LEWINGROUP®

CMS Bundled Payments for Care Improvement Advanced Model: Third Evaluation Report – Appendices

Final

Prepared for:

CMS

Submitted by:

The Lewin Group, Inc. with our partners Abt Associates, GDIT, and Telligen

February 2022

CMS Bundled Payments for Care Improvement Advanced Model: Third Evaluation Report – Appendices

The Lewin Group

With our partners Abt Associates, GDIT, and Telligen

Authors:

Julie Somers, Aylin Bradley, Kelsey Bacon, Sarah Bergman, Shannon Bicott, Reed Cammarota, Rahul Chander, Elizabeth Chung, Timothy Collins, Laura Dummit, Gina Gerding, Olivia Hayden, Raina Kelly, Grecia Marrufo, Ian Morrall, Maya Nilkant, Lorissa Pagan, Patrick Roehm, Isabella Swanson, Megan Tebbenhoff, Amanda Tripp, Andrea Hassol, Catherine Hersey, Caroline Kupersmith, Caroline Logan, Kelly Necastro, Sharmini Radakrishnan, Matt Trombley, Becky Blystone, Christine LaRocca, Laura Birmingham, Maria Joseph-King, Colleen Kummet

Lewin's address:

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

Federal Project Officer:

Daver Kahvecioglu
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)

This project was funded by the Centers for Medicare & Medicaid Services under contract no. HHSM-500-2014-000331 Task Order 75FCMC18F0089.

The statements contained in this report are solely those of the authors and do not necessarily reflect the views or policies of the Centers for Medicare & Medicaid Services. The Lewin Group assumes responsibility for the accuracy and completeness of the information contained in this report.

List of Appendices

Appendix A: Glossary of Terms and Acronyms List A-1

Appendix B: BPCI Advanced Clinical Episode and Clinical Episode Service Line Group Definitions B-1

Appendix C: Methods..... C-1

Appendix D: Comparison Group Standardized Differences Tables D-1

Appendix E: Tables of Impact Estimate Results.....E-1

Appendix F: Tables of Parallel Trends Tests Results F-1

Appendix G: Tables of Impact Estimate Sensitivity Results G-1

Appendix H: Supplemental Medicare Program Savings Results H-1

Appendix I: Supplemental COVID-19 Descriptive Results I-1

Appendix A: Glossary of Terms and Acronyms List

Exhibit A.1: Glossary of Terms

Name	Definition
90-day Post-Discharge Period (PDP)	The 90 days following discharge from the anchor stay or procedure.
Advanced Alternative Payment Model (APM)	A component of the Quality Payment Program (QPP) in which eligible clinicians may be excluded from Merit-based Incentive Payment System (MIPS) reporting requirements and payment adjustments and receive a 5% bonus incentive for achieving threshold levels of patient volumes or payment amounts. To be an Advanced APM, the model must meet these three criteria: • Requires participants to use certified EHR technology • Provides payment for covered professional services based on quality measures comparable to those used in the MIPS Quality performance category • Either (1) is a Medical Home Model expanded under CMS Innovation Center authority OR (2) requires participants to bear a significant financial risk
Anchor Procedure	The hospital outpatient procedure that triggers the start of an outpatient episode.
Anchor Stay	The hospital inpatient stay that triggers the start of an inpatient episode.
Applicant	An organization that completed and submitted a BPCI Advanced application to the Centers for Medicare & Medicaid Services (CMS).
BPCI Advanced Counterfactual	Represents what payments would have been absent the BPCI Advanced model. Calculated as the average BPCI Advanced baseline amount plus the average change for the comparison group from baseline to intervention. Used as the denominator to present results for net savings to Medicare as a percentage.
BPCI Advanced Database	A database where CMS stores secure, frequently updated data about BPCI Advanced participants and episodes, from which the evaluation team can process various reports at any time.
Clinical Episode (CE)	For Model Years 1 and 2, one of the 32 clinical episodes (CEs) and for Model Year 3, one of the 34 CEs identified by a specific Healthcare Common Procedure Coding System (HCPCS) code or Medicare Severity Diagnosis Related Group (MS-DRG) that begins with an anchor stay or anchor procedure and extends for 90 days post-discharge or procedure.
Clinical Episode Service Line Group (CESLG)	In Model Year 4, the CEs will be grouped into eight clinically related groups. Participants will be required to select clinical episode service line groups (CESLGs) instead of one or more CEs. Participants will not be required to participate in CEs within a CESLG that do not meet the minimum volume threshold during the baseline period.
Composite Quality Score (CQS)	An aggregate quality score determined by calculating a score for each quality measure at the CE level. Scores are scaled across the CEs attributed to a specific EI and weighted based on CE volume. The CQS is used to adjust positive or negative total reconciliation amounts.
Convener Participant	A type of participant that brings together at least one downstream EI to participate in BPCI Advanced, facilitate coordination among them, and bear and apportion financial risk. A convener participant may or may not be a Medicare provider or initiate episodes.
Downstream Episode Initiator (EI)	Hospitals or physician group practice (PGPs) that are associated with a convener participant and initiate episodes. Downstream EIs do not bear financial risk directly with CMS.
Episode Initiator (EI)	The hospital or PGP participating in the model as a participant or a downstream EI that can trigger episodes.
Episode	An episode is the anchor stay or procedure plus the 90-day post-discharge or post-procedure period.

Name	Definition
Financial Arrangements	An arrangement entered between the participant and Net Payment Reconciliation Amount (NPRA) sharing partner or between a PGP NPRA sharing partner and a NPRA sharing group practice practitioner for purposes of sharing NPRA with organizations or individuals or for the contribution of shared repayment amounts or internal cost savings.
First Cohort	Participants and EIs that began participation in the model on October 1, 2018 and remained in the model past the retroactive withdrawal period.
Target Price Baseline Period	The period of time referenced for calculation of historical payments used for target prices. For Model Years 1 and 2, the baseline period spans 4 years from January 1, 2013 through December 31, 2016. For Model Year 3, the baseline period spans 4 years from October 1, 2014 through September 30, 2018.
Impact Analysis Baseline Period	The period of time used prior to the BPCI Advanced intervention period used in the impact analyses. The baseline period spans nearly five years from April 1, 2013 to December 31, 2017.
Net Payment Reconciliation Amount (NPRA)	The amount paid to a participant when aggregate Medicare allowed amounts for CEs which the participant has selected, including an adjustment from the CQS, are lower than the target price for such CEs.
Non-convener Participant	An individual hospital or PGP that assumes financial risk for CEs. Non-convener participants are also EIs.
NPRA Sharing Arrangement	An arrangement between a participant and an NPRA sharing partner that outlines, in writing, the terms of sharing NPRA, the contribution of internal cost savings to the BPCI Advanced savings pool, and the apportionment to the NPRA sharing partner of any repayment amount owed by the participant.
Post-acute care (PAC)	All care services received by the beneficiary after discharge from the qualifying hospital stay or procedure. Includes care from the PAC provider (SNF, IRF, LTCH, HHA), as well as any potential inpatient hospitalization (readmissions), professional services, or outpatient care.
Performance Period	A defined period during which episodes may initiate and all Medicare FFS payments aggregated for a specific episode are attributed to a participant. The performance periods are used to determine reconciliation for episodes. Apart from the first performance period, performance periods will run from January 1 through June 30 and July 1 through December 31. The BPCI Advanced Model includes 10 performance periods, running through December 31, 2023.
Risk Adjustment	Risk adjustment controls for observable beneficiary indicators that may also impact the outcome of interest. Without adequate risk adjustment, providers with a sicker or more service intensive patient mix would likely have worse outcomes and providers with healthier patients would likely have better outcomes even if nothing else differed. All measures were risk adjusted for demographic factors, prior health conditions based on Hierarchical Chronic Conditions (HCC) indicators, measures of prior care use, and provider characteristics.
Reconciliation	The semi-annual process where CMS compares the aggregate Medicare FFS allowed amounts for all items and services included in episodes attributed to a participant, against the target price for those episodes to determine whether the participant is eligible to receive a NPRA payment from CMS or is required to pay a repayment amount to CMS.
Retroactive Withdrawal	A one-time opportunity for participants to withdraw some or all of their EIs or CEs without being held financially accountable for episodes initiated between October 1, 2018 and March 1, 2019.
Second Cohort	Participants and EIs that began participation in the model on January 1, 2020.
Target Price	The benchmark price for each EI-CE combination with the CMS discount applied.

Exhibit A.2: Acronym List

Acronym	Definition
AMI	Acute myocardial infarction
APM	Alternative Payment Model
BPCI	Bundled Payments for Care Improvement
CABG	Coronary artery bypass graft
CE	Clinical episode
CESLG	Clinical episode service line group
CHF	Congestive heart failure
CMMI	Center for Medicare & Medicaid Innovation
CMS	Centers for Medicare & Medicaid Services
COPD	Chronic obstructive pulmonary disease
COVID-19 PHE	Coronavirus Disease 2019 Public Health Emergency
CQS	Composite Quality Score
DiD	Difference-in-differences
DJRLE	Double joint replacement of the lower extremity
EI	Episode initiator
ESRD	End-stage renal disease
FFS	Fee-for-service
GI	Gastrointestinal
HCC	Hierarchical Condition Category
HCPCS	Healthcare Common Procedure Coding System
HH	Home health
IRF	Inpatient rehabilitation facility
LOS	Length of stay
MS-DRG	Medicare Severity Diagnosis Related Group
MJRLE	Major joint replacement of the lower extremity
MJRUE	Major joint replacement of the upper extremity
NPRA	Net Payment Reconciliation Amount
PAC	Post-acute care
PCI	Percutaneous coronary intervention
PGP	Physician group practice
POS	Provider of Service
PP	Percentage point
SNF	Skilled nursing facility
SPRI	Simple pneumonia and respiratory infections
UTI	Urinary tract infection

Appendix B: BPCI Advanced Clinical Episode and Clinical Episode Service Line Group Definitions

Exhibit B.1: BPCI Advanced Clinical Episode Types, Model Years 1, 2, and 3

Clinical Episode Type	Clinical Episode
Medical	• Acute Myocardial Infarction • Cardiac Arrhythmia • Cellulitis • Chronic Obstructive Pulmonary Disease, Bronchitis, Asthma • Congestive Heart Failure • Disorders of Liver Except Malignancy, Cirrhosis or Alcoholic Hepatitis • Gastrointestinal Hemorrhage • Gastrointestinal Obstruction • Inflammatory Bowel Disease* • Renal Failure • Seizures* • Sepsis • Simple Pneumonia and Respiratory Infections • Stroke • Urinary Tract Infection

Surgical	• Back and Neck Except Spinal Fusion (Inpatient)
	• Back and Neck Except Spinal Fusion (Outpatient)
	• Bariatric Surgery*
	• Cardiac Defibrillator (Inpatient)
	• Cardiac Defibrillator (Outpatient)
	• Cardiac Valve
	• Coronary Artery Bypass Graft
	• Double Joint Replacement of the Lower Extremity
	• Endovascular Cardiac Valve Replacement*
	• Fractures of the Femur and Hip or Pelvis
	• Hip and Femur Procedures Except Major Joint
	• Lower Extremity and Humerus Procedures Except Hip, Foot, Femur
	• Major Bowel Procedure
	• Major Joint Replacement of the Lower Extremity**
	• Major Joint Replacement of the Upper Extremity
	• Pacemaker
	• Percutaneous Coronary Intervention (Inpatient)
	• Percutaneous Coronary Intervention (Outpatient)
	• Spinal Fusion*
	  ○ Cervical Spinal Fusion
	  ○ Combined Anterior Posterior Spinal Fusion
	  ○ Spinal Fusion (Non-Cervical)

Note: * Bariatric surgery, endovascular cardiac valve replacement, inflammatory bowel disease, seizures, and spinal fusion clinical episodes were new for Model Year 3. The spinal fusion episode combines and replaces three clinical episodes, cervical spinal fusion, combined anterior posterior spinal fusion, and spinal fusion (non-cervical), which were separate CEs in Model Years 1 and 2.
** Beginning in Model Year 3, major joint replacement of the lower extremity is a multi-setting clinical episode that can be triggered with either an inpatient or outpatient procedure.

Exhibit B.2: BPCI Advanced Inpatient Clinical Episodes and Medicare Severity Diagnosis Related Groups (MS-DRGs), Model Year 4

Clinical Episode	MS-DRGs Trigger Codes							
	1	2	3	4	5	6	7	8
Acute Myocardial Infarction	280	281	282					
Back and Neck Except Spinal Fusion	518	519	520					
Bariatric Surgery*	619	620	621					
Cardiac Arrhythmia	308	309	310					
Cardiac Defibrillator	222	223	224	225	226	227		
Cardiac Valve	216	217	218	219	220	221		
Cellulitis	602	603						
Chronic Obstructive Pulmonary Disease, Bronchitis, Asthma	190	191	192	202	203			
Congestive Heart Failure	291	292	293					
Coronary Artery Bypass Graft	231	232	233	234	235	236		
Disorders of Liver Except Malignancy, Cirrhosis or Alcoholic Hepatitis	441	442	443					
Double Joint Replacement of the Lower Extremity	461	462						
Endovascular Cardiac Valve Replacement*	266	267						
Fractures of the Femur and Hip or Pelvis	533	534	535	536				
Gastrointestinal Hemorrhage	377	378	379					
Gastrointestinal Obstruction	388	389	390					
Hip and Femur Procedures Except Major Joint	480	481	482					
Inflammatory Bowel Disease*	385	386	387					
Lower Extremity and Humerus Procedure Except Hip, Foot, Femur	492	493	494					
Major Bowel Procedure	329	330	331					
Major Joint Replacement of the Lower Extremity**	469	470	521	522				
Major Joint Replacement of the Upper Extremity	483							
Pacemaker	242	243	244					
Percutaneous Coronary Intervention	246	247	248	249	250	251		
Renal Failure	682	683	684					
Seizures*	100	101						
Sepsis	870	871	872					
Simple Pneumonia and Respiratory Infections	177	178	179	193	194	195		
Spinal Fusion*	453	454	455	459	460	471	472	473
Stroke	061	062	063	064	065	066		
Urinary Tract Infection	689	690						

Note: * Bariatric surgery, endovascular cardiac valve replacement, inflammatory bowel disease, seizures, and spinal fusion CEs were new for Model Year 3. The spinal fusion episode combines and replaces three CEs - cervical spinal fusion, combined anterior posterior spinal fusion, and spinal fusion (non-cervical), which were separate CEs in Model Years 1 and 2. Additionally, endovascular cardiac valve replacement episodes are triggered by the corresponding MS-DRG codes and at least one procedure code from Exhibit B.3. ** Beginning in Model Year 3, major joint replacement of the lower extremity is a multi-setting CE that can be triggered with either an inpatient or outpatient procedure. DRGs 521 and 522 became active October 1, 2020. For a list of trigger Healthcare Common Procedure Coding System (HCPCS) Codes, see Exhibit B.2.

Source: Centers for Medicare & Medicaid Services (2020, October). BPCI Advanced. Retrieved from https://innovation.cms.gov/media/document/bpci-advanced-clinical-episodes-quality-measures-correlation-table-my4.

Exhibit B.3: BPCI Advanced Outpatient Clinical Episodes and Healthcare Common Procedure Coding System (HCPCS) Codes, Model Year 4

Clinical Episode	HCPCS Trigger Codes												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Back and Neck Except Spinal Fusion	62287	63005	63011	63012	63017	63030	63040	63042	63045	63046	63047	63056	63075
Cardiac Defibrillator	33249	33262	33263	33264	33270								
Percutaneous Coronary Intervention	92920	92924	92928	92933	92937	92943	C9600	C9602	C9604	C9607			
Major Joint Replacement of the Lower Extremity**	27447												

Note: ** Beginning in Model Year 3, major joint replacement of the lower extremity is a multi-setting episode that can be triggered with either an inpatient or outpatient procedure. For a list of trigger Medicare Severity Diagnosis Related Groups (MS-DRGs), see Exhibit B.1.

Source: Centers for Medicare & Medicaid Services (2020, October). BPCI Advanced. Retrieved from https://innovation.cms.gov/media/document/bpci-advanced-clinical-episodes-quality-measures-correlation-table-my4.

Exhibit B.4: Procedure Codes for Endovascular Cardiac Valve Replacement, Model Year 4

Procedure Code	ICD-9/ICD-10
3505	ICD-9
3506	ICD-9
02RF37H	ICD-10
02RF37Z	ICD-10
02RF38H	ICD-10
02RF38Z	ICD-10
02RF3JH	ICD-10
02RF3JZ	ICD-10
02RF3KH	ICD-10
02RF3KZ	ICD-10
X2RF332	ICD-10

Note: Endovascular cardiac valve replacement episodes are identified by a MS-DRG (see Exhibit B.1) and at least one of these procedure codes.

Source: Centers for Medicare and Medicaid Services (2020, October). BPCI Advanced. Retrieved from https://innovation.cms.gov/media/document/bpci-advanced-clinical-episodes-quality-measures-correlation-table-my4.

Exhibit B.5: BPCI Advanced Clinical Episode Service Line Groups, Model Year 4

Clinical Episode Service Line Group	Clinical Episodes
Cardiac Care	• Acute Myocardial Infarction • Cardiac Arrhythmia • Congestive Heart Failure
Cardiac Procedures	• Cardiac Defibrillator (Inpatient) • Cardiac Defibrillator (Outpatient) • Cardiac Valve • Coronary Artery Bypass Graft • Endovascular Cardiac Valve Replacement • Pacemaker • Percutaneous Coronary Intervention (Inpatient) • Percutaneous Coronary Intervention (Outpatient)
Gastrointestinal Care	• Disorders of Liver Except Malignancy, Cirrhosis, or Alcoholic Hepatitis • Gastrointestinal Hemorrhage • Gastrointestinal Obstruction • Inflammatory Bowel Disease
Gastrointestinal Surgery	• Bariatric Surgery • Major Bowel Procedure
Medical & Critical Care	• Cellulitis • Chronic Obstructive Pulmonary Disease, Bronchitis, Asthma • Renal Failure • Sepsis • Simple Pneumonia and Respiratory Infections • Urinary Tract Infection
Neurological Care	• Seizures • Stroke
Orthopedics	• Double Joint Replacement of the Lower Extremity • Fractures of the Femur and Hip or Pelvis • Hip and Femur Procedures Except Major Joint • Lower Extremity and Humerus Procedure Except Hip, Foot, Femur • Major Joint Replacement of the Lower Extremity (Multi-setting) • Major Joint Replacement of the Upper Extremity
Spinal Procedures	• Back and Neck Except Spinal Fusion (Inpatient) • Back and Neck Except Spinal Fusion (Outpatient) • Spinal Fusion

Source: Centers for Medicare & Medicaid Services (2020, October). BPCI Advanced. Retrieved from https://innovation.cms.gov/media/document/bpci-advanced-clinical-episodes-quality-measures-correlation-table-my4.

Appendix C: Methods

This appendix includes the details on the data and methods used for the analyses included in the Third Evaluation Report.

A. Data Sources

Exhibit C.1 lists the data sources and their uses for this evaluation report. We used provider-level data sources to identify and describe Bundled Payments for Care Improvement Advanced (BPCI Advanced) participating providers and to select comparison providers. We used Medicare claims and enrollment data to construct episodes of care for BPCI Advanced patients and for matched comparison providers. We also used claims to create outcome measures and beneficiary risk factors associated with the outcomes.

