SUSTAINABILITY? 130

A. Key Findings 130

B. Methods 130

C. Results 130

1. Have Wave 2 ESCOs Incorporated Model Design Features in Non-ESCO Facilities or Markets? 130

2. What Were Wave 2 ESCOs' Perceptions of Model Sustainability? 131

D. Discussion 131

X. DISCUSSION 132

APPENDIX A: HEALTH INFORMATION EXCHANGES AND CEC WAIVERS 135

A. Health Information Exchanges.....135

B. Waivers 135

APPENDIX B: CEC EVALUATION LOGIC MODEL.....137

APPENDIX C: SITE VISIT METHODOLOGY.....138

A. Selection Criteria.....138

B. Data Collection Procedures.....139

C. Protocol Development.....139

D. Analysis.....140

APPENDIX D: BENEFICIARY FOCUS GROUP METHODOLOGY.....141

A. Selection Criteria and Beneficiary Recruitment 141

B. Data Collection and Analysis.....141

APPENDIX E: DIFFERENCE-IN-DIFFERENCES (DID) APPROACH.....143

A. Data and Outcome Measures 143

B. Owner Nephrologists 151

C. Comparison Group Construction 153

1. Identifying CEC Facilities 153

2. Selecting Facilities Eligible to be Included in the Comparison Group Pool.....154

3. Statistical Matching Approach.....155

4. Comparison Group Changes between the Third Annual Report and the Fourth Annual Report 164

D. Beneficiary Alignment and Eligibility.....164

E. CEC and Comparison Group Populations.....167

F. DiD Regression Model and Estimated CEC Impacts 169

APPENDIX F: POWER CALCULATION METHODOLOGY 206

APPENDIX G: ICH CAHPS® ANALYSIS SUPPLEMENT 208

A. Data Sources.....208

B. Methods.....210

C. Results.....213

APPENDIX H: STANDARDIZED MEASURES ANALYSIS 216

A. Results 216

B. Methods 218

1. Data Sources 218

2. Determination of Beneficiary Eligibility during a Given Month 219

3. Modifications to Population for Standardized Models 219

C. Standardized Hospitalization Ratio Methodology 220

1. Beneficiary Assignment 220

2. Ratio Calculation 220

D. Standardized Readmission Ratio Methodology 222

1. Beneficiary Assignment 222

2. Beneficiary Exclusions 222

3. Determination of Index Discharge 223

4. Ratio Calculation 224

5. Risk-Adjusted Model for Computing Expected Number of Readmissions 226

E. Standardized Mortality Ratio Methodology 226

1. Beneficiary Assignment 226

2. Ratio Calculation 227

F. Model Variables: Adjustors and Data Sources for the Mortality, Readmission, and Hospitalization Risk-Adjustment Models 229

G. Standardized Measures Limitations 232

APPENDIX I: MORTALITY ANALYSIS 234

A. Data and Outcome Measures 234

B. CEC and Comparison Group Populations 234

C. Survival Models and Estimated CEC Impact 235

1. Estimation Results 236

D. Model Diagnostics 246

APPENDIX J: METHODOLOGY FOR COMPARING CEC MODEL TO PRIMARY CARE-BASED ACOS 249

A. ACO and ESCO (CEC) Risk-Sharing Programs and Alignment Rules 249

B. Methods 251

APPENDIX K: UNINTENDED CONSEQUENCES 284

A. Patient Selection 284

B. Transplant Waiting List Activity 286

APPENDIX L: HOSPITAL DENSITY ANALYSIS 290

A. Data Preparation 290

B. Descriptive Results 290

C. Statistical Model 296

D. Model Diagnostics 297

E. Results 297

APPENDIX M: SKIPPED TREATMENT ANALYSIS 299

A. Data Preparation 299

B. Descriptive Results 299

C. Statistical Model 300

Glossary of Terms

Acronym	Definition
ACH	acute care hospital
ACO	accountable care organization
ACSC	Ambulatory Care Sensitive Condition
Advanced APM	Advanced Alternative Payment Model
AHRF	Area Health Resource File
AHRQ	Agency for Healthcare Research and Quality
AIM	ACO Investment Model
AR2	second annual report
AR3	third annual report
AR4	fourth annual report
AV	arteriovenous
BETOS	Berenson-Eggers Type of Services
BMI	body mass index
CBSA	Core-Based Statistical Area
CCN	CMS Certification Number
CCS	Clinical Classifications Software
CCW	Chronic Conditions Data Warehouse
CDC	Centers for Dialysis Care
CEC	Comprehensive End-Stage Renal Disease (ESRD) Care
CHF	congestive heart failure
CKD	chronic kidney disease
CME	Common Medicare Environment
CMMI	Center for Medicare & Medicaid Innovation
CMS	Centers for Medicare & Medicaid Services
CNU	Care Navigation Unit
CROWNWeb	Consolidated Renal Operations in a Web-enabled Network
CY	calendar year
DCI	Dialysis Clinic, Inc.
DFR	Dialysis Facility Report
DiD	difference-in-differences
E/M	Evaluation and Management
ED	emergency department
EHR	electronic health record
ESCO	ESRD Seamless Care Organization
ESRD	end-stage renal disease
FAI	Financial Alignment Initiative
FFS	fee-for-service
GEM	General Equivalence Mappings
HbA1c	hemoglobin A1c
HCC	Hierarchical Condition Category
HCPCS	Healthcare Common Procedure Coding System
HIE	Health Information Exchange
HR	hazard rate
HWR	hospital-wide readmission

Acronym	Definition
IAH	Independence at Home
ICC	intra-cluster correlation coefficients
ICD-9	International Classification of Disease, 9th Revision
ICD-10	International Classification of Disease, 10th Revision
ICH CAHPS	In-Center Hemodialysis Consumer Assessment of Healthcare Providers and Systems
IT	information technology
LDL	low-density lipoprotein
LDO	large dialysis organization
MA	Medicare Advantage
MACRA	Medicare Access and CHIP Reauthorization Act
MBSF	Master Beneficiary Summary File
MDS	Long Term Care Minimum Data Set
MIPS	Merit-Based Incentive Payment System
MME	morphine milligram equivalent
NGACO	Next Generation ACO
NKC	Northwest Kidney Centers
non-LDO	non-large dialysis organization, or small dialysis organization
NQF	National Quality Forum
OLS	ordinary least squares
ONS	oral nutritional supplements
OPTN	Organ Procurement and Transplantation Network
OREC	Original Reason for Entitlement Code
P4P	pay-for-performance
PAC	post-acute care
PBPM	per beneficiary per month
PCP	primary care provider
PH	proportional hazards
PPS	Prospective Payment System
PPT	percentage points
PQI	Prevention Quality Indicator
PSM	propensity score matching
PY	performance year
PY1	performance year one (October 1, 2015 through December 31, 2016)
PY2	performance year two (January 1, 2017 to December 31, 2017)
PY3	performance year three (January 1, 2018 to December 31, 2018)
PY4	performance year four (January 1, 2019 to December 31, 2019)
PY5	performance year five (January 1, 2020 to March 31, 2021)
QIP	Quality Incentive Program
QQ	quantile-quantile
REMIS	Renal Management Information System
RSCT	Renal Supportive Care Team
SDO	small dialysis organization
SHR	standardized hospitalization ratio
SMD	standardized mean difference
SMR	standardized mortality ratio
SNF	skilled nursing facility

Acronym	Definition
SRR	standardized readmission ratio
SRTR	Scientific Registry of Transplant Recipients
SSP	Shared Savings Program
TDAPA	Transitional Drug Add-on Payment Adjustment
TOC	transition of care
US	United States

Executive Summary

A. Introduction

Medicare beneficiaries with end-stage renal disease (ESRD) are a medically complex group that requires significantly more resources than the general Medicare population. In 2017, fewer than 1% of the fee-for-service (FFS) Medicare beneficiary population had ESRD, yet they accounted for 7.2% of FFS Medicare payments.[3] Beneficiaries with ESRD have more frequent and longer hospitalizations than other beneficiaries and their readmission rates are more than twice that of the general Medicare population.

In an effort to provide better care for Medicare beneficiaries with ESRD, the Centers for Medicare & Medicaid Services (CMS) launched the Comprehensive ESRD Care (CEC) Model in 2015 under the authority of the Center for Medicare & Medicaid Innovation (CMMI). The CEC Model is an Advanced Alternative Payment Model (Advanced APM) that creates financial incentives for dialysis facilities, nephrologists, and other Medicare providers to coordinate care for Medicare beneficiaries with ESRD. The model is designed to improve clinical and patient-centered outcomes for Medicare beneficiaries with ESRD, while promoting value and reducing per-capita payments.

The CEC Model expands the reach of recent value-based payment initiatives targeting dialysis-related care such as the ESRD Prospective Payment System (ESRD PPS) and the ESRD Quality Incentive Program (ESRD QIP). Under the CEC Model, dialysis facilities, nephrologists, and other providers partner to form ESRD Seamless Care Organizations (ESCOs). ESCOs are specialty-oriented accountable care organizations (ACOs) that assume financial responsibility for the quality of care and Medicare Part A and Part B payments of their aligned beneficiaries. The ESCOs participating in the model are separated into two waves, differentiated by the date on which they joined the CEC Model. Wave 1 includes ESCOs that joined the model on October 1, 2015; Wave 2 includes ESCOs that joined the model on January 1, 2017. Both Wave 1 and Wave 2 ESCOs had the ability to add or drop facilities. The model runs five performance years (from October 2015 to March 2021) and this report includes results for the first four performance years (from October 2015 to December 2019). This report reflects the model performance period through December, 2019 and predates the COVID-19 pandemic.

This fourth annual report (AR4) provides findings on the impact of the CEC Model during the first four performance years (PYs): October 1, 2015 through December 31, 2016 (PY1), January 1, 2017 through December 31, 2017 (PY2), January 1, 2018 through December 31, 2018 (PY3), and January 1, 2019 through December 31, 2019 (PY4). The report combines findings from quantitative and qualitative data to address a core set of questions. For instance, data from site visits with Wave 2 ESCOs addressed changes in partnerships, care redesign strategies they implemented, perceived successes and challenges, and thoughts about the sustainability of various aspects of the model. Quantitative methods complement qualitative methods by addressing how participation in the CEC Model for both Wave 1 and Wave 2 ESCOs affected dialysis care, coordination of care beyond dialysis, hospitalizations and emergency department (ED) visits,

[3] United States Renal Data System. 2019 USRDS annual data report: Epidemiology of kidney disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2019.

Medicare payments across the continuum of care and patient survival over the first four performance years. This report also included two new quantitative analyses that were motivated by issues consistently noted in the qualitative data generated in the site visit interviews. These new analyses focus on skipped and rescheduled dialysis treatments and changes over time in the set of hospitals used by patients.

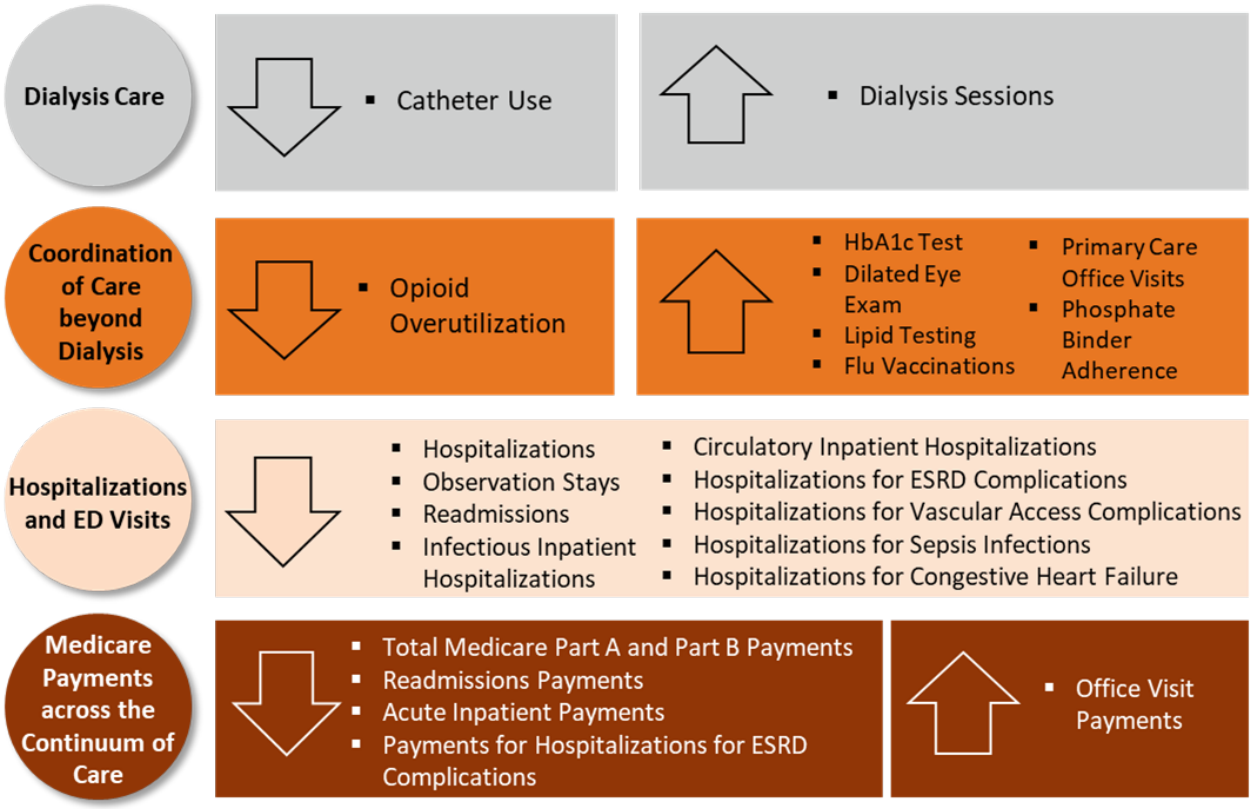
B. Overview of Findings

The CEC Model is designed to create incentives for dialysis facilities and nephrologists to coordinate care for Medicare beneficiaries with ESRD across settings by making the ESCOs accountable—financially and clinically—for care delivered in other inpatient and outpatient settings. The CEC Model expanded in the second performance year. In January 2017, 24 new ESCOs joined the 13 original ESCOs that began operations in October 2015. In the fourth performance year, 4 dropped out of the model, but the total number of facilities participating continued to rise as the remaining ESCOs added new facilities as of January 1, 2019. Nationally, 16% of dialysis facilities are now participating in the model.

Overall, the CEC Model showed promising but modest results over the first four performance years, with improvements on some quality and health care utilization measures as well as a decrease in total payments (see **Exhibit ES-1** for a summary of the evaluation findings). However, the magnitudes of these improvements were generally larger in PY1 and PY2 than in PY3 and PY4, and were primarily driven by Wave 1 ESCOs. ESCO performance on several clinical and cost measures for PY4 continued to exceed that of a matched comparison group, yet these improvements were generally smaller than those seen in earlier performance years. The CEC Model resulted in a $151 million aggregate reduction in payments for CEC beneficiaries over the first four performance years. This reduction was primarily generated through a reduction in hospitalizations and readmissions. The number of hospitalizations and the percent of beneficiaries with at least one readmission each decreased 3% across the four performance years. Additionally, ESCOs reported various interventions to improve adherence to dialysis. These interventions resulted in an increase in the number of dialysis sessions and a decrease in payments and hospitalizations for ESRD-related complications.

The additional year of data in AR4 updates the results from the third annual report (AR3). These analyses provide evidence that the CEC Model performed better for beneficiaries with ESRD than primary care-based ACOs during the first year of alignment. Spending and utilization outcomes improved under the CEC Model, whereas primary care-based ACOs showed no evidence of improved outcomes or reduced payments for beneficiaries with ESRD.

Exhibit ES-1. Summary of Evaluation Findings*



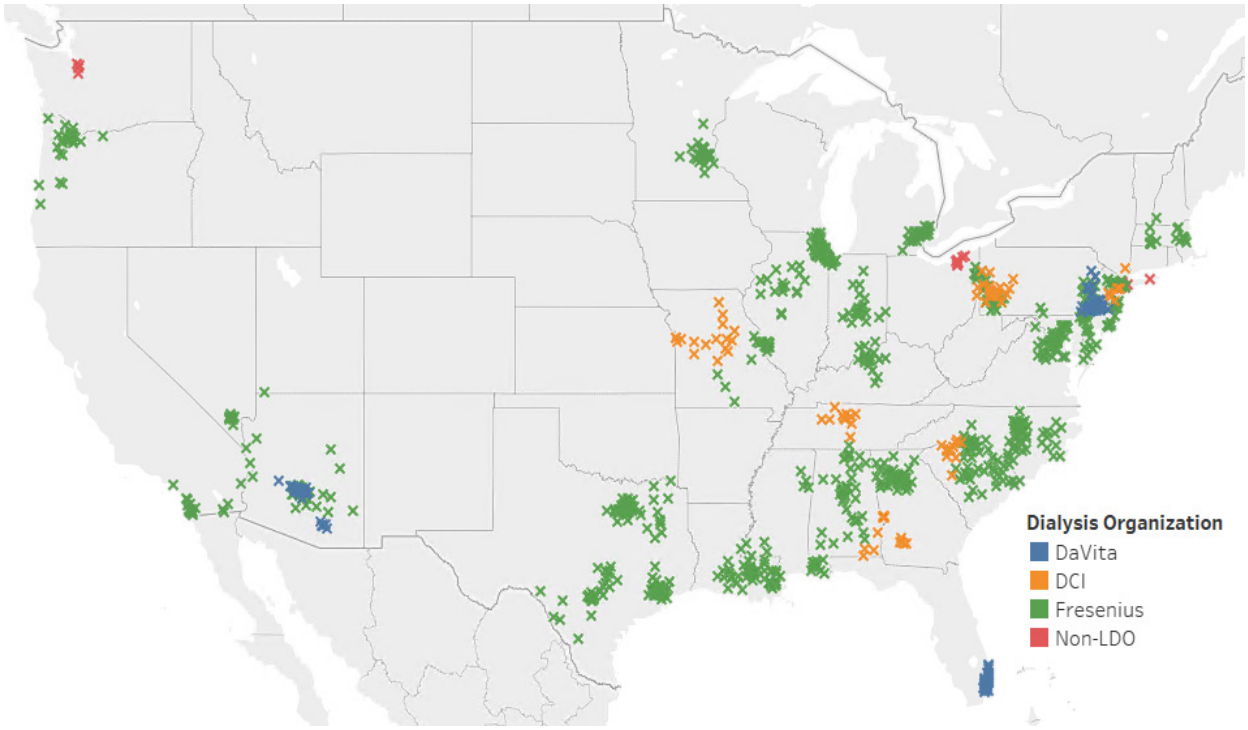
***Shows statistically significant evaluation impacts for all ESCOS across PY1-PY4**

Notes: ⬇ boxes indicate measures with a statistically significant decrease; ⬆ boxes indicate measures with a statistically significant increase. Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance identified with p-values ≤ 0.10. *We evaluated the impact of the CEC Model on the number of events per month on the following outcomes: hospitalizations, ED visits, observation stays, circulatory and infectious inpatient hospitalizations. For all other measures under this domain, we only explored the impact of the CEC Model on the odds of experiencing at least one event in a given month.

1. Who Participates in the CEC Model?

Thirty-seven ESCOs, representing three large dialysis organizations (LDOs), defined as those having 200 or more dialysis facilities (DaVita, Fresenius, and Dialysis Clinic, Inc. [DCI]) and four small dialysis organizations or non-LDOs (Rogosin Institute, Atlantic Dialysis, Centers for Dialysis Care [CDC], and Northwest Kidney Centers [NKC]), participated in the CEC Model during PY1-PY4. Of these 37 ESCOs, 13 joined the CEC Model on October 1, 2015 as Wave 1 ESCOs, 24 ESCOs joined the CEC Model as Wave 2 ESCOs on January 1, 2017, and 4 ESCOs left the model in PY4. Collectively, these ESCOs had 1,210 dialysis facilities after 144 were added in PY4 and were spread across 32 states and Washington, D.C. The locations of participating facilities are shown in **Exhibit ES-2**.

Exhibit ES-2. Location of CEC Dialysis Facilities



Source: CEC Model participation data extracted from Salesforce on 01/28/2020.

The 37 ESCOs are diverse along several important dimensions, including geographic region, ownership, and size. While both LDOs and non-LDOs are represented in the model, Fresenius was the dominant participant, making up 73% of ESCO facilities. DaVita was the next largest group, representing 9% of ESCO facilities (all in Wave 1 ESCOs). ESCOs covered a wide range of markets in terms of Medicare Part A and Part B payments per beneficiary per month (PBPM), with no apparent selection into high-cost markets. In general, ESCOs tended to operate in larger markets, likely reflecting the requirement to have at least 350 patients dialyzing at ESCO facilities and meeting the eligibility criteria to be aligned to an ESCO.[4] In particular, ESCOs were located in many of the largest population centers in the United States (US), with the average CEC Core-Based Statistical Area (CBSA) having a population three and a half times larger than the average non-CEC CBSA. However, compared to earlier joining facilities that were overwhelmingly located in metropolitan areas, Wave 2 PY4 joiner facilities were often located in non-metropolitan areas, were less likely to offer a late shift, and served a higher proportion of beneficiaries with dual Medicare-Medicaid status.

2. How Have Structural Features of the Wave 2 ESCOs Changed Over Time?

During PY2, we collected information about early model investments by Wave 2 ESCOs. These findings were provided in the Performance Year 2 Annual Evaluation Report. To monitor these features over time, we conducted a second set of site visits with a sample of Wave 2 ESCOs in

[4] To be eligible for alignment beneficiaries dialyzing in an ESCO facility must be enrolled in Medicare Part A and Part B, be older than 18 years old, receive at least 50% of their dialysis series in the ESCO market are, not have a functioning transplant or have Medicare as secondary payer. Beneficiaries previously aligned to some Medicare ACOs or other Medicare demonstration programs are excluded from alignment.

PY4. We summarize changes in staffing, partnerships with other providers, information technology (IT), and use of CEC Model waivers among Wave 2 ESCOs.

Consistent with the findings reported in AR3 for Wave 1 ESCOs, Wave 2 ESCOs retained many of the structural features they had developed during PY2 (their first year of operation). However, there were some changes to staffing models. Fresenius, whose ESCOs made up a large share of all Wave 2 ESCOs, continued the changes noted in the third annual report (AR3) for its Wave 1 ESCOs by using a hybrid care coordination model made up of on-site care coordinators and telephonic care coordination. The face-to-face presence was cited as enhancing the visibility of the ESCO to both patients and dialysis facility staff. Some ESCOs established new collaborations with vascular surgeons and home health agencies, reflecting the belief that those providers are essential to maintaining dialysis care and helping to prevent unnecessary hospital admission or readmissions. For similar reasons, Wave 2 ESCOs continued to focus on reducing missed treatments and providing flexible rescheduling options. A new analysis in this annual report complemented these analyses by explicitly identifying each patient's "normal" dialysis schedule to identify the delivery of on-time dialysis, missed treatments, and rescheduled treatments in a more granular fashion. CEC resulted in small but statistically significant improvements in the likelihood that dialysis treatments were delivered as scheduled or were rescheduled if missed.

While focus on medication reconciliation remained significant, most ESCOs discontinued use of dedicated pharmacist support. Changes in IT investments were mostly refinements of earlier investments, but some ESCOs reported increased use of other available information sources such as state Health Information Exchanges. There was also little change in which waivers were used by Wave 2 ESCOs, but Fresenius did implement a new limitation on the use of the transportation waiver to six one-way trips per quarter per patient. This limitation was in response to concerns that the waiver was sometimes used for routine or long-term travel issues rather than the intended urgent or short-term issues. Overall, the structural stability of Wave 2 ESCOs may reflect learning from the experience of Wave 1 ESCOs, either in the same organization (Fresenius or DCI) or from observing ESCOs from other organizations.

A new quantitative analysis was undertaken in response to the observations from the site visits. Participants noted that they had established good information-sharing relationships with some, but not all, hospitals used by patients at their facility. As a result, they preferred their patients to use the subset of hospitals with the most effective partnerships, but they also expressed frustration at their inability to "steer" patients to those preferred providers. We tested whether the set of hospitals used by ESCO facilities' patients became narrower or more concentrated over time relative to the comparison group. These analyses did not yield any evidence that ESCOs were able to steer patients to a smaller set of hospitals.

3. How Has Care Redesign Evolved Under Wave 2 ESCOs?

In PY4, all ESCOs site participants reported continued specific approaches implemented in PY2 and refined person–centered care coordination. Interdisciplinary teams leveraged knowledge of beneficiary behavior and life events to help target care coordination to high-risk individuals not identified by computer algorithms, but met less frequently and were more selective in which beneficiaries were discussed. ESCOs also began applying care redesign strategies, that did not

require waivers, to all patients in the facility, regardless of their CEC alignment, to provide one standard of care for all at the facility. Several ESCOs placed greater emphasis on patient and caregiver education and empowerment to improve outcomes and adherence with the treatment plan. Topics were expanded to include what warrants hospitalization, fluid management, and signs of infection. Another notable change in PY4 was an increased focus on palliative care by some ESCOs.

4. What Were Beneficiaries' Perceptions of the CEC Model?

Findings from beneficiary focus groups were similar to those reported in prior years. Most beneficiaries were unaware or only minimally aware of the CEC Model. While participants were generally not aware of being in an ESCO, some beneficiaries were broadly aware of at least some of its activities, particularly the care coordinator role. Beneficiaries generally did not perceive changes in nephrologist and staff accessibility and communication but satisfaction with communication was generally mixed as high staff turnover limited effective communication. Some beneficiaries said they would like more access to their nephrologist.

5. What Were the Impacts of the CEC Model?

Overall, during the first four performance years, the CEC Model resulted in improvements in delivery and quality of dialysis care and reductions in acute care utilization and Medicare payments. The estimated impacts over the first four performance years of the model on dialysis care, coordination of care beyond dialysis, hospitalizations and ED visits, and Medicare payments across the continuum of care are summarized in **Exhibit ES-3**. Unless otherwise noted, all CEC effects are reported as impact estimates relative to similar Medicare beneficiaries with ESRD not participating in the model, and as percent changes relative to the pre-CEC period.

Exhibit ES-3. Summary of Difference-in-Differences Impact Estimates, All ESCOs PY1-PY4

Measures		CEC		Comparison		Difference-in-Differences Estimate			
		Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Dialysis Care	Number of Outpatient Dialysis Sessions in a Given Month	12.2	12.3	12.3	12.2	0.05 ***	0.03	0.08	0.43%
	Emergency Dialysis (percent with at least one)	1.9%	2.0%	1.9%	2.0%	-0.06	-0.15	0.03	-3.2%
	Hemodialysis (percent with at least one)	92.7%	91.7%	92.1%	91.0%	0.06	-0.48	0.61	0.07%
	Peritoneal Dialysis (percent with at least one)	5.8%	6.7%	6.3%	7.2%	-0.003	-0.56	0.56	-0.05%
	Home Hemodialysis (percent with at least one)	1.5%	1.8%	1.4%	1.6%	0.11	-0.18	0.41	7.4%
	Home Dialysis (percent with at least one)	7.9%	8.2%	7.8%	8.0%	0.13	-0.14	0.40	1.7%
	Percent of Beneficiaries Starting Dialysis with No Prior Nephrology Care	26.2%	24.3%	28.3%	26.9%	-0.50	-2.3	1.3	-1.9%
	Fistula Use (percent of beneficiaries in a given month who had a fistula and had at least 90 days of dialysis)	65.6%	64.7%	65.1%	64.3%	-0.10	-0.74	0.54	-0.15%
	Catheter Use (percent of beneficiaries in a given month who had a catheter for 90 days or longer)	9.3%	10.0%	11.3%	12.5%	-0.48 **	-0.85	-0.11	-5.2%
Coordination of Care Beyond Dialysis	Percent of Beneficiaries Receiving at Least One Low-Density Lipoprotein (LDL) Cholesterol Test in a Given Year	58.7%	58.0%	55.0%	51.5%	2.9 ***	1.5	4.2	4.9%
	Percent of Beneficiaries Receiving at Least One Hemoglobin A1c (HbA1c) Test in a Given Year	78.2%	76.8%	78.3%	75.1%	1.9 ***	1.0	2.7	2.4%
	Percent of Diabetic Beneficiaries Receiving at Least One Dilated Eye Exam in a Given Year	39.9%	41.2%	40.4%	40.4%	1.3 ***	0.59	2.0	3.2%

Measures		CEC		Comparison		Difference-in-Differences Estimate			
		Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Coordination of Care Beyond Dialysis (cont.)	Percent of Beneficiaries Receiving Flu Vaccinations^	64.3%	69.4%	62.5%	64.1%	3.5 ***	2.7	4.4	5.5%
	Number of Primary Care E&M Office/Outpatient Visits per 1,000 Beneficiaries per Month	233.3	225.5	227.4	212.6	7.0 ***	2.8	11.1	3.0%
	Number of Specialty Care E&M Office/Outpatient Visits per 1,000 Beneficiaries per Month	438.7	430.8	426.8	420.9	-2.0	-8.4	4.4	-0.46%
	Percent of Beneficiaries Receiving Hospice Services in a Given Month	0.90%	0.87%	0.83%	0.77%	0.04	-0.02	0.09	4.2%
	Percent of Beneficiaries with Greater than 50 mg Average Morphine Milligram Equivalent (MME) in a Given Month	6.2%	5.1%	6.0%	5.3%	-0.36 **	-0.63	-0.08	-5.8%
	Percent of Beneficiaries with Greater than 80% of Days Covered for Phosphate Binder Prescription in a Given Month	34.6%	37.7%	34.8%	35.3%	2.6 ***	2.0	3.2	7.6%
	Percent of Beneficiaries with at Least One Contraindicated Medication Prescription Fill in a Given Month	3.5%	3.7%	3.6%	3.7%	0.08	-0.11	0.27	2.2%
Hospitalizations and Emergency Department Visits	Number of Hospitalizations per 1,000 Beneficiaries per Month	133.0	130.1	131.6	132.8	-4.2 ***	-6.3	-2.0	-3.1%
	Number of ED Visits per 1,000 Beneficiaries per Month	141.7	153.1	149.2	161.3	-0.67	-3.6	2.3	-0.47%
	Number of Observation Stays per 1,000 Beneficiaries per Month	25.7	27.2	24.0	26.7	-1.2 **	-2.2	-0.24	-4.7%
	Number of Endocrine/Metabolic Inpatient Hospitalizations per 1,000 Beneficiaries per Month	16.6	14.5	15.9	14.1	-0.29	-0.77	0.20	-1.7%
	Number of Circulatory Inpatient Hospitalizations per 1,000 Beneficiaries per Month	38.2	41.2	37.4	42.4	-1.9 ***	-2.8	-0.94	-4.9%

Measures		CEC		Comparison		Difference-in-Differences Estimate			
		Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Hospitalizations and Emergency Department Visits (cont.)	Number of Infectious Inpatient Hospitalizations per 1,000 Beneficiaries per Month	14.2	14.6	15.3	16.2	-0.54 *	-1.0	-0.08	-3.8%
	Percent of Beneficiaries with at Least One Hospitalization for Vascular Access Complications in a Given Month	0.59%	0.60%	0.62%	0.66%	-0.03 *	-0.06	-0.001	-5.1%
	Percent of Beneficiaries with at Least One Hospitalization for ESRD Complications in a Given Month	1.8%	2.0%	1.7%	2.0%	-0.11 ***	-0.17	-0.05	-6.0%
	Percent of Beneficiaries with at Least One Hospitalization for Catheter-Related Bloodstream Infection in a Given Month	0.14%	0.09%	0.15%	0.10%	-0.002	-0.01	0.01	-1.2%
	Percent of Beneficiaries with at Least One Hospitalization for Peritonitis in a Given Month	0.10%	0.09%	0.09%	0.08%	0.001	-0.01	0.01	1.1%
	Percent of Beneficiaries with at Least One Hospitalization for Sepsis in a Given Month	1.1%	1.2%	1.3%	1.4%	-0.05 *	-0.09	-0.01	-4.3%
	Percent of Beneficiaries with at Least One Admission for Diabetes Complications in a Given Month	0.88%	0.82%	0.87%	0.80%	0.002	-0.04	0.04	0.28%
	Percent of Beneficiaries with at Least One Admission for Congestive Heart Failure (CHF) in a Given Month	1.5%	1.8%	1.5%	1.9%	-0.13 ***	-0.20	-0.07	-8.8%
	Percent of Beneficiaries with at Least One Readmission within 30-days of an Index Hospitalization Stay in a Given Month	29.9%	29.3%	29.6%	29.9%	-0.81 *** ‡	-1.3	-0.34	-2.7%
	Percent of Beneficiaries with at Least One ED Visit within 30-days of an Acute Hospitalization in a Given Month	20.1%	21.6%	20.9%	22.3%	0.06	-0.34	0.45	0.28%

Measures		CEC		Comparison		Difference-in-Differences Estimate			
		Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Medicare Spending across the Continuum of Care	Total Part A and Part B PBPM	$6,394	$6,530	$6,378	$6,594	-$80 **	-$133	-$26	-1.2%
	Acute Inpatient PBPM	$1,664	$1,693	$1,666	$1,747	-$51 ***	-$78	-$24	-3.1%
	Readmissions PBPM	$585	$592	$582	$617	-$27 ***	-$44	-$10	-4.6%
	Institutional Post-Acute Care PBPM	$556	$537	$548	$550	-$21	-$42	$0	-3.7%
	Home Health PBPM	$173	$170	$170	$166	$0	-$5	$5	0.18%
	Hospice PBPM	$24	$24	$22	$21	$1	-$1	$2	3.2%
	Hospital Outpatient PBPM	$386	$429	$409	$461	-$8 ‡	-$18	$1	-2.2%
	Office Visits PBPM	$53	$55	$52	$53	$1 *	$0	$1	1.1%
	Total Part B PBPM	$4,077	$4,204	$4,068	$4,207	-$12	-$34	$9	-0.30%
	Total Dialysis PBPM	$2,600	$2,739	$2,610	$2,741	$7 ‡	-$1	$15	0.27%
	Hospitalizations for ESRD Complications PBPM	$155	$176	$147	$180	-$11 ***	-$17	-$5	-7.2%
	Part B Drug PBPM	$24	$37	$24	$39	-$1 ‡	-$4	$2	-4.9%
Unintended Consequences	Total Part D Drug Cost PBPM	$826	$973	$848	$958	$37 *** ‡	$21	$52	4.4%
	Total Part D Phosphate Binder Drug Cost PBPM	$292	$378	$307	$367	$26 *** ‡	$17	$35	8.9%

Notes: A DiD design was used to estimate the differential change in outcomes for beneficiaries receiving care from CEC dialysis facilities between the pre-CEC and the intervention periods relative to a comparison group of beneficiaries aligned to matched dialysis facilities that were not participating in CEC. Estimates include both waves from October 2015 - December 2019 and are the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

Dialysis Care. We expected the CEC Model to incent better vascular access practices and improve adherence to dialysis, which could in turn reduce hospitalization rates. Vascular access-related bacteremia, caused by infected catheter sites, can require hospitalization. The successful creation of arteriovenous (AV) fistulas and AV grafts can reduce risk of infection. Care coordination by the ESCOs may include referrals to vascular surgeons to increase the rate of fistula placements. Consistent with expectations, use of catheters for more than 90 days showed a statistically significant decrease of over 5%.[5] Because there was no statistically significant impact on fistula use over the four year period, it appears that the reduction in catheter use was mainly accompanied by an increase in the use of AV grafts. There was also a small increase in total outpatient dialysis sessions and a small, although not statistically significant, decline in emergency dialysis sessions, which are signs that ESCOs' reported increased efforts to promote dialysis adherence had some success.

There was no evidence of changes in patient-reported quality of dialysis care at CEC dialysis facilities. We did not expect to see changes in these measures since dialysis facilities already have financial incentives to score highly on these outcomes through the ESRD QIP,[6] and these results confirm the CEC Model has not resulted in lower dialysis quality.

Coordination of Care beyond Dialysis. Because ESCOs are accountable for all of a beneficiary's Medicare Parts A and B costs, providers have the incentive to invest in preventive services and chronic disease management activities beyond their standard dialysis care. Also, ESCOs may have an incentive to offer beneficiaries with ESRD education about hospice and end-of-life care, for instance, through their partnerships with palliative care organizations. We found that CEC beneficiaries experienced a statistically significant increase in preventive health care services, such as hemoglobin A1c (HbA1c) testing, low-density lipoprotein (LDL) cholesterol testing, dilated eye exams, and flu vaccinations. CEC reduced the likelihood of a beneficiary with ESRD overusing opioid prescriptions by 6% and improved adherence to phosphate binder use by 8%. CEC beneficiaries had more evaluation and management (E/M) primary care office visits. Unlike primary care, specialty care E/M office visits did not change significantly. CEC had no statistically significant impact on hospice use.

Hospitalizations and ED Visits. By introducing incentives for reducing total cost of care, the CEC Model was expected to reduce acute hospitalization admissions, readmissions, and ED use. CEC beneficiaries experienced statistically significant reductions in hospitalizations. Specifically, CEC reduced the number of hospital visits by 3% in the first four years of the model. There were significant reductions in circulatory and infectious hospitalizations, as well as hospitalization associated with ESRD complications. CEC beneficiaries were also 3% less likely to have a readmission and 5% less likely to have an observation stay, both changes were significant. The number of ED visits decreased under the CEC Model, but this decline was not statistically significant.

Mortality. The third annual report included an initial survival analysis to study the impact of the CEC Model on mortality. This analysis was motivated by observations of favorable trends in the Standardized Mortality Ratio in the CEC population as well as the emergence of longer average

[5] There are three types of vascular access for hemodialysis: fistulas, grafts, and catheters.
[6] https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/ESRDQIP/index.html

time since start of dialysis in CEC than in the matched comparison group. The latter could have occurred if mortality was lower in the CEC group. In this report, we updated these analyses to include data from PY4. This was a significant update because prior analyses allowed limited follow up time for patients aligned to Wave 2 ESCOs. Overall, the CEC continued to show a statistically significant, but modest, association with better patient survival. The association was stronger among patients aligned to the CEC during their first year of dialysis. There were no statistically significant differences in survival between Waves.

Medicare Payments across the Continuum of Care. ESCOs were able to reduce costs mainly through a reduction in payments for hospitalizations, although the overall impact on payments was modest. Average total Medicare Part A and Part B standardized payments, our measure of overall Medicare payments, decreased from the pre-CEC period to PY4 for both the CEC and comparison group beneficiaries. The decrease in PBPM payments was greater for the CEC group, resulting in a 1% relative reduction ($80) for CEC beneficiaries. These cumulative impacts on PBPM payments are somewhat smaller than the estimated impacts through PY2 (2%, or $114) and PY3 (2%, $93), shown in the previous annual reports.[7] Medicare PBPM payment declines for CEC beneficiaries relative to the comparison group were driven by lower payments for hospitalization ($51) and readmissions ($27), with partially offsetting increases in payments for office visits ($1) and dialysis ($7).

Waves 1 and 2 also experienced different results in PBPM costs (see **Exhibit ES-4** for a comparison of Wave 1 and Wave 2 estimated payment reductions). The decline in payments was driven by Wave 1 ESCOs. While the average reduction in PBPM payments for all ESCOs was $80, estimates were smaller and not statistically significant for Wave 2 ESCOs ($49 in their first performance year versus $150 for Wave 1 ESCOs in their first performance year). The reduction in PBPM payments for Wave 2 ESCOs was $42 in the second performance year, compared with $186 in Waves 1 ESCOs. The reduction in PBPM payments for Wave 2 ESCOs was $16 in their third performance year, compared with $79 in Waves 1 ESCOs. Notably, Wave 1 ESCOs continued to reduce PBPM payments during their fourth performance year (by $102).

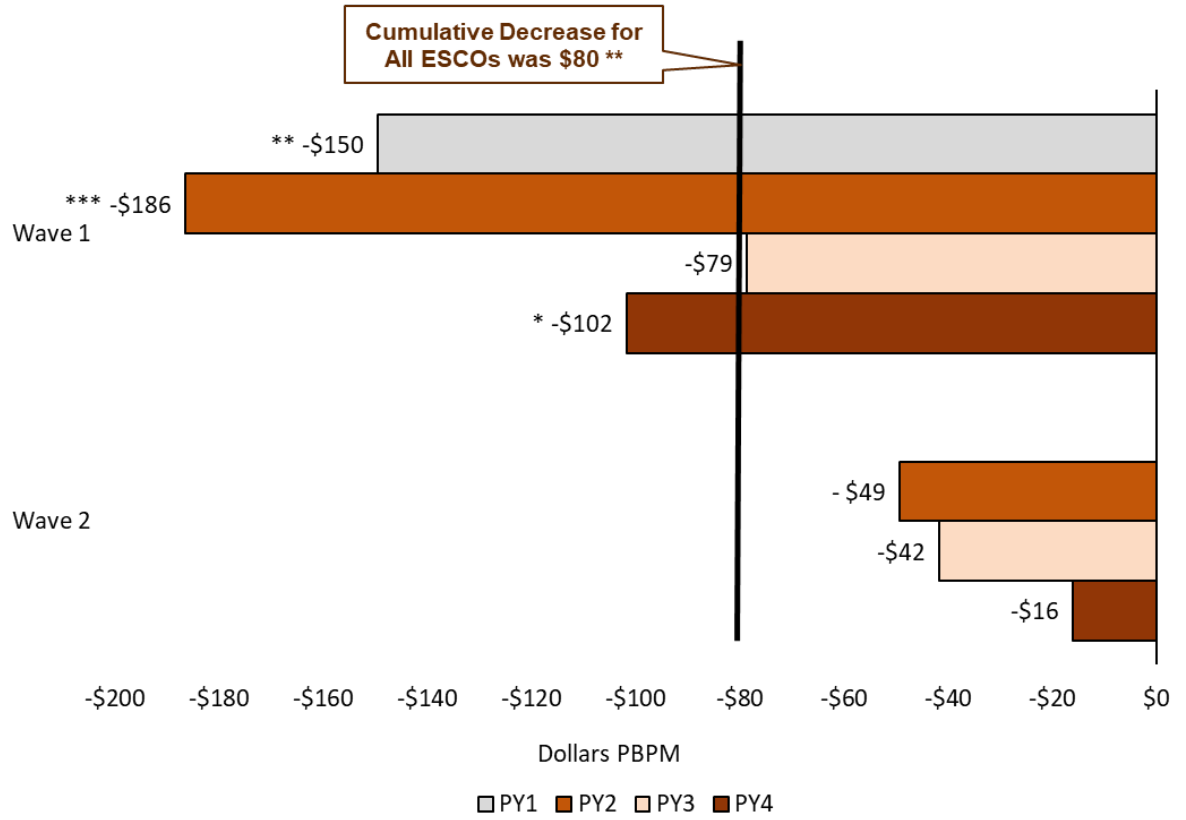
The smaller decline in Medicare payments in Wave 2 ESCOs and the improvement in PY4 performance over PY3 for Wave 1 ESCOs might be attributable to differences in facilities across waves. Whereas Wave 1 ESCO facilities had higher Medicare payments and higher standardized hospitalization and readmission rates prior to joining than non-CEC facilities, those joining in Wave 2 had lower payments and lower standardized readmission rates prior to joining than non-CEC facilities. This suggests that the facilities in Wave 2 ESCOs may have had less room to improve on their pre-CEC performance. In general, PY4 joiners were relatively high cost facilities compared to their market average for both waves, however, we observed a divergence in market characteristics by Wave. Wave 1 PY4 joiner facilities were in more metropolitan markets with higher populations, higher incomes, and lower rates of poverty than the Wave 1 PY3 joiners. These new Wave 1 facilities are more akin to the original joiners, than additions of the previous year. In contrast, Wave 2 PY4 joiners continued to expand in a similar fashion as they did in PY3. The Wave 2 PY4 joiners' facilities, are in less metropolitan areas, with lower

[7] See CEC Model Performance Year 2 Evaluation Report (at https://innovation.cms.gov/Files/reports/cec-annrpt-py2.pdf) and Year 3 Evaluation Report (at https://innovation.cms.gov/data-and-reports/2020/cec-annrpt-py3).

populations and lower median household income. The combination of these factors may have presented challenges to reducing payments for Wave 2 ESCOs.

Additionally, Wave 1 and Wave 2 had different "lead-in" periods. Delays in the start date for Wave 1 may have allowed greater preparation time and may have contributed to differences in outcomes across the two waves. Wave 1 ESCOs may contain more motivated participants that were willing to be early adopters, while at least some Wave 2 nephrologist participants may have been motivated more strongly by gaining exemption from Merit-Based Incentive Payment System (MIPS) requirements and the payment bonus associated with participating in an Advanced APM than by enthusiasm for the model. Wave 2 also did not experience the same magnitude of improvement in its second performance year relative to its first that was seen in Wave 1's second performance year.

Exhibit ES-4. Impact of CEC on Total Part A and Part B Medicare Payments PBPM



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-28-E-30.**

6. What Were the Differences in Performance Between the CEC and Primary Care-Based ACO Models?

We found key differences in performance between the CEC Model and the primary care-based ACO models, relative to a FFS comparison group, for four of the six outcomes that we evaluated. Specifically, Medicare payments, hospitalizations, and readmissions significantly decreased and fistula use increased among FFS beneficiaries with ESRD who became aligned to CEC during the first year after alignment. Conversely, FFS beneficiaries with ESRD who were newly aligned to a primary care-based ACO experienced no statistically significant impacts.

7. Were There Unintended Consequences of the CEC Model?

While the CEC Model is intended to create incentives for more efficient and/or higher quality care, it is also important to monitor for potential unintended consequences. We examined if the model inadvertently shifted payments to parts of the Medicare program for which the ESCOs are not accountable (Part D prescription drug benefit); resulted in implicit or explicit selection of more favorable patients; reduced transplant waitlist participation; or decreased utilization of calcimimetics. Our analyses found that total Medicare Part D drug costs had increased slightly in PY3 and PY4, under the CEC Model. The increase is not considered an adverse unintended consequence of the CEC Model. The increase in Part D spending appears to reflect both an increase in adherence to phosphate binders under the CEC Model and a relative increase in higher cost formulations by CEC beneficiaries. There was no evidence of adverse patient selection or decreased use of calcimimetics under the CEC Model. Finally, there was no evidence that participation in CEC impacted transplant waiting list participation.

C. Discussion

From the first four years of experience, the CEC Model appears promising, with lower payments, improvements in some utilization measures, and no obvious indicators of unintended or adverse consequences. Part A and B Medicare PBPM payments declined by $80. Relative to the average payments in the pre-CEC period ($6,394), this represents a decrease in payments of 1%. The payment reductions were most evident in Medicare Part A with significant reductions in acute inpatient hospitalizations and readmissions. Reductions in utilization paralleled the payment reductions, with significant declines in hospitalizations and readmissions. The number of dialysis treatments increased, which could be a consequence of fewer missed treatments or scheduling an extra dialysis treatment (e.g., to manage fluid overload). Hospitalizations and payments for dialysis- related complications declined. Significant reductions in catheter use were also observed, suggesting overall improvements in the quality of dialysis care, along with improvements in preventive services.

Utilization and payment results reinforce the qualitative findings from ESCO site visits. Improving coordination of care across settings was cited as a key objective by the ESCOs, backed by new investments in areas such as care coordination staff and IT to facilitate enhanced communication across providers. Reducing hospitalizations and readmissions was a particular area of emphasis. Similarly, the observed increase in the number of dialysis treatments may reflect a decrease in skipped outpatient treatments, either directly or indirectly (due to less time in hospital), which was another key emphasis cited by the ESCOs and supported by quantitative analyses showing an increase in the likelihood of receiving dialysis as scheduled and having missed treatments re-

scheduled under the CEC Model relative to the comparison group. It could also reflect extra treatments provided to remove more fluid to avoid an ED visit. Many ESCOs sought to improve communications with local EDs in order to divert beneficiaries with conditions such as fluid overload from the inpatient setting. Attempts to increase communication with the ED were sometimes coupled with having extra dialysis chairs available and extended hours to facilitate rescheduled or extra treatments. Overall, many of the care redesign strategies were enhancements or more formal extensions of processes in existence prior to the implementation of the CEC Model. Most of the changes in structure and operations reported by Wave 2 ESCOs in PY4 relative to PY2 were refinements of activities rather than major restructuring. Many ESCOs felt that building partnerships with hospice and palliative care providers was important, but it was an area where their efforts continued to lag behind other initiatives. More generally, ESCO representatives identified varied levels of engagement of non-participating providers as a challenge that may have limited the reductions in payments that were achieved.

An analysis of mortality showed that the CEC was associated with better survival, similar to the findings reported in AR3. Although the magnitude of the effect was modest, it appeared to be stronger for beneficiaries aligned earlier in their course of dialysis. This association should continue to be monitored as more beneficiary follow-up time accrues. Other measured model effects, such as the increase in dialysis treatments and declines in hospitalizations overall and specifically due to dialysis complications are potential mechanisms that might underlie improved survival.

The CEC experience can inform efforts to develop specialty-oriented ACOs focusing on clinical populations with other chronic conditions such as diabetes, HIV, or congestive heart failure. The dialysis-dependent ESRD population may be a particularly appropriate population for the development of a specialty-oriented ACO, such as the CEC Model, because the dialysis schedule inherently creates frequent and regular interaction between patients and the at-risk entities (dialysis facilities and nephrologists). Hemodialysis patients visit the dialysis unit three times weekly and see the nephrologist three to four times monthly. Home dialysis patients have less frequent (typically monthly), but still regular, contact. Frequent and regular contact with the ACO's at-risk entities may provide opportunities to monitor patient condition and intervene to improve outcomes. For example, ESCO site visit participants commonly reported that the ESCO would reach out to the patient to determine the cause of a missed treatment and attempt to reschedule it to reduce the risk of adverse outcomes. In addition, ESCOs emphasized the importance of having multiple providers reiterate and reinforce patient education messages to help patients remember and adopt the guidance provided. Such opportunities to intervene are inherently more sporadic and variable across patients in the context of both primary care-based ACOs and hypothetical specialty-oriented ACOs that could be developed for other conditions. Therefore, positive outcomes for the CEC Model might not be directly generalizable to populations with other chronic illnesses, such as diabetes, HIV, or congestive heart failure. Nonetheless, the CEC experience could still provide lessons about the potential benefits of specialty providers increasing their responsibilities in an ACO context, whether that ACO is entirely comprised of a population with a particular chronic condition or only represents a defined subpopulation within a primary care-based ACO.

There are several limitations to the findings in this report. First, because CEC is a voluntary model, the ESCOs are not representative of the population of Medicare dialysis providers,

limiting our ability to generalize the results presented here to all Medicare dialysis providers or all FFS ESRD dialysis beneficiaries. However, the addition of new participants in PY2 and new facilities in PY3 and PY4 increased the representation of markets participating in CEC. Another limitation is that, although the analysis employed matching methods to select an appropriate comparison group to infer counterfactual outcomes for the ESCOs, the characteristics we selected for matching and the specificity of the data may not adequately account for all differences between CEC and comparison facilities and their beneficiaries. There may also be unobservable characteristics, such as motivation to participate in an Advanced APM which we cannot sufficiently control for with secondary data.

The final evaluation report will complete the evaluation for the duration of the model.

I. Introduction

The Centers for Medicare & Medicaid Services (CMS) launched the Comprehensive End-Stage Renal Disease (ESRD) Care (CEC) Model in 2015 under the authority of the Center for Medicare & Medicaid Innovation (CMMI). The CEC Model is designed to improve clinical and patient-centered outcomes for Medicare beneficiaries with ESRD while promoting value and reducing per capita payments. Under the CEC Model, dialysis facilities, nephrologists, and other providers can partner to form ESRD Seamless Care Organizations (ESCOs). ESCOs act as specialty-oriented accountable care organizations (ACOs), which assume responsibility for the complete care and costs of their aligned Medicare fee-for-service (FFS) beneficiaries with ESRD. The CEC Model promotes comprehensive and coordinated care and improved access to services. The CEC Model expands the reach of recent value-based payment initiatives targeting dialysis-related care such as the ESRD Prospective Payment System (PPS) and the ESRD Quality Incentive Program (QIP).[8]

The Lewin Group, Inc. (Lewin), along with its partners, the University of Michigan's Kidney Epidemiology and Cost Center, and General Dynamics Information Technology, are under contract to CMS to evaluate the first five years of the CEC Model. The goal of the evaluation is to assess the impact of the CEC Model on the quality of care and health outcomes of its beneficiaries with ESRD, as well as their utilization of inpatient/outpatient services and Medicare payments.

This report is the fourth of five annual reports. It covers the 37 ESCOs operating during the first four performance years (PYs) of the model from October 1, 2015 through December 31, 2019. Of these 37 ESCOs, 13 (Wave 1) joined at the start of PY1 on October 1, 2015 and 24 (Wave 2) joined the CEC Model on January 1, 2017, at the start of PY2. Several Wave 1 and 2 ESCOs added facilities in PY3 and PY4.[9] Overall, the number of CEC participating facilities increased from 216 in PY1, to 685 in PY2, to 1,066 in PY3 and 1,210 through PY4.

Research Questions

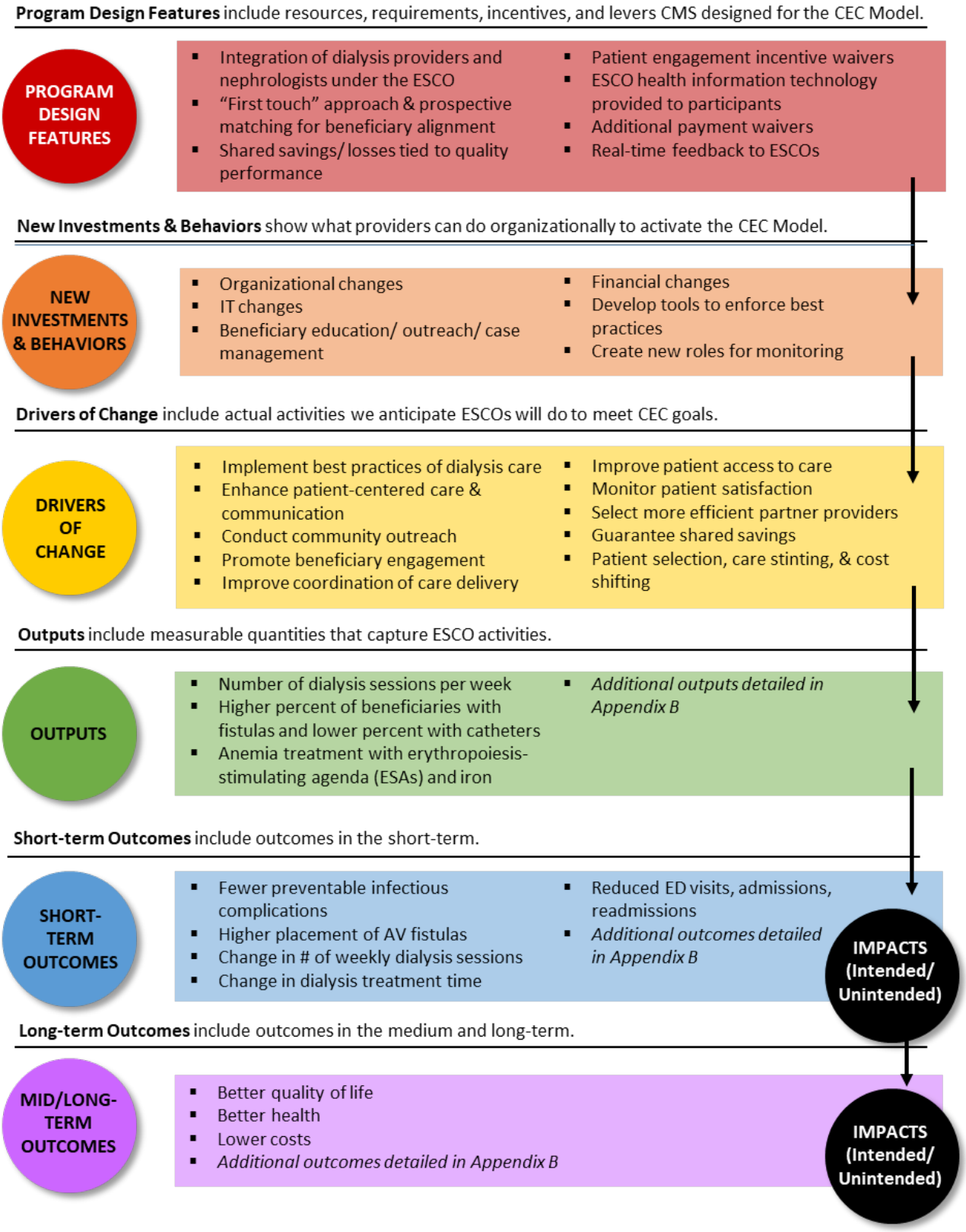
The fourth annual report (AR4) is organized to address several core research questions[10] as detailed below. We generated these research questions based on the conceptual framework, or logic model, of the CEC Model shown in **Exhibit 1**.

[8] See the CEC Model Performance Year 1 Annual Evaluation Report (https://innovation.cms.gov/Files/reports/cec-annrpt-py1.pdf) and the CEC Model website (https://innovation.cms.gov/initiatives/comprehensive-ESRD-care/) for additional information on the CEC Model.

[9] For more information, please see **Appendix F**.

[10] Formative evaluation research questions focus on characteristics of participants, entry decisions, investments by participants, care redesign approaches, implementation challenges, scalability and sustainability, and stories of success. Summative evaluation research questions assess impact in better care, better health, payments and utilization, and unintended consequences.

Exhibit 1. CEC Evaluation Logic Model (Abbreviated Version)



The conceptual framework that describes our understanding of the resources ESCOs bring to the CEC Model, the design features and incentives that are put in place under the CEC Model, the actions and behaviors that participants may take, and the outcomes that may be achieved are provided in **Exhibit 1** (above) and **Appendix B**.

1. Who Participates in the CEC Model?

To provide context for the CEC Model, we describe Wave 1 and Wave 2 ESCO participants and the markets they serve and compared them to non-CEC participants and markets. We developed market profiles using data from the Provider of Service, Dialysis Facility Compare, Area Health Resource Files, and other secondary data. We also compared CEC-aligned beneficiaries to non-CEC beneficiaries to understand differences in demographic, clinical, and utilization characteristics that may influence the impact of the CEC Model on outcomes.

2. How Have Structural Features of the Wave 2 ESCOs Changed Over Time?

Using data from site visits with Wave 2 ESCOs in PY4, we assessed the structural changes Wave 2 ESCOs made since original implementation (i.e., PY2) and the barriers they have encountered.[11] Data from ESCO site visits and interviews were used to investigate their decision-making processes and motivations for these changes, as well as any obstacles they faced. We provide information about changes in partnerships dialysis organizations made to operate their ESCOs, new information technology (IT) and staff investments, and changes to use of model waivers. We summarize ESCO owners' perceptions of the model's financial and risk arrangements in its fourth year of performance. Finally, we examined the use of IT to streamline or provide access to information across all partners (through adoption of health IT platforms and other communication pathways); and any changes in financial arrangements (i.e., pay for performance, care coordination payments, and shared savings distributions) that support the achievement of model outcomes. ESCO site visit participants preferred to have patients use hospitals with which they had established strong information-sharing arrangements, but reported frustration at the perceived difficulty of influencing patients' choice of hospital. Based on these reports, a new analysis was performed to determine if ESCO patients used a narrower set of hospitals over time.

3. How Has Care Redesign Evolved Under Wave 2 ESCOs?

We examined how Wave 2 ESCOs' care redesign strategies for reducing costs, improving quality, and coordinating care have evolved since implementation in PY2. Care coordination (i.e., better coordination among providers across the continuum of care) is a key focus of care redesign in the CEC Model. Care redesign strategies included increasing availability of dialysis treatments, enhancing the structure of care coordination, diverting beneficiaries from the ED, and conducting medication reconciliation, especially following a hospitalization. Strategies to meet these goals involved enhancing patient education and improving communication between providers and between providers and beneficiaries. To identify commonalities and differences across ESCOs, we looked at data from site visits with ESCOs regarding any changes in their

[11] This report presents findings from the second round of site visits with Wave 2 ESCOs. For findings from the first round of Wave 2 ESCO site visits, please see the second annual report (https://innovation.cms.gov/Files/reports/cec-annrpt-py2.pdf).

approaches to care redesign since PY2 and reasons for these changes. Our data also allowed us to recognize challenges across ESCOs and unique innovations among participating ESCOs.

4. What Were Beneficiaries' Perceptions of the CEC Model?

We assessed beneficiaries' perceptions of the CEC Model during focus groups with those who received services at selected Wave 2 ESCO dialysis facilities. We examined their level of awareness of the CEC Model and their impressions of their care, as well as whether they noticed changes in the quality of their care since the start of the CEC Model.

5. What Were the Impacts of the CEC Model?

We evaluated the impact of the CEC Model on dialysis care, coordination of non-dialysis care, inpatient and outpatient utilization outcomes such as hospitalizations, readmission, and ED visits, and the rate of Medicare per beneficiary per month (PBPM) payments across the continuum of care during the first four performance years of the model.

First, we explored indicators related to the delivery of dialysis care, which involved assessing the model's impact on pre-dialysis care, dialysis treatment modality, use of emergency dialysis treatments, and patients' experience with dialysis care. Multiple evidence-based clinical metrics were used to assess the model's impact on the care delivered by dialysis facilities and nephrologists (e.g., establishment of permanent vascular access, number of outpatient dialysis sessions, or percent of beneficiaries with unscheduled emergency dialysis sessions). A detailed analysis of the likelihood of receiving dialysis treatments as scheduled and rescheduling treatments that were missed was added to this annual report. To assess the extent ESCOs focused on improving pre-dialysis care, we investigated the impact of the model on the percent of beneficiaries who receive nephrology care before the start of dialysis. Additionally, we used the In-Center Hemodialysis Consumer Assessment of Healthcare Providers (ICH CAHPS®) survey to assess the impact of the CEC Model on beneficiaries' self-reported experiences with dialysis care and to capture potential unintended consequences of the model.

Second, we looked at measures associated with the coordination of care beyond dialysis, such as appropriate preventive health care, disease management, and end-of-life care. These measures included flu vaccinations and diabetes-related testing (e.g., hemoglobin A1c [HbA1c] tests and diabetic eye exams), phosphate binder adherence for disease management, and hospice use for end-of-life care (given the high mortality rate in the ESRD population and the fact that several ESCOs originally aimed to focus on hospice referrals and access to palliative care resources). Since many ESRD patients are prescribed multiple medications for management of symptoms and comorbid (co-occurring) conditions, we included measures to examine medication reconciliation to assess opioid overutilization and any changes in use of contraindicated medications. We also included measures that evaluated the potential impact of the CEC Model on the quality of care associated with diseases that often accompany ESRD (e.g., diabetes, congestive heart failure [CHF]).

Third, we examined changes in utilization of distinct inpatient and outpatient services received by beneficiaries with ESRD related to hospitalizations, readmissions, ED visits, and outpatient visits with other providers. Given that reducing inpatient utilization has been identified as an area for needed improvement in ESRD care and was the primary focus of most ESCOs, we were especially interested in this outcome and any changes over the four performance years. Because

patients with ESRD often have comorbid conditions and CEC is intended to help providers focus on the continuum of care, we also looked at cause-specific hospital admissions related to diabetes, CHF, and infections.

Fourth, an analysis of survival, comparing CEC beneficiaries to those in the matched comparison group, was estimated for the first time.

Finally, because ESCOs are expected to redesign care and adopt cost-saving strategies, this fourth annual report examines changes in the costs of care, using Medicare standardized payments for total Part A and Part B services and payments by type of services.[12] We also conducted additional analysis that targeted payments for claims specifically associated with hospitalizations for ESRD complications, as well as institutional post-acute care costs. All analyses accounted for the case-mix of beneficiaries by matching on key demographic, clinical, and utilization characteristics.

6. What Were the Differences in Performance between the CEC and Primary Care-Based ACO Models?

We evaluated whether ESCOs in the CEC Model were better able to provide care for Medicare beneficiaries with ESRD than primary care-based ACOs by exploring whether beneficiaries with ESRD who became aligned to CEC had better outcomes than those who became aligned to a primary care-based ACO. The results illustrate the performance of each of the care models relative to a baseline period before beneficiaries are aligned to a model.

7. Were There Unintended Consequences of the CEC Model?

ESCOs may employ multiple approaches to reduce their costs of care under the CEC Model. Strategies to deliver care more efficiently or coordinate care across providers may improve quality of care and health outcomes while reducing costs. However, strategies such as stinting on care, postponing care, changing referral patterns and transplant strategies, or substituting inferior or inappropriate services could result in worse quality of care and quality of life for beneficiaries. Still other strategies could reduce the cost of care for CEC beneficiaries while increasing costs to other payers, including other parts of the Medicare program (Medicare Part D) or Medicaid.

To assess whether the CEC Model had unintended consequences for CEC beneficiaries, we examined the impact of the CEC Model on Part D drug costs and waitlisting for transplants. We also used Medicare claims data to assess referral patterns for dialysis to explore whether nephrologists were selectively referring healthier patients to ESCO facilities. Lastly, we explored the relative changes in the use of calcimimetics before and after these drugs were moved from Part D to Part B for CEC participants and the comparison group.

[12] These amounts combine the Medicare payments with the patient coinsurance and copayment amounts. Then, these amounts are standardized to remove the effects of wage differences and for teaching status and other policy adjustments.

II. What Shifts Have Occurred in ESCO Participation?

Thirty-three of the 37 ESCOs that ever participated in CEC remained in the model in PY4. Remaining ESCOs continued to expand in PY4 increasing the number of facilities and owner nephrologists as well as expanding regional representation which allowed ESCOs to reach more patients. In PY4, 33 ESCOs included 1,172 facilities (16% of dialysis facilities in the U.S.). In addition, 14% of the fee-for-service Medicare population was aligned to an ESCO. Reasons for expansion included adding facilities where CEC nephrologists had medical directorships, responding to relaxation of the CBSA restriction, or standardizing care across facilities. No new ESCOs were created after PY2 and four ESCOs terminated participation in the model in PY4.[13] ESCOs added 144 facilities and expanded into 4 new Medicare Core-Based Statistical Areas (CBSAs) between PY3 and PY4.

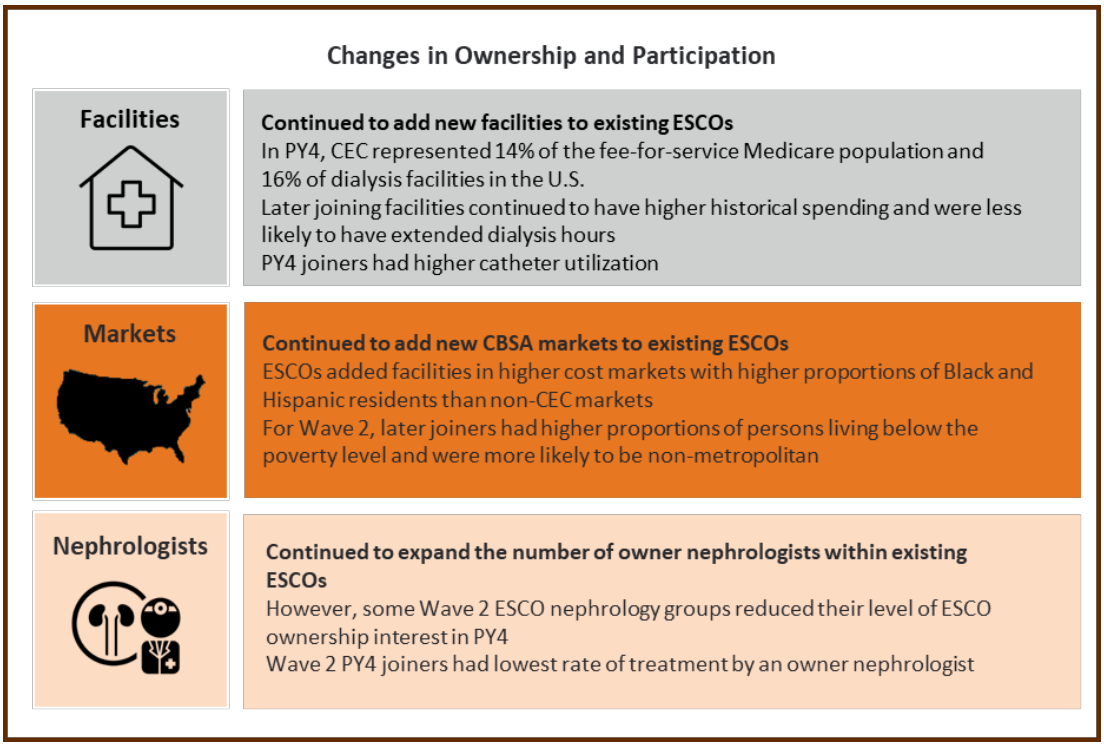
Nephrologists joined the CEC model each year, bringing the count of owner nephrologists from 247 in the first quarter of PY1 to 1,719 in the final quarter of PY4, an increase of 103 from one year prior. The reduction in reporting requirements for CEC Model participants authorized under the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) and the payment bonus associated with participating an Advanced Alternative Payment Models, continued to encourage participation of nephrologists through PY4. Additional owner nephrologists increased the opportunity for beneficiaries aligned to facilities new to the model to be treated by a nephrologist who faced the CEC care incentives.

> *"Not having to do MACRA or MIPS was a huge thing and you got the 5% Medicare [bonus]."*
>
> – ESCO Site Visit Participant

> *"It's not even so much the MACRA bonus, it's just the not getting a pay cut because none of the metrics for MIPS are really applicable at all to a nephrology practice…You end up doing a bunch of meaningless work to try to keep your money the same that doesn't positively impact outcomes."*
>
> – ESCO Site Visit Participant

[13] Through their tenure the four ESCOs that terminated model participation in PY4, included 71 facilities.

A. Key Findings



B. Methods

We constructed a dialysis facility dataset, based on data from CMS, that included facility-level characteristics from the 2015 Dialysis Facility Compare database and a summary of 2012-2014 Medicare claims, as well as market-level characteristics from 2014 based on the Area Health Resource Files, and the Census American Community Survey. We aggregated county-level characteristics to the CBSA level[14] by weighting individual county observations by population. CEC markets were defined as those CBSAs that had at least one CEC facility, while non-CEC CBSAs were those without CEC facilities. In addition, in PY4, we conducted site visits with 11 Wave 2 ESCOs including all three participating non-LDOs, DCI, and a sample of Fresenius ESCOs. See **Appendix C** for a discussion of site visit selection criteria, data collection procedures, protocol development, and analysis methods.

C. Results

The discussion below describes the growth in ESCO and facility participation, nephrologist participation and geographic representation.

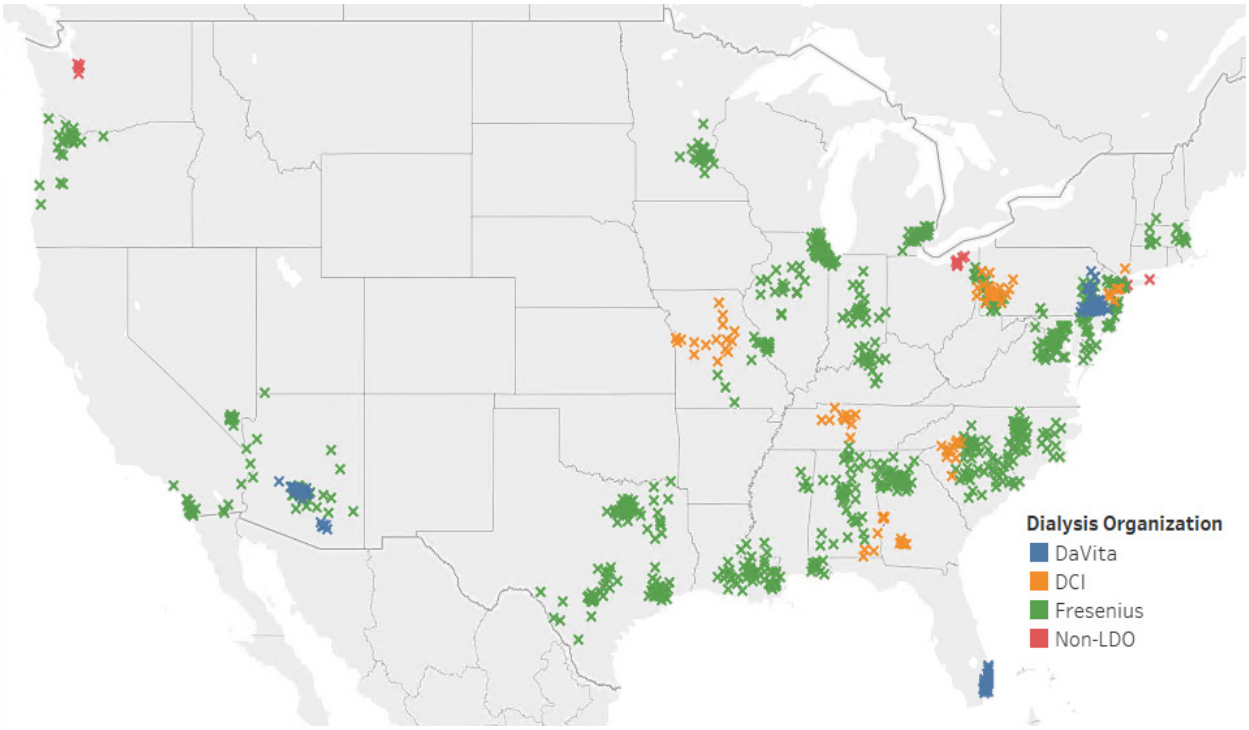
1. What Changes Have Occurred Among Participating Facilities?

The 37 ESCOs participating in the CEC Model from PY1 to PY4 represent three large dialysis organizations (LDOs)—DaVita, Fresenius, and DCI—and four small dialysis organizations, or non-LDOs—Atlantic, Centers for Dialysis Care (CDC), Northwest Kidney Centers (NKC) and

[14] CBSAs are Metropolitan CBSAs, with each CBSA Division separated, and based on the Office of Management and Budget CBSA definition.

Rogosin. Collectively, ESCOs included 1,210 dialysis facilities across 32 states and Washington, D.C. CEC facilities represented about 16% of all dialysis facilities nationally in PY4, where ESCOs had an average of around 33 facilities each, ranging from 3 to 81 facilities per ESCO. A visualization of the location of participating facilities can be found in **Exhibit 2**.

Exhibit 2. Location of CEC Dialysis Facilities



Source: CEC Model participation data extracted from Salesforce on 01/28/2020.

The characteristics observed in 2014 (before the start of the model) for Wave 1 and Wave 2 CEC facilities and non-CEC facilities are compared in **Exhibit 3**. CEC facilities associated with Fresenius, DaVita, and DCI, and Fresenius represented 73%, 9%, and 7% of all CEC facilities, respectively. Combined, non-LDOs (Atlantic, CDC, NKC, and Rogosin) represented the remaining 11%. DaVita, Fresenius, non-LDO, and DCI represented 41%, 30%, 26%, and 3% of non-CEC facilities, respectively. LDO ESCOs were larger than non-LDO ESCOs, with around 36 dialysis facilities on average versus 7 dialysis facilities on average. In addition, the distribution by dialysis organization varied across the two waves, where Fresenius facilities represented a lower share of Wave 1 facilities (60%) than Wave 2 facilities (81%). DaVita facilities represented 26% of Wave 1 facilities, but the LDO did not add any new ESCOs in Wave 2.

Facility quality and cost characteristics. CEC and non-CEC facilities are similar on many key quality and cost characteristics, including catheter and fistula use; Medicare payments PBPM; standardized hospitalization and readmission ratios; and the percent of patients with no prior nephrology care. CEC facilities differed from non-CEC facilities with lower standardized mortality ratios (0.97 and 1.01, respectively) and fewer patients new to dialysis (11% and 15%, respectively). These characteristics are also similar across CEC waves, with the exception of higher average Medicare PBPM payments for Wave 1 facilities.

Facility capacity characteristics. Compared to non-CEC facilities, CEC facilities had, on average, two more dialysis stations and treated around 13 more Medicare beneficiaries per month. More CEC facilities offered extended hours (i.e., the facility is open after 5pm). A smaller proportion of CEC facilities (45%) offered peritoneal dialysis relative to non-CEC facilities (61%). These characteristics varied by CEC wave. Wave 2 facilities were more likely to offer late shift dialysis than Wave 1 facilities. Wave 1 facilities had higher average number of dialysis stations and Medicare beneficiaries per month relative to Wave 2 facilities.

Exhibit 3. Characteristics of CEC Facilities and Non-CEC Facilities in 2014[15,16]

Characteristic	Wave 1 CEC Facilities (N=438) Mean	Wave 2 CEC Facilities (N=772) Mean	All CEC Facilities (N=1,210) Mean	Non-CEC Facilities (N=5,229) Mean
For-Profit Facility	91.7%	91.3%	91.4%	87.6%
Chain-Owned Facility	91.9%	91.5%	91.6%	87.4%
Number of Dialysis Stations	20.5	18.6	19.3	17.0
Late Shift (facility is open after 5pm)	16.1%	21.2%	19.4%	16.4%
Peritoneal Dialysis Offered	43.4%	46.2%	45.2%	61.3%
Average Medicare Beneficiaries per Month	71.2	57.8	62.8	50.2
Hemodialysis Beneficiary Count	67.5	54.2	59.1	46.5
Peritoneal Dialysis Beneficiary Count	5.4	5.0	5.1	5.3
Percent of Patients on Hemodialysis	94.3%	94.3%	94.3%	91.9%
Percent of Patients on Peritoneal Dialysis	8.3%	8.3%	8.3%	11.3%
Percent of Patients with Vascular Catheter	9.7%	9.6%	9.6%	10.9%
Percent of Patients with Arteriovenous Fistula	60.8%	63.3%	62.4%	63.3%
Standardized Hospitalization Ratio	1.01	1.00	1.00	0.99
Standardized Mortality Ratio	0.97	0.98	0.97	1.01
Standardized Readmission Ratio	1.00	0.94	0.96	0.97
Total Part A and Part B Standardized Payment PBPM	$6,812	$6,576	$6,663	$6,602
Facility CBSA Total Part A and Part B PBPM Ratio	1.02	1.04	1.03	1.04
DaVita Indicator	25.8%	0.0%	9.3%	41.1%
DCI Indicator	7.1%	6.6%	6.8%	2.7%
Fresenius Indicator	59.8%	81.1%	73.4%	25.5%
Percent of Patients New to Dialysis	10.8%	11.1%	11.0%	14.9%
Percent of Patients with No Prior Nephrology Care	45.6%	44.4%	44.9%	45.4%

Source: Lewin analysis of the 2014 Area Health Resource Files, Dialysis Facility Compare data from 2014, CEC Model participation data from Salesforce, extracted on 01/28/2020, and Medicare claims from 2012-2014.

[15] Data were not available for select characteristics for up to 170 of the 1,210 CEC facilities. Reported mean and distribution are based on all non-missing values.

[16] Dialysis facilities that joined the CEC Model in PY5 (January 2020) and dialysis facilities without beneficiaries aligned in calendar year 2014 using the first touch method are excluded. Data were not available for select characteristics for up to 853 of the 5,229 non-CEC facilities. Reported mean and distribution are based on all non-missing values.

The characteristics observed in 2014 for each cohort of Wave 1 and Wave 2 CEC facilities are compared in **Exhibit 4**. Column headings refer to the ESCO wave and performance year joined by the facilities.

In PY4, ESCOs added facilities with higher historical (2012-2014) payments. For example, the 2012-2014 average total Part A and Part B Medicare PBPM payments among beneficiaries in facilities that joined in PY4 was 9% higher than the average for Wave 1 facilities that joined in PY1 ($7,228 vs. $6,604). Similar patterns are present when we compare Wave 2 PY4 joiners to Wave 2 earlier joiners, but to a lesser extent.

Later joining facilities continued to have higher historical spending, dual status, and ED utilization. They were also less likely to offer late shift dialysis. PY4 joiners had higher catheter utilization. Performance on historic quality measures varied by wave and joiner year.

Overall, compared to their predecessors, later-joining facilities had higher historical payments. Furthermore, PY4 joiner facilities were less likely to offer a late shift than the first joiners of their wave, which could limit their ability to accommodate missed treatments. On average, compared to the earliest joiners of their wave, beneficiaries at PY4 joining facilities had fewer months on dialysis; were more likely to be dually enrolled in Medicare and Medicaid; and higher historical utilization, including more hospitalizations, and visits to the ED. In particular, Wave 1 PY4 joiners had a slightly higher average Hierarchical Condition Category (HCC) score than the earlier joiners of their wave. Higher HCC scores represent higher predicted healthcare costs.

> *"We have four shifts…we're only closed long enough for the water to do its treatment cycle, or they would have five shifts if they were able to, so yes, we've maximized on that, and I think most of the clinics have four shifts or are headed to having four shifts."*
>
> – ESCO Site Visit Participant

Exhibit 4. Characteristics of CEC Facilities by Cohort

Characteristic	Wave 1 PY1 Joiner (N=206)	Wave 1 PY2 Joiner (N=79)	Wave 1 PY3 Joiner (N=68)	Wave 1 PY4 Joiner (N=27)	Wave 2 PY2 Joiner (N=347)	Wave 2 PY3 Joiner (N=252)	Wave 2 PY4 Joiner (N=58)
Standardized Mortality Ratio (2012-2014)	0.96	0.90	1.0	1.0	0.95	1.0	1.0
Standardized Hospitalization Ratio (2012-2014)	1.0	1.0	0.96	0.95	0.96	1.1	0.99
Standardized Readmission Ratio (2012-2014)	1.0	0.99	1.0	0.94	0.93	0.96	0.93
Late Shift Indicator	18.9%	20.3%	11.8%	7.4%	26.5%	18.3%	19.0%
Average Total Part A&B Payments PBPM (2012-2014)	$6,604	$6,637	$7,113	$7,228	$6,392	$6,567	$6,617
Facility For Profit Indicator	87.9%	96.2%	97.1%	92.6%	89.6%	93.3%	96.6%
Percent Patients with Vascular Catheter	9.3%	10.7%	9.2%	11.5%	9.6%	9.4%	11.3%
Beneficiary Count	63.7	51.4	56.4	50.5	50.8	43.3	49.1
Number of Dialysis Stations	22.1	19.8	20.9	21.2	19.6	18.7	19.1

Characteristic	Wave 1 PY1 Joiner (N=206)	Wave 1 PY2 Joiner (N=79)	Wave 1 PY3 Joiner (N=68)	Wave 1 PY4 Joiner (N=27)	Wave 2 PY2 Joiner (N=347)	Wave 2 PY3 Joiner (N=252)	Wave 2 PY4 Joiner (N=58)
Percent with No Prior Nephrology Care	44.6%	52.7%	44.0%	44.9%	43.3%	46.1%	44.0%
Percent Hemodialysis	96.0%	95.9%	97.3%	97.9%	95.8%	95.9%	95.8%
Percent of Beneficiaries with an ED visit in a given month (2014)	10.9%	10.4%	11.9%	12.1%	11.2%	12.5%	13.4%
Percent of Beneficiaries with a Readmission in a given month (2014)	28.6%	28.1%	30.8%	29.1%	28.2%	29.0%	28.0%
Percent of Beneficiaries with a Hospitalization in a given month (2014)	11.5%	12.0%	12.5%	12.6%	11.6%	12.2%	12.3%
Months on Dialysis (2014)	63.2	60.7	60.8	61.1	63.1	61.8	59.7
Percent of Beneficiaries with Dual Medicare-Medicaid Status (2014)	46.9%	50.9%	51.0%	49.9%	45.0%	47.9%	50.7%
Average HCC Score[17] *(2014)*	1.05	1.08	1.07	1.10	1.07	1.07	1.07

Source: Lewin analysis of the 2014 Area Health Resource Files; Dialysis Facility Compare data from 2014; CEC Model participation data from Salesforce, extracted on 01/28/2020.; and Medicare claims from 2012-2014.

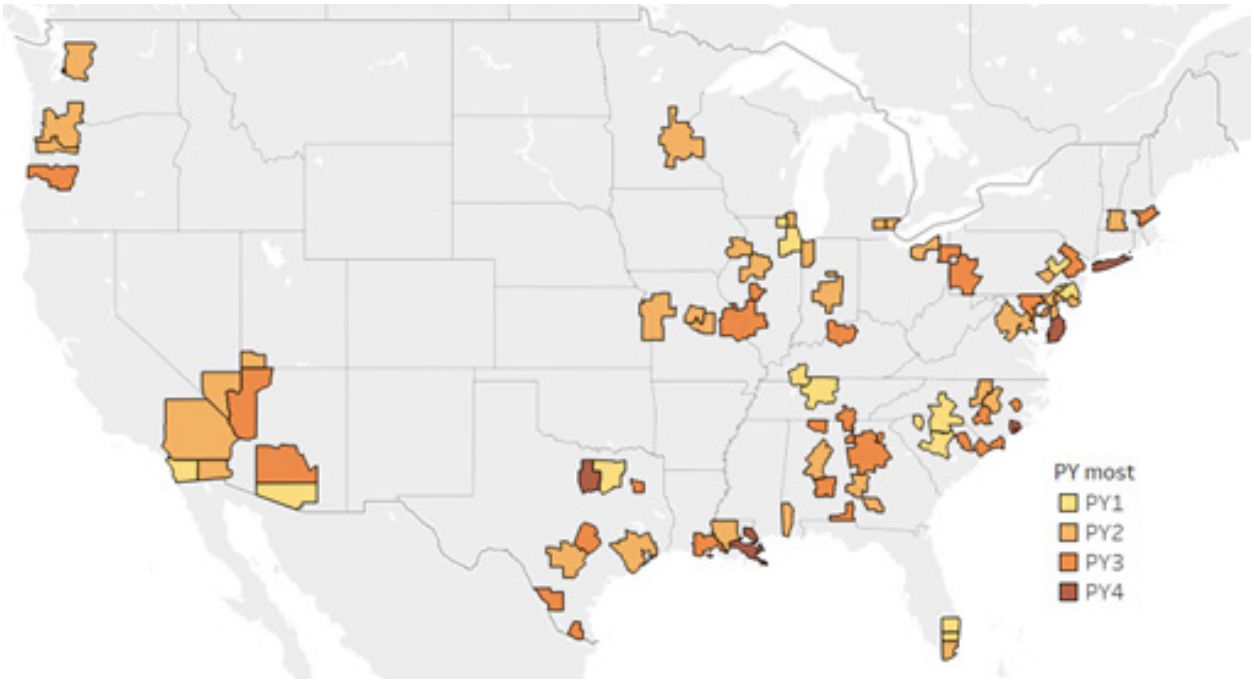
Note: Reported means and distributions are based on CEC facilities included in the analytic sample. See **Appendix E** for a description of the analytic sample.

2. What Changes Have Occurred in the Characteristics of the Markets in which ESCOs Participate?

We examined whether the CBSAs in which CEC dialysis facilities were located were similar to CBSAs not containing CEC facilities across the United States. In 2014, 384 of the 389 CBSAs had at least one dialysis facility. Beginning in PY2, the market definition changed to cover no more than three contiguous Medicare CBSAs with permissible inclusion of contiguous rural counties not included in the Medicare CBSA, instead of instead of two. This allowed ESCOs to increase their presence across CBSAs and into rural areas. In 2019, CEC facilities were located in 91 CBSAs, as illustrated by the map in **Exhibit 5**.

[17] We calculate the average HCC score at the facility-level for the CEC group using V21, and ESRD specific version, of CMS HCC risk score model.

Exhibit 5. CBSAs with CEC Facilities



Source: Dialysis Facility Compare data from 2014 and CEC Model participation data extracted from Salesforce on 01/28/2020

Markets with CEC facilities (CEC CBSAs) differed from those without CEC facilities (non-CEC CBSAs) in some dimensions, including population size, median income, racial and ethnic demographics, and types of providers. The market characteristics of CBSAs with and without CEC facilities are compared in **Exhibit 6**. CEC CBSAs included many of the largest population centers in the United States, where the average CEC CBSA had a population three times larger than the average non-CEC CBSA. Compared to non-CEC CBSAs, markets where ESCOs chose to participate had beneficiaries with ESRD who had higher total Medicare Part A and Part B standardized payments. CEC CBSAs also had a higher median income as well as a higher proportion of Black and Hispanic residents. CEC CBSAs tended to have a higher rate of specialists per 10,000 residents but lower access to skilled nursing facility (SNF) beds per 10,000 residents, relative to non-CEC CBSAs. CEC CBSAs also had fewer dialysis facilities per 10,000 residents, even though these CBSAs had a similar prevalence of ESRD.

Within CEC markets, CBSAs with Wave 1 facilities had, on average, a larger population, fewer SNF beds, a larger Hispanic population, and a lower rate of specialists per 10,000 residents than those with Wave 2 facilities. Wave 1 CBSAs also had beneficiaries with ESRD who had higher total Medicare Part A and Part B standardized payments. Wave 1 CBSAs also had fewer dialysis facilities per 10,000 residents, even though these CBSAs had a similar prevalence of ESRD.

Exhibit 6. Characteristics of Markets with and without CEC Facilities in 2014

Characteristic	Wave 1 CEC CBSAs (N=30) Mean	Wave 2 CEC CBSAs (N=64) Mean	All CEC CBSAs (N=91) Mean	All Non-CEC CBSAs (N=293) Mean
CBSA Population	2,227,304	1,425,211	1,533,546	422,953
Median Household Income	$53,604	$52,640	$52,660	$48,672
Percent White	55.5%	65.3%	62.5%	72.8%
Percent Black	15.6%	15.9%	16.0%	9.1%
Percent Hispanic	20.8%	12.0%	14.6%	11.2%
Percent 65 & Older	13.4%	13.4%	13.4%	14.4%
PCPs per 10,000	7.3	7.8	7.6	7.4
Specialists per 10,000	9.5	11.5	10.8	8.1
SNF Beds Per 10,000	45.3	52.9	50.6	56.9
Percent Dual Eligible	2.8%	2.7%	2.8%	3.0%
Hospitals with Kidney Transplant Services per 10,000	0.01	0.01	0.01	0.005
Percent with No High School Diploma	15.8%	14.3%	14.8%	14.1%
Average Total Medicare Part A and Part B Payments	$6,561	$6,350	$6,408	$6,187
Percent ESRD	0.14%	0.14%	0.14%	0.13%
Percent of ESRD with Medicare & Medicaid	51.0%	48.4%	49.3%	48.7%
Dialysis Facilities per 10,000	0.32	0.40	0.38	0. 44

Source: Lewin analysis of the 2014 Area Health Resource Files; Dialysis Facility Compare data from 2014; CEC Model participation data from Salesforce, extracted on 01/28/2020; and Medicare claims from 2012-2014.

While the common trend in the PY4 expansion, is the addition of relatively high cost facilities compared to their market average for both waves, the market characteristics by cohort in **Exhibit 7** show a divergence in the pattern of expansion of ESCOs in PY4. Wave 1 PY4 joiner facilities were in more metropolitan markets with higher population, higher income, lower rates of poverty, than the Wave 1 PY3 joiners; these new facilities are more akin to the original joiners of their wave, than additions of the previous year. In contrast, Wave 2 PY4 joiners continued to expand in a similar fashion as they did in PY3. The Wave 2 PY4 joiners' facilities, are in less metropolitan areas, with lower populations and lower median household income.

Exhibit 7. Market Characteristics by Cohort

Characteristic	Wave 1 PY1 Joiner (N=206)	Wave 1 PY2 Joiner (N=79)	Wave 1 PY3 Joiner (N=68)	Wave 1 PY4 Joiner (N=27)	Wave 2 PY2 Joiner (N=347)	Wave 2 PY3 Joiner (N=252)	Wave 2 PY4 Joiner (N=58)
Population	1,707,990	2,259,720	746,787	1,090,437	867,044	896,685	541,800
% Persons Below Poverty Level	14.8%	16.2%	19.6%	15.6%	14.9%	15.9%	17.6%
Median Household Income	$ 56,007	$ 55,734	$ 49,844	$ 56,716	$ 56,071	$ 52,775	$ 53,341
Medicare Advantage Penetration	27.2%	21.7%	20.9%	23.9%	29.7%	29.0%	27.2%
Facility/CBSA Average Total A&B Payment Ratio	0.99	0.98	1.05	1.06	1.01	1.02	1.05
% Metropolitan[18]	97.1%	92.4%	73.5%	81.5%	90.5%	84.1%	63.8%
% Urban[19]	2.9%	7.6%	26.5%	18.5%	9.5%	15.9%	34.5%

Source: Lewin analysis of the 2014 Area Health Resource Files; Dialysis Facility Compare data from 2014; CEC Model participation data from Salesforce, extracted on 01/28/2020; and Medicare claims from 2012-2014.

Note: Reported means and distributions are based on CEC facilities included in the analytic sample. See **Appendix E** for a description of the analytic sample.

3. How Has the Participation of Owner Nephrologists Changed?

Each ESCO must have at least one of each of the following included participant owners: a dialysis facility and a nephrologist and/or nephrology practice.[20] All ESCO participant owners may, but are not required to, receive shared savings payments and are liable for shared losses. Owner nephrologists are risk bearing participants in the model, and therefore have different incentives than nephrologists who are not owners in the ESCO. Similar to Wave 1 ESCOs, Wave 2 ESCO participants indicated that having nephrologists as ESCO owners helped align the physicians and dialysis staff in a shared goal to improve efficiency and quality while decreasing costs. The overall level of physician engagement was viewed as one of the factors driving the success of an ESCO, although physician engagement was not uniform across all sites within a given ESCO or between different ESCOs.

In PY4, some Wave 2 nephrology groups reduced their ESCO ownership interests from higher levels (e.g., 20-25%) in PY1 down to lower levels (e.g., 5%) in subsequent years. A wide level of physician ESCO ownership was reported by respondents ranging from 2% up to 30%. In general, nephrology groups affiliated with Fresenius tended to have higher ownership percentages than physician groups affiliated with other LDO or non-LDO ESCOs. Rationales for reducing ownership interest varied. Some ESCOs indicated that nephrologists had overestimated their ability to control the cost of care, specifically the costs of hospitalizations and overuse of

[18] Based on the 2013 Rural/Urban Continuum Codes, a facility is considered metropolitan if they are located in a metropolitan county and is considered a non-metropolitan facility otherwise. Non-metropolitan includes urban and rural counties, where the majority of CEC facilities are located in urban counties.

[19] Ibid

[20] Centers for Medicare & Medicaid Services, Center for Medicare and Medicaid Innovation, Comprehensive ESRD Care (CEC) Model, Request for Applications

medications (e.g., calcimimetics). Nephrologist frustration with the changes announced in the model operations after the CEC Model began, the inability to get accurate beneficiary alignment data and overall lack of clear and timely communication also contributed to reductions in ownership. With regards to the quality metrics impact on shared savings, one Fresenius ESCO nephrology group noted a disconnect between their favorable quality indicators and net savings that were considered disappointing. However, the ESCO model was still preferred to participating in the Merit-Based Incentive Payment System (MIPS). Similar to what was reported in AR3, ESCOs raised concerns regarding transparency and predictability of the model's financial methodology and challenges in continuing to exceed benchmarks that become stricter over time. They felt that the lack of transparency in the financial methodology makes it difficult for them to gauge whether they would have any savings or losses. In addition, one non-LDO changed from a two-sided risk model to a one-sided model in PY4. With lower levels of physician ownership and risk, their level of engagement could also decrease, which may jeopardize the incremental gains achieved by the model.

> *"It took us almost two years to get in the first numbers, so we're not expecting really quick decisions or outcomes. That's been a great frustration to us [nephrologists], too. The hard part is you make decisions now and you don't get a straight answer about what your outcome is, if the decisions that you made actually worked. So you're basically working blind for years at a time and then find out that that didn't work."*
>
> – ESCO Site Visit Participant

We analyzed whether the facility's ratio of patients to owner nephrologist was consistent across joining cohorts. If ESCOs expand through adding facilities without proportionally adding owner nephrologists, the higher patient volume per owner nephrologist coupled with less care redesign, could prove less effective for beneficiaries at later joining facilities. To determine the reach of the owner nephrologist in their ESCO's facility, we created a facility-level measure of the percent of beneficiaries who are treated by an owner nephrologist at least once within a performance year.[21] The distribution of owner nephrologist reach by performance year and cohort is shown in **Exhibit 8**.

[21] The measure presented is based on the beneficiary receiving care from an owner nephrologist (i.e., outpatient dialysis-related management services by a participating CEC nephrologist receiving a monthly capitation payment) at least once in a year. We developed another measure to describe the percent of beneficiaries who received at least half of their treatments from owner nephrologists. The conclusions using both measures are the same.

Exhibit 8. Average Percent of Beneficiaries Who Receive Treatment from an Owner Nephrologist at Least Once per Year

		PY1	PY2	PY3	PY4
Wave 1	PY1 Joiners	71%	76%	77%	77%
	PY2 Joiners		68%	60%	59%
	PY3 Joiners			74%	74%
	PY4 Joiners				77%
Wave 2	PY2 Joiners		81%	83%	83%
	PY3 Joiners			66%	71%
	PY4 Joiners				58%

On average, between 59 to 77% of beneficiaries aligned to Wave 1 ESCO facilities were treated by an owner nephrologist at least once in a performance year. Overall, the percent of aligned beneficiaries treated by owner nephrologists was similar across the four facility cohorts and over time. Although rates were consistently lowest for PY2 joiners.

"We always have good physicians [nephrologists]. But I think now, I feel like they're more a partner, with us than they ever were, with helping us meet the quality goals."

– ESCO Site Visit Participant

"What I'd like to see change would be just better communication with providers. We see mid-level providers and the doctors [nephrologists] probably aren't as involved as perhaps they should be or we all should be on the same page."

– ESCO Site Visit Participant

The Wave 2 ESCO facilities differ from Wave 1 and across PYs. Beneficiaries aligned to Wave 2 PY2 facility joiners were overall the most likely to be treated by an owner nephrologist (an average of 81% in PY2 and 83% in PY3 and PY4). However, treatment by an owner nephrologist declined in both PY3 and PY4 and Wave 2 PY4 joiner facilities have the lowest average rate of treatment by owner nephrologist at 58%.[22] Overall, we did not find any evidence that the increase in the number of facilities relative to the increase in the number of owner nephrologists of Wave 2 ESCOs in PY4 was different from Wave 1 ESCOs. This suggests that the lower rate in treatment by owner nephrologist at Wave 2 PY4 joiner facilities, is not a result of fewer owner nephrologists, but could mean that owner nephrologists were seeing fewer patients.

D. Discussion

In PY4, CEC facilities accounted for 16% of outpatient dialysis facilities nationally. Participating facilities were different than non-participating facilities in that they tended to be somewhat larger in terms of number of dialysis stations and number of Medicare beneficiaries treated, but they were similar on other key standardized outcome-related measures. The facilities that joined in PY4 had higher historical costs, and lower quality indicators related to vascular access and

[22] While Wave 2 PY3 and PY4 facility joiners are in contrast to the high treatment by owner nephrologist rates in Wave 2 PY2 joiners, these facilities appear similar to both performance years for the Wave 1 PY2 joiners in mean and distribution. For distributions of treatment by owner nephrologist by wave and performance year see **Exhibit E-4.**

emergency department utilization. The markets served by ESCOs tended to be larger than those without an ESCO. The addition of new participants in PY4 increased the representation of markets participating in CEC to include less metropolitan areas. Overall in PY4, Wave 1 ESCOs expanded in markets that were similar to PY1 and PY2 compared to the low-income and less urban PY3 markets. This is in contrast to Wave 2 ESCOs that added facilities in PY4 from markets that are relatively less metropolitan and lower income and similar to their prior years.

As these ESCOs expanded, so did their presence of owner nephrologists, which led to a relatively stable rate of treatment by owner nephrologist across joining facilities for Wave 1 ESCOs and a slight decrease for Wave 2 ESCOs. While the number of nephrologists who participated in CEC facilities grew in PY4, some Wave 2 ESCOs reported that nephrology groups decreased their level of ownership interest.

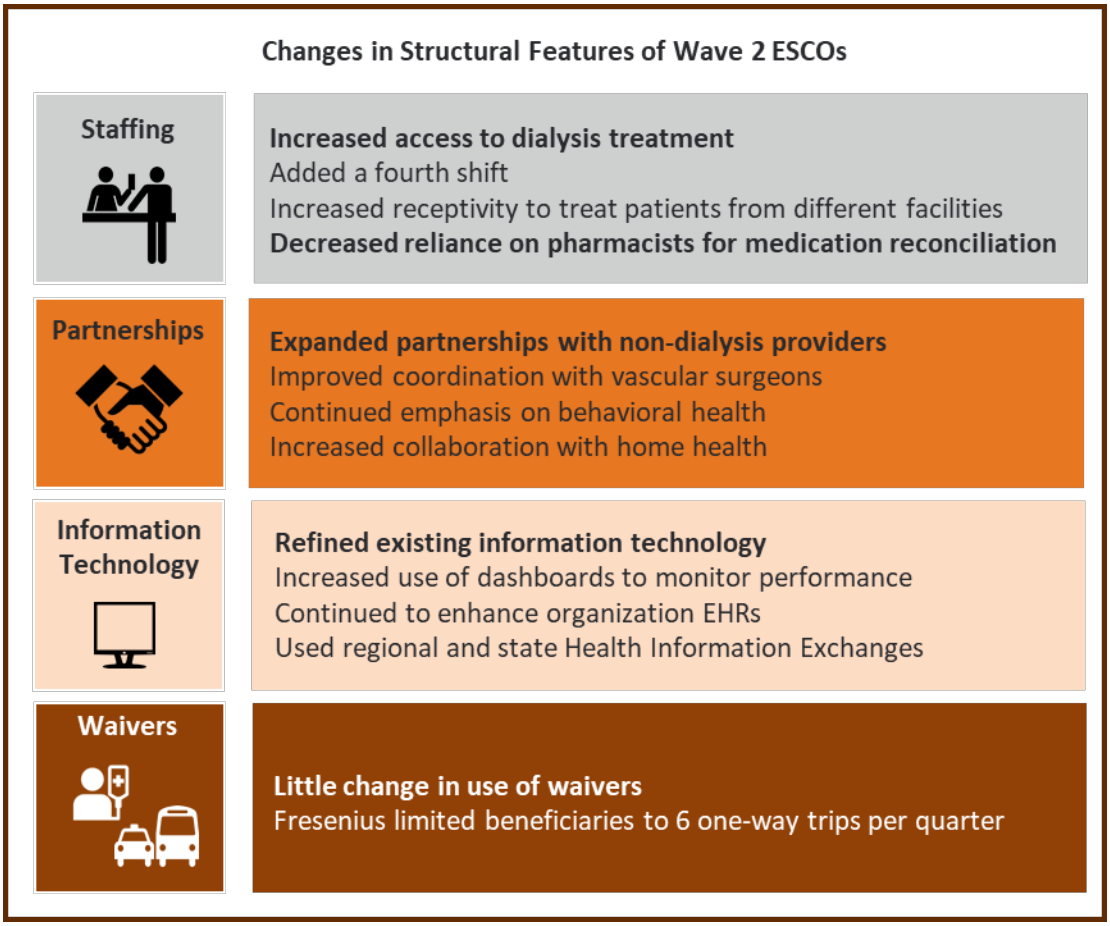
In PY4, existing ESCOs enrolled 144 facilities to the CEC Model for a total of 1,172 dialysis facilities. Fresenius, an LDO, dominated participation in the model in Wave 2. Wave 1 and Wave 2 facilities had similar characteristics, although relative share of facilities under each LDO varied from Wave 1 to Wave 2. Additionally, the CBSAs represented by Wave 1 and Wave 2 facilities differed slightly in terms of population and access to SNFs.

There were differences in facilities and beneficiary characteristics new to the CEC Model in PY4. In particular, PY4 joiner facilities had higher historical costs and higher acute care utilization than their predecessors. In general, the Wave 1 PY4 joiners more closely resembled the earlier joiners of their wave, whereas the Wave 2 PY4 joiners continued to diverge from their predecessors.

III. How Have Structural Features of the Wave 2 ESCOs Changed Over Time?

During PY2, we collected information about early model investments by Wave 2 ESCOs. These findings were provided in the Performance Year 2 Annual Evaluation Report.[23] Key findings in PY2 included improvements in electronic health records and mixed use of model transportation and oral nutritional supplement waivers. To examine these features over time, we conducted a second set of site visits with Wave 2 ESCOs in PY4. This chapter summarizes changes in staffing, partnerships with other providers, information technology (IT), and use of CEC Model waivers among Wave 2 ESCOs.

A. Key Findings



B. Methods

In PY4, we conducted site visits with 11 Wave 2 ESCOs including all three participating non-LDOs, DCI, and a sample of Fresenius ESCOs. Eighty-one in-person interviews were conducted with case management staff and physicians as well as operations, executive, data quality and

[23] https://innovation.cms.gov/Files/reports/cec-annrpt-py2.pdf

finance leadership from 27 individual dialysis facilities. See **Appendix C** for a discussion of site visit selection criteria, data collection procedures, protocol development, and analysis methods.

C. Results

1. To What Extent Have Wave 2 ESCOs Modified Staffing?

Some Wave 2 ESCOs made changes to dialysis technician, care coordination, pharmacist, and other staffing, including those described below, to accomplish diverse goals.

Dialysis Technician Availability. In PY4, Wave 2 ESCO site visit participants increased their focus on maintaining access to dialysis to provide beneficiaries with choices about when to receive treatment. This flexibility is especially important for beneficiaries to maintain jobs and manage family lives. Staff reports reflected increased emphasis on rescheduling appointments and accepting patients who were primarily dialyzed at a different facility. ESCOs were able to reschedule most treatments in the home facility with some facilities adding a fourth shift to accommodate patient schedules and in response to increased demand. Consequently, in PY4 ESCOs were less likely than in PY2 to utilize specific diversion clinics designated to accommodate extra or rescheduled treatments. In addition, some Wave 2 ESCOs reported discontinuing staffing of their 24/7 emergency phone numbers due to lack of use.

> *"More than ever in the last year or two, the focus on compliance and getting patients to come no matter what. Trying to reschedule them and encouraging them to come, the focus is enormous. Whereas it wasn't always that way years ago, but now we do whatever it takes to try to get them here. That's definitely changed."*
>
> – ESCO Site Visit Participant

Nephrologist Participation. As discussed in Section III, in PY4, some Wave 2 nephrology groups reduced their ESCO ownership interests. Many participants indicated that having nephrologists as ESCO owners has helped align the physicians and dialysis staff in a shared goal to improve efficiency and quality while decreasing costs. The overall level of physician engagement was viewed as one of the factors driving the success of an ESCO, although this was not seen uniformly across all sites within a given ESCO or between different ESCOs.

> *"A lot of the more meaningful conversations with physicians have been around the ESCO. It's been kind of an opportunity for us to collaborate with them in a more meaningful way."*
>
> – ESCO Site Visit Participant
>
> *"We still struggle with the true physician engagement…we try to get them in a meeting and I think we've had more success as of late to get more dialogue from the physicians."*
>
> – ESCO Site Visit Participant

Shifting Care Coordinator Roles. The Fresenius approach to care coordinator staffing continued to evolve in PY4. As the model matured, the Care Navigation Units (CNU) became a hybrid care model with both centralized telephonic and in-person care coordination. By PY4, the care coordination roles further evolved in the following three different positions:

1. Health Plan Service Operation Specialists who provide telephonic support and continue to set up appointments with non-dialysis providers and provide patient education, but no

longer reschedule missed dialysis treatments. ESCOs reported that it was difficult to get patients to participate in telephonic care management. The use of phone numbers that were not familiar to patients was a barrier to participation. In addition, identity verification questions required before Fresenius staff could provide information made for an awkward introduction on the phone calls. However, once engaged, patients appeared more empowered and more involved in their healthcare.

2. Intervention Specialists who provide in-person support to the ESCO's highest risk patients.
3. Prevention Specialists who provide telephonic support for patients receiving dialysis at home.

Not all ESCOs have intervention and prevention specialists, as some had challenges with implementing the CNU positions and keeping the positions filled. The intervention specialist role typically has one person supporting patients in multiple (typically around 15) facilities. Despite some challenges with implementation of the CNUs in prior years, some dialysis facility staff have begun to value the "extra eyes on the patient" provided by the CNU staff.

Pharmacist Support. Because medication reconciliation continued to be a major area of emphasis across all Wave 2 ESCOs in PY4, care coordinators, dialysis facility nurses or nephrologists conducted regular medication reconciliation, with a focus on the time period immediately following patient discharge from the hospital. While most Wave 2 ESCOs provided centralized pharmacy support for staff in PY2, only one organization reported employing pharmacists as of PY4. Other organizations that had previously employed pharmacists through the ESCOs discontinued the roles or had plans to do so in PY5.

> *"I think [the ESCO] has made the staff much more conscious about reconciling meds. Both when [patients] come in, and when they come from the hospital. We have just a great coordinator team that gets medical records so that we get on top of that sooner."*
>
> – ESCO Site Visit Participant

Additional Staff. A small number of participants reported a range of other Wave 2 ESCO and facility level staffing changes in PY4. Examples of changes at individual facilities included adding nurse practitioners to expedite the hospital follow-up process and adding a transplant coordinator to support social workers. One ESCO established a new Area Access Coordinator position to work with clinic access coordinators at clinics struggling with catheter reduction. One non-LDO added two corporate level nursing positions to coordinate hospital discharges and support rescheduling of dialysis treatments.

An In-Depth Look: Dialysis Treatment

ESCO site visit participants emphasized two recurring themes: improving patients' adherence to the dialysis schedule and increased efforts to reschedule dialysis sessions that were missed. This and prior annual reports show that the number of dialysis sessions received by beneficiaries rose under the CEC Model. However, those analyses cannot determine the extent to which this increase in treatments resulted from the decrease in hospitalizations and readmissions observed in the CEC (and hence, an increase in the proportion of time the beneficiaries can received outpatient dialysis) vs. changes in the propensity to miss treatments or to have missed treatments rescheduled. Given the significant emphasis placed by ESCO site visit participants on these two themes, we took an in-depth look at whether the CEC Model impacted beneficiaries' likelihood to miss treatments or to have missed treatments rescheduled.

Using outpatient dialysis claims, we identified the frequency and dates of dialysis sessions at the weekly level for beneficiaries aligned to ESCOs and the comparison group. To focus on adherence in the outpatient setting, the first 90 days of dialysis when schedules and frequencies may not have been fully established as well as dates of hospitalizations and ED visits were excluded. For each beneficiary-year, the dates of dialysis were used to establish the typical frequency and schedule (e.g., thrice weekly on Monday, Wednesday and Friday). For those patients routinely receiving three sessions weekly, we determined on a weekly basis how many dialysis sessions were delivered and whether they occurred on the expected days. Thus, the outcomes of interest are whether the beneficiary received three weekly treatments (vs. fewer), and whether any treatments that were missed had been rescheduled (i.e., beneficiary received the expected number of treatments but one or more was delivered later than expected, but before the next regularly scheduled treatment). Details on the measures, statistical approach and results are available in **Appendix M**.

DiD models were estimated to assess changes in adherence and treatment rescheduling before and after the intervention period among beneficiaries whose facilities joined the CEC, relative to those in the comparison group. CEC beneficiaries were significantly more likely to receive their scheduled treatments post-intervention than the comparison group. Moreover, missed treatments were significantly more likely to be rescheduled under the CEC than the comparison group. The CEC group had fewer missed treatments post-intervention, but the difference was not statistically significant. Overall, these analyses provide evidence that the efforts cited by ESCOs to ensure on time dialysis and reschedule sessions when they are missed have been successful.

2. How Have Partnerships with Non-Dialysis Providers Changed?

Wave 2 ESCOs continued to explore ways to partner with other providers to address the full range of patient needs and reduce the total cost of patient care. However, the types of providers targeted and the success of the partnerships varied by ESCO in PY4. Partnerships with hospital systems continued to be challenging for all ESCOs. Participants expressed frustration with slow discharge of patients from EDs to dialysis, difficulty obtaining discharge summaries, lack of communication with the ED, and the need to provide education repeatedly due to turnover of partner organizations' clinical and managerial staff.

Partnerships in PY4 included the following providers, programs, and organizations:

- **Vascular surgeons.** Vascular surgeons are important partners in ESRD treatment because they establish and maintain essential access sites for dialysis. One ESCO's

partnership with a vascular surgeon group is highly integrated; their vascular surgery staff participate in care coordination meetings and document directly in the ESCO's EHR. Others also described successful partnerships, with some ESCOs noting that the vascular surgeons responded more urgently to patients' access maintenance needs than before the implementation of the model. Fresenius' corporate affiliation with vascular surgery centers reportedly enhanced collaboration. However, some participants reported challenges due to shortages of vascular surgeons in their service areas.

> *"Our doctors are taking a hardline approach with our [vascular] surgeons…if it's not best for the patient and they're not doing what we need them to do [or] we can't get our patients in timely, then we're going to have to go to a different doctor. So, all of those have improved. I think the ESCO has driven that."*
>
> – ESCO Site Visit Participant

- **Behavioral health providers.** Some ESCOs have established successful partnerships with behavioral health providers, while others continue to face provider shortages. Beneficiaries in one ESCO receive chairside counseling by a behavioral healthcare specialist during dialysis. Several ESCOs anticipated implementing telehealth options under the model waiver for telehealth in 2019, but they struggled with this effort due to lack of interest among behavioral health providers. One ESCO's managers noted that they still planned to roll out behavioral telehealth in 2020, but many of their facility-based personnel had limited knowledge of the plans.
    - ESCOs continued to identify beneficiaries with behavioral health needs through screening, however, service providers are not readily available to meet the demand. When appointments are available, it can be difficult for rural beneficiaries to get to them. Behavioral health issues can also hamper patient education efforts and contribute to medication non-adherence.
- **Home health agencies.** In PY3, a Wave 1 ESCO participant described home health agencies that function as the ESCO's "eyes in the home" by providing information about patients' home environments and supports in the post-hospital discharge period. Wave 2 participants in PY4 indicated having more knowledge of which dialysis patients are also receiving home care than in the earlier years of the model, and increasing their communication accordingly.
- **Palliative care organizations and programs.** In addition to the palliative care initiatives discussed in **Section IV**, a palliative care organization representative serves on one ESCO's board of directors, and another ESCO began making referrals to a hospice provider offering hospice with dialysis.
- **Podiatrists**. One Wave 2 ESCO continued to participate in a study conducted by a university podiatrist which provided beneficiaries with free foot checks, preventive care, and shoes in the dialysis clinic. Because the study identified a large number of patients that needed podiatry care and to reduce hospitalizations related to diabetic foot issues, the ESCO is exploring ways to establish ongoing availability of podiatry services including contracting directly with or leasing facility space to the podiatrist.
- **Food Banks**. In prior years, ESCOs mentioned challenges with patient adherence to nutrition guidelines. However, for the first time in in PY4, Wave 2 ESCO site visit

participants emphasized food insecurity as a challenge for beneficiaries who are lower income or living below the poverty level. Many beneficiaries are protein malnourished and don't eat enough fresh produce. Some beneficiaries go to the hospital to get meals. Food assistance programs are available in many areas, but ESCOs described limitations:

- Besides having long waitlists and age restrictions, beneficiaries may not like the meals provided by Meals on Wheels for culinary or cultural preference reasons;
- It is hard for beneficiaries to manage transportation to food pantries, often with limited hours and which may not have dialysis-friendly foods available;
- Beneficiaries may not meet eligibility requirements for food stamps or meals programs which may not cover protein rich/dialysis friendly foods.

One Wave 2 ESCO provides $25 food gift cards to patients and suggested that food insecurity is increasing due to increased requests for the gift cards. In response, this ESCO started a pilot program with a food bank in PY4. The food bank comes to the facility twice a month to provide food to beneficiaries. Beneficiaries appreciate the service, but still have challenges related insufficient protein and produce.

An In-Depth Look: Hospital Density

During the site visits, a common theme was the importance of establishing partnerships, particularly for information-sharing, between the ESCOs and area hospitals. ESCOs stated their intent to develop formal or informal partnerships with hospitals to encourage information-sharing. ESCO participants noted that their efforts resulted in information-sharing capabilities that were stronger with some hospitals and hospital systems than with others. One by-product of these relationships is that ESCOs may try to encourage their patients to seek care at the hospitals with which the best partnerships had been developed. However, site visit participants often stated that they did not believe they could steer patients to preferred hospitals and expressed frustration that patients continued to seek care from providers that did not readily provide alerts or share data about ED visits or hospitalizations for ESCO beneficiaries.

These qualitative observations led us to analyze the extent to which hospital use changed over time among CEC beneficiaries relative to the comparison group. Although we do not have a definitive measure of the quality of information-sharing at the facility level over time, we can assess one potential consequence: based on the site visits, we would expect facilities to prefer having their patients go to hospitals where they have developed strong information-sharing partnerships. As ESCOs develop such partnerships, if they can steer beneficiaries to preferred hospitals, we would expect to see ESCO beneficiaries using fewer hospitals over time and a larger share of all admissions accounted for by the most often used hospitals.

We used inpatient claims from 2012-2019 to identify admissions for CEC aligned and comparison group beneficiaries. Our main outcome was the number of hospitals used by the patients from the same dialysis facility (CEC and comparison group facilities). Detailed description of the analyses and results can be found in **Appendix L**. Overall, ESCO facilities had a higher mean number of hospitals per facility than the comparison group. This was true both before and after the CEC intervention and across nearly all waves. Both CEC and comparison group facilities saw a decrease both over time and across most of the waves. Increases in the proportion of rural facilities and decreases in the average number of Medicare FFS beneficiaries over time explained much of the observed trends. To further evaluate hospital concentration, we introduce two metrics. The first is the percentage of admissions attributed to the hospital used by most aligned patients in a facility, i.e., top hospital. The mean percentage of admissions accounted for by the top hospital was lower for CEC than the comparison facilities. These numbers steadily decreased in all waves for both groups over time, before and after CEC intervention. Similar results were seen with proportions based on the top three, five, and ten hospitals. Using a regression model to control for differences in facility size and rural status, as well as differences between CEC and comparison facilities before the CEC intervention, our analysis showed that the number of hospitals per facility increased for the CEC facilities relative to the comparison facilities after the intervention.

These results do not support the hypothesis that ESCOs steer admissions to fewer hospitals, specifically those with which they had built stronger information-sharing relationships for care coordination efforts. Instead, they appear to confirm the site visit reports that ESCOs had difficulties influencing beneficiaries' choice of hospitals. This may be due to certain factors not entirely under the control of the ESCO such as variation in admitting privileges among nephrologists as well as patients' primary care physicians and patient preference for a particular hospital due to proximity or because that hospital accepts the patient's insurance coverage.

3. What Investments Were Made in Information Technology?

Initial IT investments by Wave 2 ESCOs were reported in the Performance Year 2 Annual Evaluation Report including ED alerts, enhanced data collection and analysis software, teleconferencing as well as providing laptops/tablets and cell phones for care coordinators.[24] In PY4, ESCOs also used secure text messaging and SharePoint sites to securely communicate patient information with team members. Most ESCOs use internally developed dashboards to monitor performance on quality metrics, some also used them to track missed treatments and fluid management. Wave 2 ESCOs continued to make enhancements to their EHR systems in PY4 similar to those reported by Wave 1 ESCOs in PY3. For example, Fresenius improved their ability to share patient EHR care notes across team members and added functionality to send care team members an alert when a case note is added. One non-LDO enhanced care management documentation and expanded discharge planning functionality within its EHR. Use of iPads or videoconferencing with pharmacists for medication reconciliation by some ESCOs was discontinued, consistent with the declining reliance on pharmacists discussed in **Section IV**.

While access to external patient information remains inconsistent, ESCO participants reported benefits of accessing regional and state Health Information Exchanges (HIEs). Several ESCOs were beginning to leverage HIEs with a range of functionality (see **Appendix A** for a list of HIEs). While consistent with the CEC Model objectives, this progress in connecting with HIEs may be more related to the efforts of the ESRD Renal Networks.

4. What is the Status of CEC Model Waiver Use among Wave 2 ESCOs?

There was little change in the use of the CEC waivers—transportation, oral nutritional supplements (ONS), patient IT, and other financial arrangements—across ESCOs between PY2 and PY4. More information about these waivers is provided in **Appendix A.**

Transportation waiver. In PY4, ESCOs continued to provide transportation to prevent missed dialysis treatments directly (by providing transportation when caregivers were not available or weather conditions made beneficiaries/caregivers hesitant to drive) and indirectly (by providing transportation for vascular access procedures needed prior to dialysis). However, participant opinions of the use and adequacy of the waiver benefit varied.

Almost all Fresenius participants deemed the waiver to be useful in preventing missed treatments and potentially reducing hospitalizations. However, due to concern that the transportation benefit was sometimes being used in non-urgent circumstances or as more than a short-term transportation solution, on October 1, 2019, quarterly use was restricted to 6 one-way trips, even if the $500 cap would not be exceeded.

> *"We've had success with it [the transportation waiver] here. Probably just like every clinic, we do have some patients that maybe overuse it. But we've had some patients that greatly benefit from it too."*
>
> – ESCO Site Visit Participant

[24] https://innovation.cms.gov/Files/reports/cec-annrpt-py2.pdf

Other Wave 2 ESCOs indicated that the majority of patients did not reach the $500 cap and concluded that the resources available under the waiver were adequate for most patients' needs. Consistent with what was reported by Wave 1 ESCOs in AR3, there was also some concern among Wave 2 ESCOs that the $500 per patient annual limit and restriction to transportation to directly dialysis-related services was not sufficient to meet transportation needs for a minority of patients. However, that concern was not raised as frequently by the Wave 2 ESCOs interviewed in PY4. This difference between Waves may be related to market characteristics. In particular, $500 was more likely to be adequate in urban areas with shorter travel distances and readily available, low-cost services like Uber or Lyft than in rural areas lacking these advantages.

> *"One patient…had a clot, he had to go to the vascular access center. His roundtrip was $395.00…the closest place is over an hour away."*
>
> – ESCO Site Visit Participant

ESCOs that did not use the waiver described other methods for addressing patient transportation needs. These methods involved making connections between patients and transportation options, establishing eligibility for other transportation benefits (e.g., Medicaid or county-level services), and distributing taxi vouchers provided by charitable organizations. One organization directly funded some patient transportation. However, they used "safe harbor" authority provided by the Department of Health and Human Services Office of Inspector General final rule that allows providers to offer free or reduced price transportation under certain conditions, rather than CEC waiver authority, to provide these benefits.[25]

Transportation challenges faced by ESCOs, whether they used the waiver or not, varied based on local circumstances. Rural facilities often encountered the greatest difficulties. Multiple ESCOs noted that county-based transportation services did not take patients across county lines for appointments. This barrier was especially noted in rural areas where, for example, a vascular access clinic might not be located in the same county as the facility. Transportation for patients who use a wheelchair was also listed as a challenge. However, some ESCOs reported that the availability of Uber and Lyft (or similar services) had been improving in their rural areas since they joined CEC.

> *"It is unrealistic to try and nourish your patients without nutritional support."*
>
> – ESCO Site Visit Participant

Other waivers. None of the other previously established waivers were discontinued in PY4. Fresenius continued to provide a financial incentive (established in PY2) to nephrologists for more timely completion of a Transition of Care form (TOC). Nephrologists document medication reconciliation and complete a discharge summary on the TOC form in order to better understand why patients were hospitalized and to prevent future hospitalizations and complications. Nephrologists with less than a 20% stake in the ESCO risk sharing with CMS can bill the ESCO for completion of the TOC form within 30 days of a hospital discharge. Another Wave 2 ESCO continued to use the oral nutritional supplement (ONS) waiver in PY4 for aligned beneficiaries meeting the waiver albumin level and the cost restrictions. This ESCO also

[25] Department of Health and Human Services. (2017, December 7). Medicare and State Health Care Programs: Fraud and Abuse; Revisions to the Safe Harbors under the Anti-Kickback Statute and Civil Monetary Penalty Rules Regarding Beneficiary Inducements. Federal Register Vol. 81, No. 235. https://www.gpo.gov/fdsys/pkg/FR-2016-12-07/pdf/2016-28297.pdf

provided ONS to all other patients using other funding sources. Other ESCOs reported using other funding sources for nutritional supplements.

Some ESCOs had attempted to implement other waivers since PY4 but were unsuccessful. One attempted to use the Patient IT waiver to provide patient education on iPads, but discontinued the program due to lack of patient interest. A few providers tried to arrange telehealth for behavioral health care, but were unsuccessful due to lack of provider interest. Only one was still planning to implement the telehealth waiver for behavioral health in 2020.

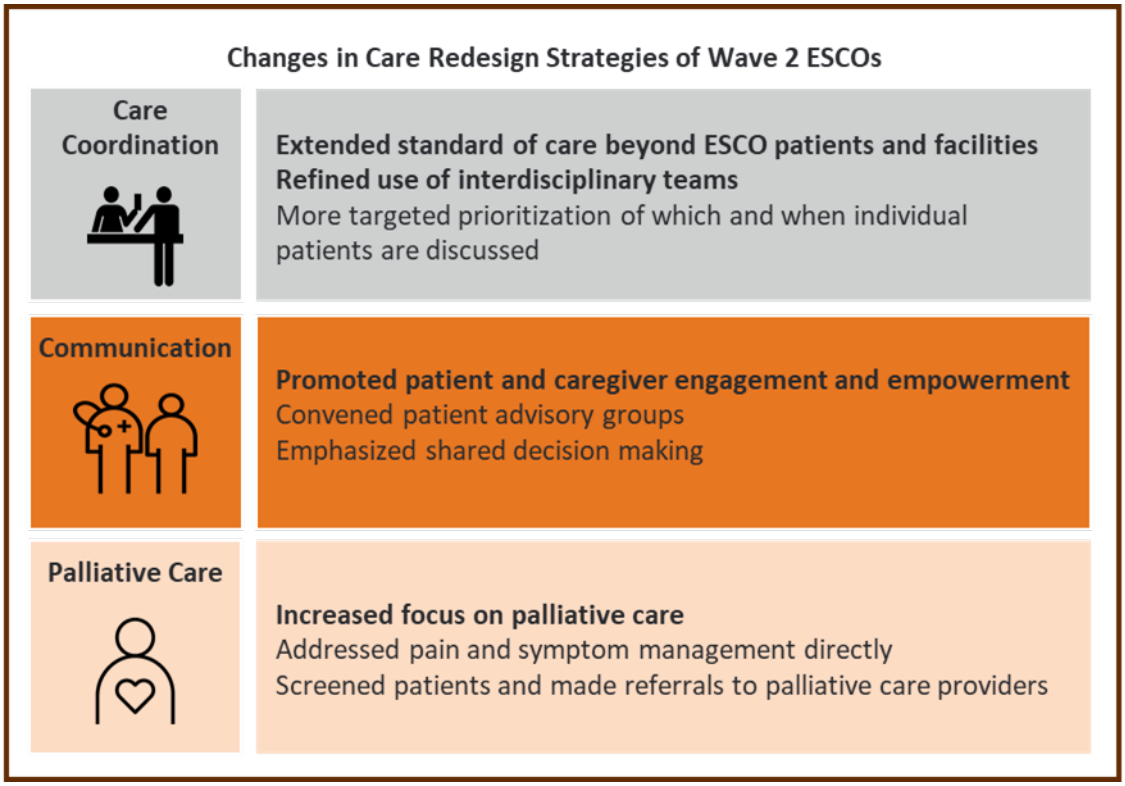
D. Discussion

Wave 2 ESCOs retained many of the structural features they had developed during PY2 (their first year of operation). Fresenius, whose ESCOs made up a large share of all Wave 2 ESCOs, continued the change noted in AR3 for its Wave 1 ESCOs by using a hybrid care coordination model made up of on-site care coordinators and telephonic care coordination. The face-to-face presence was cited as enhancing the visibility of the ESCO to both patients and dialysis facility staff. Some ESCOs established new collaborations with vascular surgeons and home health agencies, reflecting the belief that those providers are essential to maintaining dialysis care and helping to prevent unnecessary hospital admission or readmissions. For similar reasons, Wave 2 ESCOs continued to focus on reducing missed treatments and providing flexible rescheduling options when missed treatments did occur. Changes in IT investments were mostly refinements of earlier investments rather than fundamental changes, but some ESCOs reported increased use of other available information sources such as state Health Information Exchanges. There was also little change in which waivers were used by Wave 2 ESCOs, but Fresenius did implement a new limitation on the use of the transportation waiver to six one-way trips per quarter for each patient. This limitation was in response to Fresenius' concern that the waiver was sometimes used for routine or long-term travel issues rather than just for urgent or short-term issues. Overall, the structural stability of Wave 2 ESCOs may reflect learning from the experience of Wave 1 ESCOs, either in the same organization (Fresenius or DCI) or from observing ESCOs from other organizations.

IV. How Has Care Redesign Evolved Under Wave 2 ESCOs?

The CEC Model focuses on improving quality of care and health outcomes in addition to reducing unnecessary healthcare utilization and payments through the coordination of care. In care redesign, ESCOs are encouraged to implement beneficiary-centered approaches that promote comprehensive and coordinated care delivery and improve access to services. Initial information about Wave 2 ESCOs' strategies to improve patient care under the CEC Model were reported in the Performance Year 2 Annual Evaluation Report.[26] In PY4, we asked Wave 2 ESCOs about how their care redesign strategies had evolved over time.

A. Key Findings



B. Methods

We used the methods described in **Section IIIB** and **Appendix C** to analyze the qualitative data derived from the site visits**.**

C. Results

All Wave 2 ESCOs continued to refine their care redesign strategies as the model matured. In PY4, site visit participants reported movement towards applying model care redesign strategies to all patients; refined risk stratification and use of interdisciplinary teams; emphasized patient

[26] https://innovation.cms.gov/Files/reports/cec-annrpt-py2.pdf

engagement and empowerment, and improved person-centered care. In addition, two Wave 2 ESCOs increased their focus on palliative care in PY4.

1. Extended Standard of Care Beyond ESCO Patients and Facilities

> *"I don't think we look at who's ESCO and who's not. Everybody gets the same..."*
>
> – ESCO Site Visit Participant

Since the beginning of the CEC Model, ESCOs have expressed concerns about providing different levels of care to ESCO and non-ESCO patients. With the exception of waiver services, by PY4, all Wave 2 participants reported movement toward providing "one standard of care" to all patients, regardless of alignment with the CEC Model. ESCO participants representing three organizations indicated that they had begun providing the same care to all patients. The other two organizations were in the process of extending their new standard of care to all patients across all facilities.

While most ESCOs did not report any fundamental changes to their care design in PY4, all expressed strong emphasis on continuing and refining the specific approaches implemented in PY2. Wave 2 ESCO's use of "one standard of care" included increased:

- Collaboration among nephrologists and patient care technicians;
- Consensus and focus on the "whole patient" (including preventive, primary, specialty, and behavioral health care, as well as home dialysis and transplant options);
- Consistency in rescheduling missed appointments;
- Use of quality assurance and improvement techniques to enhance performance on quality of care metrics;
- Patient education to "call us first" before going to the ED; and
- Follow-up post-hospitalization to ensure all necessary appointments are scheduled and medications are reconciled.

2. Refined Risk Stratification and Use of Interdisciplinary Teams

Staff Driven Risk Stratification Approach

Nurses at one ESCO ask a "surprise question" for each patient every month to identify patients nearing end of life and who might benefit from palliative care services. The surprise question is, "Would you be surprised if this patient passed away in the next six months?" If the answer is no, the provider explores palliative care options with the patient.

ESCOs identify high-risk patients because effective management is more likely to yield improved outcomes and lower health care payments due to efficient utilization. While Wave 2 ESCOs continue to use risk stratification to identify high-risk patients and imminent hospitalization within clinics and across ESCOs, they appeared less reliant than in prior years on computer generated information to identify targeted patients. ESCOs acknowledged that the reports generated by computer algorithms do "a good job at identifying high-risk patients," but they emphasized the importance of staff knowledge to identify risk factors not associated with acuity. Participants cited recent loss of a spouse or housing and transportation issues as reasons for elevated risk.

As part of the CEC Model, ESCOs worked to improve communication between the providers involved with each beneficiary. One common approach was to convene standing meetings to discuss individual cases, often called case conferencing. The group of providers typically included the social worker, nephrologist, clinic manager, charge nurse and dietician. Initially, these interdisciplinary teams met frequently, in some cases weekly, and attempted to review all high risk cases. In PY4, several ESCOs reported several changes in interdisciplinary team meetings, which resulted in more efficient case conferencing when combined with enhanced risk identification. These meetings were held less frequently, ranging from monthly to quarterly. Rather than giving all high-risk patients an intensive review, patient reviews were prioritized based on staff judgement. This way, team members felt better able to prepare for discussions and implement team decisions. Most ESCOs reported that nephrologist participation in interdisciplinary team meetings was helpful, but noted their participation was intermittent in some cases.

3. Promoted Patient and Caregiver Engagement and Empowerment

In PY2, Wave 2 ESCOs emphasized the role of patient and caregiver education in optimizing patients' dialysis experience and outcomes. In PY4, ESCOs continued to provide initial and on-going patient education and promoted patient engagement and empowerment strategies to improve patient outcomes and adherence with treatment plans. The patient education topics they highlighted addressing with every patient, multiple times included:

- What warrants a hospitalization and why it's important to avoid hospitalization;
- Importance of fluid management;
- Signs and symptoms of infection; and
- Importance of dialysis adherence (e.g., attending or rescheduling appointments and receiving longer or extra treatments).

As an alternative to repeating the same information and providing patient education flyers that often get left behind, ESCOs tried strategies that were more engaging and empowering for patients including:

- Encouraging beneficiaries to speak up for their care, e.g., asking technicians to wash their hands or wear gloves before touching the machine. Using messages like, "It's your body, your care."
- Investing in a button-maker to make buttons for staff to wear on their lab coats. Messages like, "Did you take your binders?" and "Make sure you are washing your hands" changed monthly;
- Providing a stethoscope following catheter removal so patients could listen to their fistula and identify when it doesn't sound the way it should;

> *"[It's] coming from the patient now, it's not coming from us to the patient, it's now back. And seeing that it's like, okay they've heard us, they've seen us out there, where's that doctor who does the checks? They want to be involved and take better care of themselves is what I see. Not all of them. We have any challenges but we're seeing sort of a shift. That whole self-management piece is where we need to turn the ship around and get them to self-manage."*
>
> – ESCO Site Visit Participant

- Providing different items (e.g., stress balls, essential oil on a cotton ball) to new patients who are often scared or anxious;
- Offering crossword puzzles or suggesting drawing/coloring to make treatment more palatable and encouraging patients to stay for full treatment;
- Providing sugar free lollipops as an alternative to fluids when their mouths get dry; and

Patient leaders in some facilities helped spread and reinforce information to other beneficiaries. A Fresenius consumer advocate will also begin attending one facility's quality assurance and improvement meetings in PY4.

4. Improved Person-Centered Care

In PY4, ESCOs described ongoing culture change in their organizations towards more patient-centered care. This shift from emphasis on patient "non-compliance" to acknowledging the difficulty of living with ESRD and addressing obstacles to promote adherence was reflected in both care delivery and care planning. The goal of these efforts was to improve quality of care; however, they were also reported to contribute to improved staff morale and retention. While, these efforts were implemented for all patients concurrent with the CEC Model and are aligned with model quality incentives, they may not be directly related to the model.

> *"We had one gentleman who for years, would have monthly issues where he would… You couldn't pinpoint when it was coming, but he would just blow up. He would storm out. He would threaten, whatever. We figured that partly, it's a manager issue, but [our staff person] has worked with him and his family and communication is so much better. It's really smoothed things out. He's like a different person pretty much. Yeah. So that has been a huge help. He just needed somebody to understand what he wanted them to understand, and he wasn't good at communicating what it was that he needed. Nor was she [our staff person]."*
>
> – ESCO Site Visit Participant

Two Wave 2 ESCOs operated patient advisory groups in PY4 to proactively address patient concerns and improve the delivery of care. The advisory groups provide a forum for patient and staff representatives to collaboratively address opportunities for improving care within the dialysis units. Both ESCOs made changes to their facilities in response to requests from the patient advisory groups, including installing an awning over the entry doorway to block rain and placing a bench outside of a building for patients to sit while waiting for transportation.[27]

One Wave 2 ESCO introduced the Institute for Healthcare Improvement "What Matters to You" campaign organization-wide in PY4 to promote shared health care decision making between patients and providers. The campaign involves asking the patient "What matters to you?" in addition to "What is the matter?" in order to increase clinicians' awareness of the issues that are most important to patients. This helps clinicians develop more customized care plans with the goal of improved health outcomes. The organization also integrated "What Matters to You" into its EHR. Participants found that the "What Matters to You" campaign had several benefits,

[27] For a description of Centers for Dialysis Care (CDC) patient advisory committee, see https://innovation.cms.gov/files/x/aco-casestudy-cnts-dialysis-cares.pdf

> *"Even a week after implementation, patients who I have [previously] talked to every week, I find out something new about them and am able to shift the way that I support them."*
>
> – ESCO Site Visit Participant

including encouraging patients to be more involved in their care. Improvements in ICH CAHPS scores were attributed to the campaign's focus on providers treating patients with respect. Additionally, participants felt the campaign had an impact on staff resilience; knowing patients on a more personal level helped alleviate staff distress and develop care plans that uniquely suits patients.

5. Increased Focus on Palliative Care

Palliative care focuses on providing symptom management and relief for patients regardless of the stage of disease, including end-of-life. Two Wave 2 ESCOs increased their focus on palliative care in PY4. One provided palliative care directly and the other conducted screening and made referrals to external providers. The efforts described in this section were reported by Wave 2 ESCO site visit participants. While they are aligned with CEC Model incentives, they may not be directly related to the model.

One ESCO's care redesign strategy was establishment of a mobile Renal Supportive Care Team (RSCT) at the implementation of the CEC Model. The RSCT consists of a nephrologist trained in palliative care, a social worker, and a registered nurse. The team works with patients and families in the dialysis unit and in the patients' residences to provide education, address palliative care needs (including pain, insomnia, and mobility issues), and coordinate care. Since its inception, the team expanded from working with patients in the ESCO facilities to all facilities within the organization. Site visit participants reported that the RSCT had a positive impact on patients, staff engagement and retention, and reducing the cost of care for patients who are frequently hospitalized. Increased hospice use (compared to national rates of ESRD Medicare beneficiaries) was also attributed to the RSCT.[28] Based on the success of the RSCT, all ESCO staff, including dialysis technicians and members of the interdisciplinary team, received training needed to engage in palliative care discussions with patients. In the future, the RSCT will continue providing patient care for complex cases, but it will predominantly serve as a resource for staff within clinics as they lead conversations related to palliative care.

Another ESCO site visit participant estimated that about 10% of their patients are eligible for palliative care or hospice. The non-LDO implemented a screening tool to use when discussing patient's goals of care to identify patients for referral. Staff ask patients and their families five questions (shown in text box) to identify pain and other symptom management as well as healthcare decision making needs. Based on the responses and resulting conversations, patients may be referred to palliative

Palliative Care Screening Questions

- How is dialysis going for you?
- How are you doing on dialysis?
- Will there ever be a time when you want to stop dialysis?
- Do you have a healthcare proxy?
- If you are unable to speak, is there anybody that you would want to speak for you?

[28] Lam D., Nassutti C., Nolan M. Meet them where they are: Bringing palliative care to dialysis patients. https://www.capc.org/seminar/poster-sessions/meet-them-where-they-are-bringing-palliative-care-to-dialysis-patients/

care or hospice. This ESCO also recently hired a nephrologist with additional training in palliative care who will advance their palliative care efforts.

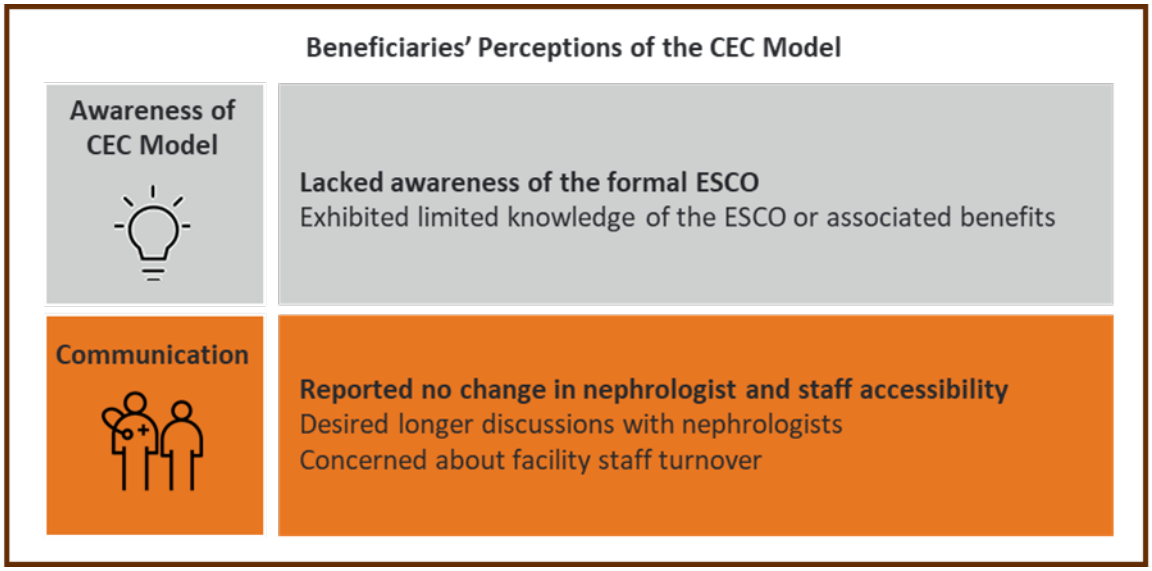
D. Discussion

One of the more notable changes in PY4 reported by the Wave 2 ESCOs was the more open expansion of ESCO interventions to non-ESCO patients in an effort to provide one standard of care. Although most programs did not report dramatic changes to their care design compared to prior years, participants noted increased efforts to educate and engage patients in their care. Many of the interventions represent the culmination of ongoing effort to promote culture change in the facilities and focused on basics such as rescheduling missed treatments and post-hospitalization follow up. Wave 2 ESCO staff developed new ways to engage patients in their care by changing the traditional model of patient education to support treatment adherence. This shift to more person-centered care for all patients was reported to be associated with improved staff morale and retention. Refinements to interdisciplinary team communication to better risk stratify patients was another change in PY4 that helped improve staff efficiency and impact. Finally, care design in PY4 included expansion of palliative care services in some ESCOs.

V. What Were Beneficiaries' Perceptions of the CEC Model?

We conducted focus groups with beneficiaries aligned to Wave 2 ESCOs to determine if they noticed changes in the delivery and quality of their care and to assess their perceptions of their care (e.g., communication with facility staff and nephrologists) since their facility joined the CEC Model. [29] These focus groups provided contextual information about quality of care and beneficiary experience, complementing what we learned from quantitative data analyses.

A. Key Findings



B. Methods

Between November 12, 2019 and December 10, 2019, we conducted focus groups with beneficiaries at three Wave 2 non-LDO ESCOs (Atlantic Dialysis, Centers for Dialysis Care, and Northwest Kidney Centers). Each focus group was held on-site at a dialysis facility associated with the ESCO, but participants may have been from any of that ESCO's participating facilities. A total of 15 beneficiaries participated across the three focus groups. Each focus group session lasted approximately 90 minutes. The focus group methodology is described in **Appendix D**.

[29] For findings from PY1 focus groups with Wave 1 ESCO beneficiaries, please see the first annual report (https://innovation.cms.gov/Files/reports/cec-annrpt-py1.pdf). For findings from the PY2 focus groups with Wave 2 ESCO beneficiaries, please see the second annual report (https://innovation.cms.gov/Files/reports/cec-annrpt-py2.pdf). For findings from the PY3 focus groups with Wave 1 ESCO beneficiaries, please see the third annual report (https://innovation.cms.gov/).

C. Results

Overall, beneficiary perceptions varied by facility and length of hemodialysis experience. Similar to other focus groups in previous performance years, most focus group participants in PY4 did not have knowledge of the ESCO and were not aware of any changes in their dialysis care due to the ESCO. Most beneficiaries had brief interactions with their nephrologists and did not report any noticeable changes in their communications with dialysis staff. However, satisfaction with their communications with staff was mixed; some beneficiaries were pleased with the level of interactions, while others would have liked to have more time with and assistance from staff. Beneficiaries would like to see some changes at their facility, such as less staff turnover and improvements to the dialysis equipment and physical environment in which their treatment takes place.

1. What Did Beneficiaries Know about the CEC Model?

Similar to the beneficiaries who participated in focus groups in prior years, most focus group participants in PY4 did not have knowledge of the ESCO. When prompted about letters sent to patients at the beginning of the model and more recent articles in dialysis organization newsletters, one beneficiary explained that they receive a high volume of information and are not able to read everything that they receive. A few beneficiaries remembered the term "ESCO" being mentioned when they were recruited for the focus group, but they could not provide specific information about what the ESCO encompassed and were not aware of any associated benefits. When prompted, some beneficiaries said they were familiar with their care coordinators, but they were unclear about the specific services this person offered and did not associate them with the ESCO.

2. What Changes Did Beneficiaries Notice Since their Facility's Participation in the ESCO Began?

Focus group participants identified a few changes in their dialysis care in recent years, but like focus group participants in prior years, they did not attribute these changes to the ESCO.[30]

Staffing. Like some focus group participants in PY3, some PY4 beneficiaries described staff turnover and the introduction of new, inexperienced technicians.

> *"It's just the way some of the new [staff] approach you…carelessly…you expect a little more kindness. They be pretty arrogant or not mindful to what you're going through."*
>
> – ESCO Site Visit Participant

[30] For findings from PY1 focus groups with Wave 1 ESCO beneficiaries, please see the first annual report (https://innovation.cms.gov/Files/reports/cec-annrpt-py1.pdf). For findings from the PY2 focus groups with Wave 2 ESCO beneficiaries, please see the second annual report (https://innovation.cms.gov/Files/reports/cec-annrpt-py2.pdf). For findings from the PY3 focus groups with Wave 2 ESCO beneficiaries, please see the third annual report (https://innovation.cms.gov/).

Beneficiaries suggested that these staffing issues negatively affected delivery of dialysis treatment because, due to their inexperience, new staff sometimes caused pain to patients during treatment. Pain was most likely due to difficulty cannulating their vascular access.

> *"With the new people, it's like they're still a little lost on what they've got to do, and sometimes, like right now, if they're gonna hook you up, it takes approximately let's say 10 minutes to hook you up; now it's taking 15, 17 minutes. And I'm calculating this, and its time that… it seems like three or four minutes is nothing, but it's four minutes here and here and here, it adds up. I'm no longer taking three and a half hours [to dialyze], I'm taking four and a half."*
>
> – ESCO Site Visit Participant

Accessibility of Nephrologist. Beneficiaries indicated there were no notable changes in the accessibility of their nephrologist or in the way their nephrologist communicated with them. These reports were similar to those given by PY3 focus group participants. Some beneficiaries actively participated in conversations about their care; others felt like their nephrologist often made changes to their care without "going over their charts or discussing their dialysis status in any medically meaningful way."

> *"The doctor could come more often to the clinic and drop by. Because there's 50 chairs downstairs, and he just basically passes by and how you doing, okay, fine, okay. So you understand it's just, what, two or three seconds to find out how you're doing, and then the next patient is basically the same."*
>
> – ESCO Site Visit Participant
>
> *"Usually the nurse practitioner will stop by and wake me up to talk. I'll occasionally see the doctor, but it's very rare."*
>
> – ESCO Site Visit Participant

Most focus group participants saw their nephrologist infrequently, typically monthly, and while they were receiving dialysis. For some beneficiaries, regular visits with their nephrologist had been replaced by visits with a nurse practitioner. A few beneficiaries wanted more access to their nephrologist, more discussion on issues that specifically affected their health status, and more time communicating in general.

Communication with Dialysis Staff. Focus group participants did not report any noticeable changes in dialysis staff communications over recent years. Beneficiaries felt they were active participants in their conversations with staff and not just listeners. They reported being able to clearly understand the information staff provided and were comfortable talking with staff. However, satisfaction with the frequency and scope of communication was mixed among participants. Some enjoyed the level of communication (particularly with social workers and care coordinators), while others reported communications were limited. Beneficiaries felt that staff turnover inhibited communication, as new workers were less familiar with patients. Beneficiaries were pleased with the assistance staff provided for rescheduling appointments. However, they indicated staff were not sufficiently involved in the

> *"I make a lot of suggestions to the doctor and the doctor makes suggestions back; and, we come to a meeting between the two of us. It's not just patient to doctor or doctor to patient."*
>
> – ESCO Site Visit Participant
>
> *"If I let them know [that I need to reschedule] about a week in advance, they can usually fit me in. There have been very few occasions where they were not able to."*
>
> – ESCO Site Visit Participant

management of medication or the coordination of non-dialysis care, nor did they provide specific direction to patients regarding ER visits. When hospitalized, most beneficiaries understood the importance of initiating communication with the dialysis facility. A few of the beneficiaries mentioned having conversations with dialysis facility staff about home dialysis options. When communicating about transplants, beneficiaries indicated these discussions typically occurred directly with nephrologists and not with staff affiliated with the dialysis facility.

Beneficiaries noted several improvements they would like to see, including:

- Efforts to retain staff/reduce staff turnover;
- More staff training on interpersonal skills;
- Better dialysis machines;
- Cleaner facilities;
- Greater control over physical environment (e.g., lighting, temperature, noise control);
- Meeting space for private health conversations with providers;
- The opportunity to provide input into dialysis schedule changes;
- Separate isolation areas for sick patients; and
- Additional education for patients on choice of dialysis center and how to get assistance with medical and personal (e.g., food, shelter) needs.

D. Discussion

Similar to past focus group participants, participants in PY4 had no clear awareness of the ESCO. Beneficiaries reported no significant changes in nephrologist and dialysis facility staff accessibility and communications. While most beneficiaries were satisfied with their interactions with facility staff, their satisfaction with the frequency and scope of communication with staff varied. Staff turnover was also highlighted as a challenge and a suggested area of improvement. A few beneficiaries wanted more access to their nephrologists and more privacy during conversations.

VI. What Were the Impacts of the CEC Model?

This section presents quantitative findings of the impact of the CEC Model on dialysis care, coordination of care beyond dialysis, hospitalizations, ED visits, mortality, and Medicare payments over the first four performance years.

A. Key Findings

CEC Model Impact

Dialysis Care 	**Vascular access placement and dialysis treatment adherence improved modestly for CEC beneficiaries but there was no evidence of changes in their experience with care** Catheter use declined (by 5%) Increased number of dialysis sessions per month (by 0.4%)
Coordination of Care Beyond Dialysis 	**Some evidence the CEC Model improved coordination of care beyond dialysis** Increased use of preventive care (e.g., flu vaccination (6%), cholesterol (5%) and diabetes tests (2%), eye exams (3%)) and primary care office visits (3%) **Favorable impact on medication utilization** Fewer CEC beneficiaries over-utilizing opioid prescriptions (6%) Greater adherence to phosphate binder medication (8%)
Hospitalizations 	**Hospitalizations declined by 3% and observation stays declined by 5%** Reduced number of hospitalizations in a given month due to infectious (by 4%) and circulatory conditions (by 5%), vascular access related complications (by 5%) and ESRD related complications (by 6%) Reduced likelihood of a hospitalization for sepsis related infections (by 4%) and CHF (by 9%)
Survival 	**Modest association with improved survival** The association was stronger among beneficiaries aligned to CEC during their first year of dialysis
Medicare Payments 	**Total Medicare Part A and Part B payments for CEC beneficiaries declined by 1%, ($80) suggesting aggregate gross savings of $151 million during the first 4 PYs** Decreased spending for acute inpatient services ($51 PBPM) and readmissions ($27 PBPM) Overall reductions in spending in later years as a result of underperforming Wave 2 and new joiners

B. Methods

Our evaluation used a difference-in-differences (DiD) approach to estimate impacts of the CEC Model on key outcomes depicted in **Exhibit 9**, relative to the comparison group. DiD is a statistical method that quantifies the impact of the model by comparing changes in risk-adjusted

outcomes for CEC beneficiaries, before and after implementation of the CEC Model, to changes in outcomes for similar beneficiaries in the comparison group, before and after CEC implementation. This approach controls for beneficiary-, market-, and facility-level differences between the CEC and comparison populations. It also minimizes biases from time-invariant differences between the CEC and comparison populations and controls for secular trends. The comparison group consisted of beneficiaries from non-participating dialysis facilities matched to CEC facilities based on key market and facility characteristics as well as the sociodemographic and clinical composition of beneficiaries served.

The DiD analysis used Medicare Part A and Part B enrollment and claims data from January 2014 to December 2019 in combination with other program, provider, and market data sources. We estimated a DiD model, that produced wave- and PY-specific effects for the original 13 ESCOs (Wave 1) and the additional 24 ESCOs (Wave 2). We used these by-wave and by-PY estimates to assess the cumulative impact of the CEC Model for all 37 ESCOs.

We divided the period of analysis into pre-CEC, transition, and post-CEC periods for each of the waves of ESCO facilities. The pre-CEC period for facilities that joined CEC in October 2015 ran from January 2014 through March 2015, and was followed by a six-month transition period from April 2015 through September 2015 to account for the delayed start of the model. The pre-CEC period for facilities that joined CEC in January 2017 ran from January 2014 through June 2016 and was followed by a six-month transition period from July 2016 through December 2016. The pre-CEC period for facilities that joined CEC in January 2018 ran from January 2014 through June 2017, and was followed by a six-month transition period from July 2017 through December 2017. The pre-CEC period for facilities that joined CEC in January 2019 ran from January 2014 through June 2018, and was followed by a six-month transition period from July 2018 through December 2018. The last intervention quarter for all waves concluded in December 2019. Wave 1 represents 50.3% and Wave 2 represents 49.7% of the CEC beneficiary months in the intervention period analytic sample. The DiD methodology, including data sources, outcomes definitions, methods for identifying comparison populations and any applied exclusion criteria, and statistical models, is described in **Appendix E**. The evaluation's statistical power to detect impacts are discussed in **Appendix F**.

ICH CAHPS® Instrument and Measures. The ICH CAHPS® survey was developed through a collaboration between CMS and the Agency for Healthcare Research and Quality and was designed to measure adult hemodialysis patients' experience with in-center hemodialysis care from Medicare-certified dialysis facilities.[31] We used this survey to assess the impact of CEC on patients' experience with dialysis care. We also use the survey to explore potential unintended consequences of the model, such as ESCOs investing only in quality measures included in the model and/or reducing quality of care on other dimensions not captured in the CEC quality measures set.[32] To this end, we selected eight ICH CAHPS® measures (see **Exhibit 9**): three global rating measures (rating of kidney doctors, dialysis center staff, and dialysis center); three composite measures currently used in the CEC Model Quality Measures Set (nephrologists' communication and caring, quality of dialysis center care and operations, and providing

[31] In-Center Hemodialysis CAHPS Survey official website (https://ichcahps.org/).
[32] Links to the quality measures set applicable to each model performance year are available at https://innovation.cms.gov/innovation-models/comprehensive-esrd-care

information to patients); and two additional measures based on individual survey responses that address other components of quality (beneficiary was seen within 15 minutes of appointment time and beneficiary received an explanation for why they were not eligible for a kidney transplant). The calculation of the global and composite measures uses the same methods CMS uses for the publicly reported ICH CAHPS® measures published on Dialysis Facility Compare.[33] Individual questions are shown in **Exhibits G-2** and **G-3**.

For each measure, we used a DiD approach to estimate the change, from the pre-CEC to the post-CEC periods, of the percent of beneficiaries reporting quality in the "top box" category (i.e., what would best demonstrate the most positive experience)[34] among beneficiaries receiving care from CEC facilities relative to beneficiaries receiving care from facilities in the comparison group. Among 1,038 matched pairs of CEC and comparison group facilities, 739 (71%) had sufficient[35] ICH CAHPS® survey responses for inclusion in the analysis. Surveys collected between the fall 2014 and fall 2019 waves of the ICH CAHPS® were included in the analysis. The data, study population, and DiD analytic methods are described in detail in **Appendix G**.

The survey data encompasses samples of beneficiaries receiving in-center hemodialysis treatment from ESCO and comparison facilities (i.e., not necessarily aligned to a CEC ESCO). Survey response rates may affect our interpretation of these results. The response rates for CEC and comparison facilities were 28% and 29%, respectively. Consequently, we cannot assess if the observed results are representative of the larger proportion of beneficiaries who did not respond.

[33] https://www.medicare.gov/dialysisfacilitycompare/#about/dialysisfacility-info

[34] "Top box" is a label used in ICH CAHPS® research to describe the most positive responses. For example, responses categorized as top box include responses of 9 or 10 on a scale of 0 (worst) to 10 (best) on the Global Ratings Measures and responses of 'Always' or 'Yes' on the Composite Scores and individual survey items.

[35] To ensure beneficiary confidentiality, the ICH CAHPS® data received for this analysis had already applied rules suppressing facility results when there were 10 or fewer respondents in a given period.

Exhibit 9. CEC Model Evaluation Difference-in-Differences Measures

Category	Evaluation Measure
Dialysis Care	▪ Number of outpatient dialysis sessions in a given month ▪ Percent of beneficiaries with at least one unscheduled or emergency dialysis session in a given month ▪ Dialysis modality • Percent of beneficiaries receiving hemodialysis in a given month • Percent of beneficiaries receiving peritoneal dialysis in a given month ▪ Percent of beneficiaries receiving home hemodialysis in a given month ▪ Percent of beneficiaries receiving home dialysis in a given month ▪ Percent of beneficiaries starting dialysis with no prior nephrology care – beneficiary had no previous nephrology care ▪ Vascular access • Fistula use: percent of adult patients in a given month who had a fistula and had 90 days or longer of dialysis • Catheter use: percent of adult patients in a given month who had a catheter for 90 days or longer ▪ Patients' experience with care (ICH CAHPS®Survey) • Rating of kidney doctors (global ratings)^ • Rating of dialysis center staff (global ratings)^ • Rating of dialysis center (global ratings)^ • Beneficiary was seen within 15 minutes of appointment time (individual survey item) • Beneficiary received an explanation for why they were not eligible for a kidney transplant (individual survey item) • Nephrologists' communication and caring (composite score)^ • Quality of dialysis center care and operations (composite score)^ • Providing information to patients (composite score)^
Coordination of Care beyond Dialysis	▪ Preventive care indicators (percent of beneficiaries) • Low-density lipoprotein (LDL) cholesterol testing • HbA1c testing • Dilated eye exam (diabetic beneficiaries) • Flu vaccinations ▪ Number of Primary Care E/M Office/Outpatient Visits per 1,000 Beneficiaries per Month ▪ Number of Specialty Care E/M Office/Outpatient Visits per 1,000 Beneficiaries per Month ▪ Percent of beneficiaries receiving hospice services in a given month ▪ Medication management indicators (percent of beneficiaries) • Indicator of opioid overutilization, average daily morphine milligram equivalent (MME) dose greater than 50 mg in a given month • Indicator of phosphate binder adherence, proportion of days covered by phosphate binder over 80% in a given month • Indicator of contraindicated medication prescription fill in a given month

Category	Evaluation Measure
Hospitalizations and Emergency Department Visits	▪ Number of hospitalizations per 1,000 beneficiaries per month ▪ Number of ED visits per 1,000 beneficiaries per month ▪ Number of Observation Stays per 1,000 Beneficiaries per Month ▪ Inpatient Hospitalizations • Number of Endocrine/Metabolic Hospitalizations per 1,000 Beneficiaries per Month • Number of Circulatory-related Hospitalizations per 1,000 Beneficiaries per Month • Number of Infection-related Hospitalizations per 1,000 Beneficiaries per Month ▪ Percent of beneficiaries with at least one hospitalization for vascular access complications in a given month ▪ Percent of beneficiaries with at least one hospitalization for ESRD complications (i.e., volume depletion, hyperpotassemia, fluid overload, heart failure, and pulmonary edema) in a given month ▪ Infections • Percent of beneficiaries with at least one hospitalization for a Venous Catheter Bloodstream Infection in a given month • Percent of Beneficiaries with at least one hospitalization for Peritonitis in a given month • Percent of beneficiaries with at least one hospitalization for a Percent of Sepsis Infections in a given month ▪ Percent of beneficiaries with at least one admission for Ambulatory Care Sensitive Conditions (ACSC) in a given month • Admissions for diabetes short-term and or long-term complications (NQF#0272 or NQF#0274) • Admissions for Congestive Heart Failure (CHF) (NQF#0277) ▪ Percent of beneficiaries with at least one readmission in a given month ▪ Percent of beneficiaries with at least one ED visit within 30-days of an acute hospitalization in a given month
Medicare Payments across the Continuum of Care	▪ Average Part A and Part B Medicare payments PBPM ▪ Average payments PBPM for the following services: inpatient, readmissions, institutional post-acute care (PAC), home health, hospice, outpatient, office visits, total Part B, dialysis care, hospitalizations for ESRD complications, and Part B drug[36]
Unintended Consequences	▪ Total Part D Drug Cost PBPM ▪ Total Part D Phosphate Binder Drug Cost PBPM

Notes: Medicare payments were standardized to remove the effects of Medicare's geographic wage, teaching and other payment adjustments. (^) Denotes measures included in the CEC Quality Model Measures Set.

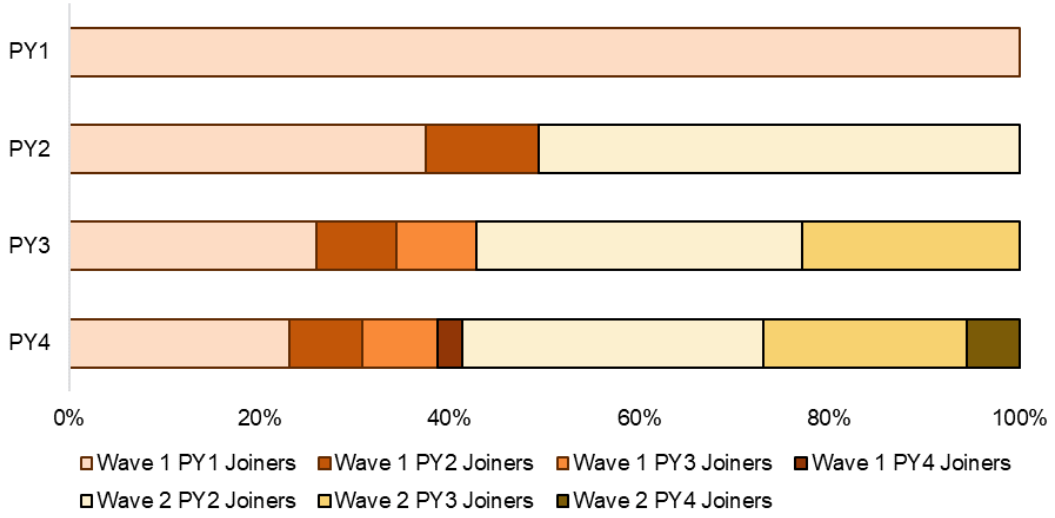
C. Results

The final sample consisted of 141,519 CEC beneficiaries (57,351 in Wave 1 and 84,168 in Wave 2 CEC facilities), and 125,950 comparison beneficiaries. The analytic sample included all the eligible and aligned monthly beneficiary observations between January 2014 and December 2019. Across ESCO waves and comparison groups, beneficiaries were similar. Both of the CEC waves and comparison beneficiaries were around 44% female, averaged 63 years in age, and had been on dialysis for an average of over 40 months. More than 92% of beneficiaries in all three groups used hemodialysis. Wave 2 CEC facilities and the comparison group had larger proportions of White (48% and 50%) and had fewer Black beneficiaries (40% and 37%)

[36] Medicare Part A and B payment categories include all beneficiary months and are not conditioned to whether a beneficiary received that specific service, hence payments can be zero in a given beneficiary month.

compared to Wave 1, which had 42% White beneficiaries and 42% Black (see **Exhibit E-14**). The composition of the ESCO analytic sample changed with each PY. The CEC beneficiary months used in the estimation of the overall PY1-PY4 impact of the CEC Model are evenly split between Wave 1 and 2. However, Wave 2 accounted for an increasing share of the analytical sample across performance years. **Exhibit 10,** describes the number of CEC beneficiary month observations in PY as well as the relative percent of those observations that belonged to each wave by the year they joined the model.

Exhibit 10. CEC Analytic Sample Composition by Wave and PY



DiD impact estimates are reported as the absolute change in the value of the outcome measure among CEC beneficiaries, relative to the comparison group, and also in terms of the relative percent change of the outcome measures, compared to the pre-CEC period. We report the statistical significance of all results. We present estimates for all ESCOs and each wave, cumulatively and by performance year. Detailed results, pre-CEC and post-CEC descriptive statistics, and sample sizes are located in **Exhibits E-19-E-30**.

1. What Was the Impact of CEC on Dialysis Care?

We investigated how the CEC Model may have impacted the delivery and quality of dialysis-related care delivered by dialysis facilities and nephrologists, the focal points of care within an ESCO. To assess care delivery and quality, we used available evidence-based clinical metrics to capture dialysis treatment adherence, nephrology care before dialysis, vascular access, and beneficiaries' experience with care. We highlighted these measures in the logic model as dialysis best practices under the sections for new behaviors and investments/drivers of change, as well as outputs and, ultimately, patient outcomes (see **Appendix B**).

At present, there is an established Pay for Performance (P4P) program, the ESRD Quality Incentive Program (QIP), which provides financial incentives for all dialysis facilities, regardless of CEC participation, to improve many of these measures. Likewise, public quality reporting through Dialysis Facility Compare also applies to all facilities and may provide indirect incentives (e.g., through influencing patient choice of facility) to maintain or improve quality. Therefore, we did not anticipate that the CEC Model would result in dramatic changes in these

measures, with the possible exception of a shift in vascular access initiation or adherence to dialysis, as improvements in those metrics could result in savings in other areas (e.g., procedures, hospitalizations). Moreover, efforts to improve vascular access and dialysis adherence were often noted at the ESCO site visits.

Overall, our analyses revealed that dialysis treatment adherence and vascular access practices continue to improve for CEC beneficiaries, but there was no evidence of any change in the percent of beneficiaries that received prior nephrology care or in their experience with care. CEC beneficiaries in Wave 1 ESCOs had stronger results, likely due to greater motivation by Wave 1 ESCOs to participate in the model. Despite the dwindling gap in tenure between Wave 1 and Wave 2, Wave 2 did not perform as well as Wave 1.

a. Dialysis Treatment Adherence and Modality

ESCO facilities' strategies to increase patients' adherence to dialysis treatment and minimize the occurrence of dialysis treatment in EDs when an outpatient dialysis session was a viable alternative evolved since the beginning of the model.[37] Similarly to Wave 1, examples of Wave 2 ESCO strategies include the following:

- Offering expanded facility hours and reserving chairs for emergencies. Increasing receptivity to treat patients from different facilities.
- Conducting more consistent proactive outreach to patients who missed treatments.
- Rescheduling dialysis sessions for the entire week following a missed session.
- Promoting patient and caregiver engagement and empowerment strategies to encourage staying for full treatment, manage fluids, and self-identify potential problems with fistula (described in in **Section IV**).
- Consistently reinforcing patient education messages including what warrants a hospitalization, signs and symptoms of infection.

Wave 2 ESCOs reported improvement in patient adherence (including fewer patients ending their dialysis sessions early) and attributed the improvement to the care redesign strategies implemented under the CEC Model. As the model matured, ESCOs reported a widespread emphasis on patient centered care (e.g., forming relationships with patients, acknowledging underlying food insecurity, and increasing collaboration across staff), which also likely contributed to improved patient adherence.

However, the success of these strategies may be offset by an emerging treatment protocol. One Wave 2 ESCO participant reported successfully providing twice weekly dialysis to new patients with reasonable residual renal function for the first six months to a year of treatment. Most patients in the US receive hemodialysis three times per week, regardless of whether or not they have residual kidney function. In fact, data from the Dialysis Outcomes and Practice Patterns Study (DOPPS) practice monitor indicate that <5% of patients currently receive twice weekly hemodialysis.[38] Similar to the study cited, 5.3% of CEC and comparison beneficiaries receive just two dialysis sessions per week. However, in the past few years, observational studies have

[37] See Annual Report 3 (https://innovation.cms.gov/) for a discussion of Wave 2 strategies.
[38] US DOPPS Practice Monitor, October 2019; http://www.dopps.org/DPM; accessed 4/20/20

provided some evidence that, when starting renal replacement therapy, twice weekly hemodialysis may provide similar survival benefit, prolonged residual kidney function, and perhaps greater quality of life among patients with residual kidney function than conventional thrice weekly treatments. This outcome was seen particularly in patients with fewer co-occurring health conditions.[39]

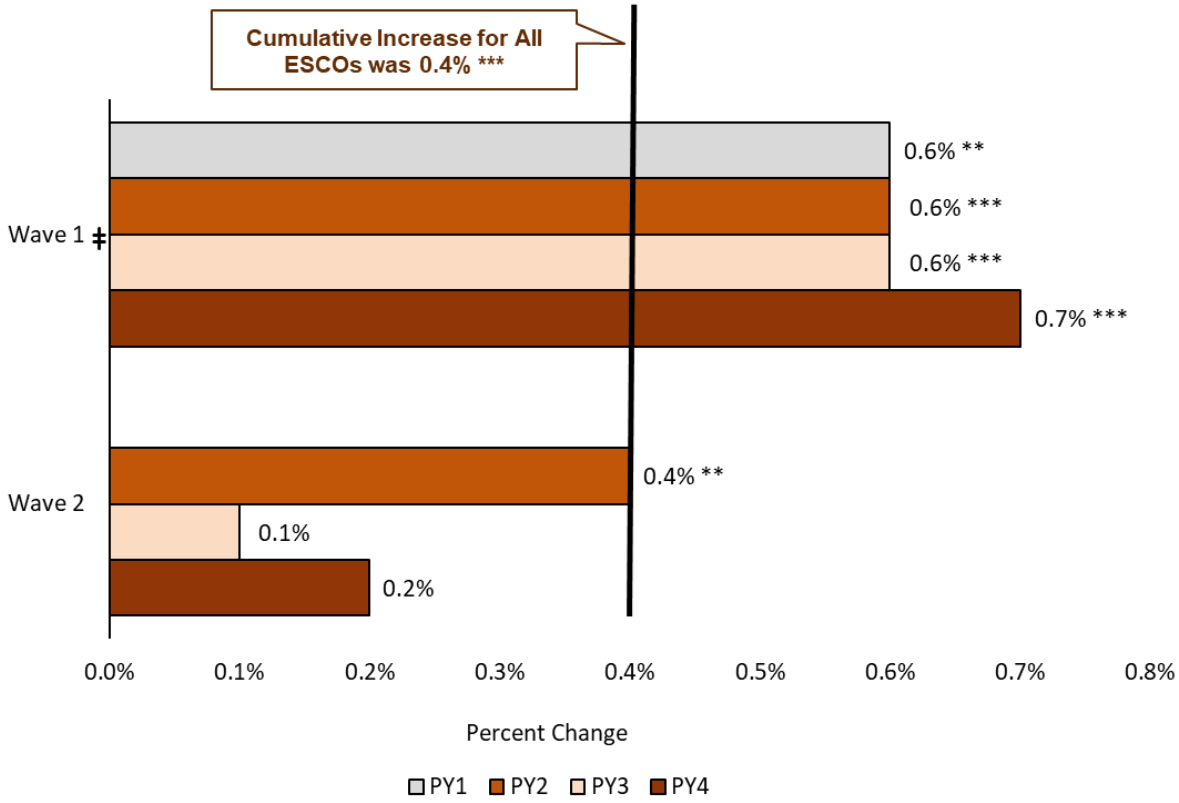
To assess the success of these strategies, we evaluated whether the model positively impacted the frequency of dialysis sessions and decreased the use of emergency dialysis sessions. There is modest evidence that supports improvement in these measures across PY1-PY4. Overall outpatient dialysis sessions increased by 0.4%, ($p \leq 0.01$), which translates into an increase of 53 outpatient sessions per 1,000 beneficiaries per month among CEC beneficiaries.[40] This change reflected both an increase in the number of sessions over time among CEC participants and a decrease in the comparison group. In Wave 1, impacts were consistently around 0.6%-0.7% across performance years (see **Exhibit 11**).[41] A corresponding statistically significant increase of 0.4% ($p \leq 0.05$) for Wave 2 CEC beneficiaries in their first year in the program was not sustained in PY3 or PY4.

[39] Mathew, A., Obi, Y., Rhee, C.M., Chen, J.L., Shah, G., Lau, W.L., Kovesdy, C.P., Mehrotra, R. Kalantar-Zadeh, K. (2016). Treatment frequency and mortality among incident hemodialysis patients in the United States comparing incremental with standard and more frequent dialysis. *Kidney International, 90*: 1071–1079.
Obi, Y., Eriguchi, R., Ou, S.M., Rhee, C.M., Kalantar-Zadeh, K. (2015). What is known and unknown about twice-weekly hemodialysis. *Blood Purification, 40*: 298–305.
Obi, Y., Streja, E., Rhee, C.M., Ravel, V., Amin, A.N., Cupisti, A., Chen, J., Mathew, A., Kovesdy, C.P., Mehrotra, R., Kalantar-Zadeh, K. (2016). Incremental hemodialysis, residual kidney function, and mortality risk in incident dialysis patients: A cohort study. *American Journal of Kidney Diseases, 68*: 256–265.

[40] DiD values are estimated at the PBPM level and transformed post estimation to per 1,000 beneficiaries per month values. Since the per 1,000 beneficiaries per month values are linear transformations of the PBPM DiD estimates, the percent change values are identical for both levels.

[41] Outpatient Dialysis sessions did not pass statistical testing of the parallel trends assumption for Wave 1. However, visual inspection of the trend graph which compared trends between the treatment (CEC) and comparison group yielded no obvious differences. Additionally, the trend coefficient, although significant, equals 0.0035. See **Exhibit E-18.**

Exhibit 11. Impact of the CEC Model on the Number of Outpatient Dialysis Sessions PBPM



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate. See **Exhibits E-19-E-21.**

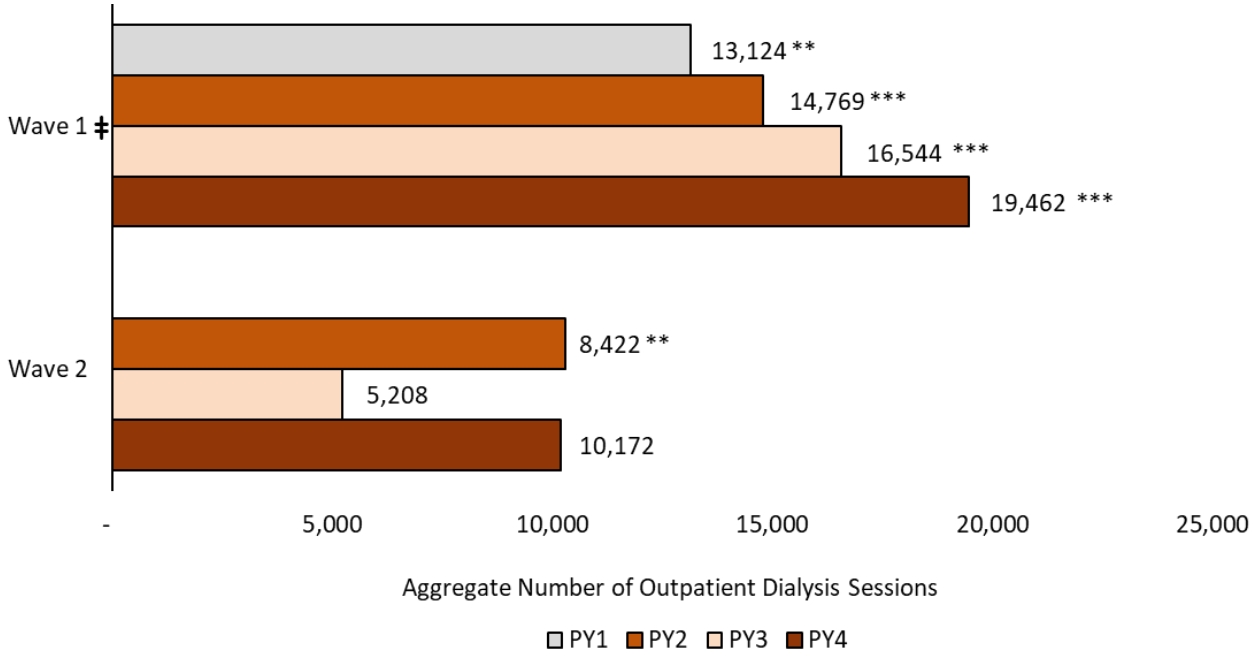
Overall, the results are consistent with the expectation that the CEC Model would create incentives to avoid or reschedule missed treatments in the outpatient setting and with the efforts reported by Wave 1 ESCOs.

The number of dialysis sessions increased for CEC beneficiaries but decreased for the comparison group from the pre-CEC to the intervention period. This resulted in a statistically significant relative increase in the number of dialysis sessions of 0.4% ($p \leq 0.05$), approximately 53 outpatient sessions per 1,000 beneficiaries per month for CEC beneficiaries across PY1-PY4.

In aggregate, the total number of outpatient dialysis sessions increased by about 13,000, 23,000, 21,000, and 29,000 relative to the comparison group in PY1, PY2, PY3, and PY4 respectively

(see **Exhibit 12**). [42] The increases in the aggregate number of dialysis session are compounded by the growth in the number of CEC beneficiaries over time.

Exhibit 12. Impact of the CEC Model on the Aggregate Number of Outpatient Dialysis Sessions



Notes: Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. Aggregate estimates are based on the estimated total number of aligned intervention member months for the 1,037 CEC facilities participating in the CEC Model. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

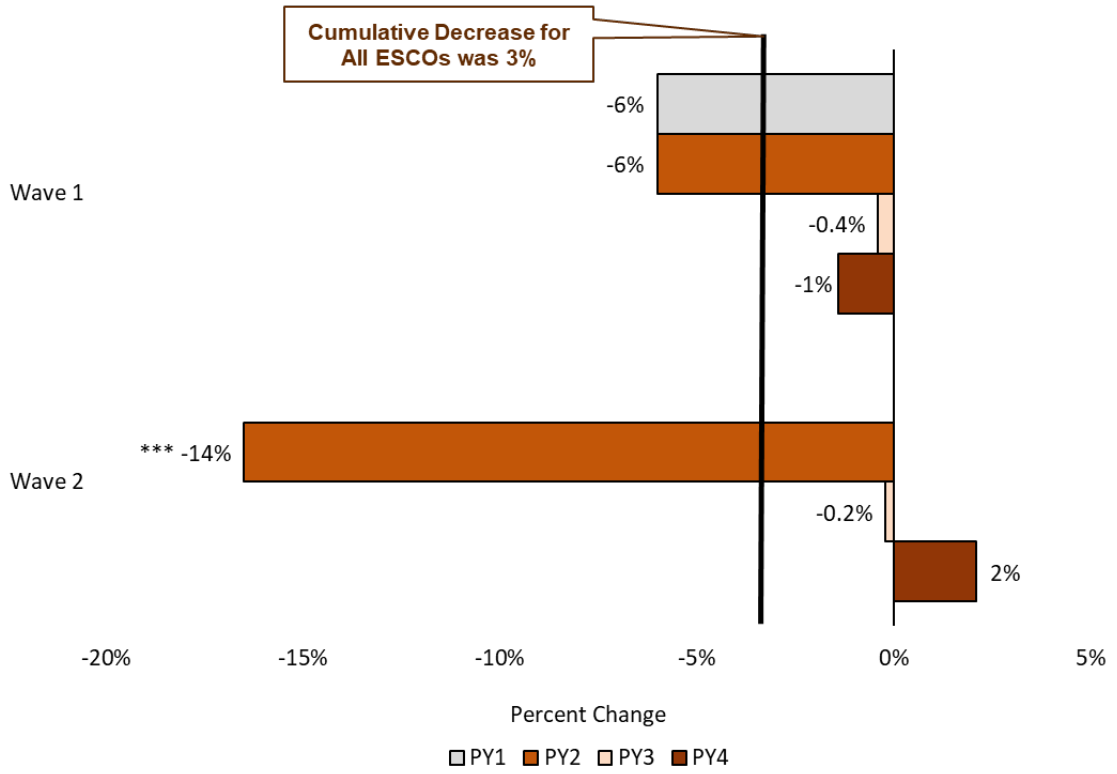
Emergency dialysis sessions (i.e., dialysis sessions that are unscheduled and occur in a non-dialysis facility setting) declined by 3% relative to the pre-CEC period, but this change was not statistically significant (**Exhibit 13)**. However, an overall decline is expected as the increase in outpatient sessions should lead to a reduced need for emergency dialysis sessions. A shift from emergency to outpatient sessions would also be consistent with ESCOs' emphasis on strategies to improve patient adherence, as described above. The CEC Model also increased the coordination of and payment for transportation to ESRD-related appointments, a significant barrier to access to dialysis care, which may have contributed to the decline in use of emergency dialysis sessions for Wave 2 ESCOs. Although emergency dialysis sessions declined in PY1 and PY2, only the Wave 2 PY2 results were statistically significant.

[42] Aggregate estimates are based on the number of aligned performance period CEC member months and the PBPM DiD estimate for each outcome. For example, aggregate PY1 increased number of dialysis sessions equals 192,810 member months multiplied by 0.06807 PBPM dialysis sessions, which equals approximately 13,124 more estimated dialysis sessions in PY1.

"Because there's nothing more important than the patient coming to the dialysis treatment. We really can't get anything else done if they don't get here to treatment. So, it's all about making sure the staff understand that. I really think it's a different mindset. I've been in dialysis 27 years. And there used to be a time that the patient called and said, I can't get to the treatment. And we said, well, if you don't feel good, go to the ER. So, it was meeting with the staff, letting them know we don't want patients to go to the ER, we want them to come here, we have to be open, we have to be flexible if a patient shows up on a wrong day, we still dialyze them…Even if you can't give them the full treatment, we give them some of the treatment. We do everything that we can. So, it's been a culture change."

– ESCO Site Visit Participant

Exhibit 13. Impact of the CEC Model on the Likelihood of Receiving Emergency Dialysis in a Given Month



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-19-E-21.**

In PY4, ESCOs expanded patient education about home dialysis and their capacity to train beneficiaries on home dialysis. One ESCO began starting patients who crash into dialysis with

peritoneal dialysis catheter and home dialysis. Fresenius efforts included the purchase of a home dialysis company. Despite these efforts, we found no evidence that the CEC Model impacted modality of dialysis treatment. Changes in the modality of treatment pre- and post-CEC were very modest and not statistically significant (see **Exhibits E-19-E-21**). The vast majority of dialysis patients in the United States receive in-center hemodialysis treatments three times a week with a typical duration of three to four hours each. (Among the beneficiaries in our analytic sample, 93% had hemodialysis and 7% had peritoneal dialysis.) The percent of patients treated with home therapies is relatively low, although home therapies may provide the flexibility to help individual patients maintain their lifestyle, and some research has shown that home hemodialysis patients report a higher quality of life relative to patients receiving in-center hemodialysis.[43]

b. Prior Nephrology Care

Although financial accountability under the CEC Model begins with initiation of dialysis, ESCOs have an incentive to provide additional care to late-stage CKD beneficiaries to improve outcomes once dialysis and model alignment begin. Unplanned dialysis starts or inadequate preparation for starting dialysis are associated with adverse outcomes.[44] Several ESCOs indicated that they were attempting to improve pre-dialysis care for this reason, unrelated to the model.

> *"We've had CKD for a while. Its uptake has been a little bit slower, where we get patients in, the patients do really well."*
>
> – ESCO Site Visit Participant

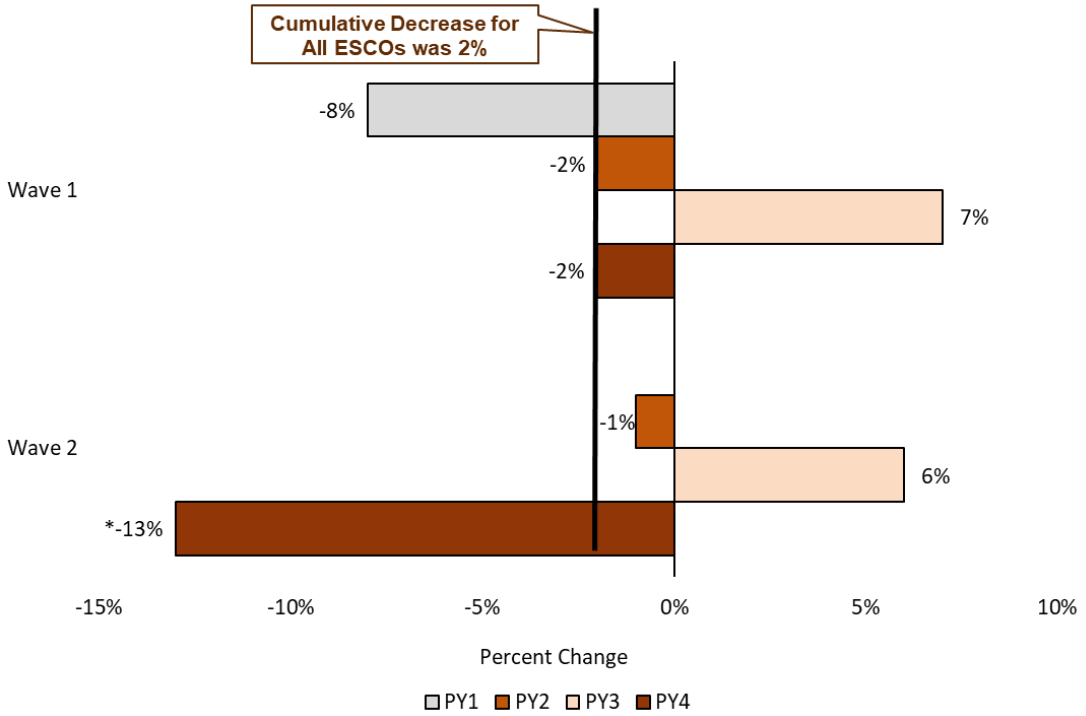
To assess the extent to which ESCOs focused on improving pre-dialysis care, we investigated the impact of the model on the percent of beneficiaries who receive nephrology care before the start of dialysis.[45] CKD education programs designed to delay disease progression and prepare CKD patients for dialysis are important for avoiding early complications and reducing costs. These programs are available to all patients not yet on dialysis. One non-LDO site visit participant suggested that the increase in insurance coverage as a result of the implementation of the Affordable Care Act and expansion of Medicaid may have resulted in increased use of CKD programs. Although pre-dialysis patients are not yet aligned to an ESCO, the potential to avoid early post-dialysis complications might motivate ESCOs to try to identify CKD patients who might become aligned to ESCOs after starting dialysis. Overall, there were no statistically significant changes in the percent of beneficiaries who started dialysis with no prior nephrology care. However, in PY4 Wave 2 ESCOs were 13% ($p \leq 0.10$) less likely to have no prior nephrology care before the start of dialysis (see **Exhibit 14)**.

[43] https://www.hsrd.research.va.gov/publications/esp/kidney-dialysis-REPORT.pdf

[44] Molnar, A.O., Hiremath, S., Brown, P.A., Akbari, A. (2016). Risk factors for unplanned and crash dialysis starts: A protocol for a systematic review and meta-analysis. *Systematic Reviews,* (5):117. https://doi.org/10.1186/s13643-016-0297-2

[45] A beneficiary was considered to have no prior dialysis care if their first vascular access type was not a graft or fistula and if they did not have select services such as treatment by a nephrologist, kidney dietician, or receive erythropoietin before the start of dialysis.

Exhibit 14. Impact of the CEC Model on the Likelihood of Not Receiving Nephrology Care Prior to Dialysis



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-19-E-21.**

c. Vascular Access Type

Because infections and infection-related hospitalizations often occur in chronic dialysis patients with tunneled catheters for vascular access, we anticipated that ESCOs may focus additional resources on successful creation of arteriovenous (AV) fistula, which is the most preferred access type, and AV graft which have lower risk of infections and other complications compared to long term catheters.

Vascular surgeons are important partners in ESRD treatment because they establish and maintain essential access sites for dialysis. ESCOs indicated that partnerships with vascular surgeons were an important strategy to reduce vascular access complications.[46] In PY4, Wave 2 ESCO site visit participants described successful partnerships, where the vascular surgeons responded more urgently to patients' access maintenance needs than before the implementation of the model.

[46] Tunneled catheters are tubes surgically placed under the skin and underlying tissues 'tunneled' into a large vein, usually in a patient's neck or chest, to allow access to the patient's bloodstream for dialysis treatments.

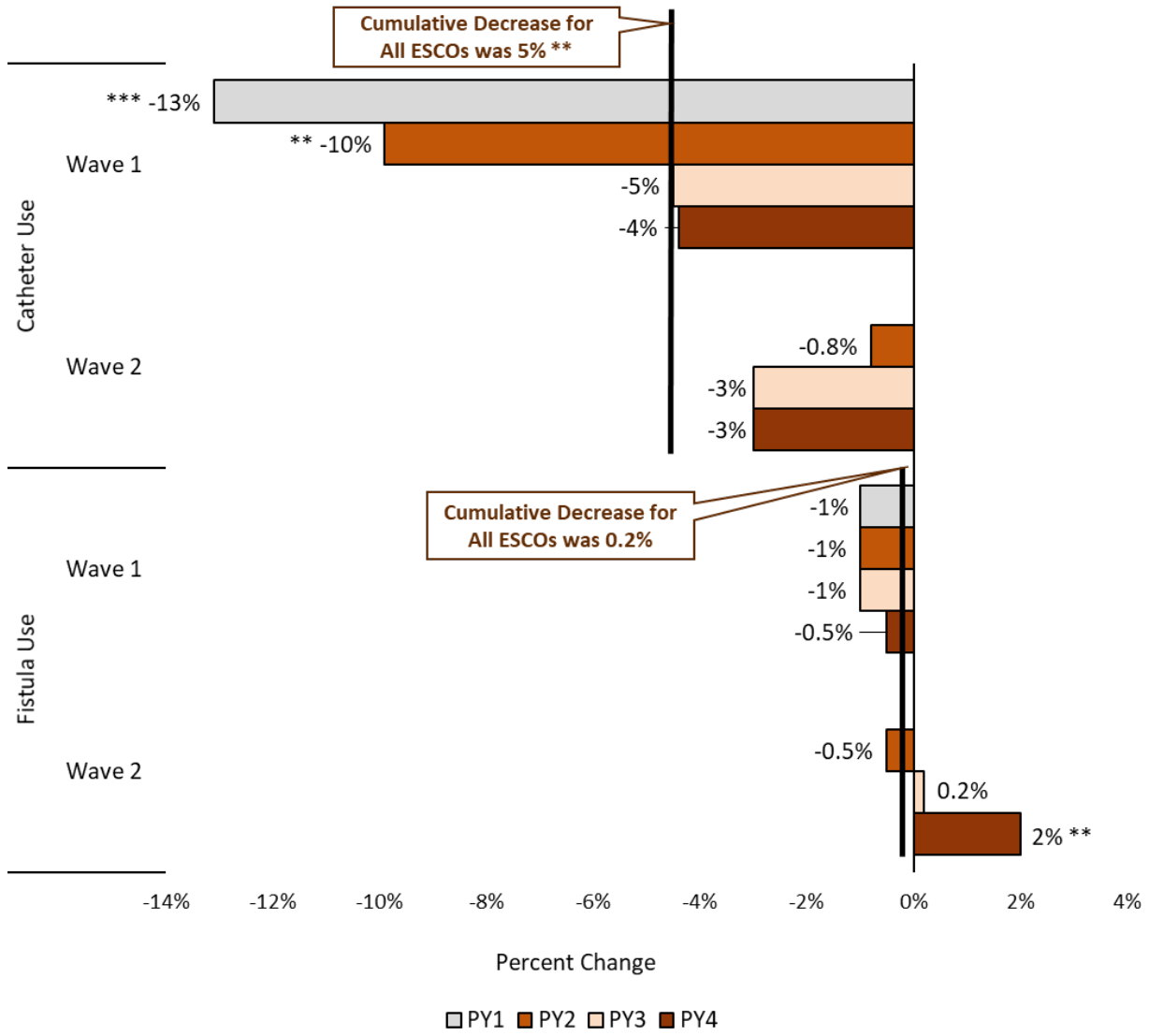
Some participants reported that shortages of vascular surgeons in their service areas created challenges with maintenance of vascular access resulting in hospitalizations. See Section III.C.2. for a discussion of partnerships with vascular surgeons.

During the first four performance years catheter use increased for both CEC comparison group beneficiaries but increased faster for the comparison group relative to CEC beneficiaries. This resulted in a decline in the percent of beneficiaries who used catheters as their vascular access for 90 days or more by 5% ($p \leq 0.05$) for CEC beneficiaries relative to the pre-CEC period (see **Exhibit 15)**. This result continued to be driven by Wave 1 ESCOs, despite the impact declining over time, with no statistically significant change among Wave 2 ESCOs. The shortages of vascular surgeons noted by Wave 2 site visit participants may contribute to this decline, especially because the Wave 2 CEC population is less metropolitan (see **Exhibit 7**) than Wave 1.

Overall, there was no statistically significant impact on fistula use over the four-year period. The CEC Model resulted in a modest increase in the percent of beneficiaries using fistula as their vascular access for Wave 2 ESCOs. In PY4, Wave 2 ESCOs, show a statistically significant increase in fistula use of 2% ($p \leq 0.05$).[47] Given the limited shift in increased fistula use, it appears that the decrease in catheter use corresponds to an increase in AV grafts.

[47] The estimated impact was driven by the comparison group which experienced a relative decrease in the use of fistulas in PY4. Fistula use among Wave 2 CEC beneficiaries remained stable throughout all performance years.

Exhibit 15. Impact of the CEC Model on the Likelihood of Vascular Access Type in a Given Month



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-19-E-21.**

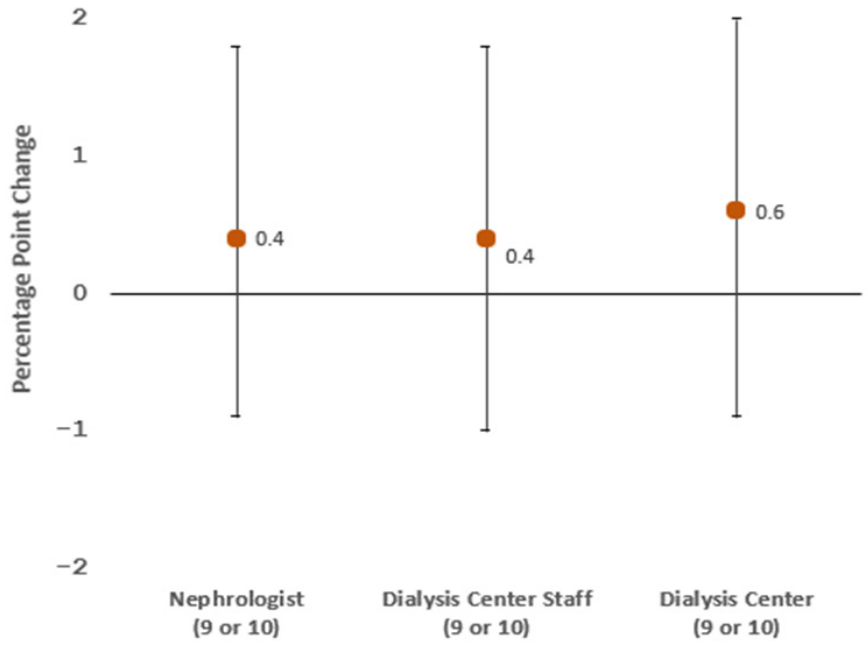
d. CEC Patients' Experience with Dialysis Care

To assess changes in patients' experience of care, we estimated the impact of the CEC Model on the percent of beneficiaries who reported the highest level of satisfaction with care (i.e., top-box level) across all ESCOs for the ICH CAHPS® measures examined. The eight ICH CAHPS®

measures evaluated included three global ratings measures (see **Exhibit 16**), two individual survey items (see **Exhibit 17**), and three composite score measures (see **Exhibit 18**). Additional descriptive statistics for each measure by wave and performance year are shown in **Appendix G**.

As in prior annual reports, overall, there was no change in patients' experience of care from the pre-CEC to the post-CEC periods relative to the comparison group, as measured by the In-Center Hemodialysis Consumer Assessment of Healthcare Providers and Systems (ICH CAHPS®) survey measures. Although reduced quality is a potential concern in any model intended to drive down total cost of care in a vulnerable population, we did not anticipate such an effect given the existing ESRD Quality Incentive Program that applies to all dialysis facilities (see **Exhibit 21**).[48]

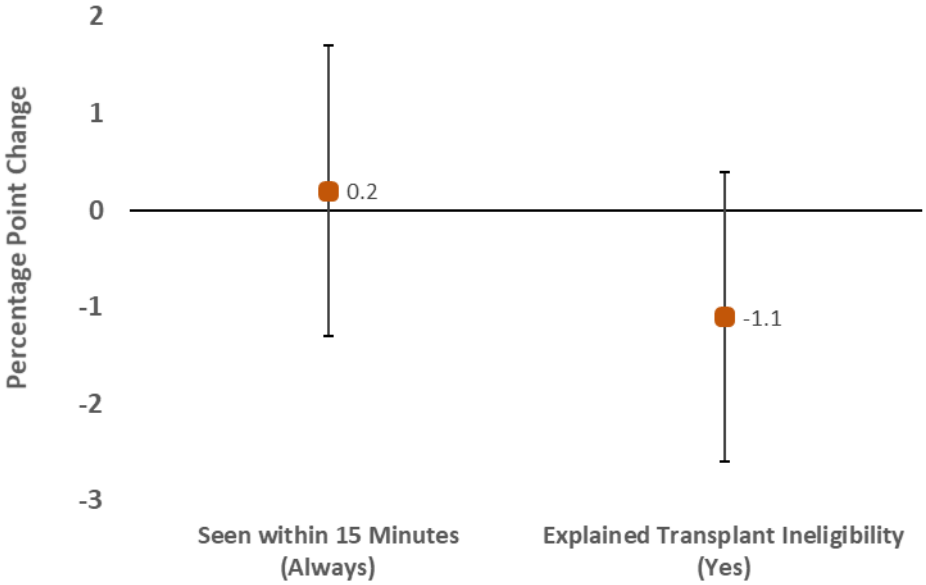
Exhibit 16. Impact of CEC on ICH CAHPS® Global Ratings Measures
Percent of Beneficiaries Reporting the Most Positive Experience



Notes: This analysis included results from the fall 2014 through the fall 2019 ICH CAHPS® surveys, which encompass the pre-period, PY1, PY2, PY3, and PY4. Plotted values are the DiD estimates and 90% confidence intervals. The responses categorized as top-box include responses of 9 or 10 on a scale of 0 (worst) to 10 (best). Individual questions are available in **Appendix G**.

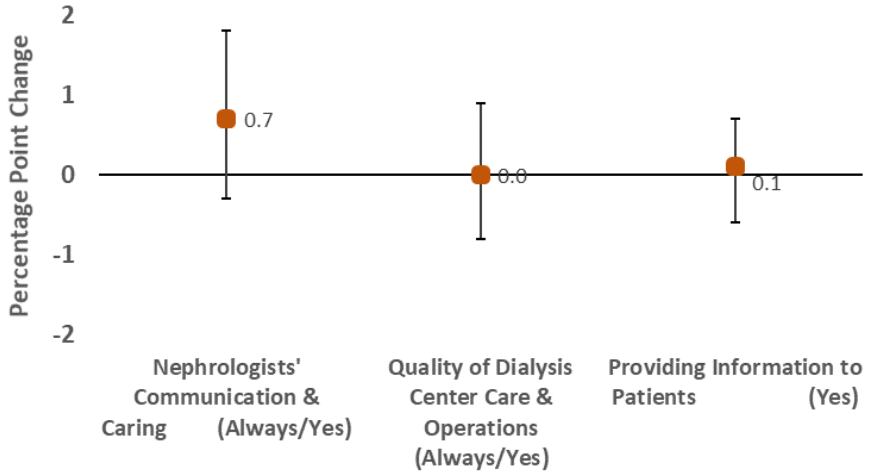
[48] We found small statistically significant, but not clinically meaningful, impacts by wave and year for four measures. Summary statistics and regression results by wave and performance year for the eight examined ICH CAHPS® measures are displayed in **Exhibit G-4.**

Exhibit 17. Impact of CEC on ICH CAHPS® Individual Survey Items
Percent of Beneficiaries Reporting the Most Positive Experience



Notes: This analysis included results from the fall 2014 through the fall 2019 ICH CAHPS® surveys, which encompass the pre-period, PY1, PY2, PY3, and PY4. Plotted values are the DiD estimates and 90% confidence intervals. Individual questions are available in **Appendix G**.

Exhibit 18. Impact of CEC on ICH CAHPS® Composite Score Measures
Percent of Beneficiaries Reporting the Most Positive Experience



Notes: This analysis included results from the fall 2014 through the fall 2019 ICH CAHPS® surveys, which encompass the pre-period, PY1, PY2, PY3, and PY4. Plotted values are the DiD estimates and 90% confidence intervals. Individual questions are available in **Appendix G.**

2. What Was the Impact of CEC on the Coordination of Care beyond Dialysis?

Because ESCOs are accountable for all the Medicare Part A and B costs of their beneficiaries, providers have an incentive to invest in preventive services and chronic disease management activities beyond standard dialysis care. ESCOs reported various efforts to coordinate non-dialysis care for aligned beneficiaries, such as promoting preventive health, chronic disease

management, and the use of other services (e.g., hospice). Some noted that the model brought about an increased focus on efforts that had been in place prior to the CEC Model, resulting in these services being provided (or patients being referred to other providers) more consistently and with greater follow-up to ensure their completion.

> *It used to be like pulling teeth to get antibiotics [for] your patients in the clinic that were [for] non-dialysis related [infections]. I don't have that problem anymore."*
>
> – ESCO Site Visit Participant

Similar to Wave 1 ESCOs, Wave 2 ESCOs described delivering more holistic care since the start of the model, in which care moved from providing dialysis to treating the whole patient. The model's emphasis on quality metrics and the associated accountability for the total cost of health care for the patient influenced the willingness of some nephrologists to address primary care needs directly, as well as motivated staff and nephrologists to work together to encourage beneficiaries to become more invested in their care. Some continue to monitor some preventive care metrics that were no longer required by the model. However, lack of provider access and transportation continued to challenge the coordination of non-dialysis care, especially in non-metropolitan areas. This may be especially the case for PY3 and PY4 joiners who are increasingly less metropolitan relative to prior joiners. We evaluated whether the CEC Model increased the use of preventive health services, such as immunizations and lab tests, and the use of hospice. We also examined care correlated with chronic disease management, such as evaluation and management (E/M) office visits and medication management. We found some evidence that overall the CEC Model improved coordination of care beyond dialysis.

a. Preventive Care

Overall, the CEC Model increased the use of preventive care screening tests and labs, as well as flu vaccinations, as shown in **Exhibit 19**. For beneficiaries with ESRD who were also diabetic, we assessed testing for low-density lipoprotein (LDL) cholesterol control, HbA1c,[49] and dilated eye exams. These preventive care measures are important because of the high rate of diabetes and heart disease in the ESRD population (among the beneficiaries in our analytic sample, 75% had diabetes and 73% had congestive heart failure, or CHF). In addition, dilated eye exams for diabetic beneficiaries is one of the quality measures that determine ESCOs total quality performance for shared savings calculations in PYs 1-3.[50] Flu vaccination is also a quality measure included in shared savings calculations in PYs 1-4.

> *"The benefit of having sort of the more hybrid measures, the focus was more on population health, it was better diabetes management, for foot checks, eye checks, getting their immunizations, really elevated the bar up to the focus pneumonia vaccinations. Then we struggled with influenza as an organization and I think it's really pushed us to improve drastically."*
>
> – ESCO Site Visit Participant

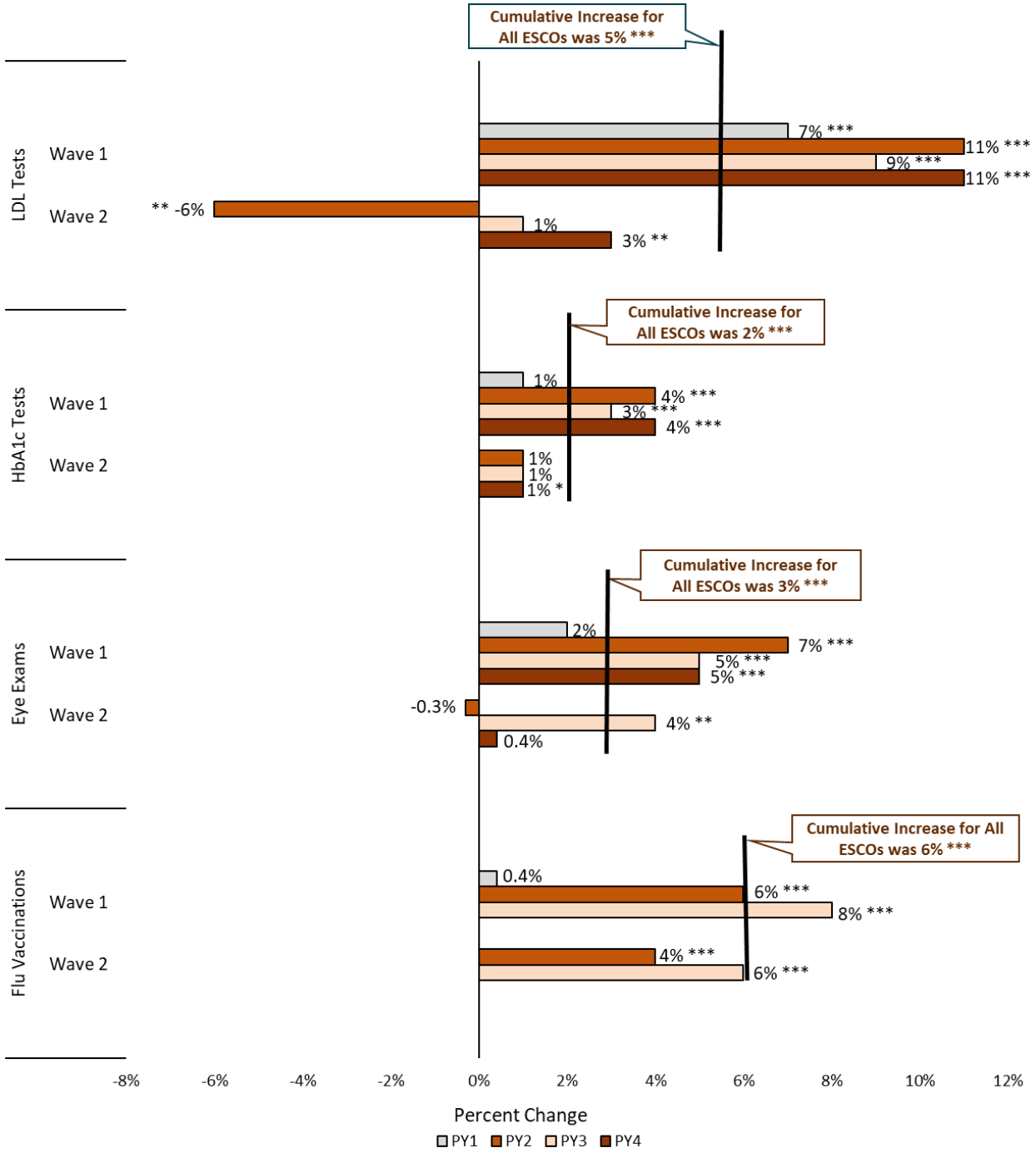
Our results showed that CEC beneficiaries were more likely to receive LDL tests, HbA1c tests, eye exams, and flu vaccinations, but these findings

[49] HBA1c testing decreased for both CEC and comparison groups, however, the decrease in testing was less pronounced for CEC beneficiaries and as a result, CEC beneficiaries are more likely to get tested relative to the comparison group. This decrease is consistent with national trends. According to the 2018 USRD Report, HbA1c testing has been decreasing over time. This may reflect an increasing awareness of the limitations of HbA1c as an indicator of average glycemia in diabetic patients with ESRD.

[50] See https://innovation.cms.gov/initiatives/comprehensive-esrd-care/ for the full CEC quality performance set.

were primarily driven by Wave 1 ESCOs, with sustained impacts over time for all measures but flu (see **Exhibit 19**). Increases in flu vaccinations were statistically significant for both waves in the second flu season (noted as PY2 in **Exhibit 19**).

Exhibit 19. Impact of the CEC Model on the Likelihood of Receiving Preventive Services in a Given Year



Notes: Preventive care measures are evaluated at the yearly level. All PYs are defined as before, except for PY1 which is defined as the 2016 calendar year and does not include the October -December 2015 period. PY2 is defined as 2017; PY3 is defined as 2018; and PY4 is defined as 2019. All ESCOs estimates include both waves from 2016 through 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the

model. The flu season is defined as August through April (i.e., PY1 represents Aug 2016 – April 2017; PY2 defined as Aug 2017 – April 2018; and PY3 defined as Aug 2018 – April 2019). Based on the data used for this analysis, a full flu season for PY4 joining Wave 1 facilities and Wave 2 ESCOs was not available. As a result, the flu estimate only represents Wave 1 PY1 joiners and Wave 1 and Wave 2 PY2/PY3 joiners. Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-22-E-24**.

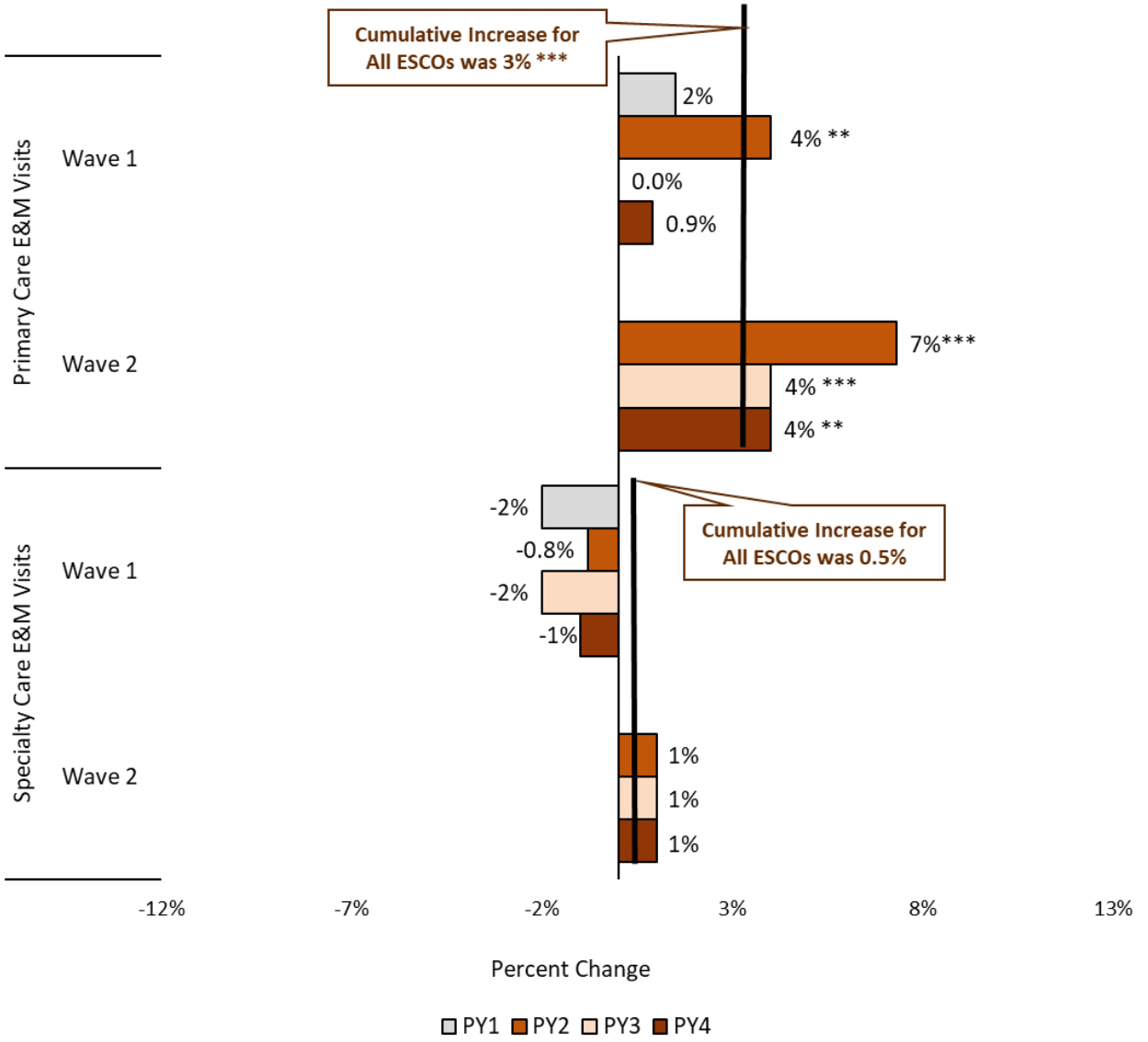
b. Evaluation and Management Office Visits

ESCOs reported increased provision of primary care during dialysis treatment visits and referrals for non-dialysis care. However, Wave 2 ESCOs also described a shift to being more proactive than reactive, noting how care coordinators helped patients establish PCPs, referred to PCPs, and encouraged patients to attend PCP appointments. Overall, the number of primary care E/M visits in a given month increased by 3% ($p \leq 0.01$) under the CEC Model, relative to the pre-CEC period, as shown in **Exhibit 20**.[51] Wave 1 ESCOs had modest and mostly not statistically significant increases across PYs. In contrast, Wave 2 ESCOs had stronger and more consistent increases in primary care visits. Although some ESCOs reported supporting referrals to specialists, there was no indication that CEC affected specialty care E/M utilization. Overall, these results demonstrate ESCOs' efforts in identifying primary care and specialty providers, referring beneficiaries to these providers, and/or setting up these appointments.

> *"I had a patient back in the other clinic that just had so many issues, and we needed to get everyone involved. And she didn't know where to go. She didn't know who to contact. [The care coordinator] did everything. Another guy…same thing. He just [had] many health problems, just a list, and he needed everyone involved, all cardiologists, the endocrinologist, like every single doctor. So I felt like it was really helpful because we were really focusing on every area of his issues, not just nephrology. It was a combination of everything."*
>
> – ESCO Site Visit Participant

[51] The E/M measures used in AR3 and AR4 differ from the versions used in the second annual report (AR2). The AR2 E/M measures were refined to include additional criteria for greater precision in later reports. See more detail in **Exhibit E-3.**

Exhibit 20. Impact of the CEC Model on the Number of Primary and Specialty Care Visits in a Given Month



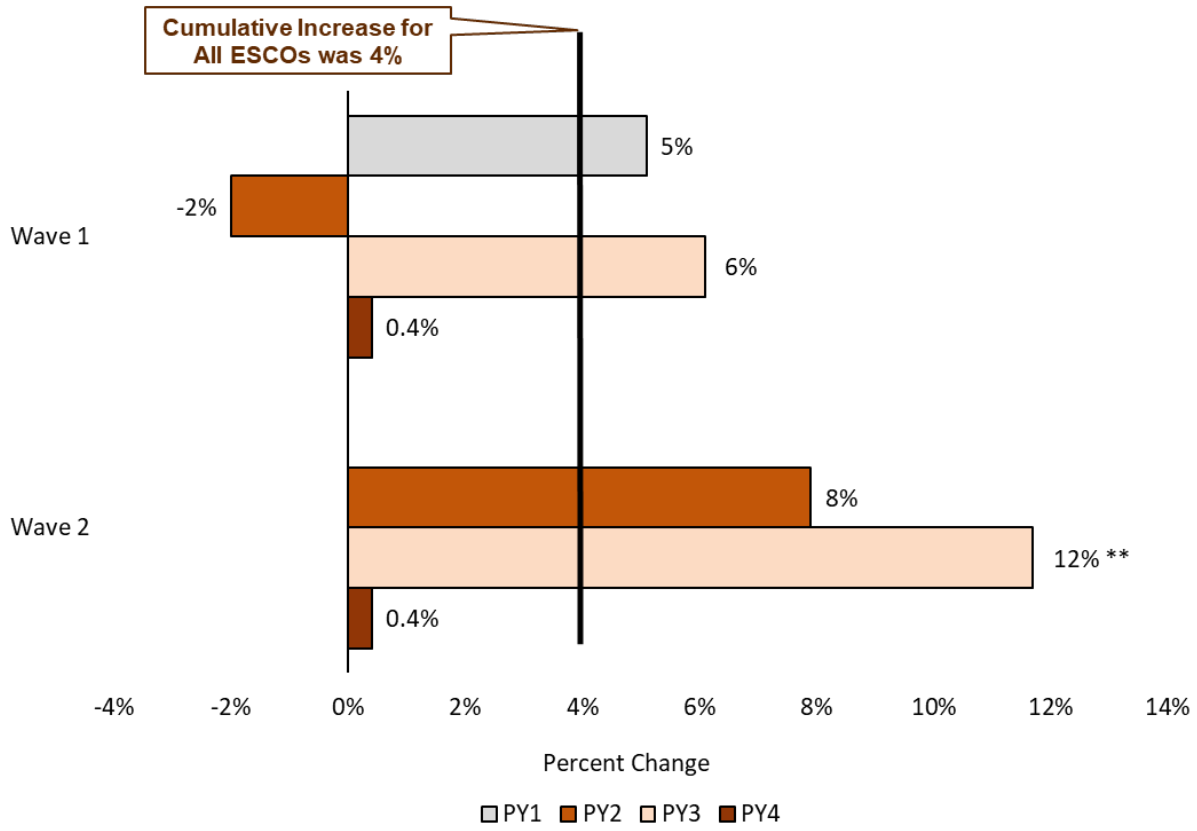
Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-22-E-24.**

c. Hospice

In early interviews, ESCOs reported that some staff and nephrologists were uncomfortable discussing end-of-life care and hospice services with beneficiaries and expressed a desire for more training and resources in these areas. Modest change was noted in more recent interviews, as ESCOs described some limited discussion between staff, patients, and caregivers about hospice. These discussions typically involved staff providing referrals to external services for advance care planning or hospice care. However, some patients were not interested in transferring to hospice care.