Exhibit C.1: Data Sources Used in the BPCI Advanced Evaluation

Data Source	Dataset Name	Date Range	Dataset Contents	Use
Provider-level Secondary Data Sources	Academic Medical Center Indicator Dataset	2013-2017	Dataset from the BPCI Advanced payment reconciliation contract that indicated if the Inpatient Prospective Payment System (IPPS) hospital is an academic medical center.	Used to identify which hospitals are academic medical centers.
	Agency for Healthcare Research and Quality (AHRQ) Hospital Linkage File	2016	Data linking hospitals to health systems.	Used to identify whether a hospital is part of a health system.
	AHRQ Compendium of U.S. Health Systems, Group Practice Linkage File	2018	Data linking physician group practices (PGPs) to health systems.	Used to identify whether a PGP is part of a health system.
	Area Health Resource File (AHRF)	2013-2017	County-level data on population, environment, geography, health care facilities, and health care professionals.	Used to create baseline hospital and PGP characteristics used in the construction of hospital comparison groups and PGP comparison groups.
	Centers for Medicare and Medicaid Services (CMS) BPCI Advanced Database	2018-2020	Information compiled by CMS on BPCI Advanced participants and their clinical episodes (CEs), including participant name, CMS Certification Number (CCN), Taxpayer Identification Number (TIN), location, type (hospital, PGP, other), BPCI Advanced "role," CE(s), BPCI Advanced participation start and end dates, and contact information.	Used to identify participants, hospital episode initiators (EIs), and PGP EIs participating in BPCI Advanced and the CEs in which they are participating. We also used to identify participants that retroactively withdrew or applied but did not become a participant or EI.
	CMS BPCI Advanced Hospital Target Pricing File	2013-2018	The CE-specific Model Years 1 and 2 preliminary target prices, historical payments, and historical volume for all BPCI Advanced-eligible hospitals.	We use the hospital efficiency measure, a component of the target price, as a matching variable in our hospital comparison group construction. We also use an indicator of whether historical hospital volume meets the threshold for target price creation to determine which hospitals were eligible to participate.

Data Source	Dataset Name	Date Range	Dataset Contents	Use
Provider-level Secondary Data Sources, Continued	CMS BPCI Advanced Reconciliation Result Files	2018-2019	Net payment reconciliation amounts (NPRA) and final target prices from the implementation contractor. Contains results for Model Years 1 and 2 Performance Period 1 True-up 2, Performance Period 2 True-up 2, and Performance Period 3 True-up 2.	Used NPRA to calculate Net Medicare Savings due to BPCI Advanced.
	CMS BPCI Database	2013-2018	Information compiled by CMS on BPCI awardees and their CEs, including awardee name, CMS Certification Number (CCN), Tax Identifier Number (TIN), location, type, CE(s), BPCI participation start and end dates, and contact information.	Used to identify hospitals and PGPs that participated in the BPCI Initiative.
	CMS Comprehensive Care for Joint Replacement (CJR) Database	2017, 2018	List of providers that have ever participated in CJR as of 12/1/2017 and list of participants in CJR as of 10/1/2018.	Used to identify hospitals that participated in the CJR Model and to identify PGP episodes at CJR hospitals.
	CMS IPPS Files	2013-2017	Hospital-level file containing provider characteristics such as Medicare days percent, resident-bed ratio, and Disproportionate share hospital (DSH) patient percent.	Used in hospital comparison group construction.
	CMS Provider of Services (POS) File	2013-2017, 2020	Information on Medicare-approved institutional providers, including provider number, size, ownership, location, and staffing.	Used in hospital comparison group construction and for provider locations in the COVID-19 descriptive analyses.
	Dartmouth Atlas Project Crosswalk Files	2015	Crosswalk files from the ZIP code level to the Hospital Service Area (HSA) and the Hospital Referral Region (HRR).	Used to assign a core-based statistical area (CBSA) code to hospitals that are not located within a CBSA code by using the largest CBSA that overlaps the HRR.
	Master Data Management (MDM)	2013-2020	Provider-level information on participation in Center for Medicare and Medicaid Innovation (CMMI) payment demonstration programs.	Used to identify providers who were involved in a Medicare Shared Savings Program (MSSP), Next Generation (Next Gen), or Pioneer Accountable Care Organization (ACO) Model as well as the Comprehensive ESRD Care Model and Vermont ACO Model.

Data Source	Dataset Name	Date Range	Dataset Contents	Use
Provider-level Secondary Data Sources, Continued	Medicare Data on Provider Practice and Specialty (MD-PPAS)	2013-2017	Mapping of Provider Enrollment and Chain/Ownership System (PECOS) codes to six broad physician specialties, other physician, and non-physician categories; mapping of physicians (NPI) billing to practices (TINs)	Used to identify physicians billing through practices, map clinician specialty codes on Medicare claims to broad specialty categories and provide guidance on how to assign a category to physicians that can be assigned to more than one category.
	Medicare Provider Enrollment, Chain, and Ownership System (PECOS)	2013-2017	Information on Medicare providers, including specialty.	Provides clinician specialty codes on Medicare claims which we map to broad specialty categories using MD-PPAS.
Transaction-level Secondary Data Sources	The Master Beneficiary Summary File (MBSF)	2013-2020	Beneficiary and enrollment information, including beneficiary unique identifier, address, date of birth/ death, sex, race/ethnicity, age and Medicare enrollment status.	Used to identify eligibility for episodes of care, beneficiary demographic characteristics, and beneficiary eligibility for inclusion in the denominator for each of the outcome measures.
	Medicare Fee-for-services (FFS) Claims	Jan 2013-Sep 2020	Medicare Part A and B claims.	Used to create all claims-based outcome measures, claims-based matching measures, and prior use risk adjusting covariates. We calculate the number of discharges and procedures by BPCI Advanced, BPCI and non-participating hospitals, BPCI Advanced and BPCI PGPs, and by CBSAs. Also used to identify clinicians, clinician specialties, and hospitals where PGPs had discharges or procedures associated with BPCI Advanced and BPCI PGP EIs. Claims also used to identify confirmed cases of COVID-19.
	Medicare Standardized Payments	2013-2020	Medicare standardized payments for 100% Part A and B claims received via the Integrated Data Repository (IDR) from the implementation contractor.	Used to create Medicare standardized payment amounts (Part A and B) and allowed standardized payment outcomes.
County-level Secondary Data Sources	USA Facts Confirmed COVID-19 Cases	Feb 2020-Jun 2020	Daily cumulative counts of confirmed COVID-19 cases by county.	Used to create measures of COVID-19 incidence by county in the COVID-19 descriptive analyses.
	USA Facts County Populations	2019	Populations by county.	Used to create measures of COVID-19 incidence by county in the COVID-19 descriptive analyses.

B. Quantitative Analysis

1. Impact of BPCI Advanced on Claim-based Outcomes

The evaluation of the model relies on a non-experimental design, which uses a comparison group of non-BPCI Advanced hospitals or physician group practices (PGPs) to infer counterfactual outcomes for hospitals or PGPs participating in BPCI Advanced. In this section, we define the outcomes, study population, methodology for creating comparison groups, methodology for related descriptive analyses, and methodology used to estimate the impact of BPCI Advanced on payments, utilization, and quality.

a. Outcomes

We used data from claims to create payment, utilization of health care services, and quality outcomes, as well as characteristics of the patient mix. The following exhibits define these outcomes and characteristics. Exhibit C.2 provides definitions of each patient characteristic variable used in the patient mix analysis. Exhibits C.3 and C.4 provide detailed information about each outcome measure used in our impact analyses and COVID-19 descriptive analyses, respectively.

Exhibit C.2 Episode Characteristics and Outcome Definitions, Patient Mix Analysis

Variable[a]	Definition
Age 80+ Years	Percent of episodes where the patient was 80 years or older
Count of Hierarchical Condition Category (HCC) Indicators	Average number of HCC comorbidity indicators per patient from diagnostic history during the 6 months prior to the episode start date
Disabled, No ESRD	Percent of episodes where the patient was disabled but did not have ESRD
HCC Score	The HCC score (or index) was constructed using beneficiary demographics and diagnostic history. Each episode was assigned an HCC score based on the beneficiary's diagnosis information during the 6 months prior to the episode start date, using v22 of CMS's 2019 Risk Score software, and 2016 (ICD-9) and 2019 (ICD-10) diagnosis to chronic condition mappings. For example, the HCC score for an episode that started on July 1, 2019 was constructed using diagnoses from January 1, 2019–June 30, 2019 claims.
Medicaid Eligibility	Percent of episodes where the patient was dual eligible
Prior Home Health Use	Percent of episodes where the patient accessed home health services in the 180 days prior to the beginning of the episode
Prior Institutional Post-Acute Care (PAC) Use	Percent of episodes where the patient accessed institutional PAC services in the 180 days prior to the beginning of the episode

Notes: ESRD = End-stage Renal Disease; HCC = Hierarchical Condition Category; ICD = International Statistical Classification of Diseases; PAC = post-acute care setting.

[a] For all variables, the eligible sample was restricted to beneficiaries who: 1) had a complete fee-for-service enrollment history six months prior to the anchor stay or procedure; and 2) had non-missing age and gender data.

Exhibit C.3 Claims-based Outcome Definitions, Impact Analyses

Domain	Outcome Name	Description	Technical Definition	Eligible Sample[a]
Payment	Total Medicare Part A & B Standardized Allowed Payment Amount	Average total Medicare Part A & B standardized allowed amount, during the anchor stay/outpatient procedure + 90-day PDP	The sum of Medicare payment and beneficiary out-of-pocket amounts for all health care services. Payments in the lower/upper ends are winsorized.[b]	Beneficiaries who: 1) maintained FFS Parts A and B enrollment throughout the measurement period; 2) had a measurement period that ended on or before March 29, 2020; 3) had non-zero anchor hospitalization payments and total Part A and Part B payments
	Total Medicare Part A & B Standardized Paid Amount	Average total Part A & B amount paid by Medicare, during the anchor stay/ outpatient procedure + 90-day PDP	The sum of Medicare payments for all health care services, without beneficiary cost sharing. Payments in the lower/upper ends are winsorized.[b]	Same as Standardized Allowed Payment Amount
	Medicare Part A SNF Standardized Allowed Amount	Average Medicare Part A standardized allowed amount, for SNF setting, totaled within the 90-day PDP	The sum of Medicare payment and beneficiary out-of-pocket amounts for Part A health care services provided for SNF during the 90-day PDP.	Same as Standardized Allowed Payment Amount
	Medicare Part A IRF Standardized Allowed Amount	Average Medicare Part A standardized allowed amount, for IRF setting, totaled within the 90-day PDP	The sum of Medicare payment and beneficiary out-of-pocket amounts for Part A health care services provided for IRF during the 90-day PDP.	Same as Standardized Allowed Payment Amount
	Medicare Part A HHA Standardized Allowed Amount	Average Medicare Part A standardized allowed amount, for HHA setting, totaled within the 90-day PDP	The sum of Medicare payment and beneficiary out-of-pocket amounts for Part A health care services provided for HHA during the 90-day PDP.	Same as Standardized Allowed Payment Amount
Utilization	Discharged to Institutional Post-acute Care Setting	The proportion of episodes discharged from the hospital to an institutional PAC setting	The proportion of episodes where the first PAC setting was SNF, LTCH, or IRF. Institutional PAC stays are only counted as a first PAC setting if the beneficiary was admitted to SNF, LTCH, or IRF within 5 days of discharge from the hospital.	Same as Standardized Allowed Payment Amount
	Number of Days in a SNF	Number of SNF days of care during the 90-day PDP	The number of days of SNF care (not necessarily consecutive) during the 90-day PDP.	Beneficiaries who: 1) maintained FFS Parts A and B enrollment throughout the measurement period; 2) had a measurement period that ends on or before March 29, 2020; 3) had non-zero anchor hospitalization payments and total Part A and Part B payments; 4) had at least one SNF day during the 90-day PDP.

Domain	Outcome Name	Description	Technical Definition	Eligible Sample[a]
Quality	Unplanned Readmission Rate	Episodes with one or more unplanned, all-cause readmissions for any condition 90 days after the anchor stay or outpatient procedure	Binary outcome (1= at least one readmission during measurement period; 0= no eligible readmission during measurement period). Eligible readmissions are IPPS claims with an MS-DRG not on the list of excluded MS-DRGs for the given CE.[c]	Beneficiaries who: 1) maintained FFS Parts A and B enrollment throughout the measurement period; 2) had a measurement period that ends on or before March 29, 2020; 3) were discharged from the anchor stay/outpatient procedure in accordance with medical advice.
	All-cause Mortality	Death from any cause during the 90 days after discharge from the anchor hospital stay or outpatient procedure	If date of death occurred during the measurement period, then mortality outcome equals one.	Beneficiaries who: 1) maintained FFS Parts A and B enrollment throughout the measurement period or until death; 2) had not received hospice care in the six months prior to admission; 3) had a measurement period that ends on or before March 29, 2020; 4) were discharged from the anchor stay or outpatient procedure in accordance with medical advice; 5) were alive at the time of anchor hospital stay/outpatient procedure.

Notes: Payment amounts adjust for Medicare payment policies to ensure that any differences across time and providers reflect real differences in resource use rather than Medicare payment policies (e.g., teaching payments or differential payment updates).

FFS = fee for service; HCPCS = Healthcare Common Procedure Coding System; HHA = home health agency; IPPS = inpatient prospective payment system; IRF = inpatient rehabilitation facility; LTCH = long term care hospital; MS-DRG = Medicare Severity Diagnosis Related Group; PAC = post-acute care setting; PDP = post-discharge period; SNF = skilled nursing facility.

[a] For all outcomes, the eligible sample was restricted to beneficiaries who: 1) had a complete FFS enrollment history six months prior to the anchor stay or procedure; and 2) had non-missing age and gender data.

[b] Total payments are winsorized by quarter and MS-DRG/HCPCS code at the 1st and 99th percentiles for total Part A and B episode payments.

[c] The outcome is based on specifications for the National Quality Forum (NQF) all-cause unplanned readmission measure (NQF measure 1789). Planned admissions are excluded based on the Agency for Healthcare Research and Quality (AHRQ) Clinical Classification System Procedure and Diagnoses codes.

Exhibit C.4 Claims-based Outcome Definitions, COVID-19 Descriptive Analyses

Domain	Outcome Name	Description	Technical Definition	Eligible Sample[a]
Payment	Total Medicare Part A and B Standardized Allowed Payment Amount	Average total Medicare Part A and B standardized allowed amount, during the anchor stay/outpatient procedure + 90-day PDP	The sum of Medicare payment and beneficiary out-of-pocket amounts for all health care services. Payments in the lower/upper ends are winsorized.[b]	Beneficiaries who: 1) maintained FFS Parts A and B enrollment throughout the measurement period; 2) had a measurement period that ended on or before September 27, 2020; 3) had non-zero anchor hospitalization payments and total Part A and Part B payments
Utilization	Any Post-Acute Care Use	The proportion of episodes where a beneficiary was discharged into institutional PAC setting or utilized home health within 14 days of discharge	The proportion of episodes where a beneficiary was discharged into a SNF, LTCH, IRF, or HHA within 14 days of discharge.	Same as Standardized Allowed Payment Amount
	Any SNF Use	The proportion of episodes where a beneficiary had at least one day of SNF use during PDP	Binary outcome (1= any SNF use for beneficiary reported during the PDP; 0= no SNF use in PDP).	Same as Standardized Allowed Payment Amount
	Any HH Use	The proportion of episodes where a beneficiary utilized at least one day of HH use during PDP	Binary outcome (1= any HHA use for beneficiary reported during the PDP; 0= no HHA use in PDP).	Same as Standardized Allowed Payment Amount
	Any IRF Use	The proportion of episodes where a beneficiary utilized at least one day of IRF use during PDP	Binary outcome (1= any IRF use for beneficiary reported during the PDP; 0= no IRF use in PDP).	Same as Standardized Allowed Payment Amount
Quality	Unplanned Readmission Rate	Episodes with one or more unplanned, all-cause readmissions for any condition 90 days after the anchor stay or outpatient procedure	Binary outcome (1= at least one readmission during measurement period; 0= no eligible readmission during measure period). Eligible readmissions are inpatient prospective payment system claims with an MS-DRG not on the list of excluded MS-DRGs for the given CE.[c]	Beneficiaries who: 1) maintained FFS Parts A and B enrollment throughout the measurement period; 2) had a measurement period that ends on or before September 27, 2020; 3) were discharged from the anchor stay/outpatient procedure in accordance with medical advice

Domain	Outcome Name	Description	Technical Definition	Eligible Sample[a]
Quality, Continued	All-cause Mortality	Death from any cause during the 90 days after discharge from the anchor hospital stay or outpatient procedure	If date of death occurred during the measurement period, then mortality outcome equals one.	Beneficiaries who: 1) maintained FFS Parts A and B enrollment throughout the measurement period or until death; 2) had not received hospice care in the six months prior to admission; 3) had a measurement period that ends on or before September 27, 2020; 4) were discharged from the anchor stay or outpatient procedure in accordance with medical advice; 5) were alive at the time of anchor hospital stay/outpatient procedure.

Notes: Payment amounts adjust for Medicare payment policies to ensure that any differences across time and providers reflect real differences in resource use rather than Medicare payment policies (e.g., teaching payments or differential payment updates).

FFS = fee for service; HCPCS = Healthcare Common Procedure Coding System; HHA = home health agency; IPPS = inpatient prospective payment system; IRF = inpatient rehabilitation facility; LTCH = long term care hospital; MS-DRG = Medicare Severity Diagnosis Related Group; PAC = post-acute care setting; PDP = post-discharge period; SNF = skilled nursing facility.

[a] For all outcomes, the eligible sample was restricted to beneficiaries who: 1) had a complete FFS enrollment history six months prior to the anchor stay or procedure; and 2) had non-missing age and gender data.

[b] Total payments are winsorized by quarter and MS-DRG/HCPCS code at the 1st and 99th percentiles for total Part A and B episode payments.

[c] The outcome is based on specifications for the National Quality Forum (NQF) all-cause unplanned readmission measure (NQF measure 1789). Planned admissions are excluded based on the Agency for Healthcare Research and Quality (AHRQ) Clinical Classification System Procedure and Diagnoses codes.

b. Study Samples

To study the BPCI Advanced Model, we identified 3,248 hospitals that were eligible to participate in BPCI Advanced for Model Years 1 and 2. We defined eligible hospitals as Inpatient Prospective Payment System (IPPS) hospitals in 2019 that existed during the baseline period for at least one year and satisfied the model's minimum volume requirement.[1] The sample excluded hospitals that met any of the following criteria: IPPS-exempt cancer hospital, inpatient psychiatric hospital, critical access hospital, located in Maryland, or participating in the Pennsylvania Rural Health Model or the Rural Community Health Demonstration. We used the BPCI Advanced databases to identify BPCI Advanced hospital episode initiators (EIs).