To investigate whether the CEC Model had an impact on hospice care, we evaluated hospice Medicare payments and hospice utilization. Because dialysis is a life-sustaining service, beneficiaries without a life-threatening illness (other than ESRD) would have to decide to stop dialysis care in order to receive hospice care. Without dialysis care, there is a very limited period of time to establish and receive hospice care. Although some ESCOs reported offering more education about hospice and end-of-life care and a few built partnerships with hospice providers, there was little indication that CEC affected hospice use (see **Exhibit 21**). The impact on hospice use overall was positive (4% increase) but not statistically significant. In the PY4 site visits, Wave 2 ESCOs described increased focus on palliative care, which includes both end of life care as well as addressing pain and symptom management regardless of stage of disease. Conversely, during site visits with Wave 1 ESCOs in AR3 participants recognized the potential importance of hospice care, primarily in patient education. Consistent with these qualitative findings, there was some indication of larger impact among Wave 2 ESCOs, but the results were not statistically significant except PY3 for Wave 2 ESCOs which showed a 12% increase ($p \leq 0.05$) relative to the comparison group. However, this impact among Wave 2 ESCOs dissipated in PY4.

Exhibit 21. Impact of the CEC Model on the Likelihood of Receiving Hospice Services in a Given Month



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-22-E-24.**

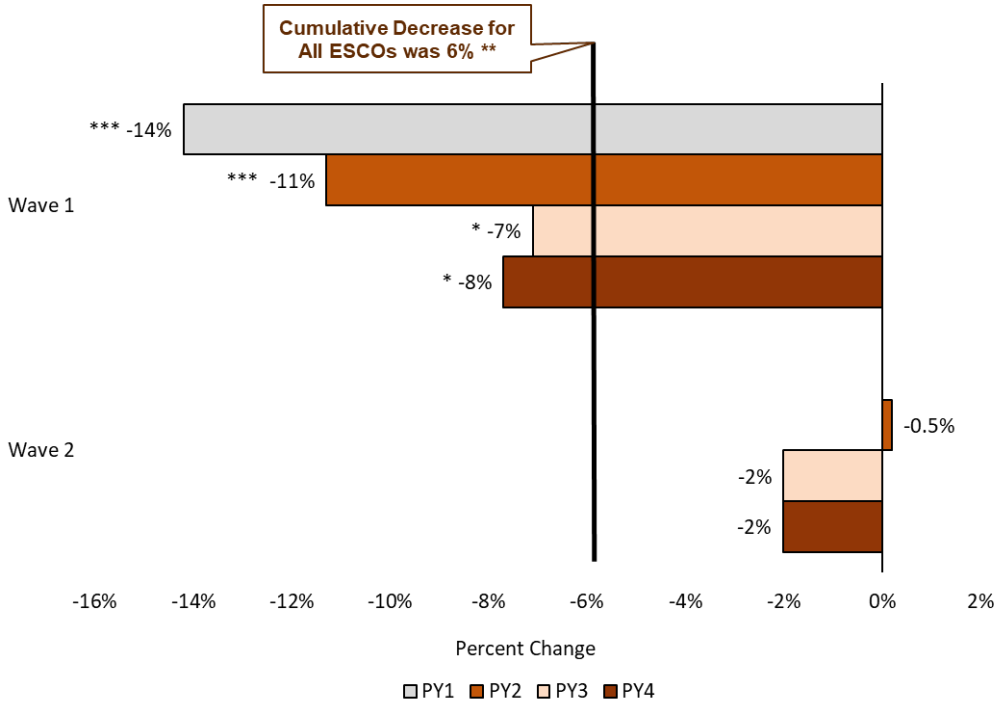
d. Medication Management

ESCO focus on medication reconciliation to reduce the incidence of complications that require urgent care from an ED and can potentially result in a hospitalization was widespread since the beginning of the model.[52] Similarly to Wave 1 ESCOs, Wave 2 ESCOs reported increased emphasis on medication management including patient education about medication adherence as well as increases in frequency and improvements in tracking of medication reconciliation. However, only one site visit participating ESCO employed a pharmacist dedicated to medication reconciliation for all patients in PY4.

[52] Please see the first annual report (https://innovation.cms.gov/Files/reports/cec-annrpt-py1.pdf) and the second annual report (https://innovation.cms.gov/Files/reports/cec-annrpt-py2.pdf).

We evaluated the impact of the model on reducing overuse of opioids and use of contraindicated medications as well as improving phosphate binder adherence. Phosphate binder adherence is important for minimizing bone disease in people with ESRD. Analysis of these three measures was restricted to beneficiary months where the beneficiary with ESRD had Medicare Part D coverage for prescription drugs, which accounted for approximately 83% of the sample. Wave 2 ESCOs commented that they frequently provided patient education about the importance of taking phosphate binders because it is difficult for patients to remember to take their phosphate binder medications. This emphasis on phosphate binder education is consistent with the improvement in adherence shown in **Exhibit 23**. Site visit participants also noted that member cost was prohibitive, however, the majority of beneficiaries receive the Medicare Part D Low Income Subsidy, which reduces member cost. Phosphate binder adherence may also be influenced by the emergence of new formulations. Given that patients on dialysis take 19 pills per day on average, and about half are from phosphate binders, more potent medications have the potential to improve quality of life by lowering pill burden.[53] The CEC Model had a statistically significant, favorable impact on opioid overuse and phosphate binder adherence (see **Exhibits 22** and **23**). We measured opioid overuse as the percent of beneficiaries who had an average daily morphine milligram equivalent (MME) greater than 50 milligrams: overuse declined by 6% ($p \leq 0.05$), relative to the pre-CEC period, although this improvement was decreasing over time and it was concentrated in Wave 1.

Exhibit 22. Impact of the CEC Model on the Likelihood of Overusing Opioids



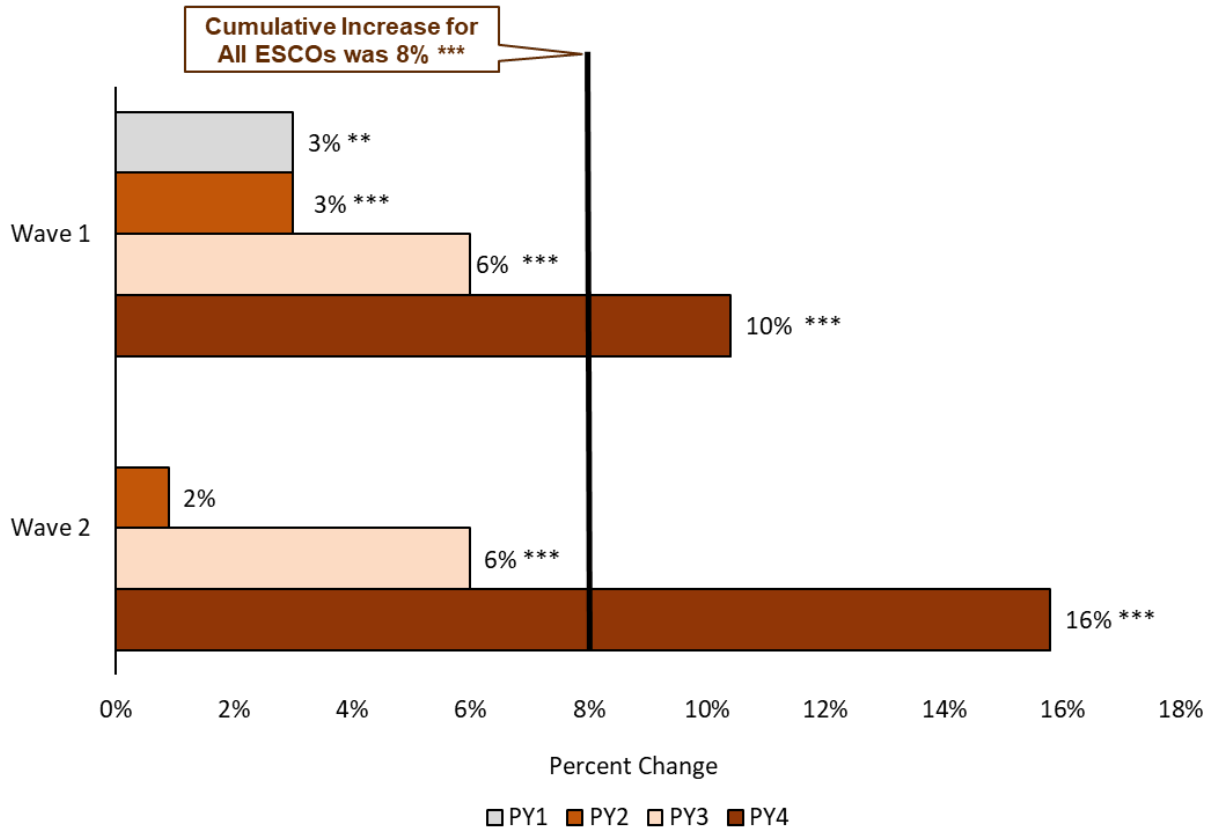
Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to

[53] Chiu, Y.W., Teitelbaum, I., Misra, M., De Leon, E.M., Adzize T,Mehrotra, R. (2009). Pill burden, adherence, hyperphosphatemia, and quality of life in maintenance dialysis patients. *Clinical Journal of the American Society of Nephrology, 4*:1089–1096.

December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-22-E-24.**

One of the most consistent findings in the evaluation is improved phosphate binder adherence. Both Wave 1 and Wave 2 CEC beneficiaries showed improved adherence to phosphate binders, with impacts increasing over time.[54] Overall, the rates of phosphate binder adherence in all ESCOs increased by 8% ($p<0.01$), relative to the pre-CEC period. Wave 1 CEC beneficiaries showed improved phosphate binder adherence with at least 80% of their days covered in a month increased from 3% ($p<0.05$) in PY1 to 10% ($p<0.01$) in PY4. Wave 2 CEC beneficiaries also showed improved phosphate binder adherence their adherence rate increased by 16% ($p<0.01$) by PY4. These improvements are consistent with reports from the site visits of patient education and reminders regarding the importance of these medications.

Exhibit 23. Impact of the CEC Model on Likelihood of Adhering to Phosphate Binder Medication in a Given Month



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to

[54] Adherence was defined for beneficiaries who received at least two phosphate binder prescription in a given year, and was calculated as the proportion of days covered by phosphate binder over 80% in a given month.

December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-22-E.24**

Finally, we evaluated whether there was an impact of the CEC Model on the use of medications that could be contraindicated for beneficiaries with ESRD, such as nitroprusside, a drug for high blood pressure that is associated with reduced nitroprusside metabolite and eventually toxicity.[55] Overall, there were no statistically significant impacts of CEC Model on contraindicated medication use besides a modest decrease in Wave 1 PY2 (see **Exhibits E-22-E-24**).

3. What Was the Impact of CEC on Hospitalizations and Emergency Department Visits?

Because the CEC is a shared savings model, it creates incentives to encourage better coordination across the continuum of care to reduce expensive inpatient utilization. Hospital admissions and readmissions are a major burden for patients with ESRD, who, on average, are admitted to the hospital nearly twice a year.[56] Furthermore, inpatient treatment for beneficiaries with ESRD accounted for about 33% of their total Medicare expenditures.[57]

ESCO efforts to prevent hospitalizations were successful in the first three years of the model,[58] and ESCOs continued to employ multiple strategies to reduce hospitalizations, ED visits, and readmissions in PY4. These efforts included expanded access to dialysis care, expanded and more consistent patient and caregiver education, automated and informal ED notification, and management of all medications, especially following a hospitalization.

Wave 2 ESCOs also reported strategies to reduce hospitalizations. Most Wave 2 ESCOs reported being more proactive about fluid management in PY4 to avoid hospitalizations from fluid overload. Their efforts involved setting goals, developing monitoring dashboards, and improving processes. One ESCO added a dry weight challenge (gradually adjusting a patient's weight) to their standing orders following a patient's hospital discharge. Because this process was time-intensive, staff

> *"Since the ESCO has been implemented, we have so much more reporting tools. Like we have a fluid management dashboard, so we can go in there daily if need be and look to see. Okay, where can we intervene and offer an extra treatment to this patient who is consistently leaving two kilos up to keep them out of the hospital?"*
>
> – ESCO Site Visit Participant

[55] A complete list of contraindicated medications is provided in **Exhibit E-3**.

[56] National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. (2018). United States Renal Data System. 2018 USRDS annual data report: Epidemiology of kidney disease in the United States, Bethesda, MD. https://www.usrds.org/2018/view/v2_04.aspx

[57] Ibid

[58] Please see the first annual report (https://innovation.cms.gov/Files/reports/cec-annrpt-py1.pdf), the second annual report (https://innovation.cms.gov/Files/reports/cec-annrpt-py2.pdf), and the third annual report (https://innovation.cms.gov/).

prioritized new and recently hospitalized patients and were more aggressive in using it in PY4 than in previous years.

> *"So education is kind of important because so and I think driving the point that hospitals are not really a place for respite and it's actually the hardest place for patients. So because you can imagine if somebody has terrible support at home. Sometimes they look at the hospitalization as a positive thing because it's a break to the families basically they're taken care of, they're given meals and so on and so forth. But by the same token it's not a good place to be. You pick up a lot of resistant bacteria. It's a hazardous place to be. So just engaging patients by the fact that outpatient care is safer than hospital care. So basically just education at this point in time."*
>
> – ESCO Site Visit Participant

Despite their success in reducing hospitalizations, ESCOs in Wave 1 and Wave 2 experienced challenges sharing information with hospitals. In PY3, Wave 1 ESCOs reported that some hospitals were not receptive to ESCO goals (including ED diversion) due to a lack of interest in or education about the ESCO, differing incentives, and concerns about liability and the legal implications of sharing patient medical record information. Wave 1 ESCOs also experienced difficulties receiving notifications and records about ED visits as well as getting information from the hospital after a patient was admitted or discharged. IT investments, including notification alert systems, access to hospital health records or state health information exchange systems (if available), and direct communication and relationships with hospital case managers helped facilitate information sharing. However, delays persisted in alert notifications and were a barrier to successful implementation of these strategies. ESCOs preferred thorough discharge summaries and cohesive follow-up between hospital and facility staff after a visit rather than real-time notification of the admission or discharge.

Perspectives on the factors that led to success in reducing hospital readmissions or ED visits varied. In PY4, some Wave 2 ESCOs successes in avoiding readmissions or ED admissions were often attributed to either formal organizational affiliation with the hospital (e.g., one Fresenius ESCO runs an acute dialysis unit in the hospital) or the relationships between clinic staff and physicians that were already well established. For example, one ESCO noted that they were usually notified only when one of their patients presented to the ED because the acute unit called them; otherwise, they would not have known about the ED admission. A few Wave 2 participants reported that post-discharge follow-up was better because physicians and facility case management staff were making sure patients were seen much sooner after discharge. They conduct dry-weight assessments, medication reconciliation, and helped the patient to achieve a more stable transition back to outpatient dialysis. They felt that these actions helped avoid preventable readmissions.

We explored the following key hospitalization and ED utilization measures with relevance to the CEC Model:

a. **Number of inpatient hospitalizations**, **ED visits**, **and hospital observation stays** (see **Exhibits 24 and 25**). ED visits are an expensive and often preventable alternative to timely ambulatory care. Observation stays are defined as a hospital stay with an expected length of stay of less than two midnights during which the beneficiary receives medical services. When looking at hospitalizations, it is important to include

observation stays to get a complete picture. Because the cost of an observation stay is lower than the per-night cost of an inpatient hospitalization, there may be an incentive to shift from inpatient admissions to observation stays.

b. **Number of most frequent hospitalizations among ESRD beneficiaries** (see **Exhibit 26**). We explored hospitalizations associated with infectious, circulatory, and endocrine/metabolic principal diagnoses (which account for about 50% of hospitalizations) to help identify key drivers for impacts uncovered for overall hospitalizations.[59] Given the relationship between these diagnoses and ESRD care, these groups are likely to be impacted by the CEC Model.

c. **Percent of beneficiaries with infection-related hospitalizations** (see **Exhibit 27)**. Three categories of infection relevant to ESRD care are not fully captured in the infection category above. For example, venous catheter bloodstream infection, and peritonitis, and some sepsis infections are not included. Therefore, these three acute care hospitalization categories provide slightly different lenses (other than principal diagnoses above) to explore hospitalizations for infections. We expected the ESCOs' reported emphasis on reducing long-term catheter use to have an impact on venous catheter bloodstream infections. Approximately 7% of beneficiaries in our sample use peritoneal dialysis as their modality. A measure of peritonitis-related hospitalizations is used to assess this modality specific infection. Impacts of the model on the approximately 7% of beneficiaries in our sample that receive peritoneal dialysis might be captured by the peritonitis measure. Lastly, we explored the sepsis category, which represents complications from all infections, to assess the ESCO's reported emphasis on improving non-dialysis care.

d. **Percent of beneficiaries hospitalized for vascular access or ESRD-related complications** (see **Exhibit 28**). Nearly all of the vascular access complications are not reflected in the top three principle diagnosis categories above. The ESRD related complications measure includes respiratory complications that are not captured in the measures above. These ESRD related hospitalization measures are more likely to be impacted by the model. In addition, ESCOs reported encouraging the use of AV fistula and AV graft over catheters for vascular access to prevent infection-related hospitalizations.

e. **Percent of beneficiaries with Diabetes or CHF related complications** (see **Exhibit 29**). We expected the model to impact measures of hospitalizations for these two Ambulatory Care Sensitive Conditions (ACSC) because of the high prevalence in the ESRD population. ESCOs also reported addressing primary care needs during dialysis treatment and coordinating care beyond dialysis needs.

f. **Percent of beneficiaries with hospital readmissions or ED visits within 30 days of an acute hospitalization** (see **Exhibit 30**). These measures are helpful indicators of the quality of post-acute care. In addition, ESCOs reported coordinating care during transition from a hospital as well as medication reconciliation to prevent readmission.

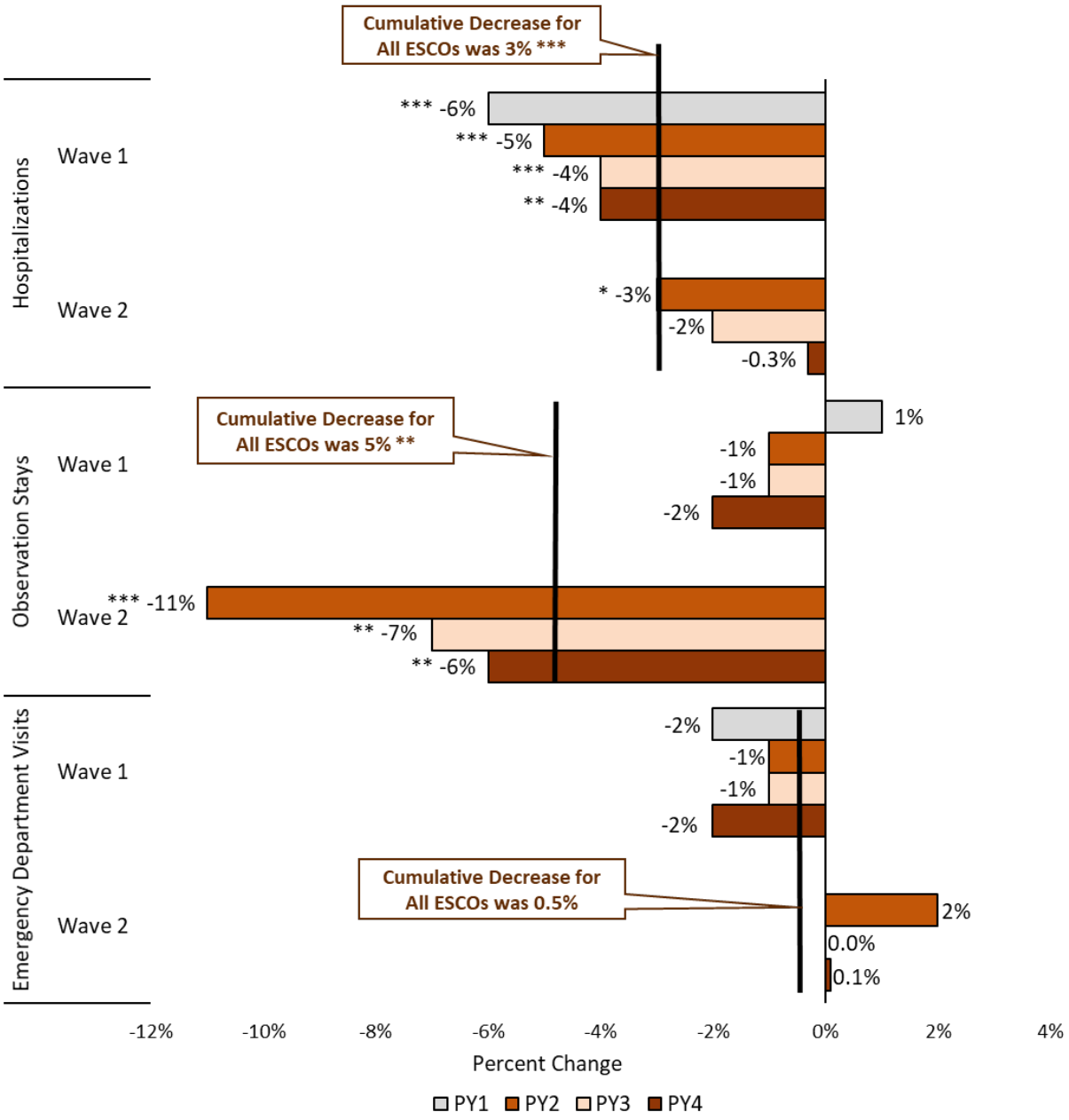
[59] Measures were defined using the same diagnose codes used in the USRD report. Table 13.16; see https://www.usrds.org/2018/download/2018_Volume_2_ESRD_in_the_US.pdf. Principal diagnosis is the condition, after study, which occasioned the admission to the hospital.

a. Overall Hospitalizations, Observation Stays, and ED Visits

The CEC Model continued to reduce the number of hospitalizations and observation stays, while it had no statistically significant impact on the number of ED visits (see **Exhibit 24**). Over the course of the first four years of the model, the number of hospitalizations had a 3% ($p \leq 0.01$) decline relative to the pre-CEC period. This impact translates into a decrease of 4 hospitalizations per 1,000 CEC beneficiaries per month. This result was driven by Wave 1 ESCOs, which experienced reductions in PBPM hospitalizations (4% to 6%, ($p \leq 0.01$)) over the life of the model, compared to their pre-CEC period. The number of observation stays decreased only for Wave 2 ESCOs which experienced a 11% ($p \leq 0.01$) reduction in observation stays in PY2, a 7% ($p \leq 0.05$) reduction in PY3, and a 6% ($p \leq 0.10$) reduction in PY4, when compared to their pre-CEC period. While there were trends toward fewer ED visits, especially for Wave 1 beneficiaries, there was no significant change in the number of ED visits.[60]

[60] The distribution of the number of occurrences (e.g., number of ED visits PBPM) may have high variance due to outlier observations, which can increase standard error estimates and make it more difficult to identify statistical significance.

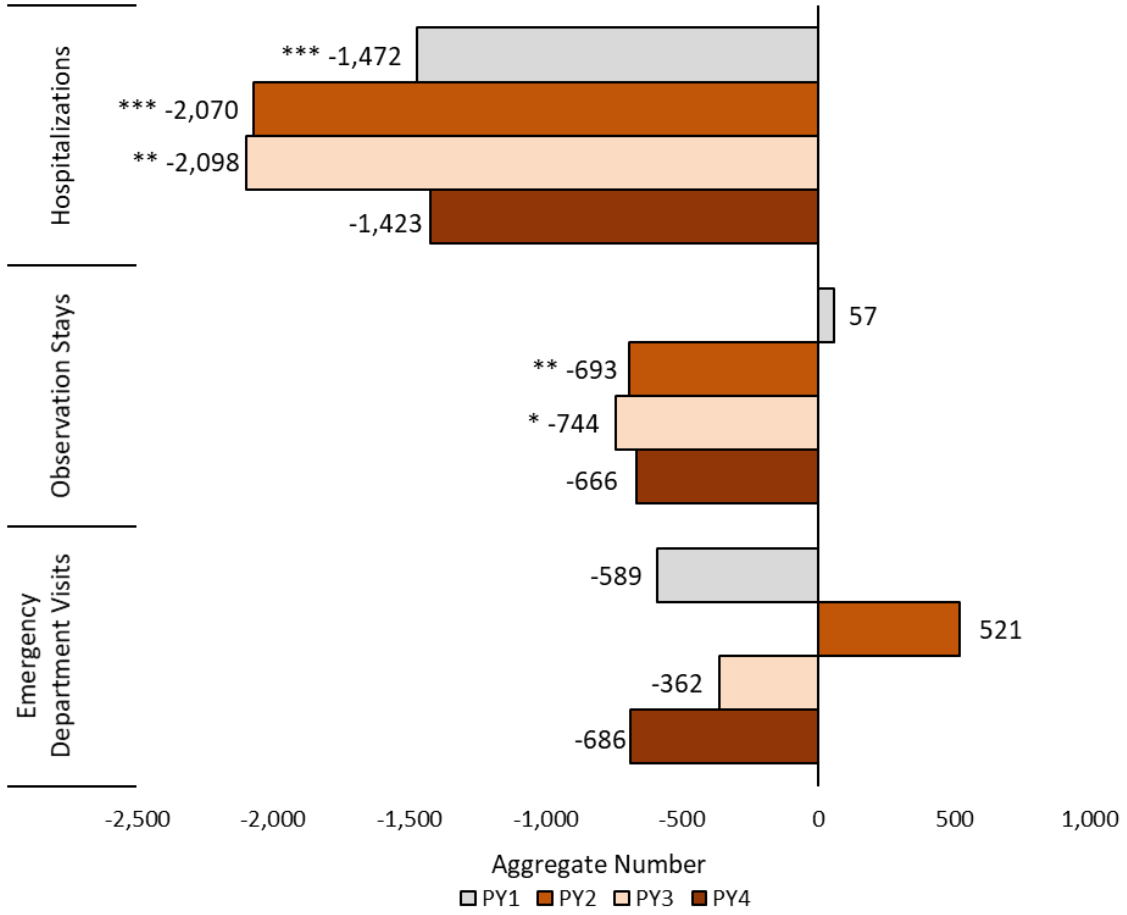
Exhibit 24. Impact of the CEC Model on the Number of Hospitalizations, Observation Stays, and ED Visits in a Given Month



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-25-E-27.**

The impacts of the CEC Model on inpatient hospitalizations, observation stays, and ED visits translate into the aggregate impacts by PY, as presented in **Exhibit 25**.

Exhibit 25. Impact of the CEC Model on the Aggregate Number of Hospitalizations, Observation Stays, and ED Visits by PY



Notes: Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. Aggregate estimates are based on the estimated total number of aligned intervention member months for the 1,037 CEC facilities in the analytic sample.

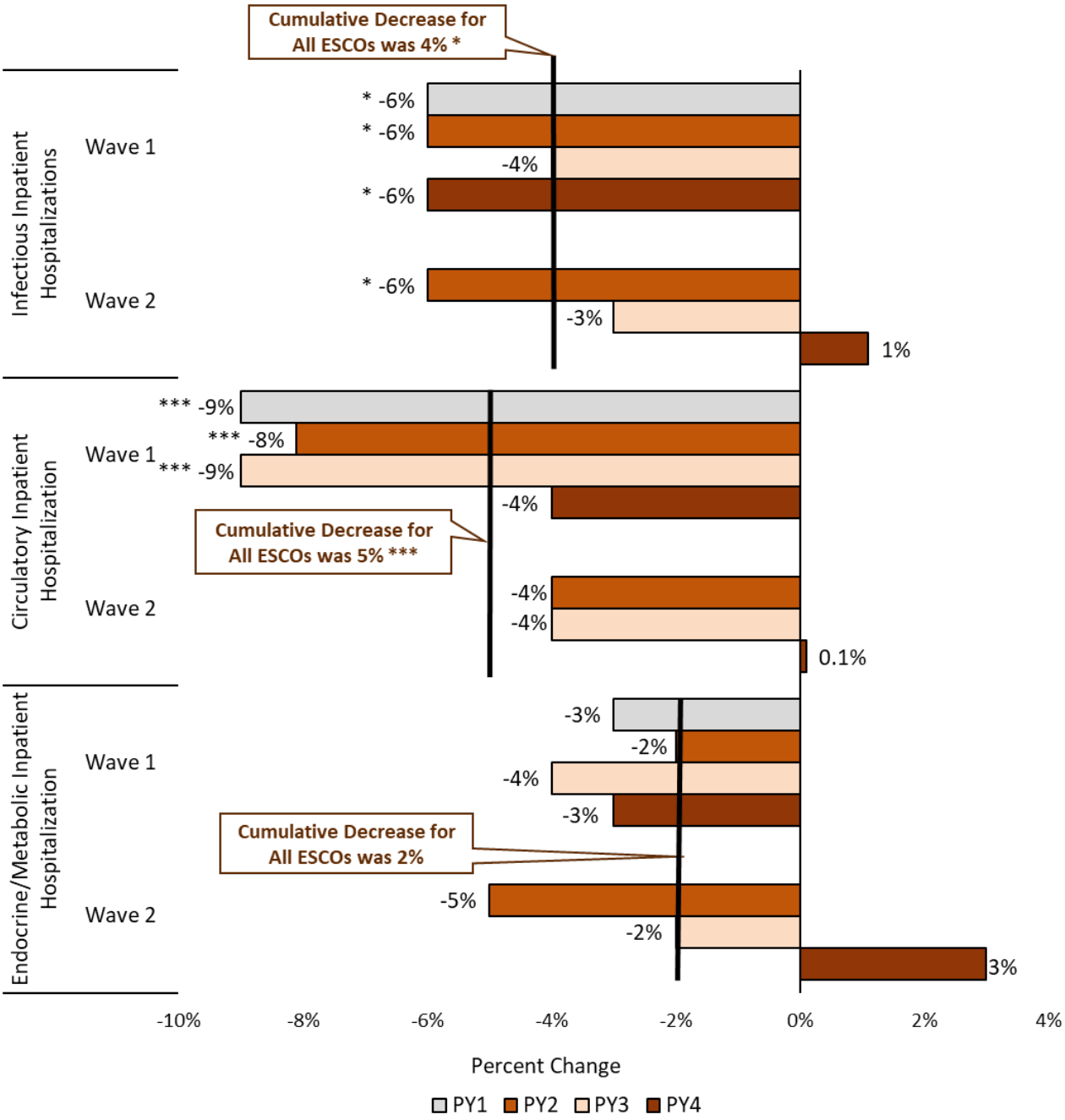
b. Most Frequent Hospitalizations Among ESRD Beneficiaries

The CEC Model had a statistically significant impact on reducing the number of inpatient hospitalizations. To better understand the source of the reduced admissions, we examined hospitalization by principal diagnosis. We selected three admission diagnosis categories (which account for about 50% of hospitalizations) based on their relevance to ESRD care, including infectious, circulatory, and endocrine/metabolic admissions.[61] Results suggest that the number of inpatient admission due to circulatory and infectious related causes decreased as a result of the CEC Model (see **Exhibit 26**). The number of PBPM admissions for both infectious and circulatory inpatient hospitalization decreased by 4% ($p \leq 0.10$) and 5% ($p \leq 0.01$) across all

[61] Measures were defined using the same diagnosis codes used in the USRD report. Table 13.16; see https://www.usrds.org/2018/download/2018_Volume_2_ESRD_in_the_US.pdf.

ESCOs, respectively. As it is the case with overall hospitalizations, the impact was driven by Wave 1 ESCOs. The decline in endocrine/metabolic hospitalizations was not statistically significant. Overall, the results suggest that reductions among infectious and circulatory related inpatient admissions were key drivers in the total number of reduced hospitalizations.

Exhibit 26. Impact of the CEC Model on the Number of Hospitalizations by Principal Diagnoses in a Given Month



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of

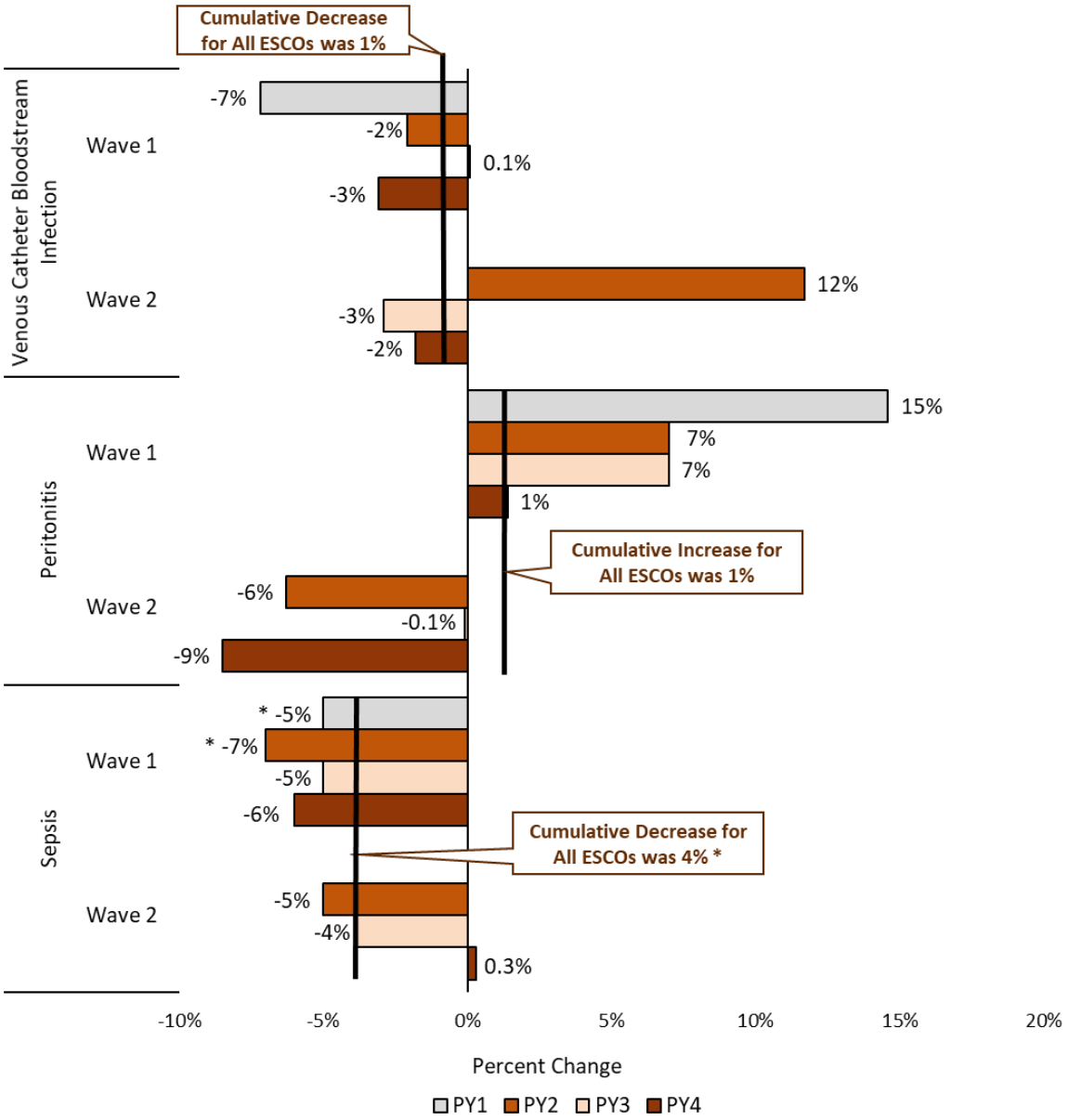
facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-25-E-27.**

c. Infection Related Hospitalizations

Given the statistically significant reductions in hospitalizations associated with an infection related principal diagnosis shown above, we examined impacts on hospitalizations due to three types of infections: catheter-related blood stream infections, peritonitis, and sepsis. We examined catheter-related blood stream infections because catheter use is prone to infection and is the least preferred form of vascular access. We explored peritonitis because 7% of beneficiaries use peritoneal dialysis. Finally, we explored sepsis because it is one of the most frequent, lethal and costly complications of central venous catheterization.[62] However, we did not restrict the sepsis to ESRD related infections in order to assess the impact of ESCO's reported coordination of care beyond dialysis. Results are presented in **Exhibit 27** and show that the CEC Model reduced the likelihood an ESRD beneficiary experienced at least one sepsis related infection for all ESCOs by 4% ($p<0.10$), relative to the pre-CEC period. Both Wave 1 and Wave 2 ESCOs had reductions in the likelihood of a sepsis admission but statistical significance occurred only for Wave 1. There were no statistically significant results for bloodstream or other dialysis related infections.

[62] https://academic.oup.com/bjaed/article/5/2/49/422088

Exhibit 27. Impact of the CEC Model on the Likelihood of Hospitalizations for Catheter-Related Bloodstream Infection, Peritonitis, and Sepsis Infection in a Given Month



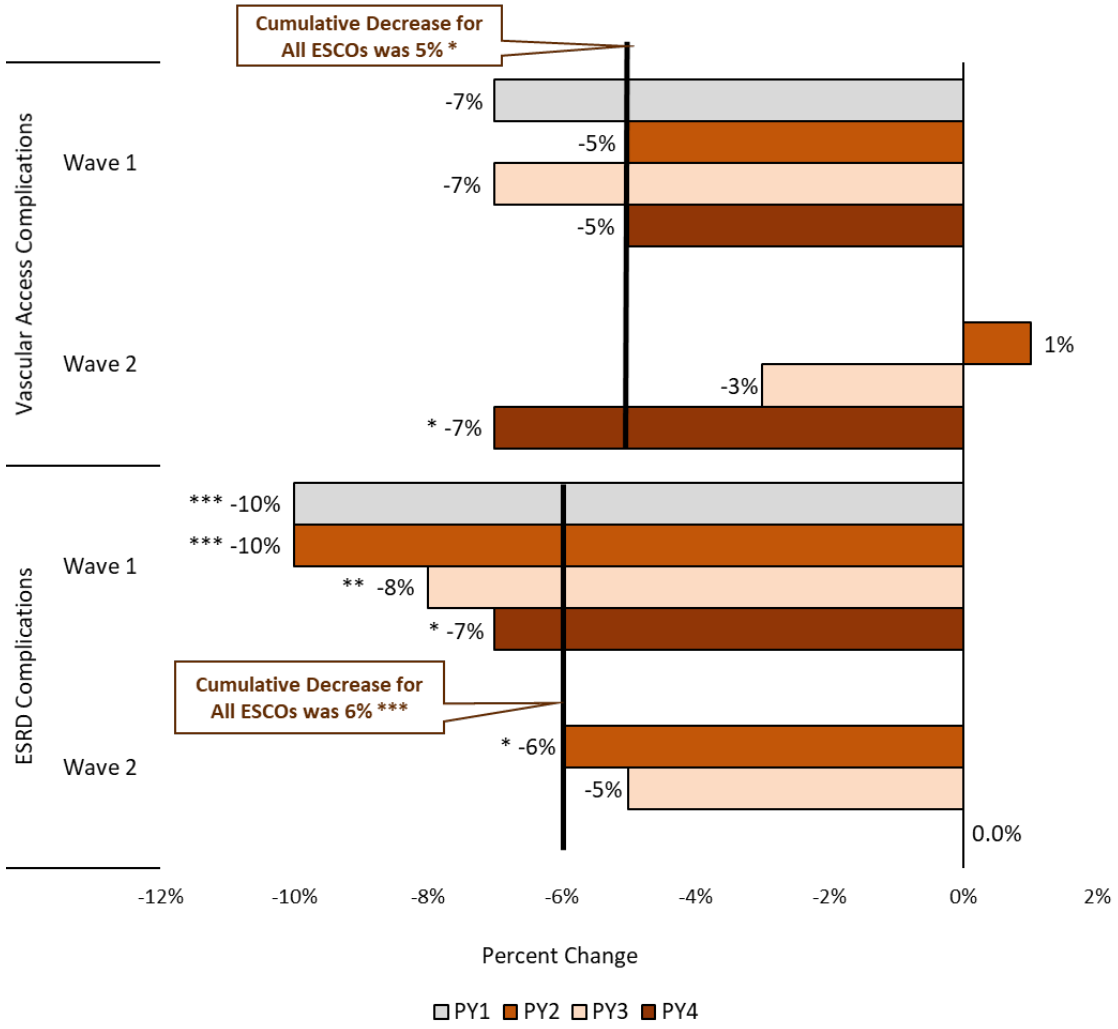
Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate. See Exhibits E-25-E-27.

d. Hospitalizations for Vascular Access and ESRD Complications

ESCOs reduced catheter use, which is prone to infections and is the least preferred form of vascular access (see **Section VIIC**). In PY4, there was a corresponding reduction in hospitalizations for vascular access complications of 5% ($p \leq 0.10$). ESRD complications such as volume depletion, fluid overload, and pulmonary edema[63] occur when beneficiaries miss or shorten dialysis treatments or poorly manage their diet. ESCOs' efforts to prevent these complications included increased access to dialysis treatment and education of patients about the importance of treatment adherence. The results for hospitalizations for vascular access complications and ESRD complications are presented in **Exhibit 28**. As expected, CEC beneficiaries were 6% ($p \leq 0.01$) less likely to experience a hospitalization for ESRD complications in a given month, relative to the pre-CEC period. This result was due primarily to Wave 1 ESCOs and the impact decreased over performance years PY2 through PY4.

[63] The set of diagnosis codes that define each type of complication can be found in **Appendix H**.

Exhibit 28. Impact of the CEC Model on the Likelihood of Hospitalizations for Vascular Access or ESRD Complications in a Given Month



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-25-E-27.**

e. Hospitalizations for Ambulatory Care Sensitive Conditions

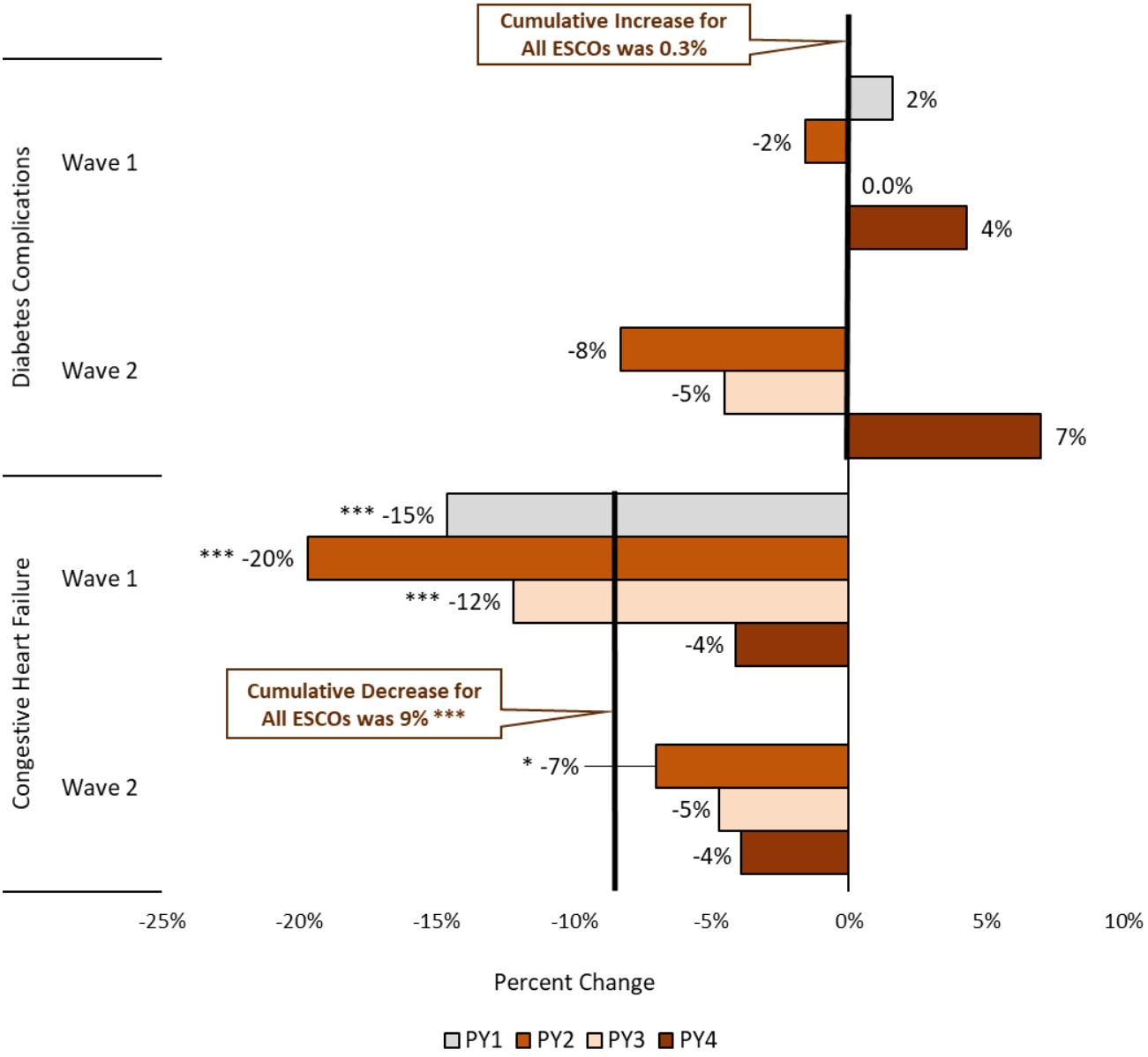
Under the CEC Model, ESCOs have an incentive to invest in prevention and management of chronic diseases to avoid complications that can lead to hospitalizations. The prevalence of two chronic diseases (diabetes and CHF) is particularly high among beneficiaries with ESRD; 75% have diabetes and 73% have CHF. Poorly managed fluid levels among beneficiaries with ESRD can both contribute to and complicate the management of CHF. Under the model, ESCOs changed their approach from a singular focus on dialysis to broader coordination of care,

including non-dialysis care. This shift includes increased emphasis on medication management, which may have improved adherence to CHF medications. The increase in testing for diabetes (i.e., HbA1c tests to measure blood glucose levels over time; see **Section VIIC**) are consistent with these efforts.

To further assess ESCOs' success in chronic disease management, we investigated changes in the percent of beneficiaries with at least one hospitalization in a 30-day period for related Ambulatory Care Sensitive Conditions (ACSC) defined by the Agency for Healthcare Research and Quality.[64] The results for the measures of ACSC hospitalizations for diabetes complications (short or long-term) and for CHF are shown in **Exhibit 29**. Short and long-term diabetes complications were combined into a single, summed measure for two reasons. First, the care processes or interventions that could prevent such hospitalizations (e.g., screenings and referrals) are likely similar for both types of complications, and facilities are likely to have diabetic patients with multiple long-term complications (e.g., retinopathy, neuropathy, vascular disease) at any point in time. Second, these admissions are relatively rare events, particularly those for short-term complications such as ketoacidosis (0.12% per month). Given the number of patients in CEC with diabetes, even a moderately large relative change (e.g., 20%) would only result in a small absolute change in the number of events (e.g., 3-5 events/month). Therefore, combining short and long-term complications into a single summary measure of diabetes complications may improve the statistical power of the analyses and help ensure that any statistically significant finding is driven by a meaningful change in the absolute number of events. Overall, CHF hospitalizations decreased by 9% ($p \leq 0.01$), relative to the pre-CEC period. This result is due primarily to Wave 1, which decreased by 15% in PY1 ($p \leq 0.01$), 20% in PY2 ($p \leq 0.01$), and 12% ($p \leq 0.01$) in PY3. No statistically significant impacts were estimated in PY4. The Wave 2 estimates for CHF admissions were also negative, but were not statistically significant in any year. We found no statistically significant effects for admissions for diabetes complications.

[64] https://www.ahrq.gov/downloads/pub/ahrqqi/pqiguide.pdf

Exhibit 29. Impact of the CEC Model on the Likelihood of Hospitalizations for Ambulatory Care Sensitive Conditions in a 30-day Period



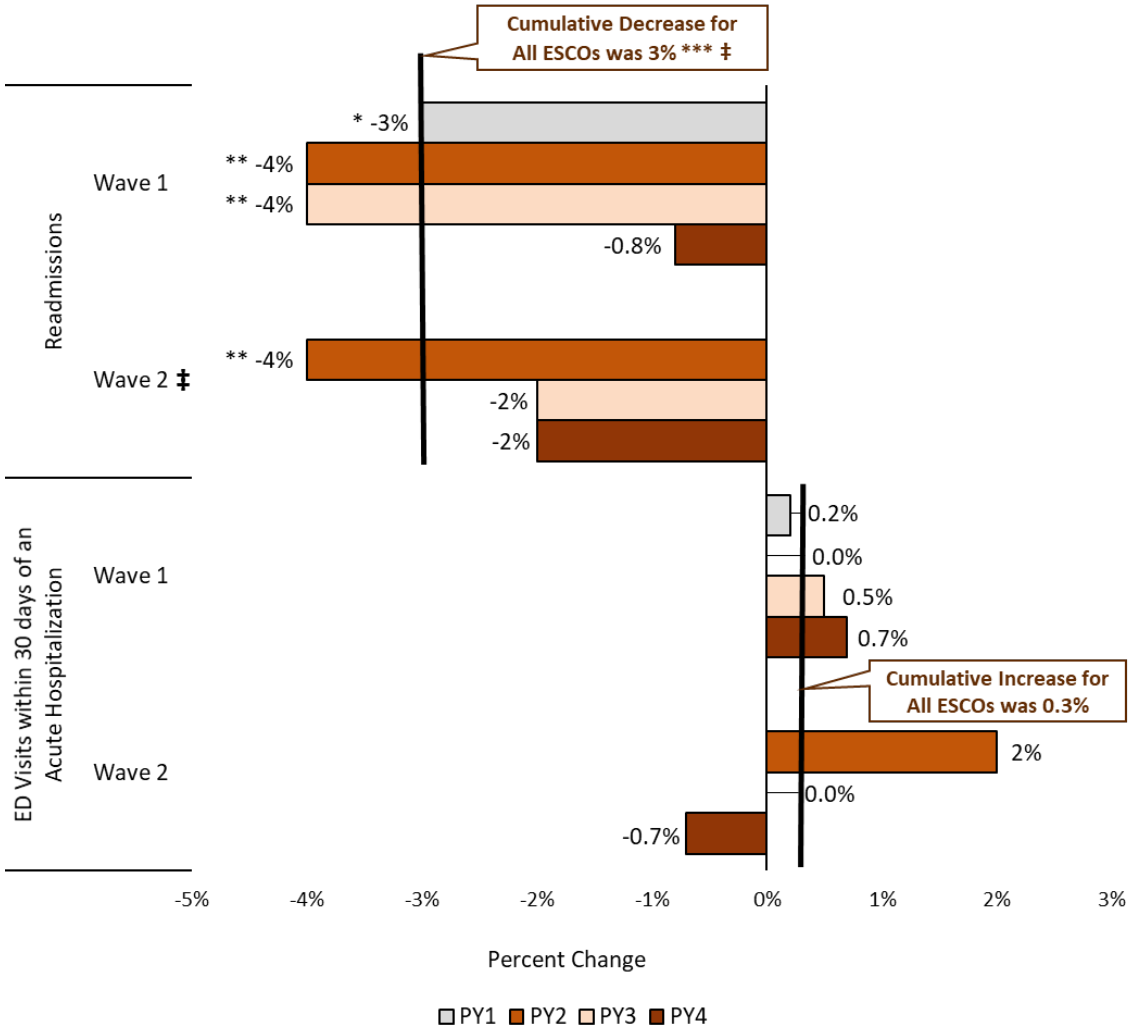
Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See Exhibits E-25-E-27.

f. Readmissions and ED Visit within 30 days of an Acute Hospitalization

ESCOs increased attention to continuity of care for patients who were hospitalized to reduce readmission and prevent ED visits in the 30 days following hospitalizations. This heightened focus included intense care coordination and interdisciplinary team discussions of each hospitalization and strategies to prevent a readmission or similar hospitalizations, post-discharge medication reconciliation, and helping patients attend follow-up appointments with their PCPs and specialists. Through post-discharge medication reconciliation, ESCOs attempted to address discrepancies between the list of medications with which a beneficiary was discharged and the medications they were taking prior to hospitalization, though challenges remained in obtaining the information from hospitals and assuring timely reconciliations.

Overall, 30-day PBPM readmissions declined by 3% ($p \leq 0.01$). There was no impact on ED visits within 30 days of an acute hospitalization (see **Exhibit 30**).

Exhibit 30. Impact of the CEC Model on the Likelihood of Readmissions or ED Visits within 30 days of an Acute Hospitalization in a Given Month



Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for

different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Readmission and ED Visit within 30 days of an Acute Hospitalization drop the last quarter of intervention data to account for a lag in claims to prevent an underestimation due to a lack of claims maturity. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate. See Exhibits E-25-E-27.

We also examined standardized measures for hospitalizations, 30-day readmissions, and mortality. These outcomes had similar event rates for the CEC and the comparison group, adjusted for case mix. Notably, we found greater standardized mortality ratio (SMR) improvements in the CEC than in the comparison group. For a detailed description of the standardized measures results, as well as of the limitations in the measures, see **Appendix H**.

4. What Was the Impact of the CEC Model on Mortality?

In the logic model underlying this evaluation, higher mortality was considered a potential unintended consequence of the CEC Model. This reflected the possibility that providers would respond to incentives to achieve shared savings by stinting on care. Therefore, the evaluation plan proposed monitoring mortality, primarily through the Standardized Mortality Ratio (SMR) in order to ensure that mortality was not worse in the CEC than in the comparison group.

Based on findings of greater SMR improvements in CEC than in the comparison group (see **Appendix H**) and the emergence of longer average time on dialysis in CEC than in the comparison group (which could occur if mortality was lower in the CEC group), we also conducted a survival analysis to test whether CEC impacted mortality more formally. The first set of results were presented in the third annual report. That report showed some suggestive findings regarding better survival in the CEC population than in the matched comparison group. This report updates the analyses using an additional year of data. This both increases the sample size and allows longer follow-up of patients, particularly those aligned to later waves of the CEC Model.

The primary framework we used to assess mortality is survival analysis, which models the time from when a patient is aligned to the model until the occurrence of the event (i.e., death). We estimated survival models, adjusted for patient characteristics. Details of the modeling approach appear in **Appendix I**.

We estimated several survival models to understand the relationship between alignment to the CEC Model and survival. The most general model compares survival in the entire CEC-aligned population (all waves and cohorts) to the entire matched comparison population (i.e., all prevalent beneficiaries).

Next, we estimated a model that limits patients' follow-up period to the first three years after alignment, so that beneficiaries aligned to early joining and later joining CEC waves could contribute to the analysis in a more proportional fashion. For example, beneficiaries aligned to Wave 1 PY1 joiners contributed all of the observed patient experience beyond three years of follow-up in the most general model.

Furthermore, we hypothesized that any impact of the CEC Model on survival would be stronger among those patients who were aligned early in their course of dialysis. First, the CEC impact on survival may be stronger for patients in their first year of dialysis (i.e., incident patients) since this is a clinically unstable time during which interventions might be more impactful. Second, unlike more experienced dialysis patients, they are less likely to have already developed care referral networks and mechanisms to cope with dialysis-related issues such as transportation, and therefore might be less likely to benefit from CEC interventions.

Finally, to examine whether the impact of the CEC Model on survival differed by wave we focused on the beneficiaries in Wave 1 PY1 and Wave 2 PY2 joiner facilities. These beneficiaries represented the large majority of each wave. We excluded the later joiners because of fewer patients and shorter follow-up than the original groups, which may limit statistical power to detect differences between cohorts.

We found a modest but statistically significant survival benefit for CEC patients, based on the most general model, which included all waves as a single treatment group (CEC) relative to their single matched comparison. On an absolute basis, 1-year survival is 0.3 percentage points (PPT) higher for CEC patients, with a 0.6 PPT advantage in 3-year survival (see **Exhibit 31**). On a relative basis, this represents about a 3% reduction in the number of mortality events (e.g., 10% 1-year mortality in CEC vs. 10.3% in the comparison group). Furthermore, when restricting follow-up to three years post-alignment, the survival benefit remains significant and similar in magnitude (see **Exhibit 31**).

Exhibit 31. Estimated Survival for CEC and Comparison Beneficiary Populations PY1-PY4

Group		Survival	
		1-Year	3-Year
All Prevalent Beneficiaries	CEC*	89.7%	71.5%
	Comparison	89.4%	70.9%
All Prevalent Beneficiaries with 3-year Follow-up	CEC*	89.7%	71.6%
	Comparison	89.4%	70.9%
All Incident Beneficiaries	CEC*	89.8%	73.3%
	Comparison	89.3%	72.3%

Notes: PY1-PY4 covers October 2015 – December 2019. Survival is measured as the time from when a patient is aligned to the model until the occurrence of the event (i.e., death). Prevalent beneficiaries include all patients aligned to a CEC or comparison group facility. Incident beneficiaries had been on dialysis for 12 or fewer months when aligned to the model. *The CEC indicator in the survival model was statistically significant at 1%. See **Exhibits I-1-I-3.**

We hypothesized that the CEC impact would be larger among patients who were exposed to the program earlier in their course of treatment. The models for incident patients (i.e., aligned during their first year on dialysis) supported this hypothesis as the CEC treatment effects for incident patients were larger than for prevalent patients. On an absolute basis, 1-year survival is 0.5 percentage points (PPT) higher for incident CEC patients relative to their comparison group vs. 0.3 PPT for prevalent patients (see **Exhibit 31**). Three-year survival showed a similar pattern. This finding is consistent with qualitative evidence derived from beneficiary focus groups conducted during each year of this evaluation. More experienced dialysis patients regularly commented that they thought the types of interventions implemented under the CEC would be most valuable to newer patients.

Finally, we examined whether the effects on survival differed by wave (see **Exhibits I-5 through I-11**). **Exhibit I-9** shows survival by wave for incident beneficiaries. Here, the wave indicator and wave-alignment interaction terms have coefficients close to zero and are not statistically significant. The align coefficient in this model is nearly identical to what is seen in the incident beneficiaries model without the wave indicators (**Exhibit I-7**). With the incident beneficiaries, these results indicate wave does not provide additional information when assessing survival differences for CEC and the comparison group. For the prevalent model, the importance of wave on mortality is not as clear (**Exhibit I-5**). Here, the wave indicator is significant while the alignment or interaction wave-alignment are not, all with similar coefficient magnitudes. **Exhibit I-6** shows that for the Wave 2 PY2 joiners, survival differs for CEC versus comparison. (Hazard Ratio=0.957, p=0.007); there is no significant difference for Wave 1 PY1 joiners. When restricting to 3 years of follow-up for the prevalent and incident beneficiaries, the results remained similar to those from the unrestricted model (see **Exhibit I-7** and **Exhibit I-9)**. Each of the models is adjusted for observable variables that may impact survival, including patient demographics, body mass index (BMI), receipt of pre-ESRD nephrology care (a proxy for having good preparation for dialysis), and comorbidities present at onset of ESRD. Most of these control variables had statistically significant associations with survival in the expected directions, and these associations were similar across the alternative model specifications. Using the general model as an example (see **Exhibit I-1**), conditions reported at incidence on CMS Form 2728 all significantly predicted lower survival. Other strong predictors of survival included white race and BMI.

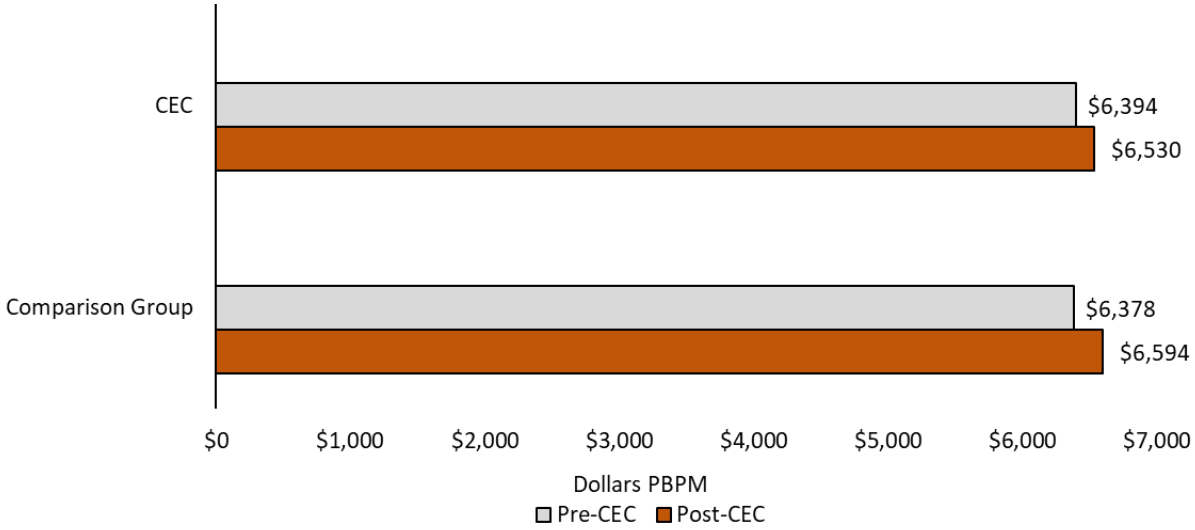
Overall, the findings from this updated analysis reinforce those of the first analysis reported in AR3. With the additional year of data, the models continue to show a modest but statistically significant survival benefit for the CEC, a stronger impact on incident patients than prevalent patients, and little conclusive evidence that the effects differed significantly by wave.

5. What Was the Impact of CEC on Medicare Payments across the Continuum of Care?

The impacts of the CEC Model on Medicare payments across the continuum of care are consistent with the changes in utilization described above. Medicare payments for outpatient dialysis sessions increased slightly, while Medicare payments for hospitalizations and readmissions went down. In general, Wave 1 ESCOs continue to have more significant and consistent impacts on payments compared to Wave 2 ESCOs. Impacts on payment increased in PY2 but declined afterwards. In aggregate, these changes combined to reduce Medicare Part A and B payments.

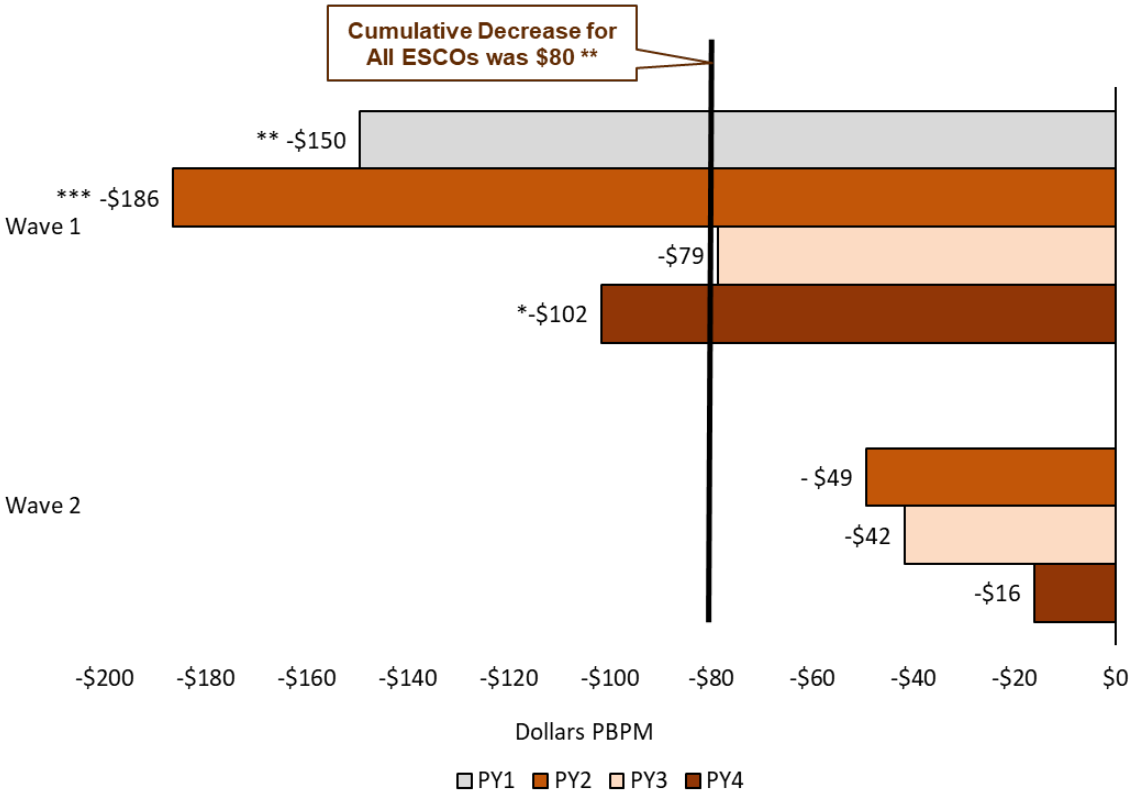
Overall, the total Medicare Part A and Part B standardized payments, a measure of overall Medicare payments, increased for both CEC beneficiaries and the matched comparison group beneficiaries, but increased faster for the comparison group relative to CEC (see **Exhibit 32**). This resulted in a statistically significant relative reduction in PBPM payments of $80 ($p \leq 0.05$) for CEC beneficiaries across PY1-PY4. This relative reduction represents about 1% of the average PBPM Medicare Part A and Part B payments for CEC beneficiaries in the pre-CEC period of $6,394.

Exhibit 32. Average Risk-Adjusted Total Medicare Part A and Part B Payments PBPM for CEC and Comparison Beneficiaries



This result was primarily driven by Wave 1 ESCOs, which had statistically significant reductions in payments in PY1, PY2, and PY4. Whereas none of the Wave 2 ESCOs reductions achieved statistical significance (see **Exhibit 33**). While Wave 1 ESCO facilities had, on average, longer exposure to the CEC Model than Wave 2 ESCOs, the difference in impacts is not likely due to differences in their length of CEC participation since Wave 1 ESCOs lowered payments in both their first and second performance years, while Wave 2 ESCOs did not. The growth of lower performing Wave 2 new joiners in the analytic sample as shown in **Exhibit 10** offset the payment reductions achieved by Wave 1.

Exhibit 33. Impact of CEC on Total Part A and Part B Medicare Payments PBPM

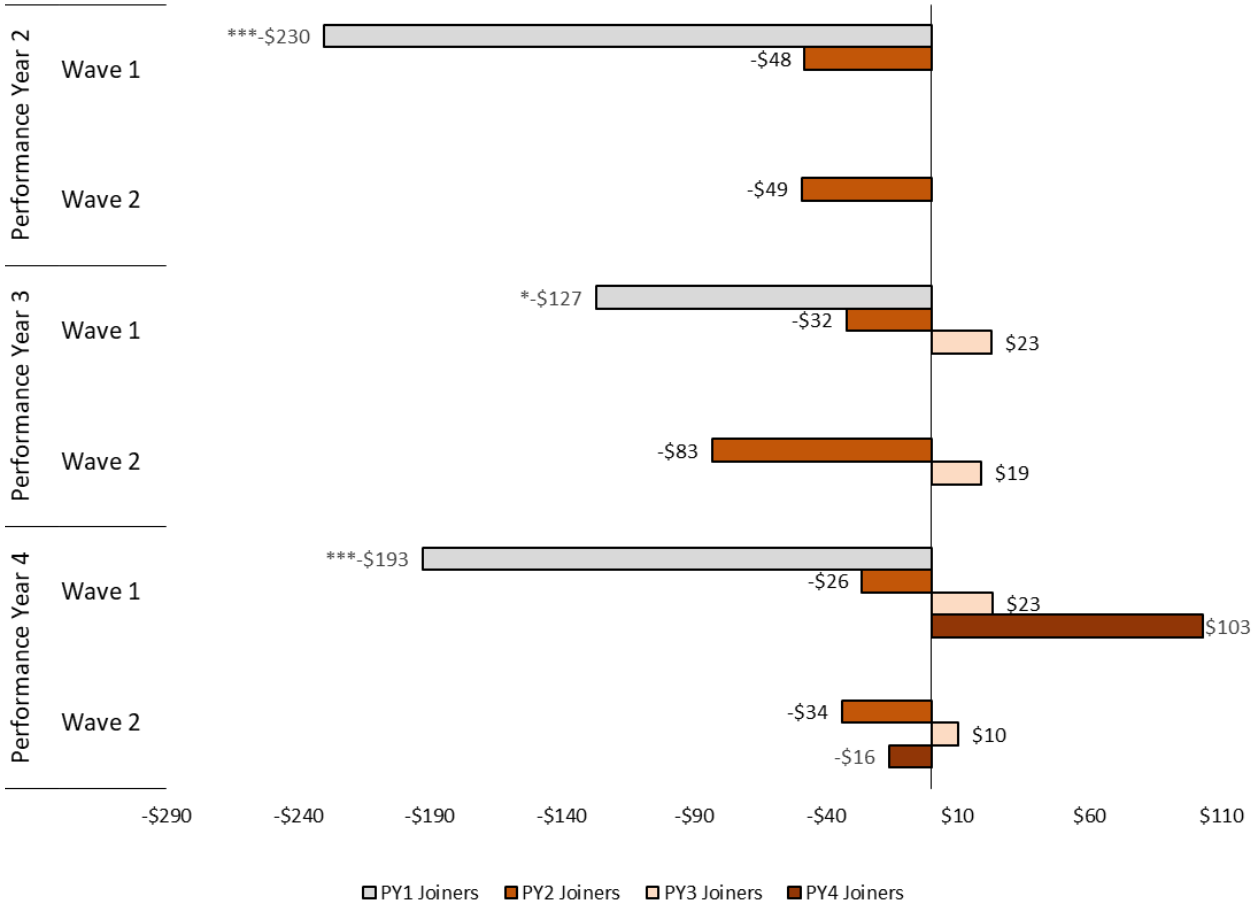


Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-28-E-30.**

To determine whether the lack of payments declines in PY3 and PY4 was due to poor performance by ESCO facilities that joined after PY3 and/or to decreased performance over time by established ESCO facilities (who joined in PY1 and PY2), we examined payment results for PY2, PY3, and PY4.[65] Our results showed that facilities that joined in PY4 (and thus had only one performance year) had no statistical significant impact on payments, as presented in **Exhibit 34**. It shows that early joiners (PY1) Wave 1 ESCOs are the only group that consistently shows statistically significant reduction in payments across all performance years. Wave 1 and 2 PY2 joiners show slight reduction in payments, but these declines are not statistically significant. Notably PY3 and PY4 joiners from both waves do now show any reduction in payments during their tenure in the CEC model.

[65] Wave 1 is the only cohort of ESCOs in PY1. As a result, -$150 (p<-0.05) PBPM in **Exhibit 33** represents the PY1 joiner result in the first PY and therefore was omitted from **Exhibit 34**

Exhibit 34. Impact of CEC on Total Part A and Part B Medicare Payments by Performance Year and ESCO Cohort PBPM



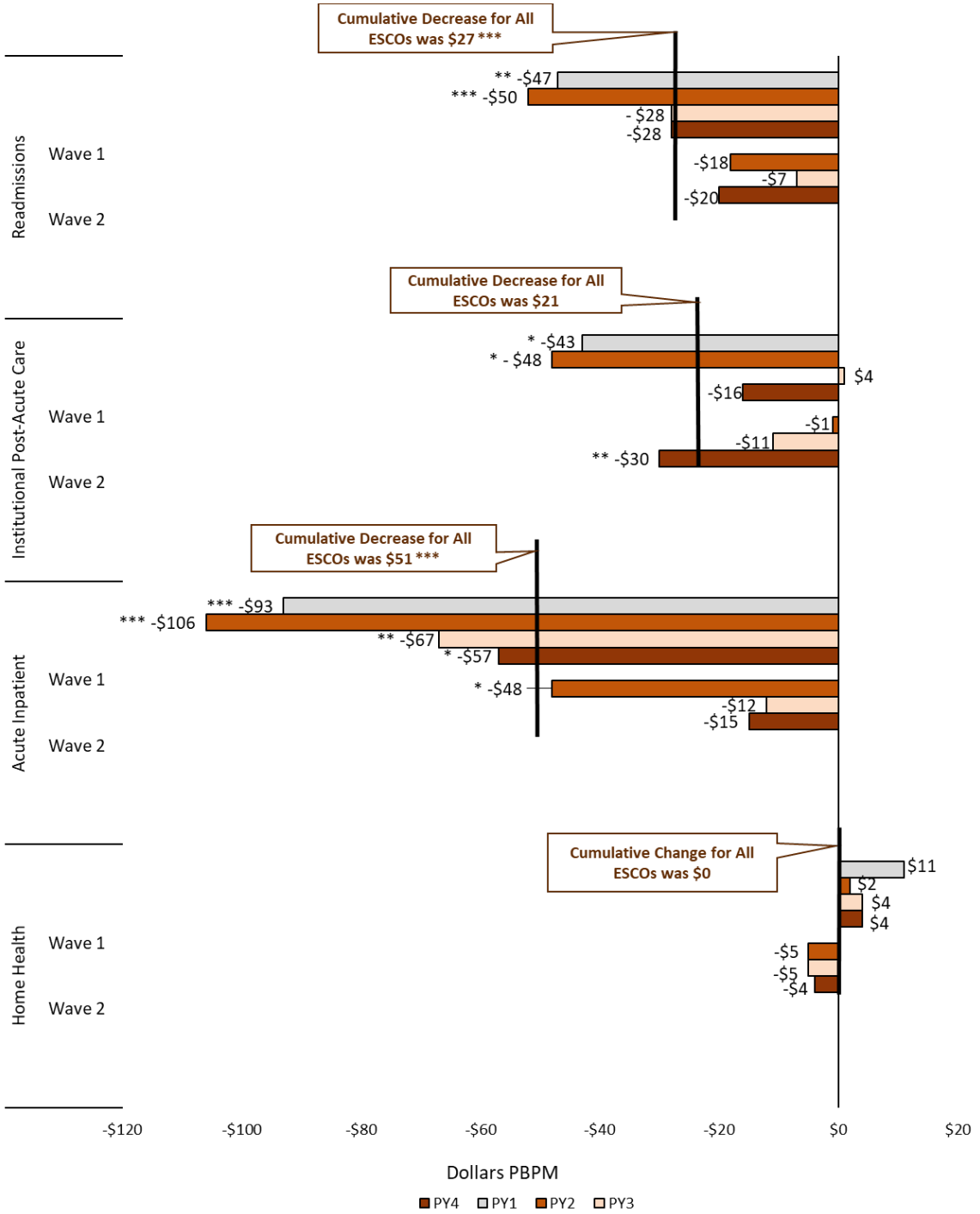
Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 1 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. See **Exhibits E-28-E-30.**

The main drivers of decreases in Medicare payments under the CEC Model were reductions in PBPM payments for hospitalizations and readmissions (see **Exhibit 35**). Specifically, relative to the comparison group, PBPM payments declined for acute inpatient stays ($51, $p \leq 0.01$) and readmissions ($27, $p \leq 0.01$). These declines in payments are consistent with our finding that CEC beneficiaries had fewer hospitalizations relative to the comparison group and were less likely to be readmitted (see **Exhibits 24** and **30**). Payments for institutional post-acute care [PAC] also

declined ($21, not statistically significant).[66] PBPM payments also declined for hospitalizations for ESRD complications ($11, $p \leq 0.01$), in line with the fact that CEC beneficiaries were less likely to experience a hospitalization for ESRD complications (see **Exhibit E-28**). Wave 1 ESCOs consistently achieved larger reductions in payments compared to Wave 2 ESCOs. Their payment reductions were greater in PY2 relative to PY1, but lower in PY3 and PY4. The impact on payments for home health services, which are often provided to safely transition patients home after an acute or post-acute institutional stay, was small and not statistically significant.

[66] Institutional PAC includes payments from inpatient rehabilitation facilities, SNFs, and long-term care hospitals. Individual analysis of these payments groups identified that payment reductions in institutional PAC was primarily driven by long-term care hospital Medicare payment reductions.

Exhibit 35. Impact of CEC on Readmissions, Institutional Post-Acute Care, Home Health, and Acute Inpatient Payments PBPM



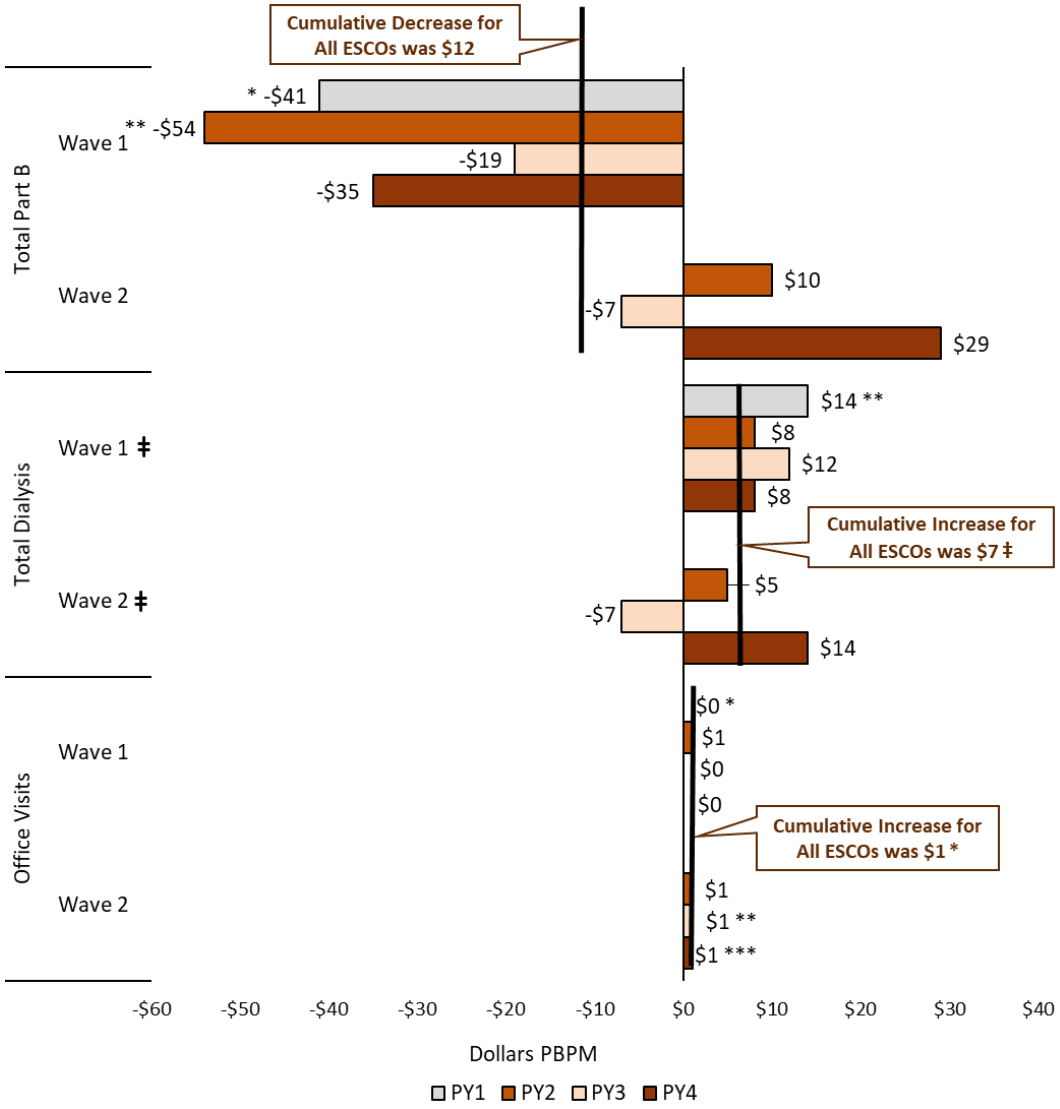
Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the

pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. Readmission are included in the overall acute inpatient payments and we exclude the last quarter of intervention data to account for a lag in claims to prevent underestimation. See **Exhibits E-28-E-30**.

There were also statistically significant impacts in payments for certain Part B services (see **Exhibit 36** below). Driven by Wave 1, all ESCOs' total dialysis PBPM payments increased by $7 (not statistically significant), relative to the comparison group.[67] Given that the bundled payment rate per session is fixed (aside from case-mix adjustments), this increase is consistent with the increase in the number of outpatient treatments (see **Exhibit 11**). An increased number of outpatient office visits for CEC beneficiaries (see **Exhibit 20**) translated into relative increases for both Wave 1 and Wave 2 ESCOs' PBPM payments for office visits, an increase of $1 ($p \leq 0.10$). No statistically significant impacts were estimated for other Part B services such as hospital outpatient, and Part B drugs (see **Exhibits E-28-E-30)**.

[67] Since dialysis payments did not pass statistical testing of the parallel trends assumption for the pooled sample that include all ESCOs as well as for both waves separately, we also inspected the trends graph which compared trends between the CEC beneficiaries and the comparison group and observed no evident differences. Additionally, the coefficient on the difference in trends in the pre-CEC period, although significant, equaled: $0.93 (all ESCOs), $1.08 (Wave 1), and $0.82 (Wave 2). See, **Exhibit E-18.**

Exhibit 36. Impact of CEC on Total Part B, Total Dialysis, and Outpatient Office Visit Payments PBPM



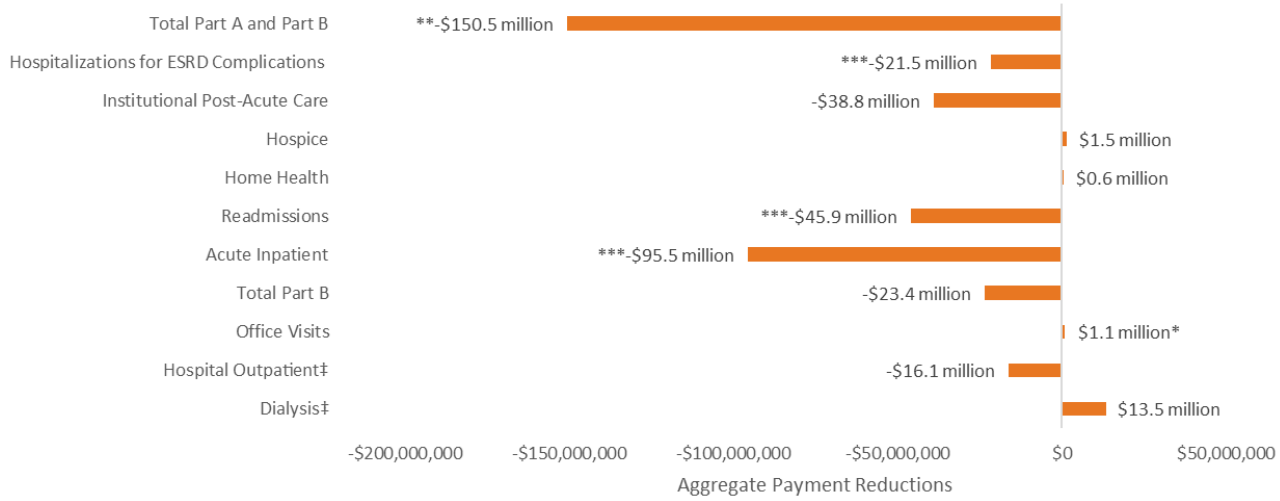
Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ DiD results are not shown because data from the pre-CEC period showed intervention and matched comparison beneficiaries were not on parallel trends for this outcome, which is required for an unbiased estimate. See **Exhibits E-28-E-30.**

The impact of the CEC Model on total Part A and Part B payments before accounting for financial reconciliation payments between ESCOs and CMS, translates into an aggregate change in payments of approximately -$151 million (90% CI, -$253 to -$48 million, p<0.05):

- -$30 million in PY1 (90% CI, -$52 to -$9 million, p<0.05),
- -$49 million in PY2 (90% CI, -$77 to -$21 million, p<0.01),
- -$37 million in PY3 (90% CI, -$76 to $3 million, p=.13), and
- -$35 million in PY4 (90% CI, -$77 to $7 million, p=0.17).

A key contributor to the decline in total payments was an aggregate change in payments for acute inpatient services (-$95.5 million) (see **Exhibit 37**).

Exhibit 37. Aggregate Estimates of Changes in Medicare Payments by Service Setting



Notes: Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. Reductions in spending are based on the estimated total number of intervention member months for the 1,210 CEC facilities participating in the CEC Model. DiD impact estimates are adjusted to non-standardized values using the average ratio total standardized and non-standardized payments. Readmission and hospitalizations for ESRD complications expenditures are included in the overall acute inpatient spending. ‡ Data from the baseline period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate**.**

Through the first four performance years of the model, ESCOs received $197 million ($107 PBPM) in shared savings.[68] The distribution of shared savings varied across performance years and ESCO waves. Over the course of the model, Wave 1 ESCOs received $179 million ($194 PBPM) in shared savings payments. Comparatively, Wave 2 ESCOs only received $17 million ($19 PBPM). Both waves experienced decreases in shared savings with each subsequent performance year. As the CEC Model expanded, PBPM shared savings declined from $265 in PY1 to $37 in PY4. In PY4, ESCOs received $23 million in shared savings. Wave 1 ESCOs received a total of $39 million in shared savings. Conversely, Wave 2 ESCOs paid a total of $15 million to Medicare, with shared losses experienced by 11 of the 21 Wave 2 ESCOs participating in PY4.

[68] Shared savings amounts in PY1-PY2 are based on the realized amounts after sequestration. However, PY3-PY4 shared savings amounts are based on amounts before sequestration as a result of the CARES Act. The PY3 shared savings amounts published in AR3 were based on the realized amounts after sequestration.

We estimated the net change in spending for Medicare as a result of the CEC Model. After accounting for the $197 million in shared savings that ESCOs received in PY1-PY4, Medicare experienced aggregate net losses of $46 million (90% CI, -$56 to $148 million, p=.46). These net losses are a result of net losses from Wave 1 ESCOs in the amount of $60 million (90% CI, -$21 to $142 million, p=.22) and net gains of $14 million (90% CI, -$39 million to $67 million, p=.66) from Wave 2 ESCOs.

6. What Was the Impact of CEC on Medicare Beneficiary Subpopulations?

We investigated the extent to which the CEC Model had a differential impact on subgroups of Medicare beneficiaries with ESRD varying in their demographic characteristics (race, sex), basis of Medicare eligibility, dual Medicaid status, and their time on dialysis (six months or less versus over six months). The results are reported in **Exhibit E-31.** To this end, we estimated stratified DiD models with the specification described in **Appendix E.** The decomposition provides insights to the subpopulations that may be influencing the respective DiD results.

For most groups, the stratified results are consistent with those observed for total Part A and Part B Medicare payments, hospitalizations, readmissions, ED visits, catheter use, and fistula use in the full CEC population. However, the stratified results show that average impacts mask differences across subgroups. For example, the largest reductions in total Part A and Part B PBPM payments by demographic group was found among Medicare beneficiaries with ESRD who:

- Were Other race (non-White/non-Black) (-$118, $p \leq 0.10$),
- Were female (-$90, $p \leq 0.01$),
- Entered Medicare due to ESRD and disability (-$89, $p \leq 0.10$), or
- Were fully Medicaid eligible (-$128, $p \leq 0.01$).

Additionally, beneficiaries with ESRD with greater than six months of dialysis experienced significant declines in PBPM payments (-$95, $p \leq 0.01$). We found no impact on payments for beneficiaries with less than six months of dialysis, which is consistent with the first six months of dialysis being the period during which beneficiaries with ESRD are at greatest risk for complications and need more services.

The largest reductions in hospitalizations by subpopulation were found among Medicare beneficiaries with ESRD who were Other race (non-White/non-Black) or had partial Medicaid eligibility. Significant decreases in 30-day readmissions were also observed for beneficiaries who were categorized as White or Other race (non-White/non-Black), female, entered Medicare due to age or ESRD, had full Medicaid coverage, or had more than six months of dialysis.

While the subgroup analyses were exploratory, it will be useful to determine the extent to which these patterns continue to hold consistent over time and use further analyses or site visits to build an understanding of their causes and consequences.

D. Discussion

This evaluation of the CEC model explored a variety of measures that covered several domains of performance (e.g., dialysis care, coordination beyond dialysis, acute care and emergency

department utilization). Overall, the experience under the CEC Model over the past four performance years suggests some improvements in delivery and quality of dialysis care and reductions in acute care utilization and Medicare payments. First, consistent with ESCOs' strategies to improve dialysis-related care and coordination of care beyond dialysis, the CEC Model generated improvements in terms of vascular access—specifically, reduction in long term catheter use, adherence to dialysis treatment, and preventive health screening measures. Second, reductions in utilization provided further evidence of ESCOs' efforts to reduce acute care utilization, with notable and statistically significant declines in hospitalizations. The changes found in the quantitative DiD analysis largely corresponded with the areas many ESCOs emphasized in the qualitative site visits (e.g., reducing acute care use was a broadly stated focus area). Finally, the CEC Model resulted in Medicare relative payment reductions across the continuum of care. Specifically, the impact analyses found relative reductions of over $80 for total Part A and Part B Medicare PBPM payments. This relative reduction represents about 1% of the average PBPM Medicare Part A and Part B payments for CEC beneficiaries in the pre-CEC period of $6,394. Over the first four years, the model generated approximately $151 million reduction in Medicare payments. However, ESCOs earned $197 million in shared savings, resulting in a net loss to Medicare of $46 million. Wave 1 ESCOs consistently achieved larger relative reductions in payments and larger impacts on most other outcome measures, compared to Wave 2 ESCOs. The relative payment reductions in Wave 1 ESCOs were greater in PY2 relative to PY1, but lower in PY3 and PY4. Payments for Wave 2 ESCOs declined modestly in PY4, while ESCO facilities that joined in PY3 and PY4 experienced increases in payments (not statistically significant). Overall, all ECSO payment impacts are declining due to poor performance from Wave 2 ESCOs and new joiners in PY3 and PY4. Given that facilities that joined in PY4 only had one year of model experience, next year's annual report will examine whether an additional year yields continued or larger declines in payments for ESCOs. Payment reductions were most evident in Medicare Part A, with significant reductions in acute inpatient, readmission, and institutional PAC categories. Dialysis payments also rose while payments for dialysis complications declined, which correlated with qualitative findings that ESCOs increased dialysis access in order to increase adherence and avoid complications. CEC Model impacts varied across waves and over time within waves. Overall, Wave 1 ESCOs reduced payments by about 2%, while reductions in payments were lower, at 0.5%, for Wave 2 ESCOs. When comparing each wave across the performance years, Wave 1 ESCOs continued to have better performance in clinical and payments outcomes than did Wave 2 ESCOs. Additionally, Wave 1 ESCOs had larger impacts in their second year of operation than in their first year, with moderately smaller improvements in PY3 but regain large reduction in payments in PY4. The differences between waves could reflect several factors. It is possible that, in the absence of MACRA, Wave 1 ESCO participants were more strongly motivated to join the program than Wave 2 ESCO participants. In addition, because of delays with model start, Wave 1 ESCOs may have had more lead time to prepare for the CEC Model and develop and implement their care coordination services. The reasons for the somewhat mitigated impacts of the model in PY3 among Wave 1 ESCOs are less apparent. The follow-up site visits conducted with Wave 1 ESCOs near the end of PY3 revealed some concerns about sustainability of the model. But those concerns seemed to focus on program rules and changing benchmarks rather than awareness of, and explanations for, outcomes in PY3 falling short of PY2 levels. Furthermore, we detected no major shift in ESCO strategies during site visits as most ESCOs reported refining, but not dramatically changing, their activities to meet program goals.

The survival analyses suggest that there is a survival benefit associated with the CEC Model. That benefit is modest overall, but is larger for those patients aligned during their first year of dialysis. Attempts to tease out wave specific effects yielded imprecise results. The effects appeared stronger in Wave 2 PY2 joiners than in Wave 1 PY1 joiners, but the difference between those waves was not statistically significant. Overall, the findings on mortality are promising and should continue to be monitored as additional follow-up data become available.

Future analyses will be able to determine the extent to which Wave 1 ESCOs can maintain or further build upon their early results. In particular, it will be useful to see whether PY5 results remain in line with the somewhat lower PY4 performance levels or return to the more favorable levels. Next year's report will also show whether Wave 2 ESCOs were able to close the performance gap relative to Wave 1 ESCOs, and whether Wave 2 ESCOs show increasing impact with time in the model. Additional analyses will also examine whether facilities joining ESCOs in PY4 are able to experience improvements in outcomes and payment reductions realized by the earlier joiners in Waves 1 and 2. Taken together, these future analyses will help reach significant conclusions about the scalability and replicability of the CEC Model.

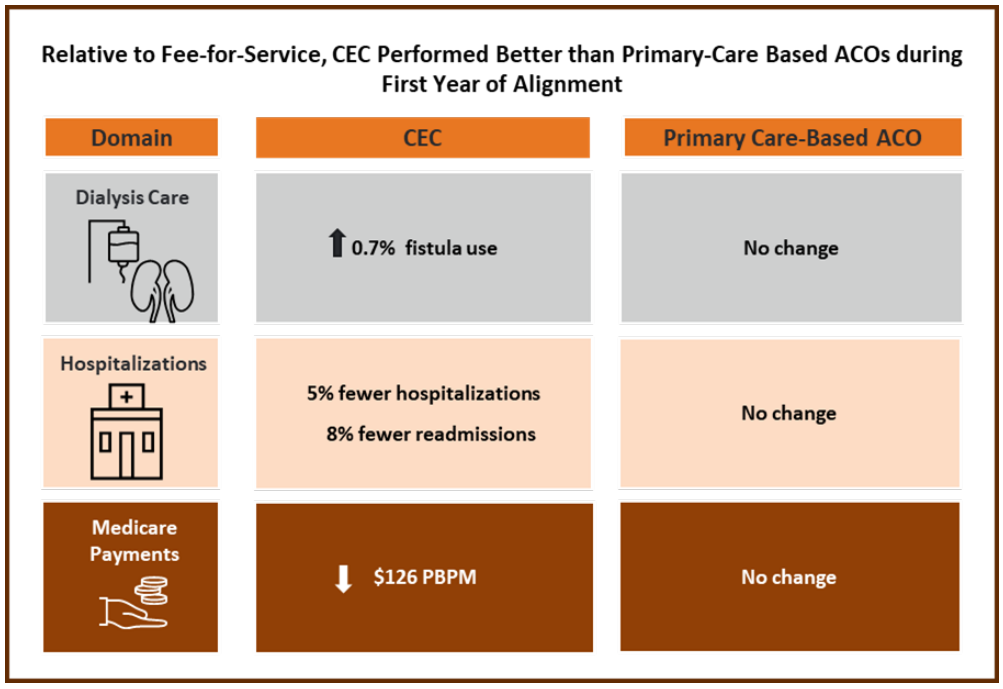
VII. What Were the Differences in Performance Between the CEC and Primary Care-Based ACO Models?

Primary care-based ACO models existed prior to the CEC and have continued to expand since the CEC was initiated. For example, the largest ACO Model, the Shared Savings Programs (SSP), served roughly 4.9 million beneficiaries in 2014 and grew to 10.4 million beneficiaries in 2019.[69] ESRD patients receiving dialysis could be aligned to either a primary care-based ACO model that is accountable for costs and outcomes for patients with a wide variety of clinical conditions, to the CEC Model which specializes in care for dialysis patients, or continue to receive care under traditional FFS. The purpose of this analysis is to compare outcomes for dialysis patients in these two types of ACO models to inform future CMS policy making. In particular, we seek to determine whether the CEC Model's theoretical advantages of specializing in the care of patients with a particular complex chronic condition and placing risk on the specialty providers results in better outcomes relative to those achieved by aligning dialysis patients to primary care-based ACOs who serve the general Medicare population. The overall goals and financial incentives of the CEC Model are similar to those of primary care-based ACOs. In both models, participants assume financial responsibility for the quality of care and Medicare Part A and Part B payments of their aligned beneficiaries. Despite these shared characteristics, there are important differences between the two models. One of the main differences is that participants in the CEC Model (ESCOs) only provide care to Medicare beneficiaries with ESRD, whereas primary care-based ACOs serve the general Medicare population. Additionally, ESCOs require inclusion of dialysis centers and nephrologists. Thus, ESCOs have more frequent and regular interactions with their aligned population, as hemodialysis patients typically visit the clinic three times a week for three- to four-hour sessions (contact with home dialysis patients is typically monthly), whereas contact with PCPs would be more sporadic and variable. Frequent and regular contact with the ACO's at risk entities may provide opportunities to monitor patient condition and intervene to improve outcomes.

To analyze whether CEC provided better results for beneficiaries with ESRD than primary care-based ACOs, we compared six outcomes (Medicare payments, hospitalizations, readmissions, ED visits, and two vascular access types) before and after alignment to each of these models, relative to a matched comparison group. Because the vast majority of ESCOs are in two-sided risk arrangements, the analysis focuses on two-sided risk ESCOs under the CEC Model and primary care-based ACOs with two-sided risk arrangements in order to hold this important feature constant.

[69] https://www.cms.gov/files/document/2020-shared-savings-program-fast-facts.pdf

A. Key Findings



B. Methods

We used a Difference in Differences (DiD) approach to evaluate whether CEC performed better than primary care-based ACOs. DiD studies the differential effect of a treatment (CEC) on a treatment group vs a control group in a natural experiment by comparing the average change over time in the outcome between these two groups.[70] With this approach, we compared the experiences of beneficiaries with ESRD over time, before and after they transitioned into either an ESCO or a primary care-based ACO, relative to beneficiaries with ESRD who remained in Medicare FFS. The additional year of data in AR4 updates the results from AR3 and includes beneficiaries aligned to two-sided risk models. Specifically, intervention groups included beneficiaries with ESRD aligned LDO ESCOs with two-sided risk arrangements (33 of 37 total ESCOs) or primary care-based ACOs with two-sided risk arrangements. Primary care-based ACOs included Pioneer, SSP Tracks 1+, 2, and 3, and Next Generation ACO (NGACO).[71] The comparison group consisted of CEC-eligible matched beneficiaries who received services under traditional FFS.

Due to the high mortality rate in the ESRD population, the intervention and comparison groups may become unbalanced over time. Beneficiaries with better odds of survival will increase their share in the analytic sample as we extend the observation period. To help mitigate this potential bias, pre-intervention observation period was limited to one year and the study population was restricted to beneficiaries who were eligible during the entire pre-intervention period. The

[70] Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics*, *119*(1), 249-275.

[71] The Advanced Payment ACO and the ACO Advance Investment models were excluded from the analysis because their model design differs from other primary care-based ACOs and the ESCOs in significant ways. In particular, payments under these models are designed to encourage participation by rural providers and smaller practices with less access to upfront capital.

comparison and intervention groups are described in **Exhibit 38**. See **Appendix J** for a full description of methods.

Exhibit 38. Intervention and Comparison Groups of the DiD Model

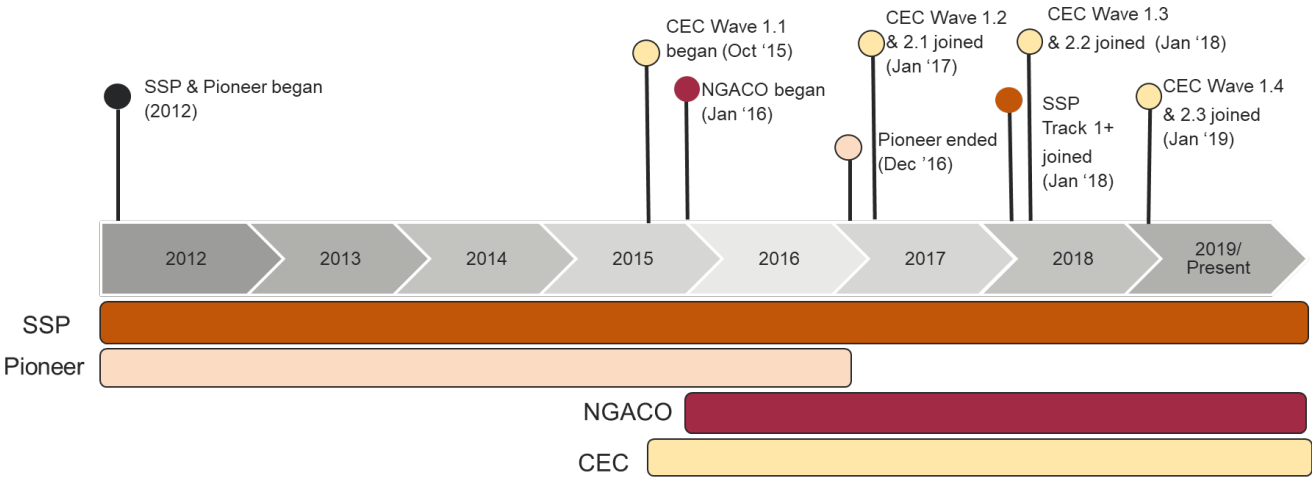
Group	Pre-Intervention Period
Intervention Group 1 (ACO)	CEC-eligible beneficiaries who received services under traditional Medicare FFS, became aligned to a primary care-based ACO, and met the following criteria: ▪ Were eligible during the entire 12 months preceding the alignment start date ▪ Were eligible up to 12 months following alignment
Intervention Group 2 (CEC)	CEC-eligible beneficiaries who received services under traditional Medicare FFS, became aligned to CEC, and met the following criteria: ▪ Were eligible during the entire 12 months preceding the alignment start date ▪ Were eligible up to 12 months following alignment
Matched Comparison Group	Matched CEC eligible beneficiaries who received services traditional Medicare FFS, did not become aligned to either model, and met the following criteria: ▪ Were eligible during the entire 12 months preceding one of the four potential alignment dates ▪ Were eligible up to 12 months following one of the four potential alignment dates

The intervention sample included beneficiaries who became newly aligned to a primary care-based ACO or CEC in 2015[72] or later. Alignment changes happened at multiple points throughout this period, which spanned different starting dates for the primary care-based ACO programs and CEC's ESCO waves included in the analysis (see **Exhibit 39**). We identified intervention and comparison groups for six potential alignment dates beginning in the year CEC started: January 2015, October 2015, January 2016, January 2017, January 2018, and January 2019. These include alignment dates where we were able to identify transitions from FFS to CEC at the three start dates of the model[73] (October 2015, January 2017, January 2018, and January 2019) and alignment dates for FFS to primary care-based ACOs transitions (January 2015, January 2016, January 2017, January 2018, and January 2019).

[72] This date was chosen because CEC launched in October 2015.

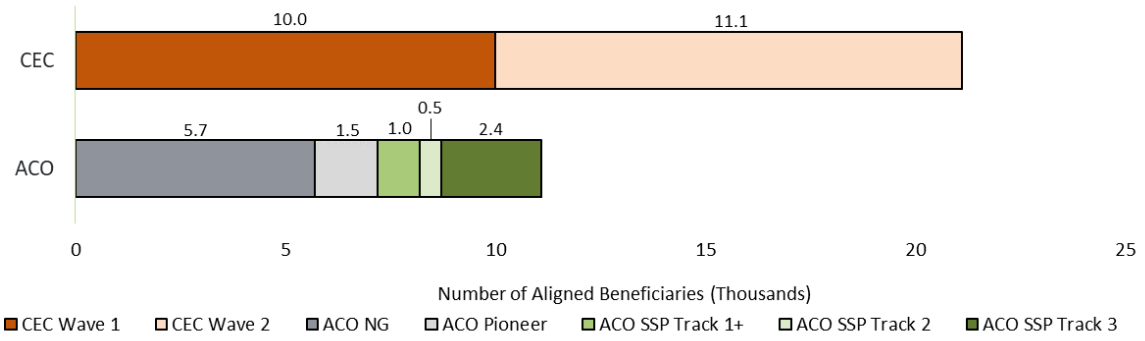
[73] While beneficiaries with ESRD can become aligned to the CEC Model at any month if they start receiving dialysis services from a CEC facility, these transitions were excluded from the analysis in order to minimize transitions associated with a change in facility of care.

Exhibit 39. Primary Care-Based ACO and CEC Timeline



The analytic sample consisted of 21,100 CEC and 11,153 primary care-based ACO newly aligned beneficiaries and 32,253 matched comparison beneficiaries[74]. The composition of beneficiaries included in the CEC and ACO analytical samples is shown in **Exhibit 40**. The ACO sample is primarily NGACO beneficiaries (51%) while the CEC sample is roughly 48% Wave 1 and 52% Wave 2 beneficiaries.

Exhibit 40. Number of Beneficiaries (in Thousands) with ESRD in CEC and Primary Care-based ACO Intervention Groups (with Two-Sided Risk)



The CEC sample for this analysis represents 17% of the CEC population used in the impact analysis. It includes only CEC beneficiaries aligned into a two-sided risk ESCO. It excludes CEC beneficiaries who had fewer than 12 months of continuous Part A and B enrollment before alignment. Only beneficiaries whose primary facility of service is the same every month are

[74] The sample size is sufficient to detect impacts on Medicare payments with 80% power of 2.5% or more for CEC and 3% or more for ACO newly aligned beneficiaries.

included in the analysis.[75] Finally, it follows beneficiaries only during their first year of alignment. As a result of these inclusion criteria, the CEC sample in this analysis differs from the overall CEC impact estimate sample in several beneficiary characteristics. Compared to the overall CEC population, CEC beneficiaries in this analysis have more months on dialysis[76] and are more likely to have partial or full Medicaid eligibility, as well as have Medicare entitlement due to ESRD.

The analysis uses two DiD specifications to separately estimate impacts of each model (CEC and primary-care ACO) during the first year of alignment, relative to a comparison group of beneficiaries who continue to receive services under traditional FFS. Each DiD model quantifies the impact of CEC or primary-care ACO by comparing changes in risk-adjusted outcomes before and after alignment, to changes in outcomes for similar beneficiaries in the comparison group during the same period. These models controlled for beneficiary-, market-, and facility-level differences between the intervention and comparison populations, minimized biases from time-invariant differences between the intervention and comparison populations, and controlled for secular trends. The matching methods, DiD model specifications, and power calculations are described in **Appendix J**.

C. Results

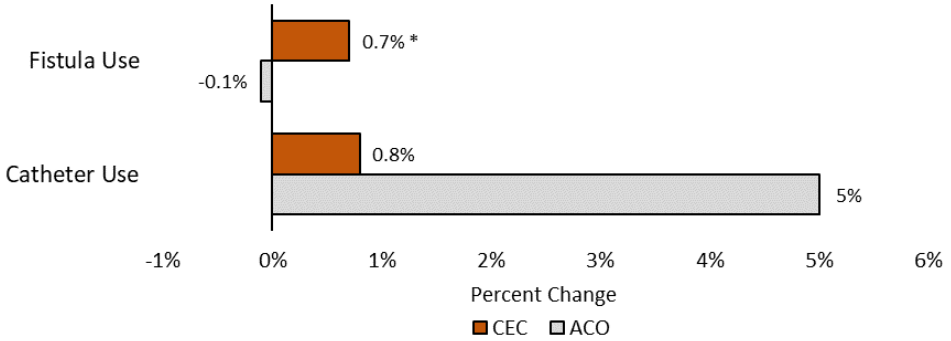
There were differences in performance between CEC and primary care-based ACO care models, with only the CEC Model resulting in a reduction in Medicare payments, hospitalizations, and readmissions. Also, fistula use increased under the CEC Model, but did not change under the primary care-based ACO model. Impacts on catheter use or ED visits were not statistically significant under either model.

Exhibit 41 shows results on quality measures for vascular access. Similar to the findings reported in AR3, fistula use increased significantly (0.7%) among CEC beneficiaries relative to the pre-intervention period during the first year of alignment, but there was no statistically significant impact for newly aligned ACO beneficiaries. Catheter use for hemodialysis for over 90 days did not significantly change for either newly aligned CEC or ACO beneficiaries in their first year of alignment.

[75] Primary service facility is defined as the dialysis facility were the beneficiary had the most dialysis services completed. In the event of equal counts of dialysis services total payments was used as the tiebreaker.

[76] On average CEC beneficiaries included in this analysis have 12 more months on dialysis (79 vs 67).