We also identified 12,326 PGPs, defined by a unique Tax Identification Number (TIN), that were eligible to participate in Model Years 1 and 2. Eligible PGPs were identified based on national provider identifier (NPI) billing patterns and episodes from 2013 to 2019. We narrowed the pool by imposing a minimum episode volume threshold, and removing PGPs that were dissimilar to the BPCI Advanced PGPs participating in Model Years 1 and 2.[2,3] Finally, we excluded PGPs that had over 75% of their baseline volume initiated at a hospital that was not eligible to participate in the CE. We used the Centers for Medicare and Medicaid Services (CMS) BPCI Advanced database to identify BPCI Advanced PGP EIs.

BPCI Advanced Study Population

The BPCI Advanced hospital treatment group was defined as hospital EIs participating in at least one CE in Model Years 1 and 2. The impact analyses for hospitals were limited to the following 13 CEs with sufficient sample size:[4]

- Acute myocardial infarction (AMI)
- Cardiac arrhythmia
- Chronic obstructive pulmonary disease (COPD), bronchitis, asthma
- Congestive heart failure (CHF)
- Gastrointestinal (GI) hemorrhage
- Hip and femur procedures except major joint
- Major joint replacement of the lower extremity (MJRLE)
- Percutaneous coronary intervention (PCI), outpatient
- Renal failure

[1] In order to participate in the model for a given CE, hospitals had to have initiated more than 40 episodes between January 1, 2013 and December 31, 2016.
[2] The minimum threshold was a minimum of 10 episodes in 2017 within a CE.
[3] We excluded PGPs that had episode volume, number of NPIs billing to the TIN, or average total episode payments that were below the minimum value of the BPCI Advanced PGPs or were 1.5 standard deviations above the maximum value of the BPCI Advanced PGPs.
[4] Each of these 13 CEs had at least 52 BPCI Advanced Hospital EIs and 7,000 total BPCI Advanced Model Years 1 and 2 episodes prior to the caliper selection in our matching process.

- Sepsis
- Simple pneumonia and respiratory infections (SPRI)
- Stroke
- Urinary tract infection (UTI)

The BPCI Advanced PGP treatment group was defined as PGP EIs participating in at least one CE in Model Years 1 and 2. The impact analyses were limited to the following 18 CEs with sufficient sample size:[5]

- Acute myocardial infarction (AMI)
- Cellulitis
- Cervical spinal fusion
- Chronic obstructive pulmonary disease (COPD), bronchitis, asthma
- Congestive heart failure (CHF)
- Gastrointestinal (GI) hemorrhage
- Gastrointestinal (GI) obstruction
- Hip & femur procedures except major joint
- Lower extremity and humerus procedure except hip, foot, femur
- Major joint replacement of the lower extremity (MJRLE)
- Major joint replacement of the upper extremity (MJRUE)
- Percutaneous coronary intervention (PCI), inpatient
- Renal failure
- Sepsis
- Simple pneumonia and respiratory infections (SPRI)
- Spinal fusion (non-cervical)
- Stroke
- Urinary tract infection (UTI)

The BPCI Advanced model did not require participating PGPs to use TINs that existed prior to the beginning of the model or provide billing data of previous, or "legacy", TINs they used. Some PGPs created new TINs at the beginning of the model and thus have no baseline claims data available. Historical baseline data is needed to identify a matched comparison PGP and implement the evaluation's difference-in-differences design. To address this limitation, we assigned legacy TINs to PGPs participating under a new TIN based on NPI billing patterns during the baseline period. Specifically, we used Part B Medicare claims and Medicare Data on Provider Practice and Specialty (MD-PPAS) data to identify the NPIs billing to newly created TINs and the legacy TINs

[5] Each of these 18 CEs had at least 56 BPCI Advanced PGP EIs and 1,500 total BPCI Advanced Model Years 1 and 2 episodes prior to the caliper selection in our matching process.

prior to the model. We re-aggregated newly formed TINs by combining the new TIN with the associated legacy TIN from the PGP that existed both in the baseline and intervention. We assigned legacy TINs to participating PGPs where there was sufficient overlap of NPIs and other practice characteristics (44 PGPs).[6] For cases where we could not identify legacy TINs, we removed the PGP EI from the sample (41 PGPs).

Episodes of Care

We constructed 90-day episodes of care for all eligible discharges across all CEs included in the BPCI Advanced study population for this report. Episodes of care include payments for certain Part B services provided the day before an eligible anchor stay or procedure, and all services provided during the anchor stay or procedure and the 90-day post-discharge period.

Episodes of care overlap when a discharge or procedure occurs during an existing episode of care. BPCI Advanced reconciliation rules resolve overlapping episodes to identify which episode of care becomes a "BPCI Advanced reconciliation episode." The **reconciliation rules** in Model Years 1, 2, and 3 are as follows:

- When episodes of care from BPCI Advanced participating providers overlap, the first episode becomes the reconciliation episode.
- When episodes from a BPCI Advanced participant and non-participant overlap, the episode of care from the BPCI Advanced participant becomes the reconciliation episode, regardless of which one occurred first.[7]

Applying these reconciliation rules – prioritizing the creation of BPCI Advanced reconciliation episodes over non-BPCI Advanced episodes – would create asymmetry between the BPCI Advanced and comparison group episodes. Specifically, asymmetric construction of episodes leads to systematic differences in episode characteristics, including payments, between the BPCI Advanced and non-participating providers. Our evaluation applies **modified rules** to resolve overlapping episodes with the goals of accurately capturing the reach of the BPCI Advanced model and developing a robust study design:

- We apply symmetric rules for episodes initiated by BPCI Advanced and comparison providers.
- We identify all eligible episodes of care for inclusion in our analysis because participants may treat all eligible anchor stay or procedures as BPCI Advanced episodes before confirming the episode has become a reconciliation episode. The inclusion of all eligible

[6] For example, suppose PGP/TIN A decided to create a new TIN that focuses on a particular CE or specialty (TIN B). By reviewing the NPIs that bill through TIN B who had previously billed to TIN A along with other practice characteristics, we can identify that TIN A is the legacy TIN for TIN B, and then assign the episode occurring during the intervention from TIN B to TIN A.

[7] There are three exceptions to these rules. First, in the case of multiple overlapping MJRLE episodes regardless of provider, the subsequent episode is included in reconciliation. Second, in cases where two episodes b egin on the same day, which is only possible when one is inpatient and one is outpatient, the reconciliation rules are applied treating the inpatient episode as the initial CE. Third, for Model Year 3, in cases of a PCI episode overlapping with a following endovascular cardiac valve replacement episode, the subsequent endovascular cardiac valve replacement episode is included in reconciliation and the preceding PCI episode is excluded.

episodes would capture any impacts for these additional episodes that are ultimately excluded from reconciliation.

- We avoid counting overlapping time periods more than once in the calculation of average outcomes by only including the first episode in our analytic sample for a given CE when a beneficiary has two overlapping eligible discharges or procedures within the same CE (e.g., acute myocardial infarction). If a beneficiary has two overlapping discharges or procedures across different CEs (e.g., sepsis and congestive heart failure) we retain both episodes in their respective analytic samples. This approach avoids counting overlapping time periods more than once in each CE impact estimate. Moreover, the inclusion of the first admission of a pair of overlapping episodes in the analytic sample, regardless of provider, prioritizes symmetry and eliminates overlap between BPCI Advanced and non-BPCI Advanced comparison samples.

To evaluate the impact of BPCI Advanced PGPs, we needed to identify episodes "initiated" by non-participating PGPs. A complicating factor in doing this is that a given episode can have two different individual providers, as the episode may have an attending NPI and an operating NPI, and the two NPIs can be associated with different PGPs. (Note this differs from hospital episodes, because an episode can only be associated with one provider, the hospital.) If an episode has two NPIs and one of the NPIs is associated with a BPCI Advanced participating PGP, the model will attribute the episode to the BPCI Advanced participating PGP. Because the evaluation also attributes episodes to non-participating PGPs, we must consider both the attending and operating NPI. In cases when an episode could be attributed to two different PGPs, we attributed the episode to the PGP associated with the attending NPI. This PGP attribution process was not used for the hospital analytical sample.

Lastly, our constructed episodes for both hospitals and PGPs differ from those created by reconciliation rules in how we account for overlap between other CMMI programs and the BPCI Advanced model. In the construction of our episodes, we assumed BPCI Advanced EIs do not know which discharges within a CE will become reconciliation episodes. Thus, in both our BPCI Advanced and comparison samples we did not exclude episodes for being aligned to other programs that have precedence over BPCI Advanced, including Medicare Shared Savings Program (MSSP) Track 3, MSSP Enhanced, Comprehensive End Stage Renal Disease Care Model, Next Generation Accountable Care Organization (ACO), and Vermont All-payer ACO.

Comparison Group Selection

The difference-in-differences approach compares the change in outcomes for those treated by BPCI Advanced participants to those treated by a group of comparable providers. This estimation strategy relies on the comparison group serving as a counterfactual of the change in outcomes in the absence of the model. We created a comparison group for each CE allowing us to infer outcomes for BPCI Advanced participants had the model not existed.

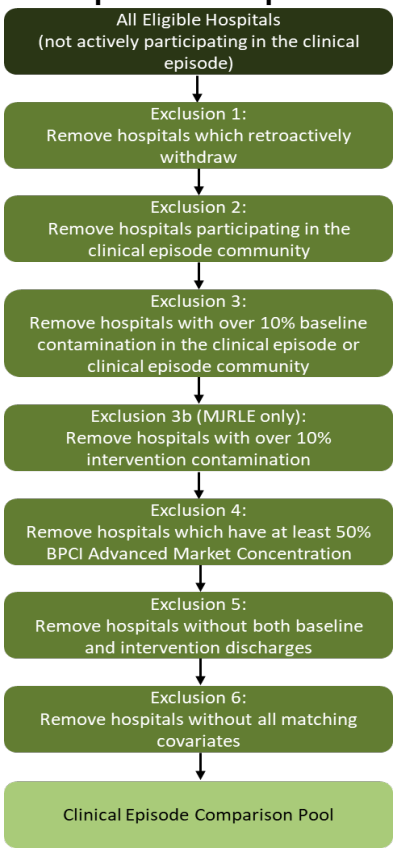
Hospital Comparison Groups

Comparison hospitals were selected for each CE in three steps (Exhibit C.5):

- First, we identified a sample of eligible hospitals from the universe of hospitals after applying exclusion criteria.

- Second, we identified hospital and market characteristics that were used to assess balance of the matched comparison group.
- Third, each BPCI Advanced hospital was matched to an eligible comparison hospital using propensity score matching, a statistical matching technique, to minimize the differences in the distributions of characteristics between BPCI Advanced and comparison hospitals.

Exhibit C.5: Steps for Identifying Eligible Comparison Hospitals



A detailed description of these steps is provided below.

Step 1: Create pool of potential comparison hospitals for each clinical episode

We identified a sample of eligible comparison hospitals by applying exclusion criteria to the universe of hospitals: [8]

- Eligible hospitals. By construction, our eligible comparison pool excluded hospitals that were not eligible for BPCI Advanced. We further excluded CJR hospitals from the MJRLE comparison pool (see Exhibits C.5 and C.6).
- Retroactive withdrawal. Excluded BPCI Advanced hospitals participating in the CE that retroactively withdrew from the CE (Hospital Exclusion 1).
- CE Community. Excluded BPCI Advanced hospitals participating in the same CE community to limit within-hospital spillover effects (Hospital Exclusion 2). CE communities are four broad groupings of CEs that involve similar medical services or are performed by the same medical specialty.[9] In addition, we excluded CJR hospitals from the CE community that contains MJRLE.
- Baseline contamination. Excluded non-participating hospitals if their contaminated share of episodes, within the CE or CE community, exceeds a 10% threshold during the

[8] Exclusion criteria were applied based on participation in CEs in Model Years 1, 2, or 3.

[9] CE communities include the following four groupings: **Surgical: ortho excluding spine** (double joint replacement of the lower extremity; hip and femur procedures except major joint; lower extremity and humerus procedure except hip, foot, femur; major joint replacement of the lower extremity; major joint replacement of the upper extremity; fractures of the femur and hip or pelvis); **surgical, non-surgical: cardiovascular** (acute myocardial infarction; cardiac arrhythmia; cardiac defibrillator inpatient; cardiac defibrillator outpatient; cardiac valve; congestive heart failure; coronary artery bypass graft; endovascular cardiac valve replacement; pacemaker; percutaneous coronary intervention inpatient; percutaneous coronary intervention outpatient); **surgical: other** (back and neck except spinal fusion inpatient; back and neck except spinal fusion outpatient; cervical spinal fusion; combined anterior posterior spinal fusion; major bowel procedure; spinal fusion non-cervical); **non-surgical other** (cellulitis; chronic obstructive pulmonary disease, bronchitis, asthma; disorders of liver except for malignancy; gastrointestinal hemorrhage; gastrointestinal obstruction; renal failure; sepsis; simple pneumonia and respiratory infections; stroke; urinary tract infection).

baseline period to limit within-hospital spillover effects (Hospital Exclusion 3).[10] For hospitals, we deemed an episode contaminated if:

  - The hospitalization was associated with a BPCI Advanced PGP, or
  - The beneficiary was admitted to a BPCI Advanced hospital or was associated with a BPCI Advanced PGP within 90 days before or after admission.

- MJRLE intervention contamination. Excluded non-participating hospitals from the MJRLE comparison pool that exceeded a 10% threshold for the share of PGP attributed episodes in the intervention to limit contamination from BPCI Advanced PGP EIs that created a TIN after the baseline period (Hospital Exclusion 3b). This exclusion was only applied in the construction of the MJRLE hospital comparison group due to the large number of BPCI Advanced PGPs participating in MJRLE that created a new TIN.
- Market contamination. Excluded non-participating hospitals that were located in markets with greater than 50% market share by BPCI Advanced EIs for a given CE to limit market spillover effects (Hospital Exclusion 4).
- Missing data. Excluded hospitals without discharges for the CE in both the baseline and intervention periods for sample balance and estimation (Hospital Exclusion 5).
- Missing covariates. Excluded hospitals with missing information on matching characteristics (Hospital Exclusion 6).

For all exclusion steps and matching, we used a national dataset of episodes from April 2013 through December 2017. To check if hospitals had missing data, we additionally used intervention episodes from October 2018 to August 2019. The number of hospitals excluded in each step (sequentially) for each CE is presented in Exhibit C.6.

[10] In order to have a comprehensive measure of contamination, this and related contamination measures were calculated using 90-day episodes of care for all eligible discharges.

Exhibit C.6: Number of Hospitals Excluded from the Comparison Pool by Reason and CE

Clinical Episode	Eligible Hospitals Comparison Pool	Number of Hospitals Excluded							Remaining Comparison Pool
		Exclusion 1. Retroactive Withdrawal	Exclusion 2. CE Community	Exclusion 3. Baseline Contamination	Exclusion 3b. MJRLE Intervention Contamination	Exclusion 4. Market Contamination	Exclusion 5. Missing Data	Exclusion 6. Missing Covariates	
AMI	1,882	79	429	280		47	34	7	1,006
Cardiac Arrhythmia	2,308	103	407	316		100	64	9	1,309
COPD, Bronchitis, & Asthma	2,699	111	602	256		90	129	18	1,493
CHF	2,561	138	325	409		72	120	13	1,484
GI Hemorrhage	2,391	81	693	225		39	67	6	1,280
Hip & Femur Procedures	2,110	109	663	490		32	27	4	785
MJRLE	2,037	98	320	522	79	91	73	8	846
PCI (Outpatient)	1,359	77	422	155		13	32	3	657
Renal Failure	2,402	108	631	256		57	75	8	1,267
Sepsis	2,554	164	496	249		177	110	12	1,346
SPRI	2,744	127	573	255		80	150	18	1,541
Stroke	2,161	125	541	211		75	50	6	1,153
UTI	2,567	128	591	241		56	103	12	1,436

Note: Counts of excluded hospitals are from sequentially applying the listed exclusions. AMI = acute myocardial infarction; CE= clinical episode; COPD = chronic obstructive pulmonary disease; CHF = congestive heart failure; GI = gastrointestinal; Hip & Femur Procedures = hip and femur procedures except major joint; MJRLE = major joint replacement of the lower extremity; PCI = percutaneous coronary intervention; SPRI = simple pneumonia and respiratory infections; UTI = urinary tract infection.

Source: The BPCI Advanced evaluation team's analysis of Medicare claims and enrollment data for episodes with anchor stays/procedures that began April 1, 2013 and ended on or before December 31, 2017 (baseline period).

Step 2: Select characteristics for balancing

We conducted descriptive analyses to identify hospital characteristics to be considered for balancing the BPCI Advanced and the matched hospital comparison groups. The characteristics we considered were:

- Levels and trends for key outcomes—total payments, post-acute care (PAC) utilization, emergency department (ED) visits, readmissions, and mortality—for each BPCI Advanced CE during the baseline (April 2013-December 2017).[11]
- The hospital efficiency measure from the BPCI Advanced target pricing methodology, which accounts for the CE-specific spending of a hospital relative to the average hospital, adjusted for patient and peer group influences on spending.
- Characteristics defined for the peer group in the BPCI Advanced pricing methodology: urban or rural location, safety net status, census division, and bed count.
- Provider-level characteristics selected from public data sources or created from claims, for example: ownership type (for profit, not for profit, government), share of patients enrolled in Medicare, relative share of dual eligible patients, and episode volume.
- Market characteristics from the Area Health Resources Files or the American Community Survey; examples include county-level demographics (e.g., population), county-level socioeconomic indicators (e.g., household income), and market variables of competition (e.g., Herfindahl index or PCPs per capita).

From this list of characteristics, we chose a subset of covariates for the matching procedure for each hospital comparison group. The measures included in the hospital matching models for all CEs are listed in Exhibit C.7. We selected the subset of covariates for all CEs that resulted in the minimum difference in baseline mean total payments while also satisfying a minimum threshold of match quality, measured as the standardized mean differences of key matching covariates.

[11] Select outcome measures were included as characteristics for matching because BPCI Advanced applicants received baseline data that was used to inform their decision to participate in the model.

Exhibit C.7: Variables Used for All Hospital Matching Models

	Measure
Hospital	Ownership - Non-Profit, For-Profit, Government
	Urban/Rural Location
	Part of Health System
	Bed Count
	Resident-Bed Ratio
	Medicare Days Percent
	DSH Patient Percentage
	Average HCC Score
	Hospital Market Share
	Episode Volume
	Efficiency Measure
Market	Population
	Median Household Income
	Medicare Advantage Penetration (%)
	Herfindahl Index
	PCPs per 10,000 People in Market
	SNF Beds per 10,000 People in Market
	IRF in Market
Baseline Outcomes	Standardized Part A&B Payment - Average
	Standardized Part A&B Payment – Linear Trend
	Readmission Rate 30-Day – Average
	Readmission Rate 30-Day – Linear Trend
	Mortality Rate 30-Day - Average
	Mortality Rate 30-Day – Linear Trend
	ED Rate 30-Day - Average
	ED Rate 30-Day – Linear Trend

Note: DSH = Disproportionate share hospital; ED = emergency department; MS-DRG = Medicare Severity Diagnosis Related Group; PCP = primary care physician; IRF = inpatient rehabilitation facility; SNF = skilled nursing facility.

Given the variation in use of PAC across CEs, we allowed the matching models to vary in the measure of PAC use by CE. While most measures were appropriate for predicting participation in all CEs, we found some matching results to be sensitive to different measures of PAC use. We considered the average and trend of two different groupings of first PAC use: all institutional PAC use, and no PAC use.[12] For each CE, we compared the variation of each of these two measures and selected the measure with lower variation on average to include in the matching model (results in Exhibit C.8). Additionally, because outpatient PCI has such low use of PAC, we did not include any PAC measures in the matching model for hospitals for this CE.

[12] The *No PAC Use* variable indicates that there was no institutional PAC use (SNF, IRF, LTCH) within 5 days of discharge and no use of home health services within 14 days of discharge.

Exhibit C.8: Post-acute Care Variables Used for Hospital Matching Models

PAC Measures included	Clinical Episodes
Rate of No PAC Use After Anchor Stay – Average & Trend	• Hip & femur procedures except major joint • Sepsis • Stroke
Rate of Institutional PAC After Anchor Stay – Average & Trend	• Acute myocardial infarction • Cardiac arrhythmia • COPD, bronchitis, asthma • Congestive heart failure • Gastrointestinal hemorrhage • Major joint replacement of the lower extremity • Renal failure • Simple pneumonia and respiratory infections • Urinary tract infection
No PAC Use Measures Included	• Percutaneous coronary intervention (outpatient)

Step 3: Apply matching method

For each CE, we implemented a one-to-one nearest neighbor matching procedure, without replacement, of potential comparison hospitals using a propensity score. A propensity score is defined as the predictive probability of receiving the "treatment" (BPCI Advanced participation), conditional on a set of characteristics. This probability was estimated using a logistic regression model that included the list of characteristics selected in Step 2.

For each CE, each BPCI Advanced hospital was matched with one comparison hospital with a log-odds propensity score absolute difference below a selected caliper. Calipers were based on the standard deviation of the estimated log-odds propensity score and were assessed using various thresholds to determine the trade-offs between the improved quality of our matches and the number of BPCI Advanced hospitals removed from the sample. BPCI Advanced hospital EIs with no potential matches inside the caliper were excluded from the sample.

Each constructed comparison group was assessed by the differences between BPCI Advanced and comparison group hospitals for the following metrics: baseline total payments, estimated propensity scores, standardized mean differences (SMD) in matching covariates, and SMD in other covariates if applicable. We sought to minimize the number of matching covariates with a SMD exceeding 0.20 in absolute value and ensure the SMD values for total payments did not exceed that threshold (see **Appendix D**). Additionally, we performed a Kolmogorov-Smirnov test of the propensity score distributions to determine whether the BPCI Advanced distribution was statistically different from the matched comparison distribution at the 10% level.

This entire process, including using calipers and not evaluating all 32 CEs, resulted in including many but not all BPCI Advanced intervention episodes in our impact analyses. For hospitals, approximately 83% of episodes in medical CEs and approximately 47% of episodes in surgical CEs were included in our evaluation sample (Exhibit C.9).[13]

[13] See **Appendix G** Section A for sensitivity analyses that examine whether the hospital results from our impact analyses are generalizable to all BPCI Advanced hospital EIs.

Exhibit C.9: Percentage of BPCI Advanced Intervention Episodes Included in Evaluation

	Total BPCI Advanced Intervention Episodes	Percentage of Total Intervention BPCI Advanced Episodes in Evaluated CEs	Percentage of BPCI Advanced Intervention Episodes in Evaluated CEs Included After Matching	Percentage of Total BPCI Advanced Intervention Episodes Included After Matching
Entire Model	740,146	91.2%	73.5%	67.0%
Medical	491,023	95.7%	81.3%	77.8%
Surgical	249,124	82.4%	55.7%	45.9%
Hospital	397,657	90.3%	85.3%	77.1%
PGP	342,490	92.2%	60.1%	55.4%
Medical Hospital	333,112	97.1%	85.5%	83.0%
Medical PGP	157,910	92.7%	72.1%	66.9%
Surgical Hospital	64,544	55.5%	83.9%	46.5%
Surgical PGP	184,579	91.8%	49.7%	45.6%

Note: Episode counts were not restricted based on the availability of variables used in risk adjustment. Episode-level weights were applied to account for episodes that overlapped between CEs. To avoid double-counting episodes, episodes were assigned to BPCI Advanced PGPs if a given episode was included in both the samples for hospital and PGP EIs. CE = clinical episode; EI = episode initiator; PGP = physician group practice.

Source: The BPCI Advanced evaluation team's analysis of Medicare claims and enrollment data for episodes with anchor stays/ procedures that began October 1, 2018 and ended on or before December 31, 2019 (intervention period) for BPCI Advanced EIs.

PGP Comparison Groups

We selected comparison PGPs for each CE in a manner that was generally similar to our approach for constructing hospital comparison groups, though we adjusted many details to tailor the approach to PGPs. We outline the steps and provide detailed descriptions below:

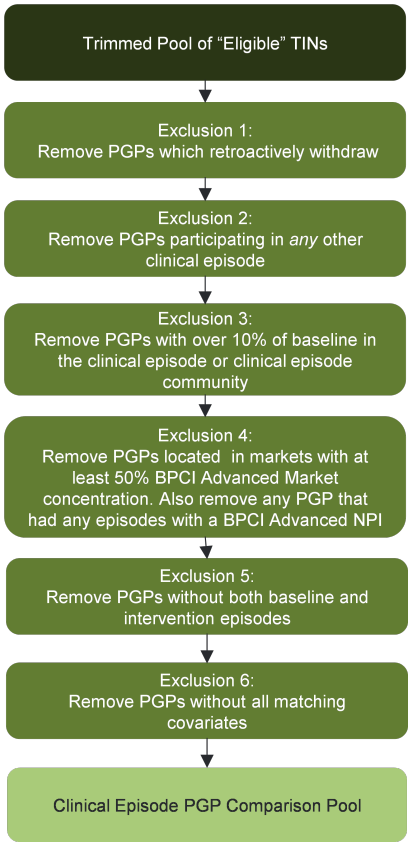
- First, we identified a sample of eligible PGPs (using TINs as the unit of observation) from the universe of PGPs after applying exclusion criteria and constructing episodes for these PGPs.
- Second, we identified PGP and market characteristics that were used to assess balance of the matched comparison group.
- Third, each BPCI Advanced PGP was matched to an eligible comparison PGP using propensity score matching to minimize the differences in the distributions of characteristics between BPCI Advanced and comparison PGPs.

Step 1: Create pool of potential comparison PGPs for each clinical episode

We identified a sample of potential comparison PGPs by applying exclusion criteria to eligible PGPs:[14]

- Retroactive withdrawal. Excluded BPCI Advanced PGPs participating in the CE (by construction) and PGPs that retroactively withdrew from the CE (PGP Exclusion 1 in Exhibits C.10 and C.11).
- CE participation. Excluded BPCI Advanced PGPs participating in any other CE(s) to minimize any within-group spillover effects (PGP Exclusion 2).[15] CE communities are four broad groupings of CEs that involve similar medical services or are performed by the same medical specialty.[16]
- Baseline contamination. Excluded non-participating PGPs with a contaminated share of baseline episodes, within the CE or CE community, exceeding a 10% threshold (PGP Exclusion 3). For PGPs, we deemed an episode contaminated if:
  - The discharge itself was associated with a BPCI Advanced EI, or
  - The beneficiary was admitted to a BPCI Advanced hospital or was associated with a BPCI Advanced PGP 90 days before or after admission.
- Market contamination. Excluded non-participating PGPs that were located in markets with greater than 50% market share by BPCI Advanced EIs for a given CE to limit market spillover effects (PGP Exclusion 4).

Exhibit C.10: Steps for Identifying Eligible Comparison PGPs



- Episode contamination. Excluded non-participating PGPs that had any episode where the attending or operating NPI was associated with a BPCI Advanced EI (PGP Exclusion 4).[17]
- Missing data. Excluded PGPs that had zero episodes in the CE during Model Years 1 and 2 (PGP Exclusion 5).

[14] Exclusion criteria were applied based on participation in CE in Model Years 1, 2, or 3.
[15] This is notably more restrictive than the equivalent exclusion used for hospital comparison groups (Hospital Exclusion 2, CE community).
[16] See previous section on hospital comparison group for a list of the CE communities.
[17] This additional component of PGP Exclusion 4, episode contamination, does not have an equivalent exclusion in the construction of hospital comparison groups.

- Missing covariates. Excluded PGPs with missing information on PGP characteristics we were considering using for matching (PGP Exclusion 6).

For all exclusion steps and matching, we used a national dataset of episodes constructed from April 2013 through December 2017. To check if PGPs had missing data, we also used episodes from the intervention period (October 2018 through December 2019). The number of PGPs excluded in each step (sequentially) for each CE is presented in Exhibit C.11.

Exhibit C.11: Number of PGPs Excluded from Comparison Pool by Reason and Clinical Episode

Clinical Episode	Eligible TIN Comparison Pool	Number of PGPs (TINs) Excluded						Remaining Comparison Pool
		Exclusion 1. Retroactive Withdrawal	Exclusion 2. Clinical Episode Participation	Exclusion 3. Baseline Contamination	Exclusion 4. Market & Episode Contamination	Exclusion 5. Missing Data	Exclusion 6. Missing Covariates	
AMI	2,158	34	117	1,101	41	89	8	768
Cellulitis	1,725	26	114	601	24	99	9	852
Cervical Spinal Fusion	841	19	107	108	56	50	1	500
COPD, Bronchitis, & Asthma	4,684	34	146	1,748	172	363	26	2,195
CHF	5,330	36	146	2,664	100	289	28	2,067
GI Hemorrhage	2,788	30	128	1,348	32	134	11	1,105
GI Obstruction	1,498	20	103	520	9	77	7	762
Hip & Femur Procedures	2,865	74	281	1,124	65	175	12	1,134
LE & Humerus Procedures	859	30	169	197	13	39	1	410
MJRLE	3,679	81	925	1,199	213	189	26	1,046
MJRUE	814	34	127	92	40	60	5	456
PCI (Inpatient)	2,404	29	130	1,052	17	114	4	1,058
Renal Failure	2,385	29	131	1,144	44	104	11	922
Sepsis	3,900	40	140	2,352	158	119	16	1,075
SPRI	3,545	30	149	1,532	115	218	19	1,482
Spinal Fusion (Non-Cervical)	1,315	33	131	169	94	101	3	784
Stroke	2,401	29	130	1,054	86	98	10	994
UTI	2,414	25	112	945	55	155	9	1,113

Note: Counts of excluded PGPs are from sequentially applying the listed exclusions. AMI = acute myocardial infarction; COPD = chronic obstructive pulmonary disease; CHF = congestive heart failure; GI = gastrointestinal; Hip & Femur Procedures = hip and femur procedures except major joint; LE & Humerus Procedures = lower extremity and humerus procedure except hip, foot, femur; MJRLE = major joint replacement of the lower extremity; MJRUE = major joint replacement of the upper extremity; PCI = percutaneous coronary intervention; PGP = physician group practice; SPRI = simple pneumonia and respiratory infections; TIN = Tax Identification Number; UTI = urinary tract infection.

Source: The BPCI Advanced evaluation team's analysis of Medicare claims and enrollment data for episodes with anchor stays/procedures that began April 1, 2013 and ended on or before December 31, 2017 (baseline period) and episodes with anchor stays/procedures that began October 1, 2018 and ended on or before December 31, 2019 (intervention period) for BPCI Advanced EIs and matched comparison providers.

Step 2: Select characteristics for balancing

We considered a variety of characteristics for balancing the BPCI Advanced PGPs and the matched comparison group. The characteristics we considered were:

- Levels and trends for key outcomes—total payments, PAC utilization, ED visits, readmissions, and mortality—for each BPCI Advanced CE during the baseline (April 2013-December 2017).
- Provider-level characteristics selected from public data sources or created from claims, for example: relative share of dual eligible patients, episode volume, number of hospitals where a PGP is actively billing, number of markets where PGP is actively billing.
- Market characteristics from the Area Health Resources Files or the American Community Survey; examples include population, household income, and measures of market competition. We assigned each PGP to a market based on the plurality of baseline episode volume.

For each CE, we chose a subset of covariates from this list of characteristics to use in the matching procedure to construct the comparison group. We selected the subset of covariates for each comparison group to satisfy a minimum criteria of match quality. This process was performed by identifying an essential list of matching covariates likely important to PGP participation in the model, and then identifying additional covariates to include for each comparison group. Emphasis was put on keeping the matching specification parsimonious and avoiding matching covariates that appeared to be sparse or overly noisy in the data for the given CE. The matching covariates included in the PGP matching models for all CEs are listed in Exhibit C.12. Matching covariates for each CE (both those used in all CEs and those that were CE-specific) can be found in **Appendix D**.

Exhibit C.12: Variables Used for All PGP Matching Models

	Measure
PGP	Urban/Rural Location
	Part of Health System
	Number of NPIs – Trinary grouping
	Operating at Multiple Hospitals
	Operating in Multiple Markets
	Episode Volume
	Share of Dual Eligible Beneficiaries
	Share of Female Beneficiaries
	Share of White Beneficiaries
	Share of Black or African American Beneficiaries
	Share of Beneficiaries Over 80 Years Old
	Share of Disabled Beneficiaries (Excluding ESRD)
	Share of Episodes with IP Stay in 180 Days Prior
	Average HCC Score
Market	Population
Baseline Outcomes	Standardized Part A&B Payment - Average
	Standardized Part A&B Payment – Linear Trend
	Rate of Institutional PAC – Average
	Rate of Institutional PAC – Linear Trend

Note: All Share variables were calculated for the patient populations for a given CE. CE = clinical episode; ESRD = End-stage Renal Disease; HCC = hierarchical condition category; MS-DRG = Medicare Severity Diagnosis Related Group; NPI = National Provider Identifier; PGP = physician group practice; PAC = post-acute care.

Step 3: Apply matching method

As with the hospital comparison group, for each CE, we implemented a one-to-one nearest neighbor matching procedure, without replacement, of potential comparison PGPs using a propensity score. For each CE, each BPCI Advanced PGP was matched with one comparison PGP with a log-odds propensity score absolute difference below a selected caliper. Calipers were based on the standard deviation of the estimated log-odds propensity score; BPCI Advanced PGPs with no potential matches inside the caliper were excluded from the sample.

Unique to the PGP comparison group construction, each comparison group was constructed by selecting a caliper and matching covariate list (as described in Step 2) to satisfy the following minimum criteria of match quality:

- Average standardized mean difference of matching covariates had to be below 0.1.
- No matching covariates could have a standardized mean difference above 0.25.

We also assessed and used a variety of other criteria, including: minimizing the difference in the baseline total payments (means and distributions), the difference in estimated propensity score, and the average standardized mean difference in matching covariates between BPCI Advanced

PGP EIs and the comparison group, and using the Kolmogorov-Smirnov test of the propensity score distributions.

As with hospitals, the use of calipers in our matching process and not evaluating all 32 CEs resulted in excluding BPCI Advanced PGP intervention episodes from our impact analyses. For PGPs, approximately 67% of episodes in medical CEs and 46% of episodes in surgical CEs were included in our evaluation sample (Exhibit C.9).[18]

Matching in a Difference-in-Differences Approach

BPCI Advanced is a national voluntary model with a large number of participants that span a wide range of geographies and provider types. By matching on key market and provider characteristics in the baseline, including outcome levels and outcome trends, we selected a subset of the eligible non-participating hospitals and PGPs that were similar to the non-random sample of BPCI Advanced EIs. Researchers have noted that matching on outcome levels in the pre-intervention period may mitigate or exacerbate bias ("regression to the means") depending on whether treatment and comparison providers are drawn from a pool of providers that have the same or different distributions of the outcome.[19,20,21] If treatment and comparison providers are drawn from providers with the same distribution of the outcome (i.e., episode payments) and differences in outcome levels in the pre-intervention period are due to the treatment assignment mechanism (i.e., hospitals with higher episode payments are more likely to participate because it will be generally easier for the hospitals to earn reconciliation payments), then matching on outcome levels in the pre-intervention period would mitigate this particular bias.[23,24] If, however, treatment and comparison providers are drawn from providers with different distributions of the outcome (i.e., the distribution of episode payments for treatment providers has a higher mean than the distribution for comparison providers), then the matching process would weight the analysis sample toward the left tail (lower episode payments) of the treatment distribution and to the right tail (higher episode payments) of the comparison distribution. Both groups would then likely revert to the long-term distributions of the outcome means (i.e., mean episode payments) in the intervention period, creating a biased DiD estimate.

There are two reasons why we believe that matching on baseline outcomes is appropriate for our analysis. First, we used a five-year baseline period for both matching and the DiD regression to estimate the 15-month intervention period of Model Years 1 and 2. Thus, we expect the baseline mean values of our matching variables to be reflective of the true underlying mean values of providers. If BPCI Advanced providers did revert to the mean during the excluded transition period (January 2018 – September 2018) or during Model Years 1 and 2, by matching on such a long baseline period, we would expect the BPCI Advanced participants and the matched comparison providers to experience the similar reversions, making the matched comparison providers the

[18] See **Appendix G** Section B for sensitivity analyses that examine whether the PGP results from our impact analyses are generalizable to all BPCI Advanced PGP EIs.