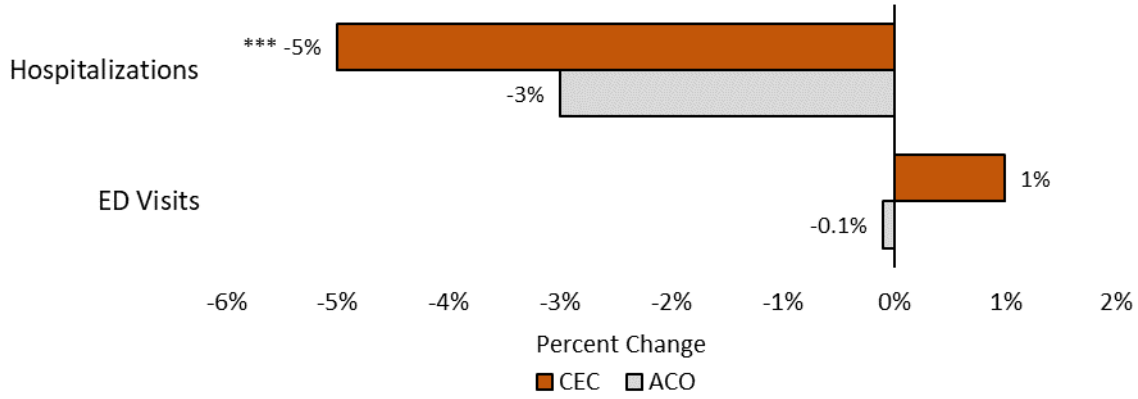
Exhibit 41. Impact of the CEC and Primary Care-Based ACO Models (with Two-Sided Risk) on the Likelihood of Vascular Access Type in a Given Month First Year of Alignment



Notes: Each impact estimate is based on retrospective cohort study that evaluated changes in outcomes for 12 months before and up to 12 months following alignment into CEC or an ACO care model relative to matched comparison groups of beneficiaries who did not transition from Medicare FFS. ***p≤0.01, **p≤0.05, *p≤0.1. See Appendix J for detailed results.

The impacts on hospitalizations and ED visits are presented in **Exhibit 42**. In their first year of alignment, CEC beneficiaries experienced statistically significant reductions in the number of hospitalizations (5%, p≤0.01) relative to the pre-intervention period, similar to the findings reported in AR3. These results translate into 5.6 fewer hospitalizations per 1,000 beneficiaries per month among the CEC population. However, there was no significant change in the number of hospitalizations or ED visits among primary care-based ACO beneficiaries after they were aligned to an ACO.

Exhibit 42. Impact of the CEC and Primary Care-based ACO Models (with Two-Sided Risk) on the Number of PBPM Hospitalizations and ED Visits First Year of Alignment

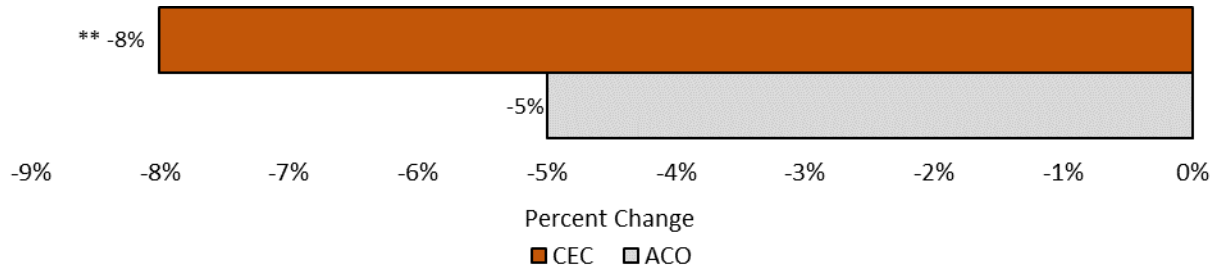


Notes: Each impact estimate is based on retrospective cohort study that evaluated changes in outcomes for 12 months before and up to 12 months following alignment into CEC or a primary care-based ACO model relative to matched comparison groups of beneficiaries who did not transition from Medicare FFS. ***p≤0.01, **p≤0.05, *p≤0.1. See **Appendix J** for detailed results.

As shown in **Exhibit 43**, readmissions significantly decreased among CEC beneficiaries in their first year of alignment (8%, p<0.05), relative to the pre-intervention period, similar to the findings

reported in AR3. Primary care-based ACO beneficiaries, however, experienced a smaller and not statistically significant decrease in readmissions after they were aligned to an ACO.

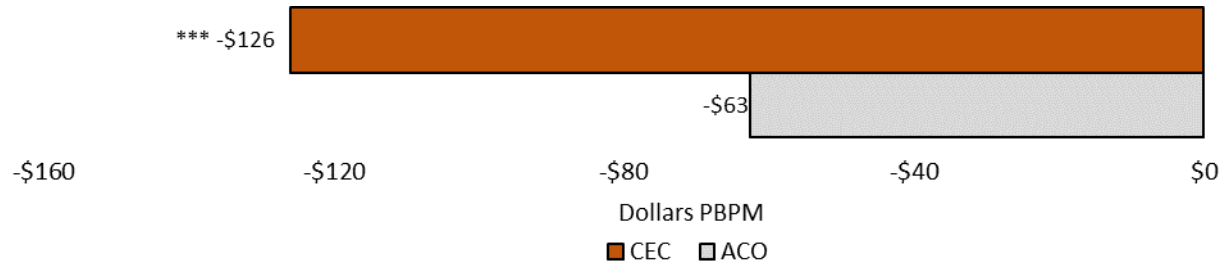
Exhibit 43. Impact of the CEC and Primary Care-based ACO Models (with Two-Sided Risk) on the Likelihood of Readmissions in a Given Month
First Year of Alignment



Notes: Each impact estimate is based on retrospective cohort study that evaluated changes in outcomes for 12 months before and up to 12 months following alignment into CEC or a primary care-based ACO model relative to matched comparison groups of beneficiaries who did not transition from Medicare FFS. ***p<0.01, **p<0.05, *p<0.1. The last quarter of intervention data is excluded to account for a lag in claims to prevent an underestimation due to a lack of claims maturity. See **Appendix J** for detailed results.

Similar to findings reported in AR3, the CEC Model had a greater impact on total Medicare Part A and Part B payments than the primary care-based ACO models, as shown in **Exhibit 44**. Relative to a matched comparison group, Medicare payments decreased by $126 PBPM (2.3%, p≤0.01) in the first year of alignment for beneficiaries with ESRD who were aligned to CEC. Similar to the results for hospitalizations and readmissions, the estimated changes in Medicare payments were smaller and not statistically significant for beneficiaries with ESRD who were aligned to a primary care-based ACO in the first year of alignment. The reduction in payments observed in newly aligned CEC beneficiaries was driven by a reduction in the number of hospitalizations and readmissions (see **Exhibits 42** and **43**).

Exhibit 44. Impact of the CEC and Primary Care-Based ACO Models (with Two-Sided Risk) on Total Medicare Part A and Part B Payments PBPM
First Year of Alignment



Notes: Each impact estimate is based on retrospective cohort study that evaluated changes in outcomes for 12 months before and up to 12 months following alignment into CEC or a primary care-based ACO model relative to matched comparison groups of beneficiaries who did not transition from Medicare FFS. ***p≤0.01, **p≤0.05, *p≤0.1. See **Appendix J** for detailed results.

D. Discussion

Results continue to support the hypothesis that beneficiaries with ESRD fare better in a specialty-oriented ACO model like the CEC than in a primary care-based ACO model. A plausible mechanism for this result may be that a specialty-oriented care model is more effective for the ESRD population, given their regular contact with at-risk providers (dialysis facility and nephrologist). Another potential mechanism is the CEC's focus on the dialysis population and its particular needs vs. dialysis patients making up a very small share of the patients aligned to primary care-based ACOs. Compared to the overall CEC population, CEC beneficiaries in this analysis have more months on dialysis and are more likely to have partial or full Medicaid eligibility, as well as have Medicare entitlement due to ESRD. All of these characteristics are associated with larger impacts on payments in the subpopulation analysis (see **Exhibit E-31**). These differences are consistent with the larger estimated reduction in payments for the sample of CEC beneficiaries in this analysis compared to the overall CEC population.

VIII. Did the CEC Model Have Unintended Consequences?

An important component of the evaluation of the CEC Model is identifying potential unintended consequences that may result from the incentives created by the CEC Model. In this section, we explore if the CEC Model affected Medicare Part D drug costs, patient selection, waiting list activity, and utilization of calcimimetics.

Medicare Part D Drug Costs. Under CEC, ESCOs are not financially accountable for Part D drugs cost incurred by their aligned beneficiaries. They may not consider the implications of their care redesign approaches on Part D drug costs[77]. The potential impact of the strategies reported by ESCOs site visit participants on Part D drug costs is ambiguous. The reduction in hospitalizations among CEC beneficiaries and the enhanced focus of ESCOs on improving adherence to medications for chronic conditions common in the ESRD population could lead to an increase in prescription drug utilization. Conversely, medication management, another strategy reported by ESCO site visit participants, could result in fewer prescriptions and lower costs. This section evaluates the impact of the CEC Model on Part D PBPM total drug costs.

Patient Selection. The CEC Model may incentivize CEC nephrologists to refer sicker patients to non-CEC facilities while keeping healthier patients at CEC facilities. The model, however, is designed to limit the ways in which CEC nephrologists may cherry-pick patients. The "first touch" approach of the program limits physicians' ability to steer existing patients away from the ESCO. Under the "first touch" approach, eligible CEC beneficiaries are prospectively aligned to an ESCO after their first visit to a dialysis facility participating in an ESCO, rather than retrospectively aligned to the provider delivering the plurality of the beneficiations services as in other ACO programs. Furthermore, once patients' dialysis schedules are established at their chosen facility, it takes a significant amount of effort to get patients to switch facilities. [78]Selection might occur if nephrologists decide to steer patients that are new to dialysis to certain types of facilities depending on their expected risk. This section investigates whether there is evidence that new dialysis patients in CEC facilities were healthier compared to new dialysis patients in matched comparison facilities.

Waiting List for Transplant. Dialysis providers have the role of initiating the process for waitlisting for a transplant either directly (by referring the patient for a transplant evaluation) or indirectly (by educating the patient about the option of transplantation). Patients that are on the waiting list have gone through an evaluation of their suitability for transplant and thus are considered relatively healthier. The removal of beneficiaries from the CEC Model if they receive a transplant may create the adverse incentive to decrease referrals. We cannot directly observe referrals or patient education processes, but a decline in the rate of waitlisting could indicate that CEC providers are delaying transplant referrals with the intent of extending the time that relatively healthier patients are aligned to ESCOs. Doing so may improve the ESCOs' overall performance and increase the chance of meeting requirements to qualify for shared savings under

[77] Total Part D drug cost represents total cost of prescriptions, including ingredients costs, dispensing fee, sales tax, and vaccine administration fee (if applicable). Medicare's share of these costs will depend on many factors, including the Plan Benefit Payment (PBP) benefit structure, beneficiary cumulative drug utilization at the date of services, drug rebates, and CMS subsidies. This report does not evaluate the impact on Medicare payments.

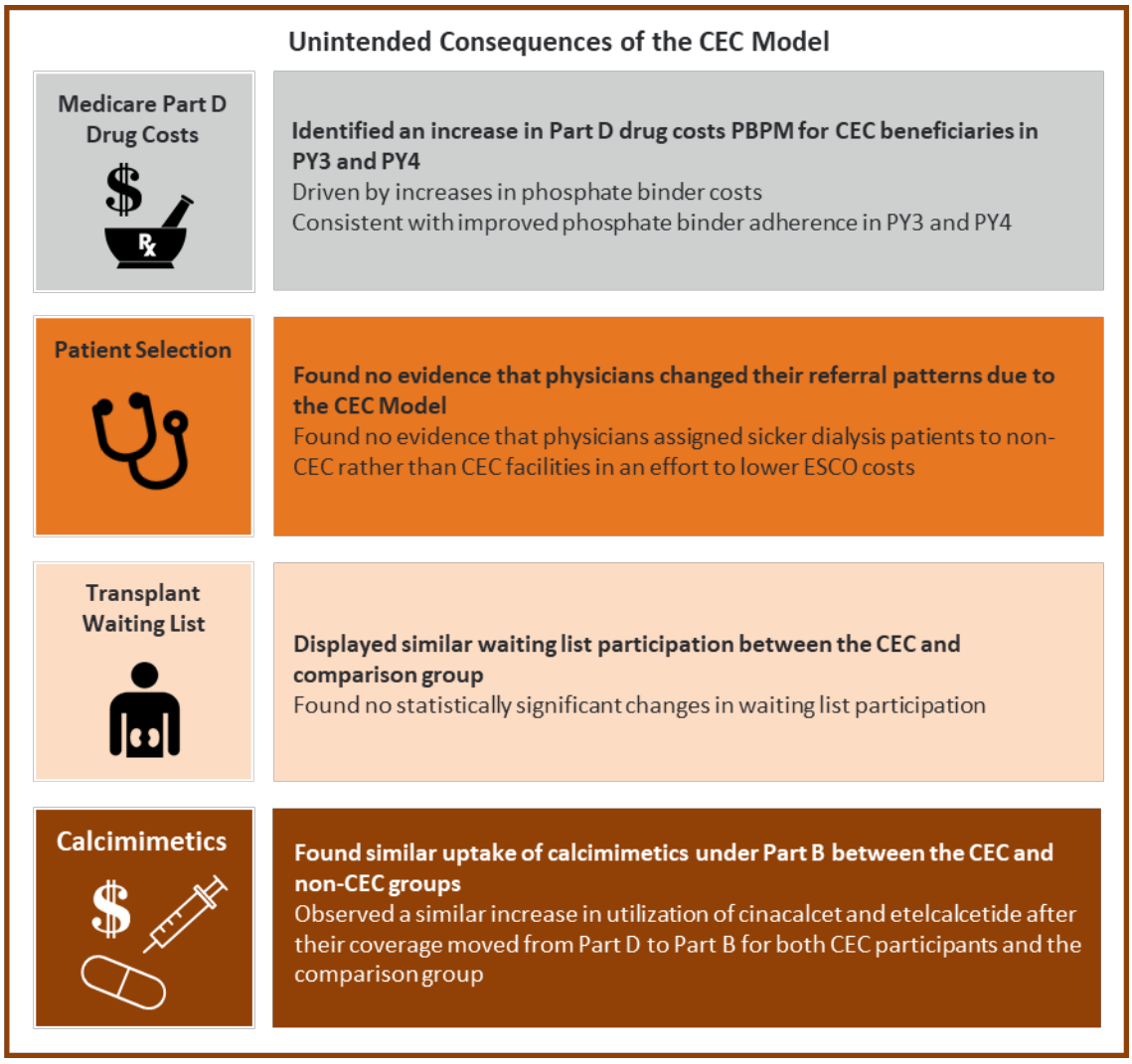
[78] On average, 74% of the ESRD beneficiaries in the analytical sample use a single facility for all their dialysis services in a year.

the model. This section presents findings on potential unintended consequences of the CEC Model impacting referral of patients for transplant evaluation for waitlisting, during the first four performance years of the CEC.

Calcimimetics. Medicare coverage of the calcimimetic drugs cinacalcet (Sensipar) and etelcalcetide (Parsabiv) moved from Part D to Part B in January 2018 after the Food and Drug Administration approved etelcalcetide for treatment of secondary hyperparathyroidism. Because these drugs were not previously included in the ESRD PPS bundled payment, CMS made a Transitional Drug Add-on Payment Adjustment (TDAPA) to dialysis claims beginning in January 2018. The purpose of the TDAPA is to reimburse providers for costs incurred while utilization data needed to update PPS payments is gathered.[79] TDAPA payments are added to the FFS dialysis visit payment whenever these drugs are administered. Under the CEC model, ESCOs PY expenditure benchmarks are modified to reflect the increase in FFS payments relative to the pre-CEC period average that is driven by TDAPA payments. However, PY expenditure benchmarks are increased by the average TDAPA payments in the reference population, which may not reflect the average TDAPA payments in the ESCO's aligned population. Therefore, ESCOs have a financial incentive to under prescribe calcimimetics starting in PY3 to generate shared savings. This section explores the use of calcimimetics before and after calcimimetics coverage moved to Part B for CEC participants and the comparison group.

[79] https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/ESRDpayment/ESRD-Transitional-Drug.html

A. Key Findings



B. Methods

We used several data sources and methods to assess unintended consequences of the CEC Model.

Medicare Part D Drug Costs. We used a DiD approach to estimate impacts of the CEC Model on Part D PBPM costs, relative to the comparison group. The analysis is restricted to only beneficiaries with Part D coverage representing 83% of the analytic sample, of which 71% have some form of Low Income Subsidy for Medicare prescription drug coverage. The DiD model for Part D PBPM drug costs followed the same specifications as the models described in **Section VII** and **Appendix E.**

Patient Selection. We used a facility-level DiD approach to assess the impact of the CEC Model on patient selection by comparing the number of new dialysis patients with multiple comorbid conditions in ESCO facilities before and after implementation of CEC, relative to this number in

comparison facilities before and after implementation of CEC.[80] We defined patients as new to dialysis if they have been on dialysis for three or fewer months as reported in CMS Form 2728.[81] We also used data from CMS Form 2728 to identify beneficiaries with multiple comorbid conditions at the start of dialysis or in the 10 years preceding the start of dialysis. Our sample includes 87,247 new dialysis patients from 2014 to June 2019. On average, new dialysis patients had 2.9 comorbid conditions, and almost half (51%) had at least three comorbidities. The top three chronic conditions among the population in the analytic sample are congestive heart failure (30%), diabetes (58%), and hypertension (88%).

Because taking on new dialysis patients can pose potential financial risk for dialysis facilities, we also considered the total number of new dialysis patients as an outcome in our analyses. A detailed description of the sample, the distribution of outcomes, and DiD models can be found in **Appendix K**.

Waiting List for Transplant. We used a DiD approach (described in **Appendix E**) to quantify the impact of the CEC Model by comparing the changes in waiting list activity between the pre-CEC and intervention periods for the aligned CEC population and the comparison population. This approach attributes any change in waiting list activity to the CEC by contrasting the experience of beneficiaries under age 70 aligned to ESCOs to the experience of beneficiaries under age 70 aligned to comparison facilities. The estimates from the DiD model are presented in **Appendix L**.

The study population included all beneficiaries under the age of 70 who were aligned between 2014 and 2019 to either a CEC facility or a matched comparison facility. The study population included only beneficiaries under 70 because older patients on the waiting list receive transplants with lower frequency than younger patients.[82] The analysis was based on yearly Medicare claims and enrollment data along with data from the Scientific Registry of Transplant Recipients (SRTR).[83] The SRTR data system includes data on all donors, waitlisted candidates, and transplant recipients in the US, submitted by the members of the Organ Procurement and Transplantation Network (OPTN).[84] The beneficiary's Medicare information was linked to the corresponding waiting list record in the SRTR database by the SRTR data administration team. The linkage indicated if the beneficiary identified in the Medicare database was in the SRTR database and the time period the beneficiary was active on any of the organ waiting lists.[85]

In a given calendar year, a beneficiary in the study population was identified as active on the waiting list if the beneficiary was active on the OPTN waiting list at some time during the year,

[80] The methods used to select the comparison facilities are described in more detail in **Appendix E**.

[81] https://www.cms.gov/Medicare/CMS-Forms/CMS-Forms/CMS-Forms-Items/CMS008867.html

[82] Transplants in people aged 70 or greater occur with much less frequency than transplants in younger patients. As a robustness check, the analysis described in this chapter was also performed. All results were robust to removing this age restriction and to using an age cutoff of 75.

[83] Since transplant waiting list placement is a low frequency event, a yearly dataset was used instead of a monthly dataset.

[84] The Health Resources and Services Administration, U.S. Department of Health and Human Services provides oversight to the activities of the OPTN and SRTR contractors.

[85] The data reported here have been supplied by the contractor for the Scientific Registry of Transplant Recipients (SRTR). The interpretation and reporting of these data are the responsibility of the author(s) and in no way should be seen as an official policy of or interpretation by the SRTR or the U.S. Government.

and the beneficiary was waiting for either a kidney or a kidney and pancreas transplant. A beneficiary who received a donation from a living donor was considered active on the OPTN waiting list during the year that the donation occurred.

Calcimimetics. To measure use of calcimimetics before and after these drugs were moved from Part D to Part B, we analyzed the percentage of beneficiaries with a etelcalcetide or cinacalcet claim. To track utilization over time, our analysis identifies etelcalcetide or cinacalcet in Medicare Part D claims prior to 2018 and in Medicare Part B claims in 2018 and 2019. Observations were restricted to beneficiary months with Medicare Part D coverage

C. Results

Our analyses found that ESRD beneficiaries who received care at ESCO facilities, had increased Part D costs in PY3 and PY4 largely for phosphate binder medications. There was no evidence of adverse selection or decreases in waitlisting or use of calcimimetics under the CEC Model.

1. What Was the Impact of CEC on Medicare Part D Drug Costs?

There were statistically significant relative increases in Part D PBPM drug costs from pre-CEC period to intervention for CEC beneficiaries relative to the comparison group. The relative increase in overall Part D costs was driven by impacts in PY3 and PY4 (see **Exhibit 45**).[86,87]

[86] Since Total Part D Drug cost did not pass statistical testing of the parallel trends assumption for all ESCOs and Wave 2, we also inspected the trends graph which compared trends between the CEC beneficiaries and the comparison group and observed no evident differences. Additionally, the coefficient on the difference in trends in the pre-CEC period, although significant, equaled: -1.43 (all ESCOs) and -1.60 (Wave 2). See **Exhibit E-18.**

[87] The last performance year estimate is incomplete and subject to change with claims maturity.

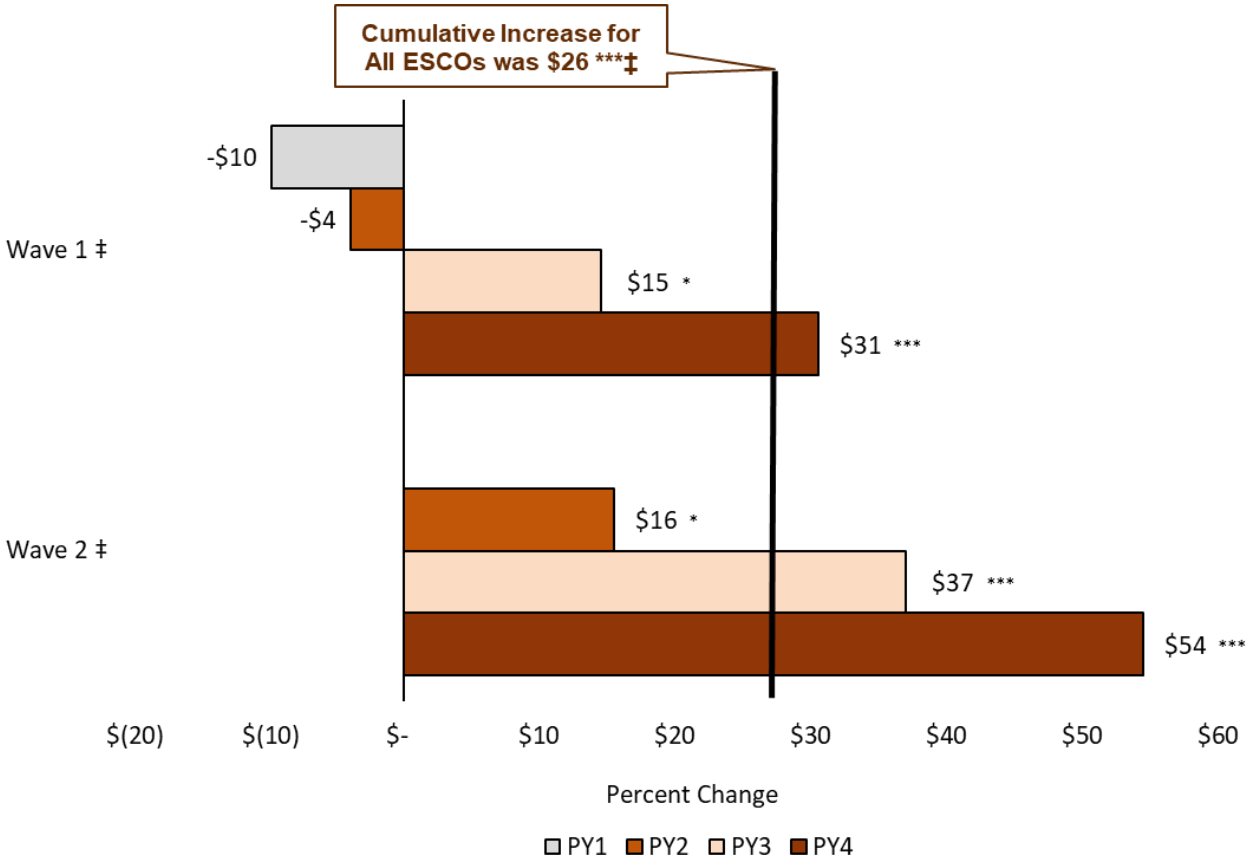
Exhibit 45. Impact of the CEC Model on Part D Drug Costs PBPM

Measure		CEC		Comparison		DiD Estimate			
		Pre-CEC	Post-CEC	Pre-CEC	Post-CEC	DiD	90% Lower CI	90% Upper CI	Percent Change
Total Part D Drug Costs	ALL ESCOs	$826	$973	$848	$958	$37 *** ‡	$21	$52	4.4%
	WAVE 1 PY1	$826	$1,086	$848	$1,101	$7	-$22	$36	0.86%
	WAVE 1 PY2	$825	$1,172	$848	$1,169	$25	-$4	$55	3.1%
	WAVE 1 PY3	$826	$789	$848	$783	$28 **	$6	$50	3.4%
	WAVE 1 PY4	$826	$780	$848	$750	$53 ***	$27	$79	6.4%
	WAVE 2 PY2	$1,135	$1,154	$1,158	$1,169	$8 ‡	-$17	$34	0.73%
	WAVE 2 PY3	$1,135	$802	$1,158	$783	$42 *** ‡	$24	$60	3.7%
	WAVE 2 PY4	$1,135	$789	$1,158	$750	$61 *** ‡	$41	$81	5.4%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. PY4 estimates are based preliminary data pulled on 04/15/2020, which is earlier than the 06/30/2020 submission period closing date. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate. Total Part D represents total cost of prescriptions including: ingredients costs, dispensing fee, sales tax, and vaccine administration fee (if applicable). See **Exhibits E-28-E-30.**

We also examined drug costs specific to phosphate binder medications. Of the $37 PBPM relative increase in Part D drug costs overall, $26 was the results of a relative increase in costs associated with phosphate binder medications for CEC beneficiaries, which was concentrated among Wave 2 ESCOs in PY3 and PY4 (see **Exhibit 46**). The relative increase in phosphate medication costs is consistent with an improvement in phosphate binder adherence among beneficiaries aligned to the CEC Model (see **Exhibit 23**). In particular, Wave 2 CEC beneficiaries' phosphate binder adherence rate increased to 16% ($p<0.01$) by PY4. While much of the relative increase phosphate binder spending in PY3 and PY4 appears to be explained by the improvement in adherence among CEC beneficiaries, it could also be driven by more CEC beneficiaries receiving phosphate binder prescriptions or a shift towards higher price formulations among CEC beneficiaries. Further analysis of phosphate utilization and average costs per day of supply shows that both factors also contributed to the relative increase in phosphate spending among CEC beneficiaries. The percent of beneficiaries taking phosphate binders in a given year increased from 69% to 72% for CEC and decreased from 70% to 68% for comparison beneficiaries from the pre-CEC period to PY4. Average phosphate binder costs per day of supply from the pre-CEC period to intervention increased for both CEC and comparison beneficiaries, but they increased less for comparison beneficiaries (12% vs. 4%).

Exhibit 46. Impact of the CEC Model on Part D Phosphate Binder Drug Spending PBPM

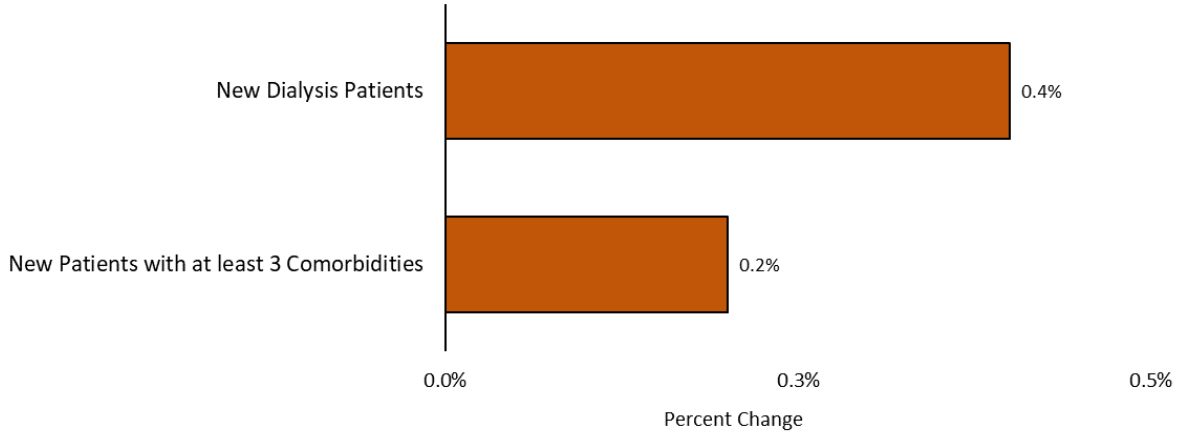


Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities for the intervention period with the pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate. See **Exhibits E-28-E-30.**

2. Was there Evidence of Adverse Selection within CEC Facilities?

Similar to prior annual reports, overall, we did not find consistent evidence that CEC facilities treated healthier new dialysis patients compared to matched comparison non-CEC facilities. Results are presented in **Exhibit 47**. Relative to non-CEC facilities, CEC facilities had 0.4% more new dialysis patients. In assessing the number of comorbidities that patients had, we found that CEC facilities had 0.2% more new patients with at least three comorbidities. None of these estimates were statistically significant.

Exhibit 47. Impact of the CEC Model on the Number of New Dialysis Patients and New Dialysis Patients with Comorbidities



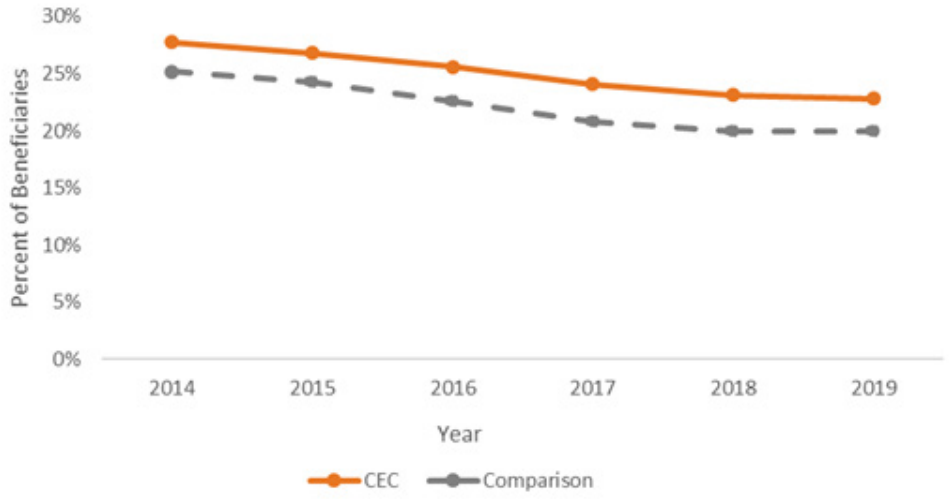
Notes: Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level assuming a two-tailed test. Regression controls for the number of new dialysis patients (with the exception of the New Dialysis Patients outcome), number of dialysis stations at each facility in each quarter, beneficiary count, whether or not the facility offers a late shift, for-profit status, indicators for LDO, rural/urban indicators, region dummies and market characteristics (percent of population that has ESRD, median family income, dual population, MA percent, ACO percent, and PCPs per 10,000). For more details, see **Exhibit K-1** and **K-2**.

3. What Was the CEC Model's Impact on Transplant Waiting List Activity?

Similar to prior annual reports, overall, we did not find consistent evidence that CEC facilities delayed waitlist referrals compared to matched comparison non-CEC facilities. Annual waiting list participation was consistently higher in the CEC facilities than non-CEC facilities across the model performance years. In addition, declining participation across model performance years was consistent for both CEC and comparison group beneficiaries, as shown in **Exhibit 48**.[88] The decreasing trends in participation of CEC and comparison group beneficiaries is consistent with national trends; over the same time period, the increase in the number of patients removed from the waiting list outpaced the additions, leading to an overall decline in waiting list entries (see **Exhibit L-3**).

[88] These numbers may be impacted by changes in the kidney allocation system which took effect in December 2014. These changes impact both comparison and participating facilities.

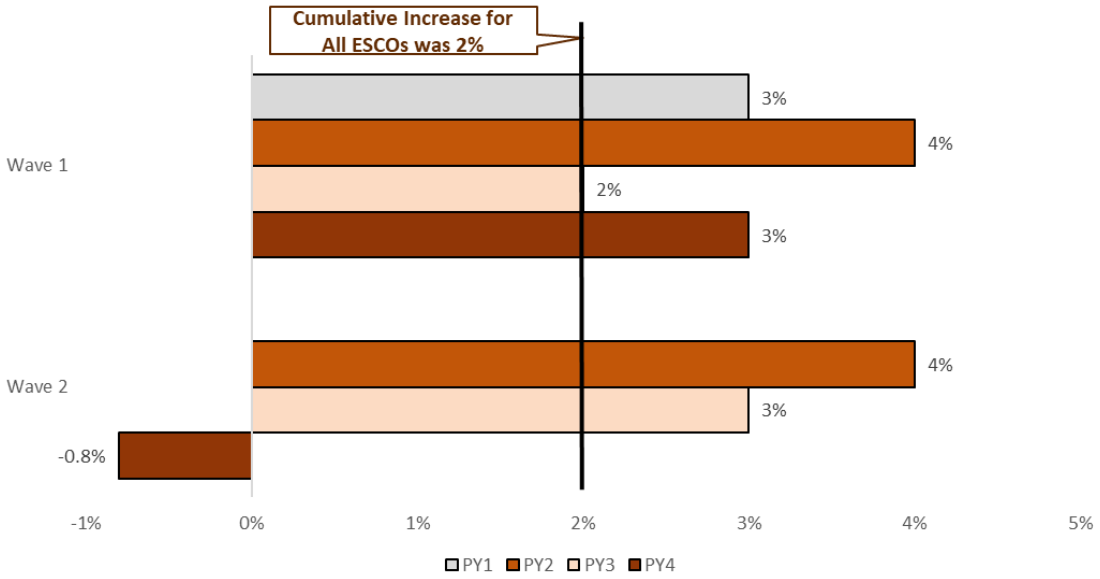
Exhibit 48. Transplant Waiting List Activity by CEC Status



The impact of the CEC Model on waiting list participation was not statistically significant overall, nor by wave or year.

There was no statistically significant decline in waiting list participation from the pre-CEC period to intervention for CEC beneficiaries relative to the comparison group. Conversely, the overall impact is positive (2%), although not statistically significant as shown in **Exhibit 49**. The impacts are also positive by wave and year, except for Wave 2 PY4. The direction of the impacts and the lack of statistical significance suggest that the CEC Model did not negatively impact waiting list participation during the first four performance years.

Exhibit 49. Impact of the CEC Model on Transplant Waiting List Activity PBPY



Notes: Estimate label values are rounded to the nearest whole number, therefore bar lengths may differ despite showing the same rounded label value. Significance of the DiD impact estimate is indicated next to each outcome bar plot where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. None of these estimates are statistically significant. For more details, see **Exhibit L-6**.

4. Did the Use of Calcimimetics Under Part B Differ Between CEC and non-CEC groups?

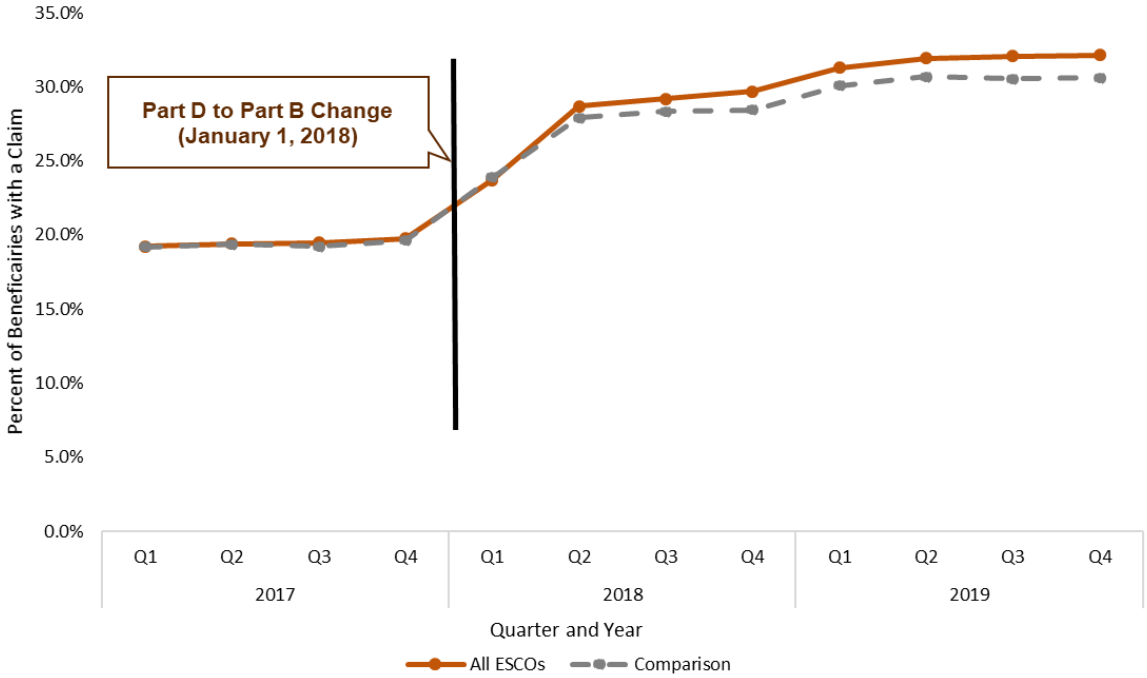
> *"[Calcimimetics] really needs to be tiered…Try this, okay, it didn't work. Try this. It didn't work, now let's try [calcimimetics]. It can't be a first-line therapy. We can't survive once it gets put in the [payment] bundle."*
>
> – ESCO Site Visit Participant

Overall, calcimimetic medications were reported to have a significant impact on cost of care, especially as the TDAPA has been reduced during the performance period. Wave 2 ESCO site visit participants' perspectives on calcimimetic use and cost varied. Fresenius providers have used calcimimetics aggressively to avoid having patients undergo parathyroidectomy, the surgical alternative to medical management. Another ESCO expressed concerns with overuse of calcimimetics, particularly by physicians that were unaware of medication costs. One non-LDO reported that even though facilities receive some payment for calcimimetics, the per-patient expense remained high and it had a negative impact on the overall cost of care. In contrast, one non-LDO organization limited the use of calcimimetics due to concerns about the evidence base and noted substantial cost savings.

Consistent with the majority of ESCO site visit participant reports, our analyses found an increase in total calcimimetic utilization after cinacalcet and etelcalcetide moved from Part D to Part B, in 2018 and 2019, for both CEC beneficiaries and the comparison group.[89] The trends in calcimimetic utilization in the two groups followed each other very closely over the three-year period (see **Exhibit 50**) with a small increase for CEC beneficiaries, relative to the comparison group. The percent of CEC beneficiaries with a cinacalcet or an etelcalcetide claim in a given quarter increased from 19.8% in the last quarter of 2017 to 32.1% in the last quarter of 2019. The comparison group experienced a similar increase over the same period, from about 19.6% to 30.6%. There is no evidence that ESCOs underutilized calcimimetics after they became available under Part B. Rather, utilization under part B was slightly higher among ESCOs than in the comparison group.

[89] The majority of calcimimetic claims in 2018 and 2019 were for cinacalcet rather than etelcalcetide.

Exhibit 50. Percent of Beneficiaries with a Cinacalcet or Etelcalcetide Claim for All ESCOs and the Comparison Group, 2017-2019



Note: Part D claims are used in 2017 and Part B claims are used in 2018 and 2019.

D. Discussion

In a model such as CEC that encourages lower payments, it is important to search for potential unintended consequences that may negatively affect beneficiary care. The analysis did not yield conclusive evidence of the unintended consequences of adverse selection. There were statistically significant differences in the change in Medicare Part D drug costs from the pre-CEC period to intervention between the CEC and comparison groups, driven by increase in PY3 and PY4. However, the increase Part D drug costs was largely caused by an increase in utilization of phosphate binder drugs. Wave 2 site visit participants emphasized patient education on the importance of taking phosphate binders and improved phosphate binder adherence was observed in the data.

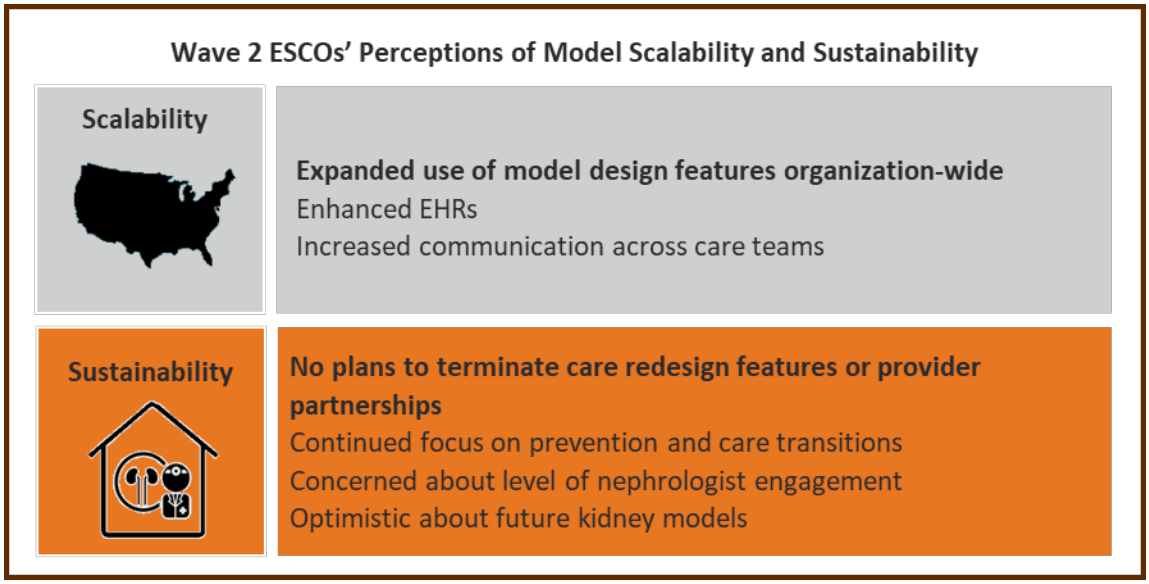
Transplant waiting list activity among beneficiaries aligned with the CEC Model has been declining over time. The decline was slightly larger for the comparison beneficiaries, however the difference in trend was not statistically significant. The declines among all groups are potentially related to changes in federal transplant policy. In particular, transplant priority for those on the waiting list is now based on start date of dialysis rather than the first date patients are placed on the waiting list. This potentially reduces the urgency of early referral to the waiting list. The waiting list analysis is limited by the frequency with which transplant waiting list activity is updated. When the health status of a beneficiary changes there is typically a delay in updating the waiting list to reflect candidate removals. Therefore, the dates of waiting list activity are approximate.

Finally, there was significant variation noted between organizations in the approach to using calcimimetics for treatment of secondary hyperparathyroidism. Despite the widespread recognition that these medications have a significant impact on overall cost of care, the number of beneficiaries who received a calcimimetic increased during 2018 when the medications transitioned to Part B claims. The proportion of ESCO beneficiaries with a calcimimetic claim was similar or higher to the comparison group, indicating that despite financial pressures, ESCO participants did not suffer unintentional consequences with regards to access to medications. However, the TDAPA transition period continues through 2020, so it may be too early to determine the complete impact of the CEC on beneficiary access to calcimimetics.

IX. What Were Wave 2 ESCOs' Perceptions of Model Scalability and Sustainability?

During interviews with Wave 2 ESCO leadership in PY4, we asked about the scalability and sustainability of the CEC Model within their organizations. ESCOs reported on existing efforts to implement model design features for non-CEC beneficiaries and non-ESCO facilities and plans to continue model design features beyond the CEC Model project period. Participants also commented on future CMMI purchasing models.

A. Key Findings



B. Methods

We used the methods described in **Section IIIB** and **Appendix C** to analyze the qualitative data derived from the site visits**.**

C. Results

As discussed in **Section IV**, existing model design features are increasingly provided to non-CEC beneficiaries or non-ESCO facilities and those efforts are likely to remain after completion of the CEC Model.

1. Have Wave 2 ESCOs Incorporated Model Design Features in Non-ESCO Facilities or Markets?

Several Wave 2 ESCOs have already applied some design features of the CEC Model beyond their ESCO beneficiaries and facilities. Changes made to EHRs, such as expanding access to case notes and adding alerts to team members when a case note is added, were implemented

> *"[The ESCO Leader] does not want a two tier system, where certain patients only get certain things because they happen to belong to the ESCO. He's made it a requirement that we are able to scale."*
>
> – ESCO Site Visit Participant

across facilities within organizations. Like EHR enhancements, other changes at the dialysis organization level included use of ED notification systems and use of interdisciplinary care team meetings to manage beneficiaries with complex care needs.

2. What Were Wave 2 ESCOs' Perceptions of Model Sustainability?

ESCOs did not discuss formal plans to discontinue operation of care redesign and other changes following conclusion of the CEC Model. They value the changed mindset as a result of the model that emphasizes prevention of missed dialysis treatments and other undesirable dialysis and non-dialysis related outcomes. Several ESCOs already continued to track CEC preventative care metrics after they were removed from the model. Some site visit participants suggested that improvements in patient engagement, focus on care transitions, and preventing hospitalizations are the care redesign strategies most likely to continue. In addition, IT strategies, such as leveraging regional and state Health Information Exchanges (HIEs) and ED alerts are also likely to remain. Alternatively, in PY4, some Wave 2 ESCOs had just started feeling like the model was working as intended following growing pains in the earlier performance years, suggesting that it is too soon to tell which strategies will be sustained.

> *"I think as a practice, we see value in this. We see that this is kind of what the future of healthcare is going to be."*
>
> – ESCO Site Visit Participant

Despite improvements in care coordination across ESCO facilities, nephrologist involvement varied. Participants were optimistic about the potential for future models' emphasis on nephrologist and transplant providers rather than dialysis facilities to improve nephrologist buy-in. Some ESCO site visit participants commented that the independent nature of nephrologists was a challenge for the ESCO level CEC Model in terms of changing care patterns. They suggested that because of the nephrologist focus, the Kidney Care Choices Models may be even more successful than CEC. Site visit participants were also pleased that the new models incorporate CKD and therefore pre-ESRD populations.

D. Discussion

ESCO leadership reported efforts to scale up and sustain CEC Model design features among dialysis patients and across all facilities, as a result of a new mindset among ESCO facilities that emphasizes prevention measures to reduce unnecessary hospital services. Variation in nephrologist engagement in the CEC Model was reported by some ESCOs. Therefore, interview participants welcomed the nephrologist focus in the Kidney Care Choices Models and anticipated the new models may have greater success than the CEC Model.

X. Discussion

The CEC Model is designed to create incentives for dialysis facilities and nephrologists to coordinate care for Medicare beneficiaries with ESRD across settings by making the ESCO accountable for the total cost of care of their aligned beneficiaries. The time period covered by this fourth annual report includes the first four performance years for the Wave 1 ESCOs that began operations in October 2015 and the first three performance years for the Wave 2 ESCOs that began operations in January 2017. In the fourth performance year, four of the 37 ESCOs dropped out of the model, but the total number of facilities participating continued to rise as the remaining ESCOs added new facilities in PY4. With this cumulative experience, the current report allows for a more thorough investigation of performance over time, which has implications for model sustainability, and differences between early and later adopters, which has implications for model scalability.

Nationally, 16% of dialysis facilities were participating in the model in PY4. Participating facilities tended to be somewhat larger than non-participating facilities, and the markets served by ESCOs tended to be larger than those without an ESCO. However, the proportion of non-metropolitan facilities among those joining the model more recently was higher than among early joiners and was more similar to the national average.

CEC participating providers often cited alignment with CEC quality and cost outcomes as a motivation for participating. Shifting attitudes towards value-based payment might also enhance more providers' interest in the model going forward. CEC attained an Advanced APM status under MACRA in 2017, which motivated nephrologists' participation in the model in Wave 2 and may have ultimately contributed to differences in performance across waves. However, the scheduled end of the Advanced APM waiver in 2024 was thought by some participants to be an obstacle to obtaining or retaining nephrologist participation in future models. Additionally, by PY4 some nephrology practices reported that they reduced their level of ownership interest in the ESCO and one non-LDO shifted to a one-sided risk arrangement.

Overall, after four years of experience, the CEC Model appears promising, with lower payments, improvements in some quality and utilization measures, and no obvious indicators of unintended adverse consequences. These outcomes, particularly those related to payment or utilization, were mostly driven by Wave 1 ESCOs. Declines of 1% were observed for total Part A and Part B Medicare payments, somewhat lower than reductions achieved in the earlier years of the model. Payment reductions were most evident in Medicare Part A, with significant reductions in acute inpatient and readmissions. Reductions in utilization paralleled the payment reductions, with significant declines in hospitalizations and readmissions. Utilization reductions were also consistent with ESCOs' reported efforts to avoid hospitalizations through risk stratification, care coordination, and improved adherence to dialysis treatments. ESCOs specifically described strategies to decrease skipped dialysis treatments by improving communications with the ED and adding extended hours and standby dialysis slots (available chairs) to divert patients from the inpatient setting for conditions that could be addressed through dialysis. The number of dialysis treatments increased as did the likelihood that treatments were delivered as scheduled and that missed treatments were rescheduled, while payments and hospitalizations for ESRD complications declined, which provides further evidence of fewer missed treatments and potentially the scheduling of extra dialysis treatments (e.g., to address fluid overload). ESCOs

also improved the quality of dialysis care, as seen in reductions in long-term catheter use, and improved some aspects of care beyond dialysis, as demonstrated in higher rates of use of preventive health services.

This pattern of results is qualitatively similar to those reported in AR3 based on the first three performance years for Wave 1 and the first two performance years for Wave 2. However, examining results by performance year reveals some important changes. First, while Wave 1 ESCOs improved their performance in PY2 relative to PY1, performance in PY3 was not as strong, but improved in PY4. For example, Wave 1 ESCOs decreased total Medicare Part A and B PBPM payments by $150 in PY1 and $186 in PY2 (both statistically significant), saved only $79 (not statistically significant) in PY3, but reduced payments by $102 in PY4 (statistically significant). Second, Wave 2 ESCOs continued to have generally weaker results than Wave 1, reinforcing the conclusion drawn in AR3 that the overall impact of the CEC was driven by Wave 1 ESCOs. Third, unlike Wave 1 ESCOs which regained some reduction in payments in PY4, Wave 2 continued to show no decreases in payments in their most recent year of operation. Fourth, ESCOs in both waves continued to add dialysis facilities. When comparing results between facilities that joined their ESCO in different years, it was clear that adding new facilities pulled down overall performance. As ESCOs expanded, the added facilities were less likely to be located within metropolitan areas, had fewer dialysis stations and were less likely to offer a late shift. Beneficiaries in these facilities may experience greater barriers to accessing all types of medical care which may hinder the ability of later joining facilities to reduce Medicare payments. These findings suggest that only the original facilities in the Wave 1 ESCOs were able to sustain reductions in payments. Despite an additional year of 'maturity' in the model later joining facilities did not reduce payments.

As noted in prior reports, the conclusion that most results were driven by Wave 1 ESCOs may reflect several factors. Facility characteristics differed by wave. Facilities in Wave 1 ESCOs had higher Medicare payments and higher standardized hospitalization and readmission rates prior to joining than non-CEC facilities. Conversely, those joining in Wave 2 had lower payments and lower standardized hospitalization and readmission rates prior to joining than non-CEC facilities, and therefore might have had less room to improve on their pre-CEC performance. Additionally, nephrologists in Wave 1 ESCOs may have been more strongly motivated to join the CEC Model since they joined before it was deemed an Advanced APM under MACRA. Finally, because of delays with the initial model start, Wave 1 ESCOs may have had more lead time to develop their strategies and capabilities.

The survival analyses suggest that there is a survival benefit associated with the CEC Model. That benefit is modest overall, but is larger for those patients aligned during their first year of dialysis. This finding suggests that the model may be more effective when it is able to affect the patient's care at the crucial time near the transition to dialysis. When an ESCO starts, its aligned beneficiaries are likely to reflect its prevalent dialysis population, including many patients who have been on dialysis for multiple years and already have established patterns of care. In patient focus groups conducted throughout this evaluation, such "experienced" patients have often commented that the ESCO's interventions such as care coordination could be particularly valuable to newer patients. As the model matures, a greater percentage of its beneficiaries would be likely to have been aligned near the onset of dialysis. We found little conclusive evidence that the effects on mortality differed significantly by wave. These findings were similar in magnitude

to those reported in AR3. Other measured model effects, such as the increase in dialysis treatments and declines in hospitalizations overall and due to dialysis complications are potential mechanisms that might influence lower mortality.

Given the incentives for efficiency that are central to shared-savings models like the CEC Model and the vulnerable population served by CEC, it is important to monitor for unintended consequences. We continue to find no evidence of adverse outcomes such as increased mortality, reduced use of calcimimetics, diversion of sicker patients away from the ESCO, or reduced transplant waitlist participation for CEC beneficiaries. Wave 2 site visit participants reported that medication management continued to be a care redesign strategy and we found improvements in phosphate binder adherence and a corresponding increase Part D costs.

This report also reflects the qualitative findings from site visits to 11 Wave 2 ESCOs that occurred in the last quarter of PY4. The majority of those ESCOs were originally visited in PY2. Overall, ESCOs refined the structures and care redesign strategies they had developed in PY2, emphasizing care coordination, the use of inter-disciplinary teams and increasing communication. Medication management continued to be a focus, especially post-discharge. Several ESCOs reported new informal partnerships with vascular surgeons and home health agencies. Wave 2 ESCOs continued to raise concerns regarding transparency and predictability of the model's financial methodology and challenges in continuing to exceed benchmarks that become stricter over time. Along with the expected end of the Advanced APM waiver in 2024, participants considered these factors to be barriers to the scalability and sustainability of the model.

Findings presented in this report have several limitations. Because the 37 ESCOs are not representative of the population of Medicare providers, our ability to generalize the results presented here are limited. However, the addition of new participants in PY2 – PY4 increased the representation of markets participating in CEC, particularly those in non-metropolitan areas. Also, although the analysis employs matching methods to select an appropriate comparison group to infer counterfactual outcomes for the ESCOs, the characteristics we selected for matching and the specificity of the data may not adequately account for all differences between CEC and comparison facilities and their beneficiaries. Further, as new facilities and markets are added to ESCOs and other ACO programs continue to evolve, the construction of appropriate comparison groups becomes even more challenging (e.g., a facility that might have been in an earlier comparison group is now in the model). Additionally, the analyses in this report are risk-adjusted to account for differences in provider and market characteristics, as well as patient mix that is measurable with claims data. As with all regression models, it is possible that we did not control for all characteristics that may affect the outcomes such as the motivation to participate in a voluntary payment model.

The final evaluation report will complete the evaluation for the model.

Appendix A: Health Information Exchanges and CEC Waivers

A. Health Information Exchanges

Several ESCOs were beginning to leverage the following HIEs:

- The Chesapeake Regional Information System for our Patients (CRISP) includes all Maryland and Delaware acute care hospitals and most District of Columbia hospitals. Providers receive real-time notification of hospital admissions and discharges as well as ED visits for patients active in their practice.
- Maryland's Immunization Information System, ImmuNet, is a web-based tool where healthcare providers report and track their patient's vaccinations 'real time' to avoid under- or over-vaccination.
- The Massachusetts Health Information HIway began in 2019 and is available to all interested providers. It offers the ESCO access to real-time patient information, such as discharge summaries.
- The Ohio ClinicSync HIE provides notifications when a patient is admitted or discharged from a hospital or visits an ED. Washington's Emergency Department Information Exchange (EDIE) provides alerts about patients who have registered in the ED.

B. Waivers

Waivers in the Comprehensive End-Stage Renal Disease (ESRD) Care (CEC) Model included:[90]

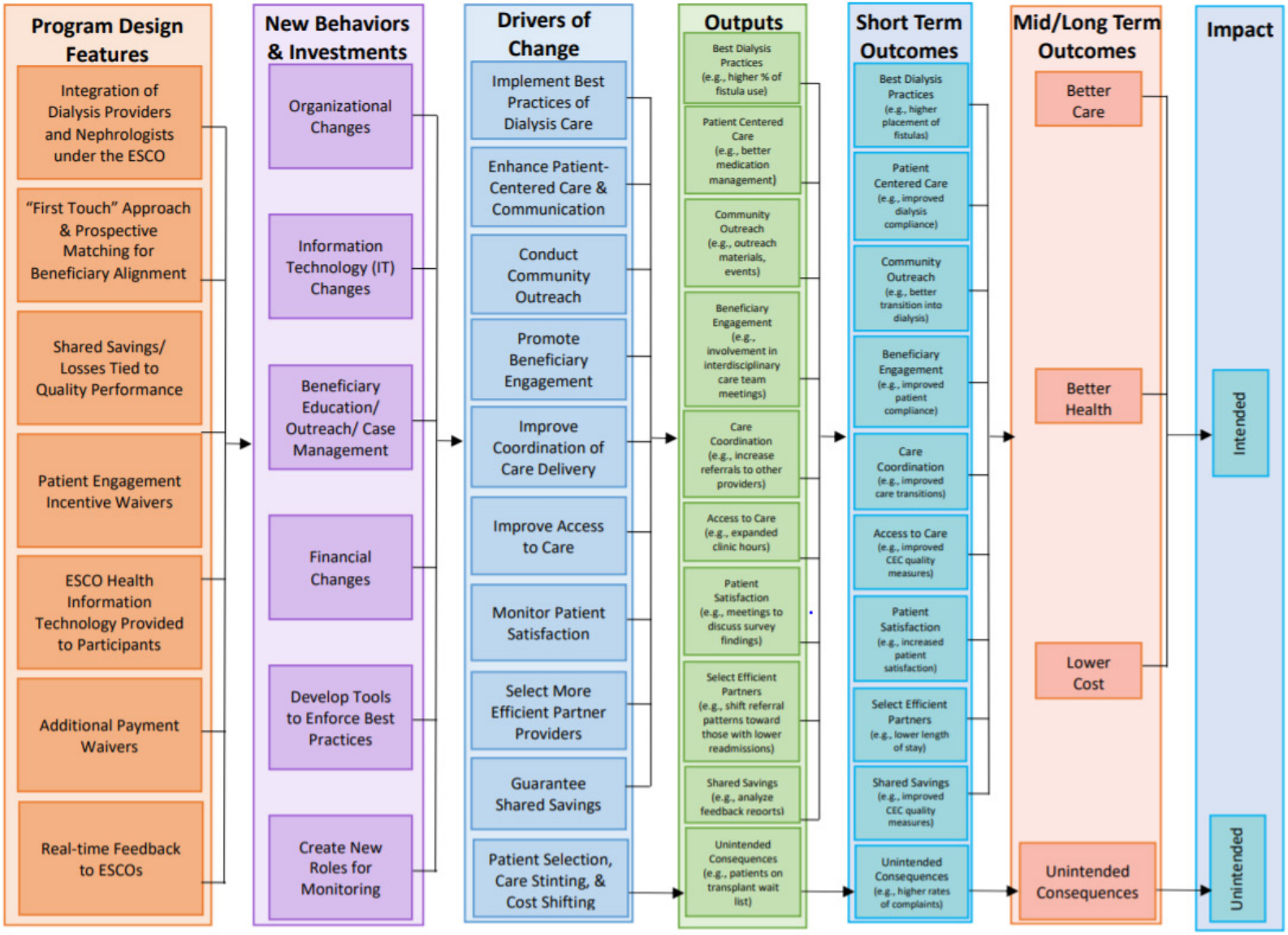
- **Patient Engagement Incentive.** Patient engagement incentive waivers allow ESRD Seamless Care Organizations (ESCOs) to provide in-kind items or services to CEC beneficiaries when related to their medical care. These waivers include technology, oral nutrition supplements (ONS), and non-emergency transportation.
    - Technology: Technology may be provided if the beneficiary does not possess or own similar technology and if the technology is considered "medically necessary" in that it will either (1) improve beneficiary-provider communication, health monitoring, or telehealth services, or (2) improve beneficiary adherence to medications, their plan of care, or their management of chronic conditions and diseases.
    - ONS: ONS may be provided free or discounted to beneficiaries only when their serum albumin level falls below the designated target level.
    - Non-emergency transportation: Non-emergency transportation can be provided for beneficiaries to access medically necessary care if they meet certain pre-set requirements.
- **Performance-based Payments to Participant Physicians.** ESCOs can provide incentives to participant providers for conducting certain medically necessary procedures or providing care that leads to better outcomes for CEC beneficiaries. These payments are

[90] https://www.cms.gov/medicare/physician-self-referral/fraud-and-abuse-waivers

based on performance-based metrics and are conditional to accurate reporting on such metrics.

- **Health Information Technology.** Participating providers and facilities may receive a health information technology (IT) waiver, but its usage must not be based upon referrals or other business generated between the participant and other parties. ESCOs must provide a consistent rationale for providing health IT based on a participant's overall use, quality reporting standards and other performance-based metrics, and care coordination activities.
- **Care Coordination Arrangements.** Care coordination arrangement waivers include ESCO clinical support services (i.e., case managers, care coordinators, and clinical training), and other items or services to improve care coordination (i.e., administrative, quality management, and data services necessary to the delivery, documentation, and assessment of care coordination services).
- **Remuneration Furnished by the Company/Organization to the ESCO.** Remuneration by the dialysis organization (DaVita, Fresenius, Dialysis Clinic, Inc. [DCI], Rogosin, Atlantic, Centers for Dialysis Care [CDC], Northwest Kidney Centers [NKC]) for ESCO support (including clinical support services, location and rounding accommodations, and other items or services to improve care coordination), ESCO health IT, and patient engagement incentives can be provided to the ESCO as a whole, but not to individuals, participants, or entities.

Appendix B: CEC Evaluation Logic Model



Appendix C: Site Visit Methodology

For the PY4 site visits, we selected a sample of 11 of the remaining 21 Wave 2 ESCOs, from, Atlantic, Centers for Dialysis Care, DCI, Fresenius and Northwest Kidney Care.[91] The sample included ESCOs that were visited in PY2 and ESCOs that did not have a previous visit. We asked corporate representatives at each of the Wave 2 non-LDO ESCOs to identify changes in implementation and share their perspectives on impacts of the initial years of the model as well as the scalability and sustainability of the model. Corporate interviews were not held with Fresenius or DCI in PY4 because interviews had been held in both PY3 and PY1 based on Wave 1 participation.

A. Selection Criteria

For the PY4 site visits, we sampled two or three facilities from each selected Wave 2 ESCO. Selection focused on facilities that originally joined the model at the start of PY2 on January 1, 2017; we did not include Wave 2 facilities that joined after this date (i.e., at the start of PY3 or PY4). To ensure diversity across facilities in our sampling, we took several criteria into account. The specific metrics and characteristics considered were:

- **Change in total costs between 2017 and 2018.** All Wave 2 facilities from selected ESCOs were categorized based on total average per beneficiary per month (PBPM) costs in 2017 (high vs. low in comparison to other facilities within their ESCO) and in terms of PBPM costs in 2018 (decreased costs vs. no change in or increased costs from prior year).
- **Change in quality metrics between 2017 and 2018.** We examined percent change in the rate of hospitalizations, readmissions, emergency department visits, and mortality.
- **Facility characteristics.** Selected facilities included those that had participated in a prior site visit in PY2 as well as those that had not participated. Other facility characteristics considered were location (rural/urban) and facility size (number of dialysis stations and number of beneficiaries).
- **Beneficiary characteristics.** We looked at the percentage of beneficiaries who are White, beneficiaries' average number of months on dialysis, and the percentage of beneficiaries new to dialysis.

A breakdown of the metrics and characteristics of site visit facilities is displayed in **Exhibit C-1**. In total, 27 facilities were selected for the PY4 site visits.

[91] During PY4, three of the initial 24 Wave 2 ESCOs dropped from the model.

Exhibit C-1. Characteristics of Wave 2 ESCO Facilities Selected for PY4 Site Visits

Characteristics		PY4 Site Visit Facilities (N=27)	
		#	%
Total PBPM Costs in 2017^‡	Lower Costs	10	37.0%
	Higher Costs	17	63.0%
Facility Had Prior Site Visit	Yes	¥	¥
	No	¥	¥
Number of Dialysis Stations at Facility•	0–18	12	44.4%
	19+	15	55.6%
Beneficiary Volume at Facility•	0–46	12	44.4%
	47+	15	55.6%
Percent of Beneficiaries Who are White•	<44%	¥	¥
	44%+	¥	¥
Beneficiary Average Months on Dialysis•	<69 months	¥	¥
	69+ months	¥	¥

Notes: ^ PY2 site visit facilities are summarized in terms of 2017 PBPM costs only.
‡ Lower and higher costs were determined based on the bottom and top 1/3 of facilities within each ESCO. Eight facilities with moderate costs (middle 1/3) were grouped with low or high because they had borderline costs and/or provided unique characteristics (e.g., demonstrated across-the-board reductions in utilization and costs).
• Reference points are based on bottom and top 1/2 of all Wave 2 facilities that joined in PY2.
¥ Cell data is suppressed, as it does not meet the minimum threshold for display of CMS data.

B. Data Collection Procedures

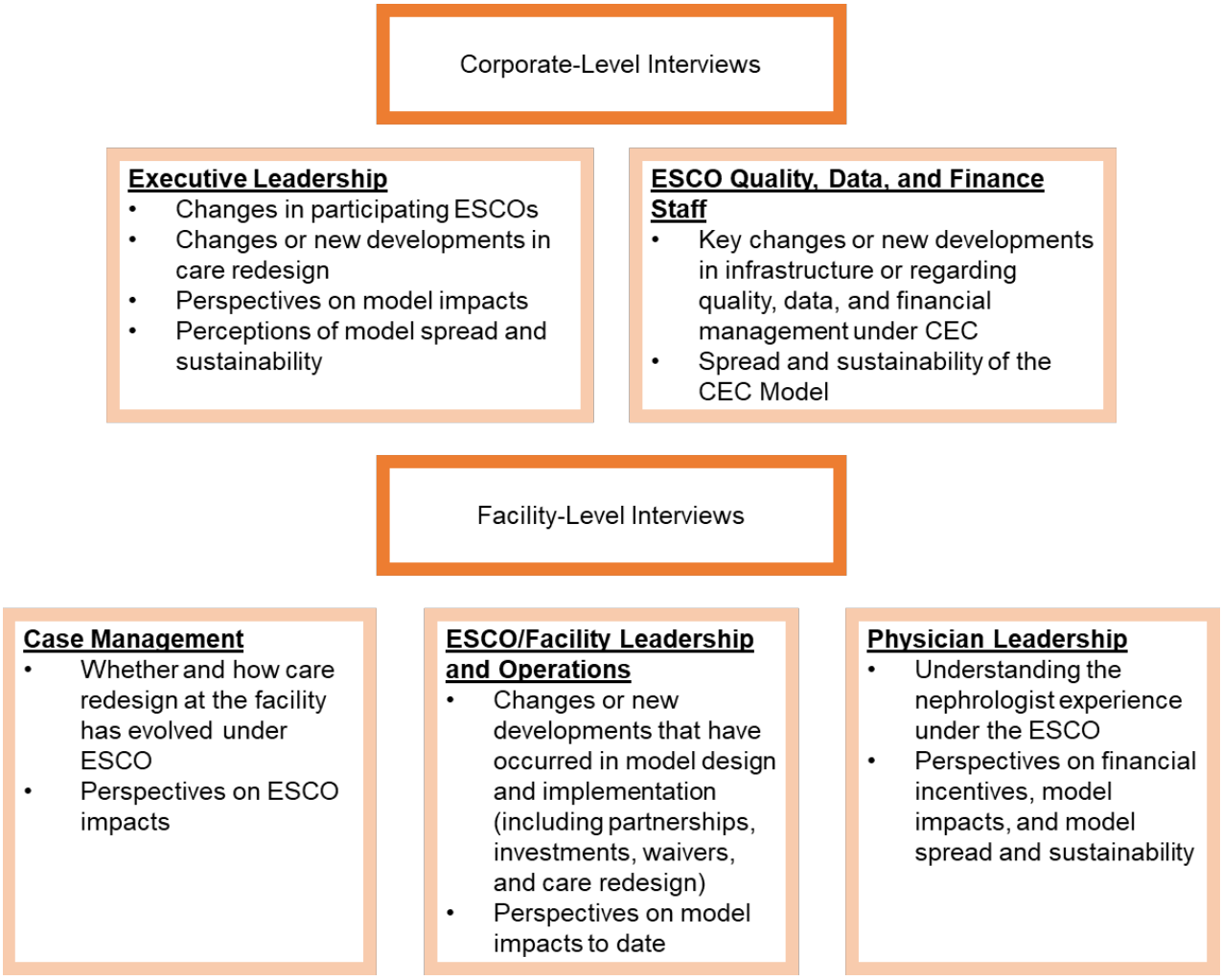
ESCOs and dialysis organizations were asked to identify staff members involved in the operation of the selected dialysis facilities and in their facility's implementation of ESCO-related programs; staff members involved in the coordination of care within and beyond the dialysis facility;[92] and ESCO co-owner physicians engaged in ESCO implementation and in delivery of direct patient care. ESCO dialysis facility visits included 45- to 75-minute interview sessions with physician leaders, facility operations staff, and case managers. Corporate site visits included 90-minute interview sessions with executive leaders and data, quality, and financial management staff. All interviews were audio-recorded and transcribed.

C. Protocol Development

We developed separate interview protocols for each type of respondent, as shown in **Exhibit C-2**. Separate protocols were used so that questions were framed appropriately for each interviewee type, to improve consistency in question delivery, and to facilitate comparison of interview findings across sites. Protocols were approved by the Centers for Medicare & Medicaid Services (CMS) prior to conducting the site visits.

[92] Coordination of care activities included, but were not limited to, scheduling dialysis treatments, scheduling outpatient physician visits, arranging transportation, delivering patient education, conducting post-hospitalization follow-up, and other related services.

Exhibit C-2. Main Interview Types and Content Addressed



D. Analysis

Site visit interview transcripts were managed and analyzed in ATLAS.ti version 8.4.22.0, a commercially available qualitative data analysis software package. An initial set of codes was developed using the logic model developed for this evaluation (see **Appendix B**), site visit protocols, and findings from site visits conducted in prior years. Transcripts were analyzed using these codes. Early in the coding process, the initial code list was applied to a small number of transcripts and to identify and resolve codes or coding instructions in need of clarification.

Following application of the initial codes to all transcripts, a more detailed analysis was conducted to identify themes within each high level code. Coders met regularly to discuss questions or issues that emerged during coding. Coded material was reviewed to identify major patterns and themes in interviewees' responses as well as any differences among dialysis organization and/or associated ESCOs and facilities. As needed, transcripts were consulted to provide context to coded material.

Appendix D: Beneficiary Focus Group Methodology

Between November 12, 2019 and December 10, 2019, we conducted focus groups with beneficiaries aligned to the CEC Model to assess the impact of the model on their experience of dialysis. Specifically, the research objectives were to:

- Obtain insights into beneficiaries' care experience, including
  - Perceptions of the dialysis facility
  - Communications with dialysis facility staff
  - Coordination of care for other health conditions
  - Access to care and other services offered by the dialysis facility, and
- Understand the impact of the CEC Model.

A. Selection Criteria and Beneficiary Recruitment

Beneficiary focus groups were held during sites visits at three non-LDO Wave 2 ESCOs (Atlantic, Centers for Dialysis Care, and Northwest Kidney Care). (See **Appendix C** for site visit methodology.) All of these non-LDO ESCOs previously hosted a focus group during PY2 site visits. Within each ESCO selected for a focus group in PY4, the location of the focus group was selected from a subset of dialysis facilities chosen for site visits. ESCO leadership determined which specific facility would host the focus group based on the availability of space to accommodate the group. Although each focus group was conducted at only one facility within an ESCO, beneficiary participants may have been from any ESCO-participating facility.

Because some attrition was anticipated due to changes in beneficiary interest or availability, we attempted to recruit 10 beneficiaries for each focus group, with the goal of hosting a total of 6–8 beneficiaries per group. However, due to low beneficiary availability in some areas, focus groups included 2–8 beneficiaries each. In PY4, 15 beneficiaries participated in focus groups, compared to 14 beneficiary participants in PY2. To facilitate recruitment, an ESCO staff member provided a list of CEC beneficiaries who received in-center hemodialysis from the facility hosting the focus group or from a nearby CEC facility. Our focus group recruiter contacted the beneficiaries via telephone and used a screening questionnaire to solicit their eligibility for and interest in participating in the focus group. An attempt was made to schedule participants who were not having dialysis on the day of the focus group. Transportation to and from the focus group location was provided if needed.

B. Data Collection and Analysis

Each focus group session lasted approximately 90 minutes and was moderated by an experienced independent facilitator. Lewin research team members observed the focus groups from the periphery of the room and were given an opportunity to have the facilitator ask participants additional questions or obtain specific clarifications during the last 10 minutes of the focus group. Participants were offered lunch and were given a $75 gift card for their participation at the end of the focus group.

The structure of each beneficiary focus group session is displayed in **Exhibit D-1**.

Exhibit D-1. Beneficiary Focus Group Discussion Flow

Activity	Descriptions
Welcome and Moderator Introduction	The Facilitator explained that she was employed by an independent company and that information was being collected for research purposes. The facilitator also obtained participant informed consent and permission to record the session.
Ground Rules	The Facilitator encouraged maximum participation and reminded participants that there are no right or wrong answers, to speak one at a time, and that their anonymity would be preserved.
Participant Introductions (10 minutes)	Participants introduced themselves by first name only and provided brief information about their length of time on and location of dialysis.
Open Discussion (75 minutes)	The Facilitator encouraged participants to discuss their likes and dislikes about the dialysis care they receive, changes in care over time, and awareness of the ESCO. The focus group protocol was organized as follows: ▪ Part 1: Perceptions of Dialysis Facility ▪ Part 2: Communication and Relationship with Nephrologists ▪ Part 3: Communication and Relationship with Dialysis Facility Staff ▪ Part 4: Awareness of ESCO
Discussion Wrap-Up	The Facilitator ended the session by summarizing the key points heard during the discussion and offered an opportunity for participants to ask any final questions. The group was then closed.

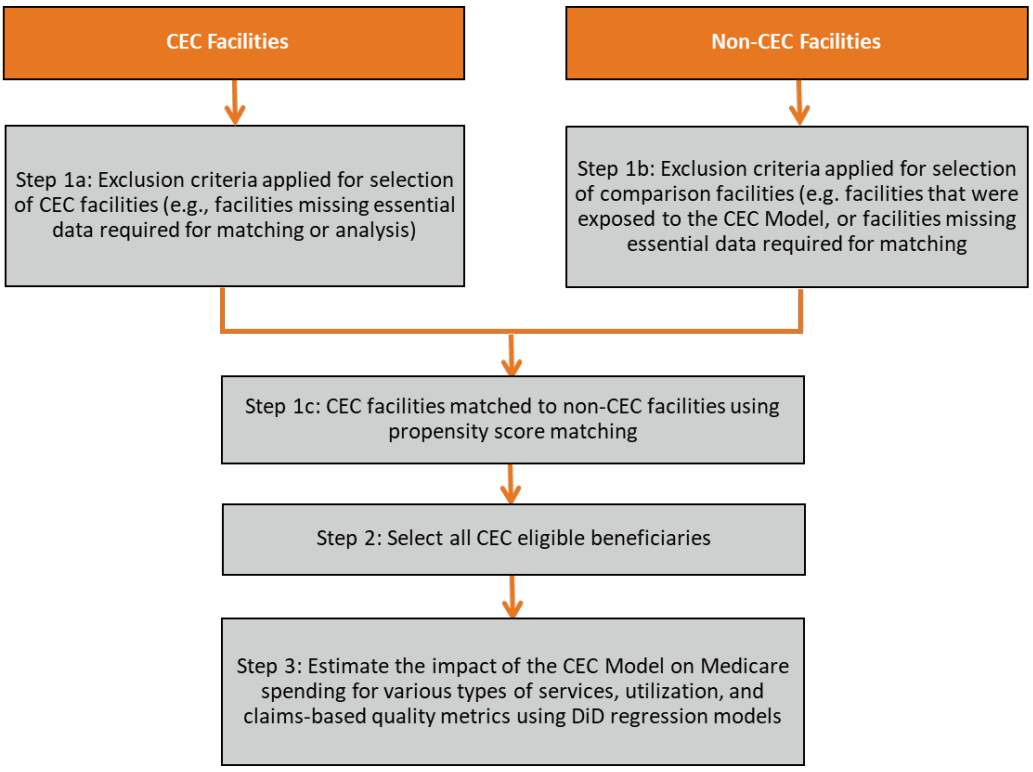
All focus groups were audio-recorded. The facilitator reviewed and summarized focus group recordings to identify the main themes across the focus groups.

Appendix E: Difference-in-Differences (DiD) Approach

The evaluation model relies on a non-experimental design, which uses a comparison group of non-CEC facilities and beneficiaries who would have been aligned to them under CEC rules, to infer counterfactual outcomes for CEC beneficiaries. The difference-in-differences (DiD) approach used in the evaluation is a statistical technique that quantifies the impact of an intervention by comparing changes in the intervention group (CEC beneficiaries) to changes in the comparison group.

The DiD approach was implemented in several steps, as shown in the flow chart in **Exhibit E-1**. First, we identified the pool of treatment and potential comparison facilities and used one-to-one propensity score matching (PSM) without replacement to select a comparison group of non-CEC facilities that is similar to the CEC facilities with respect to provider and market characteristics. Second, we applied the CEC Model rules to align eligible beneficiaries to both CEC and matched comparison facilities and assess their CEC eligibility status on a monthly basis. Beneficiaries aligned to either CEC participating or matched comparison facilities were included in our study population for every month they were also eligible for CEC. Finally, we used DiD regression models to identify the impact of the CEC Model on payments, utilization, and quality measures.

Exhibit E-1. DiD Implementation Steps



A. Data and Outcome Measures

Data used to evaluate the CEC Model are listed in **Exhibit E-2**.

Exhibit E-2. Data Sources

Data Source	Data Contents
▪ CEC Model Data	▪ CEC Participating Dialysis Facilities
▪ Master Data Management tool	▪ Beneficiary alignment to other shared savings programs (SSPs)
▪ Chronic Conditions Data Warehouse (CCW) Virtual Research Data Center (VRDC) ▪ Data from the CCW include Medicare claims for services provided between 1/1/2012 and 12/31/2019 that were processed by 4/3/2020[93]	▪ Claims for Medicare covered services
▪ Master Beneficiary Summary File (MBSF)	▪ Beneficiary characteristics, demographics, enrollment status, and chronic condition indicators[94, 95]
▪ Consolidated Renal Operations in a Web-enabled Network (CROWNWeb)	▪ Complete patient histories at incidence of dialysis including: • Cause of ESRD • Information on dialysis care • Date of first dialysis • Pre-ESRD care
▪ Dialysis Facility Compare 2014-2019	▪ Facility Organization characteristics and quality metrics[96]
▪ Area Health Resource File (AHRF) (aggregated to CBSA defined by CMS Office of Management and Budget)[97]	▪ Market Characteristics: • Population size • Economic and health care supply indicators
▪ The In-Center Hemodialysis Consumer Assessment of Healthcare Providers and Systems (ICH CAHPS)	▪ Patient experience with in-center hemodialysis care

All the outcome measures evaluated in the report using a DiD methodology are defined in **Exhibit E-3**.

[93] Kidney transplants are an exception, which also included claims that ended in 2011 to assess the kidney transplant exclusion criterion in 2012 (i.e., excluded in the 12 months following the month of a transplant).
[94] The CCW condition indicators are claims-based algorithms that identify beneficiaries with select clinical conditions (e.g., diabetes, hyperlipidemia, hypertension, etc.): https://www.ccwdata.org/web/guest/condition-categories.
[95] The MBSF originates from the Common Medicare Environment (CME) tables.
[96] To minimize missing values, a facility's most recent Dialysis Facility Compare characteristics were used if a facility had no Dialysis Facility Compare data in a given year.
[97] We used the most recent version downloaded September 2019.

Exhibit E-3. DiD Measure Outcomes and Definitions

Outcome	Definition of the Outcomes
Admissions for CHF	Monthly beneficiary flag indicating acute care hospital (ACH) admission(s) with a principal diagnosis for CHF. Acute Care Hospital (ACH admissions are defined by Part A claims with claim type 60 or 61 and the 3rd digit of the CMS Certification Number (CCN) was 0, or the 3rd/4th digit of the CCN was 13. This measure follows the AHRQ specifications for PQI 08. ICD-10 codes are based on PQI 08 v7.0 AHRQ specifications, and ICD-9 codes are based on v6.0 AHRQ specifications. This measure is restricted to beneficiaries who were identified with CHF and at least 18 years old. CHF was defined using the CCW CHF_END variable having a value of 1 or 3 (i.e., satisfied claims criteria to identify condition by the end of the calendar year (CY). Admissions are assigned to the month on the claim thru date. See https://www.qualityindicators.ahrq.gov/Downloads/Modules/PQI/V70/TechSpecs/PQI_08_Heart_Failure_Admission_Rate.pdf
Admissions for Diabetes Complications	Monthly beneficiary flag indicating ACH admission(s) with a principal diagnosis for short-term or long-term diabetes complications. ACH admissions are defined by Part A claims with claim type 60 or 61 and the 3rd digit of the CCN was 0, or the 3rd/4th digit of the CCN was 13. This measure follows the AHRQ specifications for PQI 03 and PQI 01. ICD-10 codes are based on PQI 03 and PQI 01 v7.0 AHRQ specifications, and ICD-9 codes are based on v6.0 AHRQ specifications. This measure is restricted to beneficiaries who were identified with diabetes and at least 18 years old. Diabetes was defined using the CCW DIAB_END variable having a value of 1 or 3 (i.e., satisfied claims criteria to identify condition by the end of the CY). Admissions are assigned to the month on the claim thru date. See https://www.qualityindicators.ahrq.gov/Downloads/Modules/PQI/V70/TechSpecs/PQI_01_Diabetes_Short-term_Complications_Admission_Rate.pdf https://www.qualityindicators.ahrq.gov/Downloads/Modules/PQI/V70/TechSpecs/PQI_03_Diabetes_Long-term_Complications_Admission_Rate.pdf
Arteriovenous (AV) Fistula Use	Monthly beneficiary flag indicating a beneficiary used an AV fistula for vascular access. This outcome is restricted beneficiaries who had been 90 days or longer on dialysis and requires hemodialysis to be the most recent dialysis modality in the month.
Catheter Use	Monthly beneficiary flag indicating a beneficiary had used catheter for 90 days or longer. This outcome is restricted to only hemodialysis beneficiaries with at least 90 days of hemodialysis.
Contraindicated Medications	Monthly beneficiary flag indicating a beneficiary was prescribed a medication that is contraindicated in patients with ESRD. The list of contraindicated medications includes: Narcotic Analgesics and Narcotic Antagonists (Meperidine, Propoxyphene), Antihypertensive and Cardiovascular Agents (Nitroprusside, Acetazolamide, Amiloride, Indapamide, Chlorothiazide, Chlorthalidone, Ethacrinic acid, Hydrochlorthiazide, Hydroflumethiazide, Polythiazide, Spironolactone, Thiazides, Triamterene, Mecamylamine, Phenoxybenzamine), Antimicrobial Agents (Methenamine mandelate, Nitrofurantoin, Nalidixic acid, Intravenous Itraconazole, Trimetrexate, Abacavir/Lamivudine, Cidofovir, Emtricitabine/Tenofovir, Lamivudine/Zidovudine, Ribavirin, Tenofovir, Valgancyclovir), Antineoplastic Agents (Carmustine, Topotecan), Medications for Arthritis and Gout (Penicillamine), Hypoglycemic Agents (Chlorpropamide, Gliclazide, Metformin), Hypolipidemic Agents (Bezafibrate, Clofibrate), Neuromuscular Agents (Gallamine, Pancuronium, Tubocurarine) Sedatives, Hypnotics and Other Drugs Used in Psychiatry (Ehtchlorvynol), and Miscellaneous Drugs (Acetohydroxamic acid, Cisapride, Clodronate, Desferoxamine, Anistreplase, Sulfinpyrazone, Tranexamic acid, Methsuximide, Quinine sulfate). This list was provided by nephrologists at the University of Michigan, who based their analysis on *Drug Dosing in Renal Failure*, Brier Michael E. and Aronoff, George R., eds., 5th Ed., American College of Physicians, 2007.
Dialysis Payments	Monthly standardized payments for dialysis services included under Medicare Part B. Includes claim type 40 and bill type 72X (Part B Institutional dialysis) and claim types 71, 72 and first two digits of Berenson-Eggers Type of Services Berenson-Eggers Type of Services (BETOS)=P9 (Part B non-institutional dialysis).

Outcome	Definition of the Outcomes
Dilated Eye Exam	Yearly beneficiary flag restricted to diabetic beneficiaries with ESRD that indicates a beneficiary had at least one diabetic retinal eye exam. This indicator is based on Part B institutional and non-institutional claims with a diagnosis or procedure code for the exam. Month is based on the last expense date for non-institutional claims and revenue center date for institutional claims. These methods are intended to align with the US Renal Data System (USRDS) methods and are based on codes listed in the USRDS Annual Reports (2012+) Volume 2 ESRD Analytic Methods.
Number of ED Visits	Monthly beneficiary count of outpatient ED claims/visits (i.e., did not result in inpatient hospitalization). Based on Part B Institutional claims that have a claim line with a revenue center code starting with 045. ED visit counted in the month of the revenue center date on the claim line.
ED Visits within 30-days of an Acute Hospitalization	Beneficiary flag indicating a beneficiary had at least one outpatient ED claim/visit (i.e., did not result in inpatient hospitalization) within 30-days of an acute inpatient hospital stay. The 30-days is based on the difference between the discharge date on the inpatient hospitalization and the claim from date of the outpatient claim. When an ED visit occurred within 30-days of an inpatient hospitalization, the event is counted in the month of the claim thru date of the hospitalization. This outcome applies only to beneficiaries who had an inpatient hospitalization.
Emergency Dialysis	Monthly beneficiary flag indicating that a beneficiary received at least one outpatient emergency dialysis service. These are identified on Part B Institutional claim lines with a G0257 procedure code (unscheduled or emergency dialysis treatment for a patient with ESRD in a hospital outpatient department that is not certified as an ESRD facility). Each claim line with the G0257 code is counted as one service.
Hospitalization for ESRD Complications	Monthly beneficiary flag indicating that a beneficiary had at least one admission with a principal diagnosis for ESRD complication. Admission was based on an inpatient claim (i.e., all claim types 60/61). Complications include volume depletion, hyperpotassemia, fluid overload, heart failure, and pulmonary edema. An ESRD complication was based on ICD-9 diagnosis codes 27650, 27651, 27652, 2767, 27669, 40403, 40413, 40493, 5184, 514, 4281, 428x (i.e., first three digits are 428) and ICD-10 diagnosis codes E860, E861, E869, E875, E8770, E8779, I132, J810, J811, I50x (i.e., first three digits are I50).
Payments for Hospitalization for ESRD Complications	Monthly standardized payments from inpatient admissions (i.e., all claim types 60/61) with a principal diagnosis for ESRD complication. Complications include volume depletion, hyperpotassemia, fluid overload, heart failure, and pulmonary edema. An ESRD complication was based on ICD-9 diagnosis codes 27650, 27651, 27652, 2767, 27669, 40403, 40413, 40493, 5184, 514, 4281, 428x (i.e., first three digits are 428) and ICD-10 diagnosis codes E860, E861, E869, E875, E8770, E8779, I132, J810, J811, I50x (i.e., first three digits are I50).
Flu Vaccination	Seasonal beneficiary influenza vaccination flag that indicates a beneficiary had at least one influenza vaccination during the flu season months (i.e., August through April). Influenza vaccinations are based on Part B institutional and non-institutional claims with a with a CPT or Healthcare Common Procedure Coding System (HCPCS) code.
Hemoglobin A1c (HbA1c) Test	Yearly indicator restricted to diabetic beneficiaries with ESRD that indicates a beneficiary had at least one HbA1c test. This indicator is based on Part B institutional and non-institutional claims with a procedure code for the test. Month is based on the last expense date for non-institutional claims and revenue center date for institutional claims. These methods are intended to align with the USRDS methods and are based on codes listed in the USRDS Annual Reports (2012+) Volume 2 ESRD Analytic Methods.
Hemodialysis	Monthly beneficiary flag indicating that a beneficiary received at least one inpatient and or home hemodialysis services and is based on positive non-standardized hemodialysis dialysis payments.

Outcome	Definition of the Outcomes
Home Dialysis	Monthly beneficiary flag indicating a beneficiary had at least one home dialysis service. Home dialysis is based on a Part B Institutional claim with a related condition sequence code of 74, 75, or 80. 74 = Home - Billing is for a patient who received dialysis services at home. 75 = Home 100% reimbursement - (not to be used for services after 4/15/90) The billing is for home dialysis patient using a dialysis machine that was purchased under the 100% program. 80 = Home Dialysis - Nursing Facility - Home dialysis furnished in a skilled nursing facility (SNF) or nursing facility. (eff. 4/4/05) [Source: https://www.resdac.org/cms-data/variables/claim-related-condition-code]
Home Health Payments	Monthly standardized payments for home health services (claim type 10).
Home Hemodialysis	Monthly beneficiary flag that indicates a beneficiary received at least one home hemodialysis services. The outcome is conditional on the beneficiary receiving hemodialysis services in the month and is based on positive non-standardized hemodialysis dialysis payments.
Hospice Payments	Monthly standardized payments for hospice services (claim type 50).
Hospital Outpatient Payments	Monthly standardized payments for Part B outpatient services. This measure includes all claim type 40 that are not imaging (P_B_IMG), dialysis (P_B_DIALYSIS), or therapy (P_B_THERAPY); this includes hospital outpatient (bill type 13x, 85x), clinics (bill type 71x, 73x, 77x), and all other Part B institutional services (services covered under Part B for inpatients that exhausted Part A coverage [bill type 12x], SNF [22x, 23x], community mental health center [76x], other Part B home health services [34x], home health services [14x], and Indian health services [83x]).
Number of Hospitalizations	Monthly beneficiary count of inpatient hospital stays in the month. Includes all inpatient claims based on claim type 60.
Low-Density Lipoprotein (LDL) Cholesterol Test	Yearly beneficiary indicator restricted to diabetic beneficiaries with ESRD that indicates a beneficiary had at least one LDL cholesterol test. This indicator is based on Part B institutional and non-institutional claims with a procedure code for the test. Month is based on the last expense date for non-institutional claims and revenue center date for institutional claims. These methods are intended to align with the USRDS methods and are based on codes listed in the USRDS Annual Reports (2012+) Volume 2 ESRD Analytic Methods.
Observation Stays	Monthly beneficiary count of the number of observation stays in the month. The outpatient observation is based on a Part B Institutional claim with a HCPCS code of G0378 or G0379.
Office Visits Payments	Monthly Part B non-institutional E/M standardized payments. Includes claim types 71, 72 (Part B Non-Institutional) or 81, 82 (DME) and first digit of BETOS is M, and HCPCS code was any of the following: 99201, 99202, 99203, 99204, 99205, 99211, 99212, 99213, 99214, 99215.
Opioid Overutilization	Monthly beneficiary flag that indicates a beneficiary was taking an average morphine milligram equivalent (MME) dose greater than 50mg for active opioid prescription, adjusting for early refills (same generic name, strength, dosage, form). Excludes beneficiaries who are not covered under Medicare Part D, as well as cancer patients, and beneficiaries on hospice.
Number of Outpatient Dialysis Sessions	Monthly beneficiary count of dialysis services. This outcome is restricted to beneficiaries who are only on hemodialysis and have had at least 12 months of dialysis.
Hospice	Monthly beneficiary flag that indicates a beneficiary was receiving at least one hospice service in the month (claim type 50).

Outcome	Definition of the Outcomes
No Prior Nephrology Care	Monthly beneficiary flag that indicates a beneficiary had no prior nephrology care prior to the beneficiary's first month of dialysis. The month of first dialysis was based on data from the Renal Management Information System (REMIS). Prior dialysis care was based on CMS Form 2728 (i.e., Medical Evidence Report) data for Question 18 (prior erythropoietin in 6+ months, prior nephrologist care in 6+ months, prior kidney dietician care in 6+ months, first access type was a graft or fistula, first access type was not a fistula and had maturing fistula or maturing graft). A "no" response on any of the six questions and no "yes" responses defined no prior care. A "yes" response on any of the six questions defined prior care.
Peritoneal Dialysis	Monthly beneficiary flag that indicates a beneficiary received at least one peritoneal dialysis service in the month and is based on positive non-standardized peritoneal dialysis payments.
Phosphate Binder Adherence	Monthly beneficiary indicator identifying a beneficiary who received at least two phosphate binder prescriptions in a given year and had a proportion of days covered greater than or equal to 80%, adjusting for early refills (same generic name, strength, dosage, form). Proportion of days covered is defined as the number of days per month that a beneficiary is covered by Medicare Part D prescription drug claims for the same medication or another phosphate binder, divided by the number of days in a given month. This measure does not include over-the-counter vitamins and supplements which may also be used as phosphate binders.
Readmission within 30-days of an Index Hospitalization Stay	Monthly beneficiary flag that indicates a beneficiary had at least one unplanned readmission hospitalization stay within 30-days of an index hospitalization stay. Hospitalization claims are based on select Part A claim type 60 (i.e., inpatient) claims; long-term care facilities (i.e., CCN between 2000 and 2299) and inpatient rehabilitation facilities (i.e., CCN between 3025 and 3099) are excluded.
Acute Inpatient Payments	Monthly standardized payments for acute inpatient includes claim types 60/61 where 3rd digit of the CCN=0 (inpatient prospective payment system) or 3rd/4th digit of CCN=13 (critical access hospital).
Medicare Part A and Part B Payments	Monthly standardized payments included under Medicare Part A and Part B. Payments are counted in the month of the claim thru date for all Part A claims (i.e., acute, home health, hospice, SNFs, institutional rehabilitation facilities, long-term care hospitals, and other inpatient facilities) and Part B Institutional claims (i.e., hospital outpatient, imaging, therapy, and total dialysis). Payments are counted in the month of the last expense date for all Part B non-institutional claims (i.e., E/M services, Part B covered drugs, durable medical equipment, etc.). In addition, payments are standardized to remove the effects of wage differences and for teaching status and other policy adjustments.
Part B Medicare Payments	Monthly standardized payments included under Part B actual amounts. Payments are counted in the month of the last expense date for all Part B Institutional claims and non-institutional claims. For a given CY's Part B payments, payments were included when the claim thru date (i.e., year of annual RIF file) is in the given year and +/- 1 year and the last expense date were in the same year.
Part B Drug Payments	Monthly standardized payments of Part B non-institutional drug amounts. Includes claim types 71, 72 (Part B non-Institutional) and first two digits of BETOS is O1C, O1D, O1E, or O1G.
Part D Drug Cost	Sum of drug costs (i.e., ingredient costs, dispensing fee, sales tax, and vaccination fee if applicable) for all prescription drug events with date of service in the month. These costs are counted only for Medicare beneficiaries who are enrolled in Part D during the month.
Part D Phosphate Binder Drug Cost	Sum of drug costs (i.e., ingredient costs, dispensing fee, sales tax, and vaccination fee if applicable) for all phosphate prescription drug events with date of service in the month. Phosphate binders were based on a list of 204 NDC codes. Phosphate binder prescription claims were identified using a list of National Drug Codes (NDCs) that was compiled from Optum data and identified by drug class. These costs are counted only for Medicare beneficiaries who are enrolled in Part D during the month.
Institutional Post-Acute Care (PAC) Payments	Monthly standardized payments for services incurred during that month at inpatient rehabilitation facilities, SNF, and long-term care hospitals. These correspond to claim types 60/61 where last 4 digits of the CCN are between 3025-3099 or 3rd digit of CCN is R or T, 20/30, 60/61 where 3rd/4th digits of CCN are 20, 21, 22.

Outcome	Definition of the Outcomes
Readmission Payments	Monthly standardized payments for services related to all cause hospital readmissions. A readmission occurs when a beneficiary had a claim from date of a subsequent inpatient stay that was less than or equal to 30-days after the claim through date of a prior stay (i.e., an index hospitalization). A hospitalization with a discharge status code of 07 (left against medical advice) or 20 (died) is excluded from being an index admission; hospitalizations that occur within the 30-day period following an excluded index admission are not counted as a readmission.
Hospitalization for Vascular Access Complications	Monthly beneficiary flag indicating admission(s) with a principal diagnosis for a vascular access complication. Admission was based on an inpatient claim (i.e., all claim types 60/61). A vascular access complication was based on ICD-9 diagnosis codes 9961, 99656, 99673 and ICD-10 diagnosis codes T82318A, T82319A, T82328A, T82329A, T82338A, T82339A, T82398A, T82399A, T8241XA, T8242XA, T8243XA, T8249XA, T82510A, T82511A, T82518A, T82520A, T82521A, T82528A, T82529A, T82530A, T82531A, T82538A, T82590A, T82591A, T82598A, T85611A, T85621A, T85631A, T85691A, T82818A, T82828A, T82838A, T82848A, T82858A, T82868A, T82898A.
Number of Primary Care E/M Office/Outpatient Visits[98]	Monthly beneficiary count of evaluation and management (E/M) office/outpatient services from primary care providers. E/M services are identified based on Part B non-institutional claim lines where the first character of the BETOS code is 'M' and HCPCS codes are used to identify office/outpatient services for new (99201-99205) and established patients (99211-99215). Primary care providers are identified based on Medicare provider specialty codes. A visit is a unique revenue center date with an E/M service (i.e., two lines with same date are counted as one visit). The month is based on the last expense date from the claim line.
Number of Specialty Care E/M Office/Outpatient Visits[99]	Monthly beneficiary count of evaluation and management (E/M) office/outpatient services from specialist. E/M services are based on Part B non-institutional claim lines where the first character of the BETOS code is 'M' and HCPCS codes are used to identify office/outpatient services for new (99201-99205) and established patients (99211-99215). Specialist providers are identified with Medicare provider specialty codes. A visit is a unique revenue center date with an E/M service (i.e., two lines with same date are counted as one visit). The month is based on the last expense date from the claim line.
Admissions for Venous Catheter Bloodstream Infections	Monthly beneficiary count of inpatient claims (i.e., all claim type 60/61) with a principal diagnosis code for venous catheter bloodstream infection. Note: this includes ACHs, inpatient psychiatric hospitals, long-term care hospitals, inpatient rehabilitation facilities, and other inpatient (e.g., cancer hospitals) as long as the principal diagnosis criterion is met. Month is based on the claim thru date. ICD-9 Code: 999.32: Bloodstream infection due to central venous catheter ICD-10 Code: T80.211: (including A/D/S) Bloodstream infection due to central venous catheter
Admission for Sepsis Infections	Monthly beneficiary count of inpatient claims (i.e., all claim type 60/61) with a principal diagnosis code for sepsis. Note: this includes ACHs, inpatient psychiatric hospitals, long-term care hospitals, inpatient rehabilitation facilities, and other inpatient (e.g., cancer hospitals) as long as the principal diagnosis criterion is met. Month is based on the claim thru date. ICD-9 Code: 038x (i.e., any starting with 038): Septicemia (includes specified and unspecified organisms); 995.91: Sepsis ICD-10 Code: A41x (i.e., any starting with A41): Other sepsis (includes specified and unspecified organisms); A40x (i.e., any starting with A40): Streptococcal sepsis

[98] AR2 included the effect of the CEC Model on E/M visits, where the outcome measure included a wide range of E/M services, not restricted by office/outpatient visits or by primary or specialty provider type. Reports AR3 forward, refine the measure to include only office/outpatient services (based on the HCPCS code). We also use the Medicare provider specialty codes to identify Primary Care E/M Visits.

[99] Specialty Care E/M Visits includes only office/outpatient services (based on the HCPCS code) and use the Medicare provider specialty codes to identify Specialty Care E/M Visits.

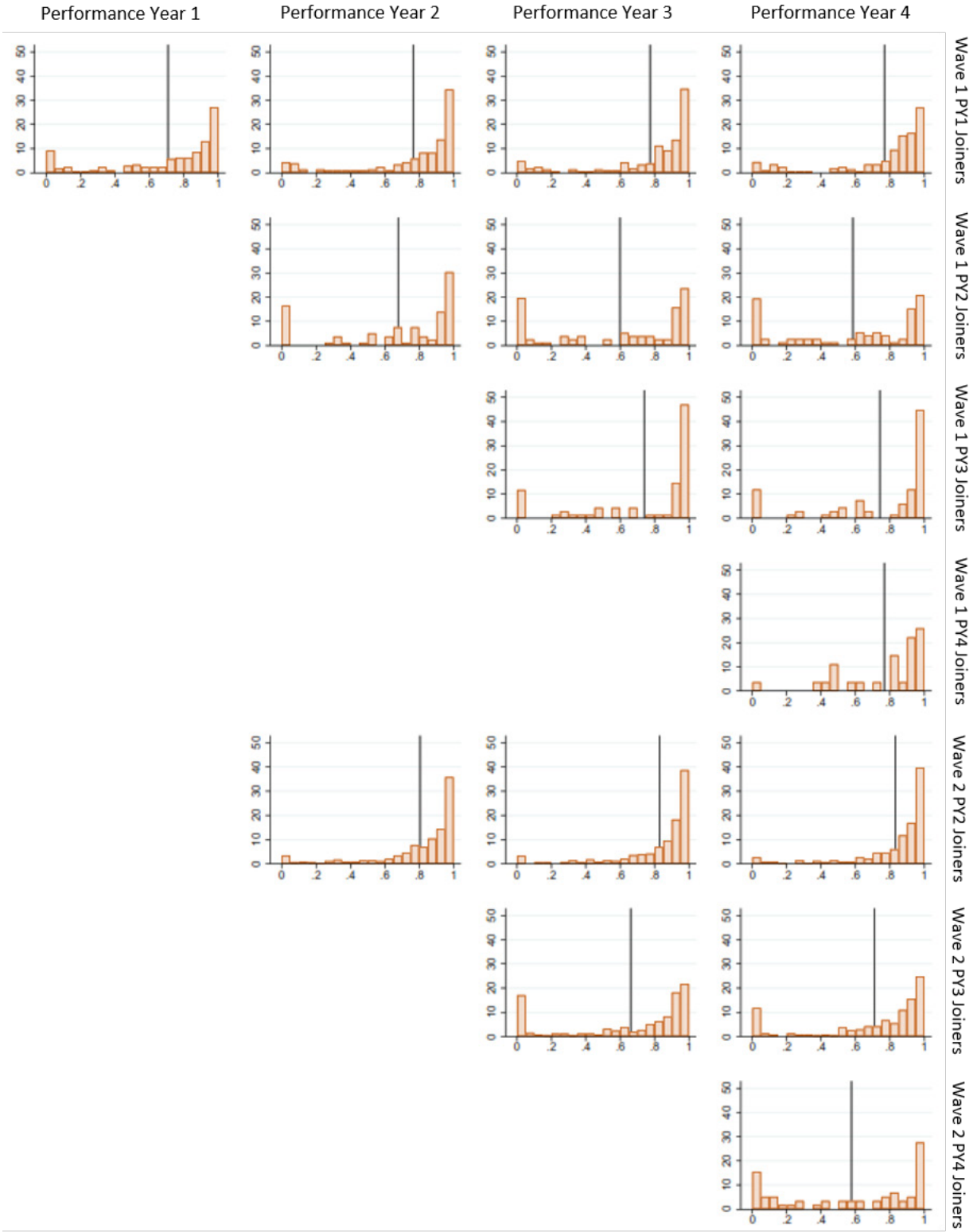
Outcome	Definition of the Outcomes
Admissions for Peritonitis	Monthly beneficiary count of inpatient claims (i.e., all claim type 60/61) with a principal diagnosis code for peritoneal dialysis catheter infection. Note: this includes ACHs, inpatient psychiatric hospitals, long-term care hospitals, inpatient rehabilitation facilities, and other inpatient (e.g., cancer hospitals) as long as the principal diagnosis criterion is met. Month is based on the claim thru date. ICD-9 Code: 996.68: Infection and inflammatory reaction due to peritoneal dialysis catheter ICD-10 Code: T85.71X (i.e., including A/D/S): Infection and inflammatory reaction due to peritoneal dialysis catheter
Number of Endocrine/ Metabolic Inpatient Hospitalizations	Monthly beneficiary count of inpatient ACH claims with a principal diagnosis for an endocrine/metabolic condition. The diagnosis codes are based on USRDS methods used to define cause of hospitalizations (see the 2018 USRDS Annual Data Report, Table 13.16). ACH claims are based on claim types 60/61 where the 3rd digit of the CCN=0 (inpatient prospective payment system [IPPS]) or 3rd/4th digit of CCN=13 (critical access hospital [CAH]). Note: this excludes other inpatient claims such as inpatient psychiatric facilities, long-term care hospitals, and inpatient rehabilitation facilities. Month is based on the claim thru date. ICD-9 Codes: 240-279 ICD-10 Codes: C880, C965, C966, D472, E7521, E7522, E753, M359, N200, N981, D800-D849, D890-D899, E000-E034, E038-E071, E0789-E35, E40-E749, E75240-E75249, E755-E7870, E7879-E789, E791-E8319, E8330-E896, H49811-H49819, M1000-M109, M1A00X0-M1A09X0, M1A20X0-M1A9XX1, M830-M839
Number of Circulatory Inpatient Hospitalizations	Monthly beneficiary count of inpatient ACH claims with a principal diagnosis for a circulatory condition. The diagnosis codes are based on USRDS methods used to define cause of hospitalizations (see the 2018 USRDS Annual Data Report, Table 13.16). CH claims are based on claim types 60/61 where the 3rd digit of the CCN=0 (inpatient prospective payment system [IPPS]) or 3rd/4th digit of CCN=13 (critical access hospital [CAH]). Note: this excludes other inpatient claims such as inpatient psychiatric facilities, long-term care hospitals, and inpatient rehabilitation facilities. Month is based on the claim thru date. ICD-9 Codes: 390-459 ICD-10 Codes: A1883, E0851, E0852, E0951, E0952, E1051, E1052, E1151, E1152, E1351, E1352, I998, I999, M3211, M3212, N262, R001, R58, T800XXA, T811718A, T8173XA, T82817A, T82818A, G450-G452, G454-G468, I00-I672, I674-I6782, I67841-I879, I890-I959, I970-I972, K640-K649, M300-M319
Number of Infectious Inpatient Hospitalizations	Monthly beneficiary count of inpatient ACH claims with a principal diagnosis for an infectious condition. The diagnosis codes are based on USRDS methods used to define cause of hospitalizations (see the 2018 USRDS Annual Data Report, Table 13.16). ACH claims are based on claim types 60/61 where the 3rd digit of the CCN=0 (inpatient prospective payment system [IPPS]) or 3rd/4th digit of CCN=13 (critical access hospital [CAH]). Note: this excludes other inpatient claims such as inpatient psychiatric facilities, long-term care hospitals, and inpatient rehabilitation facilities. Month is based on the claim thru date. ICD-9 Codes: 001-139 ICD-10 Codes: G02, G14, H32, I32, I39, I673, J020, J0300, J0301, J17, K9081, L081, L444, L946, M60009, N341, R1111, A000-A329, A35-A480, A482-B447, B4489-B780, B787-B999, D860-D869, J200-J207, M0000-M0089, M0230-M0239
Average Standardized Payments PBPM for Outpatient	Monthly beneficiary sum of Part B institutional allowed (i.e., both CMS and beneficiary payments) hospital outpatient (HOP) and other Part B service amounts.

Notes: Payments, besides total Part D, are standardized and capped at the 99th percentile of all positive expenditure values associated with the outcome.

B. Owner Nephrologists

Exhibit E-4 provides the distribution of the average percent of beneficiaries treated by an owner nephrologist by Wave and performance year.

Exhibit E-4: Distribution of Percent of Beneficiaries Who Receive Treatment from an Owner Nephrologist



C. Comparison Group Construction

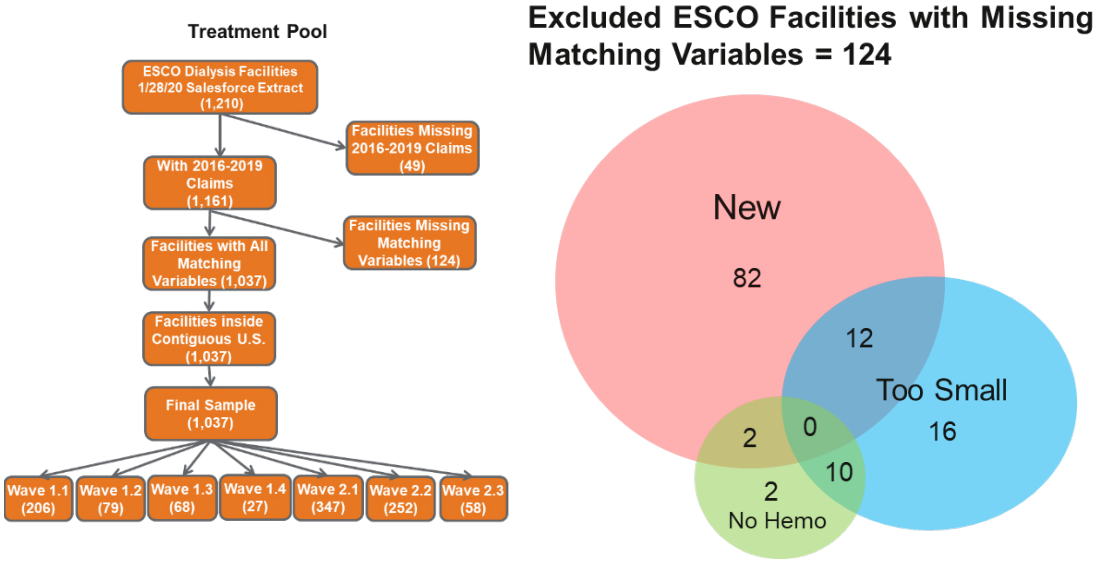
The construction of the comparison group was performed in two steps. First, we identified eligible comparison facilities and excluded those that were missing essential data or that were exposed to the intervention. Second, we used propensity score matching (PSM) to select the final group of matched comparison facilities. Descriptions of these steps are detailed below.

1. Identifying CEC Facilities

We identified 1,210 dialysis facilities participating through ESCOs on or prior to January 1, 2019 using a Salesforce extract of participation data from January 28, 2020. Salesforce is a web-based database that reposts the CEC participation data maintained by the Center for Medicare & Medicaid Innovation (CMMI).

We evaluated and applied a series of eligibility criteria to determine whether the dialysis facilities could be included in the matching model. The criteria and number of exclusions are outlined in **Exhibit E-5**. A total of 173 facilities were excluded because they were missing data; 49 facilities had no dialysis claims in at least one year from 2016-2019, and 124 facilities did not have key matching characteristics, which are required to estimate matching models in subsequent steps.[100] The 124 facilities with missing key matching variables were either too small, new since 2014, and/or without hemodialysis services (see the breakdown in the Venn diagram in **Exhibit E-5**). The remaining 1,037 facilities that met the eligibility criteria formed the treatment pool used in matching.

Exhibit E-5. CEC Facility Identification and Exclusions



CEC facility exclusions were not associated with a single organization and were generally proportional to the number of CEC facilities within each organization (see **Exhibit E-6**). The 173 unmatched facilities were comparable to the 1,037 matched facilities included in the analysis

[100] **Exhibit E-7** details the data used for the selection of the comparison group of facilities.

(i.e., there were no meaningful differences in the market and facility-level characteristics for which data was available).

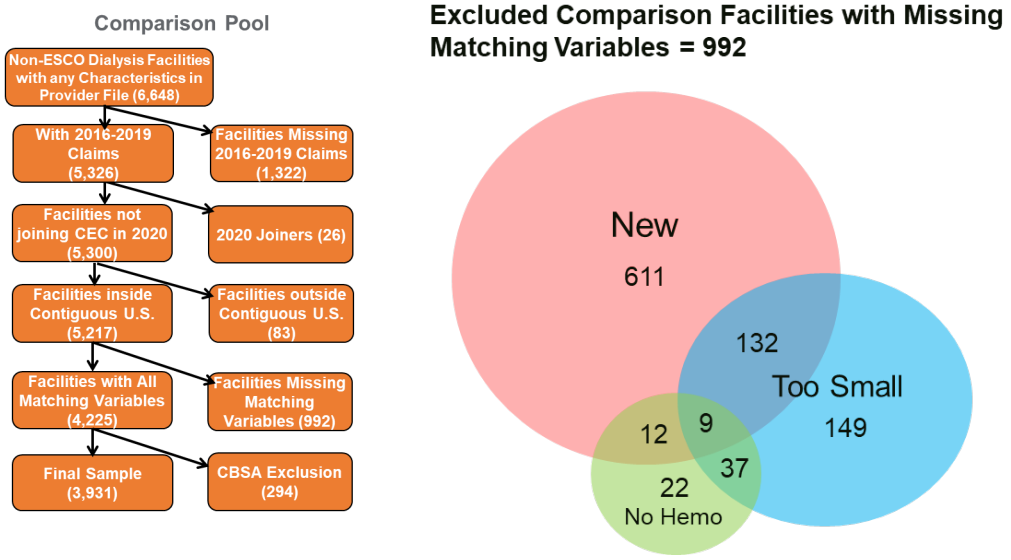
Exhibit E-6. Excluded Facilities by Organization

Organization	Number of CEC Facilities	Number of Excluded CEC Facilities
DaVita	123	19
DCI	87	11
Fresenius	972	142
CDC	7	0
Atlantic	12	1
NKC	6	0
Rogosin	3	0
Total	1,210	173

2. Selecting Facilities Eligible to be Included in the Comparison Group Pool

The preliminary comparison pool consisted of 6,648 dialysis facilities after removal of the 1,210 dialysis facilities participating in CEC on or prior to January 1, 2019. We applied the same series of eligibility criteria to ensure the comparison facilities could be included in the matching model and would have had limited exposure to the CEC Model. The criteria and number of exclusions are outlined in **Exhibit E-7**.

Exhibit E-7. Comparison Facility Identification and Exclusions



A number of potential comparison facilities (N=1,322) were excluded from matching because they did not have claims in CYs 2016-2019. Claims were not observed either because the facility changed ownership and CMS Certification Number (CCN), the unit at which facilities are identified and associated with claims; the facility was no longer providing care to Medicare patients; or the facility was new to Medicare in 2017 or later.

An additional 26 dialysis facilities were removed from the comparison pool due to potential bias. These facilities joined CEC on January 1, 2020, and it is possible that they began implementing changes in 2019 in anticipation of joining, which could have biased the CEC impact estimate.

Because ESCO facilities were not observed in Alaska, Hawaii, Puerto Rico, or U.S. Territories, 83 potential facilities in these areas were identified and excluded from the comparison pool. We examined the remaining potential comparison facilities for missing data relevant to the analysis and excluded 992 facilities who were missing important facility characteristics used in the matching process.[101] The missing data were mainly for facilities without claims in 2014, facilities without hemodialysis, or other facilities that did not regularly perform dialysis (see the Venn diagram in **Exhibit E-7**).

To limit selection bias, we excluded dialysis facilities from the comparison group pool if an ESCO from their organization was operating in the same Medicare Core-Based Statistical Area (CBSA).[102] Facilities joining in 2020 were counted as CEC participants for the purpose of implementing this exclusion. For example, because Fresenius had ESCO facilities in the Chicago, Illinois CBSA, we excluded from the comparison pool all other Fresenius facilities in the Chicago CBSA. This exclusion could result in reducing the number of comparison facilities in urban areas where CEC facilities are frequently located. However, by matching on a variety of market characteristics, we minimize market characteristics imbalances that could be impacted by this exclusion. This exclusion reduced the facilities that could potentially be included in the comparison group by 294 out of the remaining non-ESCO facilities. The final comparison pool included 3,931 dialysis facilities.

3. Statistical Matching Approach

The next step in developing the comparison group involved implementing matching methods to identify the set of facilities in the comparison pool that are representative of CEC facilities and their beneficiaries. For most CEC facilities that joined in PY1, PY2, and PY3 we kept the same matched comparison group facility as detailed in the third annual report (AR3). We preserved the matches for 948 out of the 951 CEC facilities included in the AR3 sample. However, we were unable to preserve the matches for (N=3) CEC facilities because their match did not have 2019 claims. We used PSM to match these one PY2 and two PY3 joiners, one PY3 joiner that failed exclusion rules in AR3 but passed in AR4, and the 85 PY4 joiners.

We selected provider and market characteristics that were associated with CEC participation, and we then used matching methods to identify comparison facilities that had similar values in those characteristics. The data used to construct the characteristics for the selection of the comparison group of facilities are shown in **Exhibit E-8**.

[101] Twenty facilities had an error code in the Dialysis Facility Compare data that indicates missing data for an undisclosed or unknown reason. These facilities were excluded from the comparison pool and are included in the N=992.

[102] Medicare CBSAs are Metropolitan CBSAs, with each CBSA Division separated, from the CMS Office of Management and Budget CBSA definition.

Exhibit E-8. Data Used for the Selection of the Comparison Group of Facilities

Dataset Name	Date Range	Dataset Contents	Use
Area Health Resources File (AHRF)	2012 – 2015	County-level data on population, environment, geography, health care facilities, and health care professionals	Used for descriptive analysis of CEC and non-CEC market characteristics (Predictors/characteristics were included in the comparison group selection modeling.)
CEC Participant List	Extracted 1/28/2020; Facilities participating through ESCOs on or prior to 1/1/2020	ESCO names, IDs, provider names, National Provider Identifiers (NPIs), Taxpayer Identification Numbers (TINs), addresses, start dates, and stop dates	Used to identify ESCO facilities and locations
Chronic Conditions Data Warehouse (CCW)	January 2012 – December 2019	Medicare Part A and Part B claims and beneficiary and enrollment information (Master Beneficiary Summary File, Enrollment Data Base, Common Medicare Environment [CME]), including beneficiary unique identifier, address, date of birth/death, sex, race, age, and Medicare enrollment status	Used to create outcome measures such as ED visits and total Medicare Part A and Part B standardized payments and identify eligibility for alignment, beneficiary demographic characteristics, and beneficiary eligibility for inclusion in the denominator for each of the outcome measures
Consolidated Renal Operations in a Web-enabled Network (CROWNWeb)	January 2012 – December 2019	Primary cause of renal failure, cause of renal failure groupings, height, race, dry weight, physician name, dialysis type, and incident comorbidities	Used to obtain patient demographic and medical information extracted from the CMS ESRD Medical Evidence Report form (CMS-2728)
Dialysis Facility Compare	2012 – 2019	Dialysis facilities' organizational characteristics and quality measures published on the CMS website	Used to identify facility characteristics incorporated into the DiD models and comparison groups
Long-Term Care Minimum Data Set (MDS)	2012 – 2019	Information about residence in nursing home	Used to create indicators for long-term institutional status used in risk adjustment
Master Data Management	2012 – 2019	Provider- and beneficiary-level information on participation in CMMI payment demonstration programs	Used to identify providers who are involved in accountable care organizations (ACOs) and Medicare Shared Savings Program
The ZIP Code File-SAS	17-Jan	ZIP codes and CBSAs	Used to link ZIP codes to CBSAs

The matching methods used to select a comparison group for CEC facilities were guided by the literature and informed by the empirical analysis. We explored many options for matching methods, including Mahalanobis distance, coarsened exact matching, entropy balancing, and

PSM.[103] Ultimately, we selected the PSM approach because it performed best according to multiple balance diagnostics. In the remainder of this section, each methodological consideration for PSM is discussed, including a description of the estimated model.

Matching Method. The goal of matching both market- and facility-level characteristics led to the inclusion of many covariates in the matching model. The literature indicates that, when matching on many covariates, PSM leads to better balance than other matching techniques.[104,105] In our testing, we also determined that a carefully selected PSM would yield strong diagnostic values. With these considerations and a series of model testing, we decided to proceed with PSM.

Propensity scores, defined as the probability of receiving treatment, conditional on a set of characteristics, are estimated using a logistic model. For the evaluation of the CEC Model, the key characteristics of interest in the logistic model are defined at the facility and market levels. Using the coefficients from the logistic regression model, the propensity score for each facility was then constructed as the log odds of the predicted probability of participating in CEC. Each CEC participant facility was matched to a single facility in the comparison group that was the closest in terms of propensity score and not yet matched to another CEC participant facility.

Pooled vs. Stratified Models. The sizes of the treatment and control pools that enter the model are important determinants of the success of PSM. Stratifying models by organization yielded smaller treatment and control pools and generated weaker overall matches. However, given different practice patterns and cultures across organizations, it was necessary to use organization/organization type as a matching variable. This approach resulted in the construction of a pooled dataset for matching models that combined facilities across organization type and ownership (i.e., DaVita, Fresenius, and DCI).

In PY4, additional dialysis facilities joined the model through existing ESCOs: Wave 1 PY4 joiners (N=27) and Wave 2 PY4 joiners (N=58). To provide a sufficient number of CEC facilities for matching, these cohorts were pooled into one matching model. This model ignores unique selection bias apparent in each cohort but provides a more straightforward approach to estimating the overall impact of CEC.

Caliper Selection. For distance matching models, calipers can be applied to limit the absolute distance in propensity scores between matches (i.e., if a neighbor is outside of the caliper, it is not considered a good match). There is no consensus regarding a standard caliper and many caliper widths have been used in literature.[106] For propensity score modeling, many studies use a caliper that is proportional to the standard deviation of the predicted propensity score. After the propensity score model estimation, all participants could be matched to a unique neighbor that was closer than 0.68 standard deviations of the estimated propensity score.

[103] Gu, X.S., Rosenbaum, P.R. (1993). Comparison of multivariate matching methods: Structures, distances, and algorithms. *Journal of Computational and Graphical Statistics*, 2(4):405-420.
[104] Ibid
[105] Stuart, E.A. (2010). Matching methods for causal inference: A review and a look forward. Statistical science: a review journal of the *Institute of Mathematical Statistics*, 25(1), 1-21.
[106] Austin, P.C. (2011). An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behavioral Research*, 46(3), 399-424.

Diagnostic Tests. The final step in selecting the comparison group involved using the results from PSM to conduct a series of diagnostic tests for the matched comparison samples to assess whether facilities were similar on observed covariates. Diagnostics included defining the range of common support for the propensity score and for each covariate, evaluating standardized mean differences (SMDs) for all covariates, and examining covariate distributions in quantile-quantile (QQ) plots. Results of the diagnostic tests between the CEC facilities and comparison group are shown below.

The PSM model we estimated achieved a lower average SMD than the average SMD before matching. The selected comparison group had mean values that were more similar to the CEC facilities than the entire group of non-CEC facilities and also had tighter variation of characteristics. The average SMD was considerably smaller after matching, decreasing by 0.11 (see **Exhibit E-9**).

Exhibit E-9. Average SMD Before and After Matching

Average SMD Before Matching	Average SMD After Matching
0.21	0.10

The SMDs for characteristics used in matching are displayed in **Exhibit E-10**. They are generally small, although 13 matching characteristics are above 0.10. Focusing on these, the absolute mean differences are small.[107] For example, the percent of the population over 65 years of age is 0.13 for the matched comparison group and 0.13 for the matched CEC facilities, but the SMD is -0.24.

[107] Austin, P.C (2009) Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. *Statistics in Medicine*, 28(25), 3083-3107.

Exhibit E-10. Means and SMD for Variables Included in the Matching Model[108]

Characteristics		1. CEC Participating Facilities (N=1,037)		2. Non-CEC Comparison Pool (N=3,931)		3. Std Diff Before Matching	4. Selected Comparison Group Facilities (N=1,037)		5. Std Diff After Matching
		Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Market Characteristics	ESRD Beneficiary Population >350 Indicator	0.94	0.24	0.79	0.4	0.44*	0.88	0.32	0.20*
	Percent 65 and Older	0.13	0.02	0.13	0.03	-0.20*	0.13	0.03	-0.24*
	Percent Race White	0.6	0.15	0.63	0.19	-0.16	0.62	0.18	-0.12
	Percent Race Black	0.18	0.11	0.14	0.11	0.36*	0.16	0.12	0.16
	Percent No High School Diploma	0.14	0.04	0.15	0.05	-0.13	0.14	0.04	-0.06
	Percent Single Parent Households with Children	0.34	0.05	0.34	0.06	0.06	0.34	0.06	-0.08
	Percent ESRD	0	0	0	0	0.03	0	0	-0.05
	Percent Duals	0.03	0.01	0.03	0.01	-0.24*	0.03	0.01	-0.24*
	Percent ESRD Duals	0.5	0.08	0.52	0.1	-0.17	0.51	0.1	-0.09
	Median Household Income	$54,688	$10,149	$52,323	$10,549	0.23*	$52,650	$11,880	0.18
	Medicare Advantage (MA) Penetration (percent)	0.28	0.15	0.28	0.13	0.00	0.28	0.12	-0.02
	PCPs per 10,000	7.64	1.48	7.63	1.71	0.01	7.71	1.6	-0.05
	SNF Beds per 10,000	48.36	18.92	51.09	20.59	-0.14	51.2	20.24	-0.15
	Specialists per 10,000	11.14	4.6	10.17	4.65	0.21*	10.7	4.69	0.09
	Hospitals with Kidney Transplant Services per 10,000	0.01	0.01	0.01	0.01	0.02	0.01	0.01	-0.03
	Rural Indicator	0.14	0.34	0.16	0.36	-0.06	0.18	0.38	-0.11
	Extra-Rural Indicator	0.01	0.12	0.05	0.22	-0.22*	0.02	0.15	-0.06

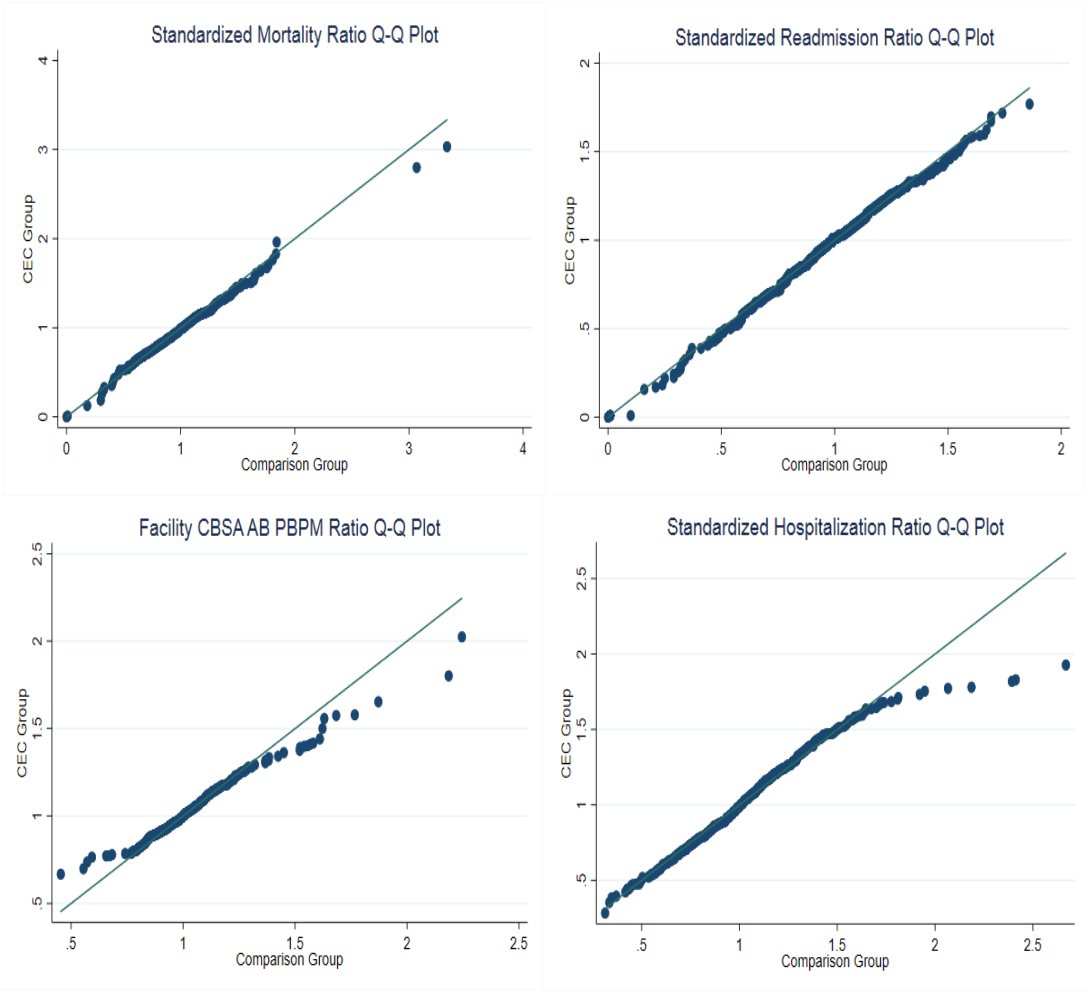
[108] The mean and standard deviation (Std Dev) are included to provide a higher degree of comparability between CEC facilities and their selected comparison.

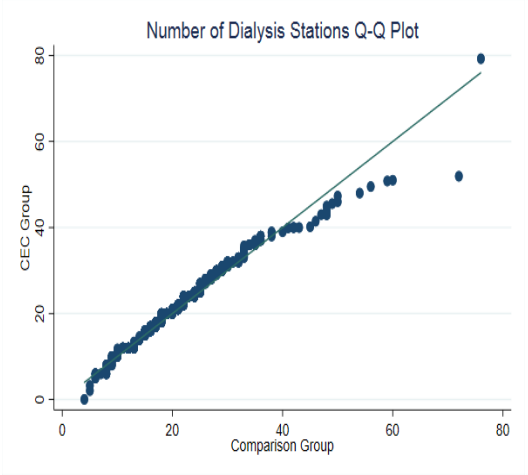
Characteristics		1. CEC Participating Facilities (N=1,037)		2. Non-CEC Comparison Pool (N=3,931)		3. Std Diff Before Matching	4. Selected Comparison Group Facilities (N=1,037)		5. Std Diff After Matching
		Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Facility Characteristics	Number of Dialysis Stations	19.98	7.68	18.33	7.67	0.21*	19.6	7.79	0.05
	Late Shift Indicator	0.21	0.4	0.18	0.39	0.06	0.21	0.41	-0.01
	Peritoneal Indicator	0.48	0.5	0.6	0.49	-0.25*	0.54	0.5	-0.13
	Percent Hemodialysis	0.96	0.09	0.95	0.09	0.16	0.96	0.08	0.05
	Percent Peritoneal Dialysis	0.06	0.11	0.08	0.12	-0.18	0.07	0.1	-0.05
	Percent Patients with Vascular Catheter	0.1	0.06	0.11	0.07	-0.17	0.11	0.06	-0.16
	Percent Patients with AV Fistula	0.62	0.11	0.64	0.11	-0.11	0.63	0.1	-0.07
	SHR	1	0.26	0.99	0.27	0.05	1.01	0.26	-0.02
	SRR	0.96	0.29	0.97	0.3	-0.03	0.97	0.28	-0.02
	SMR	0.97	0.24	1.01	0.28	-0.14	0.99	0.26	-0.07
	DaVita Indicator	0.1	0.3	0.45	0.5	-0.85*	0.23	0.42	-0.34*
	DCI Indicator	0.07	0.26	0.03	0.17	0.20*	0.07	0.26	0.00
	Fresenius Indicator	0.8	0.4	0.23	0.42	1.38*	0.67	0.47	0.30*
	Total Medicare Part A and Part B PBPM (2012-2014)	$6,577	$931	$6,497	$1,160	0.08	$6,547	$1,079	0.03
	Percent Ever Crashed Into Dialysis	0.45	0.12	0.46	0.15	-0.06	0.45	0.13	0.04
	Percent New To Dialysis	0.1	0.06	0.12	0.09	-0.31*	0.11	0.06	-0.15
	Facility CBSA PBPM Ratio	1.01	0.12	1.02	0.15	-0.04	1.01	0.14	0.00

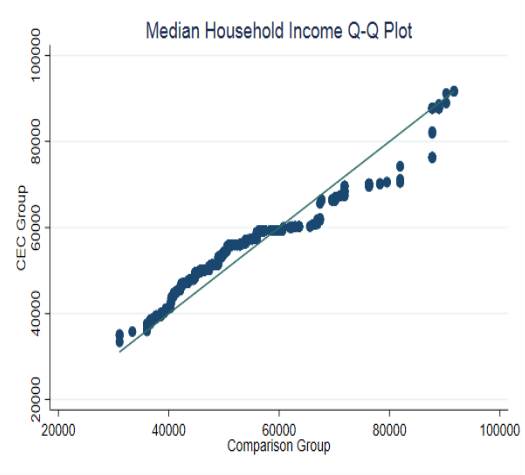
Notes: The standardized difference is calculated by the following equation: $\text{Std. Diff} = (\mu 1 - \mu 2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$ Any value below 0.1 is considered to be a negligible difference.
* Indicates a standardized mean difference greater than 0.2 in absolute value.

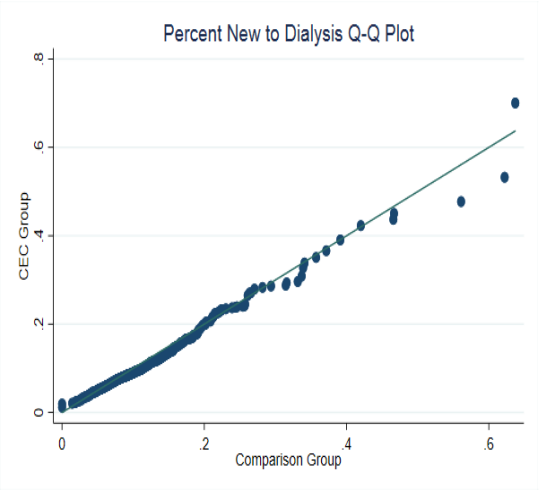
Additional diagnostic information used to assess the quality of the match between the comparison and CEC treatment groups for each wave is provided by means of Quantile-Quantile (QQ) plots which are showcased in **Exhibit E-11**. The QQ plots offer graphical descriptions that help determine if two data sets contain similar distribution for a continuous characteristic. Points along the 45-degree diagonal reference line indicate that the two groups follow a similar distribution. If most points on the plot are near the diagonal, we consider the distributions to be similar. These plots reveal that, for the majority of characteristics, the distribution falls near the ideal 45-degree diagonal. However, for a few characteristics, the tails of the distribution stray from the ideal 45-degree line. These cases are infrequent and due to outlier characteristics among facilities.

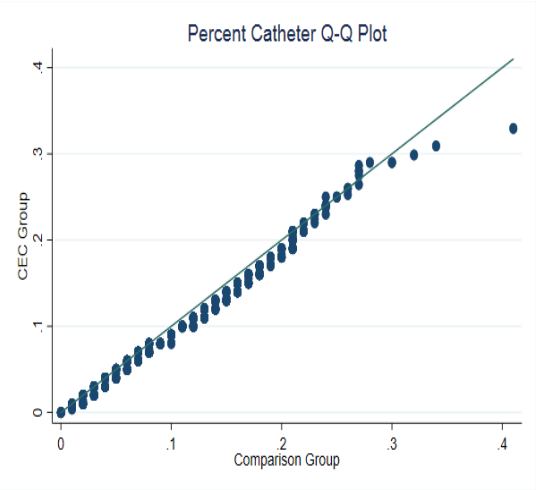
Exhibit E-11. Quantile-Quantile (QQ) Plots

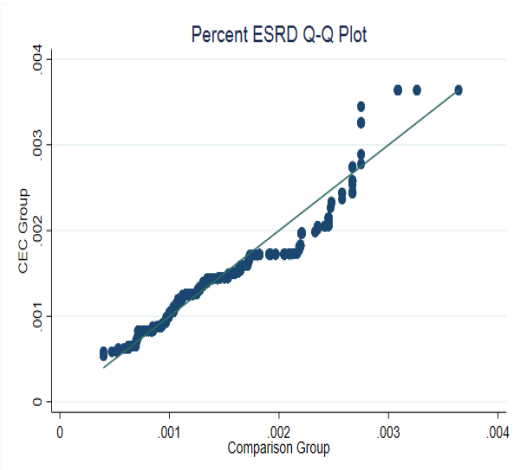


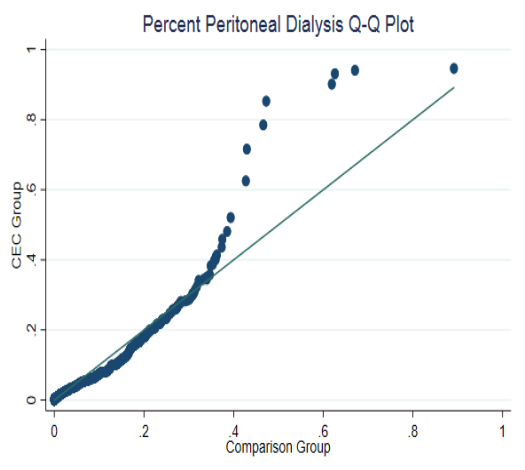

Number of Dialysis Stations Q-Q Plot
CEC Group
Comparison Group
0
20
40
60
80

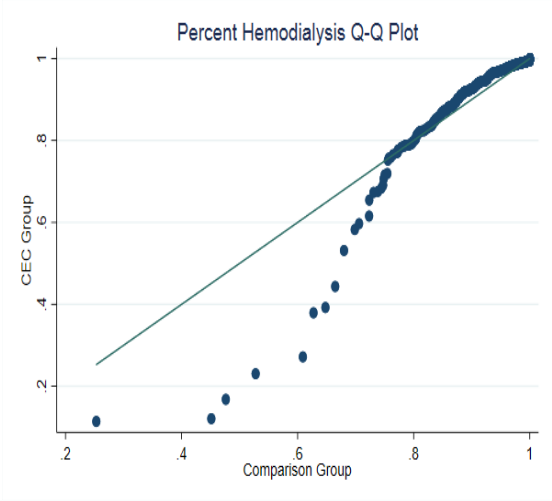

Median Household Income Q-Q Plot
CEC Group
Comparison Group
20000
40000
60000
80000
100000

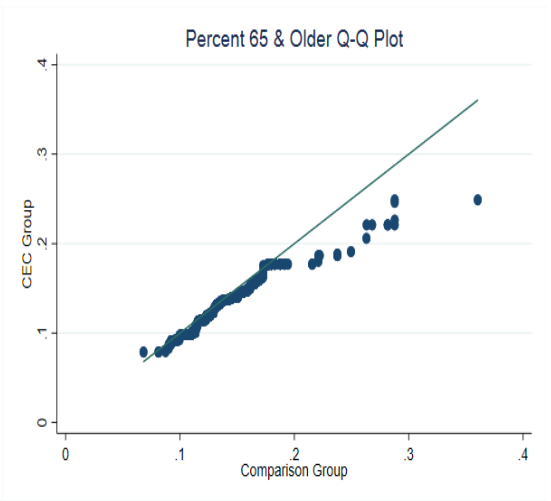

Percent New to Dialysis Q-Q Plot
CEC Group
Comparison Group
0
.2
.4
.6
.8

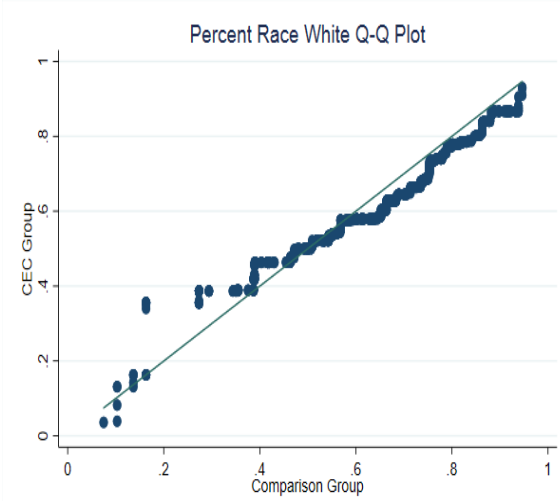

Percent Catheter Q-Q Plot
CEC Group
Comparison Group
0
.1
.2
.3
.4

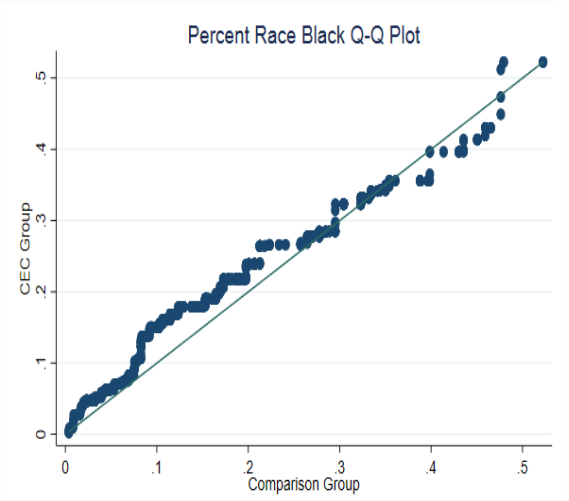

Percent ESRD Q-Q Plot
CEC Group
Comparison Group
0
.001
.002
.003
.004

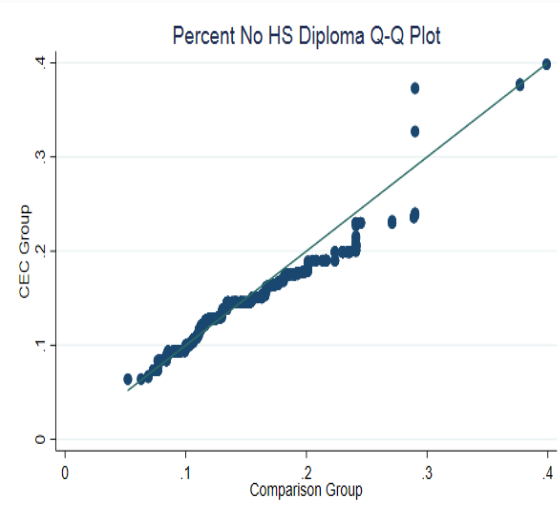

Percent Peritoneal Dialysis Q-Q Plot
CEC Group
Comparison Group
0
.2
.4
.6
.8
1

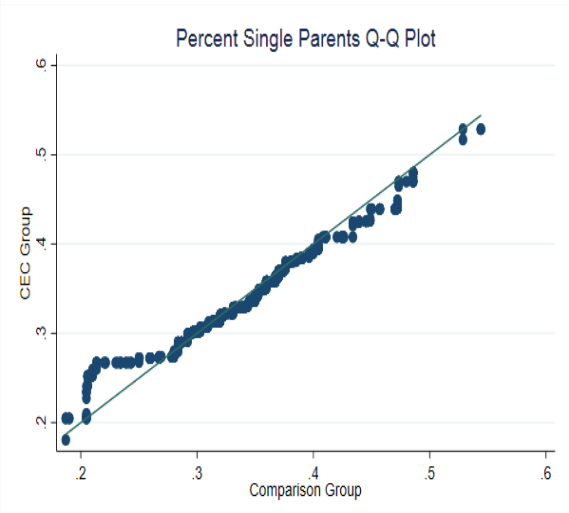

Percent Hemodialysis Q-Q Plot
CEC Group
Comparison Group
.2
.4
.6
.8
1

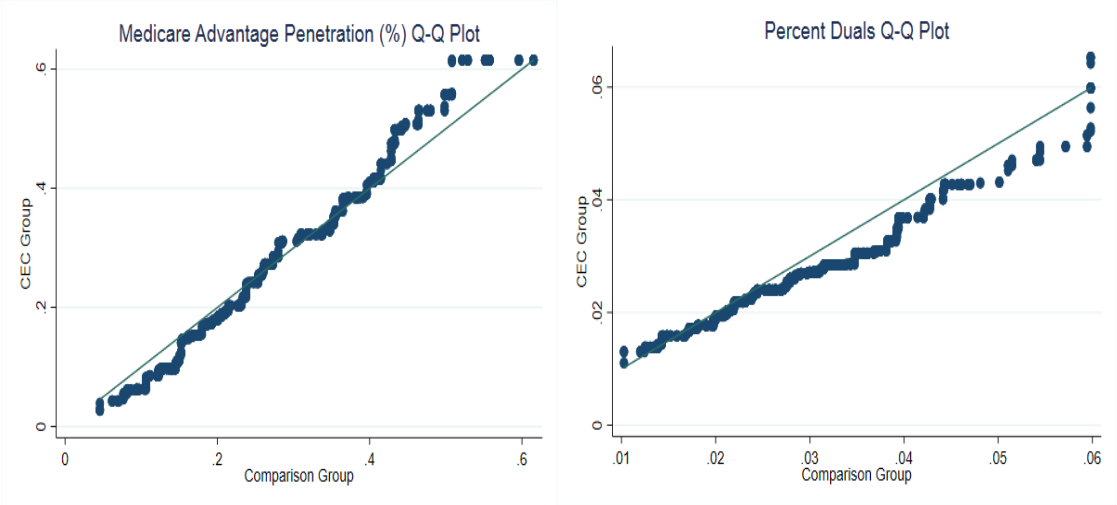

Percent 65 & Older Q-Q Plot
CEC Group
Comparison Group
0
.1
.2
.3
.4


Percent Race White Q-Q Plot
CEC Group
Comparison Group
0
.2
.4
.6
.8
1


Percent Race Black Q-Q Plot
CEC Group
Comparison Group
0
.1
.2
.3
.4
.5


Percent No HS Diploma Q-Q Plot
CEC Group
Comparison Group
0
.1
.2
.3
.4


Percent Single Parents Q-Q Plot
CEC Group
Comparison Group
.2
.3
.4
.5
.6



4. Comparison Group Changes between the Third Annual Report and the Fourth Annual Report

The comparison group described in the fourth annual report (AR4) changed from the comparison group used in the third annual report (AR3) to accommodate the growth in CEC facilities over time; the number of CEC facilities increased from 216 in PY1 to 685 in PY2, 1,066 in PY3, and 1,210 in PY4. For most CEC facilities that joined in PY1, PY2 or PY3, we kept the same matched comparison group in AR4. Matches for 948 out of 951 CEC facilities included in AR3 were preserved. However, we were unable to preserve the matches for CEC facilities that matched to comparison facilities without 2019 claims (N=3). We used PSM to match these two PY3 and one PY2 joiners, one PY3 joiner that failed exclusion rules in AR3 but passed in AR4, and the 85 PY4 joiners.

D. Beneficiary Alignment and Eligibility

To identify comparison beneficiaries for inclusion in this analysis, we simulated alignment based on the CEC Model rules. We started by applying the CEC eligibility criteria (see **Exhibit E-12**) to construct monthly eligibility indicators, which required data from the Common Medicare Environment (CME), the Master Data Management database, and the Chronic Conditions Data Warehouse (CCW). Then we combined the monthly eligibility indicators with ESRD dialysis facility (Type of Bill 72X) claims to align eligible beneficiaries to ESCOs and comparison group facilities using a two-step approach.

> **Step One.** Each month starting in January 2012, CEC eligible beneficiaries were aligned to an ESCO if the "first touch" dialysis service belonged to an ESCO and the beneficiary satisfied the eligibility criteria in that month. The first touch dialysis service is the earliest dialysis service based on the claim thru date provided on the dialysis facility claims. Beneficiaries were prospectively aligned through December 2019.[109] Beneficiaries could subsequently become unaligned in the second step of the alignment process (reconciliation) if they no longer meet the criteria to be aligned. The first step was

[109] We simulate alignment of beneficiaries prior to the start of the CEC. This provides information on beneficiaries who would have been aligned—based on identical methods—during this earlier period and allows us to assess changes in ESCOs from before and after CEC implementation.

repeated every month through December 2019 to align new beneficiaries who had their first touch dialysis after January 2012; each monthly alignment was run among beneficiaries not currently aligned. Beneficiaries were also aligned to a comparison group facility if the first touch provider was in a facility in the matched comparison group.[110]

Step Two. We simulated the CEC reconciliation process by which beneficiaries were de-aligned from their ESCO due to death, kidney transplant[111], the 50% CBSA rule, a second CBSA rule (effective in PY3+), alignment to another shared savings program (SSP), and/or no longer receiving treatment at an ESCO (see **Exhibit E-13**).[112] We applied annual de-alignments after each CY using claims processed through April 3, 2020. Beneficiaries who were de-aligned could be realigned to any ESCO or facility in the comparison group at a later time if they met the eligibility criteria at the time of first touch.

[110] It was possible for the first step to result in an ESCO alignment and comparison facility alignment at the same time. We subsequently applied rules to prevent such overlaps. To maintain ESCO prioritization, an ESCO alignment was retained and the comparison facility alignment was disregarded in any month a beneficiary was aligned to an ESCO. In addition, to minimize any potential contamination effect from ESCOs, any comparison facility alignment was disregarded in any month or within 12 months after a beneficiary was treated or aligned to an ESCO facility.

[111] In all prior annual reports, we identified kidney transplants based on two MS-DRG codes: 008, i.e., simultaneous kidney and pancreas transplant and 652, i.e., kidney transplant. For AR4, we added ICD-9 and ICD-10 procedure codes to identify kidney transplants throughout the study period. The ICD-10 procedure codes used to identify transplants were 0TY00Z0-0TY00Z2, and 0TY10Z0 -0TY10Z2. For transplants before October 1, 2015, when ICD-10 procedure codes were first implemented, the ICD-9 procedure code, 55.69 was used instead.

[112] The simulated reconciliation was applied to CYs 2012 through 2019. We apply the simulated reconciliation to these previous years to ensure consistency with the program methods (e.g., remove a beneficiary from alignment if they received less than 50% of their dialysis services in the aligned facility's market in that year).

Exhibit E-12. Monthly Eligibility Criteria

- ***Alive (inclusion criterion).*** If a beneficiary had no death date or a validated death date that was on or after the 1st of the month, the beneficiary met the alive criterion for the month of interest.
- ***Enrolled in Medicare Part A and Part B (inclusion criterion)***. A beneficiary met this criterion if he/she was enrolled in both Medicare Part A and Part B in the month.
- ***Not enrolled in Medicare Advantage (MA) (i.e., Health Maintenance Organization [HMO], managed care, or Medicare Part C) (exclusion criterion)***. A beneficiary met this exclusion criterion if he/she was enrolled in a MA plan during the month.
- ***Over age 18 (inclusion criterion).*** A beneficiary met this criterion if he/she was at least 18 years of age prior to the first day of the month.
- ***Kidney transplant (exclusion criterion).*** A beneficiary met this exclusion criterion during the month of a kidney transplant and the 12 months following that month.
- ***Resided in US (inclusion criterion***). A beneficiary met this criterion for the month of interest if he/she did not have a residential Social Security Administration state code—based on the CME address history table—outside of the United States at any time in the month.
- ***Not enrolled in a designated SSP (exclusion criterion).*** A beneficiary met this exclusion criterion if he/she was aligned with another SSP in a given month, as noted in the Master Data Management database. The SSP criteria differed prior to CY 2016. For the pre-2016 period, this exclusion encompassed alignment with the Independence at Home (IAH) Demonstration (i.e., program code 01), Pioneer ACO Model (i.e., program code 07), and the Medicare-Medicaid Coordination Office Financial Alignment Initiative (FAI) (i.e., program code 11). For the 2016 and later period, this exclusion encompassed alignment with the IAH Demonstration, Pioneer ACO Model, Medicare SSP (i.e., program code 08) when the beneficiary was categorized as Track 3, FAI, and the NGACO Model (i.e., program code 21). SSP beneficiaries were identified as Track 3 when they were aligned with a Track 3 SSP ACO. Starting in January 2018, this exclusion also included Medicare SSP beneficiaries identified as Track 1+ or the voluntary alignment track. Starting in January 2019, this exclusion also included Vermont All-Payer Model beneficiaries (i.e., program code 53). Starting in July 2019, this exclusion also included Medicare SSP beneficiaries in the prospective track.
- ***Medicare as a secondary payer (exclusion criterion).*** A beneficiary met this exclusion criterion if he/she had Medicare as a secondary payer at any time during the month.

Exhibit E-13. Reasons for De-alignment

- ***Death.*** An aligned beneficiary who died in the CY was de-aligned at the end of the CY (i.e., alignment ended on December 31 of the CY). For example, a beneficiary who was aligned in January 2012 and died in October 2012 would have an alignment start date of January 1, 2012 and an alignment end date of December 31, 2012. However, this beneficiary will be aligned and CEC eligible from January 2012 through October 2012.
- ***First touch at non-ESCO facility.*** For each beneficiary CY, we evaluated if the beneficiary had a first touch at a facility that belonged to the ESCO to which they were aligned. If the beneficiary did not have a first touch in the CY at a facility that belonged to the ESCO, then the beneficiary was de-aligned from the CY. We applied the rule similarly to the comparison group based solely on the aligned facility (i.e., no comparison group ESCOs).
- ***Kidney transplant.*** An aligned beneficiary who had a kidney transplant in the CY was de-aligned at the end of the CY (i.e., alignment ended on December 31 of the CY). For example, a beneficiary who was aligned in January 2012 and had a kidney transplant in October 2012 would have an alignment start date of January 1, 2012 and an alignment end date of December 31, 2012.
- ***SSP.*** If a beneficiary was aligned to a Medicare SSP that can take beneficiaries from CEC (i.e., only IAH) following the start of the CEC alignment, then the beneficiary was de-aligned from CEC for the CY.
- ***Dialysis in provider market (CBSA Rule).*** If a beneficiary had at least one dialysis service in a CY and less than 50% of dialysis services in the CY were from the market of the ESCO, then the beneficiary was de-aligned from the CY. The percentage of dialysis services per CY that occurred in the ESCO's market was computed based on (1) the total number of dialysis services with claim thru date in that CY after alignment started (i.e., denominator) and (2) the total number of dialysis services after alignment started that were provided in the ESCO market (i.e., numerator); that is, the dialysis service occurred in a CBSA that belonged to the ESCO's market, or if not in a CBSA (i.e., rural), the county belonged to the ESCO's market. We applied the rule similarly to the comparison group based on the aligned facility (i.e., no ESCO market).
- ***Dialysis in market or participating ESCO facility (second CBSA rule).*** Starting in PY3, ESCOs could opt-in for this second CBSA rule; only Fresenius opted-in. For beneficiaries who failed the above CBSA rule (i.e., < 50% of dialysis in the ESCO market) and had at least 50% of dialysis services in (1) the ESCO market and/or (2) at any participating facility in the ESCO to which the beneficiary is aligned, the beneficiary was de-aligned at the end of the CY (i.e., instead of the entire CY).

E. CEC and Comparison Group Populations

Patient characteristics for aligned and CEC eligible beneficiaries from ESCOs and matched comparison facilities (for the first month the beneficiary is aligned) are compared in **Exhibit E-14.**

Although there are more beneficiaries aligned and eligible in the CEC group than in the comparison group, CEC and comparison beneficiaries are very similar on average. They differ only on a few characteristics. For example, the percent of White CEC beneficiaries is 8 percentage points lower for Wave 1 and 2 percentage points lower for Wave 2, relative to the comparison group. Likewise, the percent of Black CEC beneficiaries is higher relative to the comparison group (5 percentage points higher for Wave 1 and 3 percentage points higher for Wave 2). The average CEC facility beneficiary count for Wave 1 and Wave 2 is about 7 beneficiaries higher, relative to the comparison group. We also see differences in the large dialysis organizations (LDOs) to which beneficiaries are aligned. About 67% of Wave 1 CEC beneficiaries are aligned to Fresenius facilities and 25% are aligned to DaVita facilities. About 88% of Wave 2 CEC beneficiaries are aligned to Fresenius facilities, while none are aligned to DaVita facilities. In the comparison group, 65% of beneficiaries are aligned to Fresenius facilities and 25% to DaVita facilities. These organizational indicators are also included as control variables in the DiD regression model.

Exhibit E-14. CEC and Comparison Population Average Characteristics

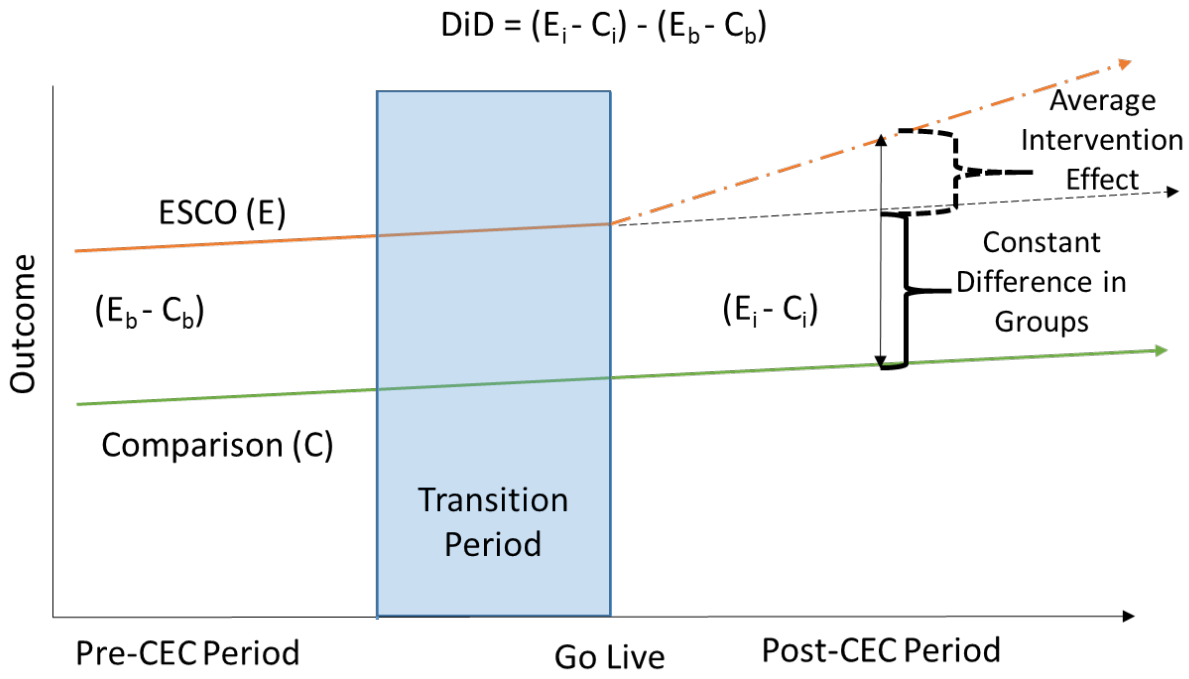
Characteristics		Wave 1 CEC (Mean) N=57,351	Wave 2 CEC (Mean) N=84,168	Comparison (Mean) N=125,950
Beneficiary Characteristics	Age	63.5	63.2	63.6
	Female	43.3%	44.1%	44.4%
	BMI (kg/m^2)	29.6	30.1	29.9
	White	42.3%	47.9%	50.2%
	Black	41.7%	39.8%	36.8%
	Other	16.0%	12.4%	13.0%
	Aged into Medicare	35.1%	34.2%	35.1%
	Disabled into Medicare	23.1%	23.1%	22.9%
	ESRD into Medicare	24.4%	25.2%	24.1%
	Disabled & ESRD into Medicare	17.4%	17.6%	17.9%
	Full Dual Eligibility	37.9%	33.8%	35.7%
	Partial Dual Eligibility	7.7%	10.2%	10.2%
	ESRD Cause: Diabetes	44.4%	44.8%	45.5%
	ESRD Cause: Hypertension	33.0%	30.8%	30.4%
	ESRD Cause: Other	19.5%	21.0%	20.8%
	ESRD Cause: Unknown	3.2%	3.4%	3.3%
	Months on Dialysis	41.4	40.6	39.8
	Hemodialysis	93.2%	92.6%	92.2%
	Peritoneal Dialysis	7.2%	7.5%	7.9%
	Both Hemodialysis/Peritoneal Dialysis	0.89%	0.86%	0.53%
	Other Dialysis	0.65%	0.47%	0.69%
Facility Characteristics	Beneficiary Count	119.4	119.9	111.1
	Late Shift Indicator	21.7%	32.5%	27.1%
	For Profit Indicator	91.5%	91.2%	92.4%
	CDC	0%	2.2%	0%
	DaVita	24.9%	0%	24.8%
	DCI	6.3%	5.0%	6.3%
	Fresenius	66.9%	87.6%	65.0%
	Atlantic	0%	2.8%	0%
	NKC	0%	2.4%	0%
	Other	0%	0%	4.0%
	Rogosin	1.9%	0%	0%
Market Characteristics	Median Household Income	$60,442	$60,168	$58,259
	MA Penetration	30.0	32.1	31.9
	Dual Per 10,000	303.6	297.1	323.4
	PCPs Per 10,000	7.8	7.8	7.8

Notes: Characteristics based on beneficiaries first month aligned. Additional controls such as seasonal, region, and CBSA costs decile indicators are not presented in this table.

F. DiD Regression Model and Estimated CEC Impacts

The DiD approach quantifies the impact of the CEC Model by comparing changes in outcomes for the CEC population before and after CEC with changes in outcomes for the comparison population before and after CEC. This approach eliminates biases from time invariant differences between the CEC and comparison populations, and controls for common trends in both groups. The DiD method applied to our outcomes of interest is presented visually in **Exhibit E-15**.

Exhibit E-15. DiD Method Illustration



The DiD model uses data over time from beneficiaries with ESRD aligned to facilities in the comparison group to obtain an appropriate counterfactual of what would happen to patients with ESRD at ESCO facilities if their aligned facility was not participating in CEC. To estimate a casual effect of the CEC Model, the DiD contrasts changes in outcomes among CEC beneficiaries against this counterfactual. As seen in the exhibit, the DiD model first evaluates the difference between the ESCO (E) and comparison (C) groups over the pre-CEC period (E_b-C_b), depicted by the green and orange lines, for each outcome of interest. The DiD model assumes that if the CEC Model did not exist, the two groups would continue to follow the same parallel trends during the post-CEC period (shown by the black dotted (E) and orange line (C), respectively). Therefore, any observed difference in outcomes between the pre-CEC period (E_b-C_b) and post-CEC period (E_i-C_i) is driven by the CEC Model. Thus, the resulting DiD estimate of the average intervention effect is (E_i-C_i) - (E_b-C_b).

Waves, Pre-CEC, Transition, and Post-CEC Periods. In PY4, the CEC evaluation introduced additional facilities participating in the CEC Model through existing ESCOs. To identify the overall impact of the CEC Model and the impact for each wave, we estimated one DiD model which includes separate indicators for each wave and performance year to identify wave specific

intervention effects for the original 13 ESCOs (Wave 1) in PY1, PY2, PY3, and PY4, and the additional 24 ESCOs (Wave 2) in PY2, PY3, and PY4.

The two waves of ESCOs comprise participating facilities with varying start dates. Wave 1 ESCOs include facilities that started participating in PY1 and new participating facilities that were added in PY2, PY3, or PY4.[113] Wave 2 ESCOs include facilities that started participating in new ESCOs in PY2 and new participating facilities that were added in PY3 and PY4. Participating facilities are designated pre-CEC, transition, and post-CEC periods depending on their start date. The periods of analysis for all groups are described in **Exhibit E-16**. Specifically, Q1 2014 represent the first calendar quarter of the pre-CEC period, i.e., January 2014 for all participating facilities. The pre-CEC period ends in March 2015 for participating facilities starting in PY1 and in June 2016, 2017, and 2018 for participating facilities starting in PY2, PY3, or PY4. For participating facilities starting in PY1, the transition period takes into consideration the delayed start of the CEC Model, which was originally scheduled for April 2015. The transition period for participating facilities starting in PY2, PY3, or PY4 includes months from the application deadline (July 2016, 2017, or 2018) to the start of PY2, PY3, or PY4. The transition periods are represented by the two quarters for each group. Finally, the areas labeled post-CEC represent the intervention periods for each group.

[113] In PY4, Wave 1 and 2 ESCOs added 45 and 99 facilities, respectively. Of the PY4 joiners, 27 Wave 1 and 58 Wave 2 facilities were included in the matched analytic sample for the impact analysis. Additionally, 147 facilities terminated their participation in the CEC model after December 2015; 129 of these 147 facilities are in the analytic sample. Twenty-Five of these facilities have rejoined or will rejoin by PY5. Site visit participants in PY3 and PY4 reported removing facilities from ESCOs due to facility closures, lack of commitment by facility providers, and resource shortages. Facilities that stop participating in the CEC Model remain in the analysis, with their matched pair, as long as the CEC facility has aligned and eligible beneficiaries in a given month, after their participation drop date. For all months after the drop date that the CEC facility has no observations, its matched comparison facility will be manually excluded (N=21). New beneficiaries cannot be aligned to facilities that left the model, but existing beneficiaries remain aligned as long as they had a first touch at a participating facility in the ESCO. One ESCO facility closed in December 2017; this facility and its match were removed from the analytic sample for PY3, and PY4.

Exhibit E-16. Waves, Pre-CEC, Transition, and Post-CEC Periods

Facility Group	Performance Year 1	Performance Year 2	Performance Year 3	Performance Year 4
Wave 1, PY1 Joiners	Pre-CEC / Transition	Post-CEC	Post-CEC	Post-CEC
Wave 1, PY2 Joiners	Pre-CEC	Transition	Post-CEC	Post-CEC
Wave 2, PY2 Joiners	Pre-CEC	Transition	Post-CEC	Post-CEC
Wave 1, PY3 Joiners	Pre-CEC	Pre-CEC / Transition	Post-CEC	Post-CEC
Wave 2, PY3 Joiners	Pre-CEC	Pre-CEC / Transition	Post-CEC	Post-CEC
Wave 1, PY4 Joiners	Pre-CEC	Pre-CEC	Pre-CEC / Transition	Post-CEC
Wave 2, PY4 Joiners	Pre-CEC	Pre-CEC	Pre-CEC / Transition	Post-CEC
Matched Comparison Group	Pre-CEC	Pre-CEC	Pre-CEC	Pre-CEC

Q1 2014	Q2 2014	Q3 2014	Q4 2014	Q1 2015	Q2 2015	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019

Model Specification. Our generalized DiD estimates the impact of the CEC Model for all ESCOs allowing for different start times for each participating facility by wave and the year they joined the CEC Model. We illustrate the DiD regression framework used to estimate the CEC Model effects for each ESCO wave and PY.

$$
\begin{aligned}
Y_{ijt} = {} & b_0 + b_1 Quarter_{it} + b_2 ESCO_{ij} + b_3 ESCO\_Post\_PY1\_W11_{ijt} \\
& + b_4 ESCO\_Post\_PY2\_W11_{ijt} + b_5 ESCO\_Post\_PY2\_W12_{ijt} \\
& + b_6 ESCO\_Post\_PY3\_W11_{ijt} + b_7 ESCO\_Post\_PY3\_W12_{ijt} \\
& + b_8 ESCO\_Post\_PY3\_W13_{ijt} + b_9 ESCO\_Post\_PY4\_W11_{ijt} \\
& + b_{10} ESCO\_Post\_PY4\_W12_{ijt} + b_{11} ESCO\_Post\_PY4\_W13_{ijt} \\
& + b_{12} ESCO\_Post\_PY4\_W14_{ijt} + b_{13} ESCO\_Post\_PY2\_W21_{ijt} \\
& + b_{14} ESCO\_Post\_PY3\_W21_{ijt} + b_{15} ESCO\_Post\_PY3\_W22_{ijt} \\
& + b_{16} ESCO\_Post\_PY4\_W21_{ijt} + b_{17} ESCO\_Post\_PY4\_W22_{ijt} \\
& + b_{18} ESCO\_Post\_PY4\_W23_{ijt} + \lambda' X_{ijt} + e_{ijt}
\end{aligned}
$$

Subscripts *i*, *j*, and *t* denote individuals, facilities, and time, respectively. *Quarter* (0,1) is a vector of calendar quarter dummies that captures aggregate factors that could cause changes in outcome *Y* over time that are common across CEC and comparison beneficiaries. *ESCO* (0,1) is a time-

invariant treatment group identifier which identifies the group of CEC eligible beneficiaries aligned at an ESCO in a given month.[114] The post-treatment indicators, represented by *ESCO_Post_PY1_W11, ESCO_Post_PY2_W11, ESCO_Post_PY2_W12, ESCO_Post_PY3_W11, ESCO_Post_PY3_W12, ESCO_Post_PY3_W13*, *ESCO_Post_PY4_W11*, *ESCO_Post_PY4_W12, ESCO_Post_PY4_W13, ESCO_Post_PY4_W14, ESCO_Post_PY2_W21, ESCO_Post_PY3_W21, ESCO_Post_PY3_W22, ESCO_Post_PY4_W21, ESCO_Post_PY4_W22*, and *ESCO_Post_PY4_W23* separate CEC beneficiaries by wave, joining year, and by PY. For example, *ESCO_Post_PY1_W11* (0,1) is indexed to *i*, *j*, and *t*, takes the value of 0 for beneficiaries in the pre-CEC and transition period and switches to =1 for CEC beneficiaries aligned to a Wave 1 PY1 joining facility when their aligned facility starts participating in PY1. *ESCO_Post_PY1_W11* is always 0 for the comparison group. [115] Weighted averages of the post treatment indicators are calculated to generate overall and specific PY impact estimates for All ESCOs, Wave 1, and Wave 2.

The DiD designs control for time-varying changes that are common to all beneficiaries and that occur during the implementation of the CEC Model, as well as time-invariant unmeasured differences between beneficiaries not otherwise captured by the model. The variables we specified in the DiD models to control for time-invariant and time-varying differences in patients, markets, and facilities that are outside the control of ESCOs, are detailed in **Exhibit E-17**. Market and facility variables are representative of the facility to which the beneficiary was assigned based on first-touch assignment. The regression model includes only beneficiary health conditions that are not likely to be affected by the CEC Model (i.e., cancer, reason for ESRD) since their inclusion would bias estimates of the impact the CEC Model had on ESRD care. Furthermore, we estimated stratified DiD models similar to the specification described by equation (1), but observations were restricted to our stratified samples of interest. Specifically, we investigated the extent to which the CEC Model had a differential impact on subgroups of Medicare beneficiaries with ESRD varying in their demographic characteristics and their time in dialysis.

[114] Rather than using the list of aligned beneficiaries produced by the implementation contractor, we simulate alignment using the program rules described above. This allows us to align beneficiaries during the pre-CEC period and apply the same methods for CEC and comparison beneficiaries.

[115] The DiD regression frameworks also include an indicator that identifies the treatment transition period observations. This indicator controls the transition period effect on outcomes and effectively exclude this time period from the DiD estimate. For brevity, the indicator was omitted from the equations.

Exhibit E-17. Control Variables Included in the DiD Model

Beneficiary Level	Facility Level	Market Level
Original Reason for Entitlement Code (OREC): Age, Disabled, ESRD, ESRD and Disabled Reason for ESRD: Hypertension, diabetes, or other Female Age BMI at ESRD incidence Months on dialysis Cancer indicator (annual) Type of dialysis indicator: Hemodialysis, peritoneal dialysis, other (monthly) Race indicators: White, Black, Other Medicaid status indicators: None, full, or partial (monthly)	Cohort facility indicators for the matched set of Wave 1 PY1, Wave 1 PY2, Wave 1 PY3, Wave 1 PY4, Wave 2 PY2, Wave 2 PY3, and Wave 2 PY4 joiners. LDO Facilities indicators: Fresenius, DCI, and DaVita Small Dialysis Facility (SDO/ non-LDO) indicator Facility beneficiary count (annual) Profit: For profit, not for profit Late shift indicator (facility offers dialysis after 5PM) Rural Urban indicators (Metro, Urban, Rural)	CBSA median household income (annual) CBSA Dual enrollees (Medicaid & Medicare) per 100,000 population in CBSA (annual) CBSA MA penetration (annual) CBSA geographic rate of PCPs per 10,000 population (annual) Region indicators Percent of ACO beneficiaries in a market

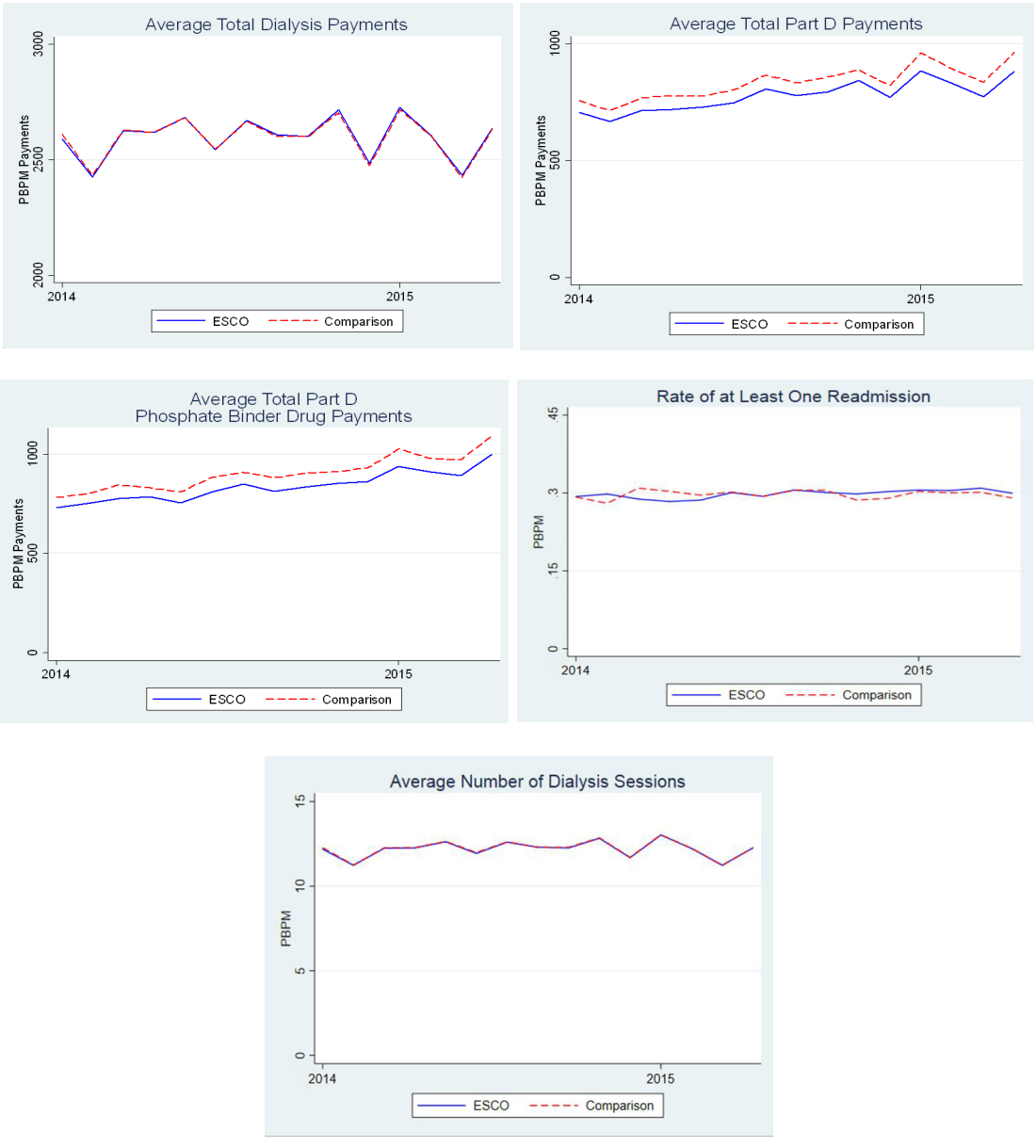
Computation of Standard Errors. In general, estimated standard errors of the DiD estimate are calculated using two-way clusters at beneficiary and service facility levels.[116,117] Two-way clusters account for intra-cluster correlation among beneficiaries receiving services from the same facility (service facility cluster) and correlation across observations from the same beneficiary across time (beneficiary cluster).

Parallel Trends Tests. A pivotal assumption of the DiD model is that the ESCO and comparison groups have the same trend in outcomes prior to the intervention (see **Exhibit E-15** for the illustration of the parallel trends assumption during the pre-CEC period). Formally, the parallel trend tests involved assessing the significance of the coefficient corresponding to the time and treatment dummy interaction term at $p \leq 0.05$, using data prior to the start of the CEC Model. If the outcome trends between treatment and comparison group are the same prior to the start of the CEC Model, then the interaction coefficient should be near zero and not statistically significant (i.e., the difference in trends is not significantly different between the two groups in the pre-CEC period). Similar to equation (1) and (2), the parallel trend test for each DiD estimate includes a full set of patient, facility, and market risk adjusters that are included in the DiD specification. We test trends over the common period where all treatment and matched comparison groups are within the pre-

[116] Cameron, A., Gelbach, J.B., Miller, D.L. (2012). Robust inference with multiway clustering. *Journal of Business & Economic Statistics*, 29(2):238-49.
[117] Two-part expenditure models apply one-way cluster methods. Standard errors for these models are clustered by service facility.

CEC period (i.e., the first five quarters of data January 2014 through March 2015).[118] We conducted parallel trend tests for every outcome and every group of CEC facilities evaluated in this report (i.e., All ESCOs, Wave 1 ESCOs, and Wave 2 ESCOs). DiD estimates that failed parallel trend test are identified in **Exhibits E-19** through **E-31** with the symbol ǂ. Five outcomes measures are presented and discussed in the report despite failing parallel trends test. We present the pre-CEC trend graphs in **Exhibit E-18**. All five measures have visually parallel trends between the ESCO and comparison groups.

Exhibit E-18: Pre-CEC Trend Graphs for Select Outcome Measures that Fail Statistical Trend Tests



[118] Trend tests for the overall all ESCO DiD result compare trends of the pooled treatment and comparison groups, whereas, trend test for the wave specific DiD estimate compare each wave specific treatment group (Wave 1 and Wave 2) relative to the trends of the pooled comparison group.

Exhibit E-19. Impact of the CEC Model on Dialysis Care, All ESCOs

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Dialysis Care	Number of Outpatient Dialysis Sessions in a Given Month	PY1-PY4	12.2	12.3	12.3	12.2	0.05 ***	0.03	0.08	0.43%
		PY1	12.2	12.4	12.3	12.3	0.07 ** ‡	0.01	0.12	0.56%
		PY2	12.2	12.3	12.3	12.2	0.06 ***	0.03	0.10	0.52%
		PY3	12.2	12.2	12.3	12.2	0.04 **	0.01	0.07	0.33%
		PY4	12.2	12.2	12.3	12.2	0.05 ***	0.02	0.08	0.43%
	Emergency Dialysis (percent with at least one)	PY1-PY4	1.9%	2.0%	1.9%	2.0%	-0.06	-0.15	0.03	-3.2%
		PY1	1.9%	1.9%	1.9%	2.0%	-0.11	-0.31	0.08	-5.9%
		PY2	1.9%	1.9%	1.9%	2.1%	-0.23 ***	-0.34	-0.12	-11.8%
		PY3	1.9%	2.1%	1.9%	2.0%	-0.01	-0.11	0.09	-0.30%
		PY4	1.9%	2.0%	1.9%	2.0%	0.01	-0.09	0.12	0.75%
	Hemodialysis (percent with at least one)	PY1-PY4	92.7%	91.7%	92.1%	91.0%	0.06	-0.48	0.61	0.07%
		PY1	92.7%	92.3%	92.1%	91.3%	0.39	-0.92	1.7	0.43%
		PY2	92.7%	91.7%	92.1%	91.2%	-0.12	-0.80	0.57	-0.12%
		PY3	92.7%	91.6%	92.1%	91.1%	-0.05	-0.56	0.47	-0.05%
		PY4	92.7%	91.2%	92.1%	90.4%	0.18	-0.38	0.74	0.20%
	Peritoneal Dialysis (percent with at least one)	PY1-PY4	5.8%	6.7%	6.3%	7.2%	-0.003	-0.56	0.56	-0.05%
		PY1	5.8%	6.0%	6.3%	6.7%	-0.21	-1.6	1.2	-3.6%
		PY2	5.8%	6.7%	6.3%	7.1%	0.06	-0.64	0.75	1.0%
		PY3	5.8%	6.9%	6.3%	7.2%	0.16	-0.37	0.69	2.8%
		PY4	5.8%	7.2%	6.3%	7.8%	-0.13	-0.69	0.43	-2.3%
	Home Hemodialysis (percent with at least one)	PY1-PY4	1.5%	1.8%	1.4%	1.6%	0.11	-0.18	0.41	7.4%
		PY1	1.5%	1.7%	1.4%	1.5%	0.08	-0.51	0.67	5.4%
		PY2	1.5%	1.7%	1.4%	1.6%	-0.04	-0.39	0.31	-2.5%
		PY3	1.5%	1.8%	1.4%	1.6%	0.10	-0.21	0.41	6.5%
		PY4	1.5%	2.2%	1.4%	1.8%	0.24	-0.06	0.54	15.8%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Dialysis Care (cont.)	Home Dialysis (percent with at least one)	PY1-PY4	7.9%	8.2%	7.8%	8.0%	0.13	-0.14	0.40	1.7%
		PY1	7.9%	8.1%	7.8%	7.9%	0.11	-0.44	0.65	1.3%
		PY2	7.9%	8.1%	7.8%	8.0%	-0.03	-0.35	0.30	-0.33%
		PY3	7.9%	8.2%	7.8%	7.9%	0.13	-0.15	0.41	1.6%
		PY4	7.9%	8.5%	7.8%	8.1%	0.26	-0.02	0.53	3.2%
	Percent of Beneficiaries Starting Dialysis with No Prior Nephrology Care	PY1-PY4	26.2%	24.3%	28.3%	26.9%	-0.50	-2.3	1.3	-1.9%
		PY1	26.2%	23.4%	28.3%	27.5%	-2.1	-5.7	1.6	-7.8%
		PY2	26.2%	23.9%	28.3%	26.4%	-0.46	-3.1	2.2	-1.7%
		PY3	26.2%	24.6%	28.3%	25.1%	1.6	-0.88	4.0	6.0%
		PY4	26.2%	24.0%	28.3%	28.3%	-2.3	-4.9	0.40	-8.6%
	Fistula Use (percent of beneficiaries in a given month who had a fistula and had at least 90 days of dialysis)	PY1-PY4	65.6%	64.7%	65.1%	64.3%	-0.10	-0.74	0.54	-0.15%
		PY1	65.6%	64.7%	65.1%	64.7%	-0.60	-1.9	0.69	-0.92%
		PY2	65.6%	64.5%	65.1%	64.4%	-0.38	-1.2	0.41	-0.58%
		PY3	65.6%	64.4%	65.1%	64.2%	-0.33	-1.0	0.36	-0.50%
		PY4	65.6%	64.7%	65.1%	63.7%	0.48	-0.21	1.2	0.73%
	Catheter Use (percent of beneficiaries in a given month who had a catheter for 90 days or longer)	PY1-PY4	9.3%	10.0%	11.3%	12.5%	-0.48 **	-0.85	-0.11	-5.2%
		PY1	9.3%	8.9%	11.3%	12.1%	-1.2 ***	-2.0	-0.47	-13.1%
		PY2	9.3%	9.8%	11.3%	12.3%	-0.50 *	-0.96	-0.03	-5.3%
		PY3	9.3%	10.5%	11.3%	12.8%	-0.34	-0.76	0.08	-3.7%
		PY4	9.3%	10.7%	11.3%	13.0%	-0.36	-0.78	0.06	-3.8%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

Exhibit E-20. Impact of the CEC Model on Dialysis Care, Wave 1

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Dialysis Care	Number of Outpatient Dialysis Sessions in a Given Month	PY1-PY4	12.2	12.3	12.3	12.2	0.07 *** ‡	0.04	0.11	0.61%
		PY1	12.2	12.4	12.3	12.3	0.07 ** ‡	0.01	0.12	0.56%
		PY2	12.2	12.3	12.3	12.2	0.08 *** ‡	0.03	0.12	0.62%
		PY3	12.2	12.3	12.3	12.2	0.07 *** ‡	0.03	0.11	0.58%
		PY4	12.2	12.3	12.3	12.2	0.08 *** ‡	0.04	0.12	0.67%
	Emergency Dialysis (percent with at least one)	PY1-PY4	1.9%	2.0%	1.9%	2.0%	-0.06	-0.20	0.08	-3.1%
		PY1	1.9%	1.9%	1.9%	2.0%	-0.11	-0.31	0.08	-5.9%
		PY2	1.9%	2.0%	1.9%	2.1%	-0.11	-0.27	0.05	-5.6%
		PY3	1.9%	2.1%	1.9%	2.0%	-0.01	-0.16	0.14	-0.43%
		PY4	1.9%	2.0%	1.9%	2.0%	-0.03	-0.18	0.12	-1.4%
	Hemodialysis (percent with at least one)	PY1-PY4	92.7%	91.6%	92.1%	91.0%	0.01	-0.95	0.97	0.01%
		PY1	92.7%	92.3%	92.1%	91.3%	0.39	-0.92	1.7	0.43%
		PY2	92.7%	91.7%	92.1%	91.2%	-0.11	-1.2	0.97	-0.12%
		PY3	92.7%	91.5%	92.1%	91.1%	-0.14	-1.0	0.75	-0.16%
		PY4	92.7%	91.0%	92.1%	90.4%	-0.04	-0.96	0.88	-0.05%
	Peritoneal Dialysis (percent with at least one)	PY1-PY4	5.8%	6.8%	6.3%	7.2%	0.18	-0.81	1.2	3.2%
		PY1	5.8%	6.0%	6.3%	6.7%	-0.21	-1.6	1.2	-3.6%
		PY2	5.8%	6.8%	6.3%	7.1%	0.23	-0.88	1.3	4.1%
		PY3	5.8%	7.1%	6.3%	7.2%	0.40	-0.52	1.3	7.0%
		PY4	5.8%	7.5%	6.3%	7.8%	0.24	-0.71	1.2	4.1%
	Home Hemodialysis (percent with at least one)	PY1-PY4	1.5%	1.9%	1.4%	1.6%	0.19	-0.31	0.70	12.5%
		PY1	1.5%	1.7%	1.4%	1.5%	0.08	-0.51	0.67	5.4%
		PY2	1.5%	1.8%	1.4%	1.6%	0.11	-0.47	0.68	6.8%
		PY3	1.5%	1.9%	1.4%	1.6%	0.22	-0.31	0.75	14.2%
		PY4	1.5%	2.2%	1.4%	1.8%	0.33	-0.21	0.87	21.3%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Dialysis Care (cont.)	Home Dialysis (percent with at least one)	PY1-PY4	7.9%	8.3%	7.8%	8.0%	0.22	-0.25	0.69	2.8%
		PY1	7.9%	8.1%	7.8%	7.9%	0.11	-0.44	0.65	1.3%
		PY2	7.9%	8.2%	7.8%	8.0%	0.14	-0.40	0.68	1.8%
		PY3	7.9%	8.3%	7.8%	7.9%	0.26	-0.23	0.75	3.3%
		PY4	7.9%	8.6%	7.8%	8.1%	0.35	-0.15	0.85	4.4%
	Percent of Beneficiaries Starting Dialysis with No Prior Nephrology Care	PY1-PY4	26.2%	24.5%	28.3%	26.9%	-0.32	-2.8	2.1	-1.2%
		PY1	26.2%	23.4%	28.3%	27.5%	-2.1	-5.7	1.6	-7.8%
		PY2	26.2%	23.7%	28.3%	26.4%	-0.63	-4.1	2.8	-2.4%
		PY3	26.2%	24.9%	28.3%	25.2%	1.8	-1.5	5.1	6.9%
		PY4	26.2%	25.8%	28.3%	28.4%	-0.52	-4.2	3.1	-2.0%
	Fistula Use (percent of beneficiaries in a given month who had a fistula and had at least 90 days of dialysis)	PY1-PY4	65.6%	64.3%	65.1%	64.3%	-0.59	-1.6	0.38	-0.89%
		PY1	65.6%	64.7%	65.1%	64.7%	-0.60	-1.9	0.69	-0.92%
		PY2	65.6%	64.5%	65.1%	64.4%	-0.45	-1.6	0.65	-0.69%
		PY3	65.6%	63.8%	65.1%	64.2%	-0.95	-2.0	0.07	-1.4%
		PY4	65.6%	63.9%	65.1%	63.7%	-0.33	-1.3	0.66	-0.50%
	Catheter Use (percent of beneficiaries in a given month who had a catheter for 90 days or longer)	PY1-PY4	9.3%	9.8%	11.3%	12.5%	-0.71 **	-1.3	-0.14	-7.6%
		PY1	9.3%	8.9%	11.3%	12.1%	-1.2 ***	-2.0	-0.47	-13.1%
		PY2	9.3%	9.4%	11.3%	12.3%	-0.92 **	-1.6	-0.25	-9.9%
		PY3	9.3%	10.4%	11.3%	12.8%	-0.42	-1.0	0.22	-4.5%
		PY4	9.3%	10.6%	11.3%	13.0%	-0.41	-1.0	0.19	-4.4%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

Exhibit E-21. Impact of the CEC Model on Dialysis Care, Wave 2

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Dialysis Care	Number of Outpatient Dialysis Sessions in a Given Month	PY2-PY4	12.3	12.2	12.4	12.2	0.03 *	0.00	0.06	0.25%
		PY2	12.3	12.3	12.4	12.2	0.05 **	0.01	0.09	0.42%
		PY3	12.3	12.2	12.4	12.2	0.02	-0.02	0.05	0.13%
		PY4	12.3	12.2	12.4	12.2	0.03	0.00	0.07	0.25%
	Emergency Dialysis (percent with at least one)	PY2-PY4	2.1%	2.0%	2.1%	2.0%	-0.07	-0.17	0.04	-3.1%
		PY2	2.1%	1.7%	2.1%	2.1%	-0.35 ***	-0.49	-0.20	-16.5%
		PY3	2.1%	2.1%	2.1%	2.0%	-0.004	-0.12	0.11	-0.19%
		PY4	2.1%	2.1%	2.1%	2.0%	0.04	-0.08	0.17	2.1%
	Hemodialysis (percent with at least one)	PY2-PY4	91.6%	91.6%	91.0%	90.9%	0.12	-0.49	0.72	0.13%
		PY2	91.6%	91.7%	91.0%	91.2%	-0.12	-1.01	0.77	-0.13%
		PY3	91.6%	91.7%	91.0%	91.1%	0.02	-0.62	0.67	0.03%
		PY4	91.6%	91.4%	91.0%	90.4%	0.34	-0.32	1.0	0.37%
	Peritoneal Dialysis (percent with at least one)	PY2-PY4	6.2%	6.7%	6.8%	7.4%	-0.19	-0.81	0.43	-3.1%
		PY2	6.2%	6.5%	6.8%	7.1%	-0.11	-1.0	0.79	-1.8%
		PY3	6.2%	6.7%	6.8%	7.2%	-0.02	-0.68	0.63	-0.37%
		PY4	6.2%	6.9%	6.8%	7.8%	-0.39	-1.1	0.27	-6.3%
	Home Hemodialysis (percent with at least one)	PY2-PY4	1.6%	1.8%	1.5%	1.6%	0.03	-0.28	0.35	2.1%
		PY2	1.6%	1.5%	1.5%	1.6%	-0.18	-0.58	0.21	-11.3%
		PY3	1.6%	1.7%	1.5%	1.6%	0.01	-0.33	0.35	0.6%
		PY4	1.6%	2.1%	1.5%	1.8%	0.18	-0.15	0.52	11.5%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Dialysis Care (cont.)	Home Dialysis (percent with at least one)	PY2-PY4	8.0%	8.2%	7.9%	8.0%	0.04	-0.24	0.33	0.54%
		PY2	8.0%	7.9%	7.9%	8.0%	-0.19	-0.55	0.17	-2.4%
		PY3	8.0%	8.1%	7.9%	7.9%	0.03	-0.27	0.34	0.40%
		PY4	8.0%	8.4%	7.9%	8.1%	0.19	-0.11	0.50	2.4%
	Percent of Beneficiaries Starting Dialysis with No Prior Nephrology Care	PY2-PY4	25.1%	23.7%	27.2%	26.5%	-0.69	-2.8	1.4	-2.7%
		PY2	25.1%	24.0%	27.2%	26.4%	-0.29	-3.5	2.9	-1.2%
		PY3	25.1%	24.4%	27.2%	25.1%	1.4	-1.4	4.2	5.6%
		PY4	25.1%	23.0%	27.2%	28.3%	-3.3 *	-6.2	-0.36	-13.1%
	Fistula Use (percent of beneficiaries in a given month who had a fistula and had at least 90 days of dialysis)	PY2-PY4	65.2%	65.0%	64.7%	64.1%	0.40	-0.32	1.1	0.61%
		PY2	65.2%	64.6%	64.7%	64.4%	-0.31	-1.3	0.64	-0.47%
		PY3	65.2%	64.9%	64.7%	64.2%	0.14	-0.64	0.92	0.22%
		PY4	65.2%	65.3%	64.7%	63.7%	1.1 **	0.25	1.9	1.6%
	Catheter Use (percent of beneficiaries in a given month who had a catheter for 90 days or longer)	PY2-PY4	10.1%	10.5%	12.1%	12.7%	-0.25	-0.65	0.15	-2.5%
		PY2	10.1%	10.2%	12.1%	12.3%	-0.08	-0.62	0.45	-0.81%
		PY3	10.1%	10.5%	12.1%	12.8%	-0.29	-0.75	0.18	-2.8%
		PY4	10.1%	10.7%	12.1%	13.0%	-0.32	-0.79	0.15	-3.1%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

Exhibit E-22. Impact of the CEC Model on Coordination of Care beyond Dialysis, All ESCOs

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Coordination of Care beyond Dialysis	Percent of Beneficiaries Receiving at Least One Low-Density Lipoprotein (LDL) Cholesterol Test in a Given Year	PY1-PY4	58.7%	58.0%	55.0%	51.5%	2.9 ***	1.5	4.2	4.9%
		PY1	58.7%	61.2%	55.0%	53.7%	3.9 **	1.0	6.8	6.7%
		PY2	58.7%	56.7%	55.0%	51.5%	1.6	-0.14	3.3	2.7%
		PY3	58.7%	57.0%	55.0%	50.7%	2.6 ***	1.3	4.0	4.5%
		PY4	58.7%	58.2%	55.0%	50.9%	3.7 ***	2.3	5.0	6.2%
	Percent of Beneficiaries Receiving at Least One Hemoglobin A1c (HbA1c) Test in a Given Year	PY1-PY4	78.2%	76.8%	78.3%	75.1%	1.9 ***	1.0	2.7	2.4%
		PY1	78.2%	76.0%	78.3%	75.2%	1.0	-1.0	3.1	1.3%
		PY2	78.2%	76.6%	78.3%	74.5%	2.3 ***	1.2	3.4	2.9%
		PY3	78.2%	76.4%	78.3%	74.9%	1.6 ***	0.74	2.5	2.1%
		PY4	78.2%	77.6%	78.3%	75.7%	2.0 ***	1.1	2.9	2.6%
	Percent of Diabetic Beneficiaries Receiving at Least One Dilated Eye Exam in a Given Year	PY1-PY4	39.9%	41.2%	40.4%	40.4%	1.3 ***	0.59	2.0	3.2%
		PY1	39.9%	41.3%	40.4%	41.0%	0.79	-0.55	2.1	2.0%
		PY2	39.9%	40.9%	40.4%	40.1%	1.3 **	0.38	2.2	3.3%
		PY3	39.9%	41.8%	40.4%	40.4%	1.8 ***	0.95	2.7	4.6%
		PY4	39.9%	40.7%	40.4%	40.3%	0.89 *	0.03	1.8	2.2%
	Percent of Beneficiaries Receiving Flu Vaccinations^	PY1-PY3	64.3%	69.4%	62.5%	64.1%	3.5 ***	2.7	4.4	5.5%
		PY1	64.3%	66.1%	62.5%	64.1%	0.25	-1.6	2.1	0.39%
		PY2	64.3%	70.1%	62.5%	65.0%	3.3 ***	2.4	4.3	5.2%
		PY3	64.3%	71.4%	62.5%	65.0%	4.6 ***	3.6	5.6	7.1%
	Number of Primary Care E&M Office/Outpatient Visits per 1,000 Beneficiaries per Month	PY1-PY4	233.3	225.5	227.4	212.6	7.0 ***	2.8	11.1	3.0%
		PY1	233.4	232.2	227.4	222.7	3.4	-4.9	11.8	1.5%
		PY2	233.3	234.2	227.4	215.5	12.7 ***	7.1	18.4	5.5%
		PY3	233.2	219.5	227.4	208.5	5.2 *	0.51	9.9	2.2%
		PY4	233.1	211.9	227.4	200.4	5.7 **	1.2	10.3	2.5%
	Number of Specialty Care E&M Office/Outpatient Visits per 1,000 Beneficiaries per Month	PY1-PY4	438.7	430.8	426.8	420.9	-2.0	-8.4	4.4	-0.46%
		PY1	438.9	430.5	426.8	429.0	-10.5	-24.3	3.3	-2.4%
		PY2	438.8	435.0	426.8	423.0	0.03	-8.2	8.2	0.01%
		PY3	438.7	426.8	426.8	418.0	-3.0	-9.9	3.8	-0.69%
		PY4	438.6	423.0	426.8	410.9	0.36	-6.9	7.6	0.08%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Coordination of Care beyond Dialysis (cont.)	Percent of Beneficiaries Receiving Hospice Services in a Given Month	PY1-PY4	0.90%	0.87%	0.83%	0.77%	0.04	-0.02	0.09	4.2%
		PY1	0.90%	0.88%	0.83%	0.77%	0.05	-0.04	0.13	5.1%
		PY2	0.90%	0.87%	0.83%	0.78%	0.03	-0.04	0.09	2.8%
		PY3	0.90%	0.89%	0.83%	0.75%	0.08 **	0.01	0.15	8.9%
		PY4	0.90%	0.86%	0.83%	0.80%	0.004	-0.07	0.08	0.40%
	Percent of Beneficiaries with Greater than 50 mg Average Morphine Milligram Equivalent (MME) in a Given Month	PY1-PY4	6.2%	5.1%	6.0%	5.3%	-0.36 **	-0.63	-0.08	-5.8%
		PY1	6.2%	5.6%	6.0%	6.3%	-0.88 ***	-1.4	-0.38	-14.2%
		PY2	6.2%	5.6%	6.0%	5.8%	-0.34 *	-0.68	-0.01	-5.5%
		PY3	6.2%	4.6%	6.0%	4.7%	-0.26	-0.55	0.03	-4.2%
		PY4	6.2%	3.9%	6.0%	4.0%	-0.29	-0.60	0.03	-4.6%
	Percent of Beneficiaries with Greater than 80% of Days Covered for Phosphate Binder Prescription in a Given Month	PY1-PY4	34.6%	37.7%	34.8%	35.3%	2.6 ***	2.0	3.2	7.6%
		PY1	34.6%	36.9%	34.8%	36.2%	1.0 *	0.03	2.0	2.9%
		PY2	34.6%	35.6%	34.8%	35.1%	0.74 *	0.09	1.4	2.1%
		PY3	34.6%	37.4%	34.8%	35.5%	2.2 ***	1.5	2.9	6.4%
		PY4	34.6%	38.9%	34.8%	34.4%	4.8 ***	4.0	5.7	14.0%
	Percent of Beneficiaries with at Least One Contraindicated Medication Prescription Fill in a Given Month	PY1-PY4	3.5%	3.7%	3.6%	3.7%	0.08	-0.11	0.27	2.2%
		PY1	3.5%	3.7%	3.6%	3.7%	0.10	-0.24	0.45	3.0%
		PY2	3.5%	3.7%	3.6%	3.6%	0.14	-0.10	0.38	3.9%
		PY3	3.5%	3.7%	3.6%	3.7%	0.17	-0.05	0.39	4.8%
		PY4	3.5%	3.6%	3.6%	3.7%	-0.06	-0.29	0.17	-1.7%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate. ^ Includes Wave 1 PY1, PY2, PY3, Wave 2 PY2 and PY3 joiners only.

Exhibit E-23. Impact of the CEC Model on Coordination of Care beyond Dialysis, Wave 1

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Coordination of Care beyond Dialysis	Percent of Beneficiaries Receiving at Least One Low-Density Lipoprotein (LDL) Cholesterol Test in a Given Year	PY1-PY4	58.7%	61.0%	55.0%	51.7%	5.6 ***	3.6	7.7	9.6%
		PY1	58.7%	61.2%	55.0%	53.7%	3.9 **	1.0	6.8	6.7%
		PY2	58.7%	61.6%	55.0%	51.5%	6.4 ***	4.0	8.9	11.0%
		PY3	58.7%	59.8%	55.0%	50.7%	5.5 ***	3.4	7.6	9.4%
		PY4	58.7%	60.6%	55.0%	50.7%	6.3 ***	4.3	8.2	10.7%
	Percent of Beneficiaries Receiving at Least One Hemoglobin A1c (HbA1c) Test in a Given Year	PY1-PY4	78.2%	77.6%	78.3%	75.1%	2.6 ***	1.3	3.9	3.4%
		PY1	78.2%	76.0%	78.3%	75.2%	1.0	-1.0	3.1	1.3%
		PY2	78.2%	77.8%	78.3%	74.5%	3.4 ***	1.9	5.0	4.4%
		PY3	78.2%	77.2%	78.3%	74.9%	2.4 ***	1.1	3.8	3.1%
		PY4	78.2%	78.0%	78.3%	74.9%	3.2 ***	1.9	4.6	4.1%
	Percent of Diabetic Beneficiaries Receiving at Least One Dilated Eye Exam in a Given Year	PY1-PY4	39.9%	41.9%	40.4%	40.5%	2.0 ***	1.1	2.9	5.0%
		PY1	39.9%	41.3%	40.4%	41.0%	0.79	-0.55	2.1	2.0%
		PY2	39.9%	42.3%	40.4%	40.1%	2.7 ***	1.5	3.9	6.8%
		PY3	39.9%	42.1%	40.4%	40.4%	2.2 ***	1.0	3.3	5.5%
		PY4	39.9%	41.8%	40.4%	40.4%	1.9 ***	0.80	3.1	4.8%
	Percent of Beneficiaries Receiving Flu Vaccinations^	PY1-PY3	64.3%	69.2%	62.5%	63.9%	3.5 ***	2.5	4.6	5.5%
		PY1	64.3%	66.1%	62.5%	64.1%	0.25	-1.6	2.1	0.39%
		PY2	64.3%	70.8%	62.5%	65.0%	4.0 ***	2.8	5.2	6.2%
		PY3	64.3%	71.2%	62.5%	64.2%	5.3 ***	4.1	6.5	8.2%
	Number of Primary Care E&M Office/Outpatient Visits per 1,000 Beneficiaries per Month	PY1-PY4	233.3	222.0	227.4	212.7	3.4	-2.7	9.5	1.5%
		PY1	233.4	232.2	227.4	222.7	3.4	-4.9	11.8	1.5%
		PY2	233.3	230.4	227.4	215.2	9.2 **	1.7	16.8	4.0%
		PY3	233.2	214.4	227.4	208.5	0.08	-6.5	6.7	0.03%
		PY4	233.1	208.3	227.4	200.4	2.1	-4.3	8.5	0.89%
	Number of Specialty Care E&M Office/Outpatient Visits per 1,000 Beneficiaries per Month	PY1-PY4	438.7	425.0	426.8	421.0	-7.9	-18.1	2.3	-1.8%
		PY1	438.9	430.5	426.8	429.0	-10.5	-24.3	3.3	-2.4%
		PY2	438.8	431.0	426.8	422.6	-3.5	-15.6	8.5	-0.81%
		PY3	438.7	419.1	426.8	417.9	-10.7	-21.4	0.02	-2.4%
		PY4	438.6	416.2	426.8	410.9	-6.5	-17.1	4.1	-1.5%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Coordination of Care beyond Dialysis (cont.)	Percent of Beneficiaries Receiving Hospice Services in a Given Month	PY1-PY4	0.90%	0.86%	0.83%	0.77%	0.02	-0.04	0.09	2.5%
		PY1	0.90%	0.88%	0.83%	0.77%	0.05	-0.04	0.13	5.1%
		PY2	0.90%	0.83%	0.83%	0.78%	-0.02	-0.10	0.07	-2.0%
		PY3	0.90%	0.87%	0.83%	0.75%	0.06	-0.03	0.14	6.1%
		PY4	0.90%	0.86%	0.83%	0.80%	0.004	-0.09	0.10	0.42%
	Percent of Beneficiaries with Greater than 50 mg Average Morphine Milligram Equivalent (MME) in a Given Month	PY1-PY4	6.2%	4.9%	6.0%	5.3%	-0.61 ***	-0.98	-0.24	-9.8%
		PY1	6.2%	5.6%	6.0%	6.3%	-0.88 ***	-1.4	-0.38	-14.2%
		PY2	6.2%	5.2%	6.0%	5.8%	-0.70 ***	-1.1	-0.26	-11.3%
		PY3	6.2%	4.4%	6.0%	4.7%	-0.44 *	-0.84	-0.04	-7.1%
		PY4	6.2%	3.7%	6.0%	4.0%	-0.48 *	-0.89	-0.07	-7.7%
	Percent of Beneficiaries with Greater than 80% of Days Covered for Phosphate Binder Prescription in a Given Month	PY1-PY4	34.6%	37.1%	34.8%	35.4%	2.0 ***	1.2	2.9	5.9%
		PY1	34.6%	36.9%	34.8%	36.2%	1.0 *	0.03	2.0	2.9%
		PY2	34.6%	36.0%	34.8%	35.1%	1.1 **	0.24	2.1	3.3%
		PY3	34.6%	37.2%	34.8%	35.5%	2.1 ***	1.1	3.0	6.0%
		PY4	34.6%	37.7%	34.8%	34.4%	3.6 ***	2.4	4.8	10.4%
	Percent of Beneficiaries with at Least One Contraindicated Medication Prescription Fill in a Given Month	PY1-PY4	3.5%	3.8%	3.6%	3.7%	0.15	-0.12	0.42	4.3%
		PY1	3.5%	3.7%	3.6%	3.7%	0.10	-0.24	0.45	3.0%
		PY2	3.5%	3.8%	3.6%	3.6%	0.28	-0.05	0.61	7.9%
		PY3	3.5%	3.8%	3.6%	3.7%	0.17	-0.13	0.47	5.0%
		PY4	3.5%	3.7%	3.6%	3.7%	0.07	-0.25	0.38	1.9%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate. ^ Includes Wave 1 PY1, PY2, PY3, Wave 2 PY2 and PY3 joiners only.

Exhibit E-24. Impact of the CEC Model on Coordination of Care beyond Dialysis, Wave 2

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Coordination of Care beyond Dialysis	Percent of Beneficiaries Receiving at Least One Low-Density Lipoprotein (LDL) Cholesterol Test in a Given Year	PY2-PY4	58.4%	54.8%	54.7%	51.0%	0.16	-1.3	1.6	0.28%
		PY2	58.3%	51.9%	54.7%	51.5%	-3.2 ***	-5.2	-1.3	-5.5%
		PY3	58.3%	54.8%	54.7%	50.7%	0.51	-1.1	2.1	0.88%
		PY4	58.3%	56.4%	54.7%	50.9%	1.8 *	0.20	3.4	3.1%
	Percent of Beneficiaries Receiving at Least One Hemoglobin A1c (HbA1c) Test in a Given Year	PY2-PY4	77.5%	76.0%	77.6%	75.0%	1.1 *	0.13	2.1	1.4%
		PY2	77.4%	75.5%	77.5%	74.5%	1.1	-0.21	2.5	1.5%
		PY3	77.4%	75.8%	77.5%	74.9%	1.0	-0.02	2.1	1.4%
		PY4	77.4%	76.7%	77.5%	75.7%	1.1 *	0.04	2.2	1.5%
	Percent of Diabetic Beneficiaries Receiving at Least One Dilated Eye Exam in a Given Year	PY2-PY4	40.1%	40.4%	40.6%	40.3%	0.61	-0.19	1.4	1.5%
		PY2	40.1%	39.5%	40.6%	40.1%	-0.11	-1.3	1.0	-0.27%
		PY3	40.1%	41.5%	40.6%	40.4%	1.6 **	0.55	2.6	3.9%
		PY4	40.1%	40.0%	40.6%	40.3%	0.15	-0.83	1.1	0.36%
	Percent of Beneficiaries Receiving Flu Vaccinations^	PY2-PY3	64.3%	69.9%	62.6%	64.6%	3.6 ***	2.5	4.6	5.5%
		PY2	64.3%	69.5%	62.6%	65.0%	2.7 ***	1.5	3.9	4.2%
		PY3	64.3%	70.0%	62.6%	64.2%	4.1 ***	2.9	5.3	6.4%
	Number of Primary Care E&M Office/Outpatient Visits per 1,000 Beneficiaries per Month	PY2-PY4	223.3	224.4	217.5	208.3	10.5 ***	5.4	15.5	4.7%
		PY2	223.4	237.6	217.5	215.6	16.2 ***	9.0	23.4	7.3%
		PY3	223.3	223.4	217.5	208.6	9.1 ***	3.4	14.8	4.1%
		PY4	223.2	214.5	217.5	200.6	8.4 **	2.8	14.0	3.8%
	Number of Specialty Care E&M Office/Outpatient Visits per 1,000 Beneficiaries per Month	PY2-PY4	435.7	433.2	423.9	417.4	4.0	-3.2	11.1	0.91%
		PY2	435.8	438.5	423.9	423.1	3.5	-6.8	13.8	0.81%
		PY3	435.7	432.6	423.9	418.0	2.8	-5.0	10.6	0.64%
		PY4	435.6	427.9	423.9	411.0	5.3	-3.2	13.7	1.2%
	Percent of Beneficiaries Receiving Hospice Services in a Given Month	PY2-PY4	0.85%	0.89%	0.78%	0.77%	0.05	-0.01	0.12	6.4%
		PY2	0.85%	0.91%	0.78%	0.78%	0.07	-0.02	0.15	7.9%
		PY3	0.85%	0.91%	0.78%	0.75%	0.10 **	0.02	0.18	11.7%
		PY4	0.85%	0.86%	0.78%	0.80%	0.004	-0.08	0.08	0.42%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Coordination of Care beyond Dialysis (cont.)	Percent of Beneficiaries with Greater than 50 mg Average Morphine Milligram Equivalent (MME) in a Given Month	PY2-PY4	6.3%	4.9%	6.1%	4.8%	-0.10	-0.40	0.20	-1.6%
		PY2	6.3%	5.9%	6.1%	5.8%	0.01	-0.38	0.40	0.18%
		PY3	6.3%	4.7%	6.1%	4.7%	-0.12	-0.45	0.20	-2.0%
		PY4	6.3%	4.0%	6.1%	4.0%	-0.15	-0.49	0.19	-2.4%
	Percent of Beneficiaries with Greater than 80% of Days Covered for Phosphate Binder Prescription in a Given Month	PY2-PY4	36.1%	37.9%	36.4%	35.0%	3.2 ***	2.5	3.9	8.9%
		PY2	36.1%	35.2%	36.4%	35.1%	0.33	-0.42	1.1	0.91%
		PY3	36.1%	37.5%	36.4%	35.5%	2.3 ***	1.6	3.1	6.5%
		PY4	36.1%	39.8%	36.4%	34.4%	5.7 ***	4.8	6.6	15.8%
	Percent of Beneficiaries with at Least One Contraindicated Medication Prescription Fill in a Given Month	PY2-PY4	3.6%	3.6%	3.7%	3.7%	-0.001	-0.22	0.22	-0.02%
		PY2	3.6%	3.5%	3.7%	3.6%	-0.01	-0.30	0.28	-0.21%
		PY3	3.6%	3.7%	3.7%	3.7%	0.16	-0.09	0.42	4.4%
		PY4	3.6%	3.5%	3.7%	3.7%	-0.15	-0.40	0.11	-4.0%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate. ^ Includes Wave 1 PY1, PY2, PY3, Wave 2 PY2 and PY3 joiners only.