[19] Daw, J. R., & Hatfield, L. A. (2018). Matching and Regression to the Mean in Difference -in-Differences Analysis. *Health Services Research*, *53*(6), 4138–4156. https://doi.org/10.1111/1475-6773.12993

[20] Daw, J. R., & Hatfield, L. A. (2018). Matching in Difference-in-Differences: between a Rock and a Hard Place. *Health Services Research*, *53*(6), 4111–4117. https://doi.org/10.1111/1475-6773.13017

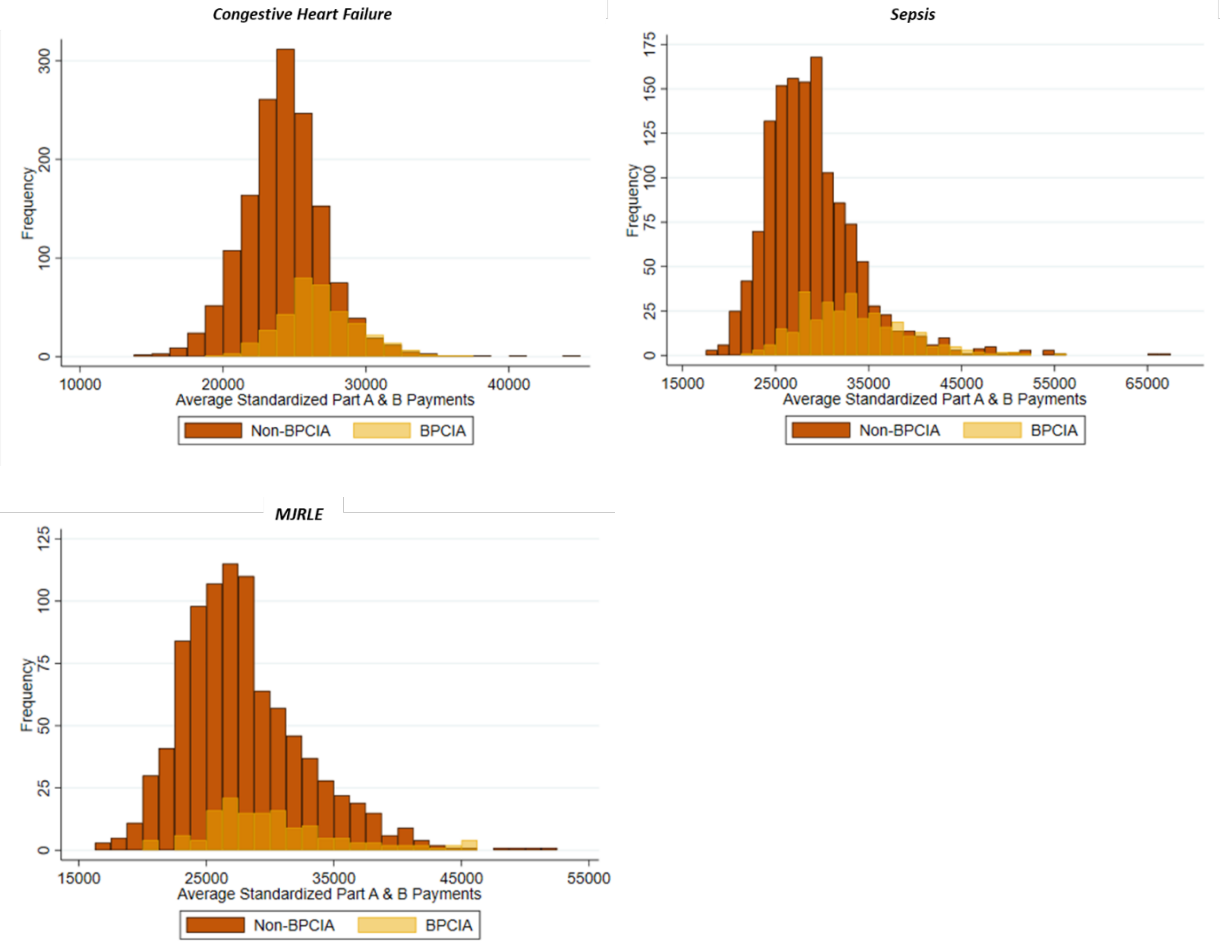
[21] Ryan A. M. (2018). Well-Balanced or too Matchy-Matchy? The Controversy over Matching in Difference-in-Differences. *Health Services Research*, *53*(6), 4111–4117. https://doi.org/10.1111/1475-6773.13015

appropriate counterfactual for BPCI Advanced participants. Our long baseline period is particularly important given the emerging literature on the inadequacies of the conventional tests for parallel trends in the pre-intervention period.[22]

Second, it does not appear that Model Years 1 and 2 BPCI Advanced participants and non-participating providers are drawn from different distributions. Exhibit C.13 visually depicts the distributions for BPCI Advanced and non-participating hospitals using frequency histograms of average standardized allowed payments in the baseline period (Q2 2013 through 2017) for CHF and sepsis, the CEs with the highest hospital participation, and MJRLE, the surgical CE with the highest hospital participation. For these CEs, the distribution of average payments for BPCI Advanced participant hospitals is contained within the distribution for non-participating hospitals. However, the average payments for BPCI Advanced hospital participants are not random within the larger non-participant distribution but are instead more heavily weighted toward higher payments. This likely reflects the non-randomness of the group of hospitals that chose to participate in the voluntary BPCI Advanced Model. Our analysis indicates that BPCI Advanced hospitals and non-participating hospitals were drawn from hospitals with the same distribution of outcomes and that differences in outcome levels in the baseline are due to the self-selection of participants into the model. As a result, participants tend to have higher average payments in the baseline and, therefore, higher target prices, which could make it easier for them to earn reconciliation payments.

[22] Bilinski, A & Hatfield, L. A. (2020). Nothing to See Here? Non-Inferiority Approaches to Parallel Trends and Other Model Assumptions, https://arxiv.org/abs/1805.03273

Exhibit C.13: Distribution of Average Payments per Episode among BPCI Advanced Hospitals and Eligible Non-Participating Hospitals for CHF, Sepsis and MJRLE Clinical Episodes, April 1, 2013 – December 31, 2017

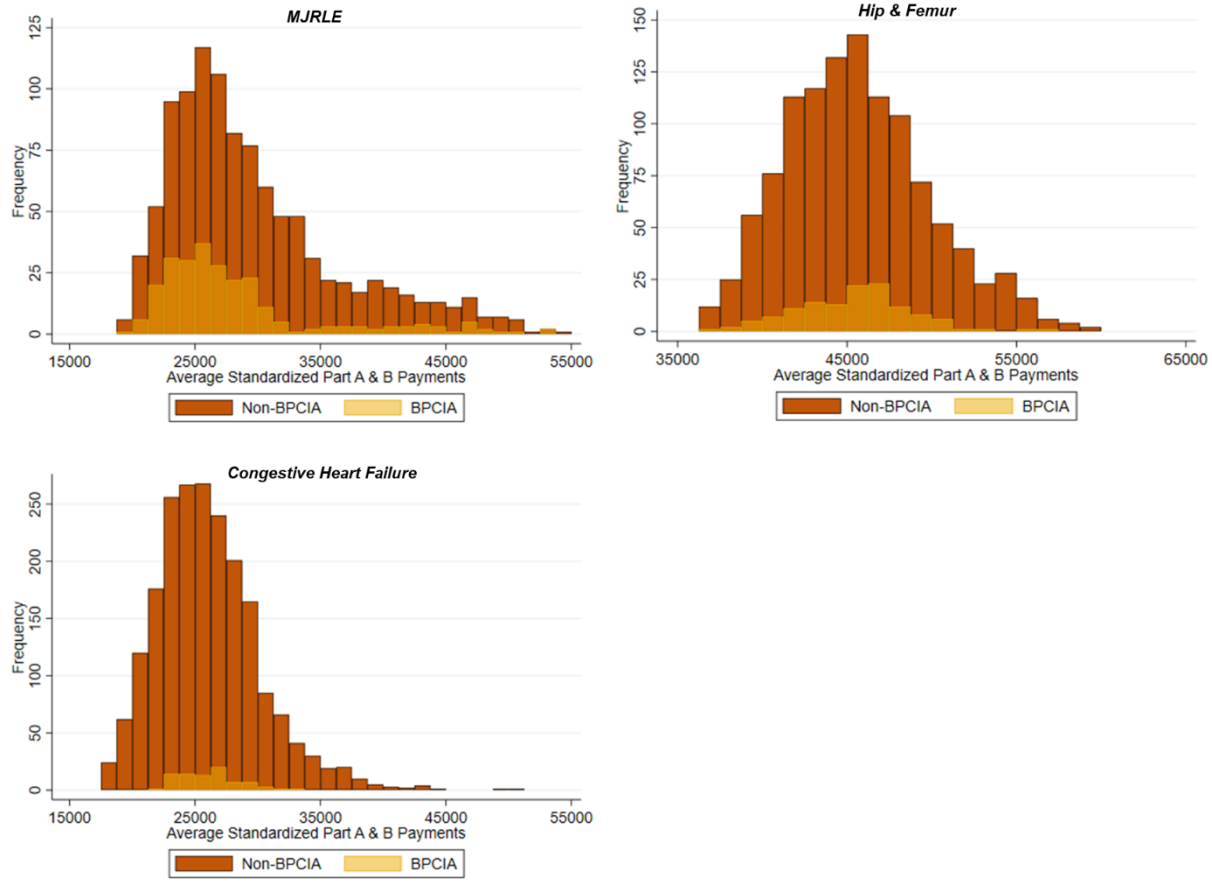


Note: Frequencies are counts of hospitals. CHF = congestive heart failure; MJRLE = major joint replacement of the lower extremity.

Source: The BPCI Advanced evaluation team's analysis of Medicare claims and enrollment data for episodes with anchor stays/procedures that began April 1, 2013 and ended on or before December 31, 2017.

We show similar graphs for PGPs of the CEs with the highest participation, MJRLE and hip and femur procedures (surgical CEs with the highest participation), and CHF (medical CE with the highest participation) (Exhibit C.14). Again, the distribution of average payments for BPCI Advanced PGP EIs is contained within the distribution for non-participating PGPs.

Exhibit C.14: Distribution of Average Payments per Episode among BPCI Advanced PGPs and Eligible Non-Participating PGPs for MJRLE, Hip & Femur, and CHF Clinical Episodes, April 1, 2013 – December 31, 2017



Note: Frequencies are counts of PGPs. CHF = congestive heart failure; MJRLE = major joint replacement of the lower extremity.
Source: The BPCI Advanced evaluation team's analysis of Medicare claims and enrollment data for episodes with anchor stays/procedures that began April 1, 2013 and ended on or before December 31, 2017.

c. Analytic Methods

Descriptive Analyses Approach

Patient Characteristics Analysis

We analyzed demographic and prior use outcomes to assess relative changes in patient mix of BPCI Advanced and matched comparison group episodes from the baseline to the intervention period by EI type for the CEs evaluated. For this analysis, we estimated unadjusted difference-in-differences (DiD) regressions with claims-based beneficiary and prior PAC use variables as the outcomes. The DiD approach is described later in this section.

COVID-19 Descriptive Analyses

We conducted descriptive analyses to describe changes that occurred during the early months of the COVID-19 public health emergency among BPCI Advanced participants and EIs. Due to the availability of claims data at the time of carrying out the analyses for this report, we calculated

results for episodes with discharge dates from June 30, 2020, or earlier. Unlike our DiD sample, episodes are aligned with months using the anchor or procedure *start* date as we were interested in describing the conditions at the time the beneficiary arrived at the hospital.

- **Amendment Selection Analysis:** To evaluate COVD-19 amendment choice by participants, we calculated the percentage of participants selecting each option. The sample included participants (N=1,689) that had not withdrawn from the model by June 28, 2020, and thus were eligible to select one of the two amendments.[23] Amendment 1 allowed the participant to forgo reconciliation for all episodes that began and ended in 2020. Amendment 2 allowed the participant to exclude episodes with a COVID-19 diagnosis from reconciliation. We calculated the proportions overall, by participant type, and by when the participant joined the model. We also calculated the proportion of EIs under each amendment by geographic region. Because the billing locations of PGPs may differ from the locations where NPIs are treating patients, PGP locations for the EI-level analysis were determined by the location of the hospital where the plurality of the PGP's episode volume occurred.
- **Geographic Analysis:** We assessed the proportion of episodes occurring in counties of varying levels of COVID-19 incidence for BPCI Advanced episodes and episodes attributed to non-participating hospitals and PGPs for March through June 2020 (in the aggregate and by month). For each county, we calculated the monthly average of daily county-level COVID-19 incidence per 100K residents and categorized the average monthly incidence into low (<1 confirmed new COVID-19 case per day per 100K residents), medium (1 to 9.9 confirmed new COVID-19 cases per day per 100K residents), high (10 to 24.9 confirmed new COVID-19 cases per day per 100K residents), and very high (25+ confirmed new COVID-19 cases per day per 100K residents).[24] We then calculated the proportion of episodes attributed to BPCI Advanced EIs and the proportion of episodes attributed to non-participant hospitals and PGPs that occurred in counties of each monthly incidence category by month and overall. We tested for differences in the proportion of episodes occurring in each category by BPCI Advanced status using two-sample tests of proportions and binary indicators for if the episode was in the incidence category. The county for the episode was determined by the location of the hospital where the anchor stay or procedure occurred. We also calculated the proportion of episodes occurring in each incidence category by month and CE.
- **Volume Analysis:** To evaluate how episode volume changed, we compared the volume attributed to BPCI Advanced EIs during October 2018 through June 2019 to the volume of the same BPCI Advanced EIs in October 2019 through June 2020. We restricted the episodes in the sample to those attributed to BPCI Advanced EIs that participated in the CE during Model Years 1 and 2 and Model Year 3. We performed the analysis by CE type (medical or surgical) and by CE.[25] We also calculated the proportion of episode

[23] Only participants that had not withdrawn from the model 90 or more days before the submission due date for the amendments (September 25, 2020) were eligible.

[24] https://ethics.harvard.edu/ttsi-technical-handbook

[25] We used Model Year 3 CE definitions for this analysis. The spinal fusion episode combines and replaces three CEs, cervical spinal fusion, combined anterior posterior spinal fusion, and spinal fusion (non-cervical), which were separate CEs in Model Years 1 and 2. MJRLE includes total knee arthroplasty episodes initiated in an outpatient

volume with a COVID-19 diagnosis by CE.[26] CEs with fewer than 60 episodes in each month without a COVID-19 diagnosis were excluded from the CE level analysis.

- **Patient Mix and Outcomes Analysis:** To assess if the patient mix of BPCI Advanced episodes changed during the COVID-19 PHE, we examined the change in claims-based patient characteristics (e.g. hierarchical condition category or HCC score, race/ethnicity, dual eligibility) in April and June 2020 compared to April and June of 2019.[27] Because a COVID-19 diagnosis may affect episode-level outcomes, we conducted the comparison both including and excluding episodes with a COVID-19 diagnosis. As we compared 2019 (occurring in Model Year 2) to 2020 (occurring in Model Year 3), we included episodes from EIs that participated in the CEs in Model Years 1 and 2 and Model Year 3 to maintain consistency of the sample. We also restricted the analysis to CEs that had at least 60 episodes without a COVID-19 diagnosis during every month of the analysis. After imposing these restrictions, we were able to evaluate changes for 21 of 34 CEs. For continuous variables (HCC score, age), we calculated changes in average beneficiary characteristics for the episodes. For binary outcomes (e.g., dual eligibility), we calculated the percentage point change in the proportion of beneficiaries who were included in the category. Using two-sample t-tests and two-sample tests of proportions, we tested if the episode average beneficiary characteristics were statistically different from each other in same month in 2020 versus 2019.

Difference-in-Differences Approach

DiD is a statistical technique that quantifies the impact of an intervention or policy. It does this by comparing changes in a *treatment* group (BPCI Advanced) to changes in a comparison group across baseline (pre-intervention) and intervention time periods. This approach eliminates biases from time invariant differences between the BPCI Advanced and comparison episodes and controls for trends that are common between the treatment and comparison populations.[28]

- The DiD baseline period was from April 2013 through December 2017.

---

setting, which were not included in the Model Years 1 and 2 definitions. A new CE, endovascular cardiac valve replacement, was introduced in Model Year 3. Per model rules, endovascular cardiac valve replacement episodes take precedence over PCI (inpatient) procedures. Thus, some episodes that would have been PCI (inpatient) during Model Years 1 and 2 were reassigned to endovascular cardiac valve replacement under the Model Year 3 definition. To maintain consistency, endovascular cardiac valve replacement episodes were included in the grouped surgical volume analysis and were excluded from the PCI (Inpatient) CE.

[26] An episode has a COVID-19 diagnosis if the beneficiary had an ICD-10 diagnosis code for COVID-19 at any time during the episode (anchor stay and 90-day post-discharge period). For our analysis, a diagnosis code of B97.29 was considered a COVID-19 diagnosis between January 27, 2020, and March 31, 2020, and a diagnosis code of U07.1 was considered a COVID-19 diagnosis starting from April 1, 2020.

[27] Race and ethnicity designations were determined using the claims-based beneficiary race code. The race and ethnicity code includes six categories (American Indian/Alaska Native, Asian/Pacific Islander, Black or African American, Hispanic, Non-Hispanic White, Other, and Unknown). A limitation of this claims-based variable is that race information cannot be determined for Hispanic beneficiaries. For more information on the algorithm used in the claims to identify the race and ethnicity of beneficiaries, see https://resdac.org/cms-data/variables/research-triangle-institute-rti-race-code.

[28] While the DiD model controls for unobserved heterogeneity that is fixed over time, there is no guarantee that this unobserved heterogeneity is, in fact, fixed. It could be the case, for example, that providers with improving outcomes are relatively more likely to sign up for the model, introducing correlation between BPCI Advanced participation and outcomes, which could bias the results.

- The BPCI Advanced intervention period began in October 2018, and included anchor stays or procedures through December 31, 2019 (Model Years 1 and 2).
- Because the request for applications for the BPCI Advanced model was released on January 9, 2018, we excluded the transition period of January through September 2018 from our baseline to limit the influence of anticipatory changes before the official model start.

We applied the DiD technique at the episode level to estimate the impact of BPCI Advanced on the key claims-based outcomes while controlling for differences between the BPCI Advanced and comparison episodes in beneficiary, market, and provider characteristics. Using episodes rather than participants as observations allows us to directly control for potential changes in patient mix, which may be a response to the model.

A small number of participants withdrew from CEs prior to the end of Model Year 2. We consider these EIs to be full Model Years 1 and 2 participants, and include all episodes attributed to these EIs in the CEs as treated by BPCI Advanced.

The DiD analyses for each outcome in this report was performed separately by CE and EI type.[29] To illustrate our estimation strategy, consider the stylized equation,

$$(1) \quad Y_{ikt} = \beta_0 + \beta_1 BPCIA_k + \beta_2 Post_t + \theta(BPCIA_k \cdot Post_t) + \boldsymbol{X_{ikt}'\beta} + e_{ikt}$$

where Y_{ikt} is the outcome of interest for episode i from provider k during time t. The variable, $BPCIA_k$ is an indicator that takes on the value 1 if provider k participated in the BPCI Advanced for the given CE. $Post_t$ is an indicator that takes the value of 1 for every episode in the intervention period, and $\boldsymbol{X}_{ikt}$ is set of covariates at the beneficiary, provider, market, and temporal level for episode i with an anchor end in period t receiving care from provider k. In this linear example, the DiD estimate is the coefficient θ, which determines the differential in outcome Y experienced by beneficiaries receiving services from BPCI Advanced EIs during the intervention period relative to beneficiaries receiving services from providers in the comparison group. Lastly, the error term is e_{ikt}.

We used multivariate regression models to control for differences in beneficiary demographics, clinical characteristics, and care use before hospitalization, along with provider characteristics that might be correlated with the outcome. Regression models were selected depending on the type and characteristics of the outcome measure. For example, ordinary least squares (OLS) models were selected for continuous and count outcomes (e.g., payments, SNF days), and logistic models were estimated for the binary outcomes (e.g., mortality, institutional PAC usage, unplanned readmissions). In all specifications standard errors were clustered at the provider level.

To calculate a single impact on payment outcomes for groups of CEs that are of interest (i.e., medical, surgical) we estimated each corresponding DiD regression together in a seemingly unrelated regression and estimated the average impact as a weighted average using intervention period volume from BPCI Advanced EIs in each CE. Because our episode definition allows episodes to overlap across CEs (see **Appendix C** Section B.1.b), we used episode-level weights

[29] For example, we estimated a DiD regression for total payments (outcome) CHF (CE) hospitals (EI).

that reflect the amount any episode overlaps with any other episode in the group of CEs and used multi-way clustering at the provider and beneficiary levels to estimate standard errors.

To calculate a single impact for the binary outcomes of unplanned readmissions and mortality rates, we estimated a single logistic regression per outcome per group of CEs. Covariates in our logistic regression model included a set of indicators for anchor stay/procedure MS-DRG/ HCPCS codes for CEs included in the group and CE-specific versions all other required covariates (i.e., the required set of covariates interacted with an indicator for CE).[30] We applied episode-level weights to account for overlaps across CEs and used multi-way clustering at the provider and beneficiary levels.

Appendix C Section B.2. below discusses an alternative DiD methodology used for the calculation of Medicare program savings.

Covariate Selection for Risk Adjustment

The DiD model adjusts for beneficiary, provider, market, and seasonal covariates to control for differences in beneficiaries, markets, and hospitals that are exogenous to the BPCI Advanced model. While we require a core set of covariates in all models, additional CE- and outcome-specific covariates were selected for each model using a least absolute shrinkage and selection operator (LASSO).

We required all DiD models to include a set of risk-adjustment covariates that was based on clinical knowledge and prior research (Exhibit C.15). For each CE and EI type, we performed a LASSO regression to select additional covariates for given outcomes.[31] Specifically, we estimated a ten-fold cross-validated linear LASSO procedure on baseline episodes from all eligible providers and then used the optimized lambda value to select the set of optional covariates. Each LASSO regression included the core set of required covariates and considered the full list of optional covariates for selection. This data-driven approach to select optional covariates helps maximize model fit while constraining the complexity of the model.

[30] Required covariates are discussed under *Covariate Selection for Risk Adjustment*.

[31] For consistency, we used the same selected covariates for total allowed payments, total Medicare paid amounts, SNF payments, IRF payments, and HH payments. We ran the LASSO procedure for each CE and EI type using the total allowed payments outcome to optimize the selected covariate list for payment outcomes. Covariates for all other (non-payment) outcome models were selected from separate outcome-, clinical-episode-, and EI-type-specific LASSO procedures.

Exhibit C.15: Required and Optional Predictive Risk Factors Used to Risk Adjust Claims Outcomes

Domain	Variable Type	Variables
Service Mix	Required	• Anchor MS-DRG or HCPCS code • Hip-fracture (MJRLE regressions only)
	Optional	[none]
Patient Demographics & Enrollment	Required	• Age • Sex • Race/ethnicity • Dual Eligible • OREC: Disability (non-ESRD) • Alignment to Medicare Shared Savings Program (MSSP) Track 3, MSSP Enhanced, Comprehensive ESRD Care Model, Next Generation ACO and Vermont ACO during the episode • Alignment to BPCI Classic for the episode (binary indicator interacted with calendar year)
	Optional	• Age squared
Prior Health Conditions	Required	• HCC score
	Optional	• Individual HCC flags
Utilization Measures Preceding the Start of the Anchor Stay or Qualifying Inpatient Stay	Required	• Binary indicators for care in SNF, IRF, LTCH, Hospice, HHA, IPPS and OIP in the **six months** preceding the start of the episode
	Optional	• Binary indicators ED visit and psychiatric visit in the six months preceding the start of the episode
Geography/Market	Required	• Census Division indicators
	Optional	• Urban indicator
Seasonality	Required	• Quarter indicators
	Optional	[none]
Provider Characteristics	Required	• Hospital size (trinary indicators for number of beds) • Percent of baseline episodes attributed to PGPs (hospital regressions only)
	Optional	• Hospital ownership indicators • Academic Medical Center • Safety Net Hospital • Binary indicator for PGPs operating in multiple markets (PGP regressions only) • Number of hospitals PGPs operate at (PGP regressions only) • Health system affiliation (PGP regressions only)

Notes: ACO = accountable care organization; HCC = hierarchical condition category; HCPCS = Healthcare Common Procedure Coding System; HHA = home health agency; ED = emergency department; ESRD = End-Stage Renal Disease; IPPS = Inpatient Prospective Payment System; IRF=inpatient rehabilitation facility; MJRLE = major joint replacement of the lower extremity; MS-DRG = Medicare severity diagnosis related group; OIP = other inpatient; OREC= Original Reason for Entitlement Code; SNF = skilled nursing facility.

Parallel Trends Tests

Our ability to interpret the DiD estimates as the unbiased impacts of the BPCI Advanced model hinges on the assumption that both BPCI Advanced and the comparison group have the same trend in outcomes prior to the intervention. We tested the null hypothesis that BPCI Advanced participants and comparison providers had parallel trends during the baseline. To do so, we ran a regression of the outcome on a time and treatment dummy interaction term in addition the full set of patient, provider, and market risk adjusters that are included in the DiD specification on baseline data, for each CE, EI type, and outcome. If there was no differential between the trends of the treatment and comparison group prior to intervention, the interaction coefficient would be near zero and not statistically significant. We rejected the null hypothesis that there were parallel trends in the baseline at the 10% level of significance. We also visually inspected baseline trends to assess the size and direction of any potential bias.

We constructed a comparison group of providers that closely matched BPCI Advanced EIs on key characteristics, however, as our analysis was performed at the more granular episode level, there were certain outcome and CE combinations in which we had evidence to reject the null of parallel trends.

Although we report results of all DiD estimates, we note outcomes for which we rejected the null hypothesis that there were parallel trends in the baseline. The results of our parallel trends test are reported in **Appendix F**.

Sensitivity Analyses

To test the robustness of our impact estimates, we conducted sensitivity analyses on key outcomes, the results of which are presented in **Appendix G**. The sensitivity analyses tested the inclusion and exclusion of specific episodes in our sample. These tests included the following sample adjustments:

For both hospital and PGP EI analyses,

- BPCI EIs often participated in the BPCI Advanced model, which could lead to relative difference in outcomes during the BPCI model (part of the BPCI Advanced baseline period). We tested the sensitivity of the impact estimate to the overlap of participants in both models by excluding episodes that were initiated by a BPCI participant.
- We assumed that, a priori, BPCI Advanced EIs do not know which discharges within a CE will become reconciliation episodes and thus included in both our BPCI Advanced and comparison samples episodes aligned to other CMMI programs that have precedence over BPCI Advanced. We tested if our results are robust to this assumption by excluding episodes aligned to MSSP Track 3, MSSP Enhanced, Comprehensive End Stage Renal Disease Care Model, Next Generation ACO, and Vermont All-payer ACO.
- To determine whether the results are generalizable to all BPCI Advanced EIs, we estimated the results using the analytic sample selected under the propensity score model with no caliper.

For hospital analyses only,

- We excluded episodes that were eventually attributed to BPCI Advanced PGPs. In addition, this was a check for sensitivity of results due to any imbalance of PGP attributed episodes in our comparison and treatment groups stemming from the PGP contamination restriction that was applied only to the potential comparison pool.

For PGP analyses of MJRLE only,

- We created a new comparison group, using identical methods, matching covariates, and caliper selection as our main MJRLE PGP comparison group, that excluded all BPCI Advanced and non-participating PGPs that operated in Metropolitan Statistical Areas (MSAs) that were designated as mandatory participation in the CJR Model in 2016. From this sample of BPCI Advanced and matched comparison PGPs, we also excluded any episodes that were initiated at hospitals that ever participated in the CJR Model, regardless of whether the hospital was participating at the time of the episode.

2. Medicare Program Savings

In this section, we define the outcomes and methodology used to calculate Medicare program savings.

a. Outcomes

Exhibit C.16: Definition of Measures Used in the Analysis of Medicare Program Savings

Measure	Definition
Per-episode Change (or Reduction) in Standardized Payments	A per-episode estimate of the change in Medicare payments attributable to BPCI Advanced using the total payments difference-in-differences (DiD) regression model(s) for a given clinical episode (CE) and episode initiator (EI) type or pooled group of CEs. The payment outcome, total Medicare Part A & B standardized paid amounts, includes all Medicare paid amounts for services that were included and excluded from the bundle during the anchor stay and 90 days post-discharge, and excludes beneficiary cost sharing. We used the 90% (or 95%) confidence interval from this DiD estimate to create upper and lower bound estimates. The DiD estimate and the bounds were multiplied by (-1) so that a positive estimate indicates a **reduction in payments**.
Standardized to Non-standardized Conversion Factor	A ratio of non-standardized to standardized Medicare paid amounts based on BPCI Advanced intervention episodes; specific to the given sample (CE and EI type or pooled group of CEs).
Per-episode Change (or Reduction) in Non-Standardized Payments	The DiD estimate of per-episode change in standardized payments multiplied by the standardized to non-standardized conversion factor. Non-standardized Medicare paid amounts reflect actual payments made from Medicare to providers because they include adjustments for wages, practice expenses, and other initiatives (e.g., medical education).

Measure	Definition
Prorated Number of BPCI Advanced Episodes	For a given CE and EI type or pooled group of CEs, the prorated total number of intervention-period episodes from all Model Years 1 and 2 BPCI Advanced EIs. The counts were calculated by weighting overlapping episodes in our analytic sample to account for when a beneficiary has more than one episode occurring on the same day (across all 32 CEs). Weights were designed to be proportional to the amount of overlap. The prorated number of episodes is used to convert per-episode estimates to aggregate estimates and vice versa.
Aggregate Change (or Reduction) in Non-standardized Payments	The per-episode change in non-standardized payments multiplied by the prorated number of episodes for a given CE and EI type or pooled group of CEs.
Reconciliation Payments	Reconciliation payments are defined as total amounts paid to BPCI Advanced participants by Medicare net of repayments from participants to Medicare. Negative values indicate that more funds have been received by Medicare than paid. For a given sample (CE and EI type or pooled group of CEs), episodes from all BPCI Advanced EIs in Model Years 1 and 2 were included. CE reconciliation payments do not account for several model adjustments that are applied at the EI and convener level (i.e., the stop-loss/stop-gain provision, the Composite Quality Score adjustment, BPCI Advanced recoupment amount, and the post-episode spending repayment amount).
Net Savings to Medicare; Net Medicare Savings; Medicare Program Savings	For a given CE and EI type or pooled group of CEs, the reduction in non-standardized payments less reconciliation payments. A positive value indicates savings; a negative value indicates losses. The terms "net savings", "[net] Medicare savings", and "[net] Medicare program savings" are used interchangeably.
Per-episode Net Savings to Medicare	For a given CE and EI type or pooled group of CEs, the net savings to Medicare divided by the corresponding prorated number of BPCI Advanced episodes.
Net Savings as a % of BPCI Advanced Counterfactual	For a given CE and EI type or pooled group of CEs, net savings as a percentage of what payments would have been absent the BPCI Advanced model. This net savings divided by the counterfactual, which is calculated as the BPCI Advanced baseline mean plus the change in the comparison group (i.e., comparison group intervention minus comparison group baseline).

b. Analytic Methods

Net savings to Medicare was defined as the difference between non-standardized paid amounts and reconciliation payments made to or received from BPCI participants following the general formula: [32,33]

Medicare savings = reduction in non-standardized payments – reconciliation payments

The reduction in non-standardized payments is approximated by multiplying the estimates from the difference-in-differences (DiD) model, which estimates the change in per-episode standardized Medicare paid amounts during the inpatient stay and 90-day PDP, by a standardized to non-standardized conversion factor.[34] The DiD impact estimates were extrapolated to all BPCI Advanced EIs, including EIs that were excluded from our impact analyses because there was not a comparison hospital or PGP inside the selected caliper for our propensity score matching. Sensitivity analyses suggest that this extrapolation was reasonable (see **Appendix G**). For each CE and EI type, the per-episode reduction in standardized payments was multiplied by the number of BPCI Advanced episodes with anchor end dates on or before December 31, 2019. To ensure we did not double-count the impact of the model across CEs, we weighted overlapping episodes, resulting in a prorated number of episodes for each CE and EI type.[35]

Reconciliation payments are payments made to BPCI Advanced participants from Medicare. Participants with intervention episode payments below their target price received the difference as reconciliation payments. Participants with intervention episode payments above their target price repaid the difference to CMS. We used all Model Years 1 and 2 reconciliation data, regardless of which performance period episodes were reconciled in, and aggregated payments across participants to the CE level within each participant type. All reconciliation data used are finalized, second true-up amounts.

To calculate savings for different groups of pooled CEs (i.e., hospital medical CEs, PGP medical CEs, hospital surgical CEs, PGP surgical CEs, all medical CEs, all surgical CEs, and all CEs or total model), we pooled CEs and EI type by estimating each corresponding DiD regression on

[32] Non-standardized paid amounts vary from the standardized allowed amounts that we use in the DiD analyses. We use non-standardized paid amounts for this analysis, which approximate the actual payments made from Medicare to providers incorporating geographic and other payment adjustments and excluding beneficiary cost sharing. We use total Medicare Part A & B standardized paid amounts in the DiD analyses—amounts that exclude payment adjustments and include beneficiary cost sharing—in order to isolate the impact of BPCI Advanced on Medicare payments.

[33] Net savings are reported such that a positive value indicates savings to Medicare and a negative value indicates losses to Medicare. Changes in non-standardized payments and reconciliation payments are reported in this same perspective for consistency.

[34] Non-standardized payments were calculated by applying a ratio of non-standardized to standardized Medicare paid amounts to our DiD impact estimates on standardized Medicare paid amounts. This was performed separately for each CE and EI type.

[35] For example, suppose a beneficiary has a COPD episode from April 1st through July 9th and a CHF episode from May 1st through August 15th. The COPD episode lasts 100 days; for the first 30 days, the beneficiary is only in the COPD episode, and for the subsequent 70 days, the beneficiary is in the two episodes. The prorated value of the COPD episode is therefore 0.65 (i.e., 30/100 from the first 30 days + (70/2)/100 from the overlapping days). The CHF episode lasts 107 days; for the first 70 days, the beneficiary is in the two episodes, and for the subsequent 37 days, the beneficiary is only in the CHF episode. The prorated value of the CHF episode is 0.67 (i.e., (70/2)/107 from the overlap days + 37/107 from the last 37 days).

standardized payments in a seemingly unrelated regression. To account for any overlapping episodes in the regressions, we used episode-level weights for each specific regression sample that account for overlap and multi-way clustering at the provider and beneficiary levels. This allowed us to create ranges (based on the confidence intervals) for the corresponding total reduction in non-standardized spending and Medicare savings that accurately reflected the corresponding sample. Since the weights used to account for overlapping episodes are sample dependent, the estimates of Medicare savings and the components (i.e., the reduction in payments and reconciliation payments) of the subgroups may not directly sum to estimates of the total model. For example, the aggregate Medicare savings estimate for surgical CEs plus the aggregate Medicare savings for medical CEs does not exactly equal the aggregate Medicare savings for the entire model.

For each Medicare savings estimate, we calculated net savings per episode by dividing net savings by the corresponding prorated number of BPCI Advanced episodes. We also represent net savings as a percentage of what payments would have been absent the BPCI Advanced Model. To do this, we first calculated a counterfactual of the BPCI Advanced mean standardized payments by taking the BPCI Advanced risk-adjusted baseline mean and adding the change in the comparison group (comparison group risk-adjusted intervention mean minus comparison group risk-adjusted baseline mean). This gives us an estimate of what standardized payments would have been absent BPCI Advanced. We then converted this counterfactual mean into non-standardized paid amounts by multiplying the counterfactual mean with the corresponding standardized to non-standardized conversion factor. This was then used as a denominator to express per-episode net savings as a percent.

Additional details about these measures and the net savings calculations can be found in Exhibit C.16.

Appendix D: Comparison Group Standardized Differences Tables

The exhibits in this appendix display the standardized differences before and after matching for each variable used to match on for each clinical episode.

Please refer to the following abbreviations, which are used throughout this appendix:

- PCP = primary care provider
- PGP = physician group practice
- CBSA = core-based statistical area
- ESRD = end-stage renal disease
- IP = inpatient
- PAC = post-acute care
- HCC = hierarchical condition category
- NPI = national provider identifier

A. Hospitals

The standardized differences before and after matching tables for the hospital comparison groups can be found in the Second Annual Evaluation Report, **Appendix F**.[1]

B. Physician Group Practices

Comparison groups were constructed for 18 clinical episodes. Other clinical episodes were excluded from the impact analyses due to small sample size. The tables below list the standardized differences before and after matching for each variable used to match on for each clinical episode.

Exhibit D.1: Standardized Differences of Matching Variables Before and After Matching, PGPs, Acute Myocardial Infarction

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	0.03	-0.09
PCPs per 10,000 in Market	-0.39	-0.12
PGP in Multiple CBSAs	0.73	0.00
Urban	-0.03	0.04
Clinical Episode Shell Volume	0.57	0.01
PGP Market Share (Clinical Episode-specific)	0.15	0.24
Dual Eligible (%)	0.07	0.08
Percent Female (%)	0.16	0.06
Percent White (%)	-0.11	0.02
Percent Black or African American (%)	0.05	0.00
Percent Over 80 Years Old (%)	0.08	-0.12
Percent Disabled, No ESRD (%)	0.03	0.22
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	0.20	0.00
Institutional PAC - Average	0.17	-0.15
Institutional PAC - Slope	-0.04	0.02
Standardized Part A&B Payment - Average	0.31	0.01
Standardized Part A&B Payment – Change	-0.03	0.01
HCC Score	0.10	0.07
Number of Hospitals - 3+	0.78	-0.21
Part of Health System	-0.61	-0.17
Number of NPIs - Small	-0.43	-0.20
Number of NPIs - Large	0.50	0.00

[1] Centers for Medicare & Medicaid Services Bundled Payments for Care Improvement Advanced Model: Year 2 Evaluation Report - Appendices. F1-F27. Available for download at https://innovation.cms.gov/data-and-reports/2021/bpci-yr2-annual-report-appendices.