Exhibit E-25. Impact of the CEC Model on Hospitalizations and Emergency Department (ED) Visits, All ESCOs

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Hospitalizations and Emergency Department Visits	Number of Hospitalizations per 1,000 Beneficiaries per Month	PY1-PY4	133.0	130.1	131.6	132.8	-4.2 ***	-6.3	-2.0	-3.1%
		PY1	133.0	125.5	131.6	131.7	-7.6 ***	-11.7	-3.5	-5.7%
		PY2	133.0	129.1	131.6	133.0	-5.3 ***	-8.0	-2.5	-4.0%
		PY3	133.0	131.4	131.6	133.9	-3.8 **	-6.4	-1.3	-2.9%
		PY4	133.0	132.1	131.6	133.2	-2.5	-5.2	0.19	-1.9%
	Number of ED Visits per 1,000 Beneficiaries per Month	PY1-PY4	141.7	153.1	149.2	161.3	-0.67	-3.6	2.3	-0.47%
		PY1	141.8	147.4	149.2	157.9	-3.1	-9.1	3.0	-2.2%
		PY2	141.6	156.9	149.2	163.1	1.3	-2.7	5.3	0.94%
		PY3	141.7	153.4	149.2	161.5	-0.66	-4.1	2.8	-0.47%
		PY4	141.6	155.1	149.2	163.9	-1.2	-4.8	2.4	-0.85%
	Number of Observation Stays per 1,000 Beneficiaries per Month	PY1-PY4	25.7	27.2	24.0	26.7	-1.2 **	-2.2	-0.24	-4.7%
		PY1	25.7	28.1	24.0	26.1	0.30	-1.6	2.2	1.2%
		PY2	25.7	26.5	24.0	26.5	-1.8 **	-3.0	-0.52	-6.9%
		PY3	25.7	27.2	24.0	26.8	-1.4 *	-2.5	-0.17	-5.3%
		PY4	25.7	28.0	24.0	27.5	-1.2	-2.4	0.02	-4.5%
	Number of Endocrine/ Metabolic Inpatient Hospitalizations per 1,000 Beneficiaries per Month	PY1-PY4	16.6	14.5	15.9	14.1	-0.29	-0.77	0.20	-1.7%
		PY1	16.6	13.5	15.9	13.3	-0.44	-1.3	0.38	-2.7%
		PY2	16.6	14.6	15.9	14.4	-0.52	-1.2	0.15	-3.2%
		PY3	16.6	14.8	15.9	14.5	-0.42	-1.1	0.24	-2.6%
		PY4	16.6	15.4	15.9	14.6	0.06	-0.64	0.77	0.39%
	Number of Circulatory Inpatient Hospitalizations per 1,000 Beneficiaries per Month	PY1-PY4	38.2	41.2	37.4	42.4	-1.9 ***	-2.8	-0.94	-4.9%
		PY1	38.1	37.8	37.4	40.6	-3.5 ***	-5.1	-1.82	-9.1%
		PY2	38.2	41.3	37.4	42.9	-2.3 ***	-3.5	-1.11	-6.1%
		PY3	38.2	42.3	37.4	43.8	-2.3 ***	-3.5	-1.08	-6.0%
		PY4	38.2	42.9	37.4	42.8	-0.67	-1.9	0.58	-1.8%
	Number of Infectious Inpatient Hospitalizations per 1,000 Beneficiaries per Month	PY1-PY4	14.2	14.6	15.3	16.2	-0.54 *	-1.0	-0.08	-3.8%
		PY1	14.2	13.8	15.3	15.7	-0.87 *	-1.7	0.00	-6.1%
		PY2	14.2	14.4	15.3	16.4	-0.86 **	-1.5	-0.22	-6.1%
		PY3	14.2	15.1	15.3	16.7	-0.50	-1.1	0.11	-3.5%
		PY4	14.2	14.8	15.3	16.10	-0.26	-0.88	0.36	-1.8%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Hospitalizations and Emergency Department Visits (cont.)	Percent of Beneficiaries with at Least One Hospitalization for Vascular Access Complications in a Given Month	PY1-PY4	0.59%	0.60%	0.62%	0.66%	-0.03 *	-0.06	-0.001	-5.1%
		PY1	0.59%	0.58%	0.62%	0.65%	-0.04	-0.10	0.02	-7.4%
		PY2	0.59%	0.59%	0.62%	0.64%	-0.01	-0.05	0.03	-1.9%
		PY3	0.59%	0.61%	0.62%	0.66%	-0.03	-0.07	0.01	-5.0%
		PY4	0.59%	0.64%	0.62%	0.71%	-0.04	-0.08	0.0005	-6.5%
	Percent of Beneficiaries with at Least One Hospitalization for ESRD Complications in a Given Month	PY1-PY4	1.8%	2.0%	1.7%	2.0%	-0.11 ***	-0.17	-0.05	-6.0%
		PY1	1.8%	1.7%	1.7%	1.8%	-0.18 ***	-0.28	-0.08	-9.9%
		PY2	1.8%	2.0%	1.7%	2.1%	-0.15 ***	-0.23	-0.07	-8.3%
		PY3	1.8%	2.2%	1.7%	2.2%	-0.12 **	-0.19	-0.04	-6.4%
		PY4	1.8%	2.2%	1.7%	2.2%	-0.05	-0.13	0.03	-2.8%
	Percent of Beneficiaries with at Least One Hospitalization for Catheter-related Bloodstream Infection in a Given Month	PY1-PY4	0.14%	0.09%	0.15%	0.10%	-0.002	-0.01	0.01	-1.2%
		PY1	0.14%	0.07%	0.15%	0.09%	-0.01	-0.03	0.01	-7.2%
		PY2	0.14%	0.09%	0.15%	0.10%	0.004	-0.01	0.02	2.6%
		PY3	0.14%	0.09%	0.15%	0.10%	-0.001	-0.02	0.01	-0.96%
		PY4	0.14%	0.12%	0.15%	0.13%	-0.003	-0.02	0.01	-1.9%
	Percent of Beneficiaries with at Least One Hospitalization for Sepsis in a Given Month	PY1-PY4	1.1%	1.2%	1.3%	1.4%	-0.05 *	-0.09	-0.01	-4.3%
		PY1	1.1%	1.1%	1.3%	1.3%	-0.06	-0.14	0.02	-5.4%
		PY2	1.1%	1.2%	1.3%	1.4%	-0.07 **	-0.13	-0.01	-6.2%
		PY3	1.1%	1.3%	1.3%	1.5%	-0.05	-0.11	0.01	-4.5%
		PY4	1.1%	1.3%	1.3%	1.4%	-0.03	-0.09	0.03	-2.4%
	Percent of Beneficiaries with at Least One Hospitalization for Peritonitis in a Given Month	PY1-PY4	0.10%	0.09%	0.09%	0.08%	0.001	-0.01	0.01	1.1%
		PY1	0.10%	0.11%	0.09%	0.10%	0.01	-0.004	0.03	14.6%
		PY2	0.10%	0.09%	0.09%	0.09%	-0.00002	-0.01	0.01	-0.02%
		PY3	0.10%	0.08%	0.09%	0.07%	0.003	-0.01	0.02	3.1%
		PY4	0.10%	0.08%	0.09%	0.08%	-0.004	-0.02	0.01	-4.4%
	Percent of Beneficiaries with at Least One Admission for Diabetes Complications in a Given Month	PY1-PY4	0.88%	0.82%	0.87%	0.80%	0.002	-0.04	0.04	0.28%
		PY1	0.88%	0.70%	0.87%	0.67%	0.01	-0.05	0.08	1.6%
		PY2	0.88%	0.84%	0.87%	0.86%	-0.04	-0.09	0.02	-4.3%
		PY3	0.88%	0.86%	0.87%	0.86%	-0.02	-0.07	0.03	-2.2%
		PY4	0.88%	0.93%	0.87%	0.86%	0.05	-0.01	0.10	5.3%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Hospitalizations and Emergency Department Visits (cont.)	Percent of Beneficiaries with at Least One Admission for Congestive Heart Failure (CHF) in a Given Month	PY1-PY4	1.5%	1.8%	1.5%	1.9%	-0.13 ***	-0.20	-0.07	-8.8%
		PY1	1.5%	1.4%	1.5%	1.6%	-0.22 ***	-0.33	-0.11	-14.6%
		PY2	1.5%	1.9%	1.5%	2.1%	-0.21 ***	-0.30	-0.12	-13.7%
		PY3	1.5%	2.0%	1.5%	2.1%	-0.13 **	-0.21	-0.04	-8.3%
		PY4	1.5%	2.0%	1.5%	2.0%	-0.06	-0.15	0.03	-4.3%
	Percent of Beneficiaries with at Least One Readmission within 30-days of an Index Hospitalization Stay in a Given Month~	PY1-PY4	29.9%	29.3%	29.6%	29.9%	-0.81 *** ‡	-1.3	-0.34	-2.7%
		PY1	29.9%	28.7%	29.6%	29.5%	-1.0 *	-1.9	-0.14	-3.4%
		PY2	29.9%	29.2%	29.6%	30.0%	-1.1 *** ‡	-1.7	-0.40	-3.6%
		PY3	29.9%	29.6%	29.6%	30.2%	-0.82 ** ‡	-1.5	-0.17	-2.7%
		PY4	29.9%	29.9%	29.6%	30.1%	-0.48 ‡	-1.2	0.22	-1.6%
	Percent of Beneficiaries with at Least One ED Visit within 30-days of an Acute Hospitalization in a Given Month	PY1-PY4	20.1%	21.6%	20.9%	22.3%	0.06	-0.34	0.45	0.28%
		PY1	20.1%	21.1%	20.9%	21.8%	0.05	-0.69	0.79	0.24%
		PY2	20.1%	21.8%	20.9%	22.4%	0.19	-0.37	0.75	0.96%
		PY3	20.1%	21.8%	20.9%	22.5%	0.04	-0.49	0.57	0.22%
		PY4	20.1%	22.0%	20.9%	22.8%	-0.03	-0.59	0.54	-0.13%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ~ Readmission drops the last quarter of intervention data to account for a lag in claims to prevent an underestimation due to a lack of claims maturity. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

Exhibit E-26. Impact of the CEC Model on Hospitalizations and Emergency Department (ED) Visits, Wave 1

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Hospitalizations and Emergency Department Visits	Number of Hospitalizations per 1,000 Beneficiaries per Month	PY1-PY4	133.0	127.8	131.6	132.8	-6.4 ***	-9.6	-3.2	-4.8%
		PY1	133.0	125.5	131.6	131.7	-7.6 ***	-11.7	-3.5	-5.7%
		PY2	133.0	127.3	131.6	133.0	-7.1 ***	-11.0	-3.3	-5.4%
		PY3	133.0	129.5	131.6	133.9	-5.8 ***	-9.3	-2.2	-4.3%
		PY4	133.0	129.2	131.6	133.2	-5.4 **	-9.2	-1.6	-4.1%
	Number of ED Visits per 1,000 Beneficiaries per Month	PY1-PY4	141.7	151.8	149.2	161.3	-2.0	-6.5	2.5	-1.4%
		PY1	141.8	147.4	149.2	157.9	-3.1	-9.1	3.0	-2.2%
		PY2	141.6	154.9	149.2	163.2	-0.76	-6.4	4.9	-0.54%
		PY3	141.7	153.1	149.2	161.6	-0.94	-6.1	4.2	-0.66%
		PY4	141.6	153.2	149.2	163.8	-3.0	-8.2	2.1	-2.1%
	Number of Observation Stays per 1,000 Beneficiaries per Month	PY1-PY4	25.7	28.2	24.0	26.7	-0.21	-1.6	1.2	-0.82%
		PY1	25.7	28.1	24.0	26.1	0.30	-1.6	2.2	1.2%
		PY2	25.7	28.0	24.0	26.5	-0.30	-2.0	1.4	-1.2%
		PY3	25.7	28.2	24.0	26.8	-0.32	-2.0	1.4	-1.3%
		PY4	25.7	28.8	24.0	27.5	-0.45	-2.2	1.3	-1.8%
	Number of Endocrine/ Metabolic Inpatient Hospitalizations per 1,000 Beneficiaries per Month	PY1-PY4	16.6	14.3	15.9	14.1	-0.47	-1.1	0.15	-2.8%
		PY1	16.6	13.5	15.9	13.3	-0.44	-1.3	0.38	-2.7%
		PY2	16.6	14.8	15.9	14.4	-0.30	-1.2	0.58	-1.8%
		PY3	16.6	14.6	15.9	14.5	-0.63	-1.5	0.24	-3.8%
		PY4	16.6	14.9	15.9	14.6	-0.48	-1.3	0.38	-2.9%
	Number of Circulatory Inpatient Hospitalizations per 1,000 Beneficiaries per Month	PY1-PY4	38.2	40.2	37.4	42.4	-2.8 ***	-4.1	-1.6	-7.4%
		PY1	38.1	37.8	37.4	40.6	-3.5 ***	-5.1	-1.8	-9.1%
		PY2	38.2	40.6	37.4	42.9	-3.1 ***	-4.7	-1.5	-8.1%
		PY3	38.2	41.2	37.4	43.8	-3.4 ***	-4.9	-1.8	-8.8%
		PY4	38.2	41.9	37.4	42.9	-1.6 *	-3.2	-0.01	-4.3%
	Number of Infectious Inpatient Hospitalizations per 1,000 Beneficiaries per Month	PY1-PY4	14.2	14.3	15.3	16.2	-0.80 **	-1.4	-0.17	-5.6%
		PY1	14.2	13.8	15.3	15.7	-0.87 *	-1.7	0.00	-6.1%
		PY2	14.2	14.4	15.3	16.4	-0.89 *	-1.7	-0.06	-6.2%
		PY3	14.2	14.9	15.3	16.7	-0.62	-1.4	0.18	-4.4%
		PY4	14.2	14.2	15.3	16.1	-0.84 *	-1.7	-0.02	-5.9%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Hospitalizations and Emergency Department Visits (cont.)	Percent of Beneficiaries with at Least One Hospitalization for Vascular Access Complications in a Given Month	PY1-PY4	0.59%	0.60%	0.62%	0.66%	-0.04	-0.08	0.01	-6.2%
		PY1	0.59%	0.58%	0.62%	0.65%	-0.04	-0.10	0.02	-7.4%
		PY2	0.59%	0.58%	0.62%	0.64%	-0.03	-0.09	0.02	-5.3%
		PY3	0.59%	0.60%	0.62%	0.66%	-0.04	-0.09	0.01	-6.7%
		PY4	0.59%	0.64%	0.62%	0.71%	-0.03	-0.09	0.02	-5.5%
	Percent of Beneficiaries with at Least One Hospitalization for ESRD Complications in a Given Month	PY1-PY4	1.8%	2.0%	1.7%	2.0%	-0.16 ***	-0.24	-0.08	-8.7%
		PY1	1.8%	1.7%	1.7%	1.8%	-0.18 ***	-0.28	-0.08	-9.9%
		PY2	1.8%	2.0%	1.7%	2.1%	-0.18 ***	-0.29	-0.08	-10.1%
		PY3	1.8%	2.1%	1.7%	2.2%	-0.15 **	-0.26	-0.05	-8.4%
		PY4	1.8%	2.1%	1.7%	2.2%	-0.12 **	-0.23	-0.02	-6.8%
	Percent of Beneficiaries with at Least One Hospitalization for Catheter-related Bloodstream Infection in a Given Month	PY1-PY4	0.14%	0.09%	0.15%	0.10%	-0.004	-0.02	0.01	-2.9%
		PY1	0.14%	0.07%	0.15%	0.09%	-0.01	-0.03	0.01	-7.2%
		PY2	0.14%	0.08%	0.15%	0.10%	-0.003	-0.02	0.01	-2.1%
		PY3	0.14%	0.09%	0.15%	0.10%	0.0002	-0.02	0.02	0.13%
		PY4	0.14%	0.12%	0.15%	0.13%	-0.004	-0.02	0.02	-3.1%
	Percent of Beneficiaries with at Least One Hospitalization for Sepsis in a Given Month	PY1-PY4	1.1%	1.2%	1.3%	1.4%	-0.07 *	-0.13	-0.01	-5.9%
		PY1	1.1%	1.1%	1.3%	1.3%	-0.06	-0.14	0.02	-5.4%
		PY2	1.1%	1.2%	1.3%	1.4%	-0.08 *	-0.15	0.00	-6.7%
		PY3	1.1%	1.3%	1.3%	1.5%	-0.06	-0.13	0.01	-5.1%
		PY4	1.1%	1.2%	1.3%	1.4%	-0.07	-0.15	0.01	-6.3%
	Percent of Beneficiaries with at Least One Hospitalization for Peritonitis in a Given Month	PY1-PY4	0.10%	0.10%	0.09%	0.09%	0.01	-0.004	0.02	7.1%
		PY1	0.10%	0.11%	0.09%	0.10%	0.01	-0.004	0.03	14.6%
		PY2	0.10%	0.09%	0.09%	0.09%	0.01	-0.01	0.02	6.5%
		PY3	0.10%	0.08%	0.09%	0.07%	0.01	-0.01	0.02	7.2%
		PY4	0.10%	0.08%	0.09%	0.08%	0.001	-0.01	0.02	1.4%
	Percent of Beneficiaries with at Least One Admission for Diabetes Complications in a Given Month	PY1-PY4	0.88%	0.83%	0.87%	0.80%	0.01	-0.04	0.06	1.2%
		PY1	0.88%	0.70%	0.87%	0.67%	0.01	-0.05	0.08	1.6%
		PY2	0.88%	0.86%	0.87%	0.86%	-0.01	-0.09	0.06	-1.6%
		PY3	0.88%	0.88%	0.87%	0.86%	-0.0003	-0.07	0.07	-0.04%
		PY4	0.88%	0.92%	0.87%	0.86%	0.04	-0.03	0.11	4.3%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Hospitalizations and Emergency Department Visits (cont.)	Percent of Beneficiaries with at Least One Admission for Congestive Heart Failure (CHF) in a Given Month	PY1-PY4	1.5%	1.7%	1.5%	1.9%	-0.18 ***	-0.27	-0.10	-12.1%
		PY1	1.5%	1.4%	1.5%	1.6%	-0.22 ***	-0.33	-0.11	-14.6%
		PY2	1.5%	1.8%	1.5%	2.1%	-0.30 ***	-0.42	-0.18	-19.7%
		PY3	1.5%	1.9%	1.5%	2.1%	-0.19 ***	-0.30	-0.07	-12.2%
		PY4	1.5%	2.0%	1.5%	2.0%	-0.06	-0.18	0.06	-4.1%
	Percent of Beneficiaries with at Least One Readmission within 30-days of an Index Hospitalization Stay in a Given Month~	PY1-PY4	29.9%	29.3%	29.6%	29.9%	-0.88 **	-1.5	-0.27	-2.9%
		PY1	29.9%	28.7%	29.6%	29.5%	-1.0 *	-1.9	-0.14	-3.4%
		PY2	29.9%	29.1%	29.6%	30.0%	-1.1 **	-1.9	-0.23	-3.7%
		PY3	29.9%	29.3%	29.6%	30.2%	-1.1 **	-1.9	-0.24	-3.5%
		PY4	29.9%	30.1%	29.6%	30.1%	-0.25	-1.1	0.64	-0.85%
	Percent of Beneficiaries with at Least One ED Visit within 30-days of an Acute Hospitalization in a Given Month	PY1-PY4	20.1%	21.6%	20.9%	22.3%	0.07	-0.44	0.59	0.37%
		PY1	20.1%	21.1%	20.9%	21.8%	0.05	-0.69	0.79	0.24%
		PY2	20.1%	21.6%	20.9%	22.4%	0.003	-0.72	0.73	0.02%
		PY3	20.1%	21.8%	20.9%	22.5%	0.10	-0.60	0.79	0.48%
		PY4	20.1%	22.2%	20.9%	22.8%	0.14	-0.59	0.87	0.69%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ~ Readmission drops the last quarter of intervention data to account for a lag in claims to prevent an underestimation due to a lack of claims maturity. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

Exhibit E-27. Impact of the CEC Model on Hospitalizations and Emergency Department (ED) Visits, Wave 2

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Hospitalizations and Emergency Department Visits	Number of Hospitalizations per 1,000 Beneficiaries per Month	PY2-PY4	132.9	132.9	131.5	133.4	-1.8	-4.2	0.51	-1.4%
		PY2	132.9	131.0	131.5	133.0	-3.4 *	-6.8	-0.13	-2.6%
		PY3	132.9	132.9	131.5	133.9	-2.4	-5.3	0.51	-1.8%
		PY4	132.9	134.2	131.5	133.2	-0.40	-3.3	2.5	-0.30%
	Number of ED Visits per 1,000 Beneficiaries per Month	PY2-PY4	152.0	155.9	159.8	163.1	0.66	-2.6	3.9	0.43%
		PY2	152.0	158.9	159.8	163.4	3.4	-1.6	8.4	2.2%
		PY3	152.1	153.6	159.8	161.8	-0.46	-4.4	3.5	-0.30%
		PY4	152.0	156.4	159.8	164.1	0.11	-3.9	4.1	0.07%
	Number of Observation Stays per 1,000 Beneficiaries per Month	PY2-PY4	28.4	26.5	26.6	26.8	-2.2 ***	-3.3	-1.1	-7.7%
		PY2	28.4	25.1	26.6	26.4	-3.1 ***	-4.7	-1.6	-11.0%
		PY3	28.4	26.4	26.6	26.7	-2.1 **	-3.5	-0.74	-7.4%
		PY4	28.4	27.6	26.6	27.4	-1.7 **	-3.0	-0.34	-5.8%
	Number of Endocrine/Metabolic Inpatient Hospitalizations per 1,000 Beneficiaries per Month	PY2-PY4	14.3	15.1	13.6	14.5	-0.10	-0.70	0.49	-0.71%
		PY2	14.3	14.3	13.6	14.4	-0.74	-1.6	0.10	-5.2%
		PY3	14.3	14.9	13.6	14.5	-0.27	-1.0	0.49	-1.9%
		PY4	14.3	15.8	13.6	14.7	0.46	-0.35	1.3	3.2%
	Number of Circulatory Inpatient Hospitalizations per 1,000 Beneficiaries per Month	PY2-PY4	41.2	43.0	40.4	43.2	-0.91	-2.0	0.19	-2.2%
		PY2	41.2	42.1	40.4	42.9	-1.6 *	-3.1	-0.11	-3.9%
		PY3	41.2	43.1	40.4	43.8	-1.5 *	-2.9	-0.09	-3.6%
		PY4	41.2	43.6	40.4	42.8	0.02	-1.4	1.4	0.05%
	Number of Infectious Inpatient Hospitalizations per 1,000 Beneficiaries per Month	PY2-PY4	14.4	15.0	15.5	16.4	-0.28	-0.82	0.25	-2.0%
		PY2	14.4	14.5	15.5	16.4	-0.83 *	-1.6	-0.02	-5.8%
		PY3	14.4	15.2	15.5	16.7	-0.41	-1.1	0.28	-2.8%
		PY4	14.4	15.2	15.5	16.1	0.16	-0.53	0.85	1.1%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Hospitalizations and Emergency Department Visits (cont.)	Percent of Beneficiaries with at Least One Hospitalization for Vascular Access Complications in a Given Month	PY2-PY4	0.65%	0.62%	0.68%	0.67%	-0.02	-0.06	0.01	-3.6%
		PY2	0.65%	0.61%	0.68%	0.64%	0.01	-0.04	0.06	1.2%
		PY3	0.65%	0.61%	0.68%	0.66%	-0.02	-0.06	0.02	-3.4%
		PY4	0.65%	0.63%	0.68%	0.71%	-0.04	-0.09	0.001	-6.5%
	Percent of Beneficiaries with at Least One Hospitalization for ESRD Complications in a Given Month	PY2-PY4	1.9%	2.2%	1.8%	2.2%	-0.06	-0.13	0.01	-3.2%
		PY2	1.9%	2.1%	1.8%	2.1%	-0.12 *	-0.22	-0.02	-6.1%
		PY3	1.9%	2.2%	1.8%	2.2%	-0.09	-0.18	0.003	-4.6%
		PY4	1.9%	2.3%	1.8%	2.2%	-0.0001	-0.09	0.09	-0.004%
	Percent of Beneficiaries with at Least One Hospitalization for Catheter-related Bloodstream Infection in a Given Month	PY2-PY4	0.09%	0.10%	0.10%	0.11%	0.001	-0.01	0.01	1.0%
		PY2	0.09%	0.09%	0.10%	0.10%	0.01	-0.01	0.03	11.7%
		PY3	0.09%	0.09%	0.10%	0.10%	-0.003	-0.02	0.01	-2.9%
		PY4	0.09%	0.12%	0.10%	0.13%	-0.002	-0.02	0.01	-1.8%
	Percent of Beneficiaries with at Least One Hospitalization for Sepsis in a Given Month	PY2-PY4	1.2%	1.3%	1.3%	1.4%	-0.03	-0.08	0.02	-2.6%
		PY2	1.2%	1.2%	1.3%	1.4%	-0.06	-0.14	0.01	-5.5%
		PY3	1.2%	1.3%	1.3%	1.5%	-0.05	-0.11	0.02	-3.9%
		PY4	1.2%	1.3%	1.3%	1.4%	0.004	-0.06	0.07	0.31%
	Percent of Beneficiaries with at Least One Hospitalization for Peritonitis in a Given Month	PY2-PY4	0.10%	0.08%	0.10%	0.08%	-0.005	-0.01	0.01	-4.9%
		PY2	0.10%	0.08%	0.10%	0.09%	-0.01	-0.02	0.01	-6.3%
		PY3	0.10%	0.08%	0.10%	0.07%	-0.0001	-0.01	0.01	-0.06%
		PY4	0.10%	0.07%	0.10%	0.08%	-0.01	-0.02	0.01	-8.5%
	Percent of Beneficiaries with at Least One Admission for Diabetes Complications in a Given Month	PY2-PY4	0.75%	0.87%	0.73%	0.86%	-0.01	-0.05	0.04	-0.78%
		PY2	0.75%	0.82%	0.73%	0.86%	-0.06	-0.13	0.01	-8.3%
		PY3	0.75%	0.84%	0.73%	0.86%	-0.03	-0.09	0.03	-4.5%
		PY4	0.75%	0.93%	0.73%	0.86%	0.05	-0.01	0.11	7.0%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Hospitalizations and Emergency Department Visits (cont.)	Percent of Beneficiaries with at Least One Admission for Congestive Heart Failure (CHF) in a Given Month	PY2-PY4	1.7%	2.0%	1.7%	2.1%	-0.08 *	-0.16	-0.01	-4.9%
		PY2	1.7%	2.0%	1.7%	2.1%	-0.12 *	-0.24	-0.004	-7.0%
		PY3	1.7%	2.0%	1.7%	2.1%	-0.08	-0.18	0.02	-4.7%
		PY4	1.7%	2.0%	1.7%	2.0%	-0.07	-0.17	0.04	-3.9%
	Percent of Beneficiaries with at Least One Readmission within 30-days of an Index Hospitalization Stay in a Given Month~	PY2-PY4	29.7%	29.6%	29.5%	30.1%	-0.74 ** ‡	-1.3	-0.18	-2.5%
		PY2	29.7%	29.2%	29.5%	30.0%	-1.1 ** ‡	-1.9	-0.22	-3.5%
		PY3	29.7%	29.8%	29.5%	30.2%	-0.63 ‡	-1.4	0.10	-2.1%
		PY4	29.7%	29.7%	29.5%	30.1%	-0.63 ‡	-1.4	0.15	-2.1%
	Percent of Beneficiaries with at Least One ED Visit within 30-days of an Acute Hospitalization in a Given Month	PY2-PY4	21.1%	21.8%	21.9%	22.6%	0.04	-0.42	0.50	0.19%
		PY2	21.1%	22.0%	21.9%	22.4%	0.38	-0.32	1.1	1.8%
		PY3	21.1%	21.7%	21.9%	22.5%	0.004	-0.61	0.61	0.02%
		PY4	21.1%	21.9%	21.9%	22.8%	-0.14	-0.79	0.51	-0.66%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ~ Readmission drops the last quarter of intervention data to account for a lag in claims to prevent an underestimation due to a lack of claims maturity. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

Exhibit E-28. Impact of the CEC Model on Medicare Payments across the Continuum of Care, All ESCOs

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Medicare Spending across the Continuum of Care	Total Part A and Part B PBPM	PY1-PY4	$6,394	$6,530	$6,378	$6,594	-$80 **	-$133	-$26	-1.2%
		PY1	$6,394	$6,271	$6,378	$6,405	-$150 **	-$255	-$44	-2.3%
		PY2	$6,394	$6,313	$6,378	$6,414	-$117 ***	-$185	-$49	-1.8%
		PY3	$6,394	$6,705	$6,378	$6,747	-$58	-$120	$4	-0.90%
		PY4	$6,394	$6,835	$6,378	$6,871	-$51	-$115	$12	-0.81%
	Acute Inpatient PBPM	PY1-PY4	$1,664	$1,693	$1,666	$1,747	-$51 ***	-$78	-$24	-3.1%
		PY1	$1,664	$1,633	$1,666	$1,728	-$93 ***	-$145	-$42	-5.6%
		PY2	$1,664	$1,652	$1,666	$1,732	-$77 ***	-$112	-$41	-4.6%
		PY3	$1,664	$1,718	$1,666	$1,757	-$36 *	-$70	-$2	-2.2%
		PY4	$1,664	$1,740	$1,666	$1,775	-$33	-$68	$3	-2.0%
	Readmissions PBPM~	PY1-PY4	$585	$592	$582	$617	-$27 ***	-$44	-$10	-4.6%
		PY1	$585	$559	$582	$604	-$47 **	-$78	-$17	-8.1%
		PY2	$585	$575	$582	$608	-$35 ***	-$57	-$13	-6.0%
		PY3	$585	$615	$582	$629	-$16	-$38	$5	-2.8%
		PY4	$585	$615	$582	$635	-$23	-$47	$0	-4.0%
	Institutional Post-Acute Care PBPM	PY1-PY4	$556	$537	$548	$550	-$21	-$42	$0	-3.7%
		PY1	$556	$526	$548	$561	-$43 *	-$84	-$2	-7.8%
		PY2	$556	$531	$548	$547	-$25	-$51	$1	-4.5%
		PY3	$556	$536	$548	$534	-$6	-$30	$18	-1.1%
		PY4	$555	$534	$548	$551	-$24	-$48	$0	-4.3%
	Home Health PBPM	PY1-PY4	$173	$170	$170	$166	$0	-$5	$5	0.18%
		PY1	$173	$181	$170	$166	$11	$0	$23	6.6%
		PY2	$173	$167	$170	$165	-$2	-$8	$5	-0.87%
		PY3	$173	$168	$170	$166	-$1	-$6	$4	-0.56%
		PY4	$173	$170	$170	$168	-$1	-$6	$5	-0.51%
	Hospice PBPM	PY1-PY4	$24	$24	$22	$21	$1	-$1	$2	3.2%
		PY1	$24	$24	$22	$21	$1	-$2	$4	3.6%
		PY2	$24	$24	$22	$21	$0	-$2	$2	1.5%
		PY3	$24	$25	$22	$20	$2 *	$0	$4	9.8%
		PY4	$24	$24	$22	$22	-$1	-$3	$2	-2.1%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Medicare Spending across the Continuum of Care (cont.)	Hospital Outpatient PBPM	PY1-PY4	$386	$429	$409	$461	-$8 ‡	-$18	$1	-2.2%
		PY1	$387	$377	$409	$417	-$18	-$36	$1	-4.5%
		PY2	$386	$434	$409	$464	-$7 ‡	-$19	$6	-1.8%
		PY3	$385	$461	$409	$493	-$8 ‡	-$19	$3	-2.1%
		PY4	$385	$456	$409	$487	-$7 ‡	-$17	$4	-1.8%
	Office Visits PBPM	PY1-PY4	$53	$55	$52	$53	$1 *	$0	$1	1.1%
		PY1	$53	$55	$52	$53	$0	-$1	$1	0.28%
		PY2	$53	$55	$52	$53	$1 *	$0	$2	1.6%
		PY3	$53	$56	$52	$53	$0	$0	$1	0.62%
		PY4	$53	$56	$52	$54	$1 **	$0	$1	1.5%
	Total Part B PBPM	PY1-PY4	$4,077	$4,204	$4,068	$4,207	-$12	-$34	$9	-0.30%
		PY1	$4,077	$4,000	$4,068	$4,032	-$41 *	-$81	-$1	-1.0%
		PY2	$4,077	$4,035	$4,068	$4,048	-$22	-$49	$5	-0.53%
		PY3	$4,077	$4,358	$4,068	$4,360	-$12	-$37	$13	-0.29%
		PY4	$4,077	$4,460	$4,068	$4,448	$3	-$23	$29	0.07%
	Total Dialysis PBPM	PY1-PY4	$2,600	$2,739	$2,610	$2,741	$7 ‡	-$1	$15	0.27%
		PY1	$2,600	$2,613	$2,610	$2,609	$14 ** ‡	$4	$23	0.52%
		PY2	$2,600	$2,608	$2,610	$2,611	$6 * ‡	$0	$12	0.24%
		PY3	$2,600	$2,850	$2,610	$2,858	$1 ‡	-$10	$12	0.03%
		PY4	$2,600	$2,933	$2,610	$2,931	$11 ‡	-$2	$24	0.44%
	Hospitalizations for ESRD Complications PBPM	PY1-PY4	$155	$176	$147	$180	-$11 ***	-$17	-$5	-7.2%
		PY1	$155	$144	$147	$156	-$19 ***	-$28	-$10	-12.5%
		PY2	$155	$180	$147	$186	-$14 ***	-$22	-$6	-9.0%
		PY3	$155	$193	$147	$197	-$12 **	-$20	-$4	-7.8%
		PY4	$155	$193	$147	$191	-$6	-$14	$2	-3.9%
	Part B Drug PBPM	PY1-PY4	$24	$37	$24	$39	-$1 ‡	-$4	$2	-4.9%
		PY1	$23	$32	$24	$31	$2	-$3	$7	8.5%
		PY2	$23	$36	$24	$34	$2 ‡	-$2	$5	8.1%
		PY3	$24	$41	$24	$43	-$1 ‡	-$5	$2	-5.8%
		PY4	$24	$45	$24	$50	-$5 * ‡	-$9	$0	-19.1%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Unintended Consequences	Total Part D Drug Cost PBPM	PY1-PY4	$826	$973	$848	$958	$37 *** ‡	$21	$52	4.4%
		PY1	$826	$1,086	$848	$1,101	$7	-$22	$36	0.86%
		PY2	$825	$1,162	$848	$1,168	$17 ‡	-$4	$38	2.0%
		PY3	$826	$796	$848	$783	$36 *** ‡	$20	$52	4.3%
		PY4	$826	$786	$848	$750	$58 *** ‡	$39	$77	7.0%
	Total Part D Phosphate Binder Drug Cost PBPM	PY1-PY4	$292	$378	$307	$367	$26 *** ‡	$17	$35	8.9%
		PY1	$291	$393	$307	$419	-$10 ‡	-$26	$7	-3.3%
		PY2	$292	$389	$307	$399	$6 ‡	-$5	$17	2.0%
		PY3	$292	$356	$307	$344	$27 *** ‡	$17	$37	9.3%
		PY4	$292	$327	$307	$297	$44 *** ‡	$33	$55	15.2%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ~ Readmission drops the last quarter of intervention data to account for a lag in claims to prevent an underestimation due to a lack of claims maturity. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

Exhibit E-29. Impact of the CEC Model on Medicare Payments across the Continuum of Care, Wave 1

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Medicare Spending across the Continuum of Care	Total Part A and Part B PBPM	PY1-PY4	$6,394	$6,477	$6,378	$6,586	-$125 **	-$209	-$41	-2.0%
		PY1	$6,394	$6,271	$6,378	$6,405	-$150 **	-$255	-$44	-2.3%
		PY2	$6,394	$6,244	$6,378	$6,415	-$186 ***	-$287	-$86	-2.9%
		PY3	$6,394	$6,684	$6,378	$6,747	-$79	-$173	$16	-1.2%
		PY4	$6,394	$6,785	$6,378	$6,871	-$102 *	-$199	-$5	-1.6%
	Acute Inpatient PBPM	PY1-PY4	$1,664	$1,664	$1,666	$1,746	-$79 ***	-$118	-$40	-4.8%
		PY1	$1,664	$1,633	$1,666	$1,728	-$93 ***	-$145	-$42	-5.6%
		PY2	$1,664	$1,623	$1,666	$1,731	-$106 ***	-$155	-$56	-6.4%
		PY3	$1,664	$1,687	$1,666	$1,757	-$67 **	-$114	-$20	-4.1%
		PY4	$1,664	$1,716	$1,666	$1,776	-$57 *	-$107	-$7	-3.4%
	Readmissions PBPM~	PY1-PY4	$585	$580	$582	$616	-$39 ***	-$62	-$15	-6.6%
		PY1	$585	$559	$582	$604	-$47 **	-$78	-$17	-8.1%
		PY2	$585	$558	$582	$608	-$52 ***	-$82	-$22	-8.9%
		PY3	$585	$603	$582	$629	-$28	-$58	$1	-4.9%
		PY4	$585	$610	$582	$635	-$28	-$60	$5	-4.7%
	Institutional Post-Acute Care PBPM	PY1-PY4	$556	$533	$548	$550	-$25	-$60	$10	-4.5%
		PY1	$556	$526	$548	$561	-$43 *	-$84	-$2	-7.8%
		PY2	$556	$508	$548	$548	-$48 *	-$89	-$7	-8.7%
		PY3	$556	$543	$548	$534	$1	-$38	$40	0.16%
		PY4	$555	$543	$548	$551	-$16	-$56	$24	-2.9%
	Home Health PBPM	PY1-PY4	$173	$175	$170	$166	$5	-$3	$13	2.9%
		PY1	$173	$181	$170	$166	$11	$0	$23	6.6%
		PY2	$173	$170	$170	$165	$2	-$8	$11	0.97%
		PY3	$173	$173	$170	$166	$4	-$4	$12	2.3%
		PY4	$173	$175	$170	$168	$4	-$4	$12	2.2%
	Hospice PBPM	PY1-PY4	$24	$24	$22	$21	$1	-$2	$3	2.2%
		PY1	$24	$24	$22	$21	$1	-$2	$4	3.6%
		PY2	$24	$23	$22	$21	$0	-$3	$3	-0.46%
		PY3	$24	$24	$22	$20	$2	-$1	$4	7.6%
		PY4	$24	$24	$22	$22	-$1	-$4	$2	-2.2%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Medicare Spending across the Continuum of Care (cont.)	Hospital Outpatient PBPM	PY1-PY4	$386	$427	$409	$460	-$10	-$25	$5	-2.6%
		PY1	$387	$377	$409	$417	-$18	-$36	$1	-4.5%
		PY2	$386	$432	$409	$464	-$8	-$27	$10	-2.2%
		PY3	$385	$465	$409	$493	-$4	-$21	$13	-0.97%
		PY4	$385	$453	$409	$487	-$10	-$27	$6	-2.7%
	Office Visits PBPM	PY1-PY4	$53	$55	$52	$53	$0	-$1	$1	0.33%
		PY1	$53	$55	$52	$53	$0	-$1	$1	0.28%
		PY2	$53	$56	$52	$53	$1	$0	$2	1.9%
		PY3	$53	$55	$52	$53	$0	-$1	$1	-0.59%
		PY4	$53	$55	$52	$54	$0	-$1	$1	0.04%
	Total Part B PBPM	PY1-PY4	$4,077	$4,174	$4,068	$4,201	-$36 *	-$67	-$5	-0.89%
		PY1	$4,077	$4,000	$4,068	$4,032	-$41 *	-$81	-$1	-1.0%
		PY2	$4,077	$4,004	$4,068	$4,049	-$54 **	-$90	-$18	-1.3%
		PY3	$4,077	$4,351	$4,068	$4,361	-$19	-$54	$16	-0.47%
		PY4	$4,077	$4,422	$4,068	$4,448	-$35	-$72	$2	-0.85%
	Total Dialysis PBPM	PY1-PY4	$2,600	$2,737	$2,610	$2,736	$10 * ‡	$1	$20	0.39%
		PY1	$2,600	$2,613	$2,610	$2,609	$14 ** ‡	$4	$23	0.52%
		PY2	$2,600	$2,610	$2,610	$2,612	$8 ‡	-$1	$17	0.30%
		PY3	$2,600	$2,861	$2,610	$2,859	$12 ‡	-$2	$26	0.46%
		PY4	$2,600	$2,929	$2,610	$2,931	$8 ‡	-$8	$23	0.30%
	Hospitalizations for ESRD Complications PBPM	PY1-PY4	$155	$171	$147	$179	-$16 ***	-$23	-$9	-10.4%
		PY1	$155	$144	$147	$156	-$19 ***	-$28	-$10	-12.5%
		PY2	$155	$176	$147	$186	-$19 ***	-$29	-$8	-12.0%
		PY3	$155	$188	$147	$197	-$17 ***	-$28	-$7	-11.2%
		PY4	$155	$189	$147	$191	-$10	-$21	$0	-6.6%
	Part B Drug PBPM	PY1-PY4	$24	$38	$24	$38	$0	-$4	$4	0.88%
		PY1	$23	$32	$24	$31	$2	-$3	$7	8.5%
		PY2	$23	$38	$24	$34	$4	$0	$9	18.8%
		PY3	$24	$43	$24	$43	$0	-$5	$5	-0.60%
		PY4	$24	$46	$24	$50	-$5	-$10	$1	-18.7%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Unintended Consequences	Total Part D Drug Cost PBPM	PY1-PY4	$826	$974	$848	$966	$30 **	$9	$52	3.7%
		PY1	$826	$1,086	$848	$1,101	$7	-$22	$36	0.86%
		PY2	$825	$1,172	$848	$1,169	$25	-$4	$55	3.1%
		PY3	$826	$789	$848	$783	$28 **	$6	$50	3.4%
		PY4	$826	$780	$848	$750	$53 ***	$27	$79	6.4%
	Total Part D Phosphate Binder Drug Cost PBPM	PY1-PY4	$292	$364	$307	$369	$11 ‡	-$2	$23	3.6%
		PY1	$291	$393	$307	$419	-$10 ‡	-$26	$7	-3.3%
		PY2	$292	$379	$307	$399	-$4 ‡	-$19	$12	-1.3%
		PY3	$292	$343	$307	$344	$15 * ‡	$1	$28	5.0%
		PY4	$292	$313	$307	$297	$31 *** ‡	$15	$46	10.4%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ~ Readmission drops the last quarter of intervention data to account for a lag in claims to prevent an underestimation due to a lack of claims maturity. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

Exhibit E-30. Impact of the CEC Model on Medicare Payments across the Continuum of Care, Wave 2

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Medicare Spending across the Continuum of Care	Total Part A and Part B PBPM	PY2-PY4	$6,409	$6,657	$6,393	$6,675	-$33	-$89	$22	-0.52%
		PY2	$6,409	$6,381	$6,393	$6,414	-$49	-$127	$29	-0.77%
		PY3	$6,409	$6,721	$6,393	$6,747	-$42	-$108	$25	-0.65%
		PY4	$6,409	$6,871	$6,393	$6,871	-$16	-$84	$52	-0.25%
	Acute Inpatient PBPM	PY2-PY4	$1,720	$1,730	$1,723	$1,755	-$22	-$52	$8	-1.3%
		PY2	$1,720	$1,681	$1,723	$1,732	-$48 *	-$91	-$6	-2.8%
		PY3	$1,720	$1,742	$1,723	$1,757	-$12	-$50	$26	-0.71%
		PY4	$1,720	$1,758	$1,723	$1,776	-$15	-$54	$24	-0.87%
	Readmissions PBPM~	PY2-PY4	$609	$611	$606	$623	-$14	-$33	$4	-2.4%
		PY2	$609	$592	$606	$608	-$18	-$45	$9	-3.0%
		PY3	$609	$624	$606	$629	-$7	-$32	$17	-1.2%
		PY4	$609	$617	$606	$635	-$20	-$47	$6	-3.4%
	Institutional Post-Acute Care PBPM	PY2-PY4	$557	$536	$550	$545	-$17	-$37	$3	-3.0%
		PY2	$558	$554	$550	$548	-$1	-$30	$27	-0.27%
		PY3	$558	$531	$550	$535	-$11	-$36	$13	-2.1%
		PY4	$557	$529	$550	$551	-$30 **	-$55	-$5	-5.4%
	Home Health PBPM	PY2-PY4	$170	$165	$166	$166	-$4	-$10	$1	-2.6%
		PY2	$170	$164	$166	$165	-$5	-$12	$3	-2.7%
		PY3	$170	$165	$166	$166	-$5	-$11	$2	-2.8%
		PY4	$170	$167	$166	$168	-$4	-$11	$2	-2.5%
	Hospice PBPM	PY2-PY4	$24	$24	$21	$21	$1	-$1	$3	4.3%
		PY2	$24	$24	$21	$21	$1	-$2	$3	3.2%
		PY3	$24	$25	$21	$20	$3 *	$0	$5	11.7%
		PY4	$24	$24	$21	$22	$0	-$3	$2	-2.0%
	Hospital Outpatient PBPM	PY2-PY4	$395	$450	$419	$481	-$7 ‡	-$18	$3	-1.8%
		PY2	$396	$435	$419	$463	-$5 ‡	-$20	$10	-1.3%
		PY3	$395	$458	$419	$493	-$11 ‡	-$24	$1	-2.9%
		PY4	$395	$459	$419	$487	-$4 ‡	-$16	$8	-1.1%
	Office Visits PBPM	PY2-PY4	$55	$56	$54	$53	$1 ***	$0	$2	1.8%
		PY2	$55	$55	$54	$53	$1	$0	$2	1.2%
		PY3	$55	$56	$54	$53	$1 **	$0	$1	1.5%
		PY4	$55	$57	$54	$54	$1 ***	$1	$2	2.4%

Measures		Performance Year	CEC		Comparison		Difference-in-Differences Estimate			
			Pre-CEC Mean	PY Mean	Pre-CEC Mean	PY Mean	DiD	90% Lower CI	90% Upper CI	Percent Change
Medicare Spending across the Continuum of Care (cont.)	Total Part B PBPM	PY2-PY4	$4,044	$4,304	$4,035	$4,283	$12	-$13	$37	0.29%
		PY2	$4,044	$4,067	$4,035	$4,048	$10	-$23	$43	0.25%
		PY3	$4,044	$4,363	$4,035	$4,361	-$7	-$35	$22	-0.16%
		PY4	$4,044	$4,486	$4,035	$4,448	$29	$0	$59	0.73%
	Total Dialysis PBPM	PY2-PY4	$2,608	$2,793	$2,618	$2,798	$4 ‡	-$7	$14	0.15%
		PY2	$2,608	$2,607	$2,618	$2,611	$5 ‡	-$2	$12	0.19%
		PY3	$2,608	$2,842	$2,618	$2,858	-$7 ‡	-$20	$5	-0.28%
		PY4	$2,608	$2,936	$2,618	$2,931	$14 ‡	-$2	$30	0.54%
	Hospitalizations for ESRD Complications PBPM	PY2-PY4	$170	$193	$161	$191	-$6	-$14	$1	-3.8%
		PY2	$170	$185	$161	$186	-$9	-$20	$1	-5.4%
		PY3	$170	$197	$161	$196	-$8	-$18	$1	-4.8%
		PY4	$170	$196	$161	$191	-$3	-$13	$6	-1.9%
	Part B Drug PBPM	PY2-PY4	$32	$39	$32	$42	-$3 ‡	-$6	$1	-8.5%
		PY2	$32	$33	$32	$34	-$1 ‡	-$5	$3	-2.7%
		PY3	$32	$41	$32	$43	-$2 ‡	-$7	$2	-7.2%
		PY4	$32	$45	$32	$50	-$5 ‡	-$10	$0	-14.4%
Unintended Consequences	Total Part D Drug Cost PBPM	PY2-PY4	$1,135	$921	$1,158	$900	$43 *** ‡	$26	$59	3.8%
		PY2	$1,135	$1,154	$1,158	$1,169	$8 ‡	-$17	$34	0.73%
		PY3	$1,135	$802	$1,158	$783	$42 *** ‡	$24	$60	3.7%
		PY4	$1,135	$789	$1,158	$750	$61 *** ‡	$41	$81	5.4%
	Total Part D Phosphate Binder Drug Cost PBPM	PY2-PY4	$416	$372	$432	$347	$41 *** ‡	$31	$51	9.9%
		PY2	$415	$399	$432	$400	$16 * ‡	$2	$29	3.7%
		PY3	$416	$366	$432	$345	$37 *** ‡	$26	$48	8.9%
		PY4	$416	$337	$432	$298	$54 *** ‡	$42	$67	13.1%

Notes: PY1 covers October 2015 - December 2016; PY2 covers January 2017 - December 2017; PY3 covers January 2018 - December 2018; and PY4 covers January 2019 - December 2019. All ESCOs estimates include both waves from October 2015 - December 2019. The estimate of All ESCOs is the combined cumulative impact of CEC, accounting for different lengths of exposure to the model. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Significance of the DiD impact estimate is indicated next to each outcome where * implies significance at the 10% level, ** at the 5% level, and *** at the 1% level assuming a two-tailed test. ~ Readmission drops the last quarter of intervention data to account for a lag in claims to prevent an underestimation due to a lack of claims maturity. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact estimate.

Exhibit E-31. Impact of the CEC Model on Core Measures for Selected Beneficiary Subgroups, PY1-PY4, All ESCOs

Category		Total Part A and Part B PBPM	Number of Hospitalizations per 1,000 Beneficiaries per Month	Percent of Beneficiaries with at Least One Readmission within 30-days of an Index Hospitalization Stay in a Given Month~	Number of ED Visits per 1,000 Beneficiaries per Month	Fistula Use (percent of beneficiaries in a given month who had a fistula and had at least 90 days of dialysis)	Catheter Use (percent of beneficiaries in a given months who had a catheter for 90 days or longer)
Race	White	-$67	-2.7	-0.95 **	-2.33	0.57	-0.76 **
	Black	-$96 **	-3.9 **	-0.48	1.44	-0.46	-0.40
	Other	-$118 *	-9.0 ***	-1.4 *	-4.60	-1.3 *	0.22
Sex	Male	-$74 **	-2.7 *	-0.67 * ‡	-0.74	0.23	-0.45 *
	Female	-$90 **	-6.0 ***	-0.94 **	-0.68	-0.52	-0.54
OREC	Age	-$60	-2.1	-0.77 *	0.20	0.06	-0.87 **
	Disabled	-$64	-6.0 **	-0.67	2.05	0.26	-0.67
	ESRD	-$93 **	-5.1 **	-1.8 ***	0.19	-0.15	-0.07
	ESRD and Disabled	-$89 *	-4.1 *	-0.20 ‡	-5.34	-0.63	-0.02
Dual Medicaid Medicare Status	Partial	-$157 *** ‡	-7.9 ***	0.001	-4.22	-0.67	-0.50
	Full	-$128 ***	-5.8 ***	-1.6 ***	-0.81	-1.1 *	-0.26
Months on Dialysis	<= six months	$88	3.1	1.3 *	2.35	0.57	-1.0
	> six months	-$95 ***	-4.6 ***	-1.1 ***	-0.81	-0.23	-0.36 *

Notes: All ESCOs estimates include both waves from October 2015 - December 2018. About 19.9% of facilities have 17 quarters of CEC participation (October 2015 to December 2019), 41.1% of facilities have 12 quarters of CEC participation (January 2017 to December 2019), 30.9% of facilities have 8 quarters of CEC participation (January 2018 to December 2019), and the remaining 8.2% participated in CEC from January 2019 to December 2019 (4 quarters). Each impact estimate is based on a DiD analysis and reflects the difference in the regression-adjusted mean outcome for beneficiaries in CEC facilities in the intervention period and pre-CEC period relative to the same difference over time for beneficiaries in matched comparison facilities. Medicare payment outcomes are standardized to remove the effect of geographic and other adjustments. CI= confidence interval, ***p<0.01, **p<0.05, *p<0.1. (*) Other race includes all non-White and non-Black beneficiaries with the majority of beneficiaries being Hispanic or Asian races. For more details on OREC see https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/mc86c07.pdf. ~ Readmission expenditures are included in the overall acute inpatient payments and drops the last quarter of intervention data to account for a lag in claims to prevent an underestimation due to a lack of claims maturity. ‡ Data from the pre-CEC period showed intervention and matched comparison facilities were not on parallel trends for this outcome, which is required for an unbiased impact.

Historic use of preventative care varies across location and cohort. CEC beneficiaries aligned to facilities in metropolitan areas had similar historic rates of primary care E/M visits across cohort. The number of visits in non-metropolitan areas was lower, especially for beneficiaries aligned to later joining cohorts. Overall, beneficiaries had a greater number of specialty care E/M visits compared to primary care. The rate of specialty care visits was greater among beneficiaries in metropolitan areas and lowest for beneficiaries aligned to later joining Wave 2 non-metropolitan facilities.

Exhibit E-32. Use of Preventive Care by Facility Location

Characteristics	Facility Location	Wave 1 PY1 Joiners (N=206)	Wave 1 PY2 Joiners (N=79)	Wave 1 PY3 Joiners (N=68)	Wave 1 PY4 Joiners (N=27)	Wave 2 PY2 Joiners (N=347)	Wave 2 PY3 Joiners (N=252)	Wave 2 PY4 Joiners (N=58)
Primary Care E/M Visits PBPM (2014)	Metropolitan	0.25	0.25	0.22	0.23	0.24	0.24	0.23
	Non-metropolitan	0.25	0.27	0.14	0.12	0.24	0.23	0.20
Specialty Care E/M Visits PBPM (2014)	Metropolitan	0.45	0.44	0.44	0.48	0.43	0.44	0.47
	Non-metropolitan	0.38	0.43	0.31	0.42	0.39	0.39	0.30

Appendix F: Power Calculation Methodology

In this section, we describe our power calculation methodology and our findings concerning the ability of our model to detect changes in Medicare payments. Power calculations provide essential information for researchers to determine the smallest detectable difference, with a given sample size, in the average of the outcome variable between treatment and control groups. An equally important consideration in study designs is to control the type 1 error, which is the probability of falsely rejecting the null hypothesis when it is in fact true, or, in other words, claiming treatment efficacy when in fact it does not exist. We set an acceptable level of type 1 error to be 0.1, and compute power under this specification.

To compute power, we use a STATA user command called "clsampsi," developed by Batistatou et al. (2014).[119] The authors use a formula based on a non-central F distribution as described by Moser et al. (1989).[120]

$$1-\beta = (\Phi\left[\frac{\delta}{\sqrt{\left[\frac{\sigma_t^2}{N_t}\left\{1+\left(\bar{m}+\frac{\sigma_{mt}^2}{\bar{m}}-1\right)\rho_t\right\}+\frac{\sigma_c^2}{N_c}\left\{1+\left(\bar{m}+\frac{\sigma_{mc}^2}{\bar{m}}-1\right)\rho_c\right\}\right]}}-z_\alpha\right]) \qquad (1)$$

Here, δ denotes various effect sizes for potential predicted savings, ρ_t and ρ_c are intra-cluster correlation coefficients (ICC) (which measure how related the clustered observations are) for the treatment and control group, respectively. Clustered practices are standard in DiD designs.[121] Furthermore, we also consider how the fit of an estimation would impact power by adjusting the variance and ICC factors using an assumed R^2 of 0.3.[122] The term $\frac{\sigma_{mt,c}^2}{\bar{m}}$ corresponds to the variation in the size of clusters which has been shown by Guittet et al. (2006) to heavily influence power, when there is large variation.[123] Additionally, $\bar{m}$ refers to the average number of individuals per cluster. Finally, σ_t^2, N_t, σ_c^2, and N_c, are the variance outcome and the total sample size for each trial arm (t: treatment, c: control), respectively, and z_α is the one-tail z statistic. Combining these factors, we are able to generate two terms commonly referred to as the design effect.

We calculate values of the factors discussed above for the outcome variable Medicare payments using the matched beneficiary data. A key component of Equation (1) is the ICC, which depends on how observations are clustered. For each group, we cluster observations by their aligned facility to identify individual beneficiary observations. Specifically, we cluster by aligned ESCO and comparison facilities identified in the matched sets which corresponds to 2,074 clusters units. As a result, the power calculations do not take into consideration the repeated nature of the

[119] Batistatou, E., Roberts, C., Roberts, S. (2014). Sample size and power calculations for trials and quasi-experimental studies with clustering. *Stata Journal,* 14(1):159-75.

[120] Moser, B.K., Stevens, G.R., Watts, C.L. (1989). The two-sample t test versus Satterthwaite's approximate F test. *Communications in Statistics - Theory and Methods,* 18(11):3963-3975.

[121] Bertrand, M., Duflo, E., Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics,* 119(1):249-75.

[122] The R^2 value provides an indication of how well the covariates of regression estimate the outcome of interest. Thus, the greater the value of R^2 the lower the necessary sample size needed to reach a desired level of power.

[123] Guittet, L., Ravaud, P., Giraudeau, B. (2006). Planning a cluster randomized trial with unequal cluster sizes: Practical issues involving continuous outcomes. *BMC Medical Research,* 6(1):17.

data, which would only improve power if all other calculations and assumptions were maintained.

For the second year evaluation of the CEC Model, the number of dialysis facilities and patients provides reasonable confidence that the analysis will detect modest impacts on Medicare service use and costs for all beneficiaries. Specifically, the combined PY1-PY4 estimates of power using one-tailed tests at the 10% significance level and adjustments for goodness of fit from the regression models imply that the evaluation has 80% power to detect impacts on standardized Medicare payments of 1% or more.

Appendix G: ICH CAHPS® Analysis Supplement

A. Data Sources

The In-Center Hemodialysis Consumer Assessment of Healthcare Providers and Systems (ICH CAHPS®) survey is administered twice annually. This analysis supplement includes results from surveys from fall 2014 through fall 2019. The ICH CAHPS® survey periods, included as pre-CEC (baseline period) or post-CEC (intervention period) in the analysis, differed based on when the facility began CEC participation.

- Among facilities that began CEC participation in PY1, the analysis included results from the fall 2014 and spring 2015 surveys for the pre-CEC period. The post-CEC period included results from surveys from fall 2015, spring 2016, fall 2016, spring 2017, fall 2017, spring 2018, fall 2018, spring 2019, and fall 2019.
- Among facilities that began CEC participation in PY2, the analysis for the pre-CEC period included results from the fall 2014, spring 2015, fall 2015, spring 2016, and fall 2016 surveys. Results from the spring 2017, fall 2017, spring 2018, fall 2018, spring 2019, and fall 2019 surveys were included for the post-CEC period.
- Among facilities that began CEC participation in PY3, the analysis included results from the fall 2014, spring 2015, fall 2015, spring 2016, fall 2016, spring 2017, and fall 2017 surveys for the pre-CEC period. Results for the post-CEC period included surveys from spring 2018, fall 2018, spring 2019, and fall 2019.
- Among facilities that began CEC participation in PY4, the analysis included results from the fall 2014, spring 2015, fall 2015, spring 2016, fall 2016, spring 2017, fall 2017, spring 2018, and fall 2018 surveys for the pre-CEC period. Results for the post-CEC period included surveys from spring 2019 and fall 2019.

We received risk-adjusted, facility-level ICH CAHPS® data from CMS to prevent any potential beneficiary confidentiality concerns. Measures were risk adjusted using the methodology for publicly reporting ICH CAHPS® survey results on the Dialysis Facility Compare website.[124] The risk adjustment methods account for the following characteristics: mode of survey administration; overall health; overall mental health; heart disease; deafness or serious difficulty hearing; blindness or serious difficulty seeing; difficulty concentrating, remembering, or making decisions; difficulty dressing or bathing; age; sex; education; language; assistance with the survey; and number of years on dialysis. We weighted results from each ICH CAHPS® survey wave (e.g., fall or spring) by the number of respondents to pool the risk adjusted measures within a facility across survey periods (for example, we pooled the fall 2014 and spring 2015 surveys for pre-CEC period values among facilities that began CEC participation in PY1).

Study Population. The analytic dataset included survey data from samples of beneficiaries receiving in-center hemodialysis treatment from ESCO and comparison facilities during each semiannual survey period. Beneficiaries eligible for sampling by CMS (i.e., those who would receive the ICH CAHPS® survey) received in-center hemodialysis at a specific facility for at least 3 months, were at least 18 years of age, and were not institutionalized, deceased, or receiving hospice

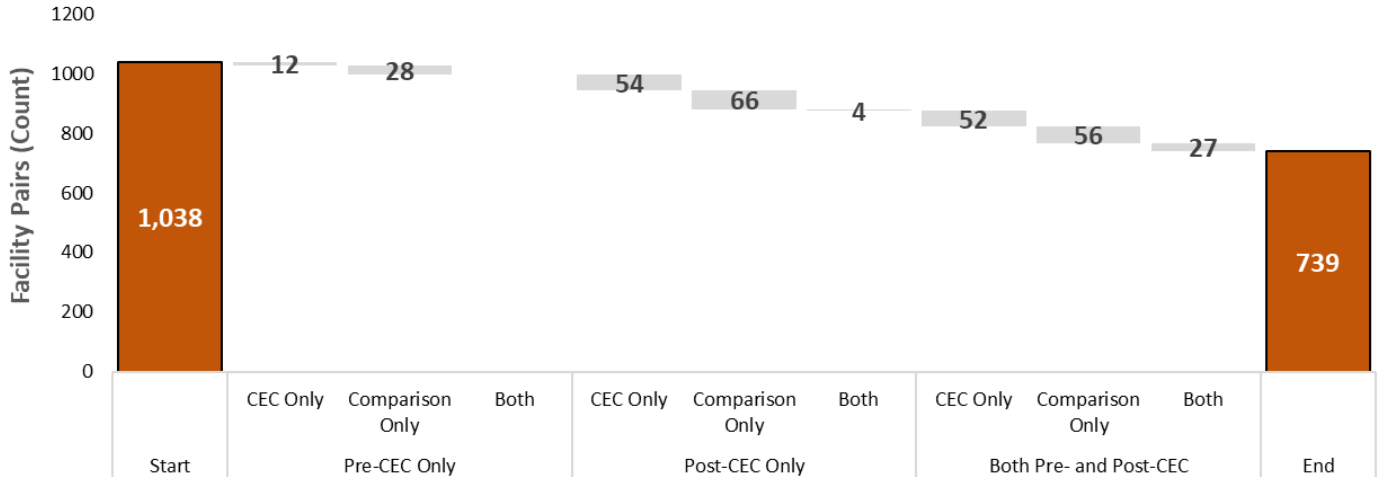
[124] https://ichcahps.org/

care. Among facilities with more than 200 beneficiaries meeting these criteria, 200 beneficiaries were randomly sampled. Among facilities with 200 or fewer beneficiaries, all beneficiaries were included in the sample.

This analysis included beneficiary responses from 1,038 ESCO facilities and 1,038 matched comparison group facilities. The pool of comparison group facilities for this analysis was the same pool that was used in the other analyses in this fourth annual report. (A description of the methods for selecting comparison facilities is provided in **Appendix E**.) We received data that had already applied ICH CAHPS® suppression rules (i.e., suppressing facility results when there were 10 or fewer respondents) to ensure beneficiary confidentiality, which reduced the number of facilities available for the analysis by 299 pairs. In **Exhibit G-1** we provide a summary of the reasons these facility pairs were excluded, which include (1) whether the facility pair was excluded due to the CEC facility, the comparison group facility, or both, and (2) whether the facility pair was excluded due to insufficient data in the pre-CEC period, the post-CEC period, or both.[125] Specifically, 40 facility pairs were excluded because either a CEC facility (12 pairs) or a matched comparison facility (28 pairs) did not have pre-CEC data. A larger group, 124 pairs, were excluded because a CEC facility (54 pairs), a matched comparison facility (66 pairs), or both the CEC facility and the matched comparison facility (4 pairs) had 10 or fewer respondents in the post-CEC period. Finally, 135 facility pairs were excluded because at least one facility in the pair (i.e., CEC or matched comparison or both) did not have data in both the pre- and post-CEC periods.

On average, the excluded CEC facilities were slightly smaller, having fewer dialysis stations compared to the included CEC facilities (17 vs. 21), with a standardized mean difference (SMD) of 0.5. Similarly, the excluded comparison facilities were slightly smaller on average, having fewer dialysis stations compared to included comparison facilities (17 vs. 21), with a SMD of 0.6. Across the 7 LDOs and non-LDOs, the proportion of excluded facilities averaged 31% and ranged between 14% and 66%; Fresenius facilities accounted for the majority of excluded facilities (n=241, or 80%).

Exhibit G-1. Summary of ICH CAHPS® Facility Pair Exclusions



[125] A facility pair was excluded if either facility had ten or fewer respondents in all periods in either the pre-CEC or post-CEC period.

B. Methods

We employed ordinary least squares (OLS) regression to derive the DiD estimates. The dependent variables were the risk-adjusted, facility-level values, with no additional adjustment for other covariates. Dialysis facilities in the regression were weighted by the number of aligned beneficiaries at each facility from the corresponding CEC periods. The beneficiary counts included in the pre- and post-CEC periods differed based on when the facility began CEC participation.

- Among facilities that began CEC participation in PY1, the pre-CEC counts included quarter four (Q4) 2014 through quarter one (Q1) 2015, and the post-CEC counts included Q4 2015 through Q4 2019.
- Among facilities that began CEC participation in PY2, the pre-CEC counts included Q4 2014 through quarter two (Q2) 2016, and the post-CEC counts included Q1 2017 through Q4 2019.
- Among facilities that began CEC participation in PY3, the pre-CEC counts included Q4 2014 through Q2 2017, and the post-CEC counts included Q1 2018 through Q4 2019.
- Among facilities that began CEC participation in PY4, the pre-CEC counts included Q4 2014 through Q2 2018, and the post-CEC counts included Q1 2019 through Q4 2019.

Results for 739 of the total 1,038 matched pairs of facilities (note: 299 pairs were excluded) were included in all measures, except for the measure assessing if beneficiaries received an explanation of transplant ineligibility, which included 735 matched pairs of facilities (note: 303 pairs were excluded).[126]

The questions used from the ICH CAHPS® survey for the global ratings measures, composite scores, and individual survey items are shown in **Exhibits G-2** and **G-3**.

[126] The question regarding explanation of transplant ineligibility had fewer observations because this survey question is restricted to beneficiaries who responded "yes" to the preceding question that asked if they are eligible for a kidney transplant. Therefore, some additional facilities were excluded if they had 10 or fewer responses to this question, even if they had more than 10 beneficiary responses on all other questions.

Exhibit G-2. ICH CAHPS® Global Ratings and Select Individual Questions

Category	Question	Response
Global Ratings	Rating of Nephrologist (Q8): Using any number from 0 to 10, where 0 is the worst kidney doctors possible and 10 is the best kidney doctors possible, what number would you use to rate the kidney doctors you have now?	0 -10, where Worst =0 and 10 = Best
	Rating of Dialysis Center Staff (Q32): Using any number from 0 to 10, where 0 is the worst dialysis center staff possible and 10 is the best dialysis center staff possible, what number would you use to rate your dialysis center staff?	0 -10, where Worst =0 and 10 = Best
	Rating of the Dialysis Center (Q35): Using any number from 0 to 10, where 0 is the worst dialysis center possible and 10 is the best dialysis center possible, what number would you use to rate this dialysis center?	0 -10, where Worst =0 and 10 = Best
Individual Items	Q33: In the last 3 months, when you arrived on time, how often did you get put on the dialysis machine within 15 minutes of your appointment or shift time?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q38: In the last 12 months, has a doctor or dialysis center staff explained to you why you are not eligible for a kidney transplant?	1 = Yes, 2 = No

Exhibit G-3. ICH CAHPS® Questions Included in Composite Scores

Category	Question	Response
Nephrologists' Communication & Caring	Q3: In the last 3 months, how often did your kidney doctors listen carefully to you?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q4: In the last 3 months, how often did your kidney doctors explain things in a way that was easy for you to understand?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q5: In the last 3 months, how often did your kidney doctors show respect for what you had to say?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q6: In the last 3 months, how often did your kidney doctors spend enough time with you?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q7: In the last 3 months, how often did you feel your kidney doctors really cared about you as a person?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q9: Do your kidney doctors seem informed and up-to-date about the health care you receive from other doctors?	1 = Yes, 2 = No
Quality of Dialysis Center Care & Operations	Q10: In the last 3 months, how often did the dialysis center staff listen carefully to you?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q11: In the last 3 months, how often did the dialysis center staff explain things in a way that was easy for you to understand?	1 = Never 2 = Sometimes 3 = Usually 4 = Always

Category	Question	Response
Quality of Dialysis Center Care & Operations (cont.)	Q12: In the last 3 months, how often did the dialysis center staff show respect for what you had to say?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q13: In the last 3 months, how often did the dialysis center staff spend enough time with you?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q14: In the last 3 months, how often did you feel the dialysis center staff really cared about you as a person?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q15: In the last 3 months, how often did dialysis center staff make you as comfortable as possible during dialysis?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q16: In the last 3 months, did dialysis center staff keep information about you and your health as private as possible from other patients?	1 = Yes, 2 = No
	Q17: In the last 3 months, did you feel comfortable asking the dialysis center staff everything you wanted about dialysis care?	1 = Yes, 2 = No
	Q21: In the last 3 months, how often did dialysis center staff insert your needles with as little pain as possible?	1 = Never 2 = Sometimes 3 = Usually 4 = Always 5 = I insert my own needles
	Q22: In the last 3 months, how often did dialysis center staff check you as closely as you wanted while you were on the dialysis machine?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q24: In the last 3 months, how often was the dialysis center staff able to manage problems during your dialysis?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q25: In the last 3 months, how often did dialysis center staff behave in a professional manner?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q26: In the last 3 months, did dialysis center staff talk to you about what you should eat and drink?	1 = Yes, 2 = No
	Q27: In the last 3 months, how often did dialysis center staff explain blood test results in a way that was easy to understand?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q33: In the last 3 months, when you arrived on time, how often did you get put on the dialysis machine within 15 minutes of your appointment or shift time?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
	Q34: In the last 3 months, how often was the dialysis center as clean as it could be?	1 = Never 2 = Sometimes 3 = Usually 4 = Always

Category	Question	Response
Quality of Dialysis Center Care & Operations (cont.)	Q43: In the last 12 months, how often were you satisfied with the way they handled these problems?	1 = Never 2 = Sometimes 3 = Usually 4 = Always
Providing Information to Patients	Q19: The dialysis center staff can connect you to the dialysis machine through a graft, fistula, or catheter. Do you know how to take care of your graft, fistula, or catheter?	1 = Yes, 2 = No
	Q28: As a patient you have certain rights. For example, you have the right to be treated with respect and the right to privacy. Did this dialysis center ever give you any written information about your rights as a patient?	1 = Yes, 2 = No
	Q29: Did dialysis center staff at this center ever review your rights as a patient with you?	1 = Yes, 2 = No
	Q30: Has dialysis center staff ever told you what to do if you experience a health problem at home?	1 = Yes, 2 = No
	Q31: Has any dialysis center staff ever told you how to get off the machine if there is an emergency at the center?	1 = Yes, 2 = No
	Q36: You can treat kidney disease with dialysis at a center, a kidney transplant, or with dialysis at home. In the last 12 months, did your kidney doctors or dialysis center staff talk to you as much as you wanted about which treatment is right for you?	1 = Yes, 2 = No
	Q38: In the last 12 months, has a doctor or dialysis center staff explained to you why you are not eligible for a kidney transplant?	1 = Yes, 2 = No
	Q39: Peritoneal dialysis is dialysis given through the belly and is usually done at home. In the last 12 months, did either your kidney doctors or dialysis center staff talk to you about peritoneal dialysis?	1 = Yes, 2 = No
	Q40: In the last 12 months, were you as involved as much as you wanted in choosing the treatment for kidney disease that is right for you?	1 = Yes, 2 = No

C. Results

The CEC Model was associated with some small statistically significant, but not clinically meaningful impacts in reporting of the most positive experience ("top-box scores") on four measures. The rating of nephrologist measure improved by 2.4 percentage points and 2.8 percentage points respectively for Wave 1 in PY3 ($p<0.1$) and PY4 ($p<0.05$). The measure of being seen within 15 minutes improved by 2.8 percentage points in Wave 1 PY4 ($p<0.1$), and the measure of nephrologist communication and caring improved 2.5 percentage points in Wave 1 PY4 ($p<0.05$). We also found a small statistically significant decrease for Wave 2 in PY3 and PY4 ($p<0.1$) for the explained transplant ineligibility measure.

There are no universal thresholds for what would constitute a clinically meaning difference for ICH-CAHPS scores. In one study, differences of less than 3 points in CAHPS measures were treated as meaningful (Paddison et al., 2013). Others have acknowledged the need for further work to establish meaningful differences in ICH-CAHPS scores (Cavanaugh 2016; Wood et al, 2014; Dad et al 2020). However, a greater than five-point difference/change is typically considered clinically meaningful, whereas smaller differences/changes might not be considered clinically meaningful, even if they are statistically significant. This may be particularly applicable when

interpreting the ICH-CAHPS measures where percentage point differences are for "top-box" scores, that is, the highest score possible.[127]

Summary statistics and regression results for the eight examined ICH CAHPS® measures are provided in **Exhibit G-4**.

Exhibit G-4. Summary of Impact of CEC on ICH CAHPS® Measures

Measure (Response)	ESCO Wave	Performance Year	Facility N (Pairs)	Average Response[a]				DiD
				CEC Facilities[b]		Comparison Facilities[b]		
				Pre-CEC	Post-CEC	Pre-CEC	Post-CEC	
Rating of Kidney Doctors (Top - 9 or 10) [c]	1	PY1	124	55.2%	56.9%	58.8%	59.8%	0.8
	1	PY2	166	55.2%	57.4%	58.8%	60.3%	0.8
	1	PY3	198	55.2%	59.3%	58.8%	60.6%	2.4*
	1	PY4	208	55.2%	59.3%	58.8%	60.2%	2.8**
	2	PY2	184	58.1%	58.6%	58.8%	60.3%	-0.9
	2	PY3	303	58.1%	59.4%	58.8%	60.6%	-0.5
	2	PY4	319	58.1%	59.2%	58.8%	60.2%	-0.3
Rating of Dialysis Center Staff (Top - 9 or 10) [c]	1	PY1	124	56.8%	58.5%	59.7%	59.8%	1.6
	1	PY2	166	56.8%	59.4%	59.7%	60.8%	1.4
	1	PY3	198	56.8%	59.0%	59.7%	62.0%	-0.1
	1	PY4	208	56.8%	60.3%	59.7%	61.8%	1.4
	2	PY2	184	57.3%	58.6%	59.7%	60.8%	0.2
	2	PY3	303	57.3%	58.7%	59.7%	62.0%	-0.8
	2	PY4	319	57.3%	59.4%	59.7%	61.8%	0
Rating of Dialysis Center (Top - 9 or 10) [c]	1	PY1	124	62.2%	64.7%	64.5%	64.7%	2.4
	1	PY2	166	62.2%	64.5%	64.5%	65.6%	1.3
	1	PY3	198	62.2%	64.8%	64.5%	67.1%	0.2
	1	PY4	208	62.2%	65.9%	64.5%	66.7%	1.5
	2	PY2	184	62.2%	63.8%	64.5%	65.6%	0.4
	2	PY3	303	62.2%	63.9%	64.5%	67.1%	-0.9
	2	PY4	319	62.2%	65.0%	64.5%	66.7%	0.6

[127] Paddison, C., Elliott, M.N., Haviland, A.M., Farley, D.O., Lyratzopoulos, G., Hambarsoomian, K., Dembosky, J.W., Roland, M.O. (2013). Experiences of care among Medicare beneficiaries with ESRD: Medicare Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey results. *American Journal of Kidney Diseases, 61*(3):440–9. https://doi.org/10.1053/j.ajkd.2012.10.009

Cavanaugh, K. (2016). Patient experience assessment is a requisite for quality evaluation: A discussion of the In-Center Hemodialysis Consumer Assessment of Health Care Providers and Systems (ICH CAHPS) survey. *Seminars in Dialysis, 29*(2):135–43.

Wood, R., Paoli, C. J., Hays, R. D., Taylor-Stokes, G., Piercy, J., & Gitlin, M. (2014). Evaluation of the Consumer Assessment of Healthcare Providers and Systems In-Center Hemodialysis survey. *Clinical Journal of the American Society of Nephrology, 9*(6), 1099–1108. https://doi.org/10.2215/CJN.10121013.

Dad, T., Grobert, M.E., Richardson, M.M. (2020). Using patient experience survey data to improve in-center hemodialysis care: A practical review. *American Journal of Kidney Diseases, 76*(3):407-416. https://doi.org/10.1053/j.ajkd.2019.12.013.

Measure (Response)	ESCO Wave	Performance Year	Facility N (Pairs)	Average Response[a]				DiD
				CEC Facilities[b]		Comparison Facilities[b]		
				Pre-CEC	Post-CEC	Pre-CEC	Post-CEC	
Seen within 15 Minutes (Always) [d]	1	PY1	124	36.7%	39.2%	39.5%	40.7%	1.2
	1	PY2	166	36.7%	40.5%	39.5%	41.1%	2.1
	1	PY3	198	36.7%	41.4%	39.5%	44.5%	-0.3
	1	PY4	208	36.7%	43.7%	39.5%	43.7%	2.8*
	2	PY2	184	37.8%	40.1%	39.5%	41.1%	0.7
	2	PY3	303	37.8%	41.5%	39.5%	44.5%	-1.4
	2	PY4	319	37.8%	42.7%	39.5%	43.7%	0.7
Explained Transplant Ineligibility (Yes) [d]	1	PY1	123	66.6%	67.3%	69.3%	68.4%	1.6
	1	PY2	182	66.6%	67.6%	69.3%	68.8%	1.5
	1	PY3	196	66.6%	67.5%	69.3%	70.5%	-0.3
	1	PY4	206	66.6%	68.5%	69.3%	70.8%	0.4
	2	PY2	182	69.8%	68.8%	69.3%	68.8%	-0.5
	2	PY3	301	69.8%	68.2%	69.3%	70.5%	-2.7*
	2	PY4	317	69.8%	68.9%	69.3%	70.8%	-2.4*
Nephrologists' Communication & Caring (Always or Yes) [e]	1	PY1	124	64.2%	66.1%	66.1%	66.8%	1.2
	1	PY2	166	64.2%	66.1%	66.1%	66.7%	1.3
	1	PY3	198	64.2%	66.4%	66.1%	67.1%	1.3
	1	PY4	208	64.2%	67.6%	66.1%	67.1%	2.5**
	2	PY2	184	66.4%	66.8%	66.1%	66.7%	-0.2
	2	PY3	303	66.4%	66.9%	66.1%	67.1%	-0.5
	2	PY4	319	66.4%	67.0%	66.1%	67.1%	-0.4
Quality of Dialysis Center Care & Operations (Always or Yes) [e]	1	PY1	124	59.0%	60.3%	60.4%	60.9%	0.9
	1	PY2	166	59.0%	60.7%	60.4%	61.5%	0.6
	1	PY3	198	59.0%	60.6%	60.4%	62.1%	0
	1	PY4	208	59.0%	61.5%	60.4%	62.1%	0.8
	2	PY2	184	59.2%	59.6%	60.4%	61.5%	-0.8
	2	PY3	303	59.2%	60.1%	60.4%	62.1%	-0.8
	2	PY4	319	59.2%	60.6%	60.4%	62.1%	-0.3
Providing Information to Patients (Yes) [e]	1	PY1	124	77.6%	78.5%	79.4%	79.3%	1
	1	PY2	166	77.6%	78.4%	79.4%	79.3%	0.8
	1	PY3	198	77.6%	78.0%	79.4%	79.8%	-0.1
	1	PY4	208	77.6%	78.7%	79.4%	80.1%	0.4
	2	PY2	184	78.4%	78.1%	79.4%	79.3%	-0.2
	2	PY3	303	78.4%	78.2%	79.4%	79.8%	-0.6
	2	PY4	319	78.4%	78.6%	79.4%	80.1%	-0.4

Note: (a) Responses are weighted and are risk-adjusted facility-level averages (please see Analysis section above for additional detail); (b) all measures included results for 739 of 1,038 total matched facilities, except the Explained Transplant Ineligibility measure, which included 735 matched facilities; (c) denotes the three global ratings measures; (d) denotes the two individual survey items; (e) denotes the three composite score measures. Asterisks denote varying levels of statistical significance: *** for $p \leq 0.01$, ** for $p \leq 0.05$, and * for $p \leq 0.1$.

Appendix H: Standardized Measures Analysis

This appendix describes the findings and methodology used to create and evaluate the standardized measures for hospitalization, readmission, and mortality. Each measure is discussed individually, with limitations summarized at the end of the section.

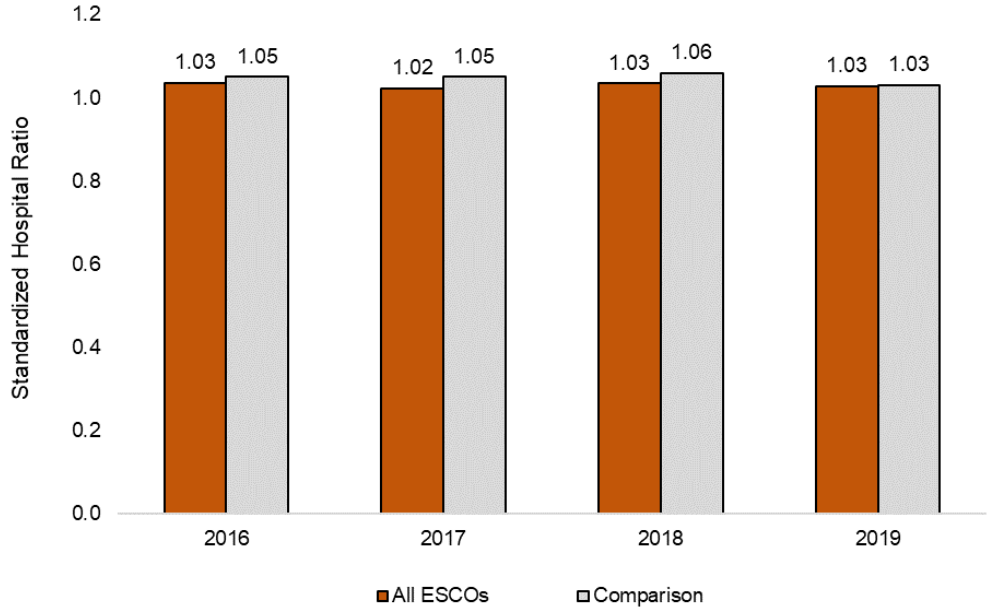
Hospitalization, readmission, and mortality are primary health outcomes and serve as important indicators for assessing quality of care under any health care delivery model. In the CEC context, these measures provide a potential assurance that the CEC Model is not adversely impacting beneficiary outcomes, such as survival.

A. Results

Standardized measures for hospitalization, readmission, and mortality are useful for examining whether ESCO-specific adverse event rates (i.e., hospitalizations, 30-day readmissions, and mortality) are similar to event rates for the comparison group, adjusted for case mix. These standardized measures reflect the number of adverse events for beneficiaries in an ESCO, relative to the number of adverse events that would be expected based on overall Medicare ESRD rates, adjusted for the characteristics of beneficiaries at that ESCO.

Beginning in 2016, hospitalization rates, as measured by the standardized hospitalization ratio (SHR), have remained fairly consistent for the ESCOs. The comparison group showed similar pattern but with a decline in 2019, putting SHR in line with the ESCOs. The SHR for the ESCOs and the comparison group for each year, from 2016 through 2019, are presented in **Exhibit H-1**.

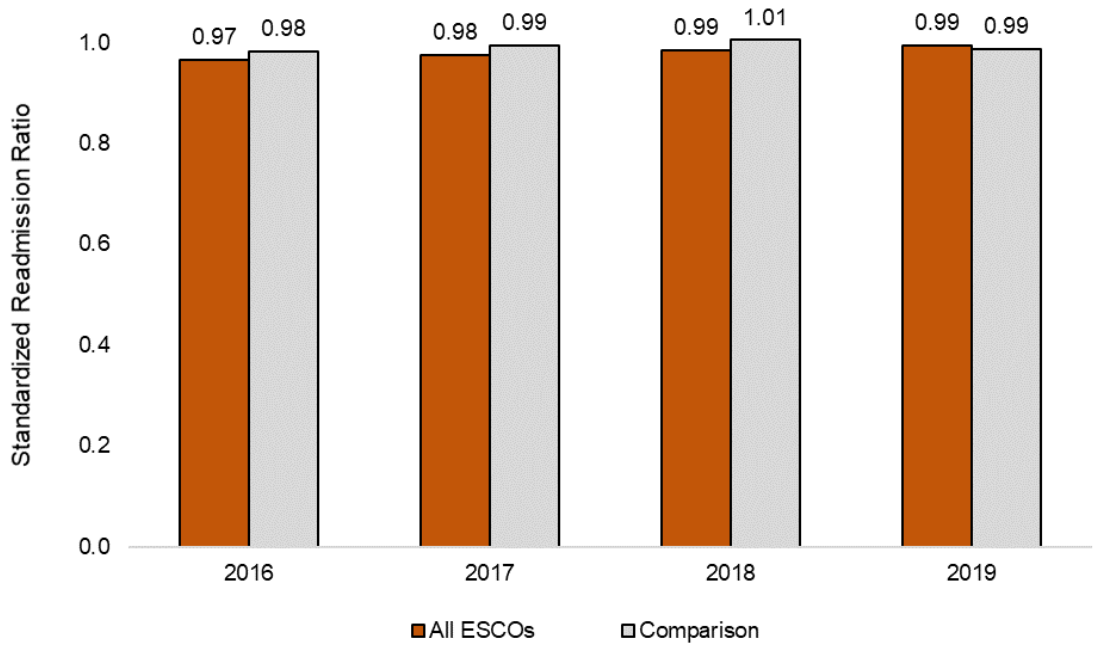
Exhibit H-1. Standardized Hospitalization Ratio for All ESCOs and Comparison Group, 2016-2019



No improvement was seen in readmissions, as the standardized readmission ratio (SRR) for the ESCOs increased 3% between 2016 and 2019. By 2019, the SRR for the comparison group had

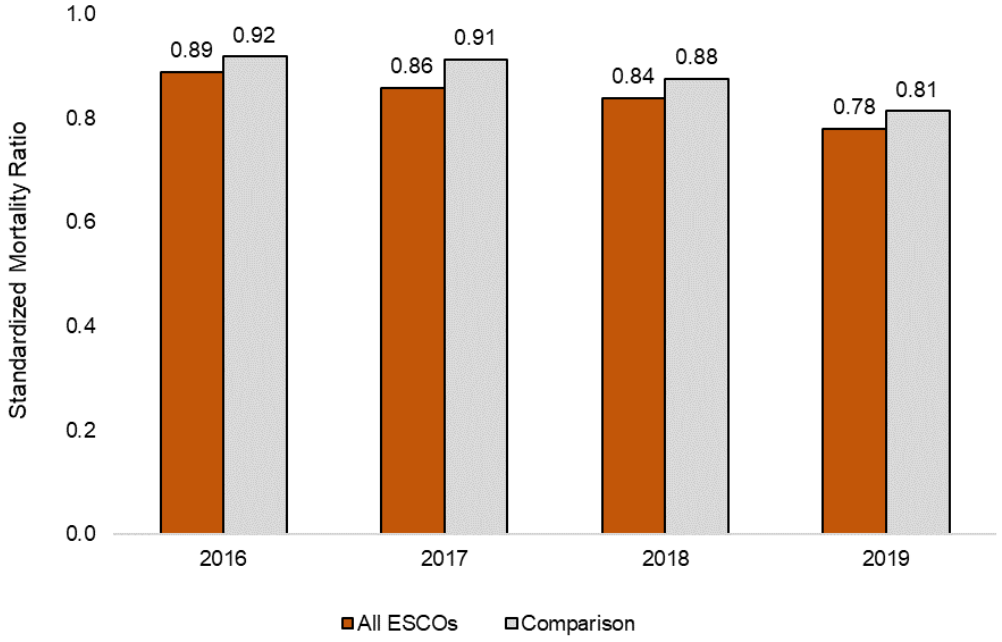
no net change from 2016 to 2019, with 2019 value similar to all ESCO group. The SRR for all ESCOs and the comparison group for 2016 through 2019 are shown in **Exhibit H-2**.

Exhibit H-2. Standardized Readmission Ratio for All ESCOs and Comparison Group, 2016-2019



The standardized mortality ratio (SMR) for all ESCOs and the comparison group from 2016 through 2019 are displayed in **Exhibit H-3**. Overall, we observed decreasing SMR trends for all ESCOs and the comparison group. The all ESCOs group had somewhat lower SMR over the same period; both the all ESCOs and comparison groups, respectively, trend toward declining mortality that is most pronounced from 2018 to 2019. The all ESCOs group shows a 12% decrease in SMR since 2016, while the comparison groups posts an 11% decline. These trends suggest a possible effect of the CEC Model on mortality, although results should be interpreted with caution as some of the CEC results in 2016 are for Wave 2 ESCOs and reflect those organizations' pre-CEC performance rather than a CEC effect. Even when interpreted conservatively, these trends may provide assurance that these observed declines and other potential changes in care motivated by the CEC Model incentives have not adversely impacted beneficiary mortality.

Exhibit H-3. Standardized Mortality Ratio for All ESCOs and Comparison Group, 2016-2019



Calculation and interpretation of the standardized measures are subject to some limitations, including ambiguity in determining whether observed changes over time are due to changes in risk-adjusted expected events, observed events, or both.

B. Methods

1. Data Sources

The main data source for this fourth annual report was the CMS's Chronic Conditions Data Warehouse (CCW), from which we pulled Medicare claims data, beneficiary characteristics (e.g., demographics and enrollment), and CCW condition indicators.[128] This report includes CCW claims from January 1, 2015 through March 31, 2020, processed by July 2020.[129] All CCW claims were final action claims and had a minimum of three months of run-out.[130]

For the calculation of standardized measures, we used claims data from the CCW to identify hospitalization admission and discharge dates, primary diagnosis code for hospital admissions, and comprehensive listings of diagnosis codes across all institutional settings.

[128] The CCW condition indicators are claims-based algorithms that identify beneficiaries with select clinical conditions (e.g., diabetes, hyperlipidemia, hypertension, etc.): https://www.ccwdata.org/web/guest/condition-categories.

[129] Kidney transplants are an exception, which also included claims that ended in 2011 to assess the kidney transplant exclusion criterion in 2012 (i.e., excluded in the 12 months following the month of a transplant).

[130] The analytic CCW claims files are based on final action claims. We used final action claims only to avoid internal data inconsistencies caused by use of original claims (e.g., we observed beneficiaries aligned based on original claims for whom we found no final action claims).

We also extracted data (through December 2019) from the January 2020 quarterly file of the Consolidated Renal Operations in a Web-enabled Network (CROWNWeb) to complete the beneficiary history.

Beneficiary demographic and clinical information at ESRD incidence were extracted from the CMS ESRD Medical Evidence Report form (CMS-2728). These data included, but were not limited to, primary cause of renal failure, cause of renal failure groupings, height, race, dry weight, physician name, dialysis type, and comorbidities at ESRD incidence.

The ESRD Death Notification form (CMS-2746) provided data relating to primary causes of death for beneficiaries with ESRD.

The first service date was extracted from the Renal Management Information System (REMIS).

The Long-term Care Minimum Data Set (MDS) identified prior year nursing home status for adjustment to the models for mortality and hospitalization, respectively. For the annual report, the complete MDS 2019 assessments were obtained in the March 2020 download from CMS.

2. Determination of Beneficiary Eligibility during a Given Month

The standardized measures incorporate the monthly CEC eligibility criteria. Specifically, in the calculation of the standardized hospitalization ratio (SHR) and standardized mortality ratio (SMR), if a beneficiary was not eligible during the month, the time at risk and events that occurred during the month (hospital admissions or deaths) were excluded from the calculation. For the standardized readmission ratio (SRR), hospital discharges that occurred during an ineligible month were not counted as an index discharge. An index discharge is used as the basis to identify if a subsequent hospital admission is considered to be a readmission. Any readmission associated with an ineligible index discharge was removed. However, if the readmission itself happened in an eligible month and it did not meet any of the exclusion criteria, then the readmission was kept and the associated discharge would be considered as a potential index discharge.

3. Modifications to Population for Standardized Models

Prior to this third annual report and the Q1 2018 quarterly report, the CEC evaluation team used publicly available Dialysis Facility Report (DFR) model coefficients to calculate expected values for mortality, readmissions, and hospitalizations used in CUSUM and the annual standardized measures.

As an alternative to applying the DFR risk-adjustment coefficients (derived from the national ESRD dialysis population), we estimated coefficients based on the CEC population with some modifications to model specifications. Overall, the populations in the CEC and DFR estimation models differ. Compared to the national-based DFR population, the CEC population includes only beneficiaries with type 72 Medicare dialysis claims. There are some other measure-specific specifications for the CEC population, as outlined in Q1 2018 methods for the risk model and revised population on which these are modeled. For the DFR population, inclusion criteria are measure-specific and for a larger population than the CEC population.

Coefficients estimated using a CEC population are likely to better represent the beneficiaries in the ESCOs and yield more accurate expected event rates. As discussed in detail in the Q1 2018 quarterly report methods, applying the CEC population to estimate the risk-adjustment coefficients impacts the results in the standardized measures analyses. The effects are most pronounced in the SHR and less so in both the standardized ratios for readmission and mortality. Please note all time at risk and events regardless of the eligibility criteria are included in the model to generate the coefficients.

C. Standardized Hospitalization Ratio Methodology

This section reviews the techniques used to compute the SHR, including the determination of beneficiary assignment and the development of other steps. Then we describe the risk-adjusted model for the expected number of events during a given time period and the specification of the SHR measure.

1. Beneficiary Assignment

Assignment to an ESCO begins after a patient has had ESRD for at least 90 days. As of Q1 2018, the 60-day rule previously applied for care alignment to an ESCO was removed as a criterion. Therefore, once past the 90-day mark for ESRD, time-at-risk aligned to an ESCO is from the first day that indicates receipt of dialysis care. Time-at-risk ends at the earliest occurrence of the following: three days prior to a transplant, date of death, or end of ESCO alignment. As mentioned above, after we determine beneficiary assignment, we exclude the ineligible time-at-risk and hospitalization events according to the monthly eligibility criteria.

Exclusions include the following:

- Beneficiaries with a missing ESRD Medical Evidence Form (CMS-2728) in CROWNWeb.
- Beneficiaries with a missing date of birth or sex.

2. Ratio Calculation

a. Observed/Expected (O/E)

The SHR is calculated by dividing the observed total admissions (O) by the expected total admissions (E). The SHR calculation enables comparison of the ESCO's experience to the average experience of the ESRD Medicare population in the United States. A value of less than 1.0 indicates that the ESCO's total number of admissions was less than expected, relative to the national ESRD Medicare population, whereas a value of greater than 1.0 indicates that the facility had total admissions higher than expected, relative to the national ESRD Medicare population.

b. Observed Number of Hospital Admissions

O equals the observed number of hospital admissions among the beneficiaries assigned to this ESCO in the calendar year (CY). Admissions are counted at the discharge date. When applicable, admissions are bridged according to the discharge dates and admission dates. When there is one day between a discharge and admission, these events are bridged and a single

admission is counted. If there is more than one day between two hospitalization events, then both events would be counted as hospital admissions.

c. Expected Number of Hospital Admissions

E equals the expected number of hospital admissions among beneficiaries assigned to this ESCO in a CY. The expected number of hospital admissions is calculated based on rates for the ESRD Medicare population for hospital admissions in the same year. A Cox model adjusts for beneficiary age, sex, diabetes, duration of ESRD, nursing home status, comorbidities at ESRD incidence, BMI at incidence, and CY. Duration of ESRD is divided into six intervals with cut points at six months, one year, two years, three years, and five years; hospitalization rates are estimated separately within each interval. The baseline rate is assumed to be constant within each of these six intervals and are denoted as $\alpha_1,\ldots,\alpha_6$.

For each beneficiary, the time at-risk in each ESRD interval is multiplied by the (adjusted) ESRD Medicare admissions rate for that interval, and a sum over the intervals gives the expected number of admissions for each beneficiary. Let q denote the number of beneficiary characteristics being incorporated into the model, and note that these characteristics will include both main effect and interaction terms. Most covariates are fixed at entry for beneficiaries in the model, but some, such as nursing home status, can change over time. Let Z_{ijk} be the specific value of the j^{th} beneficiary in the i^{th} ESRD within period k. The risk adjustment factor is given by

$$R_{ijk} = \exp(\beta^T Z_{ijk})$$

where β is the regression coefficient. Technical details for estimating β are provided below.

Let t_{ijk} represent the days at-risk (until the current evaluation time) for beneficiary j in ESCO i and in the kth interval with estimated rate α_k (defined in the first paragraph of this subsection). The corresponding expected number of hospital admissions in the kth interval for this beneficiary j is calculated as

$$E_{ijk}=\alpha_k t_{ijk} R_{ijk}$$

It should be noted that t_{ijk} and hence can be 0 if beneficiary j is never at risk during the k^{th} interval. Summing the E_{ijk} over all of the six intervals and all N beneficiaries in a given ESCO gives the expected number of hospital admissions during follow-up at that ESCO. Details for variables included in the models may be found in Section F (Model Variables) of this appendix, below.

d. Risk-Adjusted Model for Computing Expected Number of Hospital Admissions

The calculation of expected hospital admissions is based on a two-stage model. In the first stage, the Cox model with piecewise-constant baseline rates stratified by facilities is used to estimate regression parameters associated with $\hat{\beta}^T Z_{ij}$; that is, the baseline hospitalization rate function for the j^{th} beneficiary in the i^{th} facility is assumed as

$$\lambda_{ij}(t) = \lambda_0(t)\exp\left(\hat{\beta}^T Z_{ij}\right),$$

where $Z_{ij'}$ is a vector of adjustment covariates, β is the corresponding parameter, and $\lambda_{0i}(t)$ is the facility-specific baseline hospitalization rate function. This approach avoids complicated issues

arising from, for example, interactions between beneficiary characteristics and facility effects. In the second stage, the population baseline hospitalization rate function is computed through an unstratified Cox model using $\hat{\beta}^T Z_{ij}$ as an offset; in other words, the baseline hospitalization rate function for the j^{th} beneficiary in the i^{th} facility is assumed as

$$\lambda_{ij}(t) = \lambda_0(t)\exp(\hat{\beta}^T Z_{ij}),$$

where $\lambda_0(t)$ is the common baseline hospitalization rate function. For computation purposes, we adopt piecewise constant baseline rates; that is, the baseline rate is assumed to be a piecewise constant function with six intervals (i.e., 91 days-six months, six months-one year, one-two years, two-three years, three-five years, or five or more years duration of ESRD) and a separate level or rate in each interval.[131] We denote the estimated rates obtained at stage 2 as $\alpha_1, \ldots, \alpha_6$.

D. Standardized Readmission Ratio Methodology

In this section, we review the methods used to compute the SRR, including beneficiary assignment and the development of other steps. Then we describe the risk-adjusted model for the expected number of events during a given time period and the specification of the SRR measure.

1. Beneficiary Assignment

For the standardized readmission ratio, assignment to an ESCO is from the first day that indicates receipt of dialysis care. The SRR for an ESCO serves as a measure of 30-day unplanned hospital readmission for dialysis beneficiaries discharged from any acute care hospital (ACH). The SRR for an ESCO is defined to be the ratio of observed number of unplanned readmissions (which meet inclusion criteria) that occur within 30 days of an eligible indexed discharge divided by the expected readmission, given the number of discharges, characteristic of hospitalization, characteristics of beneficiaries, and median readmission rate for Medicare ESRD beneficiaries. Note that in this report, "hospital" always refers to ACH.

Monthly eligibility status guides if a discharge is considered to be an index discharge and aligned to an ESCO. For example, if an admission occurs during an ineligible month but the corresponding discharge date occurs during an eligible month, then the index discharge is eligible, assuming other criteria are met. If a readmission occurs during an ineligible month but the index discharge occurs during an eligible month, the readmission will count against that eligible index discharge and be aligned to that ESCO.

2. Beneficiary Exclusions

Beneficiary exclusions are listed below:

- Beneficiaries with a missing ESRD Medical Evidence Form (CMS-2728) in CROWNWeb
- Beneficiaries with a missing date of birth or sex

[131] This specification was developed by Liu D., Kalbfleisch J.D., Schaubel D.E. (2014). Methods for estimating center effects on recurrent events. *Statistics in Biosciences*, 1;6(1):19-37.

3. Determination of Index Discharge

Index discharges are restricted to Medicare-covered hospitalizations for inpatient care at short-term ACHs and critical access hospitals. Discharges from skilled nursing facilities (SNFs), long-term care hospitals, rehabilitation hospitals, and Prospective Payment System (PPS)-exempt cancer hospitals—as well as those from separate dedicated units for hospice, rehabilitation, and psychiatric care—are excluded. To be counted as an index discharge, the beneficiary must be receiving dialysis treatment for ESRD at the time of discharge.

In addition to monthly eligibility requirements, the SRR denominator (index discharge) excludes hospitalizations:

- For beneficiaries who died during the hospitalization (*Rationale: There was no opportunity for readmission*);
- That are followed within 30-days by the beneficiary's death (and no readmission);
- For beneficiaries who were discharged against medical advice (Rationale: Providers did not have the opportunity to deliver full care and prepare the beneficiary for discharge);
- That include a primary diagnosis of medical treatment of cancer, certain psychiatric conditions, or rehabilitation for prosthesis[132] (*Rationales: Admissions for medical treatment of cancer have a different mortality and readmission profile than the rest of the Medicare population, and outcomes for these admissions do not correlate well with outcomes for other admissions; patients admitted for psychiatric treatment are typically cared for in separate psychiatric or rehabilitation centers that are not comparable to short-term ACHs; rehabilitation for prosthesis admissions are not typically to a short-term ACH and are not for acute care*);
- That occur after a beneficiary's 12th hospital admission in the time period (Rationale: During the technical expert panel's review of the SRR measure, members were concerned that, especially for small facilities, allowing a beneficiary at high risk of readmission (e.g., an HIV-positive patient) to contribute without limit to the denominator and numerator could unfairly skew that facility's measure. In response to this concern, hospitalizations following an individual beneficiary's 12th discharge in the time period were excluded. Sensitivity analyses excluding this cap (representing 0.8% of 2012 hospital discharges) led to only small changes in the flagging rate for smaller facilities);
- That took place at PPS-exempt cancer hospitals (Rationale: These hospitals care for a unique population of patients that cannot reasonably be compared to patients admitted to other hospitals);[133]

[132] See http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsphttp://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp and https://www.hcup-us.ahrq.gov/toolssoftware/ccs10/ccs10.jsp for descriptions of the AHRQ Clinical Classifications Software (CCS) used to identify these conditions.

[133] CMS 2016 All-Cause Hospital-Wide Measure Updates and Specifications Report: Hospital-Level 30-Day Risk Standardized Readmission Measure –Version 5.0, submitted by Yale New Haven Health Service Corporation/Center for Outcomes Research & Evaluation (YNHHSC/CORE), March 2016. https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Downloads/Hospital-Visits-after-Hospital-Outpatient-Surgery-Measure.pdf
In developing the SRR measure, CMS wanted the Dialysis Facility SRR to align with the Hospital Wide Readmission (HWR) measure to the greatest extent possible. To that end, the SRR adopted the exclusion criteria applied in the HWR measure by the Yale Center for Outcomes Research, the developer of this measure.

- That result in a transfer to another acute care facility (Rationale: For beneficiaries who are transferred between one ACH and another, the measure considers these multiple contiguous hospitalizations as a single acute episode of care, and readmission for transferred beneficiaries is attributed to the hospital that ultimately discharges the beneficiary to a non-acute care setting).

4. Ratio Calculation

a. Observed/Expected

The SRR measure is useful for examining whether facility-specific readmission rates are in line with the national average for Medicare patients across all dialysis facilities (adjusted for case mix). The SRR reflects the number of readmission events for beneficiaries in an ESCO, relative to the number of readmission events that would be expected, based on rates for the ESRD Medicare population, and the characteristics of the beneficiaries at that ESCO as well as the number of discharges. An ESCO that experienced readmissions at a rate higher than average for all ESRD Medicare patients will have an SRR greater than 1.0. In contrast, an ESCO experiencing readmissions at a rate lower than average for all ESRD Medicare patients will have an SRR less than 1.0.

The SRR was calculated from January 1, 2016 to December 31, 2019. For the annual SRR measures, the eligible index discharge date determines the year in which any corresponding readmission would be counted. For example, if an eligible hospitalization began in December 30, 2014, with a corresponding discharge date on January 4, 2015, the index discharge would be counted in 2015. If an index discharge occurred in December 2014, but the eligible readmission occurred in January 2015, this readmission would be counted in 2014.

b. Observed Number of Readmissions

The observed event (O) is the actual number of readmission events over the CY among beneficiaries aligned to an ESCO. A readmission event is defined as an admission to an ACH, with exclusions as stated above, within 30-days of the eligible indexed discharge date. Planned and unplanned readmissions are identified using Version 1.0 of the algorithm developed by the Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation for the Hospital-Wide All-Cause Unplanned Readmission Measure, which was endorsed in 2012 (National Quality Forum [NQF] #1789).[134] Hospitalizations are counted as events in the numerator if they meet the definition of an unplanned readmission that (a) occurred within 30-days of a hospital discharge and (b) was not preceded by a "planned" readmission that also occurred within 30-days of discharge. A readmission is considered "planned" under two scenarios:[135]

1. The beneficiary undergoes a procedure that is always considered planned (e.g., bone marrow transplant) or has a primary diagnosis that always indicates the hospitalization is

[134] Centers for Medicare & Medicaid Services. (2012, July). Hospital-Wide All-Cause Unplanned Readmission Measure Final Technical Report. (Contract number: HHSM-500-2008-0025I/HHSM-500-T0001, Modification No. 000007). https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Measure-Methodology.html

[135] Centers for Medicare & Medicaid Services. (2014, June). Report for the Standardized Readmission Ratio. (Contract number: HHSM-500-2013-13017I). https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/ESRDQIP/Downloads/MeasureMethodologyReportfortheProposedSRRMeasure.pdf

planned (e.g., maintenance chemotherapy). These are identified using Clinical Classifications Software (CCS) groupers.[136]

2. The beneficiary undergoes a procedure that may be considered planned if it is not accompanied by an acute diagnosis. For example, a hospitalization involving a heart valve procedure accompanied by a primary diagnosis of diabetes would be considered planned, whereas a hospitalization involving a heart valve procedure accompanied by a primary diagnosis of acute myocardial infarction would be considered unplanned. These are identified using a combination of CCS groupers and individual International Classification of Diseases (ICD) codes (9th Revision [ICD-9]: before October 2015; 10th Revision [ICD-10]: after October 2015).

Note that a discharge from a planned admission may be considered an index discharge.

To monitor readmission rates, let X_{ij} denote the observed outcome for the j^{th} discharge within the i^{th} facility. To compute SRR, j is sorted based on the time of discharge. Furthermore, X_{ij}=1 if the j^{th} discharge in ESCO i results in a readmission within 30-days, and X_{ij}=0 otherwise. The observed number of events (until the t^{th} observations) for the ESCO is given by

$$O_{it} = \sum_{j=1}^{t} X_{ij}$$

c. Expected Number of Readmissions

The expected event (E) is the number of readmission events that would be expected if beneficiaries at the facility experienced readmission events at the median ESRD Medicare population rate for patients with similar characteristics.

The expected number of events in one ESCO until the t^{th} discharge is computed as $\sum_{j=1}^{t} P_{ijM}$, where P_{ijM} represents the expected probability if the ESCO under investigation has the same effects as the population average (benchmark: defined as the median facility effect across all dialysis facilities), e.g.,

$$P_{ijM} = \frac{\exp(\gamma_M + \beta^T Z_{ij})}{1 + \exp(\gamma_M + \beta^T Z_{ij})}$$

with γ_M being the median population effect. The estimates for β and γ_M are calculated by fitting a logistic regression model. Regression adjustments include age, sex, duration of ESRD, diabetes as cause of ESRD, BMI at incidence, days hospitalized during index hospitalization, past-year comorbidities, high-risk diagnosis groups, and CY. Details for variables included in the models may be found in **Section F** (Model Variables) of this appendix, below.

[136] See http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp and https://www.hcup-us.ahrq.gov/toolssoftware/ccs10/ccs10.jsp for descriptions of each Condition Category (CC).

5. Risk-Adjusted Model for Computing Expected Number of Readmissions

The development of a new readmission model for the Q1 2018 quarterly report provided us with the opportunity to develop a two-stage model that is more reflective of readmission patterns in our CEC population.

The computation of E_{ij} (here, expected readmission for the j^{th} beneficiary in the i^{th} facility) is done in a two-stage model. In the first stage, we consider a logistic model in which facilities are represented as fixed effects. Regression adjustments include age, sex, years with ESRD, diabetes as cause of ESRD, BMI at incidence, days hospitalized during index hospitalization, past-year comorbidities, high-risk diagnosis groups, and CY. This leads to a regression model of the form:

$$logit(P_{ij}) = \log\left(\frac{P_{ij}}{1-P_{ij}}\right) = \gamma_i + \beta^T Z_{ij},$$

where P_{ij} is the probability of readmission for the j^{th} discharge assigned to facility i, Z_{ij} is a vector of adjustment covariates for this discharge, and β is the corresponding coefficient. The parameter γ_i corresponds to the fixed facility effects in the sense that a large value of γ_i would indicate that the i^{th} facility has higher readmission rates.

In the second stage, the population average intercept γ_M is computed through a logistic model (with no covariates) using $\hat{\beta}^T Z_{ij}$ from the first stage as an offset.

The expected number of events in one ESCO until the i^{th} discharge is computed as $E_{it} = \sum_{j=1}^{t} P_{ijM}$, where P_{ijM} represents the expected probability if the ESCO under investigation has the same effects as the population average:

$$P_{ijM} = \frac{\exp(\gamma_M + \beta^T Z_{ij})}{1 + \exp(\gamma_M + \beta^T Z_{ij})}$$

In prior quarters, instead of fitting the second stage model to calculate population average intercept γ_M, we used the median fixed patient effect γ_i (as determined in the first stage) to calculate the expected probability P_{ijM}. The two-stage model now developed using the CEC population is a better representation of the population median for readmissions.

E. Standardized Mortality Ratio Methodology

This section presents the methods used to compute the SMR, including the determination of beneficiary assignment and the development of other steps. Then we describe the risk-adjusted model for the expected number of events during a given time period and the specification of the SMR measure.

1. Beneficiary Assignment

For SMR, beneficiary time-at-risk is defined as the duration of time over which the death of a beneficiary would be aligned to that particular ESCO, thus counting as an observed event. Beneficiary time-at-risk is aligned to an ESCO after he/she has had ESRD for at least 90 days

and has been aligned to that ESCO for at least 60 days.[137] If the beneficiary had been treated in that ESCO for more than 60 days prior to January 1, 2012, that beneficiary's time-at-risk would be aligned to that ESCO as of January 1, 2012. If the beneficiary had been treated for fewer than 60 days at the ESCO and aligned on January 1, 2012, the beneficiary's time-at-risk aligned to the ESCO facility would begin on day 61. Time-at-risk ends at the earliest occurrence of the following: one day prior to a transplant, date of death, or end of ESCO alignment plus 60 days.[138] As mentioned above, after we determine beneficiary assignment, we exclude the ineligible time-at-risk and death events according to the monthly eligibility criteria.

Beneficiary exclusions include the following:

- Beneficiaries with a missing ESRD Medical Evidence Form (CMS-2728) in CROWNWeb
- Beneficiaries with a missing date of birth or sex.

2. Ratio Calculation

a. Observed/Expected

The SMR is useful for examining whether facility-specific mortality rates are in line with the ESRD Medicare patient population average across all dialysis facilities (adjusted for case mix) and provides additional assurance that the CEC Model is not adversely impacting beneficiary survival. The annual SMR is the actual number of deaths divided by the expected number of deaths during the CY. An ESCO that experienced deaths at a rate higher than the ESRD Medicare patient population average will have an SMR greater than 1.0. In contrast, an ESCO experiencing deaths at a rate lower than the national average will have an SMR less than 1.0.

b. Observed Number of Deaths

O equals the observed number of deaths among the beneficiaries aligned to an ESCO during the CY. This count does not include deaths from street drugs or accidents unrelated to treatment, which vary by facility (for example, urban facilities that treat large numbers of male and young patients report proportionally higher number of deaths from these causes when compared to

[137] Since a patient's follow-up in the database can be incomplete during the first 90 days of ESRD therapy, we only include a patient's follow-up into the measure after that patient has received chronic renal replacement therapy for at least 90 days. This minimum 90-day period also assures that most patients are eligible for Medicare, either as their primary or secondary insurer. It also excludes from analysis patients who die or recover renal function during the first 90 days of ESRD. In order to exclude patients who only received temporary dialysis therapy, we assign patients to a facility only after they have been on dialysis there for the past 60 days. This 60-day period is used both for patients who started ESRD for the first time and for those who returned to dialysis after a transplant. For additional details, see https://dialysisdata.org/sites/default/files/content/ESRD_Measures/nqf/SMR%20MIF.pdf.

[138] This rule is used in the mortality (SMR), hospitalization (SHR), and transfusion standardized outcome measures publically reported on Dialysis Facility Compare. It applies to both discharging dialysis and admitting facilities. Patient outcomes continue to be aligned to a dialysis facility for up to 60 days after the patient leaves that facility and, therefore, are not aligned to a patient's new facility until 60 days after their admission date. The rule attempts to acknowledge the delayed clinical consequences of dialysis facility care provided in the recent past (e.g., cumulative infection risk associated with specific vascular access use, cumulative risks of inadequate dialysis, or fluid management).

other facilities).[139] Since these deaths are unlikely to have been due to treatment facility characteristics, we excluded them from the observed number of deaths calculations.

c. Expected Number of Deaths

E equals the expected number of death events among the beneficiaries assigned to this ESCO during the CY. The expected number of deaths is calculated based on a Cox risk model, adjusting for beneficiary age, race, ethnicity, sex, diabetes, years with ESRD, nursing home status, comorbidities at incidence, BMI at incidence, and CY. For this report, we tested and revised model specifications to better fit the ESRD Medicare population in comparison to the DFR SMR model that had been developed for the national population.