Exhibit D.2: Standardized Differences of Matching Variables Before and After Matching, PGPs, Cellulitis

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.17	-0.09
PCPs per 10,000 in Market	-0.14	0.08
PGP in Multiple CBSAs	1.32	-0.06
Urban	0.05	-0.07
Clinical Episode Shell Volume	0.74	0.11
PGP Market Share (Clinical Episode-specific)	0.45	0.11
Dual Eligible (%)	-0.04	0.04
Percent Female (%)	-0.06	-0.04
Percent White (%)	0.15	-0.09
Percent Black or African American (%)	-0.16	0.10
Percent Over 80 Years Old (%)	-0.15	-0.19
Percent Disabled, No ESRD (%)	-0.04	0.18
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.15	-0.16
Institutional PAC - Average	0.12	-0.06
Institutional PAC - Slope	0.22	0.16
Standardized Part A&B Payment - Average	0.18	0.02
Standardized Part A&B Payment – Change	-0.06	0.00
HCC Score	-0.23	0.07
Number of Hospitals - 3+	0.71	-0.05
Part of Health System	-0.53	0.05
Number of NPIs - Small	-0.48	0.08
Number of NPIs - Large	0.79	0.09

Exhibit D.3: Standardized Differences of Matching Variables Before and After Matching, PGPs, Cervical Spinal Fusion

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.08	0.14
PGP in Multiple CBSAs	0.22	-0.18
Urban	0.00	0.00
Clinical Episode Shell Volume	0.44	0.07
Dual Eligible (%)	-0.53	0.03
Percent Female (%)	0.15	-0.01
Percent White (%)	0.22	0.02
Percent Black or African American (%)	-0.05	-0.02
Percent Over 80 Years Old (%)	-0.10	0.02
Percent Disabled, No ESRD (%)	-0.33	0.12
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.25	0.20
Institutional PAC - Average	-0.22	0.09
Institutional PAC - Slope	-0.04	0.12
Mortality Rate 90-Day - Average	0.05	0.03
Mortality Rate 90-Day - Change	-0.09	-0.07
Standardized Part A&B Payment - Average	-0.28	0.12
Standardized Part A&B Payment – Change	-0.12	0.04
Readmission Rate 90-Day – Average	0.01	0.22
Readmission Rate 90-Day – Change	-0.03	0.10
HCC Score	-0.51	0.06
Number of Hospitals - 3+	0.55	0.07
Part of Health System	-0.81	-0.10
Number of NPIs - Small	-0.22	0.09
Number of NPIs - Large	0.23	0.21

Exhibit D.4: Standardized Differences of Matching Variables Before and After Matching, PGPs, Chronic Obstructive Pulmonary Disease, Bronchitis, Asthma

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.19	-0.07
PGP in Multiple CBSAs	1.26	0.07
Urban	0.16	-0.04
Clinical Episode Shell Volume	0.95	0.02
Dual Eligible (%)	-0.16	-0.06
Percent Female (%)	-0.14	-0.07
Percent White (%)	0.09	0.03
Percent Hispanic (%)	0.12	-0.15
Percent Black or African American (%)	-0.13	-0.04
Percent Over 80 Years Old (%)	-0.04	-0.14
Percent Disabled, No ESRD (%)	-0.12	0.09
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.34	-0.14
Institutional PAC - Average	-0.21	-0.12
Institutional PAC - Slope	-0.03	-0.10
Mortality Rate 90-Day - Average	0.10	0.14
Mortality Rate 90-Day - Change	0.00	0.20
Standardized Part A&B Payment - Average	0.07	-0.03
Standardized Part A&B Payment – Change	-0.07	-0.15
Readmission Rate 90-Day – Average	-0.19	-0.03
Readmission Rate 90-Day – Change	-0.03	-0.19
HCC Score	-0.11	-0.14
Number of Hospitals - 3+	0.99	-0.03
Part of Health System	-0.14	0.07
Number of NPIs - Small	0.00	0.00
Number of NPIs - Large	1.12	0.04

Exhibit D.5: Standardized Differences of Matching Variables Before and After Matching, PGPs, Congestive Heart Failure

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.27	0.15
PGP in Multiple CBSAs	1.34	0.15
Urban	0.04	0.00
Clinical Episode Shell Volume	1.17	0.08
Dual Eligible (%)	-0.11	-0.13
Percent Female (%)	-0.17	0.00
Percent White (%)	0.10	0.08
Percent Hispanic (%)	-0.06	0.11
Percent Black or African American (%)	-0.07	-0.07
Percent Over 80 Years Old (%)	-0.16	0.16
Percent Disabled, No ESRD (%)	0.16	-0.11
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.34	-0.09
Institutional PAC - Average	-0.10	0.04
Institutional PAC - Slope	0.08	0.01
Mortality Rate 90-Day - Average	-0.06	-0.05
Mortality Rate 90-Day - Change	-0.05	0.02
Standardized Part A&B Payment - Average	0.06	-0.03
Standardized Part A&B Payment – Change	-0.07	-0.12
Readmission Rate 90-Day – Average	-0.17	-0.04
Readmission Rate 90-Day – Change	-0.20	-0.06
HCC Score	-0.23	-0.18
Number of Hospitals - 3+	1.12	0.14
Part of Health System	0.10	-0.16
Number of NPIs - Small	-0.75	0.00
Number of NPIs - Large	1.48	-0.14

Exhibit D.6: Standardized Differences of Matching Variables Before and After Matching, PGPs, Gastrointestinal Hemorrhage

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.22	-0.01
PGP in Multiple CBSAs	1.36	0.14
Urban	0.10	-0.06
Clinical Episode Shell Volume	0.64	0.16
Dual Eligible (%)	0.01	0.01
Percent Female (%)	0.07	-0.02
Percent White (%)	-0.03	-0.03
Percent Hispanic (%)	0.09	-0.09
Percent Black or African American (%)	0.02	0.14
Percent Over 80 Years Old (%)	-0.25	0.09
Percent Disabled, No ESRD (%)	0.16	0.00
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	0.09	-0.12
Institutional PAC - Average	-0.03	0.10
Institutional PAC - Slope	0.06	-0.02
Mortality Rate 90-Day - Average	0.39	-0.19
Mortality Rate 90-Day - Change	0.10	-0.21
Standardized Part A&B Payment - Average	0.20	-0.14
Standardized Part A&B Payment – Change	0.08	0.05
Readmission Rate 90-Day – Average	-0.04	-0.15
Readmission Rate 90-Day – Change	0.03	0.14
HCC Score	-0.03	-0.24
Number of Hospitals - 3+	1.18	0.00
Part of Health System	-0.25	0.13
Number of NPIs - Small	-0.57	-0.24
Number of NPIs - Large	0.49	0.00

Exhibit D.7: Standardized Differences of Matching Variables Before and After Matching, PGPs, Gastrointestinal Obstruction

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.01	0.03
PCPs per 10,000 in Market	-0.28	0.06
PGP in Multiple CBSAs	0.91	0.09
Urban	0.14	-0.25
Clinical Episode Shell Volume	0.56	0.02
PGP Market Share (Clinical Episode-specific)	0.04	0.21
Dual Eligible (%)	-0.08	0.14
Percent Female (%)	-0.11	-0.14
Percent White (%)	0.01	0.06
Percent Black or African American (%)	0.05	-0.07
Percent Over 80 Years Old (%)	0.03	0.15
Percent Disabled, No ESRD (%)	-0.13	0.01
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.16	-0.14
Institutional PAC - Average	0.18	-0.02
Institutional PAC - Slope	-0.11	-0.11
Standardized Part A&B Payment - Average	0.16	-0.09
Standardized Part A&B Payment – Change	-0.06	-0.21
HCC Score	-0.15	0.03
Number of Hospitals - 3+	0.71	0.00
Part of Health System	-0.51	0.00
Number of NPIs - Small	-0.48	-0.07
Number of NPIs - Large	0.44	0.00

Exhibit D.8: Standardized Differences of Matching Variables Before and After Matching, PGPs, Hip & Femur Procedures Except Major Joint

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.11	-0.05
PGP in Multiple CBSAs	0.48	0.08
Urban	0.26	-0.07
Clinical Episode Shell Volume	1.09	0.11
PGP Market Share (Clinical Episode-specific)	0.21	0.15
Dual Eligible (%)	-0.33	0.13
Percent Female (%)	0.07	0.01
Percent White (%)	0.20	0.02
Percent Black or African American (%)	-0.02	0.05
Percent Over 80 Years Old (%)	-0.01	-0.04
Percent Disabled, No ESRD (%)	-0.14	0.18
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.04	0.02
Institutional PAC - Average	-0.19	0.00
Institutional PAC - Slope	-0.01	0.01
Mortality Rate 90-Day - Average	0.10	0.06
Mortality Rate 90-Day - Change	0.15	0.07
Standardized Part A&B Payment - Average	-0.03	0.01
Standardized Part A&B Payment – Change	-0.12	0.05
Readmission Rate 90-Day – Average	0.03	0.01
Readmission Rate 90-Day – Change	-0.03	0.08
HCC Score	-0.25	0.05
Number of Hospitals - 3+	0.65	0.18
Part of Health System	-0.58	0.03
Number of NPIs - Small	-0.70	-0.15
Number of NPIs - Large	0.95	-0.02

Exhibit D.9: Standardized Differences of Matching Variables Before and After Matching, PGPs, Lower Extremity and Humerus Procedure Except Hip, Foot, Femur

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	0.14	-0.06
PGP in Multiple CBSAs	0.48	0.00
Urban	0.28	0.13
Clinical Episode Shell Volume	0.66	0.13
Dual Eligible (%)	-0.38	0.10
Percent Female (%)	0.39	-0.03
Percent White (%)	0.22	0.02
Percent Hispanic (%)	-0.05	-0.06
Percent Black or African American (%)	-0.15	0.08
Percent Over 80 Years Old (%)	-0.10	-0.10
Percent Disabled, No ESRD (%)	-0.38	0.05
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.03	0.14
Institutional PAC - Average	0.29	-0.11
Institutional PAC - Slope	0.12	0.12
Mortality Rate 90-Day - Average	0.05	-0.14
Mortality Rate 90-Day - Change	-0.04	-0.19
Standardized Part A&B Payment - Average	0.13	-0.08
Standardized Part A&B Payment – Change	0.21	0.09
Readmission Rate 90-Day – Average	-0.12	-0.10
Readmission Rate 90-Day – Change	0.16	-0.18
HCC Score	-0.23	0.12
Number of Hospitals - 3+	0.76	-0.10
Part of Health System	-0.90	-0.13
Number of NPIs - Small	-0.02	0.00
Number of NPIs - Large	0.52	0.10

Exhibit D.10: Standardized Differences of Matching Variables Before and After Matching, PGPs, Major Joint Replacement of the Lower Extremity

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	0.18	-0.09
PCPs per 10,000 in Market	0.10	-0.09
PGP in Multiple CBSAs	0.32	0.07
Urban	0.44	-0.02
Clinical Episode Shell Volume	0.83	0.18
PGP Market Share (Clinical Episode-specific)	0.04	0.12
Dual Eligible (%)	-0.28	-0.02
Percent Female (%)	-0.05	-0.04
Percent White (%)	0.06	0.03
Percent Black or African American (%)	0.01	-0.03
Percent Over 80 Years Old (%)	-0.10	-0.01
Percent Disabled, No ESRD (%)	-0.30	-0.05
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.07	-0.02
Institutional PAC - Average	-0.04	0.02
Institutional PAC - Slope	-0.23	0.08
Standardized Part A&B Payment - Average	-0.10	0.00
Standardized Part A&B Payment – Change	-0.16	0.01
HCC Score	-0.10	-0.04
Number of Hospitals - 3+	0.68	0.12
Part of Health System	-0.49	0.00
Number of NPIs - Small	-0.56	0.02
Number of NPIs - Large	0.83	0.08

Exhibit D.11: Standardized Differences of Matching Variables Before and After Matching, PGPs, Major Joint Replacement of the Upper Extremity

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	0.02	-0.10
PGP in Multiple CBSAs	0.16	0.00
Urban	0.33	0.06
Clinical Episode Shell Volume	0.85	0.08
Dual Eligible (%)	-0.40	0.00
Percent Female (%)	0.08	-0.10
Percent White (%)	0.02	0.11
Percent Black or African American (%)	0.06	-0.08
Percent Over 80 Years Old (%)	-0.17	-0.07
Percent Disabled, No ESRD (%)	-0.31	0.00
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.24	-0.03
Institutional PAC - Average	-0.01	0.00
Institutional PAC - Slope	0.08	-0.03
Mortality Rate 90-Day - Average	-0.15	-0.01
Mortality Rate 90-Day - Change	-0.07	0.03
Standardized Part A&B Payment - Average	-0.09	-0.04
Standardized Part A&B Payment – Change	0.12	0.03
Readmission Rate 90-Day – Average	-0.21	0.01
Readmission Rate 90-Day – Change	0.07	-0.01
HCC Score	-0.42	-0.12
Number of Hospitals - 3+	0.54	0.19
Part of Health System	-0.91	-0.13
Number of NPIs - Small	-0.68	0.06
Number of NPIs - Large	0.83	0.14

Exhibit D.12: Standardized Differences of Matching Variables Before and After Matching, PGPs, Percutaneous Coronary Intervention (Inpatient)

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	0.20	-0.01
PGP in Multiple CBSAs	0.71	0.00
Urban	-0.11	0.07
Clinical Episode Shell Volume	0.52	-0.21
Dual Eligible (%)	0.09	-0.08
Percent Female (%)	0.19	-0.02
Percent White (%)	-0.07	-0.03
Percent Black or African American (%)	-0.06	0.07
Percent Over 80 Years Old (%)	0.33	0.05
Percent Disabled, No ESRD (%)	-0.23	0.03
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	0.11	0.03
Institutional PAC - Average	0.28	0.11
Institutional PAC - Slope	0.18	-0.03
Mortality Rate 90-Day - Average	0.10	0.04
Mortality Rate 90-Day - Change	-0.17	0.04
Standardized Part A&B Payment - Average	0.33	0.19
Standardized Part A&B Payment – Change	-0.15	0.15
Readmission Rate 90-Day – Average	0.08	0.12
Readmission Rate 90-Day – Change	0.02	0.07
HCC Score	0.04	-0.18
Number of Hospitals - 3+	0.79	0.05
Part of Health System	-0.48	-0.17
Number of NPIs - Small	-0.30	-0.07
Number of NPIs - Large	0.28	-0.21

Exhibit D.13: Standardized Differences of Matching Variables Before and After Matching, PGPs, Renal Failure

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.15	-0.14
PCPs per 10,000 in Market	-0.36	-0.02
PGP in Multiple CBSAs	0.98	0.08
Urban	-0.10	-0.05
Clinical Episode Shell Volume	0.72	-0.09
PGP Market Share (Clinical Episode-specific)	0.39	0.10
Dual Eligible (%)	0.02	0.12
Percent Female (%)	0.00	0.06
Percent White (%)	0.05	-0.19
Percent Black or African American (%)	-0.06	0.08
Percent Over 80 Years Old (%)	-0.02	-0.14
Percent Disabled, No ESRD (%)	0.04	0.17
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.45	-0.07
Institutional PAC - Average	-0.03	0.03
Institutional PAC - Slope	0.06	0.25
Standardized Part A&B Payment - Average	0.02	-0.04
Standardized Part A&B Payment – Change	0.01	0.19
HCC Score	-0.33	0.02
Number of Hospitals - 3+	0.62	0.11
Part of Health System	-0.34	-0.12
Number of NPIs - Small	-0.68	-0.09
Number of NPIs - Large	0.68	-0.04

Exhibit D.14: Standardized Differences of Matching Variables Before and After Matching, PGPs, Sepsis

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.17	0.25
PGP in Multiple CBSAs	1.34	0.10
Urban	-0.12	0.09
Clinical Episode Shell Volume	1.18	0.12
Dual Eligible (%)	0.01	0.03
Percent Female (%)	0.28	-0.04
Percent White (%)	-0.12	0.02
Percent Black or African American (%)	0.06	-0.09
Percent Over 80 Years Old (%)	0.12	0.03
Percent Disabled, No ESRD (%)	-0.11	0.02
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.49	0.14
Institutional PAC - Average	-0.25	-0.01
Institutional PAC - Slope	0.02	0.02
Mortality Rate 90-Day - Average	-0.25	0.10
Mortality Rate 90-Day - Change	-0.06	0.03
Standardized Part A&B Payment - Average	-0.29	0.12
Standardized Part A&B Payment – Change	-0.15	-0.21
Readmission Rate 90-Day – Average	-0.40	0.01
Readmission Rate 90-Day – Change	-0.11	-0.09
HCC Score	-0.45	0.13
Number of Hospitals - 3+	1.14	0.18
Part of Health System	-0.24	-0.04
Number of NPIs - Small	-0.86	0.00
Number of NPIs - Large	1.21	0.15

Exhibit D.15: Standardized Differences of Matching Variables Before and After Matching, PGPs, Simple Pneumonia and Respiratory Infections

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.27	-0.14
PCPs per 10,000 in Market	-0.19	-0.11
PGP in Multiple CBSAs	1.47	0.09
Urban	-0.02	-0.09
Clinical Episode Shell Volume	0.95	0.06
PGP Market Share (Clinical Episode-specific)	0.53	0.08
Dual Eligible (%)	-0.12	0.10
Percent Female (%)	-0.11	-0.10
Percent White (%)	-0.11	0.05
Percent Black or African American (%)	0.06	0.13
Percent Over 80 Years Old (%)	-0.03	-0.15
Percent Disabled, No ESRD (%)	-0.11	0.09
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.41	-0.11
Institutional PAC - Average	-0.19	-0.01
Institutional PAC - Slope	-0.10	-0.08
Standardized Part A&B Payment - Average	-0.20	0.01
Standardized Part A&B Payment – Change	-0.03	-0.06
HCC Score	-0.34	-0.03
Number of Hospitals - 3+	0.97	0.08
Part of Health System	-0.11	-0.07
Number of NPIs - Small	-0.78	0.00
Number of NPIs - Large	1.16	-0.04

Exhibit D.16: Standardized Differences of Matching Variables Before and After Matching, PGPs, Spinal Fusion (Non-cervical)

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.10	-0.12
PGP in Multiple CBSAs	0.03	-0.05
Urban	0.09	0.11
Clinical Episode Shell Volume	0.68	0.04
Dual Eligible (%)	-0.45	-0.14
Percent Female (%)	0.16	-0.15
Percent White (%)	0.03	-0.01
Percent Hispanic (%)	-0.32	0.10
Percent Black or African American (%)	0.22	-0.03
Percent Over 80 Years Old (%)	-0.01	0.04
Percent Disabled, No ESRD (%)	-0.40	-0.10
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.41	-0.08
Institutional PAC - Average	0.04	0.00
Institutional PAC - Slope	-0.20	0.16
Mortality Rate 90-Day - Average	-0.28	0.11
Mortality Rate 90-Day - Change	-0.05	-0.14
Standardized Part A&B Payment - Average	-0.22	-0.06
Standardized Part A&B Payment – Change	-0.10	0.17
Readmission Rate 90-Day – Average	-0.18	0.06
Readmission Rate 90-Day – Change	-0.05	0.10
HCC Score	-0.44	-0.06
Number of Hospitals - 3+	0.41	0.14
Part of Health System	-0.59	0.00
Number of NPIs - Small	-0.49	-0.04
Number of NPIs - Large	0.70	0.07

Exhibit D.17: Standardized Differences of Matching Variables Before and After Matching, PGPs, Stroke

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.26	0.06
PGP in Multiple CBSAs	1.05	0.12
Urban	0.00	0.10
Clinical Episode Shell Volume	0.62	-0.06
PGP Market Share (Clinical Episode-specific)	0.44	-0.08
Dual Eligible (%)	-0.12	0.00
Percent Female (%)	-0.03	-0.04
Percent White (%)	0.07	-0.03
Percent Black or African American (%)	-0.14	0.05
Percent Over 80 Years Old (%)	-0.11	-0.04
Percent Disabled, No ESRD (%)	-0.04	-0.04
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.24	-0.16
Institutional PAC - Average	-0.04	0.02
Institutional PAC - Slope	0.00	0.22
Mortality Rate 90-Day - Average	-0.04	0.18
Mortality Rate 90-Day - Change	0.11	-0.08
Standardized Part A&B Payment - Average	-0.21	0.23
Standardized Part A&B Payment – Change	0.02	0.08
Readmission Rate 90-Day – Average	-0.22	0.11
Readmission Rate 90-Day – Change	-0.04	-0.07
HCC Score	-0.22	-0.01
Number of Hospitals - 3+	0.86	0.07
Part of Health System	-0.30	-0.04
Number of NPIs - Small	-0.75	-0.22
Number of NPIs - Large	0.73	-0.07

Exhibit D.18: Standardized Differences of Matching Variables Before and After Matching, PGPs, Urinary Tract Infection

Variable	Standardized Difference Before Matching	Standardized Difference After Matching
Population - Continuous	-0.21	0.05
PGP in Multiple CBSAs	1.29	0.04
Urban	0.03	-0.23
Clinical Episode Shell Volume	0.84	0.00
PGP Market Share (Clinical Episode-specific)	0.46	0.17
Dual Eligible (%)	-0.10	0.23
Percent Female (%)	0.00	0.02
Percent White (%)	0.10	-0.18
Percent Black or African American (%)	-0.10	0.12
Percent Over 80 Years Old (%)	-0.05	0.07
Percent Disabled, No ESRD (%)	-0.06	-0.04
Hybrid Episode Shells with IP Stay in 180 Days Before Episode (%)	-0.41	-0.14
Institutional PAC - Average	-0.09	0.03
Institutional PAC - Slope	0.01	-0.04
Mortality Rate 90-Day - Average	0.28	0.04
Mortality Rate 90-Day - Change	-0.13	0.04
Standardized Part A&B Payment - Average	-0.09	0.12
Standardized Part A&B Payment – Change	0.18	0.00
Readmission Rate 90-Day – Average	-0.25	-0.14
Readmission Rate 90-Day – Change	0.09	-0.07
HCC Score	-0.34	-0.12
Number of Hospitals - 3+	0.80	-0.03
Part of Health System	-0.25	-0.13
Number of NPIs - Small	-0.72	-0.07
Number of NPIs - Large	0.91	-0.03

Appendix E: Tables of Impact Estimate Results

The following tables display the difference-in-differences results for all payment, utilization, and quality measures assessed in this report. Results are presented by clinical episode and pooled across clinical episodes. In all exhibits, the main impact estimates that are statistically significant at the 1%, 5% or 10% significance level are indicated by brown, medium orange, and light orange shaded cells, respectively. Medicare payments were risk-adjusted and standardized to remove the effects of geographic differences in wages, extra amounts to account for teaching programs and other policy factors. All results are based on the BPCI Advanced evaluation team's analysis of Medicare claims and enrollment data for episodes with anchor stays/procedures beginning April 1, 2013 and ending on or before December 31, 2017 (baseline period) and episodes with anchor stays/procedures beginning October 1, 2018 and ending on or before December 31, 2019 (intervention period) for BPCI Advanced EIs and matched comparison providers.