Unlike the models for SHR and SRR, the coefficients for the SMR model showed instability for some of the variable coefficients when updated for data years (2015-2018). In the prior SMR model, the interaction of race and diabetes, years with ESRD, sex, and age, respectively, were included as were interactions with race and ethnicity. For the CEC population, these interaction terms did not improve model stability or predictability. We therefore tested all interaction terms with race or ethnicity. The results of this evaluation led to the removal of the race and ethnicity interaction terms; coefficients across race main effects then became stable and statistically consistent across the four year model as well as when the model was evaluated by year.

The next revised set of variables related to age. Our evaluation showed how mortality differed across categorical age groups, with a change in slope at 25 years. We modified the age spline to more accurately reflect how age differentially affects mortality for those under the age of 25 years compared to those over the age of 25 years, across the ESRD Medicare population. The final set of interaction terms evaluated included years of ESRD interacted with diabetes and sex, respectively, as well as the interaction term for female and diabetes. Similar to the interactions terms across the race categories, most of these other interaction terms did not add stability or predictability to model. The final model retained two interaction terms: (1) less than one year of ESRD by incident diabetes diagnosis and (2) one to two years of ESRD by incident diabetes diagnosis.

The model also controls for age-adjusted population death rates by state and race, based on the U.S. population in 2014-2016.[140]

For mortality, the expected number of events is computed as

$$E_i(t) = \sum_{j=1}^{n_i} \int_0^t Y_{ij}(u) \exp\left(\hat{\beta}^T Z_{ij}\right) d\,\hat{\Lambda}_0\left(u;\hat{\beta}\right),$$

where $Y_{ij}(u)$ is the at-risk indicator at time u, Z_{ij} is the covariate vector for the j-th beneficiary in ESCO i, β is the estimated coefficients for adjustment variables $\hat{\Lambda}_0\left(t;\hat{\beta}\right)$ is the estimated national average cumulative baseline hazard, which will be detailed below. Details for variables included in the models may be found in **Section F** (Model Variables) of this appendix.

[139] Turenne, M.N., Loos, M.E., Port, F.K., Emmert, G., Hulbert-Shearon, T.E., Wolfe, R.A., Levine, G.N., Daugirdas, J.T., Agodoa, L.Y.C., Held, P.J. (1996). The impact of deaths due to AIDS, accidents, and street drugs on standardized mortality ratios (SMRs) by facility. U.S. Renal Data System and University of Michigan, Ann Arbor. Poster presented at the American Society of Nephrology, New Orleans, LA, November, 1996. Abstracts – *Journal of the American Society of Nephrology,* 7:1467.

[140] Table 16, Health, United States, 2017 (https://www.cdc.gov/nchs/hus/contents2017.htm#Table_016).

d. Risk-Adjusted Model to Compute the Expected Mortality

The risk-adjusted model used to compute the expected number of deaths is discussed below.

Subscript *i* represents the facility and subscript *j* represents the individual beneficiary-level values. Let *F* be the total number of facilities. The total number of beneficiaries is denoted by $n = \sum_{i=1}^{F} n_i$, where n_i is the number of subjects in facility *i*. Let T_{ij} represent the survival time and C_{ij} represent censoring time[141] for the j^{th} beneficiary in facility *i*. Observation times are denoted by $X_{ij} = T_{ij} \wedge C_{ij}$, with at risk indicator $Y_{ij}(t) = I(X_{ij} \geq t)$, where $a \wedge b = \min(a, b)$and $I(A)$ is an indicator function taking the value 1 when condition A holds and 0 otherwise. The observed death indicators are denoted by $\Delta_{ij} = I(T_{ij} \leq C_{ij})$, and the death counting process is defined as $N_{ij}(t) = \Delta_{ij} I(X_{ij} \leq t)$. The observed data consist of *n* independent vectors, $(X_{ij}, \Delta_{ij}, Z_{ij})$, where Z_{ij} is a vector of adjustment covariates.

The computation of E_{ij} (here, expected mortality for the j^{th} beneficiary in the i^{th} facility) is done in a two-stage model. In the first stage, a Cox model stratified by dialysis facilities is used to estimate regression parameters associated with Z_{ij}, e.g., the hazard function for the j^{th} beneficiary in the i^{th} facility is assumed as

$$\lambda_{ij}(t) = \lambda_{0i}(t)\exp(\hat{\beta}^T Z_{ij})$$

where β is the coefficient for adjustment variables and $\lambda_{0i}(t)$ is the facility-specific baseline hazard function. This approach avoids the confounding between beneficiary characteristics and facility effects.

In the second stage, the population average cumulative baseline hazard is computed through an unstratified Cox model (with no covariates) using $\hat{\beta}^T Z_{ij}$ as an offset, i.e., the hazard function for the *j*-th beneficiary in the *i*-th facility is assumed as

$$\lambda_{ij}(t) = \lambda_0(t)\exp(\hat{\beta}^T Z_{ij}),$$

where $\lambda_0(t)$ is the common baseline hazard function. The corresponding estimated cumulative baseline hazard is

$$\hat{\Lambda}_0(t;\hat{\beta}) = \sum_{j=1}^{n_i} \int_0^t \frac{dN_{ij}(u)}{\sum_{j=1}^{n_i} Y_{ij}(u)\exp(\hat{\beta}^T Z_{ij})}$$

F. Model Variables: Adjustors and Data Sources for the Mortality, Readmission, and Hospitalization Risk-Adjustment Models

The following are details on the risk adjustors and data sources for the mortality, readmission, and hospitalization risk-adjustment models used to calculate the respective expected values. All three models use each covariate unless otherwise indicated.

- *Age*: Beneficiary age is derived from the date of birth in the Master Beneficiary Summary File (MBSF).

[141] Censored at transplant; ineligibility/removal from ESCO; end of study period.

- *Race and ethnicity*: Race and ethnicity are determined from CMS's Medical Evidence Report form (CMS-2728) at the time of ESRD incidence. Race and ethnicity (i.e., Hispanic versus non-Hispanic) are included as separate covariates, which are included only in the SMR model.
- *Sex*: Beneficiary sex is obtained from the MBSF.
- *Diabetes as cause of ESRD*: Beneficiary primary cause of ESRD is obtained from his/her CMS-2728 form. When the cause of ESRD is missing, it is assumed that diabetes is not the cause.
- *Years with ESRD*: Each beneficiary's length of time with ESRD is determined using the first dialysis service date from the REMIS database.
- *Nursing home status*: In the mortality and hospitalization models, the MDS is used to determine if a beneficiary was in a nursing home in the previous year.
- *Comorbidities at ESRD incidence*: Comorbidities are determined using a selection of comorbid conditions reported on the CMS-2728 form, namely alcohol dependence, atherosclerotic heart disease, cerebrovascular disease, CHF, diabetes, drug dependence, inability to ambulate, inability to transfer, cancer, other cardiac disease, peripheral vascular disease, and tobacco use (current smoker). Each comorbidity is included as a separate covariate in the mortality and hospitalization models.
- *BMI at ESRD incidence*: Beneficiary BMI is based on the height and weight provided on his/her CMS-2728 form. When height and/or weight are missing, a BMI is imputed for the beneficiary based on the average BMI of all beneficiaries—specific to sex, race, diabetic status, and age at ESRD incidence.
- *CY*: Calendar year
- *Population death rates*: In the mortality model, age-adjusted population death rates (per 100,000) by state and race in 2014 to 2016 are obtained from the U.S. Centers for Disease Control and Prevention's National Center for Health Statistics.[142]
- *Days hospitalized during index hospitalization*: In the readmissions model, the length of each hospitalization is determined by taking the difference between the date of admission and the date of discharge available on the inpatient claim. For beneficiaries who are transferred between one ACH and another, the measure considers these multiple contiguous hospitalizations as a single acute episode of care, and the length is calculated by taking the difference between the date of admission for the first hospitalization and the date of discharge from the last hospitalization included.
- *Past-year comorbidities (risk variables):* In the readmissions model, all unique ICD diagnosis codes are identified for each patient reported on Medicare claims in the 365 days preceding (and inclusive of) the index discharge date. Note that SRR was developed to align with the risk adjustment approach of the CMS Hospital Wide All-Cause Readmission Measure. A part of this SRR includes risk adjustment for prevalent comorbidities (in the

[142] Table 16, Health, United States, 2017 (http://www.cdc.gov/nchs/data/hus/2017/016.pdf).

prior year) that are specifically associated with readmissions.[143] Five available claim types for codes are examined: inpatient, outpatient, SNF, hospice, and home health claims. These diagnosis codes are grouped by diagnosis area using CMS's HCCs.[144] The Condition Categories (CCs) used in the calculation of the readmissions model are:

- CCs 177 and 178: Amputation status
- CC 79: Cardiorespiratory failure/shock
- CC 46: Coagulation defects and other specified hematologic disorders
- CCs 51 and 52: Drug and alcohol disorders
- CCs 25 and 26: End-stage liver disease
- CC 109: Fibrosis of lung or other chronic lung disorders
- CCs 67-69, 100, and 101: Hemiplegia, paraplegia, paralysis
- CC 158: Hip fracture/dislocation
- CC 174: Major organ transplant (excluding kidney)
- CC 7: Metastatic cancer/acute leukemia
- CC 44: Other hematological disorders
- CCs 6 and 111-113: Other infectious disease and pneumonias
- CCs 10-12: Other major cancers
- CC 32: Pancreatic disease
- CCs 54-56, 58, and 60: Psychiatric comorbidity
- CC 77: Respirator dependence/tracheostomy status
- CC 38: Rheumatoid arthritis and inflammatory connective tissue disease
- CC 74: Seizure disorders and convulsions
- CC 2: Septicemia/shock
- CCs 8 and 9: Severe cancer
- CCs 1 and 3-5: Severe infection
- CCs 148 and 149: Ulcers

- *Discharged with High-Risk Condition*: In the readmissions model, a high-risk diagnosis is defined as any diagnosis area (grouped by the Agency for Healthcare Research and Quality [AHRQ] CCS) that was rare in the population but had a 30-day readmission rate of at least 40%. Note that high-risk diagnosis groups related to cancer or mental health

[143] When SMR and SHR were originally developed, they only included adjustment for a set of comorbidities at ESRD incidence. The current SMR and SHR were updated in 2016 to include prevalent comorbidity adjustment and are the production versions reported on DFC. They received final NQF endorsement in early 2017.

[144] Evaluation of the CMS-HCC Risk Adjustment Model Final Report, prepared by RTI International, March 2011 (https://www.cms.gov/Medicare/HealthPlans/MedicareAdvtgSpecRateStats/downloads/evaluation_risk_adj_model_2011.pdf)

are not index discharges, and thus such diagnoses are not included. The CCS areas identified as high-risk are:

- CCS 5: HIV infection
- CCS 6: Hepatitis
- CCS 56: Cystic fibrosis
- CCS 57: Immunity disorders
- CCS 61: Sickle cell anemia
- CCS 190: Fetal distress and abnormal forces of labor
- CCS 151: Other liver diseases
- CCS 182: Hemorrhage during pregnancy; abruptio placenta; placenta previa
- CCS 186: Diabetes or abnormal glucose tolerance complicating pregnancy; childbirth; or the puerperium
- CCS 210: Systemic lupus erythematosus and connective tissue disorders
- CCS 243: Poisoning by nonmedicinal substances

G. Standardized Measures Limitations

These measures utilize indirect standardization. While statistically appropriate for the data structure of these outcomes, the resulting ambiguity in determining whether observed changes over time are due to changes in risk-adjusted expected events, observed events, or both, can be challenging. In addition, how these complex models, based on multiple years of data, adjust for the declining mortality and hospitalization relative to other risk adjusters is uncertain. Comparisons of standardized measures performance between the ESCOs and the comparison group within a given year helps give a clearer picture, particularly when matching is used to select comparison groups.

In addition, the SRR has complex risk-adjustment and exclusion components based on diagnoses derived from Medicare claims data. The predictive models that calculate the expected readmission values were developed using ICD-9 diagnosis coding system several years prior to implementation in the CEC evaluation. On October 1, 2015, CMS mandated conversion to ICD-10 diagnosis coding. Initial crosswalks were developed, based on CMS-recommended General Equivalence Mappings (GEM) reference databases for ICD-9 to ICD-10 conversion. These crosswalks have been implemented in the SRR reported publicly on Dialysis Facility Compare in 2016. Additional changes to the crosswalk are planned, based on the initial experience with the crosswalk, including an interim step of adding additional ICD-10 codes from the GEM ICD-10 to ICD-9 reference, as well as additional clinical review of the resulting crosswalk and coding results. Given the uncertainty inherent in conversion to a new coding tool, results for any measure dependent on complex claims-based risk adjustment should be interpreted with caution in the initial time period after implementation of the new tool. Such is the case for SRR, particularly for changes in SRR from 2014 through 2016, given that ICD-9 was used exclusively in 2014, both ICD-9 and ICD-10 systems were used for parts of 2015, and ICD-10 is being used as the sole coding instrument for 2016 data.

A summary of each standardized measure by year for all ESCOs and the comparison group are displayed in **Exhibits H-4** through **H-6**.

Exhibit H-4. Standardized Hospitalization Ratio for All ESCOs and Comparison Group

Group	Statistic	Standardized Hospitalization Ratio (Admissions) Summary			
		2016	2017	2018	2019
All ESCOs	Beneficiary-years at risk	28,832	32,238	45,878	48,746
	Observed number of hospital admissions	44,835	49,978	72,555	77,219
	Expected number of hospital admissions	43,329	48,868	70,145	75,104
	SHR	1.03	1.02	1.03	1.03
Comparison Group	Beneficiary-years at risk	22,890	24,569	33,050	34,336
	Observed number of hospital admissions	36,513	39,873	54,265	55,846
	Expected number of hospital admissions	34,826	37,870	51,404	54,039
	SHR	1.05	1.05	1.06	1.03

Exhibit H-5. Standardized Readmission Ratio for All ESCOs and Comparison Group

Group	Statistic	Standardized Readmission Ratio Summary			
		2016	2017	2018	2019
All ESCOs	Index discharges	43,574	47,983	69,397	73,186
	Observed number of readmissions	13,248	14,725	21,567	22,971
	Expected number of readmissions	13,714	15,098	21,890	23,107
	SRR	0.97	0.98	0.99	0.99
Comparison Group	Index discharges	36,244	39,188	52,542	53,517
	Observed number of readmissions	11,212	12,346	16,835	16,925
	Expected number of readmissions	11,413	12,421	16,750	17,145
	SRR	0.98	0.99	1.01	0.99

Exhibit H-6. Standardized Mortality Ratio for All ESCOs and Comparison Group

Group	Statistic	Standardized Mortality Ratio Summary			
		2016	2017	2018	2019
All ESCOs	Beneficiary years at risk	28,306	31,602	44,852	47,827
	Observed number of deaths	4,610	5,182	7,518	8,054
	Expected number of deaths	5,181	6,040	8,959	10,322
	SMR	0.89	0.86	0.84	0.78
Comparison Group	Beneficiary years at risk	22,811	24,362	32,695	33,824
	Observed number of deaths	3,957	4,411	5,940	6,134
	Expected number of deaths	4,308	4,830	6,778	7,538
	SMR	0.92	0.91	0.88	0.81

Appendix I: Mortality Analysis

This appendix defines the methodology used to conduct the mortality analysis. Results are summarized at the end of the section.

A. Data and Outcome Measures

The CMS's CCW was the main data source for this mortality analysis. We used Medicare claims data, beneficiary characteristics (e.g., demographics and enrollment), and CCW condition indicators.[145] This analysis includes CCW claims from January 1, 2014 through December 31, 2019 that were processed by March 31, 2020.[146] All CCW claims were final action claims and had a minimum of three months of run out.[147]

We also extracted patient data from Consolidated Renal Operations in a Web-enabled Network (CROWNWeb) to complete the patient history. Data were pulled from the January 2020 quarterly file (for data through December 2019) extracted from CROWNWeb.

Patient demographic and clinical information were extracted from the CMS ESRD Medical Evidence Report form (Form-2728). These data included, but were not limited to, primary cause of renal failure, cause of renal failure groupings, height, race, dry weight, physician name, dialysis type, and incident comorbidities.

Date of death was extracted from the Master Beneficiary Summary Files which include validated dates of death for each beneficiary if death occurred.

The first dialysis service date was extracted from the Renal Management Information System (REMIS).

The analysis sample starts with the same set of beneficiaries and analysis time period (monthly data from January 2014 – December 2019) as the overall DiD analysis

B. CEC and Comparison Group Populations

For this mortality analysis, beneficiary time-at-risk is defined as the duration of time over which the death of a beneficiary would be aligned to an ESCO or comparison group facility, thus counting as an observed event. Beneficiary time-at-risk is aligned to an ESCO or comparison group facility after he/she has had ESRD for at least 90 days.[148] Time-at-risk ends at the earliest

[145] The CCW condition indicators are claims-based algorithms that identify beneficiaries with select clinical conditions (e.g., diabetes, hyperlipidemia, hypertension, etc.) https://www.ccwdata.org/web/guest/condition-categories.

[146] Kidney transplants are an exception, which also included claims that ended in 2011 to assess the kidney transplant exclusion criterion in 2012 (i.e., excluded in the 12 months following the month of a transplant).

[147] The analytic CCW claims files are based on final action claims. We used final action claims only to avoid internal data inconsistencies caused by use of original claims (e.g., we observed beneficiaries aligned based on original claims for whom we found no final action claims).

[148] Since a patient's follow-up in the database can be incomplete during the first 90 days of ESRD therapy, we only include a patient's follow-up into the measure after that patient has received chronic renal replacement therapy for at least 90 days. This minimum 90-day period also assures that most patients are eligible for Medicare, either as their primary or secondary insurer. It also excludes from analysis patients who die or recover renal function during the first 90 days of ESRD. For additional details, see https://dialysisdata.org/sites/default/files/content/ESRD_Measures/nqf/SMR%20MIF.pdf.

occurrence of the following: one day prior to a transplant, date of death, end of alignment, or the end of the follow-up period on December 31, 2019.

Beneficiaries with missing model covariates were excluded from the survival models.

This survival analysis does not incorporate the monthly CEC eligibility criteria. If a beneficiary became ineligible during the follow-up period, that beneficiary was retained for this analysis so as to not bias the results of the survival models.

In addition to survival models examining all beneficiaries, separate survival analyses were conducted for incident beneficiaries. Incident beneficiaries were defined as those who were aligned to an ESCO or comparison group facility during their first year of dialysis.

In addition to analyses examining the full period of follow-up, survival models were run after restricting follow-up time to three years for both prevalent and incident beneficiaries.

C. Survival Models and Estimated CEC Impact

A frequently used statistical model for survival analysis is the Cox proportional hazards models (Cox, 1972), which evaluates the treatment (CEC participation) effect while accounting for patients' characteristics. We set time 0 to be the later of alignment date and 90 days after ESRD, which approximates the treatment (or control) start date. This has been commonly used in clinical trials when comparing survival across different groups (e.g. treatment vs control). We fitted several Cox models which included different populations which will be detailed below. In each model, all the included patients were followed until death (event), transplant date minus 1 (censoring), becoming unaligned (censoring), loss to follow-up (censoring), or end of study (December 31, 2019) (censoring), whichever came first. As described below, we performed tests of the proportional hazards assumption underlying the Cox model to confirm its appropriateness for this application.

The most general model compares survival in the entire CEC-aligned population (all waves and cohorts) to the entire matched comparison population. Because Wave 1 PY1 joiners contributed all of the observed patient experience beyond three years, a more restricted version of this model was fitted by limiting patient's follow up to the first three years after alignment. In this case, death beyond 3 years will be coded as censoring at 3 years. This restriction is intended to allow Wave 1 PY1 joiners and subsequent waves and cohorts to contribute to the estimates in a more symmetrical fashion. We further considered models that only used data from patients who became aligned to the CEC or comparison group during their first year on dialysis (we call these "incident" models and call the previously described models without this restriction "prevalent" models).

A second set of models was estimated to test whether the impact of the CEC on survival differed by wave. To implement this test, when fitting the models we included an interaction term between alignment and wave. In our analysis, we specifically considered the patients aligned to facilities joining in Wave 1 PY1 (starting 10/1/2015) and Wave 2 PY2 (starting 1/1/2017) and their matched comparisons. The model included an indicator for alignment (1 if aligned to CEC, 0 if aligned to the comparison), wave (1 if aligned to either a Wave 2 PY2 joiner or its comparison, 0 if aligned to either a Wave 1 PY1 joiner or its comparison), and an interaction between alignment and wave. The alignment indicator estimates the effect of CEC for Wave 1 PY1 joiners, while the interaction estimates how the effect of CEC differs between Wave 2 PY2

joiners and Wave 1 PY1 joiners. That is, an interaction term close to 0 may suggest that the CEC effect is similar across both waves. In our analysis, we considered the following four permutations of populations: prevalent and incident samples, each with and without limiting patient-level follow-up to three years post alignment.

In summary, the different survival models we estimate are specified as follows:

1. Model 1: Adjusts for ESCO alignment, year, age, vintage (prevalent model only), race, sex, diabetes as cause of ESRD, ethnicity, log of BMI at incidence, log of BMI at incidence spline at 35, pre-ESRD nephrology care, and incident comorbidities, including atherosclerotic heart disease, other cardiac disease, congestive heart failure, inability to ambulate, inability to transfer, cancer, diabetes (all types including cause of ESRD), peripheral vascular disease, cerebrovascular disease, tobacco use, alcohol dependence, drug dependence, and having at least one comorbidity.
2. Model 2: Adjusts for the same covariates listed for Model 1 (apart from year) but also includes a Wave Indicator (Wave 1 PY1 joiner = 0; Wave 2 PY2 joiner = 1) and a Wave Indicator*Alignment interaction term.
3. Models 1c, 1d, 2c, and 2d are restricted to incident beneficiaries only. Models 1b, 1d, 2b, and 2d are restricted to three years of follow-up time.

1. Estimation Results

The most general model (**Exhibit I-1**), which includes all waves as a single treatment group (CEC) relative to their single matched comparison (control), shows a modest but statistically significant survival benefit for CEC patients. When restricting follow-up to 3 years post-alignment, the survival benefit remains significant and similar in magnitude (**Exhibit I-2**). The hazard ratio slightly decreased from 0.972 to 0.971, which implies that the CEC benefits on survival for patients beyond 3 years of follow-up were only slightly smaller than for patients during the first 3 years.

We hypothesized that the CEC impact would be larger among patients who were exposed to the program earlier in their course of treatment. These models (**Exhibit I-3** and **Exhibit I-4**) for incident patients (aligned during their first year on dialysis) supported this hypothesis as the CEC treatment effects were about 1.5 times the magnitude of those in the prevalent models. For the incident model that included all waves (**Exhibit I-3**), the CEC indicator coefficient equaled -0.046 (p=0.01) with Hazard Rate (HR)= 0.955; for the prevalent model that included all waves, the CEC indicator coefficient equaled -0.045 (p=0.01) with HR= 0.956.

The next set of models tested whether the effects on mortality differed by wave. The three key variables are alignment to CEC, which tests the general impact of the CEC on survival; the Wave 2 indicator, which accounts for any time trends in survival that affected both the CEC patients and their comparisons; and the interaction between these two variables, which tests whether the impact differs between waves. CEC effect was associated with slightly better survival than the comparison group. **Exhibit I-5** shows CEC (for Wave 1 PY1) indicator coefficient equaled -0.019, but the difference was not significant (p=.264). Similarly, Wave 2 PY2 joiners was associated with slightly better survival than for Wave 1 PY1 (Hazard Ratio=0.975), but again that association was not significant (p=0.278). **Exhibit I-6** compares CEC vs comparison for

Wave 1 PY1 and CEC versus Comparison for Wave 2 PY2. For Wave 1 PY1 group, we again don't see a significant survival effect for CEC alignment. For the Wave 2 PY2 joiners, CEC alignment was associated with significantly better survival than the comparison group (Hazard Ratio=0.957) with a significant p-value (p=0.007) for the test of the null hypothesis that effect for Wave 2 PY2 joiners is not different than zero (**Exhibit I-6**). When restricting to 3 years of follow-up, the results remained similar to those from the unrestricted model. Overall, these models show better survival in the CEC, and better survival in Wave 2 than in Wave 1, but these effects are generally not statistically significant. When combined with the results of the general (non-wave specific) models that showed modest but statistically significant survival advantages for CEC, we conclude that there is insufficient statistical power to accurately differentiate performance between waves.

Restricting the models to patients aligned during their first year on dialysis (**Exhibit I-9** and **Exhibit I-12**), the effects are again somewhat larger than in the prevalent model. In Wave 1 PY1 joiners, CEC was associated with better survival than the comparison group (HR= 0.954), but the difference was not significant (p=.103) (**Exhibit I-9**). Note in **Exhibit I-9**, that the wave indicator and interaction of the wave indicator and align both have very small and are not statistically significant coefficients. The align coefficient in this model (-0.047) is nearly identical to the align coefficient (-0.046) without the wave indicators **(Exhibit I-3, Model 2c**). This shows that it is appropriate to focus on the main results of CEC versus the comparison results as the wave differential is not statistically important. **Exhibit I-10** shows the results by CEC vs. comparison within Wave 1 PY1 and Wave 2 PY2. When comparing CEC vs comparison for Wave 2 PY2 joiners, we find that CEC was associated with better survival than the comparison group (HR=0.957), but the difference was not significant (p=0.149) (**Exhibit I-10**). Results are similar for the Wave 1 PY1 joiners. Results for the 3-year model are reflective of other incident models (**Exhibits I-11** and **I-12**).

Exhibit I-1. Model 1a—Analysis of Maximum Likelihood Estimates: All Prevalent Beneficiaries

Covariates (N=160,420)	Coeff	SE	p-value	HR
Align (Control=0; ESCO=1)	-0.03	0.01	0.003	0.97
Year (2017)	0.03	0.01	0.015	1.0
Year (2018)	0.10	0.01	<.0001	1.1
Year (2019)	0.15	0.02	<.0001	1.2
Age	0.03	0.00	<.0001	1.0
Dialysis Start < 1 Year	-0.01	0.02	0.47	0.99
Dialysis Start between 2 Years and 3 Years	0.04	0.02	0.05	1.0
Dialysis Start Greater than 3 Years	0.25	0.02	<.0001	1.3
White	0.40	0.02	<.0001	1.5
Black	-0.003	0.02	0.87	1.0
Female	-0.01	0.01	0.52	0.99
Diabetes as Cause of ESRD	0.05	0.01	0.001	1.1
Hispanic	-0.27	0.02	<.0001	0.76
Unknown Ethnicity	-0.22	0.29	0.45	0.81
Log of BMI at Incidence	-0.51	0.03	<.0001	0.60
BMI at Incidence: Missing	-0.13	0.21	0.55	0.88

Covariates (N=160,420)	Coeff	SE	p-value	HR
Log of BMI at Incidence Spline at 35	0.58	0.07	<.0001	1.8
Incident Comorbidity: Atherosclerotic Heart Disease	0.07	0.01	<.0001	1.1
Incident Comorbidity: Other Cardiac Disease	0.13	0.01	<.0001	1.1
Incident Comorbidity: Congestive Heart Failure	0.20	0.01	<.0001	1.2
Incident Comorbidity: Inability to Ambulate	0.26	0.03	<.0001	1.3
Incident Comorbidity: Chronic Obstructive Pulmonary Disease	0.19	0.02	<.0001	1.2
Incident Comorbidity: Inability to Transfer	0.23	0.03	<.0001	1.3
Incident Comorbidity: Malignant Neoplasm, Cancer	0.09	0.02	<.0001	1.1
Incident Comorbidity: Diabetes (All Types including Cause of ESRD)	0.15	0.02	<.0001	1.2
Incident Comorbidity: Peripheral vascular Disease	0.13	0.02	<.0001	1.1
Incident Comorbidity: Cerebrovascular Disease, CVA, TIA	0.07	0.02	<.0001	1.1
Incident Comorbidity: Tobacco Use (Current Smoker)	0.13	0.02	<.0001	1.1
Incident Comorbidity: Alcohol Dependence	0.17	0.04	0	1.2
Incident Comorbidity: Drug Dependence	0.24	0.05	<.0001	1.3
Incident Comorbidity: At Least One Comorbidity	0.17	0.02	<.0001	1.2
Pre-ESRD Nephrology Care: No	0.07	0.01	<.0001	1.1
Pre-ESRD Nephrology Care: Unknown	0.16	0.01	<.0001	1.2
Pre-ESRD Nephrology Care: Missing	0.28	0.02	<.0001	1.3

Notes: C Statistic = 0.677.

Exhibit I-2. Model 1b—Analysis of Maximum Likelihood Estimates: All Prevalent Beneficiaries with 3-Year Follow-up

Covariates (N=160,420)	Coeff	SE	p-value	HR
Align (Control=0; ESCO=1)	-0.03	0.01	0.003	0.97
Year (2017)	0.03	0.01	0.02	1.0
Year (2018)	0.10	0.01	<.0001	1.1
Year (2019)	0.15	0.02	<.0001	1.2
Age	0.03	0.00	<.0001	1.0
Dialysis Start < 1 Year	-0.02	0.02	0.33	0.98
Dialysis Start between 2 Years and 3 Years	0.04	0.02	0.07	1.0
Dialysis Start Greater than 3 Years	0.25	0.02	<.0001	1.3
White	0.40	0.02	<.0001	1.5
Black	0.00	0.02	0.99	1.0
Female	-0.01	0.01	0.53	0.99
Diabetes as Cause of ESRD	0.05	0.02	0.001	1.1
Hispanic	-0.27	0.02	<.0001	0.76
Unknown Ethnicity	-0.16	0.29	0.58	0.85
Log of BMI at Incidence	-0.52	0.03	<.0001	0.59
BMI at Incidence: Missing	-0.16	0.22	0.47	0.85
Log of BMI at Incidence Spline at 35	0.61	0.07	<.0001	1.8
Incident Comorbidity: Atherosclerotic Heart Disease	0.07	0.01	<.0001	1.1
Incident Comorbidity: Other Cardiac Disease	0.13	0.01	<.0001	1.1
Incident Comorbidity: Congestive Heart Failure	0.20	0.01	<.0001	1.2
Incident Comorbidity: Inability to Ambulate	0.27	0.03	<.0001	1.3

Covariates (N=160,420)	Coeff	SE	p-value	HR
Incident Comorbidity: Chronic Obstructive Pulmonary Disease	0.20	0.02	<.0001	1.2
Incident Comorbidity: Inability to Transfer	0.23	0.03	<.0001	1.3
Incident Comorbidity: Malignant Neoplasm, Cancer	0.10	0.02	<.0001	1.1
Incident Comorbidity: Diabetes (All Types including Cause of ESRD)	0.14	0.02	<.0001	1.2
Incident Comorbidity: Peripheral Vascular Disease	0.13	0.02	<.0001	1.1
Incident Comorbidity: Cerebrovascular Disease, CVA, TIA	0.07	0.02	<.0001	1.1
Incident Comorbidity: Tobacco Use (Current Smoker)	0.12	0.02	<.0001	1.1
Incident Comorbidity: Alcohol Dependence	0.17	0.04	<.0001	1.2
Incident Comorbidity: Drug Dependence	0.26	0.05	<.0001	1.3
Incident Comorbidity: At Least One Comorbidity	0.18	0.02	<.0001	1.2
Pre-ESRD Nephrology Care: No	0.07	0.01	<.0001	1.1
Pre-ESRD Nephrology Care: Unknown	0.16	0.02	<.0001	1.2
Pre-ESRD Nephrology Care: Missing	0.28	0.02	<.0001	1.3

Notes: C Statistic = 0.677.

Exhibit I-3. Model 1c—Analysis of Maximum Likelihood Estimates: All Incident Beneficiaries

Covariates (N=54,349)	Coeff	SE	p-value	HR
Align (Control=0; ESCO=1)	-0.05	0.02	0.01	0.96
Year (2017)	0.02	0.03	0.50	1.0
Year (2018)	0.08	0.03	0.005	1.1
Year (2019)	0.07	0.03	0.04	1.1
Age	0.03	0.001	<.0001	1.0
Black	-0.44	0.02	<.0001	0.65
Race Other	-0.45	0.03	<.0001	0.64
Female	-0.02	0.02	0.30	0.98
Diabetes as Cause of ESRD	-0.03	0.03	0.25	0.97
Hispanic	-0.34	0.04	<.0001	0.71
Unknown Ethnicity	0.24	0.71	0.74	1.3
Log of BMI at Incidence	-0.82	0.05	<.0001	0.44
BMI at Incidence: Missing	-8.1	41.2	0.84	0.00
Log of BMI at Incidence Spline at 35	1.1	0.13	<.0001	3.0
Incident Comorbidity: Atherosclerotic Heart Disease	0.03	0.02	0.18	1.0
Incident Comorbidity: Other Cardiac Disease	0.14	0.02	<.0001	1.2
Incident Comorbidity: Congestive Heart Failure	0.30	0.02	<.0001	1.3
Incident Comorbidity: Inability to Ambulate	0.34	0.04	<.0001	1.4
Incident Comorbidity: Chronic Obstructive Pulmonary Disease	0.23	0.03	<.0001	1.3
Incident Comorbidity: Inability to Transfer	0.42	0.05	<.0001	1.5
Incident Comorbidity: Malignant Neoplasm, Cancer	0.21	0.03	<.0001	1.2
Incident Comorbidity: Diabetes (All Types including Cause of ESRD)	0.12	0.03	<.0001	1.1
Incident Comorbidity: Peripheral Vascular Disease	0.18	0.03	<.0001	1.2
Incident Comorbidity: Cerebrovascular Disease, CVA, TIA	0.09	0.03	0.001	1.1
Incident Comorbidity: Tobacco Use (Current Smoker)	0.01	0.04	0.83	1.0
Incident Comorbidity: Alcohol Dependence	0.29	0.08	0	1.3

Covariates (N=54,349)	Coeff	SE	p-value	HR
Incident Comorbidity: Drug Dependence	0.33	0.08	<.0001	1.4
Incident Comorbidity: At Least One Comorbidity	0.17	0.04	<.0001	1.2
Pre-ESRD Nephrology Care: No	0.22	0.02	<.0001	1.2
Pre-ESRD Nephrology Care: Unknown	0.33	0.02	<.0001	1.4
Pre-ESRD Nephrology Care: Missing	-7.9	100.5	0.94	0.00

Notes: C Statistic = 0.703.

Exhibit I-4. Model 1d—Analysis of Maximum Likelihood Estimates: All Incident Beneficiaries with 3-Year Follow-up

Covariates (N=54,349)	Coeff	SE	p-value	HR
Align (Control=0; ESCO=1)	-0.05	0.02	0.01	0.96
Year (2017)	0.02	0.03	0.50	1.0
Year (2018)	0.08	0.03	0.005	1.1
Year (2019)	0.07	0.03	0.04	1.1
Age	0.03	0.001	<.0001	1.0
Black	-0.43	0.02	<.0001	0.65
Race Other	-0.46	0.03	<.0001	0.63
Female	-0.02	0.02	0.24	0.98
Diabetes as Cause of ESRD	-0.03	0.03	0.31	0.97
Hispanic	-0.35	0.04	<.0001	0.71
Unknown Ethnicity	0.24	0.71	0.74	1.3
Log of BMI at Incidence	-0.84	0.05	<.0001	0.43
BMI at Incidence: Missing	-8.1	41.3	0.84	0.00
Log of BMI at Incidence Spline at 35	1.1	0.13	<.0001	3.0
Incident Comorbidity: Atherosclerotic Heart Disease	0.03	0.02	0.19	1.0
Incident Comorbidity: Other Cardiac Disease	0.14	0.02	<.0001	1.1
Incident Comorbidity: Congestive Heart Failure	0.30	0.02	<.0001	1.3
Incident Comorbidity: Inability to Ambulate	0.35	0.04	<.0001	1.4
Incident Comorbidity: Chronic Obstructive Pulmonary Disease	0.24	0.03	<.0001	1.3
Incident Comorbidity: Inability to Transfer	0.42	0.05	<.0001	1.5
Incident Comorbidity: Malignant Neoplasm, Cancer	0.22	0.03	<.0001	1.2
Incident Comorbidity: Diabetes (All Types including Cause of ESRD)	0.11	0.03	0.00	1.1
Incident Comorbidity: Peripheral Vascular Disease	0.18	0.03	<.0001	1.2
Incident Comorbidity: Cerebrovascular Disease, CVA, TIA	0.10	0.03	0.001	1.1
Incident Comorbidity: Tobacco Use (Current Smoker)	-0.01	0.04	0.75	0.99
Incident Comorbidity: Alcohol Dependence	0.29	0.08	<.0001	1.3
Incident Comorbidity: Drug Dependence	0.35	0.08	<.0001	1.4
Incident Comorbidity: At Least One Comorbidity	0.18	0.04	<.0001	1.2
Pre-ESRD Nephrology Care: No	0.23	0.02	<.0001	1.3
Pre-ESRD Nephrology Care: Unknown	0.34	0.02	<.0001	1.4
Pre-ESRD Nephrology Care: Missing	-7.9	101.1	0.94	0.00

Notes: C Statistic = 0.703.

Exhibit I-5. Model 2a—Analysis of Maximum Likelihood Estimates: All Prevalent Beneficiaries, Interaction Model for Wave 1 PY1 and Wave 2 PY2 Joiners

Covariates (N=99,635)	Coeff	SE	p-value	HR
Align (Control=0; ESCO=1)	-0.02	0.02	0.26	0.98
Wave Indicator (Wave 1 PY1=0; Wave 2 PY2=1)	0.03	0.02	0.06	1.0
*Wave Indicator*Align*	-0.03	0.02	0.28	0.98
Age	0.03	0.001	<.0001	1.0
Dialysis Start < 1 Year	-0.02	0.02	0.26	0.98
Dialysis Start between 2 Years and 3 Years	0.02	0.03	0.46	1.0
Dialysis Start Greater than 3 Years	0.24	0.02	<.0001	1.3
White	0.42	0.02	<.0001	1.5
Black	0.02	0.02	0.37	1.0
Female	-0.009	0.01	0.46	0.99
Diabetes as Cause of ESRD	0.05	0.02	0.003	1.1
Hispanic	-0.25	0.02	<.0001	0.78
Unknown Ethnicity	0.003	0.30	0.99	1.0
Log of BMI at Incidence	-0.51	0.04	<.0001	0.60
BMI at Incidence: Missing	-0.001	0.23	1.0	1.0
Log of BMI at Incidence Spline at 35	0.61	0.08	<.0001	1.8
Incident Comorbidity: Atherosclerotic Heart Disease	0.07	0.02	<.0001	1.1
Incident Comorbidity: Other Cardiac Disease	0.13	0.02	<.0001	1.1
Incident Comorbidity: Congestive Heart Failure	0.20	0.01	<.0001	1.2
Incident Comorbidity: Inability to Ambulate	0.26	0.03	<.0001	1.3
Incident Comorbidity: Chronic Obstructive Pulmonary Disease	0.18	0.02	<.0001	1.2
Incident Comorbidity: Inability to Transfer	0.23	0.04	<.0001	1.3
Incident Comorbidity: Malignant Neoplasm, Cancer	0.08	0.02	0.001	1.1
Incident Comorbidity: Diabetes (All Types including Cause of ESRD)	0.15	0.02	<.0001	1.2
Incident Comorbidity: Peripheral Vascular Disease	0.13	0.02	<.0001	1.1
Incident Comorbidity: Cerebrovascular Disease, CVA, TIA	0.04	0.02	0.05	1.0
Incident Comorbidity: Tobacco Use (Current Smoker)	0.16	0.03	<.0001	1.2
Incident Comorbidity: Alcohol Dependence	0.17	0.05	0.002	1.2
Incident Comorbidity: Drug Dependence	0.21	0.06	0.00	1.2
Incident Comorbidity: At Least One Comorbidity	0.18	0.02	<.0001	1.2
Pre-ESRD Nephrology Care: No	0.07	0.02	<.0001	1.1
Pre-ESRD Nephrology Care: Unknown	0.19	0.02	<.0001	1.2
Pre-ESRD Nephrology Care: Missing	0.29	0.03	<.0001	1.3

Notes: C Statistic = 0.679. Wave 1 indicates beneficiary is aligned to a Wave 1 PY1 joiner facility and Wave 2 indicates beneficiary is aligned to a Wave 2 PY2 joiner facility.

Exhibit I-6. Model 2a—Complete-Year Cox Model: Prevalent Beneficiaries

CEC vs Comparison	Effect	95% Lower CI	95% Upper CI	p-value
Wave 1	-0.01	-0.05	0.02	0.53
Wave 2	-0.04	-0.08	-0.01	0.007

CEC vs Comparison	Hazard Ratio	95% Lower CI	95% Upper CI	p-value
Wave 1	0.99	0.96	1.0	0.53
Wave 2	0.96	0.93	0.99	0.007

Notes: Wave 1 indicates beneficiary is aligned to a Wave 1 PY1 joiner facility and Wave 2 indicates beneficiary is aligned to a Wave 2 PY2 joiner facility.

Exhibit I-7. Model 2b—Analysis of Maximum Likelihood Estimates: Prevalent Beneficiaries, Interaction Model with 3-Year Follow-up

Covariates (N=99,635)	Coeff	SE	p-value	HR
Align (Control=0; ESCO=1)	-0.02	0.02	0.21	0.98
Wave Indicator (Wave 1 PY1=0; Wave 2 PY2=1)	0.03	0.02	0.10	1.0
*Wave Indicator*Align*	-0.02	0.02	0.40	0.98
Age	0.03	0.001	<.0001	1.0
Dialysis Start < 1 Year	-0.03	0.02	0.15	0.97
Dialysis Start between 2 Years and 3 Years	0.01	0.03	0.62	1.0
Dialysis Start Greater than 3 Years	0.24	0.02	<.0001	1.3
White	0.42	0.02	<.0001	1.5
Black	0.03	0.02	0.26	1.0
Female	-0.009	0.01	0.47	0.99
Diabetes as Cause of ESRD	0.05	0.02	0.004	1.1
Hispanic	-0.26	0.02	<.0001	0.77
Unknown Ethnicity	0.08	0.30	0.79	1.1
Log of BMI at Incidence	-0.54	0.04	<.0001	0.59
BMI at Incidence: Missing	-0.03	0.23	0.90	0.97
Log of BMI at Incidence Spline at 35	0.66	0.08	<.0001	1.9
Incident Comorbidity: Atherosclerotic Heart Disease	0.07	0.02	<.0001	1.1
Incident Comorbidity: Other Cardiac Disease	0.12	0.02	<.0001	1.1
Incident Comorbidity: Congestive Heart Failure	0.21	0.01	<.0001	1.2
Incident Comorbidity: Inability to Ambulate	0.28	0.03	<.0001	1.3
Incident Comorbidity: Chronic Obstructive Pulmonary Disease	0.19	0.02	<.0001	1.2
Incident Comorbidity: Inability to Transfer	0.24	0.04	<.0001	1.3
Incident Comorbidity: Malignant Neoplasm, Cancer	0.09	0.02	0.00	1.1
Incident Comorbidity: Diabetes (All Types including Cause of ESRD)	0.15	0.02	<.0001	1.2
Incident Comorbidity: Peripheral Vascular Disease	0.14	0.02	<.0001	1.1
Incident Comorbidity: Cerebrovascular Disease, CVA, TIA	0.03	0.02	0.13	1.0
Incident Comorbidity: Tobacco Use (Current Smoker)	0.15	0.03	<.0001	1.2
Incident Comorbidity: Alcohol Dependence	0.17	0.05	0.001	1.2
Incident Comorbidity: Drug Dependence	0.23	0.06	<.0001	1.3
Incident Comorbidity: At Least One Comorbidity	0.19	0.02	<.0001	1.2

Covariates (N=99,635)	Coeff	SE	p-value	HR
Pre-ESRD Nephrology Care: No	0.07	0.02	<.0001	1.1
Pre-ESRD Nephrology Care: Unknown	0.19	0.02	<.0001	1.2
Pre-ESRD Nephrology Care: Missing	0.29	0.03	<.0001	1.3

Notes: C Statistic = 0.680. Wave 1 PY1 indicates beneficiary is aligned to a Wave 1 PY1 joiner facility and Wave 2 PY2 indicates beneficiary is aligned to a Wave 2 PY2 joiner facility.

Exhibit I-8. Model 2b—3-Year Cox Model: Prevalent Beneficiaries

CEC vs Comparison	Effect	95% Lower CI	95% Upper CI	p-value
Wave 1	-0.01	-0.05	0.02	0.44
Wave 2	-0.04	-0.08	-0.01	0.01

CEC vs Comparison	Hazard Ratio	95% Lower CI	95% Upper CI	p-value
Wave 1	0.99	0.95	1.0	0.44
Wave 2	0.96	0.93	0.99	0.009

Notes: Wave 1 indicates beneficiary is aligned to a Wave 1 PY1 joiner facility and Wave 2 indicates beneficiary is aligned to a Wave 2 PY2 joiner facility.

Exhibit I-9. Model 2c—Analysis of Maximum Likelihood Estimates: Incident Beneficiaries, Interaction Model for Wave 1 PY1 and Wave 2 PY2 Joiners

Covariates (N=35,630)	Coeff	SE	p-value	HR
Align (Control=0; ESCO=1)	-0.05	0.03	0.10	0.95
Wave Indicator (Wave 1 PY1=0; Wave 2 PY2=1)	0.006	0.03	0.84	1.0
*Wave Indicator*Align*	0.003	0.04	0.95	1.0
Age	0.03	0.001	<.0001	1.0
Black	-0.44	0.03	<.0001	0.65
Race Other	-0.45	0.04	<.0001	0.64
Female	-0.005	0.02	0.82	1.0
Diabetes as Cause of ESRD	-0.05	0.03	0.13	0.96
Hispanic	-0.34	0.04	<.0001	0.71
Unknown Ethnicity	0.28	1.0	0.78	1.3
Log of BMI at Incidence	-0.81	0.06	<.0001	0.45
BMI at Incidence: Missing	-8.2	49.3	0.87	0.00
Log of BMI at Incidence Spline at 35	1.0	0.15	<.0001	2.8
Incident Comorbidity: Atherosclerotic Heart Disease	0.07	0.03	0.03	1.1
Incident Comorbidity: Other Cardiac Disease	0.13	0.03	<.0001	1.1
Incident Comorbidity: Congestive Heart Failure	0.30	0.02	<.0001	1.3
Incident Comorbidity: Inability to Ambulate	0.36	0.05	<.0001	1.4
Incident Comorbidity: Chronic Obstructive Pulmonary Disease	0.21	0.03	<.0001	1.2
Incident Comorbidity: Inability to Transfer	0.40	0.06	<.0001	1.5
Incident Comorbidity: Malignant Neoplasm, Cancer	0.19	0.04	<.0001	1.2
Incident Comorbidity: Diabetes (All Types including Cause of ESRD)	0.12	0.03	0.001	1.1
Incident Comorbidity: Peripheral Vascular Disease	0.16	0.03	<.0001	1.2

Covariates (N=35,630)	Coeff	SE	p-value	HR
Incident Comorbidity: Cerebrovascular Disease, CVA, TIA	0.05	0.04	0.17	1.0
Incident Comorbidity: Tobacco Use (Current Smoker)	0.03	0.05	0.49	1.0
Incident Comorbidity: Alcohol Dependence	0.15	0.10	0.11	1.2
Incident Comorbidity: Drug Dependence	0.46	0.10	<.0001	1.6
Incident Comorbidity: At Least One Comorbidity	0.17	0.04	<.0001	1.2
Pre-ESRD Nephrology Care: No	0.22	0.03	<.0001	1.2
Pre-ESRD Nephrology Care: Unknown	0.37	0.03	<.0001	1.4
Pre-ESRD Nephrology Care: Missing	-7.8	141.5	0.96	0.00

Notes: C Statistic = 0.704. Wave 1 indicates beneficiary is aligned to a Wave 1 PY1 joiner facility and Wave 2 indicates beneficiary is aligned to a Wave 2 PY2 joiner facility.

Exhibit I-10. Model 2c—Complete-Year Cox Model: Incident Beneficiaries

CEC vs Comparison	Effect	95% Lower CI	95% Upper CI	p-value
Wave 1	-0.04	-0.10	0.02	0.21
Wave 2	-0.05	-0.11	0.02	0.15

CEC vs Comparison	Hazard Ratio	95% Lower CI	95% Upper CI	p-value
Wave 1	0.96	0.91	1.0	0.21
Wave 2	0.96	0.90	1.0	0.15

Notes: Wave 1 indicates beneficiary is aligned to a Wave 1 PY1 joiner facility and Wave 2 indicates beneficiary is aligned to a Wave 2 PY2 joiner facility.

Exhibit I-11. Model 2d—Analysis of Maximum Likelihood Estimates: Incident Beneficiaries, Interaction Model for Wave 1 PY1 and Wave 2 PY2 Joiners with 3-Year Follow-up

Covariates (N=35,630)	Coeff	SE	p-value	HR
Align (Control=0; ESCO=1)	-0.05	0.03	0.13	0.96
Wave Indicator (Wave 1 PY1=0; Wave 2 PY2=1)	0.007	0.03	0.83	1.0
*Wave Indicator*Align*	0.003	0.04	0.95	1.0
Age	-0.43	0.03	<.0001	0.65
Black	-0.47	0.04	<.0001	0.62
Race Other	-0.008	0.02	0.72	0.99
Female	-0.04	0.03	0.17	0.96
Diabetes as Cause of ESRD	0.03	0.001	<.0001	1.0
Hispanic	-0.36	0.05	<.0001	0.70
Unknown Ethnicity	0.27	1.0	0.79	1.3
Log of BMI at Incidence	-0.83	0.07	<.0001	0.44
BMI at Incidence: Missing	-8.2	49.4	0.87	0.00
Log of BMI at Incidence Spline at 35	1.1	0.16	<.0001	2.9
Incident Comorbidity: Atherosclerotic Heart Disease	0.07	0.03	0.03	1.1
Incident Comorbidity: Other Cardiac Disease	0.13	0.03	<.0001	1.1
Incident Comorbidity: Congestive Heart Failure	0.31	0.02	<.0001	1.4

Covariates (N=35,630)	Coeff	SE	p-value	HR
Incident Comorbidity: Inability to Ambulate	0.37	0.05	<.0001	1.5
Incident Comorbidity: Chronic Obstructive Pulmonary Disease	0.22	0.03	<.0001	1.2
Incident Comorbidity: Inability to Transfer	0.40	0.06	<.0001	1.5
Incident Comorbidity: Malignant Neoplasm, Cancer	0.20	0.04	<.0001	1.2
Incident Comorbidity: Diabetes (All Types including Cause of ESRD)	0.10	0.04	0.003	1.1
Incident Comorbidity: Peripheral Vascular Disease	0.16	0.03	<.0001	1.2
Incident Comorbidity: Cerebrovascular Disease, CVA, TIA	0.05	0.04	0.13	1.1
Incident Comorbidity: Tobacco Use (Current Smoker)	0.002	0.05	0.96	1.0
Incident Comorbidity: Alcohol Dependence	0.16	0.10	0.11	1.2
Incident Comorbidity: Drug Dependence	0.48	0.10	<.0001	1.6
Incident Comorbidity: At Least One Comorbidity	0.19	0.04	<.0001	1.2
Pre-ESRD Nephrology Care: No	0.23	0.03	<.0001	1.3
Pre-ESRD Nephrology Care: Unknown	0.38	0.03	<.0001	1.5
Pre-ESRD Nephrology Care: Missing	-7.8	142.4	0.96	0.00

Notes: C Statistic = 0.704. Wave 1 indicates beneficiary is aligned to a Wave 1 PY1 joiner facility and Wave 2 indicates beneficiary is aligned to a Wave 2 PY2 joiner facility.

Exhibit I-12. Model 2d—Complete-Year Cox Model: Incident Beneficiaries

CEC vs Comparison	Effect	95% Lower CI	95% Upper CI	p-value
Wave 1	-0.04	-0.10	0.02	0.23
Wave 2	-0.04	-0.10	0.02	0.16

CEC vs Comparison	Hazard Ratio	95% Lower CI	95% Upper CI	p-value
Wave 1	0.96	0.91	1.0	0.23
Wave 2	0.96	0.90	1.0	0.16

Notes: Wave 1 indicates beneficiary is aligned to a Wave 1 PY1 joiner facility and Wave 2 indicates beneficiary is aligned to a Wave 2 PY2 joiner facility.

Exhibit I-13. Estimated Survival for Patients in CEC and Comparison Group (Wave 1 PY1 and Wave 2 PY2 Joiners)

Model	Group	1-Year	3-Year
Model 2a: Prevalent Beneficiaries	CEC Wave 1 PY1	89.4%	71.1%
	Comparison Wave 1 PY1	89.2%	70.6%
	CEC Wave 2 PY2	89.3%	70.9%
	Comparison Wave 2 PY2	88.8%	69.8%
Model 2b: Prevalent Beneficiaries with 2-year Follow-up	CEC Wave 1 PY1	89.4%	71.1%
	Comparison Wave 1 PY1	89.2%	70.5%
	CEC Wave 2 PY2	89.3%	70.9%
	Comparison Wave 2 PY2	88.9%	69.8%
Model 2c: Incident Beneficiaries	CEC Wave 1 PY1	89.7%	73.1%
	Comparison Wave 1 PY1	89.2%	72.0%
	CEC Wave 2 PY2	89.6%	72.9%
	Comparison Wave 2 PY2	89.1%	71.9%

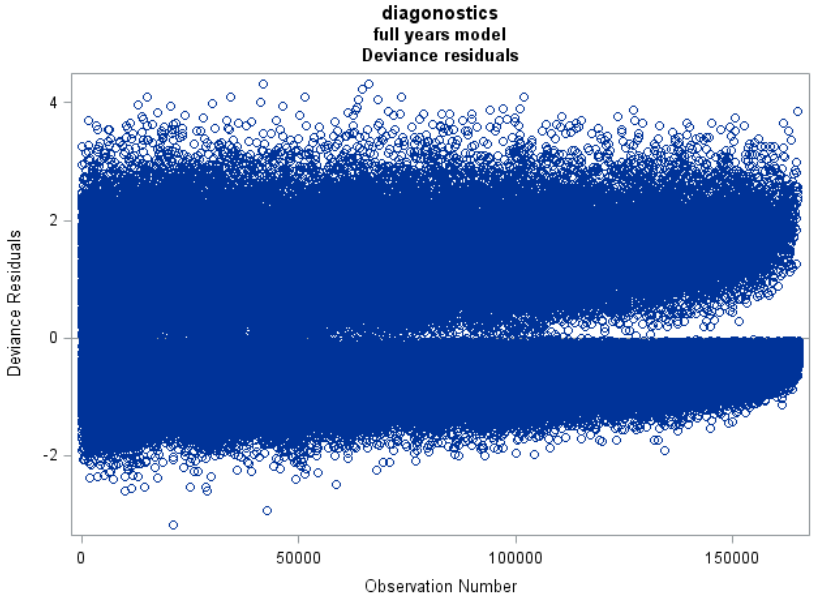
Model	Group	1-Year	3-Year
Model 2d: Incident Beneficiaries with 2-year Follow-up	CEC Wave 1 PY1`	89.7%	73.1%
	Comparison Wave 1 PY1	89.3%	72.2%
	CEC Wave 2 PY2	89.7%	73.1%
	Comparison Wave 2 PY2	89.2%	72.1%

Notes: Wave 1 indicates beneficiary is aligned to a Wave 1 PY1 joiner facility and Wave 2 indicates beneficiary is aligned to a Wave 2 PY2 joiner facility.

D. Model Diagnostics

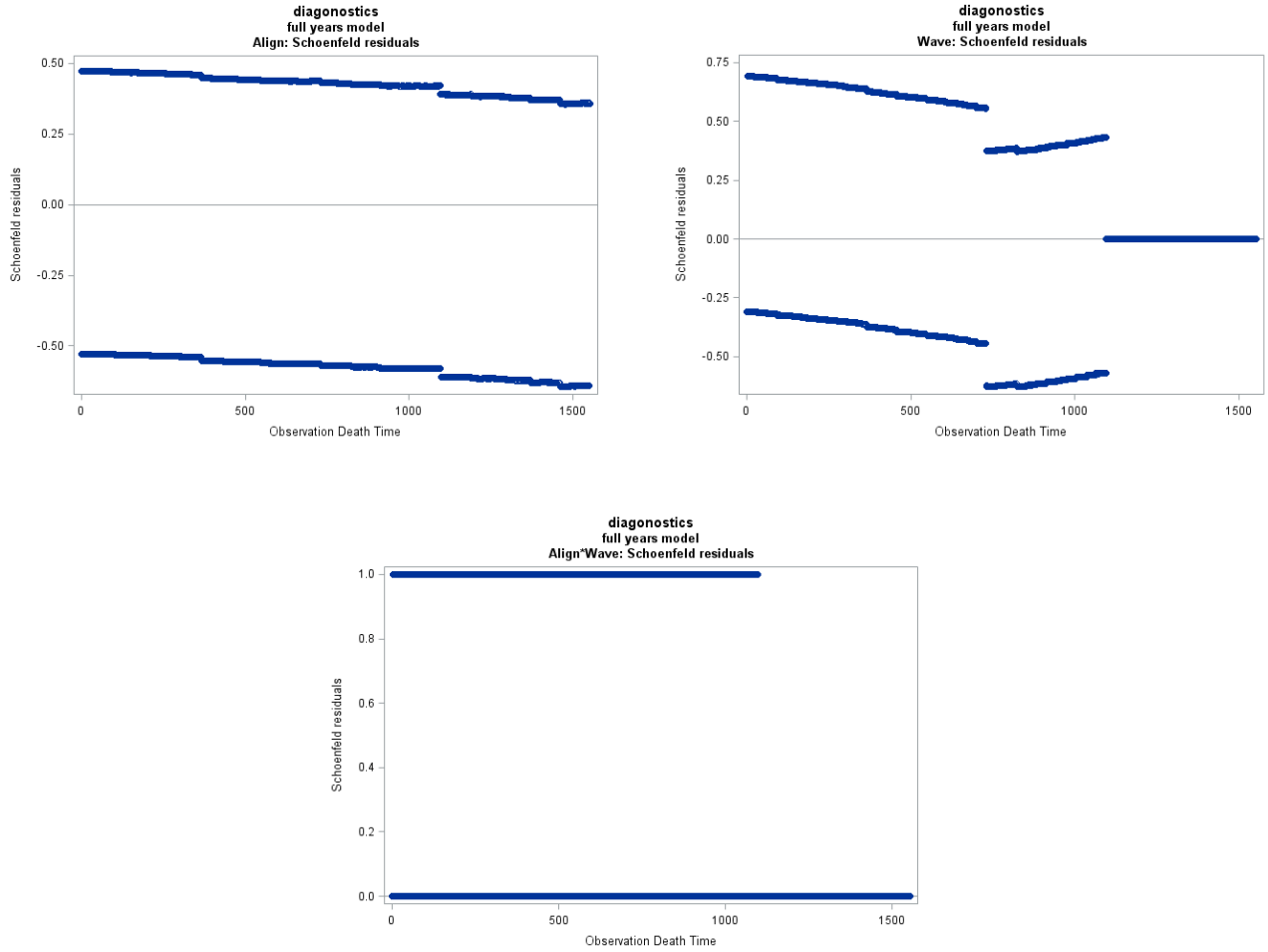
We visually perform model diagnostics for the Cox model with complete follow-up as well as with maximal 3-year follow-up. We first draw the scatter plot of deviance residuals to check whether the functional forms of covariates used in the model were proper and whether there were outliers in the observations. We then plot the Schoenfeld residuals against each covariate in the model to check the proportional hazards (PH) assumption on that covariate. For all the plots, any patterns that deviates from random scattering around 0 may indicate lack of fit or violation of the PH assumption.

Exhibit I-14. Complete-Year Cox Model: Deviance Residuals



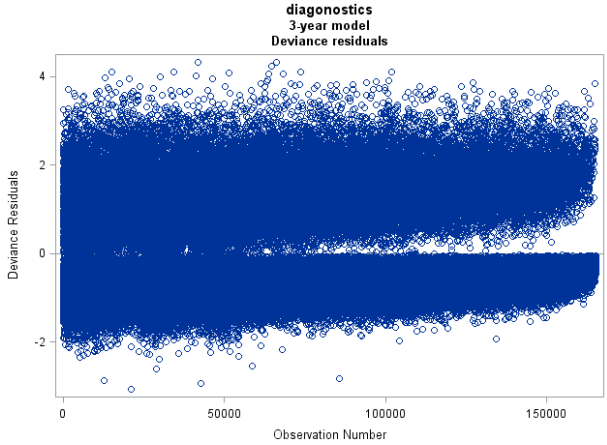
As the residuals were roughly scattered around 0, the functional forms for the covariates seemed to be proper. There were no indications for outliers as well.

Exhibit I-15. Complete-Year Cox Model: Schoenfeld Residuals (Proportional Hazards)



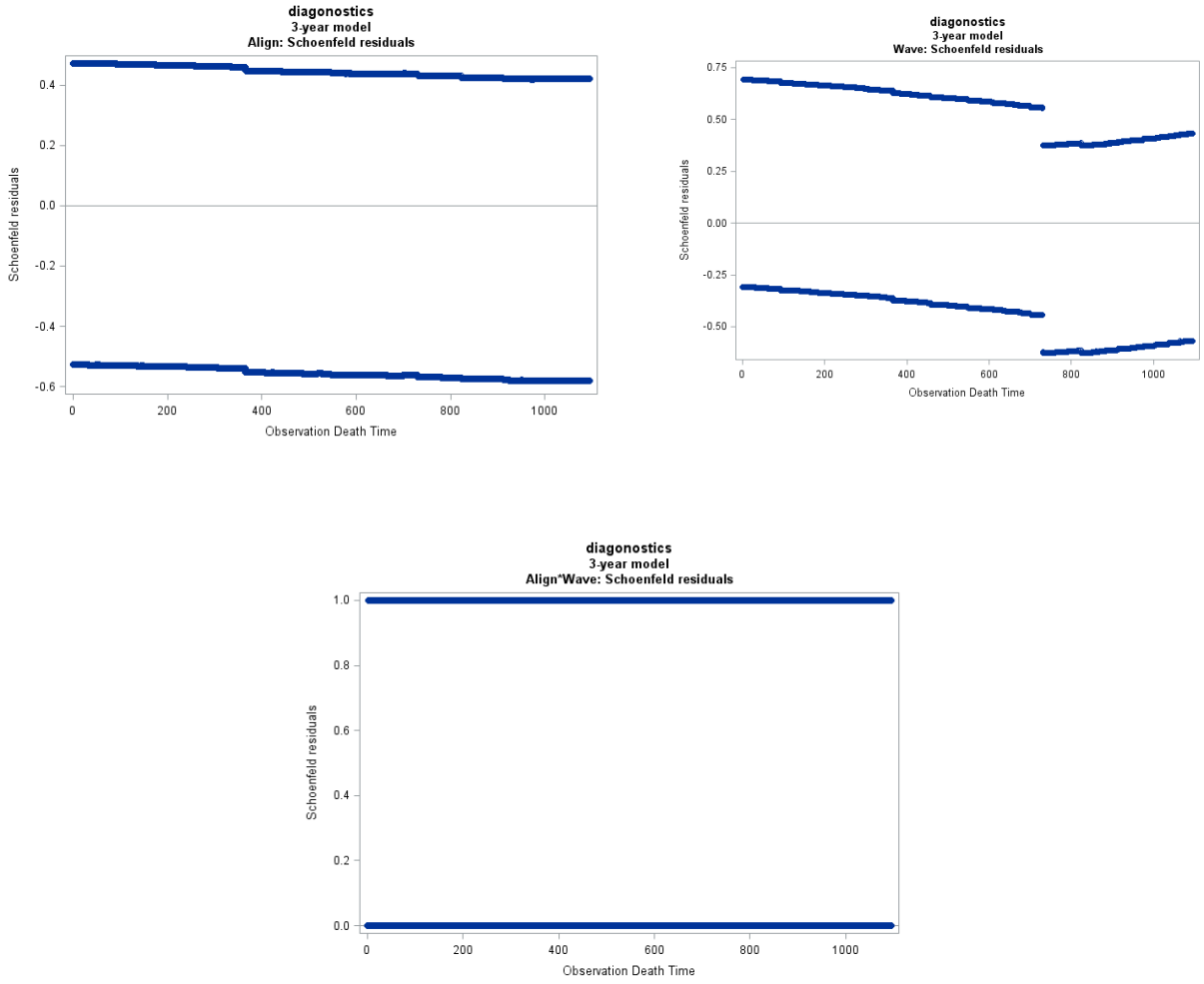
As the residuals were roughly scattered around 0 for each covariate, there were no obvious patterns to indicate violations of the PH assumption as indicated by these plots.

Exhibit I-16. 2-Year Cox Model: Deviance Residuals



As the residuals were roughly scattered around 0, the functional forms for the covariates seemed to be proper. There were no indications for outliers as well.

Exhibit I-17. 2-Year Cox Model: Schoenfeld Residuals (Proportional Hazards)



As the residuals were roughly scattered around 0 for each covariate, there were no obvious patterns to indicate violations of the PH assumption as indicated by these plots.

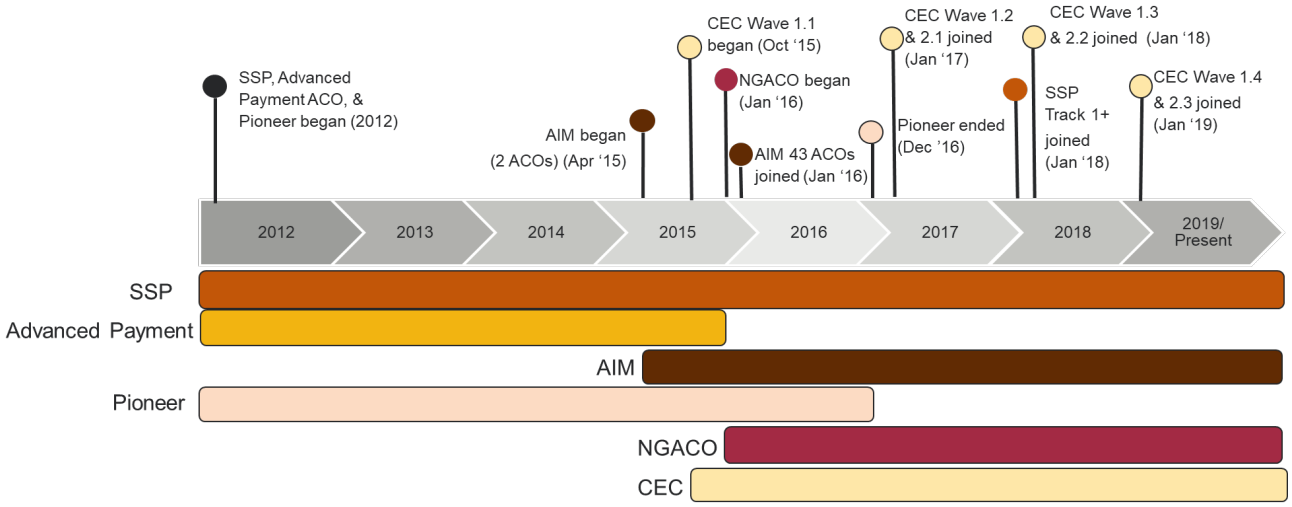
Appendix J: Methodology for Comparing CEC Model to Primary Care-Based ACOs

We used the DiD approach to assess whether CEC provided better results for beneficiaries with ESRD than primary care-based accountable care organizations (ACOs). The DiD approach compared the experiences of beneficiaries with ESRD over time, before and after they transitioned into either CEC or a primary care-based ACO, relative to beneficiaries with ESRD who remained in Medicare FFS. We estimated the DiD impact of CEC relative to FFS and the DiD impact of primary care-based ACOs relative to FFS, and compared the results of the two types of care models.

A. ACO and ESCO (CEC) Risk-Sharing Programs and Alignment Rules

In addition to CEC, a specialty-oriented ACO, Medicare beneficiaries with ESRD could become aligned to one of the following primary care-based ACOs: Medicare Shared Savings Program (SSP) or one of its four different risk-sharing tracks (Advanced Payment, ACO Investment Model [AIM],[149] Pioneer, and Next Generation [NGACO]). In terms of size, SSP is by far the largest program and grew from 4.9 assigned beneficiaries in 2014 to 10.4 million in 2019.[150] NGACO began with 51 and currently has 41 participating ACOs.[151] Pioneer began with 32 ACOs and ended with 9. There were 34 ESCOs in the CEC Model in 2019. The ACO models overlap with CEC, as shown in **Exhibit J-1**.

Exhibit J-1. ACO and CEC Timeline



[149] Although included in **Exhibit J-1**, we did not consider Advanced Payment or AIM ACOs in this analysis because they have a unique structure compared to the primary care-based ACOs previously listed and the ESCOs. Specifically, ACOs in both these models receive an upfront fixed payment, upfront variable payment, and an ongoing monthly payment to encourage participation by rural providers and smaller practices with less access to upfront capital.

[150] Shared Savings Program Fast Facts – As of January 1, 2020, Medicare Shared Savings Program. https://www.cms.gov/files/document/2020-shared-savings-program-fast-facts.pdf

[151] Next Generation Accountable Care Organization (ACO) Model Fact Sheet, Center for Medicare and Medicaid Innovation. https://innovation.cms.gov/files/fact-sheet/nextgenaco-fs.pdf

Risk Arrangements: The ACOs and ESCOs we considered in this analysis receive financial incentives for care coordination based on two-sided risk.

In a two-sided risk arrangement, ACOs receive a percentage of savings and are also at risk for a portion of spending over the target. The two-sided risk structure encourages a higher level of accountability by financially penalizing ACOs that incur costs above the set benchmark. To help compensate for the downside risk, two-sided risk participants who reduce costs below the benchmark receive a larger financial gain relative to one-sided risk. The amount of risk sharing varies within and between primary care-based ACO programs (30-100%) and the CEC Model (50-100%).

In addition to earning potential shared savings and losses adjusted for quality performance, SSP (Track 1+, Track 2, and Track 3), NGACO, and CEC that have two-sided risk are all considered Advanced Alternative Payment Models (APMs) and are given additional financial rewards (5%) for taking on more risk and going further in improving patient care.[152] ACOs with two-sided risk are similar to ESCOs made up of LDO facilities, while ACOs that do not accept downside risk are relatively similar to non-LDO ESCOs.[153] The notable difference is that the ACOs are able to decide whether to accept downside risk, while the ESCO's acceptance of risk is determined first by organizational membership, then choice. To ensure comparable incentive structures and to better disentangle the driving factors that generate differences in patient outcomes between the ACOs and ESCOs, we continue to implemented our recommendation from AR2 and restricted the sample to beneficiaries who were aligned to two-sided risk ACOs or ESCOs. This restriction results in the exclusion of SSP Track 1 ACOs and the three non-LDO ESCOs that opted for one-sided risk tracks. A total of 837 CEC and 37,389 SSP Track 1 beneficiaries were dropped after limiting to two-sided risk arrangements. Almost one-fourth (23%) of the total ACO transitioning sample are ACO beneficiaries aligned to a two-sided risk structure, 9% of whom are aligned to SSP Track 1+.

Alignment Rules. Though Pioneer ACOs, SSP ACOs, NGACO, and the CEC Model all utilize claims-based prospective alignment when assigning beneficiaries, there are differences in beneficiary alignment between the programs. Under SSP, alignment is based on plurality of services. This means that a beneficiary is assigned to an ACO if he or she receives a greater proportion of primary care services (measured in allowed charges) within the ACO than the proportion of services received at any other organization outside the ACO or if the beneficiary receives a plurality of services from PCPs or certain professionals within the ACO. This may be less than a majority of total services. For Track 2 of SSP, CMS uses prospective beneficiary alignment along with retrospective reconciliation (retrospective alignment for each performance year which removes anyone who is not alignment-eligible in that year). For Track 1+ and Track 3, on the other hand, CMS uses only prospective beneficiary alignment.

Two ACO models have started to use voluntary alignment. The Pioneer ACO Model began testing voluntary alignment in PY4 (2015). While the NGACO Model used claims-based alignment in PY1 (2016), an option for voluntary alignment was added in PY2 (2017). Under voluntary

[152] The incentive payment is 5% of the estimated aggregate payment amounts for Medicare Part B covered professional services furnished by the quality performance in the year preceding the payment year. The 5% incentive is earned if the participant receives 25% of their Medicare Part B payments through an Advanced APM or sees 20% of their Medicare patients through an Advanced APM. (The percentages of payments and patients rise to 50% or 35% in 2019 and to 75% or 50% in 2021)

[153] Three non-LDOs opted for one-sided risk tracks for all years in the model. One non-LDO began the CEC Model under a two-sided risk arrangement and later transitioned to one-sided risk.

alignment, beneficiaries can choose to be aligned to an ACO. In the Pioneer Model they may be aligned even if they are not aligned through claims. Voluntary alignment provides beneficiaries the opportunity to confirm or deny their care relationships with certain NGACO/Pioneer participants.

In the CEC Model, eligible beneficiaries are assigned to an ESCO after their first visit to a dialysis facility participating in an ESCO. If a beneficiary receives more than 50% of their care from another dialysis facility outside of the CBSA market in a performance year or receives a transplant, is aligned to another SSP, and/or is no longer receiving treatment at an ESCO, then the beneficiary is removed from the ESCO's alignment list in subsequent performance years.

B. Methods

We used a DiD approach to evaluate whether CEC performed better than primary care-based ACOs. With this approach, we compared the experiences of beneficiaries with ESRD over time, before and after they transitioned into either an ESCO or a primary care-based ACO, relative to beneficiaries with ESRD who remained in Medicare FFS. The additional year of data in AR4 updates the results from AR3 and evaluates beneficiaries that transition into two-sided risk arrangements. Specifically, the intervention groups included beneficiaries with ESRD aligned with two-sided risk CEC ESCOs or primary care-based ACOs with two-sided risk arrangements. Primary care-based ACOs included Pioneer, Shared Savings Program (SSP) Tracks 1+, 2, and 3, and Next Generation ACO (NGACO). The comparison group consisted of CEC-eligible matched beneficiaries who continued to receive services FFS.

The analysis compares the first year experience of beneficiaries who became aligned to 2-sided risks ESCOs or primary care-based ACOs, compared to ESRD beneficiaries who continue to receive services under traditional FFS. The analysis imposed several restrictions. First, we restricted the sample to beneficiaries who had at least 12 consecutive months of FFS enrollment before alignment to one of the intervention groups. Requiring the same minimum number of pre-CEC period months helps ensure that differences in outcomes following alignment to an ESCO or ACO are due to treatment effects and not compositional changes in the data. Since the model can impact mortality, we did not required beneficiaries in the analytical sample to survive the entire post-alignment observation period. A given beneficiary may have less than 12 months of data following an alignment start date due to de-alignment, eligibility rules, or death. Second, the sample includes only beneficiaries who receive the majority of services from the same dialysis facility during the study period (prior to and after alignment dates). Third, ACO and FFS beneficiaries who become aligned to an ESCO at any point during the study period are excluded from the analysis for at least one year from the point of their last month of ESCO alignment.[154]

The comparison group for this analysis is created at the patient level. Specifically, we matched CEC and ACO beneficiaries to traditional FFS beneficiaries with ESRD that would have been ACO and CEC eligible. We generated a propensity score by including characteristics that may influence outcomes, such as time since start of dialysis, reasons for ESRD, comorbidities, and demographic factors like age, race, and sex. The DiD strategy for the patient-level match followed beneficiaries with ESRD as they transitioned from traditional FFS Medicare to different payment

[154] The study design in AR4 and AR3 is similar to AR2 with only two differences. The analysis is limited to only two-sided risk intervention groups and all beneficiaries have 12 consecutive months of FFS enrollment (in AR2 only one month prior to alignment was required).

models (i.e., ACO, CEC) and compared changes in outcomes before and after alignment. The identifying assumption of the DiD model in this patient-level match was that beneficiaries who remained in traditional FFS are a good approximation of what would have happened to transitioning beneficiaries if they would have stayed in FFS.

We identified six potential alignment dates where a beneficiary could transition to either ACO or CEC: (1) January 2015 [ACO newly aligned], (2) October 2015 [CEC newly aligned start date of Wave 1 ESCOs], (3) January 2016 [ACO newly aligned], (4) January 2017 [ACO and CEC newly aligned; start date of Wave 2 ESCOs and late-starting Wave 1 ESCO facilities], (5) January 2018 [ACO and CEC newly aligned; start date of Wave 2 ESCOs and Wave 1 ESCO facilities joining in PY3], and (6) January 2019 [ACO and CEC newly aligned; start date of Wave 2 ESCOs and Wave 1 ESCO facilities joining in PY4].These alignment dates were used to identify intervention and comparison beneficiaries. ACO participation status was determined using the Master Data Management file, while CEC participation status is determined using CEC alignment criteria.

Due to the high mortality rate in the ESRD population, the share of beneficiaries with better odds of survival in the analysis sample increases as we extend the number of baseline months required for inclusion. This is because beneficiaries would have to be enrolled in FFS for at least the duration of the baseline period to be included in the study. Since surviving beneficiaries may be inherently different than a typical beneficiary with ESRD, extending the number of required months for inclusion would affect our ability to generalize results to the average beneficiary with ESRD. Given the consideration discussed above, we only required 12 consecutive baseline enrollment months. For each of the beneficiaries meeting this criterion, all 12 months of baseline data and up to 12 months of intervention data were included in the analysis. If a beneficiary had less than 12 months of intervention data, the available months were included. We did not require 12 months of intervention data because the model can impact mortality and we wanted the analysis to reflect this potential impact.

Comparison Group Construction. We used PSM to select comparison beneficiaries that best resembled newly aligned ACO and CEC beneficiaries with characteristics listed in **Exhibit J-2**. We used average values for all of the baseline characteristics, with some exceptions: Medicare Part A and Part B payments were aggregated to total baseline payments in the 12 consecutive months prior to alignment; age and time on dialysis were measured in the month prior to becoming newly aligned to an ACO or to CEC; BMI is measured at the time of a beneficiary's first ESRD diagnosis; and chronic conditions are based on beneficiary status in the year prior to alignment date.[155] Any beneficiaries who had missing values for the matching characteristics were excluded from the matching process and from all subsequent analysis.

[155] Chronic condition indicators were taken from the Chronic Conditions Data Warehouse (CCW) which are defined using claims-based criteria for a given condition by the end of the reference year. For the purposes of matching, the values are based on the calendar year prior to the alignment date. Detailed specifications for conditions can be found at https://www.ccwdata.org/web/guest/condition-categories.

Exhibit J-2. Matching Covariates

Group	Covariates
Beneficiary	CCW Indicators for the following conditions: Acquired Hypothyroidism, Acute Myocardial Infarction, Alzheimer's and Related Disorders Alzheimer's Disease, Anemia, Asthma, Atrial Fibrillation, Benign Prostatic, Breast Cancer, Cancer, Cataracts, Cause of ESRD: (Diabetes, Hypertension, and Unknown), Chronic Congestive Heart Failure, Congestive Heart Failure, Chronic Obstructive Pulmonary Disease, Colorectal Cancer, Diabetes, Depression, Endometrial Cancer, Female, Glaucoma, Hip Fracture, Hyperlipidemia, Hyperplasia Hypertension, Ischemic Heart Disease, Original Reason for Entitlement to Care: (Disability, ESRD, and ESRD & Disability), Osteoporosis, Prostate Cancer, Race: (Black and White), Rheumatoid/Osteo-Arthritis, and Stroke. Age and Months on Dialysis in Month Prior to Alignment Date, BMI at first ESRD Diagnosis, Percent Baseline Months: Hemodialysis, Partial Medicaid Dual Enrollment, and Full Medicaid Dual Enrollment. Total Standardized Part A and Part B Payments in baseline period
Facility	Percent Baseline Months: For-Profit, Home Dialysis, Late-Shift, LDO, and Peritoneal Dialysis. Average Baseline Months: Standardized Hospitalization, Mortality and Readmission Ratio
Market	Average Baseline Months: ACO Percent, Dual Beneficiaries per 10,000, ESRD Beneficiary Count, Median Household Income, and Medicare Advantage Penetration. Indicators of: Region (Midwest, Northwest, and South)

Separate logit models were estimated for each treatment group (ACO or CEC) and for each group's relevant alignment dates. Traditional FFS beneficiaries were separated into comparison pools for each alignment date if they met the previously described restrictions. A given comparison beneficiary could contribute to more than one comparison pool if they had eligible observations that extended through multiple alignment windows. After assigning the traditional FFS beneficiaries who are never aligned to an ACO or ESCO in a given observation period to comparison pools, a total of seven matching models were estimated.[156] Next, ACO and CEC beneficiaries were matched to the closest comparison non-aligned beneficiary based on the predicted probabilities within each group defined by either the alignment or potential alignment date. The predicted probability of becoming a newly aligned ACO or CEC beneficiary was used to match ACO or CEC beneficiaries to non-aligned beneficiaries. A caliper was applied to ensure that only beneficiaries with a close match were included in the model. Each ACO and CEC beneficiary was matched to a single comparison beneficiary that was the closest in terms of propensity score and not yet matched to another ACO or CEC beneficiary within a given alignment date.

Comparison of Pre and Post Matching Result. A comparison of ACO to traditional care FFS beneficiaries and CEC to traditional care FFS beneficiaries, before and after matching, using SMDs for each alignment date is provided in **Exhibits J-3** through **J-11**. The before-matching populations typically vary most on market characteristics relative to the comparison pool. After matching, the differences between both groups decreased substantially. The results show that none of the matching covariates had a SMD greater than 0.1 for any matched population.

[156] Comparison pools used for matching CEC beneficiaries was restricted to FFS beneficiaries who receive their dialysis care from an LDO because the CEC sample consisted of only 0.3% beneficiaries treated at an SDO. The restricted limited issues with model convergence.

Exhibit J-3. Descriptive Statistics and Standardized Mean Differences (FFS to ACO, January 2015)

Characteristics	ACO Benes with a match (01/2015 switch) N=1,217		FFS Comparison Pool N=69,647		Std Diff Before Matching	FFS Comparison Group N=1,217		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Acquired Hypothyroidism Indicator	0.16	0.36	0.18	0.38	-0.06	0.15	0.36	0.02
Acute Myocardial Infarction Indicator	0.03	0.16	0.03	0.17	-0.01	0.03	0.18	-0.02
Age in Month Prior to alignment date	62.2	14.7	62.8	14.5	-0.04	62.2	15.1	0.002
Alzheimer's and Related Disorders Indicator	0.11	0.32	0.13	0.33	-0.04	0.11	0.32	-0.003
Alzheimer's Disease Indicator	0.02	0.13	0.03	0.17	-0.07	0.01	0.11	0.05
Anemia Indicator	1.0	0.03	1.0	0.04	0.02	1.0	0.00	-0.04
Asthma Indicator	0.09	0.28	0.08	0.28	0.01	0.10	0.30	-0.04
Atrial Fibrillation Indicator	0.12	0.32	0.12	0.33	-0.02	0.12	0.32	0
Benign Prostatic Hyperplasia Indicator	0.06	0.23	0.05	0.22	0.03	0.05	0.22	0.02
BMI at time of first ESRD diagnosis	29.1	8.2	29.8	8.3	-0.08	29.5	8.1	-0.05
Breast Cancer Indicator	0.02	0.13	0.02	0.13	0.004	0.01	0.12	0.03
Cancer	0.06	0.24	0.06	0.24	0.01	0.05	0.22	0.05
Cataracts Indicator	0.15	0.36	0.13	0.34	0.05	0.15	0.36	0.005
Cause of ESRD: Diabetes	0.45	0.50	0.45	0.50	-0.002	0.44	0.50	0.01
Cause of ESRD: Hypertension	0.28	0.45	0.30	0.46	-0.04	0.28	0.45	0.002
Cause of ESRD: Unknown	0.03	0.16	0.02	0.14	0.03	0.03	0.17	-0.03
Chronic Congestive Heart Failure Indicator	0.55	0.50	0.56	0.50	-0.01	0.55	0.50	-0.01
Chronic Obstructive Pulmonary Disease Indicator	0.16	0.37	0.19	0.40	-0.09	0.17	0.38	-0.03
Colorectal Cancer Indicator	0.01	0.11	0.01	0.12	-0.02	0.01	0.09	0.03
Congestive Heart Failure Indicator	0.55	0.50	0.56	0.50	-0.01	0.56	0.50	-0.01
Depression Indicator	0.23	0.42	0.22	0.42	0.01	0.24	0.43	-0.02
Diabetes Indicator	0.72	0.45	0.69	0.46	0.06	0.73	0.44	-0.02
Endometrial Cancer Indicator	0.002	0.04	0.003	0.06	-0.03	0.003	0.06	-0.03
Female	0.42	0.49	0.46	0.50	-0.08	0.43	0.50	-0.02
Glaucoma Indicator	0.11	0.31	0.09	0.28	0.08	0.13	0.34	-0.07
Hip Fracture Indicator	0.01	0.12	0.01	0.12	-0.003	0.01	0.10	0.04
Hyperlipidemia Indicator	0.60	0.49	0.57	0.49	0.07	0.62	0.49	-0.03
Hypertension Indicator	0.86	0.34	0.85	0.35	0.03	0.88	0.33	-0.04

Characteristics	ACO Benes with a match (01/2015 switch) N=1,217		FFS Comparison Pool N=69,647		Std Diff Before Matching	FFS Comparison Group N=1,217		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Ischemic Heart Disease	0.60	0.49	0.59	0.49	0.03	0.59	0.49	0.02
Months of Dialysis in Month Prior to alignment date	67.4	62.4	74.0	61.9	-0.11	66.2	56.4	0.02
OREC: Disability	0.18	0.39	0.19	0.39	-0.01	0.18	0.39	0
OREC: ESRD	0.24	0.43	0.20	0.40	0.09	0.26	0.44	-0.04
OREC: ESRD and Disability	0.26	0.44	0.32	0.47	-0.12	0.25	0.44	0.01
Osteoporosis Indicator	0.04	0.20	0.04	0.19	0.02	0.05	0.22	-0.05
Percent Months Hemodialysis	0.90	0.29	0.92	0.27	-0.06	0.90	0.29	0.01
Percent Months with Full Medicaid Dual Enrollment	0.59	0.48	0.42	0.48	0.36 *	0.58	0.48	0.04
Percent Months with Partial Medicaid Dual Enrollment	0.04	0.17	0.13	0.32	-0.37 *	0.04	0.18	-0.02
Prostate Cancer Indicator	0.03	0.16	0.02	0.15	0.02	0.02	0.15	0.03
Race: Black	0.29	0.45	0.38	0.49	-0.19	0.28	0.45	0.02
Race: White	0.41	0.49	0.44	0.50	-0.07	0.42	0.49	-0.03
Rheumatoid/Osteo-Arthritis Indicator	0.24	0.43	0.28	0.45	-0.08	0.23	0.42	0.03
Stroke Indicator	0.07	0.25	0.07	0.26	-0.02	0.07	0.26	-0.03
Total Baseline Standardized Part A and Part B Payments	$64,358	$39,426	$64,846	$39,284	-0.01	$65,623	$40,309	-0.03
Facility: For-Profit	0.89	0.31	0.88	0.33	0.04	0.88	0.32	0.02
Facility: Home Dialysis	0.81	0.39	0.86	0.35	-0.13	0.82	0.38	-0.03
Facility: Late Shift	0.33	0.47	0.23	0.42	0.21 *	0.31	0.46	0.04
Facility: LDO	0.65	0.48	0.72	0.45	-0.15	0.65	0.48	-0.01
Facility: Peritoneal Dialysis	0.70	0.46	0.67	0.47	0.07	0.70	0.46	0.01
Facility: Standardized Hospital Ratio	1.0	0.23	0.95	0.24	0.18	0.98	0.26	0.03
Facility: Standardized Mortality Ratio	0.93	0.26	1.0	0.24	-0.28 *	0.93	0.23	0.01
Facility: Standardized Readmission Ratio	1.0	0.26	0.97	0.27	0.15	1.0	0.26	-0.02
ACO Percentage	0.25	0.10	0.12	0.11	1.3	0.26	0.14	-0.07
CBSA: Dual Beneficiaries per 10,000	397	103	335	105	0.59 *	391	101	0.05
CBSA: ESRD Beneficiary Count	6,109	5,401	2,867	3,335	0.72 *	5,642	5,300	0.09
CBSA: Median Household Income	$60,906	$11,529	$54,514	$11,922	0.55 *	$60,933	$11,900	-0.002
CBSA: Medicare Advantage Penetration	35.9	12.8	30.1	12.9	0.46 *	35.0	12.7	0.07

Characteristics	ACO Benes with a match (01/2015 switch) N=1,217		FFS Comparison Pool N=69,647		Std Diff Before Matching	FFS Comparison Group N=1,217		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Region: Midwest	0.12	0.33	0.15	0.36	-0.08	0.13	0.34	-0.04
Region: Northeast	0.39	0.49	0.11	0.31	0.69 *	0.40	0.49	-0.01
Region: South	0.06	0.25	0.50	0.50	-1.1 *	0.07	0.26	-0.03

Notes: The standardized difference was calculated by the following equation: $\text{Std. Diff} = (\mu 1 - \mu 2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$. Any value below 0.1 is considered to be a negligible difference.
* Indicates a standardized mean difference greater than 0.2 in absolute value.

Exhibit J-4. Descriptive Statistics and Standardized Mean Differences (FFS to CEC, October 2015)

Characteristics	CEC Benes with a match (10/2015 switch) N=6,077		FFS Comparison Pool N=46,461		Std Diff Before Matching	FFS Comparison Group N=6,077		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Acquired Hypothyroidism Indicator	0.16	0.36	0.16	0.37	-0.01	0.16	0.36	-0.0005
Acute Myocardial Infarction Indicator	0.02	0.14	0.03	0.16	-0.04	0.02	0.14	0.005
Age in Month Prior to alignment date	62.4	14.1	63.0	14.3	-0.04	62.1	14.6	0.02
Alzheimer's and Related Disorders Indicator	0.16	0.36	0.10	0.30	0.16	0.14	0.35	0.03
Alzheimer's Disease Indicator	0.02	0.16	0.02	0.15	0.02	0.02	0.15	0.02
Anemia Indicator	1.0	0.04	1.0	0.04	-0.01	1.0	0.03	-0.02
Asthma Indicator	0.08	0.27	0.08	0.27	-0.01	0.08	0.26	0.01
Atrial Fibrillation Indicator	0.10	0.30	0.11	0.31	-0.02	0.11	0.31	-0.02
Benign Prostatic Hyperplasia Indicator	0.06	0.23	0.05	0.22	0.02	0.06	0.23	0.002
BMI at time of first ESRD diagnosis	29.9	8.3	30.0	8.4	-0.001	29.9	8.5	0.01
Breast Cancer Indicator	0.02	0.13	0.02	0.13	0.01	0.02	0.12	0.02
Cancer	0.06	0.23	0.06	0.22	0.03	0.06	0.23	0.01
Cataracts Indicator	0.12	0.33	0.13	0.33	-0.01	0.12	0.32	0.02
Cause of ESRD: Diabetes	0.40	0.49	0.44	0.50	-0.09	0.39	0.49	0.01
Cause of ESRD: Hypertension	0.36	0.48	0.31	0.46	0.11	0.35	0.48	0.02
Cause of ESRD: Unknown	0.02	0.14	0.02	0.14	0.005	0.02	0.14	-0.003
Chronic Congestive Heart Failure Indicator	0.51	0.50	0.52	0.50	-0.03	0.51	0.50	-0.01
Chronic Obstructive Pulmonary Disease Indicator	0.15	0.36	0.18	0.38	-0.08	0.15	0.36	0.001
Colorectal Cancer Indicator	0.01	0.12	0.01	0.11	0.01	0.02	0.12	-0.01
Congestive Heart Failure Indicator	0.51	0.50	0.52	0.50	-0.03	0.51	0.50	-0.01
Depression Indicator	0.20	0.40	0.21	0.41	-0.03	0.20	0.40	-0.01
Diabetes Indicator	0.65	0.48	0.67	0.47	-0.04	0.65	0.48	0.01
Endometrial Cancer Indicator	0.003	0.05	0.003	0.05	-0.001	0.004	0.06	-0.02
Female	0.44	0.50	0.45	0.50	-0.02	0.45	0.50	-0.02
Glaucoma Indicator	0.09	0.29	0.08	0.27	0.04	0.09	0.29	0.01
Hip Fracture Indicator	0.01	0.09	0.01	0.11	-0.03	0.01	0.09	0

Characteristics	CEC Benes with a match (10/2015 switch) N=6,077		FFS Comparison Pool N=46,461		Std Diff Before Matching	FFS Comparison Group N=6,077		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Hyperlipidemia Indicator	0.58	0.49	0.53	0.50	0.10	0.57	0.50	0.03
Hypertension Indicator	0.84	0.36	0.84	0.37	0.01	0.85	0.36	-0.01
Ischemic Heart Disease	0.53	0.50	0.55	0.50	-0.04	0.53	0.50	-0.01
Months of Dialysis in Month Prior to alignment date	78.6	64.7	75.0	62.6	0.06	78.9	64.2	-0.005
OREC: Disability	0.19	0.39	0.19	0.40	-0.01	0.19	0.39	0.01
OREC: ESRD	0.22	0.41	0.22	0.41	0.003	0.22	0.41	-0.001
OREC: ESRD and Disability	0.32	0.46	0.30	0.46	0.02	0.32	0.47	-0.01
Osteoporosis Indicator	0.03	0.17	0.03	0.18	-0.02	0.03	0.17	0.005
Percent Months Hemodialysis	0.95	0.22	0.91	0.27	0.13	0.94	0.22	0.01
Percent Months with Full Medicaid Dual Enrollment	0.39	0.48	0.41	0.48	-0.04	0.40	0.48	-0.02
Percent Months with Partial Medicaid Dual Enrollment	0.12	0.31	0.14	0.33	-0.08	0.11	0.30	0.01
Prostate Cancer Indicator	0.03	0.16	0.02	0.14	0.04	0.03	0.16	0.01
Race: Black	0.54	0.50	0.40	0.49	0.29 *	0.54	0.50	0.005
Race: White	0.32	0.47	0.43	0.50	-0.22 *	0.32	0.47	0.01
Rheumatoid/Osteo-Arthritis Indicator	0.27	0.44	0.26	0.44	0.03	0.26	0.44	0.03
Stroke Indicator	0.07	0.25	0.07	0.25	0.02	0.07	0.25	0.005
Total Baseline Standardized Part A and Part B Payments	$64,370	$38,261	$64,160	$38,772	0.01	$65,252	$39,510	-0.02
Facility: For-Profit	0.88	0.32	0.94	0.23	-0.21 *	0.87	0.33	0.03
Facility: Home Dialysis	0.97	0.16	0.87	0.34	0.40 *	0.98	0.15	-0.03
Facility: Late Shift	0.24	0.43	0.22	0.41	0.04	0.23	0.42	0.02
Facility: LDO	1	0	1	0		1	0	
Facility: Peritoneal Dialysis	0.46	0.50	0.65	0.48	-0.39 *	0.47	0.50	-0.02
Facility: Standardized Hospital Ratio	1.0	0.21	0.95	0.24	0.10	0.97	0.24	0.01
Facility: Standardized Mortality Ratio	0.97	0.20	1.0	0.23	-0.17	0.96	0.22	0.02
Facility: Standardized Readmission Ratio	1.0	0.23	0.97	0.28	0.06	1.0	0.28	-0.01
ACO Percentage	0.20	0.12	0.14	0.12	0.54 *	0.20	0.11	0.03
CBSA: Dual Beneficiaries per 10,000	279	62	334	104	-0.64 *	277	87	0.03

Characteristics	CEC Benes with a match (10/2015 switch) N=6,077		FFS Comparison Pool N=46,461		Std Diff Before Matching	FFS Comparison Group N=6,077		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
CBSA: ESRD Beneficiary Count	4,545	3,158	2,652	3,099	0.60 *	4,597	4,018	-0.01
CBSA: Median Household Income	$60,295	$6,708	$55,198	$11,694	0.53 *	$60,198	$10,055	0.01
CBSA: Medicare Advantage Penetration	31.3	9.5	30.6	13.0	0.06	32.1	12.0	-0.07
Region: Midwest	0.10	0.30	0.16	0.36	-0.16	0.11	0.31	-0.03
Region: Northeast	0.27	0.44	0.09	0.28	0.49	0.25	0.43	0.04
Region: South	0.52	0.50	0.52	0.50	0.01	0.52	0.50	0.002

Notes: The standardized difference was calculated by the following equation: $\text{Std. Diff} = (\mu 1 - \mu 2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$. Any value below 0.1 is considered to be a negligible difference.

* Indicates a standardized mean difference greater than 0.2 in absolute value.

Exhibit J-5. Descriptive Statistics and Standardized Mean Differences (FFS to ACO, January 2016)

Characteristics	ACO Benes with a match (01/2016 switch) N=1,770		FFS Comparison Pool N=64,432		Std Diff Before Matching	FFS Comparison Group N=1,770		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Acquired Hypothyroidism Indicator	0.16	0.36	0.18	0.38	-0.05	0.18	0.38	-0.06
Acute Myocardial Infarction Indicator	0.04	0.19	0.03	0.17	0.04	0.04	0.18	0.02
Age in Month Prior to alignment date	62.7	14.3	62.9	14.3	-0.01	62.9	14.8	-0.02
Alzheimer's and Related Disorders Indicator	0.12	0.32	0.13	0.33	-0.04	0.13	0.33	-0.04
Alzheimer's Disease Indicator	0.02	0.15	0.03	0.16	-0.02	0.03	0.16	-0.02
Anemia Indicator	1.0	0.03	1.0	0.04	0.01	1.0	0.02	-0.02
Asthma Indicator	0.10	0.30	0.09	0.28	0.05	0.10	0.30	-0.01
Atrial Fibrillation Indicator	0.13	0.33	0.12	0.33	0.01	0.13	0.34	-0.01
Benign Prostatic Hyperplasia Indicator	0.06	0.24	0.05	0.23	0.04	0.07	0.25	-0.03
BMI at time of first ESRD diagnosis	29.3	8.1	29.9	8.3	-0.08	29.3	8.0	-0.004
Breast Cancer Indicator	0.01	0.12	0.02	0.13	-0.01	0.02	0.14	-0.04
Cancer	0.06	0.24	0.06	0.23	0.02	0.07	0.26	-0.04
Cataracts Indicator	0.14	0.34	0.13	0.34	0.02	0.14	0.35	-0.01
Cause of ESRD: Diabetes	0.39	0.49	0.45	0.50	-0.11	0.41	0.49	-0.03
Cause of ESRD: Hypertension	0.31	0.46	0.30	0.46	0.02	0.31	0.46	0.01
Cause of ESRD: Unknown	0.02	0.15	0.02	0.14	0.02	0.02	0.15	0.004
Chronic Congestive Heart Failure Indicator	0.56	0.50	0.55	0.50	0.01	0.55	0.50	0.003
Chronic Obstructive Pulmonary Disease Indicator	0.19	0.39	0.20	0.40	-0.04	0.20	0.40	-0.03
Colorectal Cancer Indicator	0.01	0.12	0.01	0.12	0.004	0.02	0.13	-0.02
Congestive Heart Failure Indicator	0.56	0.50	0.55	0.50	0.01	0.56	0.50	0.005
Depression Indicator	0.22	0.41	0.23	0.42	-0.02	0.22	0.41	-0.003
Diabetes Indicator	0.67	0.47	0.69	0.46	-0.04	0.68	0.47	-0.01
Endometrial Cancer Indicator	0.005	0.07	0.003	0.06	0.02	0.005	0.07	-0.01
Female	0.45	0.50	0.45	0.50	-0.003	0.46	0.50	-0.01
Glaucoma Indicator	0.10	0.30	0.08	0.27	0.07	0.10	0.30	0.01
Hip Fracture Indicator	0.02	0.12	0.01	0.11	0.02	0.01	0.12	0.01

Characteristics	ACO Benes with a match (01/2016 switch) N=1,770		FFS Comparison Pool N=64,432		Std Diff Before Matching	FFS Comparison Group N=1,770		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Hyperlipidemia Indicator	0.60	0.49	0.56	0.50	0.08	0.59	0.49	0.001
Hypertension Indicator	0.87	0.33	0.86	0.35	0.04	0.88	0.33	-0.02
Ischemic Heart Disease	0.61	0.49	0.58	0.49	0.07	0.64	0.48	-0.06
Months of Dialysis in Month Prior to alignment date	77.8	67.2	74.9	62.7	0.04	78.1	67.4	0.00
OREC: Disability	0.20	0.40	0.20	0.40	-0.002	0.19	0.39	0.01
OREC: ESRD	0.24	0.43	0.22	0.42	0.03	0.23	0.42	0.01
OREC: ESRD and Disability	0.27	0.45	0.29	0.46	-0.05	0.27	0.45	0.00
Osteoporosis Indicator	0.04	0.19	0.04	0.19	-0.0002	0.04	0.19	-0.01
Percent Months Hemodialysis	0.93	0.24	0.92	0.26	0.06	0.93	0.25	0.02
Percent Months with Full Medicaid Dual Enrollment	0.46	0.49	0.42	0.48	0.09	0.48	0.49	-0.03
Percent Months with Partial Medicaid Dual Enrollment	0.07	0.24	0.14	0.33	-0.22 *	0.07	0.23	0.02
Prostate Cancer Indicator	0.03	0.17	0.02	0.15	0.05	0.04	0.19	-0.03
Race: Black	0.40	0.49	0.38	0.49	0.04	0.38	0.48	0.05
Race: White	0.39	0.49	0.43	0.50	-0.08	0.40	0.49	-0.02
Rheumatoid/Osteo-Arthritis Indicator	0.27	0.44	0.29	0.45	-0.04	0.28	0.45	-0.03
Stroke Indicator	0.07	0.26	0.07	0.26	0.004	0.07	0.26	0.002
Total Baseline Standardized Part A and Part B Payments	$63,697	$38,048	$64,028	$38,994	-0.01	$63,486	$36,939	0.01
Facility: For-Profit	0.83	0.38	0.88	0.33	-0.14	0.84	0.37	-0.02
Facility: Home Dialysis	0.85	0.35	0.85	0.36	0.02	0.86	0.35	-0.01
Facility: Late Shift	0.24	0.43	0.23	0.42	0.03	0.25	0.44	-0.02
Facility: LDO	0.61	0.49	0.73	0.44	-0.26 *	0.62	0.49	-0.03
Facility: Peritoneal Dialysis	0.71	0.45	0.66	0.47	0.10	0.72	0.45	-0.03
Facility: Standardized Hospital Ratio	1.0	0.25	0.95	0.25	0.40 *	1.0	0.27	0.01
Facility: Standardized Mortality Ratio	0.95	0.25	1.0	0.25	-0.20 *	0.94	0.23	0.03
Facility: Standardized Readmission Ratio	1.0	0.26	0.97	0.28	0.25 *	1.0	0.25	0.01
ACO Percentage	0.27	0.13	0.15	0.13	0.97 *	0.27	0.15	-0.01
CBSA: Dual Beneficiaries per 10,000	358	120	333	105	0.22 *	355	115	0.03

Characteristics	ACO Benes with a match (01/2016 switch) N=1,770		FFS Comparison Pool N=64,432		Std Diff Before Matching	FFS Comparison Group N=1,770		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
CBSA: ESRD Beneficiary Count	4,423	4,273	2,851	3,355	0.41 *	4,412	4,464	0.002
CBSA: Median Household Income	$60,019	$13,904	$56,585	$12,554	0.26 *	$60,764	$13,753	-0.05
CBSA: Medicare Advantage Penetration	36.5	13.8	31.3	13.2	0.38 *	36.1	12.8	0.03
Region: Midwest	0.31	0.46	0.15	0.35	0.40 *	0.32	0.47	-0.01
Region: Northeast	0.19	0.39	0.11	0.31	0.24 *	0.19	0.39	0.003
Region: South	0.26	0.44	0.49	0.50	-0.50 *	0.25	0.43	0.02

Notes: The standardized difference was calculated by the following equation: $\text{Std. Diff} = (\mu 1 - \mu 2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$. Any value below 0.1 is considered to be a negligible difference.
* Indicates a standardized mean difference greater than 0.2 in absolute value.

Exhibit J-6. Descriptive Statistics and Standardized Mean Differences (FFS to ACO, January 2017)

Characteristics	ACO Benes with a match (01/2017 switch) N=3,119		FFS Comparison Pool N=61,614		Std Diff Before Matching	FFS Comparison Group N=3,119		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Acquired Hypothyroidism Indicator	0.19	0.39	0.17	0.38	0.04	0.18	0.39	0.01
Acute Myocardial Infarction Indicator	0.04	0.19	0.03	0.18	0.04	0.03	0.18	0.03
Age in Month Prior to alignment date	63.8	14.3	62.8	14.2	0.07	63.5	14.4	0.02
Alzheimer's and Related Disorders Indicator	0.14	0.35	0.14	0.34	0.01	0.13	0.34	0.01
Alzheimer's Disease Indicator	0.03	0.17	0.03	0.16	0.01	0.03	0.18	-0.01
Anemia Indicator	1.0	0.04	1.0	0.04	0.00	1.0	0.03	-0.04
Asthma Indicator	0.09	0.29	0.08	0.28	0.03	0.09	0.28	0.02
Atrial Fibrillation Indicator	0.13	0.34	0.12	0.32	0.03	0.12	0.33	0.03
Benign Prostatic Hyperplasia Indicator	0.06	0.24	0.06	0.23	0.03	0.06	0.24	0.001
BMI at time of first ESRD diagnosis	29.7	8.3	30.0	8.4	-0.04	29.9	8.2	-0.03
Breast Cancer Indicator	0.02	0.14	0.02	0.13	0.03	0.02	0.14	0.005
Cancer	0.07	0.26	0.06	0.23	0.06	0.07	0.26	-0.004
Cataracts Indicator	0.15	0.35	0.13	0.34	0.04	0.15	0.36	-0.01
Cause of ESRD: Diabetes	0.45	0.50	0.45	0.50	0.00	0.45	0.50	-0.001
Cause of ESRD: Hypertension	0.28	0.45	0.30	0.46	-0.06	0.28	0.45	-0.01
Cause of ESRD: Unknown	0.02	0.13	0.02	0.13	-0.01	0.02	0.13	-0.005
Chronic Congestive Heart Failure Indicator	0.58	0.49	0.55	0.50	0.07	0.59	0.49	-0.03
Chronic Obstructive Pulmonary Disease Indicator	0.21	0.41	0.20	0.40	0.02	0.21	0.41	-0.003
Colorectal Cancer Indicator	0.02	0.14	0.01	0.12	0.03	0.02	0.12	0.02
Congestive Heart Failure Indicator	0.58	0.49	0.55	0.50	0.07	0.59	0.49	-0.02
Depression Indicator	0.26	0.44	0.23	0.42	0.07	0.25	0.44	0.01
Diabetes Indicator	0.70	0.46	0.69	0.46	0.02	0.71	0.45	-0.02
Endometrial Cancer Indicator	0.003	0.05	0.004	0.06	-0.01	0.004	0.06	-0.02
Female	0.46	0.50	0.45	0.50	0.03	0.47	0.50	-0.02
Glaucoma Indicator	0.07	0.25	0.06	0.23	0.04	0.07	0.25	-0.01
Hip Fracture Indicator	0.02	0.13	0.01	0.11	0.03	0.01	0.12	0.02

Characteristics	ACO Benes with a match (01/2017 switch) N=3,119		FFS Comparison Pool N=61,614		Std Diff Before Matching	FFS Comparison Group N=3,119		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Hyperlipidemia Indicator	0.63	0.48	0.57	0.50	0.13	0.63	0.48	-0.004
Hypertension Indicator	0.90	0.30	0.87	0.33	0.09	0.91	0.29	-0.02
Ischemic Heart Disease	0.62	0.49	0.57	0.49	0.09	0.62	0.48	-0.01
Months of Dialysis in Month Prior to alignment date	76.9	67.7	76.0	64.1	0.01	76.7	66.3	0.003
OREC: Disability	0.22	0.41	0.20	0.40	0.03	0.22	0.42	-0.01
OREC: ESRD	0.23	0.42	0.25	0.43	-0.05	0.23	0.42	0.003
OREC: ESRD and Disability	0.24	0.43	0.26	0.44	-0.06	0.24	0.43	-0.004
Osteoporosis Indicator	0.04	0.20	0.04	0.19	0.03	0.04	0.20	0.01
Percent Months Hemodialysis	0.91	0.28	0.92	0.27	-0.03	0.92	0.27	-0.02
Percent Months with Full Medicaid Dual Enrollment	0.43	0.48	0.43	0.48	0.01	0.43	0.48	0.01
Percent Months with Partial Medicaid Dual Enrollment	0.11	0.30	0.14	0.33	-0.09	0.11	0.30	0.01
Prostate Cancer Indicator	0.03	0.16	0.02	0.15	0.01	0.03	0.17	-0.03
Race: Black	0.35	0.48	0.38	0.48	-0.05	0.35	0.48	-0.004
Race: White	0.46	0.50	0.42	0.49	0.08	0.47	0.50	-0.01
Rheumatoid/Osteo-Arthritis Indicator	0.33	0.47	0.30	0.46	0.06	0.33	0.47	0.01
Stroke Indicator	0.07	0.26	0.07	0.26	0.01	0.07	0.26	0.01
Total Baseline Standardized Part A and Part B Payments	$66,884	$39,996	$63,892	$39,073	0.08	$66,960	$41,814	-0.002
Facility: For-Profit	0.88	0.33	0.88	0.32	-0.02	0.87	0.33	0.01
Facility: Home Dialysis	0.86	0.35	0.84	0.37	0.06	0.86	0.34	-0.01
Facility: Late Shift	0.26	0.44	0.23	0.42	0.06	0.26	0.44	-0.01
Facility: LDO	0.70	0.46	0.73	0.44	-0.08	0.71	0.46	-0.02
Facility: Peritoneal Dialysis	0.70	0.46	0.66	0.47	0.08	0.70	0.46	0.01
Facility: Standardized Hospital Ratio	1.0	0.23	0.95	0.25	0.10	1.0	0.25	0.03
Facility: Standardized Mortality Ratio	0.97	0.26	1.0	0.26	-0.12	0.97	0.25	0.01
Facility: Standardized Readmission Ratio	1.0	0.26	0.97	0.28	-0.01	1.0	0.28	0.01
ACO Percentage	0.24	0.15	0.16	0.13	0.54 *	0.24	0.15	-0.005
CBSA: Dual Beneficiaries per 10,000	338	111	333	105	0.05	339	109	-0.005

Characteristics	ACO Benes with a match (01/2017 switch) N=3,119		FFS Comparison Pool N=61,614		Std Diff Before Matching	FFS Comparison Group N=3,119		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
CBSA: ESRD Beneficiary Count	3,111	3,651	2,869	3,372	0.07	3,047	3,590	0.02
CBSA: Median Household Income	$60,525	$13,825	$58,694	$13,824	0.13	$60,354	$13,601	0.01
CBSA: Medicare Advantage Penetration	35.1	11.8	32.2	13.0	0.23 *	34.9	12.8	0.01
Region: Midwest	0.24	0.43	0.15	0.36	0.24 *	0.25	0.43	-0.01
Region: Northeast	0.19	0.40	0.11	0.31	0.25 *	0.20	0.40	-0.01
Region: South	0.33	0.47	0.48	0.50	-0.30 *	0.34	0.47	-0.01

Notes: The standardized difference was calculated by the following equation: $\text{Std. Diff} = (\mu 1 - \mu 2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$. Any value below 0.1 is considered to be a negligible difference.

* Indicates a standardized mean difference greater than 0.2 in absolute value.

Exhibit J-7. Descriptive Statistics and Standardized Mean Differences (FFS to CEC January 2017)

Characteristics	CEC Benes with a match (01/2017 switch) N=7,758		FFS Comparison Pool N=45,219		Std Diff Before Matching	FFS Comparison Group N=7,758		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Acquired Hypothyroidism Indicator	0.16	0.37	0.16	0.37	-0.01	0.15	0.36	0.03
Acute Myocardial Infarction Indicator	0.03	0.17	0.03	0.17	-0.003	0.03	0.17	0.002
Age in Month Prior to alignment date	62.6	14.2	62.7	14.2	-0.003	62.4	14.3	0.02
Alzheimer's and Related Disorders Indicator	0.14	0.35	0.13	0.34	0.02	0.14	0.34	0.004
Alzheimer's Disease Indicator	0.03	0.16	0.03	0.16	-0.01	0.03	0.16	-0.01
Anemia Indicator	1.0	0.05	1.0	0.04	-0.02	1.0	0.05	-0.01
Asthma Indicator	0.08	0.27	0.08	0.28	-0.01	0.08	0.28	-0.01
Atrial Fibrillation Indicator	0.12	0.33	0.12	0.32	0.01	0.11	0.32	0.02
Benign Prostatic Hyperplasia Indicator	0.05	0.23	0.05	0.23	-0.004	0.06	0.23	-0.01
BMI at time of first ESRD diagnosis	30.2	8.5	30.1	8.4	0.01	30.2	8.4	-0.01
Breast Cancer Indicator	0.02	0.13	0.02	0.13	-0.01	0.01	0.12	0.02
Cancer	0.05	0.23	0.06	0.23	-0.01	0.05	0.22	0.01
Cataracts Indicator	0.12	0.33	0.13	0.34	-0.03	0.12	0.33	-0.004
Cause of ESRD: Diabetes	0.42	0.49	0.45	0.50	-0.05	0.42	0.49	-0.002
Cause of ESRD: Hypertension	0.32	0.47	0.31	0.46	0.02	0.31	0.46	0.01
Cause of ESRD: Unknown	0.02	0.14	0.02	0.13	0.01	0.02	0.14	0.002
Chronic Congestive Heart Failure Indicator	0.54	0.50	0.55	0.50	-0.02	0.53	0.50	0.01
Chronic Obstructive Pulmonary Disease Indicator	0.18	0.38	0.20	0.40	-0.06	0.18	0.38	-0.003
Colorectal Cancer Indicator	0.01	0.11	0.01	0.12	-0.02	0.01	0.10	0.01
Congestive Heart Failure Indicator	0.54	0.50	0.55	0.50	-0.02	0.53	0.50	0.01
Depression Indicator	0.21	0.41	0.23	0.42	-0.04	0.21	0.41	0.002
Diabetes Indicator	0.66	0.48	0.68	0.47	-0.06	0.66	0.47	-0.01
Endometrial Cancer Indicator	0.002	0.05	0.003	0.06	-0.02	0.002	0.05	0.003
Female	0.44	0.50	0.45	0.50	-0.01	0.45	0.50	-0.01
Glaucoma Indicator	0.06	0.24	0.06	0.23	0.02	0.06	0.24	0.01
Hip Fracture Indicator	0.01	0.12	0.01	0.11	0.01	0.01	0.12	-0.01

Characteristics	CEC Benes with a match (01/2017 switch) N=7,758		FFS Comparison Pool N=45,219		Std Diff Before Matching	FFS Comparison Group N=7,758		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Hyperlipidemia Indicator	0.55	0.50	0.53	0.50	0.03	0.54	0.50	0.02
Hypertension Indicator	0.88	0.32	0.87	0.34	0.05	0.88	0.33	0.02
Ischemic Heart Disease	0.57	0.49	0.57	0.50	0.01	0.57	0.50	0.01
Months of Dialysis in Month Prior to alignment date	78.9	65.5	76.6	64.4	0.03	78.6	65.2	0.005
OREC: Disability	0.20	0.40	0.21	0.40	-0.01	0.20	0.40	-0.01
OREC: ESRD	0.26	0.44	0.25	0.43	0.03	0.27	0.44	-0.02
OREC: ESRD and Disability	0.26	0.44	0.27	0.44	-0.03	0.25	0.44	0.01
Osteoporosis Indicator	0.03	0.18	0.04	0.18	-0.01	0.03	0.18	-0.01
Percent Months Hemodialysis	0.94	0.23	0.92	0.26	0.08	0.93	0.24	0.02
Percent Months with Full Medicaid Dual Enrollment	0.36	0.47	0.42	0.48	-0.13	0.38	0.47	-0.04
Percent Months with Partial Medicaid Dual Enrollment	0.14	0.33	0.14	0.34	-0.02	0.13	0.32	0.01
Prostate Cancer Indicator	0.02	0.15	0.02	0.15	-0.005	0.02	0.15	-0.004
Race: Black	0.44	0.50	0.39	0.49	0.10	0.44	0.50	0.01
Race: White	0.40	0.49	0.42	0.49	-0.04	0.40	0.49	0.003
Rheumatoid/Osteo-Arthritis Indicator	0.31	0.46	0.30	0.46	0.01	0.31	0.46	-0.004
Stroke Indicator	0.07	0.26	0.07	0.25	0.01	0.07	0.26	-0.01
Total Baseline Standardized Part A and Part B Payments	$63,428	$38,758	$63,633	$38,809	-0.01	$63,261	$37,863	0.004
Facility: For-Profit	0.91	0.29	0.94	0.23	-0.14	0.90	0.29	0.01
Facility: Home Dialysis	0.94	0.24	0.85	0.36	0.29 *	0.94	0.24	-0.002
Facility: Late Shift	0.29	0.45	0.22	0.42	0.15	0.28	0.45	0.01
Facility: LDO	1.00	0.00	1	0		1	0	
Facility: Peritoneal Dialysis	0.53	0.50	0.65	0.48	-0.24 *	0.54	0.50	-0.01
Facility: Standardized Hospital Ratio	0.93	0.24	0.95	0.25	-0.08	0.93	0.24	-0.02
Facility: Standardized Mortality Ratio	0.94	0.20	1.0	0.24	-0.29 *	0.93	0.23	0.02
Facility: Standardized Readmission Ratio	0.92	0.30	0.97	0.28	-0.16	0.93	0.29	-0.02
ACO Percentage	0.22	0.14	0.15	0.13	0.46 *	0.22	0.14	-0.04
CBSA: Dual Beneficiaries per 10,000	309	129	333	104	-0.21 *	313	102	-0.04

Characteristics	CEC Benes with a match (01/2017 switch) N=7,758		FFS Comparison Pool N=45,219		Std Diff Before Matching	FFS Comparison Group N=7,758		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
CBSA: ESRD Beneficiary Count	3,553	3,355	2,626	3,085	0.29 *	3,580	3,712	-0.01
CBSA: Median Household Income	$61,115	$11,714	$57,592	$12,960	0.29 *	$61,000	$12,899	0.01
CBSA: Medicare Advantage Penetration	33.3	14.0	31.8	13.0	0.11	33.5	12.6	-0.02
Region: Midwest	0.21	0.41	0.16	0.36	0.13	0.22	0.41	-0.03
Region: Northeast	0.12	0.33	0.09	0.28	0.12	0.13	0.34	-0.03
Region: South	0.48	0.50	0.50	0.50	-0.04	0.45	0.50	0.06

Notes: The standardized difference was calculated by the following equation: $\text{Std. Diff} = (\mu 1 - \mu 2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$. Any value below 0.1 is considered to be a negligible difference.

* Indicates a standardized mean difference greater than 0.2 in absolute value.

Exhibit J-8. Descriptive Statistics and Standardized Mean Differences (FFS to ACO, January 2018)

Characteristics	ACO Benes with a match (01/2018 switch) N=3,702		FFS Comparison Pool N=59,022		Std Diff Before Matching	FFS Comparison Group N=3,702		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Acquired Hypothyroidism Indicator	0.18	0.39	0.17	0.38	0.03	0.18	0.39	-0.001
Acute Myocardial Infarction Indicator	0.03	0.18	0.03	0.18	0.001	0.03	0.18	0.01
Age in Month Prior to alignment date	63.0	14.4	62.7	14.1	0.02	62.9	13.9	0.01
Alzheimer's and Related Disorders Indicator	0.14	0.35	0.14	0.35	0.004	0.14	0.34	0.02
Alzheimer's Disease Indicator	0.03	0.17	0.03	0.16	0.01	0.03	0.17	-0.02
Anemia Indicator	1.0	0.05	1.0	0.05	-0.01	1.0	0.06	0.01
Asthma Indicator	0.09	0.28	0.08	0.27	0.02	0.08	0.28	0.005
Atrial Fibrillation Indicator	0.14	0.35	0.12	0.32	0.07	0.14	0.35	0.004
Benign Prostatic Hyperplasia Indicator	0.07	0.25	0.06	0.24	0.04	0.07	0.25	0.004
BMI at time of first ESRD diagnosis	29.8	8.5	30.1	8.4	-0.04	29.7	8.2	0.004
Breast Cancer Indicator	0.02	0.13	0.02	0.13	0.01	0.02	0.13	0.002
Cancer	0.06	0.24	0.05	0.23	0.02	0.06	0.23	0.01
Cataracts Indicator	0.13	0.34	0.13	0.34	0.01	0.13	0.34	0.005
Cause of ESRD: Diabetes	0.44	0.50	0.45	0.50	-0.01	0.44	0.50	0.003
Cause of ESRD: Hypertension	0.29	0.45	0.31	0.46	-0.03	0.29	0.46	-0.004
Cause of ESRD: Unknown	0.02	0.14	0.02	0.13	0.02	0.02	0.13	0.02
Chronic Congestive Heart Failure Indicator	0.56	0.50	0.55	0.50	0.03	0.57	0.50	-0.01
Chronic Obstructive Pulmonary Disease Indicator	0.19	0.39	0.20	0.40	-0.02	0.19	0.40	-0.02
Colorectal Cancer Indicator	0.02	0.13	0.01	0.11	0.03	0.01	0.12	0.02
Congestive Heart Failure Indicator	0.56	0.50	0.55	0.50	0.03	0.57	0.49	-0.01
Depression Indicator	0.26	0.44	0.23	0.42	0.06	0.25	0.43	0.01
Diabetes Indicator	0.70	0.46	0.69	0.46	0.02	0.70	0.46	0.01
Endometrial Cancer Indicator	0.005	0.07	0.004	0.06	0.01	0.003	0.06	0.02
Female	0.45	0.50	0.45	0.50	-0.0004	0.44	0.50	0.005
Glaucoma Indicator	0.09	0.29	0.08	0.28	0.03	0.08	0.28	0.03
Hip Fracture Indicator	0.01	0.11	0.01	0.11	0.001	0.01	0.09	0.03

Characteristics	ACO Benes with a match (01/2018 switch) N=3,702		FFS Comparison Pool N=59,022		Std Diff Before Matching	FFS Comparison Group N=3,702		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Hyperlipidemia Indicator	0.63	0.48	0.58	0.49	0.10	0.61	0.49	0.05
Hypertension Indicator	0.90	0.29	0.87	0.33	0.10	0.91	0.29	-0.01
Ischemic Heart Disease	0.60	0.49	0.57	0.50	0.07	0.61	0.49	-0.002
Months of Dialysis in Month Prior to alignment date	73.5	67.1	76.1	65.4	-0.04	75.2	65.2	-0.03
OREC: Disability	0.21	0.41	0.21	0.41	0.001	0.21	0.41	0.001
OREC: ESRD	0.29	0.45	0.28	0.45	0.01	0.30	0.46	-0.02
OREC: ESRD and Disability	0.20	0.40	0.23	0.42	-0.07	0.21	0.41	-0.02
Osteoporosis Indicator	0.04	0.21	0.04	0.18	0.05	0.04	0.20	0.01
Percent Months Hemodialysis	0.91	0.28	0.92	0.27	-0.03	0.91	0.28	-0.002
Percent Months with Full Medicaid Dual Enrollment	0.43	0.48	0.44	0.48	-0.03	0.42	0.48	0.004
Percent Months with Partial Medicaid Dual Enrollment	0.11	0.30	0.14	0.33	-0.07	0.11	0.30	-0.003
Prostate Cancer Indicator	0.02	0.14	0.02	0.15	-0.01	0.02	0.15	-0.01
Race: Black	0.34	0.47	0.38	0.48	-0.07	0.33	0.47	0.02
Race: White	0.45	0.50	0.41	0.49	0.08	0.47	0.50	-0.03
Rheumatoid/Osteo-Arthritis Indicator	0.31	0.46	0.31	0.46	0.01	0.30	0.46	0.02
Stroke Indicator	0.07	0.26	0.07	0.26	0.01	0.07	0.25	0.02
Total Baseline Standardized Part A and Part B Payments	$65,563	$39,291	$63,480	$38,858	0.05	$64,494	$38,759	0.03
Facility: For-Profit	0.88	0.33	0.89	0.32	-0.04	0.88	0.33	-0.002
Facility: Home Dialysis	0.86	0.34	0.83	0.37	0.08	0.86	0.35	0.01
Facility: Late Shift	0.26	0.44	0.23	0.42	0.09	0.26	0.44	0.004
Facility: LDO	0.72	0.45	0.75	0.43	-0.07	0.72	0.45	0.001
Facility: Peritoneal Dialysis	0.72	0.45	0.66	0.47	0.13	0.72	0.45	0.002
Facility: Standardized Hospital Ratio	1.0	0.23	0.95	0.25	0.12	1.0	0.26	0.01
Facility: Standardized Mortality Ratio	0.98	0.23	1.0	0.26	-0.07	0.98	0.25	0.02
Facility: Standardized Readmission Ratio	1.0	0.27	0.97	0.28	0.03	1.0	0.27	-0.003
ACO Percentage	0.27	0.15	0.19	0.14	0.54 *	0.27	0.15	-0.01
CBSA: Dual Beneficiaries per 10,000	331	111	331	106	0.0001	332	107	-0.002
CBSA: ESRD Beneficiary Count	3,290	3,869	2,904	3,419	0.11	3,265	3,704	0.01

Characteristics	ACO Benes with a match (01/2018 switch) N=3,702		FFS Comparison Pool N=59,022		Std Diff Before Matching	FFS Comparison Group N=3,702		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
CBSA: Median Household Income	$62,197	$13,410	$61,155	$14,834	0.07	$61,884	$14,418	0.02
CBSA: Medicare Advantage Penetration	36.3	11.3	33.5	12.8	0.23 *	36.1	12.0	0.01
Region: Midwest	0.20	0.40	0.14	0.35	0.16	0.20	0.40	0.01
Region: Northeast	0.13	0.33	0.11	0.31	0.05	0.12	0.32	0.03
Region: South	0.38	0.48	0.48	0.50	-0.20	0.39	0.49	-0.03

Notes: The standardized difference was calculated by the following equation: $\text{Std. Diff} = (\mu 1 - \mu 2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$. Any value below 0.1 is considered to be a negligible difference.

* Indicates a standardized mean difference greater than 0.2 in absolute value.

Exhibit J-9. Descriptive Statistics and Standardized Mean Differences (FFS to CEC January 2018)

Characteristics	CEC Benes with a match (01/2018 switch) N=5,927		FFS Comparison Pool N=44,344		Std Diff Before Matching	FFS Comparison Group N=5,927		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Acquired Hypothyroidism Indicator	0.16	0.36	0.17	0.37	-0.02	0.16	0.36	0.005
Acute Myocardial Infarction Indicator	0.04	0.19	0.04	0.18	0.005	0.04	0.19	-0.005
Age in Month Prior to alignment date	62.0	13.9	62.6	14.1	-0.04	61.8	14.0	0.01
Alzheimer's and Related Disorders Indicator	0.14	0.34	0.14	0.35	-0.01	0.13	0.34	0.01
Alzheimer's Disease Indicator	0.02	0.16	0.03	0.16	-0.01	0.03	0.16	-0.01
Anemia Indicator	1.0	0.06	1.0	0.05	-0.03	1.0	0.06	0
Asthma Indicator	0.08	0.27	0.08	0.27	0.01	0.07	0.26	0.01
Atrial Fibrillation Indicator	0.12	0.32	0.12	0.32	-0.002	0.11	0.31	0.03
Benign Prostatic Hyperplasia Indicator	0.05	0.23	0.06	0.23	-0.01	0.06	0.23	-0.01
BMI at time of first ESRD diagnosis	30.7	8.5	30.2	8.4	0.06	30.7	8.6	0.0004
Breast Cancer Indicator	0.02	0.13	0.02	0.13	-0.0004	0.02	0.13	0.01
Cancer	0.06	0.23	0.06	0.23	0.01	0.06	0.23	0.01
Cataracts Indicator	0.12	0.32	0.13	0.33	-0.03	0.12	0.32	-0.002
Cause of ESRD: Diabetes	0.44	0.50	0.44	0.50	-0.02	0.43	0.50	0.01
Cause of ESRD: Hypertension	0.34	0.47	0.31	0.46	0.06	0.34	0.47	-0.01
Cause of ESRD: Unknown	0.01	0.12	0.02	0.13	-0.01	0.02	0.12	-0.003
Chronic Congestive Heart Failure Indicator	0.56	0.50	0.54	0.50	0.03	0.55	0.50	0.02
Chronic Obstructive Pulmonary Disease Indicator	0.20	0.40	0.20	0.40	0.0001	0.20	0.40	-0.01
Colorectal Cancer Indicator	0.01	0.12	0.01	0.11	0.01	0.01	0.11	0.01
Congestive Heart Failure Indicator	0.56	0.50	0.55	0.50	0.03	0.55	0.50	0.02
Depression Indicator	0.20	0.40	0.23	0.42	-0.06	0.19	0.39	0.03
Diabetes Indicator	0.68	0.47	0.68	0.47	-0.01	0.67	0.47	0.02
Endometrial Cancer Indicator	0.002	0.04	0.004	0.06	-0.03	0.002	0.04	0.01
Female	0.45	0.50	0.45	0.50	0.01	0.45	0.50	0.01
Glaucoma Indicator	0.09	0.28	0.08	0.27	0.02	0.08	0.28	0.01
Hip Fracture Indicator	0.01	0.10	0.01	0.11	-0.02	0.01	0.10	-0.01

Characteristics	CEC Benes with a match (01/2018 switch) N=5,927		FFS Comparison Pool N=44,344		Std Diff Before Matching	FFS Comparison Group N=5,927		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Hyperlipidemia Indicator	0.63	0.48	0.55	0.50	0.17	0.62	0.48	0.02
Hypertension Indicator	0.88	0.32	0.87	0.33	0.03	0.88	0.32	-0.01
Ischemic Heart Disease	0.56	0.50	0.57	0.50	-0.01	0.56	0.50	-0.001
Months of Dialysis in Month Prior to alignment date	78.5	64.0	76.7	65.5	0.03	78.3	65.1	0.002
OREC: Disability	0.22	0.42	0.21	0.41	0.02	0.22	0.42	-0.004
OREC: ESRD	0.29	0.45	0.28	0.45	0.02	0.29	0.45	-0.01
OREC: ESRD and Disability	0.25	0.43	0.23	0.42	0.03	0.25	0.43	0
Osteoporosis Indicator	0.03	0.17	0.03	0.18	-0.03	0.03	0.17	-0.01
Percent Months Hemodialysis	0.95	0.22	0.92	0.27	0.12	0.94	0.22	0.01
Percent Months with Full Medicaid Dual Enrollment	0.40	0.48	0.43	0.48	-0.06	0.39	0.48	0.03
Percent Months with Partial Medicaid Dual Enrollment	0.16	0.35	0.14	0.33	0.06	0.16	0.35	0.01
Prostate Cancer Indicator	0.02	0.15	0.02	0.15	0.01	0.02	0.15	-0.01
Race: Black	0.52	0.50	0.39	0.49	0.26 *	0.52	0.50	-0.001
Race: White	0.35	0.48	0.42	0.49	-0.15	0.35	0.48	-0.01
Rheumatoid/Osteo-Arthritis Indicator	0.31	0.46	0.31	0.46	-0.01	0.30	0.46	0.02
Stroke Indicator	0.08	0.27	0.07	0.25	0.03	0.08	0.27	-0.002
Total Baseline Standardized Part A and Part B Payments	$65,441	$40,942	$63,243	$38,577	0.06	$64,972	$39,955	0.01
Facility: For-Profit	0.96	0.20	0.94	0.23	0.07	0.95	0.22	0.03
Facility: Home Dialysis	0.87	0.34	0.85	0.36	0.06	0.88	0.33	-0.04
Facility: Late Shift	0.19	0.40	0.22	0.41	-0.06	0.20	0.40	-0.02
Facility: LDO	1.00	0.00	1	0		1	0	
Facility: Peritoneal Dialysis	0.52	0.50	0.65	0.48	-0.27 *	0.53	0.50	-0.03
Facility: Standardized Hospital Ratio	1.0	0.25	0.95	0.25	0.04	1.0	0.25	-0.02
Facility: Standardized Mortality Ratio	1.0	0.23	1.0	0.24	0.09	1.0	0.25	-0.01
Facility: Standardized Readmission Ratio	1.0	0.26	0.97	0.28	0.03	1.0	0.28	-0.02
ACO Percentage	0.19	0.15	0.19	0.14	0.01	0.19	0.13	0.01
CBSA: Dual Beneficiaries per 10,000	315	118	332	105	-0.15	317	103	-0.01
CBSA: ESRD Beneficiary Count	2,961	3,122	2,634	3,087	0.11	2,997	3,226	-0.01

Characteristics	CEC Benes with a match (01/2018 switch) N=5,927		FFS Comparison Pool N=44,344		Std Diff Before Matching	FFS Comparison Group N=5,927		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
CBSA: Median Household Income	$58,801	$13,332	$59,976	$13,916	-0.09	$58,601	$11,702	0.02
CBSA: Medicare Advantage Penetration	31.6	12.3	33.1	12.8	-0.12	31.8	12.0	-0.02
Region: Midwest	0.03	0.18	0.15	0.36	-0.42 *	0.03	0.17	0.01
Region: Northeast	0.12	0.32	0.09	0.29	0.07	0.11	0.31	0.02
Region: South	0.69	0.46	0.50	0.50	0.40 *	0.70	0.46	-0.01

Notes: The standardized difference was calculated by the following equation: $\text{Std. Diff} = (\mu 1 - \mu 2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$. Any value below 0.1 is considered to be a negligible difference.

* Indicates a standardized mean difference greater than 0.2 in absolute value.

Exhibit J-10. Descriptive Statistics and Standardized Mean Differences (FFS to ACO January 2019)

Characteristics	ACO Benes with a match (01/2019 switch) N=1,345		FFS Comparison Pool N=53,619		Std Diff Before Matching	FFS Comparison Group N=1,345		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Acquired Hypothyroidism Indicator	0.21	0.41	0.18	0.38	0.09	0.23	0.42	-0.04
Acute Myocardial Infarction Indicator	0.04	0.19	0.03	0.18	0.03	0.04	0.21	-0.03
Age in Month Prior to alignment date	63.5	14.1	62.6	14.1	0.06	63.9	14.0	-0.03
Alzheimer's and Related Disorders Indicator	0.14	0.35	0.14	0.35	-0.01	0.15	0.36	-0.02
Alzheimer's Disease Indicator	0.03	0.17	0.03	0.16	0.02	0.03	0.17	0
Anemia Indicator	1.0	0.05	1.0	0.05	0.01	1.0	0.07	0.04
Asthma Indicator	0.09	0.28	0.07	0.26	0.06	0.08	0.27	0.03
Atrial Fibrillation Indicator	0.14	0.35	0.12	0.33	0.07	0.16	0.37	-0.05
Benign Prostatic Hyperplasia Indicator	0.09	0.28	0.06	0.24	0.09	0.10	0.30	-0.04
BMI at time of first ESRD diagnosis	30.2	8.4	30.1	8.4	0.02	30.6	8.7	-0.04
Breast Cancer Indicator	0.01	0.11	0.02	0.13	-0.04	0.01	0.09	0.03
Cancer	0.06	0.24	0.06	0.23	0.03	0.06	0.23	0.03
Cataracts Indicator	0.13	0.34	0.13	0.33	0.01	0.13	0.33	0.01
Cause of ESRD: Diabetes	0.46	0.50	0.45	0.50	0.02	0.48	0.50	-0.03
Cause of ESRD: Hypertension	0.28	0.45	0.31	0.46	-0.05	0.28	0.45	0.01
Cause of ESRD: Unknown	0.01	0.09	0.02	0.13	-0.07	0.01	0.08	0.03
Chronic Congestive Heart Failure Indicator	0.58	0.49	0.55	0.50	0.05	0.57	0.50	0.02
Chronic Obstructive Pulmonary Disease Indicator	0.19	0.39	0.19	0.40	-0.01	0.18	0.38	0.03
Colorectal Cancer Indicator	0.02	0.14	0.01	0.11	0.05	0.01	0.12	0.04
Congestive Heart Failure Indicator	0.58	0.49	0.56	0.50	0.05	0.57	0.50	0.02
Depression Indicator	0.29	0.45	0.23	0.42	0.12	0.29	0.45	0
Diabetes Indicator	0.69	0.46	0.70	0.46	-0.01	0.70	0.46	-0.005
Endometrial Cancer Indicator	0.004	0.07	0.003	0.06	0.02	0.005	0.07	-0.01
Female	0.43	0.49	0.44	0.50	-0.02	0.41	0.49	0.04
Glaucoma Indicator	0.09	0.29	0.08	0.27	0.04	0.09	0.29	0.003
Hip Fracture Indicator	0.01	0.11	0.01	0.11	0.01	0.01	0.11	0.01

Characteristics	ACO Benes with a match (01/2019 switch) N=1,345		FFS Comparison Pool N=53,619		Std Diff Before Matching	FFS Comparison Group N=1,345		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Hyperlipidemia Indicator	0.67	0.47	0.59	0.49	0.16	0.67	0.47	-0.005
Hypertension Indicator	0.90	0.30	0.87	0.33	0.09	0.90	0.30	0.005
Ischemic Heart Disease	0.59	0.49	0.57	0.49	0.03	0.60	0.49	-0.03
Months of Dialysis in Month Prior to alignment date	69.2	62.9	75.6	66.0	-0.10	68.5	58.7	0.01
OREC: Disability	0.23	0.42	0.22	0.41	0.01	0.24	0.42	-0.02
OREC: ESRD	0.33	0.47	0.31	0.46	0.04	0.31	0.46	0.03
OREC: ESRD and Disability	0.13	0.34	0.20	0.40	-0.18	0.12	0.33	0.03
Osteoporosis Indicator	0.03	0.18	0.04	0.19	-0.02	0.03	0.18	0
Percent Months Hemodialysis	0.92	0.26	0.91	0.27	0.01	0.92	0.27	-0.01
Percent Months with Full Medicaid Dual Enrollment	0.50	0.49	0.45	0.48	0.10	0.51	0.48	-0.02
Percent Months with Partial Medicaid Dual Enrollment	0.07	0.25	0.13	0.32	-0.20 *	0.07	0.24	0.02
Prostate Cancer Indicator	0.03	0.16	0.02	0.15	0.02	0.03	0.17	-0.03
Race: Black	0.30	0.46	0.37	0.48	-0.15	0.28	0.45	0.04
Race: White	0.46	0.50	0.41	0.49	0.12	0.46	0.50	-0.001
Rheumatoid/Osteo-Arthritis Indicator	0.31	0.46	0.31	0.46	0.01	0.31	0.46	0.02
Stroke Indicator	0.09	0.28	0.07	0.26	0.05	0.09	0.29	-0.03
Total Baseline Standardized Part A and Part B Payments	$69,074	$40,559	$67,909	$39,906	0.03	$68,477	$39,909	0.01
Facility: For-Profit	0.86	0.34	0.89	0.31	-0.07	0.86	0.35	0.01
Facility: Home Dialysis	0.83	0.38	0.83	0.37	-0.02	0.83	0.38	-0.002
Facility: Late Shift	0.30	0.46	0.23	0.42	0.17	0.30	0.46	0.01
Facility: LDO	0.62	0.48	1	0	-0.28 *	1	0	-0.05
Facility: Peritoneal Dialysis	0.74	0.44	0.66	0.47	0.18	0.74	0.44	0.02
Facility: Standardized Hospital Ratio	1.0	0.23	0.95	0.26	0.19	1.0	0.26	0.002
Facility: Standardized Mortality Ratio	1.0	0.23	1.0	0.27	-0.15	1.0	0.26	0.01
Facility: Standardized Readmission Ratio	1.0	0.27	0.97	0.28	0.16	1.0	0.27	0.02
ACO Percentage	0.33	0.15	0.23	0.15	0.66 *	0.33	0.15	0.02
CBSA: Dual Beneficiaries per 10,000	349	108	327	107	0.21 *	352	114	-0.02
CBSA: ESRD Beneficiary Count	4,069	4,683	2,971	3,471	0.27 *	3,978	4,349	0.02

Characteristics	ACO Benes with a match (01/2019 switch) N=1,345		FFS Comparison Pool N=53,619		Std Diff Before Matching	FFS Comparison Group N=1,345		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
CBSA: Median Household Income	$66,520	$14,848	$61,754	$14,973	0.32 *	$66,364	$15,831	0.01
CBSA: Medicare Advantage Penetration	38.2	10.3	34.3	12.6	0.34 *	38.8	10.9	-0.06
Region: Midwest	0.20	0.40	0.14	0.34	0.17	0.20	0.40	-0.01
Region: Northeast	0.24	0.43	0.11	0.31	0.34 *	0.24	0.43	-0.01
Region: South	0.25	0.43	0.46	0.50	-0.46 *	0.24	0.43	0.02

Notes: The standardized difference was calculated by the following equation: $\text{Std. Diff} = (\mu 1 - \mu 2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$. Any value below 0.1 is considered to be a negligible difference.

* Indicates a standardized mean difference greater than 0.2 in absolute value.

Exhibit J-11. Descriptive Statistics and Standardized Mean Differences (FFS to CEC January 2019)

Characteristics	CEC Benes with a match (01/2019 switch) N=1,338		FFS Comparison Pool N=40,289		Std Diff Before Matching	FFS Comparison Group N=1,338		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Acquired Hypothyroidism Indicator	0.16	0.37	0.17	0.37	-0.02	0.16	0.37	0.002
Acute Myocardial Infarction Indicator	0.03	0.17	0.03	0.18	-0.01	0.03	0.16	0.02
Age in Month Prior to alignment date	63.2	14.0	62.6	14.1	0.04	63.5	13.8	-0.02
Alzheimer's and Related Disorders Indicator	0.16	0.37	0.14	0.35	0.06	0.17	0.38	-0.04
Alzheimer's Disease Indicator	0.02	0.15	0.02	0.15	-0.004	0.03	0.16	-0.01
Anemia Indicator	1.0	0.08	1.0	0.05	-0.04	1.0	0.08	0
Asthma Indicator	0.07	0.25	0.07	0.26	-0.02	0.07	0.25	-0.01
Atrial Fibrillation Indicator	0.13	0.33	0.12	0.33	0.02	0.14	0.35	-0.04
Benign Prostatic Hyperplasia Indicator	0.04	0.21	0.06	0.24	-0.07	0.05	0.21	-0.01
BMI at time of first ESRD diagnosis	30.5	8.4	30.2	8.4	0.04	30.6	8.5	-0.01
Breast Cancer Indicator	0.02	0.14	0.02	0.13	0.03	0.03	0.16	-0.03
Cancer	0.06	0.23	0.06	0.23	-0.01	0.07	0.25	-0.04
Cataracts Indicator	0.13	0.33	0.13	0.33	-0.004	0.13	0.34	-0.01
Cause of ESRD: Diabetes	0.44	0.50	0.44	0.50	-0.01	0.44	0.50	-0.01
Cause of ESRD: Hypertension	0.33	0.47	0.32	0.47	0.04	0.34	0.47	-0.01
Cause of ESRD: Unknown	0.01	0.10	0.02	0.13	-0.06	0.01	0.11	-0.01
Chronic Congestive Heart Failure Indicator	0.57	0.50	0.55	0.50	0.03	0.57	0.50	-0.003
Chronic Obstructive Pulmonary Disease Indicator	0.18	0.39	0.20	0.40	-0.04	0.19	0.40	-0.03
Colorectal Cancer Indicator	0.01	0.10	0.01	0.11	-0.02	0.02	0.12	-0.05
Congestive Heart Failure Indicator	0.57	0.50	0.56	0.50	0.03	0.57	0.50	-0.002
Depression Indicator	0.23	0.42	0.23	0.42	-0.01	0.23	0.42	-0.01
Diabetes Indicator	0.68	0.47	0.69	0.46	-0.01	0.69	0.46	-0.02
Endometrial Cancer Indicator	0.003	0.05	0.003	0.06	-0.01	0.003	0.05	0
Female	0.44	0.50	0.44	0.50	0.01	0.44	0.50	0.02
Glaucoma Indicator	0.08	0.26	0.08	0.27	-0.02	0.08	0.28	-0.03
Hip Fracture Indicator	0.01	0.11	0.01	0.11	0.01	0.01	0.11	0.01

Characteristics	CEC Benes with a match (01/2019 switch) N=1,338		FFS Comparison Pool N=40,289		Std Diff Before Matching	FFS Comparison Group N=1,338		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
Hyperlipidemia Indicator	0.64	0.48	0.56	0.50	0.17	0.64	0.48	-0.003
Hypertension Indicator	0.89	0.31	0.87	0.34	0.07	0.90	0.30	-0.02
Ischemic Heart Disease	0.57	0.50	0.57	0.49	-0.01	0.57	0.49	-0.01
Months of Dialysis in Month Prior to alignment date	81.3	69.0	76.3	66.1	0.07	81.1	68.7	0.002
OREC: Disability	0.21	0.40	0.22	0.42	-0.05	0.22	0.41	-0.03
OREC: ESRD	0.29	0.45	0.30	0.46	-0.03	0.29	0.45	-0.003
OREC: ESRD and Disability	0.23	0.42	0.20	0.40	0.07	0.21	0.41	0.04
Osteoporosis Indicator	0.03	0.17	0.04	0.19	-0.02	0.03	0.18	-0.01
Percent Months Hemodialysis	0.94	0.24	0.92	0.27	0.08	0.94	0.23	-0.01
Percent Months with Full Medicaid Dual Enrollment	0.37	0.48	0.44	0.48	-0.13	0.36	0.47	0.02
Percent Months with Partial Medicaid Dual Enrollment	0.18	0.38	0.14	0.33	0.13	0.17	0.36	0.03
Prostate Cancer Indicator	0.03	0.16	0.02	0.15	0.02	0.03	0.17	-0.01
Race: Black	0.50	0.50	0.38	0.49	0.24 *	0.50	0.50	0.01
Race: White	0.36	0.48	0.41	0.49	-0.11	0.36	0.48	-0.01
Rheumatoid/Osteo-Arthritis Indicator	0.32	0.47	0.31	0.46	0.03	0.32	0.47	-0.002
Stroke Indicator	0.07	0.25	0.07	0.26	-0.005	0.05	0.22	0.09
Total Baseline Standardized Part A and Part B Payments	$68,799	$38,625	$67,709	$39,790	0.03	$69,488	$40,111	-0.02
Facility: For-Profit	0.97	0.17	0.94	0.23	0.13	0.97	0.18	0.03
Facility: Home Dialysis	0.81	0.39	0.85	0.36	-0.09	0.83	0.37	-0.04
Facility: Late Shift	0.20	0.40	0.22	0.42	-0.05	0.22	0.41	-0.03
Facility: LDO	0.99	0.12	1	0	-0.17	1	0	-0.17
Facility: Peritoneal Dialysis	0.51	0.50	0.66	0.48	-0.30 *	0.52	0.50	-0.02
Facility: Standardized Hospital Ratio	0.9	0.27	0.95	0.26	-0.18	0.9	0.23	-0.01
Facility: Standardized Mortality Ratio	1.0	0.24	1.0	0.24	0.03	1.0	0.27	0.01
Facility: Standardized Readmission Ratio	0.9	0.29	0.97	0.28	-0.24 *	0.9	0.31	-0.01
ACO Percentage	0.27	0.12	0.23	0.15	0.24 *	0.27	0.14	-0.002
CBSA: Dual Beneficiaries per 10,000	301	99	328	106	-0.26 *	300	102	0.001
CBSA: ESRD Beneficiary Count	2,660	2,242	2,691	3,146	-0.01	2,644	2,837	0.01

Characteristics	CEC Benes with a match (01/2019 switch) N=1,338		FFS Comparison Pool N=40,289		Std Diff Before Matching	FFS Comparison Group N=1,338		Std Diff After Matching
	Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
CBSA: Median Household Income	$61,381	$14,638	$60,644	$14,125	0.05	$61,122	$13,424	0.02
CBSA: Medicare Advantage Penetration	31.6	13.9	34.0	12.5	-0.18	31.3	11.7	0.03
Region: Midwest	0.01	0.11	0.15	0.35	-0.52 *	0.01	0.11	-0.01
Region: Northeast	0.14	0.35	0.09	0.29	0.15	0.16	0.36	-0.04
Region: South	0.70	0.46	0.48	0.50	0.45 *	0.70	0.46	-0.01

Notes: The standardized difference was calculated by the following equation: $\text{Std. Diff} = (\mu 1 - \mu 2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$. Any value below 0.1 is considered to be a negligible difference.

* Indicates a standardized mean difference greater than 0.2 in absolute value.

Model Specification. To perform the DiD analysis, all of the pre- and post-alignment period data of the newly aligned beneficiaries and their matched comparison beneficiary, of each alignment date for each treatment group (ACO or CEC), were stacked together. Effectively, this stacking normalized the observations around the date a beneficiary could or did transition into an ACO or CEC. We estimated separate regression models for each treatment group and compared treated and comparison outcomes for each of the alignment groups (cohort) in a pooled regression framework.

The basic analysis again takes the form of two separate stacked DiD fixed-effects models, one for each treatment group:

$$Y_{ict} = \alpha + \beta_{ct}T_{tc} + \eta_{1c}ACO_{ic} + \delta_1 Post\_ACO_{ict} + \lambda' X_{ict} + e_{ict} \quad (1)$$

$$Y_{ict} = \alpha + \beta_{ct}T_{tc} + \eta_{1c}CEC_{ic} + \delta_1 Post\_CEC_{ict} + \lambda' X_{ict} + e_{ict} \quad (2)$$

where subscripts *i*, *c*, and *t* denote individual, cohort of alignment date, and month. T represents alignment date by month specific fixed effects four each of the six alignment dates. ACO and CEC are separate indicator variables that identify the group of individuals who are considered treated regardless of time for each of the treatment cohorts (i.e., each alignment date). They take the form of 0 for comparison beneficiaries and 1 for treatment beneficiaries who belong to a specific alignment date cohort. Post ACO and Post CEC are the DiD post-treatment indicators for each of our treatment groups. The variables were coded 0 for all comparison and treatment baseline months, 0 for individuals in the comparison after the alignment date, and 1 for individuals who were aligned to an ACO or CEC Model after the alignment date. Thus, δ_1 from each regression are the primary coefficients of interest.

Finally, *X* was a vector of additional variable characteristics that controls for time-varying differences in beneficiary, facility, and market characteristics and are the same controls used in previous analysis. Market and facility controls were based on where the beneficiary received the majority of their care. The regression frameworks also include an indicator for a three-month treatment transition period. This indicator controls the transition period effect on outcomes and effectively exclude this time period from the DiD estimate. All estimated standard errors of the DiD estimate were calculated using two-way clusters at beneficiary and service facility levels.[157]

To assess whether the treatment and comparison group follow similar pre-intervention trends, we estimate linear trends models following the same design described in **Appendix E**, **Section F**. Formally, the parallel trend tests involved assessing the significance of the coefficient corresponding to the time and treatment dummy interaction term at $p<0.05$, using data prior to the start of the preceding alignment dates. If the outcome trends between treatment and comparison groups are the same prior to a beneficiary potential transition to an ACO or CEC care model, then the interaction coefficient should be near zero and not statistically significant.

The DiD estimates of all outcomes considered in the ACO analysis for both intervention groups, along with the p-value that corresponds to the linear parallel trends test, are shown in **Exhibits J-12** and **J-13**.

[157] Cameron, A., Gelbach, J.B., Miller, D.L. (2012). Robust inference with multiway clustering. *Journal of Business & Economic Statistics*, 29(2):238-49

Exhibit J-12. Impact Estimates for Newly Aligned ACO Beneficiaries

Measures	Number of Observations	Impact Estimates	90% Lower CI	90% Upper CI	Percent Change	Trend Test P-Value
Total Part A and Part B Standardized Medicare Payments	497,455	-$63	-$151	$26	-1.1%	0.66
Number of ED Visits per 1,000 Beneficiaries per Month	497,455	-0.12	-5.7	5.5	-0.09%	0.75
Fistula Use (percent of beneficiaries in a given month who had a fistula and had at least 90 days of dialysis)	448,021	-0.04	-0.68	0.59	-0.07%	0.67
Catheter Use (percent of beneficiaries in a given month who had a catheter for 90 days or longer)	448,021	0.44	-0.04	0.92	4.9%	1.0
Number of Hospitalizations per 1,000 Beneficiaries per Month	496,300	-3.5	-8.1	1.1	-2.9%	0.79
Percent of Beneficiaries with at Least One Readmission in a Given Month	44,969	-1.3	-2.8	0.32	-5.2%	0.06

Notes: Each impact estimate was based on retrospective cohort study that evaluated changes in outcomes for 12 months before and up to 12 months after following alignment into an ESCO or ACO care model relative to matched comparison groups of beneficiaries who did not transition from traditional FFS care. CI= confidence interval, ***p≤0.01, **p≤0.05, *p≤0.1.

Exhibit J-13. Impact Estimates for Newly Aligned CEC Beneficiaries

Measures	Number of Observations	Impact Estimates	90% Lower CI	90% Upper CI	Percent Change	Trend Test P-Value
Total Part A and Part B Standardized Medicare Payments	949,086	-$126 ***	-$189	-$64	-2.3%	0.40
Number of ED Visits per 1,000 Beneficiaries per Month	949,086	1.8	-2.3	5.8	1.2%	0.99
Fistula Use (percent of beneficiaries in a given month who had a fistula and had at least 90 days of dialysis)	881,992	0.49 *	0.07	0.91	0.74%	0.09
Catheter Use (percent of beneficiaries in a given month who had a catheter for 90 days or longer)	881,992	0.05	-0.27	0.37	0.80%	0.77
Number of Hospitalizations per 1,000 Beneficiaries per Month	947,344	-5.6 ***	-8.7	-2.5	-5.0%	0.18
Percent of Beneficiaries with at Least One Readmission in a Given Month	79,679	-1.8 **	-3.0	-0.57	-7.6%	0.13

Notes: Each impact estimate was based on retrospective cohort study that evaluated changes in outcomes for 12 months before and up to 12 months after following alignment into an ESCO or ACO care model relative to matched comparison groups of beneficiaries who did not transition from traditional FFS care. CI= confidence interval, ***p≤0.01, **p≤0.05, *p≤0.1.

Power Calculations. Finally, power calculations of the primary care-based ACO and CEC intervention groups, relative to the pooled comparison group, were calculated using the same methodology as the CEC Model evaluation presented in the earlier sections of the report. See **Appendix F** for details and equations of power methods.

The number of ACO and CEC newly aligned beneficiaries gives reasonable confidence that the analysis will detect modest impacts on Medicare service use and costs for all beneficiaries. Specifically, estimates of power using one-tailed tests at the 10% significance level and adjustments for goodness of fit from the regression models imply that the evaluation has 80% power to detect impacts on standardized Medicare payment of 2.5% or more for CEC and 3% or more for ACO newly aligned beneficiaries.

Appendix K: Unintended Consequences

A. Patient Selection

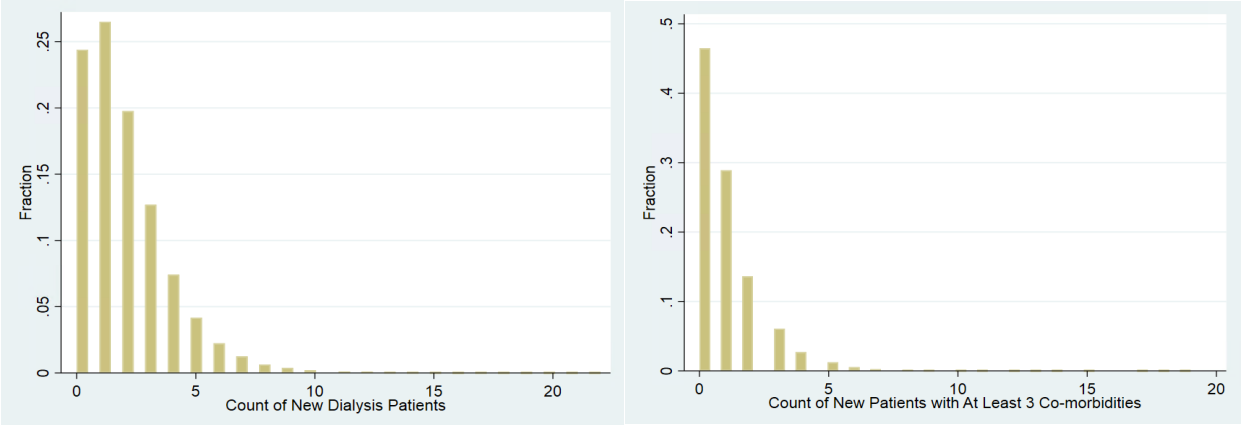
Descriptive Counts of New Dialysis Patients and Comorbidities. Patients new to dialysis are identified as any beneficiaries whose first observation, from December 2013 to June 2019, indicates they had three or fewer months of dialysis. [158] We included new dialysis patients up to their third month of dialysis to (1) limit beneficiaries who had previous dialysis, a gap, and then began dialysis again during our sample period; (2) include beneficiaries that became eligible for Medicare as a result of having ESRD. About half the patients in our sample were Medicare eligible as a result of ESRD, and most already had three months of dialysis when they were observed in the claims data.

To measure patients' health status, we required an assessment of patient health that was reasonably observed by the nephrologist at the initiation of chronic dialysis. Since a claims history with comorbidity information is not available for about half of the beneficiaries with ESRD who qualify for Medicare as a result of ESRD, we used data from CMS Form 2728 to identify beneficiaries with reported comorbidity conditions. This form is completed by the physician within 45 days of dialysis initiation to certify that a patient has reached ESRD and requires chronic dialysis or a kidney transplant. We used data from CMS-2728 to identify beneficiaries who had any of 19 comorbid conditions listed on the form that were observed at ESRD incidence, including: CHF; atherosclerotic heart disease; other cardiac disease; cerebrovascular disease; peripheral vascular disease; history of hypertension; amputation; diabetes; current smoker/tobacco use; malignant neoplasm, cancer; toxic nephropathy; alcohol dependence; drug dependence; inability to ambulate; inability to transfer; needs assistance with daily activities; institutionalized (assisted living, nursing home, or other institution); and non-renal congenital abnormality.

We aggregated the beneficiary-month level data to the aligned facility-quarter level. The analytic sample consisted of 22,764 facility-quarter observations from CEC facilities and 22,765 facility-quarterly observations from non-CEC comparison facilities over the period of January 2014 through June 2019. Therefore, for each CEC and matched comparison facility, we observed the number of beneficiaries with ESRD who were new to dialysis and the number who were new to dialysis and had at least two, three, four, and five comorbid conditions in each quarter. In our main analysis, we focused on new dialysis patients and those with at least three comorbid conditions. In **Exhibit K-1**, we present the distribution of these outcomes across facilities and quarters. The median facility and quarter had one beneficiary with ESRD that was new to dialysis and one with at least three comorbidities. We can see that the counts of outcomes of interest can be characterized by a very small number of beneficiaries on a facility-quarter basis.

[158] This analysis period ends in June 2019 instead of December 2019 to account for the lag in the CMS Form 2728 data, which is used to identify chronic conditions.

Exhibit K-1. Distribution of Number of Beneficiaries with ESRD New to Dialysis and with a Given Number of Comorbidities, across Facilities and Quarter



Model Specification. As described in the previous section, a challenge in determining whether or not CEC facilities had fewer patients with comorbidities at ESRD incidence is the small number of new dialysis beneficiaries for a given facility and quarter. The natural starting point to model the number of new dialysis patients with multiple comorbidities would be to estimate a Poisson regression specification.[159] The number of new dialysis patients with comorbidities are interpreted as "counts" that follow a Poisson distribution, and this specification assumes that the logarithm of these counts can be modeled by a linear combination of parameters. The estimating equation

$$Log(Y_{jmq}) = b_0 + \delta_q + b_2 ESCO_j + b_3 ESCO\_Post\_PY1\_W11_{jmq} + b_4 ESCO\_Post\_PY2\_W11_{jmq} + b_5 ESCO\_Post\_PY2\_W12_{jmq} + b_6 ESCO\_Post\_PY3\_W11_{jmq} + b_7 ESCO\_Post\_PY3\_W12_{jmq} + b_8 ESCO\_Post\_PY3\_W13_{jmq} + b_9 ESCO\_Post\_PY4\_W11_{jmq} + b_{10} ESCO\_Post\_PY4\_W12_{jmq} + b_{11} ESCO\_Post\_PY4\_W13_{jmq} + b_{12} ESCO\_Post\_PY4\_W14_{jmq} + b_{13} ESCO\_Post\_PY2\_W21_{jmq} + b_{14} ESCO\_Post\_PY3\_W21_{jmq} + b_{15} ESCO\_Post\_PY3\_W22_{jmq} + b_{16} ESCO\_Post\_PY4\_W21_{jmq} + b_{17} ESCO\_Post\_PY4\_W22_{jmq} + b_{18} ESCO\_Post\_PY4\_W23_{jmq} + \lambda' X_{jmq} + e_{jmq}$$

where Y is the count of patients new to dialysis with comorbidity(ies) at facility j in market m in quarter q, *ESCO* is the CEC status of facility j and indicates the post CEC period for facility j. X includes market characteristics and facility characteristics and dummies for each cohort of ESCOs and their comparison group matches, and δ are quarterly dummies. The post-treatment indicators, represented by *ESCO_Post_PY1_W11, ESCO_Post_PY2_W11, ESCO_Post_PY2_W12, ESCO_Post_PY3_W11, ESCO_Post_PY3_W12, ESCO_Post_PY3_W13, ESCO_Post_PY4_W11, ESCO_Post_PY4_W12, ESCO_Post_PY4_W13, ESCO_Post_PY4_W14, ESCO_Post_PY2_W21, ESCO_Post_PY3_W21, ESCO_Post_PY3_W22, ESCO_Post_PY4_W21, ESCO_Post_PY4_W22, and ESCO_Post_PY4_W23* separate CEC beneficiaries by wave, joining year, and by PY. Weighted averages of the post treatment indicators are calculated to generate overall and specific PY impact estimates for All ESCOs, Wave 1, and Wave 2.

There are several well-known limitations to the Poisson model. The most restrictive assumption of the model is that the mean and the variance of the dependent variable are assumed to be equal (or

[159] Modeling these outcomes with a normally distributed error by estimating OLS models is not appropriate in our particular case.

'equidispersion'). In addition, because of this restrictive assumption, there is the 'excess zeros problem' in which the model predicts the probability of a zero count to be considerably less than is actually observed in the sample. The negative binomial model circumvents the limitations of the Poisson model since it has the same mean as the Poisson, but the conditional variance is quadratic in the mean, and consequently it does not impose that the mean and variance are equal.

For each outcome, we estimated Poisson and negative binomial models. In deciding the most appropriate model between the Poisson and negative binomial models, we performed a statistical test for whether equidispersion was a problem in our data. For all our outcomes, the likelihood ratio test suggested that the negative binomial model was a more appropriate model.[160] We included in the model the following facility characteristics: beneficiary count, whether the facility offers a late shift, profit status, LDO status, rural/urban status, and dummies for region. Market characteristics included: median household income, dual eligible population, PCPs per 10,000 population, Medicare Advantage (MA) penetration, ACO penetration, and percent of Medicare beneficiaries in the CBSA that had ESRD at the pre-CEC period. The estimation results from the Poisson model are shown in **Exhibit K-2**. The Poisson specification shows that the magnitude and sign of the DiD estimates are similar to the negative binomial specification results presented in the report. They do not suggest a significant association between the CEC and the number of new patients with multiple comorbidities, relative to the comparison population.

Exhibit K-2. Number of Additional Patients with Comorbidities at CEC Facilities vs. Comparison Facilities, Poisson Model

Model: Poisson	CEC		Comparison		DiD Estimate			
Outcome	Pre-CEC	Post-CEC	Pre-CEC	Post-CEC	DiD	90% Lower CI	90% Upper CI	Percent Change
New Dialysis Patients	2.1	1.7	2.2	1.8	0.04	-0.02	0.10	1.8%
New Patients with at Least Three Comorbidities	1.1	0.90	1.1	0.94	0.02	-0.03	0.06	1.8%

Notes: ***p≤0.01, **p≤0.05, *p≤0.1.

B. Transplant Waiting List Activity

This appendix details the new approach for analyzing transplant waiting list activity in PY4. As noted in **Section IX** of this annual report, although the CEC Model could have unintentionally impacted ESCO facility transplant referral behavior and subsequently the percentage of their beneficiaries on the waiting list for a transplant, we did not find any evidence that the CEC had an impact on waitlist rates.

Yearly DiD Strategy for Waiting List Activity. Because waiting list activity is a relatively infrequent event, the unit of observation in this analysis was beneficiary-year instead of a beneficiary-month.

A waiting list entry refers to registration with a transplant center. A beneficiary may have multiple entries in a year at multiple centers, meaning they are on multiple waitlists. The yearly count of entries on the transplant waiting list for the larger ESRD population of beneficiaries that were active

[160] For all outcomes, the overdisperson parameter had a p-value ≤0.000.

on the list is summarized in **Exhibit K-3**. The exhibit shows that the raw yearly number of entries that were added or removed varied over time. Specifically, we observed an increase in the overall number of entries added to the transplant waiting list (with the exception of a small decrease in 2015) and an increase in the overall number of entries removed from the waiting list in recent years. Beneficiaries are removed from a center's waiting list for the following reasons: they received a transplant (at any center); experienced a change in health status that makes them no longer an eligible candidate for transplant; no longer wish to pursue transplant; or death.

Exhibit K-3. Number of Raw Annual Transplant Waitlist Entries Added and Removed

Year	Number of Entries Added	Number of Entries Removed
2014	38,810	35,864
2015	37,621	38,802
2016	37,947	40,173
2017	38,197	40,950
2018	41,560	41,919
2019	44,288	43,921

Notes: The entries include multiple waitlist records for beneficiaries active in multiple transplant centers.

Data Source: Scientific Registry of Transplant Recipients kidney/pancreas waiting list.

Redefinition of Time Periods. As is the case with other annual measures, we redefined the pre-CEC, transition, and post-CEC periods to include full calendar years (CYs). For Wave 1 PY1 joiners, this change resulted in a shorter pre-CEC period (it no longer includes the first quarter of 2015) and shorter post-CEC period (it now excludes the first intervention quarter). For facilities joining in all other years, the first two quarters of their joining year are reallocated from the pre-CEC to the transition period, with no change in the post-CEC period. CYs assigned to these periods for the comparison and CEC groups are shown in **Exhibit K-4.**

Exhibit K-4. Waves, Pre-CEC, Transition, and Post-CEC by Calendar Year

Facility Wave	Pre-CEC		Performance Year 1	Performance Year 2	Performance Year 3	Performance Year 4
	2014	2015	2016	2017	2018	2019
Wave 1 PY1 Joiners	Pre-CEC	Transition	Post-CEC			
Wave 1 PY2 Joiners	Pre-CEC		Transition	Post-CEC		
Wave 2 PY2 Joiners	Pre-CEC		Transition	Post-CEC		
Wave 1 PY3 Joiners	Pre-CEC			Transition	Post-CEC	
Wave 2 PY3 Joiners	Pre-CEC			Transition	Post-CEC	
Wave 1 PY4 Joiners	Pre-CEC				Transition	Post-CEC
Wave 2 PY4 Joiners	Pre-CEC				Transition	Post-CEC
Matched Comparison Group	Pre-CEC		Post-CEC			

Model Specification. We follow the model described in Appendix E Section F, with annual indicators rather than quarterly indicators to account for the difference in the units of observation. The variables included in the model are summarized in **Exhibit K-5**.

Exhibit K-5. Control Variables Included in the DiD Model

Variable Type	Variable
Beneficiary Level	Female; Age; BMI at ESRD Incidence; Months on Dialysis; Cancer Indicator; Type of Dialysis (Hemodialysis, Peritoneal Dialysis, Other); Race (Black, White, Other); Medicaid Status (None, Full, or Partial)
Facility Level	Facility indicators for Wave 1 PY1, Wave 1 PY2, Wave 1 PY3, Wave 1 PY4, Wave 2 PY2, Wave 2 PY3, and Wave 2 PY4; Profit Indicator (For Profit, Not for Profit)
Market Level	Region Indicators; Urban/ Rural Indicator (Metro Area, Urban Area, Rural Area); Number of Kidney Transplant Hospitals per 10,000 population, measured in 2011

The results of the DiD regression analysis are summarized in **Exhibit K-6**. While the percentage of CEC beneficiaries on the waiting list was lower in the post-CEC period across all waves and PYs, similar declines were observed for the comparison group and the estimated impact of CEC on transplant waiting list rates was not statistically significant for any wave or performance year. This

suggests there is no evidence indicating that the CEC Model was associated with adverse changes in waiting list activity.

Exhibit K-6. Impact of the CEC Model on Waiting List Activity[161]

Group	Performance Year	CEC		Comparison		DiD Estimate			
		Pre-CEC	Post-CEC	Pre-CEC	Post-CEC	DiD	90% Lower CI	90% Upper CI	Percent Change
ALL ESCOs	PY1-PY4	27.0%	23.6%	25.0%	21.0%	0.01	-0.001	0.01	2.3%
Wave 1	PY1-PY4	27.0%	23.9%	25.0%	21.2%	0.01	-0.003	0.02	2.8%
Wave 2	PY2-PY4	26.6%	23.1%	24.5%	20.6%	0.01	-0.003	0.01	1.8%
Wave 1	PY1	27.0%	25.6%	25.0%	22.9%	0.01	-0.01	0.02	2.5%
Wave 1	PY2	27.0%	24.1%	25.0%	21.1%	0.01	-0.003	0.02	3.6%
Wave 1	PY3	27.0%	22.9%	25.0%	20.4%	0.01	-0.01	0.02	2.0%
Wave 1	PY4	27.0%	23.2%	25.0%	20.4%	0.01	-0.003	0.02	3.0%
Wave 2	PY2	26.5%	24.1%	24.5%	21.1%	0.01	-0.001	0.02	3.7%
Wave 2	PY3	26.5%	23.3%	24.5%	20.4%	0.01	0.00	0.02	3.3%
Wave 2	PY4	26.5%	22.1%	24.5%	20.3%	-0.002	-0.01	0.01	-0.80%

Notes: ***p<0.01, **p<0.05, *p<0.1.

[161] Since the outcome is annual, there is only one observation before 2015. Given this data constraint, we do not test parallel trends for this outcome.

Appendix L: Hospital Density Analysis

A. Data Preparation

Inpatient claims from 2012-2019 were used to identify admissions for CEC aligned and comparison group patients and hospital identifiers (PROVHFCA). Dialysis facility information, CEC wave, alignment dates, and death dates for patients aligned only to ESCO or comparison facilities were obtained from Q17 annual research files and linked by KECC_ID to the inpatient claims. These data were used to calculate the mean number of hospitals per dialysis facility, the percentage of rural (vs urban) facilities for wave by year, facility size based on count of aligned patients per year (in ESCO and comparison group facilities), each hospital's percentage share of admissions from the dialysis facility, the cumulative share of each hospital admission for a given dialysis facility, and the number of hospitals needed to account for a certain percentage of patient admissions for any given dialysis facility. The information was summarized by wave and year for matched CEC and comparison dialysis facilities. Hospitalizations that occurred outside of alignment or after the death date were not included in analysis.

B. Descriptive Results

Main Outcome: Our main outcome was the number of hospitals used by the patients from the same facility (ESCO and comparison dialysis facilities). We computed the mean number of hospitals by wave, year and ESCO or comparison status and summarized in **Exhibit L-1**.

Exhibit L-1. Mean Number of Hospitals per Dialysis Facility

ESCO Dialysis Facilities (Overall mean=10.3 hospitals per facility)										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	14.0	14.1	14.2	14.3	14.2¨	13.9¨	14.0¨	13.5¨	14.1	13.9
Wave 1, PY2 Joiners	13.4	12.5	12.7	12.9	12.5	13.0¨	12.5¨	12.6¨	12.8	12.7
Wave 1, PY3 Joiners	10.2	10.5	10.6	10.5	10.6	10.1	10.7¨	11.1¨	10.4	10.9
Wave 1, PY4 Joiners	10.1	11.2	11.1	10.6	10.7	10.0	8.8	10.2¨	10.4	10.2
Wave 2, PY1 Joiners	10.4	10.6	10.4	10.7	10.6	10.6¨	10.4¨	10.3¨	10.6	10.4
Wave 2, PY2 Joiners	9.7	9.8	9.8	10.1	9.6	9.4	9.9¨	10.1¨	9.7	10.0
Wave 2, PY3 Joiners	9.1	9.1	9.0	8.9	8.3	8.1	7.8	8.4¨	8.6	8.4

Comparison Facilities (Overall mean=8.1 hospitals per facility)										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	9.4	9.4	9.6	9.7	9.7¨	9.2¨	8.8¨	8.8¨	9.5	9.1
Wave 1, PY2 Joiners	9.1	8.7	8.9	9.4	8.6	8.5¨	8.6¨	8.4¨	8.9	8.5
Wave 1, PY3 Joiners	8.5	8.7	8.4	8.7	8.4	8.1	7.7¨	7.4¨	8.5	7.6
Wave 1, PY4 Joiners	8.7	9.3	9.6	9.1	9.6	8.6	8.3	8.7¨	9.0	8.7
Wave 2, PY1 Joiners	9.1	8.7	8.7	8.8	8.7	8.4¨	8.5¨	8.2¨	8.8	8.4
Wave 2, PY2 Joiners	8.4	8.1	8.3	8.5	8.4	8.3	7.9¨	7.6¨	8.3	7.8
Wave 2, PY3 Joiners	9.1	9.3	9.9	9.4	8.8	9.2	8.3	8.6¨	9.1	8.6

Note: Post-CEC intervention cells are marked (¨).

Secondary Outcomes: We also investigated whether changes in trends were due to possible confounders, such as percentage of rural facilities and facility size based on the number of aligned patients. Descriptive statistics are summarized in **Exhibit L-2 and L-3.** We found that ESCOs had a lower proportion of rural facilities and higher mean facility size compared to the comparison group, which was true for nearly all waves. Across the years 2012-2019, the proportion of rural facilities among the ESCO group slightly decreased, while the proportion of rural facilities among the comparison group remained stable. Moreover, the mean facility size decreased in both ESCO and comparison facilities over the same period.

Exhibit L-2. Proportion of Dialysis Facilities that are Rural

Proportion of Rural ESCO Facilities (overall rural proportion=0.13)									
	2012	2013	2014	2015	2016	2017	2018	2019	Average
Wave 1, PY1 Joiners	0.02	0.02	0.03	0.03	0.03¨	0.03¨	0.03¨	0.03¨	0.03
Wave 1, PY2 Joiners	0.08	0.07	0.07	0.07	0.06	0.06¨	0.07¨	0.07¨	0.07
Wave 1, PY3 Joiners	0.25	0.26	0.25	0.25	0.25	0.23	0.22¨	0.22¨	0.24
Wave 1, PY4 Joiners	0.17	0.17	0.17	0.19	0.18	0.17	0.14	0.14¨	0.17
Wave 2, PY1 Joiners	0.10	0.10	0.10	0.10	0.10	0.10¨	0.10¨	0.10¨	0.10
Wave 2, PY2 Joiners	0.16	0.16	0.17	0.17	0.16	0.16	0.16¨	0.16¨	0.16
Wave 2, PY3 Joiners	0.37	0.37	0.37	0.39	0.39	0.36	0.32	0.29¨	0.36

Proportion of Rural Comparison Facilities (overall rural proportion=0.16)									
	2012	2013	2014	2015	2016	2017	2018	2019	Average
Wave 1, PY1 Joiners	0.09	0.09	0.09	0.09	0.09¨	0.09¨	0.09¨	0.09¨	0.09
Wave 1, PY2 Joiners	0.09	0.09	0.09	0.09	0.09	0.09¨	0.09¨	0.09¨	0.09
Wave 1, PY3 Joiners	0.28	0.28	0.28	0.28	0.28	0.28	0.28¨	0.28¨	0.28
Wave 1, PY4 Joiners	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44¨	0.44
Wave 2, PY1 Joiners	0.11	0.11	0.11	0.11	0.11	0.11¨	0.11¨	0.11¨	0.11
Wave 2, PY2 Joiners	0.24	0.24	0.24	0.24	0.24	0.24	0.24¨	0.24¨	0.24
Wave 2, PY3 Joiners	0.30	0.29	0.31	0.31	0.31	0.31	0.31	0.31¨	0.30

Note: Post-CEC intervention cells are marked (¨).

Exhibit L-3. Dialysis Facility Size (Aligned Patient Count)

Aligned Patient Count for ESCO Dialysis Facilities (overall mean facility size=59.6 patients)										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	79.6	77.2	77.4	75.4	73.4¨	70.4¨	68.5¨	63.9¨	77.4	69.0
Wave 1, PY2 Joiners	66.7	63.5	62.7	62.3	59.7	56.8¨	57.0¨	56.8¨	63.0	56.9
Wave 1, PY3 Joiners	70.6	69.6	69.4	67.8	66.8	62.7	61.5¨	62.0¨	67.8	61.7
Wave 1, PY4 Joiners	60.1	59.3	58.3	56.7	52.6	49.1	41.9	41.2¨	54.0	41.2
Wave 2, PY1 Joiners	65.0	63.3	61.7	61.4	58.0	57.3¨	53.9¨	52.1¨	61.9	54.4
Wave 2, PY2 Joiners	54.7	53.9	52.7	52.5	50.2	48.6	48.1¨	48.2¨	52.1	48.1
Wave 2, PY3 Joiners	60.6	60.6	59.1	56.4	51.8	47.9	41.3	42.3¨	54.0	42.3

Aligned Patient Count for Comparison Dialysis Facilities (overall mean facility size= 53.30 patients)										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	62.2	57.1	57.4	56.5	54.1¨	51.4¨	47.0¨	45.6¨	58.3	49.5
Wave 1, PY2 Joiners	58.7	54.3	55.9	55.0	52.2	50.6¨	48.4¨	48.2¨	55.2	49.1
Wave 1, PY3 Joiners	61.9	57.6	57.4	55.3	53.3	49.7	46.1¨	43.6¨	55.9	44.8
Wave 1, PY4 Joiners	71.3	68.4	68.6	63.0	57.9	54.3	45.4	42.7¨	61.3	42.7
Wave 2, PY1 Joiners	64.7	59.8	60.3	59.0	55.2	52.0¨	48.2¨	46.5¨	59.8	48.9
Wave 2, PY2 Joiners	56.0	51.3	51.6	51.0	48.9	46.4	41.9¨	40.9¨	50.9	41.4
Wave 2, PY3 Joiners	67.3	61.2	62.8	60.3	56.1	50.6	46.7	44.6¨	57.9	44.6

Note: Post-CEC intervention cells are marked (¨).

Additional Outcomes: This first four sets of tables show the mean percentage of admissions accounted for by the top 1, 3, 5, and 10 hospitals used for admissions at the dialysis facility for ESCO facilities and comparison facilities, respectively, across wave and years summarized in **Exhibit L-4.** The trends we observe in the ESCO facilities are similar whereby there is not much movement in the percentage of admissions accounted for by the top 1, 3, 5, 10 hospitals before and after intervention. The Comparison facilities, while showing a higher percentage of admissions accounted for by fewer hospitals does not show much movement either over time by wave.

Exhibit L-4. Mean Percentage of Dialysis Facilities' Inpatient Admissions by the Top One, Three, Five, and Ten Hospitals Receiving Admissions

Mean Percentage of Admissions for the Hospital Receiving Top Admission Percentage for ESCO Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	0.51	0.49	0.47	0.47	0.47¨	0.46¨	0.47¨	0.46¨	0.49	0.46
Wave 1, PY2 Joiners	0.52	0.52	0.50	0.50	0.48	0.46¨	0.47¨	0.47¨	0.50	0.47
Wave 1, PY3 Joiners	0.61	0.58	0.56	0.59	0.56	0.55	0.52¨	0.50¨	0.57	0.51
Wave 1, PY4 Joiners	0.53	0.54	0.52	0.57	0.53	0.55	0.56	0.51¨	0.54	0.51
Wave 2, PY1 Joiners	0.54	0.53	0.53	0.51	0.50	0.50¨	0.50¨	0.49¨	0.52	0.50
Wave 2, PY2 Joiners	0.54	0.54	0.53	0.52	0.54	0.52	0.52¨	0.52¨	0.53	0.52
Wave 2, PY3 Joiners	0.64	0.62	0.60	0.62	0.59	0.59	0.58	0.54¨	0.61	0.54

Mean Percentage of Admissions for the Hospital Receiving Top Admission Percentage for Comparison Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	0.56	0.56	0.53	0.53	0.53¨	0.52¨	0.54¨	0.53¨	0.54	0.53
Wave 1, PY2 Joiners	0.59	0.58	0.56	0.55	0.56	0.57¨	0.54¨	0.56¨	0.57	0.56
Wave 1, PY3 Joiners	0.62	0.60	0.61	0.58	0.59	0.61	0.59¨	0.58¨	0.60	0.58
Wave 1, PY4 Joiners	0.56	0.58	0.58	0.55	0.54	0.55	0.55	0.50¨	0.56	0.50
Wave 2, PY1 Joiners	0.59	0.59	0.58	0.58	0.57	0.56¨	0.56¨	0.56¨	0.58	0.56
Wave 2, PY2 Joiners	0.60	0.59	0.58	0.58	0.56	0.56	0.56¨	0.56¨	0.58	0.56
Wave 2, PY3 Joiners	0.58	0.56	0.57	0.55	0.54	0.53	0.53	0.52¨	0.55	0.52

Mean Percentage of Admissions for the Hospital Receiving Top Three Admission Percentages for ESCO Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	0.77	0.75	0.75	0.74	0.73¨	0.73¨	0.74¨	0.73¨	0.75	0.73
Wave 1, PY2 Joiners	0.77	0.76	0.75	0.75	0.75	0.73¨	0.74¨	0.72¨	0.75	0.73
Wave 1, PY3 Joiners	0.85	0.84	0.83	0.83	0.83	0.83	0.81¨	0.79¨	0.84	0.80
Wave 1, PY4 Joiners	0.84	0.82	0.81	0.82	0.78	0.82	0.79	0.78¨	0.81	0.78
Wave 2, PY1 Joiners	0.82	0.81	0.80	0.79	0.78	0.79¨	0.78¨	0.78¨	0.80	0.78
Wave 2, PY2 Joiners	0.81	0.81	0.80	0.79	0.80	0.80	0.79¨	0.78¨	0.80	0.79
Wave 2, PY3 Joiners	0.86	0.85	0.85	0.84	0.85	0.84	0.83	0.82¨	`0.84	0.82

Mean Percentage of Admissions for the Hospital Receiving Top Three Admission Percentages for Comparison Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	0.84	0.83	0.82	0.82	0.82¨	0.82¨	0.83¨	0.82¨	0.83	0.82
Wave 1, PY2 Joiners	0.84	0.84	0.84	0.83	0.83	0.84¨	0.82¨	0.83¨	0.84	0.83
Wave 1, PY3 Joiners	0.87	0.86	0.88	0.86	0.86	0.86	0.86¨	0.86¨	0.87	0.86
Wave 1, PY4 Joiners	0.85	0.85	0.84	0.83	0.83	0.82	0.84	0.81¨	0.84	0.81
Wave 2, PY1 Joiners	0.85	0.86	0.85	0.85	0.85	0.84¨	0.84¨	0.85¨	0.85	0.84
Wave 2, PY2 Joiners	0.86	0.87	0.86	0.85	0.84	0.84	0.85¨	0.85¨	0.85	0.85
Wave 2, PY3 Joiners	0.85	0.84	0.84	0.83	0.84	0.83	0.83	0.82¨	0.84	0.82

Mean Percentage of Admissions for the Hospital Receiving Top Five Admission Percentages for ESCO Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	0.86	0.85	0.84	0.84	0.84¨	0.84¨	0.84¨	0.84¨	0.85	0.84
Wave 1, PY2 Joiners	0.86	0.85	0.85	0.85	0.85	0.83¨	0.85¨	0.83¨	0.85	0.84
Wave 1, PY3 Joiners	0.92	0.91	0.91	0.91	0.90	0.90	0.90¨	0.88¨	0.91	0.89
Wave 1, PY4 Joiners	0.91	0.89	0.88	0.89	0.86	0.90	0.89	0.86¨	0.89	0.86
Wave 2, PY1 Joiners	0.90	0.89	0.89	0.88	0.88	0.88¨	0.87¨	0.88¨	0.89	0.88
Wave 2, PY2 Joiners	0.89	0.90	0.89	0.89	0.88	0.89	0.88¨	0.87¨	0.89	0.88
Wave 2, PY3 Joiners	0.92	0.92	0.91	0.91	0.91	0.91	0.90	0.89¨	0.91	0.89

Mean Percentage of Admissions for the Hospital Receiving Top Five Admission Percentages for Comparison Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	0.92	0.91	0.91	0.91	0.90¨	0.91¨	0.91¨	0.91¨	0.91	0.91
Wave 1, PY2 Joiners	0.92	0.92	0.91	0.91	0.91	0.92¨	0.91¨	0.92¨	0.91	0.92
Wave 1, PY3 Joiners	0.94	0.93	0.94	0.93	0.93	0.94	0.93¨	0.94¨	0.94	0.94
Wave 1, PY4 Joiners	0.92	0.91	0.92	0.92	0.91	0.91	0.91	0.89¨	0.91	0.89
Wave 2, PY1 Joiners	0.92	0.92	0.93	0.92	0.92	0.92¨	0.92¨	0.92¨	0.92	0.92
Wave 2, PY2 Joiners	0.93	0.93	0.93	0.93	0.92	0.92	0.93¨	0.93¨	0.93	0.93
Wave 2, PY3 Joiners	0.93	0.92	0.92	0.91	0.92	0.91	0.92	0.91¨	0.92	0.91

Mean Percentage of Admissions for the Hospital Receiving Top Ten Admission Percentages for ESCO Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	0.94	0.94	0.93	0.94	0.93¨	0.93¨	0.93¨	0.92¨	0.94	0.93
Wave 1, PY2 Joiners	0.94	0.94	0.94	0.94	0.94	0.93¨	0.94¨	0.93¨	0.94	0.94
Wave 1, PY3 Joiners	0.96	0.96	0.96	0.97	0.96	0.96	0.96¨	0.95¨	0.96	0.96
Wave 1, PY4 Joiners	0.97	0.97	0.96	0.97	0.95	0.97	0.97	0.94¨	0.96	0.94
Wave 2, PY1 Joiners	0.96	0.96	0.96	0.95	0.96	0.95¨	0.95¨	0.94¨	0.96	0.95
Wave 2, PY2 Joiners	0.96	0.96	0.96	0.95	0.95	0.95	0.95¨	0.93¨	0.96	0.94
Wave 2, PY3 Joiners	0.98	0.97	0.97	0.96	0.97	0.97	0.95	0.93¨	0.97	0.93

Mean Percentage of Admissions for the Hospital Receiving Top Ten Admission Percentages for Comparison Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	0.97	0.97	0.96	0.96	0.96¨	0.96¨	0.96¨	0.96¨	0.96	0.96
Wave 1, PY2 Joiners	0.96	0.96	0.97	0.95	0.95	0.97¨	0.96¨	0.96¨	0.96	0.96
Wave 1, PY3 Joiners	0.99	0.97	0.98	0.97	0.97	0.98	0.98¨	0.99¨	0.98	0.99
Wave 1, PY4 Joiners	0.98	0.98	0.98	0.98	0.98	0.96	0.97	0.96¨	0.97	0.96
Wave 2, PY1 Joiners	0.97	0.97	0.97	0.97	0.97	0.97¨	0.97¨	0.97¨	0.97	0.97
Wave 2, PY2 Joiners	0.98	0.98	0.97	0.97	0.97	0.97	0.97¨	0.97¨	0.97	0.97
Wave 2, PY3 Joiners	0.98	0.97	0.97	0.96	0.96	0.95	0.97	0.97¨	0.96	0.97

Note: Post-CEC intervention cells are marked (¨).

Looking at these data in another way, the next three sets of tables illustrate the number of hospitals that account for at least 50%, 75%, and 90% of admissions, see **Exhibit L-5**. We calculate and order the relative percentage of total admissions for every hospital that had any admissions for the dialysis facility in a given year. Ranking these percentage of admissions by hospital from greatest to smallest and creating a cumulative percentage, we are then able to identify the number of hospitals used by the dialysis facility to reach 50%, 75%, and 90% of their cumulative admissions. For example, if a dialysis facility's ranked percentages for the total number of hospital admissions has its first hospital accounting for 50% of annual admissions, the next hospital accounting for 20% of annual admissions, and the next hospital accounting for 15% of annual admissions, then that dialysis facility would have 1 hospital for 50% of admissions, and 3 hospitals for 75% of admissions. On average, we found that this metric was higher in ESCO facilities than in the comparison facilities. The numbers increased before and after the CEC intervention in all waves for both ESCO and comparison groups which is an indication of changes over time.

Exhibit L-5. Mean Number of Hospitals for 50%, 75% and 90% of Admissions

Mean Number of Hospitals that Account for at least 50% of Admissions for ESCO Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	1.7	1.8	1.9	1.9	1.9¨	1.9¨	1.8¨	1.9¨	1.8	1.9
Wave 1, PY2 Joiners	1.6	1.7	1.8	1.8	1.9	1.9¨	1.8¨	1.9¨	1.8	1.9
Wave 1, PY3 Joiners	1.3	1.4	1.5	1.4	1.5	1.5	1.7¨	1.7¨	1.4	1.7
Wave 1, PY4 Joiners	1.6	1.6	1.7	1.5	1.7	1.5	1.5	1.7¨	1.6	1.7
Wave 2, PY1 Joiners	1.6	1.6	1.6	1.7	1.7	1.7¨	1.8¨	1.7¨	1.6	1.7
Wave 2, PY2 Joiners	1.6	1.6	1.7	1.7	1.7	1.7	1.7¨	1.7¨	1.6	1.7
Wave 2, PY3 Joiners	1.3	1.4	1.5	1.4	1.4	1.5	1.5	1.7¨	1.4	1.7

Mean Number of Hospitals that Account for at least 50% of Admissions for Comparison Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	1.5	1.5	1.6	1.6	1.6¨	1.6¨	1.6¨	1.6¨	1.6	1.6
Wave 1, PY2 Joiners	1.4	1.5	1.5	1.6	1.5	1.5¨	1.5¨	1.5¨	1.5	1.5
Wave 1, PY3 Joiners	1.4	1.4	1.4	1.5	1.4	1.3	1.4¨	1.5¨	1.4	1.4
Wave 1, PY4 Joiners	1.4	1.3	1.4	1.5	1.5	1.6	1.4	1.7¨	1.5	1.7
Wave 2, PY1 Joiners	1.4	1.4	1.4	1.4	1.5	1.5¨	1.5¨	1.5¨	1.4	1.5
Wave 2, PY2 Joiners	1.4	1.4	1.4	1.4	1.5	1.5	1.4¨	1.5¨	1.4	1.4
Wave 2, PY3 Joiners	1.4	1.5	1.4	1.5	1.5	1.6	1.5	1.6¨	1.5	1.6

Mean Number of Hospitals that Account for at least 75% of Admissions for ESCO Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	3.4	3.6	3.8	3.9	3.9¨	3.9¨	3.8¨	3.9¨	3.7	3.9
Wave 1, PY2 Joiners	3.4	3.4	3.7	3.7	3.7	3.9¨	3.8¨	3.9¨	3.6	3.9
Wave 1, PY3 Joiners	2.5	2.6	2.8	2.5	2.6	2.6	2.8¨	3.1¨	2.6	3.0
Wave 1, PY4 Joiners	2.6	2.8	2.8	2.7	3.1	2.7	2.9	3.2¨	2.8	3.2
Wave 2, PY1 Joiners	2.8	3.0	3.0	3.2	3.2	3.2¨	3.3¨	3.3¨	3.0	3.2
Wave 2, PY2 Joiners	2.9	2.9	3.1	3.1	3.0	3.0	3.1¨	3.2¨	3.0	3.2
Wave 2, PY3 Joiners	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.8¨	2.4	2.8

Mean Number of Hospitals that Account for at least 75% of Admissions for Comparison Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	2.6	2.7	2.9	2.8	2.8¨	2.8¨	2.8¨	2.9¨	2.8	2.8
Wave 1, PY2 Joiners	2.5	2.5	2.6	2.8	2.7	2.7¨	2.8¨	2.7¨	2.6	2.7
Wave 1, PY3 Joiners	2.2	2.3	2.2	2.3	2.3	2.3	2.4¨	2.4¨	2.3	2.4
Wave 1, PY4 Joiners	2.5	2.7	2.5	2.7	2.6	2.8	2.7	3.0¨	2.7	3.0
Wave 2, PY1 Joiners	2.4	2.4	2.5	2.5	2.5	2.6¨	2.6¨	2.6¨	2.5	2.6
Wave 2, PY2 Joiners	2.4	2.4	2.4	2.5	2.6	2.7	2.5¨	2.5¨	2.5	2.5
Wave 2, PY3 Joiners	2.5	2.7	2.6	2.8	2.6	2.8	2.8	2.8¨	2.7	2.8

Mean Number of Hospitals that Account for at least 75% of Admissions for ESCO Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	6.7	7.0	7.2	7.3	7.5¨	7.5¨	7.4¨	7.3¨	7.1	7.4
Wave 1, PY2 Joiners	6.9	6.6	6.9	7.1	6.8	7.4¨	7.0¨	7.2¨	6.9	7.2
Wave 1, PY3 Joiners	4.6	4.8	5.1	4.9	5.0	5.0	5.4¨	5.8¨	4.9	5.6
Wave 1, PY4 Joiners	4.7	5.4	5.5	5.1	5.6	5.2	5.0	6.0¨	5.2	6.0
Wave 2, PY1 Joiners	5.2	5.4	5.4	5.7	5.7	5.7¨	5.8¨	5.7¨	5.5	5.7
Wave 2, PY2 Joiners	5.2	5.3	5.4	5.6	5.4	5.3	5.7¨	5.8¨	5.4	5.7
Wave 2, PY3 Joiners	4.4	4.4	4.5	4.6	4.5	4.5	4.4	5.0¨	4.5	5.0

Mean Number of Hospitals that Account for at least 75% of Admissions for Comparison Facilities										
	2012	2013	2014	2015	2016	2017	2018	2019	Before Intervention	After Intervention
Wave 1, PY1 Joiners	4.6	4.8	5.1	5.1	5.2¨	5.0¨	4.9¨	5.0¨	4.9	5.0
Wave 1, PY2 Joiners	4.5	4.6	4.8	5.1	4.8	4.6¨	4.9¨	4.8¨	4.8	4.8
Wave 1, PY3 Joiners	3.9	4.2	3.9	4.2	4.3	4.1	4.0¨	3.9¨	4.1	4.0
Wave 1, PY4 Joiners	4.0	4.4	4.6	4.6	4.9	4.7	4.6	5.1¨	4.5	5.1
Wave 2, PY1 Joiners	4.4	4.3	4.3	4.4	4.5	4.4¨	4.5¨	4.5¨	4.4	4.5
Wave 2, PY2 Joiners	4.0	4.1	4.3	4.4	4.5	4.5	4.4¨	4.3¨	4.3	4.3
Wave 2, PY3 Joiners	4.3	4.7	4.8	5.0	4.6	4.8	4.7	4.8¨	4.7	4.8

Note: Post-CEC intervention cells are marked (¨).

C. Statistical Model

We used a Poisson regression model adjusted for covariates expected to be associated with the number of hospitals per dialysis facility. This aligns with the DiD (difference in differences) approach to understand how CEC intervention affects the number of hospitals used for admissions per facility after adjusting for hospital concentration prior to the CEC intervention. Poisson regression models were used since our main outcome was the number of hospitals per facility per year. For facilities that joined CEC in PY1, the pre-intervention (time=0) period was years 2014 and 2015; the intervention period (time=1) included years 2016 through 2019. Because these analyses are based on the patient-year, for PY1 joiners, the last three months for 2015 were classified as the pre-intervention period. It is misclassifying three months for one sub-wave which is unlikely to

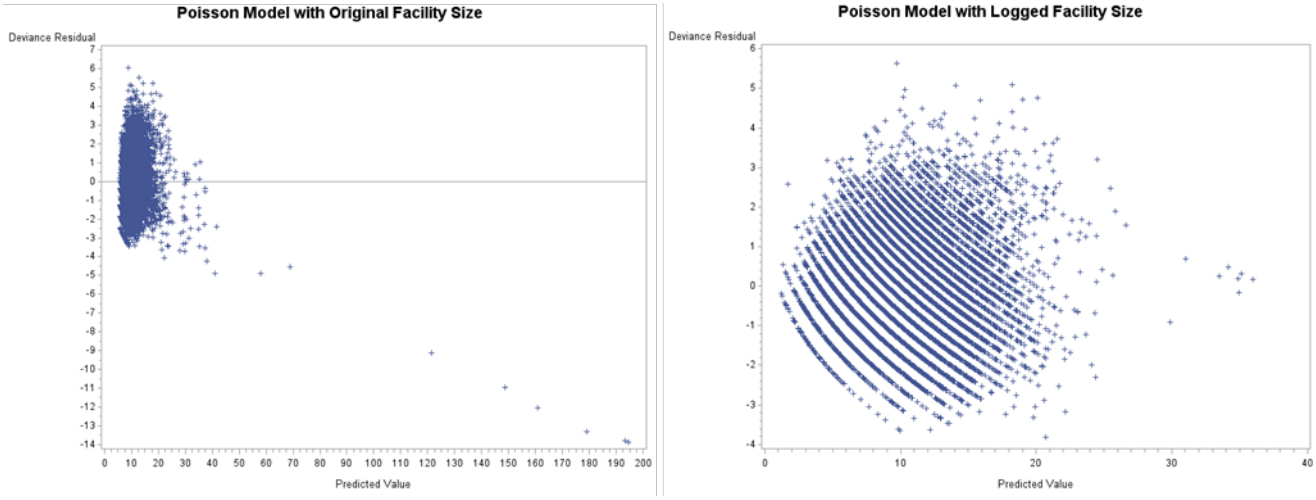
have an impact. It is especially important to use full year when identifying post-intervention because we have treatment patterns are based the year.

For facilities that joined in PY2, the pre-intervention period (time=0) included years 2014, 2015, and 2016; the intervention period (time=1) for PY2 included years 2017 through 2019. For PY3, the pre-intervention period (time=0) included years 2014 through 2017; the intervention period (time=1) were years 2018 and 2019. For facilities that joined CEC in PY4, the pre-intervention period (time=0) included years 2014 through 2018; the intervention period (time=1) was in 2019. The covariates in the model included ESCO (ESCO facilities vs control facilities), Time (pre vs post intervention), facility size (annual count of aligned patients for each facility), facility location (urban vs rural) and year. Also included in the model is an interaction term between ESCO and Time, which will help implement the DiD approach that relies on comparing pre-post differences between the intervention and comparison groups. After conducting model diagnostics, our final model included the logarithm of facility size as a covariate instead of using the annual count.

D. Model Diagnostics

During model diagnostics, we found a few outliers for facility size. To reduce the impact of the facility size outliers, we then tested the model using the logged facility size. The deviance residual plot with original facility size (**Exhibit L-6**) revealed that residuals were not dispersed around zero and therefore not the optimal model approach. With the logged facility size in the model, the residual plots show improved dispersion around zero.

Exhibit L-6: Deviance Residual Plots for Poisson Models with Facility and Logged Facility Size



E. Results

On average, larger facilities and urban facilities have a higher number of hospitals per facility. Summarized, in **Exhibit L-7,** we found that, prior to the CEC intervention period (time=0), ESCO facilities were expected to have 19.5% more hospitals per facility than the comparison facilities. After the CEC intervention, this difference increased based on the interaction between ESCO and Intervention. Specifically, ESCO facilities were expected to have 24.9% more hospitals used for admissions than the comparison group facilities. Therefore, the CEC intervention was associated

with a 4.5% significant increase in the number of hospitals per facility, even after adjusting for a higher number of hospitals per facility among ESCO facilities before the intervention.

Exhibit L-7. Results of the Poisson Regression on the Number of Hospitals Used for Admissions per Dialysis Facility per Year (N=16,498)

Covariates	Estimate	Rate Ratio	Standard	P value
Intercept	0.16	1.2	0.02	<.0001
Log Facility Size	0.49	1.6	0.005	<.0001
Urban	0.09	1.1	0.009	<.0001
CEC	0.18	1.2	0.007	<.0001
Time (Post Treatment Period=1)	0.06	1.1	0.01	<.0001
CEC x Time	0.04	1.0	0.01	0.00
2013	0.02	1.0	0.01	0.06
2014	0.03	1.0	0.01	0.01
2015	0.05	1.1	0.01	<.0001
2016	0.04	1.0	0.01	0.003
2017	0.0003	1.0	0.01	0.98
2018	-0.007	0.99	0.02	0.65
2019	-0.004	1.0	0.02	0.80

Notes: For the calendar year variable 2012 is the reference category (rate ratio=1.0). The rate ratio is the exponential of the estimated coefficient.

Appendix M: Skipped Treatment Analysis

A. Data Preparation

This analysis is intended to address how CEC impacts patients' treatment skipping and rescheduling, in comparison to the control group. For this purpose, outpatient claims from 2014-2019 were used to identify dialysis treatment dates for in-center HD beneficiaries. Ultrafiltration sessions were counted as treatments. Each year's claims file was merged with the annual research file from the corresponding year to identify beneficiaries aligned to the CEC or the comparison group. Same day claims, records with treatment dates after the verified death date, before the first dialysis treatment date, or outside of alignment were eliminated. In order to avoid issues with Medicare eligibility and establishing a regular treatment schedule, the first 90 days following a beneficiary's first dialysis treatment were excluded from analysis. The weeks containing December 25th and January 1st were also excluded for each year due to disruptions in treatment schedules caused by the holiday period. The DiD files were merged with these data to include beneficiary characteristics and match status. In years 2014 through 2017, matched dialysis facilities equaled 1037 for both CEC and comparison groups. In 2018, facility count equaled 1036 for CEC and 1037 for comparison group. In 2019, facility count equaled 1020 for CEC and 1037 for comparison group.

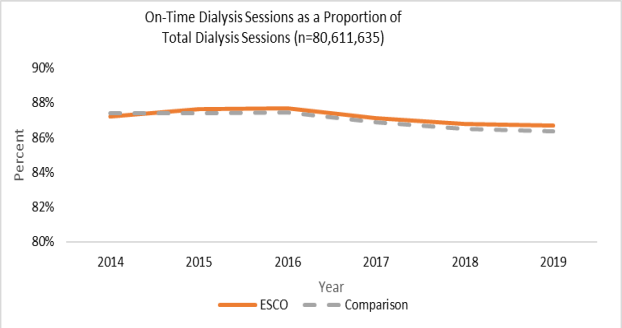
To more clearly demonstrate the effect of CEC, we focus our analysis on beneficiaries who are scheduled to receive dialysis thrice per week, as this treatment protocol is used for most in-center HD patients and therefore may represent characteristics of the general dialysis patient population. Beneficiary data in matched facilities are included for the study year if weekly session patterns reveal the beneficiary dialyzes thrice a week for more than 1/3 of the weeks during that year. For beneficiaries new to dialysis, once past the first 90 days following the first dialysis session, they are included in analysis if they receive dialysis thrice per week in more than half of the subsequent 26 weeks.

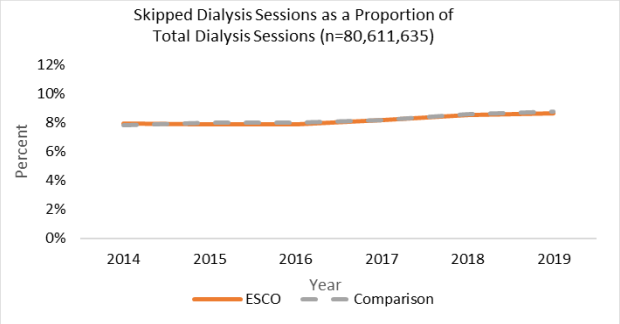
Using this method, approximately 99% of the beneficiaries are included. Indicators were created for on-time, skipped, and rescheduled treatments by week. The indicator was based on the gaps between each treatment and the day of the week for any given week. Treatments that were missed due to hospitalizations and emergency department use were not treated as a skipped treatment. If a thrice weekly beneficiary missed an expected day for dialysis, a rescheduled session was identified if dialysis had been received the day following a skipped session. For a Friday or Saturday skipped treatment, dialysis received on the first or second subsequent day following the skip was considered a rescheduled session. Dialysis sessions were summarized to create variables for the total number of dialysis sessions, on-time dialysis sessions, skipped dialysis sessions, and rescheduled dialysis sessions at the patient-year level.

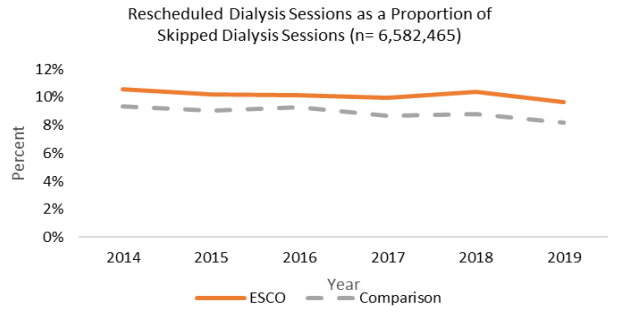
B. Descriptive Results

Below are the plots (**Exhibit M-1**) of the on-time dialysis sessions and skipped dialysis sessions as a proportion of the total dialysis sessions. The plot of rescheduled dialysis sessions as a proportion of skipped sessions shows variability in both magnitude and trend over the study years; overall CEC facilities have a rate of rescheduled dialysis sessions equal to 10% while the comparison group rate equals 9%.

Exhibit M-1. Dialysis Sessions Plots for Skipped Treatment Analyses







C. Statistical Model

To adjust for the differences between CEC and control facilities at the baseline when evaluating the CEC impact on on-time rate, skipped treatment rate and reschedule rate, we adopt a Difference in Difference (DiD) model, which includes alignment to CEC facilities (CEC=1 for CEC, and 0 for control), an indicator for before and after the intervention starts (time=0 before the intervention or baseline, and 1 after the intervention) and the interaction between "CEC" and "time." In the model, the coefficient of "CEC" corresponds to the difference between CEC and control facilities at the baseline (time=0), and the coefficient of "time" corresponds to the difference before and after intervention for the control facilities (see the discussion below) and characterizes the time impact even without intervention. In addition, the coefficient of the interaction between "CEC" and "time" is the difference (or ratio when the outcome is linked to predictors via a log function) between the difference (or ratio) before and after intervention for the CEC facilities and the difference (or ratio) before and after intervention for the control facilities. Therefore, the interaction term is our major interest in the DiD model.

More specifically, the "time" indicator is defined based on PY when facilities were aligned or joined CEC. For example, for facilities that joined CEC in PY1, the pre-intervention period was years 2014-2015. Therefore, we assigned time=0 for years 2014-2015 for these facilities, and also for the control facilities that were matched with these CEC facilities. Moreover, as the intervention for these CEC facilities started at year 2016, we assigned time=1 for year 2016 and afterwards (e.g. 2016-2019) for the CEC facilities as well as the control facilities that were matched with them.

Similarly, for facilities that joined in PY2, the pre-intervention period (time=0) included years 2014-2016, and the intervention period (time=1) included years 2017-2019. For PY3, the pre-

intervention period (time=0) included years 2014-2017, while the intervention period (time=1) were years 2018 and 2019. For facilities that joined CEC in PY4, the pre-intervention period (time=0) included years 2014-2018, and the intervention period (time=1) was 2019.

Additional covariates included in the model were year indicators (with reference year of 2014), and beneficiary characteristics: original reason for Medicare entitlement, annual cancer indicator, months on dialysis, age, cause ESRD, sex, BMI, race, percentage of months with dual full enrollment and percentage of months dual partial enrollment, annual patient count at the facility, and percentage of dialysis sessions in the year that happened while the patient was in a nursing home. The basic descriptive results are shown in **Exhibit M-2**.

Exhibit M-2. Summary Statistics for Variables used in the Model

Characteristic (N=622,580)	CEC Mean/Percentage (N=341,939; 55%)	Comparison Mean/Percentage (N=280,641; 45%)
Age	63.5 (14.3)	63.8 (14.4)
Female	44%	45%
Race		
Black	45%	42%
White	40%	45%
Other	14%	13%
Original Reason for Medicare Entitlement		
Age	31%	31%
Disability	22%	22%
ESRD	25%	25%
Disability and ESRD	21%	22%
Months on Dialysis	59.3 (60.9)	58.5 (61.9)
UM Body Mass Index (w/Imputed)	30.3 (8.4)	30.3 (8.4)
Cancer Indicator	7%	7%
ESRD Cause: Diabetes	45%	46%
ESRD Cause: Hypertension	33%	32%
ESRD Cause: Other	22%	23%
Percent of Months in Year with Full Dual Medicare/Medicaid Eligibility	0.36 (0.46)	0.36 (0.46)
Percent of Months in Year with Partial Dual Medicare/Medicaid Eligibility	0.11 (0.30)	0.12 (0.31)
Annual Facility Patient Count	82.7 (48.9)	68.6 (38.9)
Percent of Annual Dialysis Sessions while in Nursing Home	0.09 (0.24)	0.10 (0.26)

Notes: Standard deviation are reported in parenthesis but are not reported for 0/1 indicators.

We fit models separately for the outcomes of on-time sessions, skipped treatment and rescheduled treatments. We use on-time sessions to exemplify our modeling, and highlight the differences when modeling skipped treatment and rescheduled treatments.

With the number of on-time sessions as the outcome, we fit a Poisson regression model

$$log(on-time_{ij}) = log(total\ session_{ij}) + \alpha + \beta_a CEC_{ij} + \beta_t time_{ij} + \beta_{did} CEC_{ij} * time_{ij} + \beta^T Z_{ij}$$

where $ontime_{ij}$ is the number of on-time sessions for patient *i* in year *j*, β_{did} is the differential change in outcomes for CEC beneficiaries relative to the comparison group, and β^T is the regression coefficient for additional covariates. Here, $log(totalsession_{ij})$ is the offset term with the total number of sessions for each patient. We use the same offset when the outcome is number of skipped treatments. When the outcome is number of rescheduled treatment, we use the log of the total number of skipped sessions as the offset variable.

We fit a Poisson regression using the GEE approach to account for correlations of repeated measurements within beneficiary and ESCO. Results are shown in **Exhibits M-3, M-4 and M-5**. Note that our specified Poisson model is equal to

$$log\left(\frac{on-time_{ij}}{totalsession_{ij}}\right) = \alpha + \beta_a CEC_{ij} + \beta_t time_{ij} + \beta_{did} CEC_{ij} * time_{ij} + \beta^T Z_{ij}$$

This model directly regresses the on-time session rate, in lieu of counts, on covariates, and is more interpretable. In the following, we interpret the coefficients in the context of this model.

As shown in **Exhibits M-3, M-4 and M-5**, CEC increases the on-time session rate slightly by 0.3% (RR=1.003, p=0.001) but has no impact (RR=0.995, p=0.618) on skipped session rate, compared to the control group. However, CEC does help reschedule missed treatments. In comparison with the control group, CEC increases the reschedule session rate by 8.2% (RR=1.082, p<0.001). Therefore, the pattern of findings is consistent with the qualitative reports from ESCOs about their efforts to improve treatment adherence and promptly reschedule missed treatments, though the empirical magnitudes of the effects were small.

Exhibit M-3. Results for On-time Session Rate

On-Time Sessions N=622,580	Estimate	Rate Ratio	SE	p-value
Intercept	-0.280	0.756	0.003	<.0001
CEC	0.001	1.001	0.001	0.127
Time (Post Treatment Period=1)	0.003	1.003	0.001	0.010
*CEC * Time*	0.003	1.003	0.001	0.001
2015	0.002	1.002	0.001	0.001
2016	0.001	1.001	0.001	0.316
2017	-0.008	0.992	0.001	<.0001
2018	-0.014	0.986	0.001	<.0001
2019	-0.017	0.983	0.001	<.0001
OREC: Old Age and Survivor's Insurance	-0.008	0.992	0.001	<.0001
OREC: Disability Insurance Benefits	-0.020	0.981	0.001	<.0001
OREC: End-Stage Renal Disease (ESRD)	-0.004	0.996	0.001	0.001
Cancer Indicator	-0.020	0.980	0.001	<.0001

On-Time Sessions N=622,580	Estimate	Rate Ratio	SE	p-value
Months on Dialysis	0.000	1.000	0.000	<.0001
Age	0.002	1.002	0.000	<.0001
ESRD Cause = Diabetes	0.003	1.003	0.001	0.001
ESRD Cause = Hypertension	0.001	1.001	0.001	0.465
Female	-0.017	0.983	0.001	<.0001
BMI	0.000	1.000	0.000	<.0001
Black	0.004	1.004	0.001	<.0001
Other Non-white	0.034	1.035	0.001	<.0001
Percent of Months in Year with Full Dual Medicare/Medicaid Eligibility	-0.019	0.981	0.001	<.0001
Percent of Months in Year with Partial Dual Medicare/Medicaid Eligibility	-0.010	0.990	0.001	<.0001
Annual Facility Patient Count	-0.0001	1.000	0.000	<.0001
Percent of Annual Dialysis Sessions while in Nursing Home	-0.017	0.983	0.001	<.0001

Notes: For the race variable, White is the reference category; For the original reason for Medicare Entitlement variable, "Both Disability and ESRD" is the reference category; For the calendar year variable, 2014 is the reference year; For the ESRD cause variable, Other is the reference category. The rate ratio is the exponential of the estimated coefficient.

Exhibit M-4. Results for the Skipped Session Rate

Skipped Sessions N=622,580	Estimate	Rate Ratio	SE	p-value
Intercept	-1.373	0.253	0.028	<.0001
CEC	-0.013	0.987	0.009	0.149
Time (Post Treatment Period=1)	-0.037	0.964	0.011	0.001
*CEC * Time*	-0.005	0.995	0.011	0.618
2015	0.024	1.024	0.005	<.0001
2016	0.029	1.030	0.007	<.0001
2017	0.077	1.080	0.010	<.0001
2018	0.139	1.149	0.012	<.0001
2019	0.167	1.182	0.013	<.0001
OREC: Old Age and Survivor's Insurance	-0.043	0.958	0.015	0.004
OREC: Disability Insurance Benefits	0.059	1.061	0.012	<.0001
OREC: End-Stage Renal Disease (ESRD)	0.030	1.030	0.011	0.009
Cancer Indicator	-0.008	0.992	0.014	0.565
Months on Dialysis	-0.003	0.997	0.000	<.0001
Age	-0.015	0.985	0.000	<.0001
ESRD Cause = Diabetes	-0.115	0.891	0.010	<.0001
ESRD Cause = Hypertension	0.014	1.014	0.011	0.224
Female	0.091	1.095	0.008	<.0001
BMI	-0.003	0.997	0.001	<.0001
Black	0.012	1.012	0.009	0.175
Other Non-white	-0.284	0.753	0.013	<.0001

Skipped Sessions N=622,580	Estimate	Rate Ratio	SE	p-value
Percent of Months in Year with Full Dual Medicare/Medicaid Eligibility	0.191	1.210	0.009	<.0001
Percent of Months in Year with Partial Dual Medicare/Medicaid Eligibility	0.150	1.162	0.012	<.0001
Annual Facility Patient Count	0.0004	1.000	0.000	<.0001
Percent of Annual Dialysis Sessions while in Nursing Home	-0.525	0.592	0.015	<.0001

Notes: See the footnote for **Exhibit M-3.**

Exhibit M-5. Results for Rescheduled Session Rate (as a Proportion of Skipped Sessions)

Rescheduled Sessions N=513,345	Estimate	Rate Ratio	SE	p-value
Intercept	-2.358	0.095	0.050	<.0001
CEC	0.081	1.084	0.016	<.0001
Time (Post Treatment Period=1)	-0.005	0.995	0.019	0.807
*CEC * Time*	0.079	1.082	0.018	<.0001
2015	-0.036	0.965	0.009	<.0001
2016	-0.039	0.962	0.012	0.001
2017	-0.087	0.917	0.016	<.0001
2018	-0.060	0.941	0.020	0.002
2019	-0.135	0.873	0.021	<.0001
OREC: Old Age and Survivor's Insurance	-0.031	0.970	0.026	0.224
OREC: Disability Insurance Benefits	-0.128	0.880	0.021	<.0001
OREC: End-Stage Renal Disease (ESRD)	-0.037	0.964	0.020	0.069
Cancer Indicator	0.049	1.051	0.023	0.030
Months on Dialysis	0.003	1.003	0.000	<.0001
Age	-0.008	0.992	0.001	<.0001
ESRD Cause = Diabetes	0.029	1.030	0.019	0.119
ESRD Cause = Hypertension	-0.093	0.911	0.020	<.0001
Female	-0.039	0.962	0.014	0.004
BMI	0.015	1.015	0.001	<.0001
Black	-0.001	0.999	0.015	0.947
Other Non-white	0.079	1.082	0.021	0.000
Percent of Months in Year with Full Dual Medicare/Medicaid Eligibility	-0.395	0.673	0.016	<.0001
Percent of Months in Year with Partial Dual Medicare/Medicaid Eligibility	-0.237	0.789	0.023	<.0001
Annual Facility Patient Count	0.001	1.001	0.000	<.0001
Percent of Annual Dialysis Sessions while in Nursing Home	0.378	1.459	0.024	<.0001

Notes: See the footnote for **Exhibit M-3.**