Please refer to the following abbreviations, which are used throughout this appendix:

- DiD = difference-in-differences
- LCI = lower confidence interval at the 95% and 90% level
- UCI = upper confidence interval at the 95% and 90% level
- CE = clinical episode
- EI = episode initiator
- PDP = post-anchor/procedure discharge period
- PAC = post-acute care
- SNF = skilled nursing facility
- IRF = inpatient rehabilitation facility
- HH = home health
- Adv = advanced
- Int = intervention
- Comp = comparison
- ‡ = denotes results where we reject the null hypothesis that BPCI Advanced and matched comparison providers had parallel trends in the baseline period for this outcome at the 10% level of significance

A. Pooled Estimates

Exhibit E.1: Model Impact of BPCI Advanced on All Clinical Episodes for Total Allowed Payment Amount, Inpatient Through 90-day PDP, BPCI Advanced Hospitals and PGPs, October 1, 2018 – December 31, 2019

CE Type and EI Type	# of BPCI Adv Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI
All CEs Pooled	500,687	$27,010	$26,321	$26,690	$26,744	-$743	0.00	-$882	-$603	-$860	-$626
Medical CEs	386,825	$26,160	$25,919	$25,859	$26,182	-$564	0.00	-$724	-$404	-$698	-$430
Hospitals	305,272	$26,589	$26,321	$26,319	$26,604	-$553	0.00	-$732	-$375	-$703	-$404
PGPs	106,115	$24,970	$24,773	$24,696	$24,994	-$495	0.00	-$836	-$154	-$781	-$209
Surgical CEs	115,416	$30,078	$27,876	$29,659	$28,810	-$1,353	0.00	-$1,607	-$1,099	-$1,567	-$1,140
Hospitals	37,650	$30,700	$28,716	$29,718	$28,990	-$1,256	0.00	-$1,653	-$858	-$1,589	-$922
PGPs	84,256	$29,987	$27,625	$29,773	$28,831	-$1,420	0.00	-$1,741	-$1,099	-$1,690	-$1,151

Exhibit E.2: Model Impact of BPCI Advanced on All Clinical Episodes for Total Allowed Payment Amount, Inpatient Through 90-day PDP, BPCI Advanced Hospitals and PGPs, as a Percentage of Baseline Mean, October 1, 2018 – December 31, 2019

CE Type and EI Type	Number of BPCI Advanced Intervention Episodes	DiD as a Percentage of Baseline Mean	95% LCI	95% UCI	90% LCI	90% UCI
All CEs Pooled	500,687	-2.7%	-3.3%	-2.2%	-3.2%	-2.3%
Medical CEs	386,825	-2.2%	-2.8%	-1.5%	-2.7%	-1.6%
Hospitals	305,272	-2.1%	-2.8%	-1.4%	-2.6%	-1.5%
PGPs	106,115	-2.0%	-3.3%	-0.6%	-3.1%	-0.8%
Surgical CEs	115,416	-4.5%	-5.3%	-3.7%	-5.2%	-3.8%
Hospitals	37,650	-4.1%	-5.4%	-2.8%	-5.2%	-3.0%
PGPs	84,256	-4.7%	-5.8%	-3.7%	-5.6%	-3.8%

Exhibit E.3: Model Impact of BPCI Advanced on All Clinical Episodes for Unplanned Readmissions Through 90-day PDP, BPCI Advanced Hospitals and PGPs, October 1, 2018 – December 31, 2019

CE Type and EI Type	# of BPCI Adv Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI
All CEs Pooled	497,402	28.2%	27.2%	28.1%	27.3%	-0.19 pp	0.14	-0.45 pp	0.06 pp	-0.41 pp	0.02 pp
Medical CEs	383,282	32.4%	31.4%	32.4%	31.4%	-0.08 pp	0.55	-0.36 pp	0.19 pp	-0.31 pp	0.15 pp
Hospitals	302,442	32.9%	31.8%	32.7%	31.8%	-0.05 pp	0.73	-0.35 pp	0.25 pp	-0.31 pp	0.20 pp
PGPs	105,240	31.0%	30.1%	31.5%	30.4%	0.19 pp	0.50	-0.36 pp	0.74 pp	-0.27 pp	0.65 pp
Surgical CEs	115,671	14.0%	13.1%	13.7%	13.4%	-0.57 pp	0.07	-1.19 pp	0.05 pp	-1.09 pp	-0.05 pp
Hospitals	37,640	14.7%	14.0%	14.4%	14.3%	-0.63 pp	0.18	-1.56 pp	0.29 pp	-1.41 pp	0.14 pp
PGPs	84,518	13.6%	12.6%	13.2%	12.9%	-0.74 pp	0.08	-1.56 pp	0.08 pp	-1.43 pp	-0.05 pp

Exhibit E.4: Model Impact of BPCI Advanced on All Clinical Episodes for Unplanned Readmissions Through 90-day PDP, as a Percentage of the Baseline Mean, BPCI Advanced Hospitals and PGPs, October 1, 2018 – December 31, 2019

CE Type and EI Type	Number of BPCI Advanced Intervention Episodes	DiD as a Percentage of Baseline Mean	95% LCI	95% UCI	90% LCI	90% UCI
All CEs Pooled	497,402	-0.7%	-1.6%	0.2%	-1.4%	0.1%
Medical CEs	383,282	-0.3%	-1.1%	0.6%	-1.0%	0.4%
Hospitals	302,442	-0.2%	-1.1%	0.8%	-0.9%	0.6%
PGPs	105,240	0.6%	-1.2%	2.4%	-0.9%	2.1%
Surgical CEs	115,671	-4.1%	-8.5%	0.4%	-7.8%	-0.4%
Hospitals	37,640	-4.3%	-10.6%	2.0%	-9.6%	1.0%
PGPs	84,518	-5.4%	-11.5%	0.6%	-10.5%	-0.4%

Exhibit E.5: Model Impact of BPCI Advanced on All Clinical Episodes for Mortality Through 90-day PDP, BPCI Advanced Hospitals and PGPs, October 1, 2018 – December 31, 2019

CE Type and EI Type	# of BPCI Adv Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI
All CEs Pooled	492,425	12.8%	11.3%	12.7%	11.2%	0.05 pp	0.56	-0.13 pp	0.24 pp	-0.10 pp	0.21 pp
Medical CEs	379,011	15.6%	13.8%	15.5%	13.6%	0.08 pp	0.49	-0.15 pp	0.31 pp	-0.11 pp	0.28 pp
Hospitals	299,007	15.8%	14.0%	15.7%	13.8%	0.06 pp	0.63	-0.20 pp	0.32 pp	-0.15 pp	0.28 pp
PGPs	104,082	14.8%	13.2%	14.9%	13.3%	0.02 pp	0.93	-0.44 pp	0.48 pp	-0.37 pp	0.41 pp
Surgical CEs	114,940	3.3%	2.7%	3.2%	2.6%	-0.03 pp	0.68	-0.18 pp	0.12 pp	-0.16 pp	0.09 pp
Hospitals	37,324	3.9%	3.2%	3.7%	3.1%	-0.10 pp	0.50	-0.38 pp	0.19 pp	-0.34 pp	0.14 pp
PGPs	84,037	3.0%	2.4%	2.9%	2.4%	-0.01 pp	0.93	-0.18 pp	0.16 pp	-0.15 pp	0.14 pp

Exhibit E.6: Model Impact of BPCI Advanced on All Clinical Episodes for Mortality Through 90-day PDP, as a Percentage of Baseline Mean, BPCI Advanced Hospitals and PGPs, October 1, 2018 – December 31, 2019

CE Type and EI Type	Number of BPCI Advanced Intervention Episodes	DiD as a Percentage of Baseline Mean	95% LCI	95% UCI	90% LCI	90% UCI
All CEs Pooled	492,425	0.4%	-1.0%	1.9%	-0.8%	1.6%
Medical CEs	379,011	0.5%	-1.0%	2.0%	-0.7%	1.8%
Hospitals	299,007	0.4%	-1.2%	2.0%	-1.0%	1.8%
PGPs	104,082	0.1%	-3.0%	3.3%	-2.5%	2.8%
Surgical CEs	114,940	-1.0%	-5.6%	3.6%	-4.8%	2.9%
Hospitals	37,324	-2.5%	-9.8%	4.8%	-8.6%	3.6%
PGPs	84,037	-0.3%	-6.1%	5.5%	-5.1%	4.6%

B. Hospital Clinical Episodes

Exhibit E.7: Impact of BPCI Advanced on Acute Myocardial Infarction Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	14,211	15,004	$26,985	$26,926	$26,547	$26,701	-$213‡	0.46	-$785	$359	-$693	$267	-0.8%
Total paid payment amount, inpatient through 90-day PDP	14,211	15,004	$23,861	$23,802	$23,461	$23,558	-$155‡	0.56	-$672	$362	-$589	$279	-0.7%
Patients discharged to institutional PAC	14,211	15,004	24.0%	21.0%	23.5%	20.8%	-0.28 pp	0.64	-1.5 pp	0.9 pp	-1.3 pp	0.7 pp	-1.2%
Unplanned readmission rate, 90-day PDP	13,987	14,803	36.4%	35.4%	35.5%	34.0%	0.57 pp	0.39	-0.7 pp	1.9 pp	-0.5 pp	1.7 pp	1.6%
All-cause mortality rate, 90-day PDP	13,845	14,694	18.1%	16.5%	18.4%	16.2%	0.60 pp	0.23	-0.4 pp	1.6 pp	-0.2 pp	1.4 pp	3.3%
Number of days at a SNF (minimum one day), 90-day PDP	3,569	3,525	31.7	27.4	31.8	29.6	-2.0‡	0.00	-3.2	-0.8	-3.0	-1.0	-6.3%
Part A SNF allowed payment amount, 90-day PDP	14,211	15,004	$4,390	$3,731	$4,254	$3,968	-$373‡	0.00	-$632	-$114	-$590	-$156	-8.5%
Part A IRF allowed payment amount, 90-day PDP	14,211	15,004	$659	$721	$632	$650	$44	0.51	-$88	$176	-$67	$155	6.7%
Part A HH allowed payment amount, 90-day PDP	14,211	15,004	$1,152	$1,158	$1,121	$1,122	$5‡	0.84	-$46	$56	-$37	$48	0.5%

Exhibit E.8: Impact of BPCI Advanced on Cardiac Arrhythmia Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	24,309	26,567	$19,274	$19,653	$19,046	$19,754	-$329	0.06	-$678	$20	-$622	-$36	-1.7%
Total paid payment amount, inpatient through 90-day PDP	24,309	26,567	$16,529	$16,784	$16,314	$16,838	-$268	0.09	-$582	$46	-$532	-$5	-1.6%
Patients discharged to institutional PAC	24,309	26,567	15.1%	13.7%	14.8%	13.8%	-0.34 pp	0.33	-1.0 pp	0.3 pp	-0.9 pp	0.2 pp	-2.2%
Unplanned readmission rate, 90-day PDP	24,056	26,323	31.3%	29.4%	30.7%	29.5%	-0.66 pp	0.18	-1.6 pp	0.3 pp	-1.5 pp	0.1 pp	-2.1%
All-cause mortality rate, 90-day PDP	23,944	26,188	8.6%	7.9%	8.8%	8.0%	0.02 pp	0.93	-0.5 pp	0.5 pp	-0.4 pp	0.4 pp	0.3%
Number of days at a SNF (minimum one day), 90-day PDP	4,114	4,329	32.5	27.9	33.3	30.4	-1.7	0.00	-2.8	-0.6	-2.6	-0.8	-5.2%
Part A SNF allowed payment amount, 90-day PDP	24,309	26,567	$3,060	$2,597	$2,983	$2,765	-$245‡	0.00	-$414	-$76	-$386	-$103	-8.0%
Part A IRF allowed payment amount, 90-day PDP	24,309	26,567	$528	$617	$533	$587	$36	0.38	-$44	$115	-$31	$102	6.8%
Part A HH allowed payment amount, 90-day PDP	24,309	26,567	$1,013	$997	$959	$939	$4	0.81	-$32	$40	-$26	$34	0.4%

Exhibit E.9: Impact of BPCI Advanced on Chronic Obstructive Pulmonary Disease Episodes, Bronchitis, Asthma, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	24,352	25,200	$20,637	$20,558	$20,139	$20,300	-$239	0.18	-$590	$112	-$534	$55	-1.2%
Total paid payment amount, inpatient through 90-day PDP	24,352	25,200	$17,916	$17,833	$17,454	$17,553	-$182	0.25	-$495	$130	-$445	$80	-1.0%
Patients discharged to institutional PAC	24,352	25,200	16.2%	13.9%	14.9%	13.1%	-0.51 pp	0.24	-1.3 pp	0.3 pp	-1.2 pp	0.2 pp	-3.1%
Unplanned readmission rate, 90-day PDP	24,014	24,910	36.0%	34.8%	35.8%	34.2%	0.31 pp	0.53	-0.7 pp	1.3 pp	-0.5 pp	1.1 pp	0.9%
All-cause mortality rate, 90-day PDP	23,788	24,700	8.4%	6.9%	8.3%	6.9%	-0.09 pp	0.72	-0.6 pp	0.4 pp	-0.5 pp	0.3 pp	-1.1%
Number of days at a SNF (minimum one day), 90-day PDP	4,637	4,253	30.7	27.6	31.6	29.8	-1.3‡	0.05	-2.6	0.0	-2.4	-0.2	-4.2%
Part A SNF allowed payment amount, 90-day PDP	24,352	25,200	$3,130	$2,757	$2,951	$2,722	-$143	0.21	-$368	$81	-$332	$45	-4.6%
Part A IRF allowed payment amount, 90-day PDP	24,352	25,200	$461	$450	$484	$565	-$93	0.04	-$181	-$4	-$166	-$19	-20.1%
Part A HH allowed payment amount, 90-day PDP	24,352	25,200	$1,211	$1,212	$1,160	$1,141	$21	0.33	-$21	$63	-$14	$56	1.7%

Exhibit E.10: Impact of BPCI Advanced on Congestive Heart Failure Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	58,051	61,849	$26,675	$25,991	$26,406	$26,195	-$473	0.01	-$804	-$141	-$750	-$195	-1.8%
Total paid payment amount, inpatient through 90-day PDP	58,051	61,849	$23,615	$22,954	$23,357	$23,085	-$389	0.01	-$686	-$93	-$638	-$140	-1.6%
Patients discharged to institutional PAC	58,051	61,849	25.0%	21.5%	24.7%	21.8%	-0.66 pp	0.04	-1.3 pp	0.0 pp	-1.2 pp	-0.1 pp	-2.6%
Unplanned readmission rate, 90-day PDP	57,518	61,356	41.3%	40.2%	41.0%	40.4%	-0.47 pp	0.18	-1.2 pp	0.2 pp	-1.0 pp	0.1 pp	-1.1%
All-cause mortality rate, 90-day PDP	56,956	60,784	18.3%	15.5%	18.2%	15.4%	-0.06 pp‡	0.82	-0.6 pp	0.5 pp	-0.5 pp	0.4 pp	-0.3%
Number of days at a SNF (minimum one day), 90-day PDP	16,052	16,868	31.1	27.5	31.5	29.4	-1.4	0.00	-2.2	-0.7	-2.1	-0.8	-4.7%
Part A SNF allowed payment amount, 90-day PDP	58,051	61,849	$4,567	$3,967	$4,501	$4,236	-$335	0.00	-$498	-$172	-$472	-$198	-7.3%
Part A IRF allowed payment amount, 90-day PDP	58,051	61,849	$672	$709	$686	$781	-$58	0.12	-$131	$15	-$120	$3	-8.6%
Part A HH allowed payment amount, 90-day PDP	58,051	61,849	$1,547	$1,618	$1,517	$1,549	$39	0.03	$4	$75	$10	$69	2.6%

Exhibit E.11: Impact of BPCI Advanced on Gastrointestinal Hemorrhage Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	10,773	12,340	$22,295	$22,976	$21,995	$22,682	-$5	0.98	-$532	$521	-$446	$436	0.0%
Total paid payment amount, inpatient through 90-day PDP	10,773	12,340	$19,324	$20,016	$19,046	$19,662	$77	0.75	-$392	$545	-$316	$469	0.4%
Patients discharged to institutional PAC	10,773	12,340	19.9%	18.7%	19.9%	18.4%	0.20 pp	0.74	-1.0 pp	1.4 pp	-0.8 pp	1.2 pp	1.0%
Unplanned readmission rate, 90-day PDP	10,654	12,248	31.4%	30.9%	30.7%	30.5%	-0.30 pp	0.67	-1.7 pp	1.1 pp	-1.5 pp	0.9 pp	-1.0%
All-cause mortality rate, 90-day PDP	10,563	12,134	10.5%	9.6%	10.8%	9.6%	0.32 pp	0.49	-0.6 pp	1.2 pp	-0.4 pp	1.1 pp	3.0%
Number of days at a SNF (minimum one day), 90-day PDP	2,476	2,723	34.6	30.1	35.3	32.2	-1.3	0.13	-3.1	0.4	-2.8	0.1	-3.9%
Part A SNF allowed payment amount, 90-day PDP	10,773	12,340	$4,057	$3,591	$3,929	$3,768	-$305‡	0.05	-$616	$6	-$566	-$44	-7.5%
Part A IRF allowed payment amount, 90-day PDP	10,773	12,340	$409	$480	$397	$481	-$13	0.82	-$126	$99	-$107	$81	-3.2%
Part A HH allowed payment amount, 90-day PDP	10,773	12,340	$1,017	$1,033	$1,000	$994	$21	0.46	-$36	$79	-$27	$70	2.1%

Exhibit E.12: Impact of BPCI Advanced on Hip & Femur Procedures Except Major Joint Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	9,318	9,182	$46,611	$44,940	$46,042	$46,640	-$2,269	0.00	-$3,248	-$1,289	-$3,090	-$1,448	-4.9%
Total paid payment amount, inpatient through 90-day PDP	9,318	9,182	$41,028	$39,969	$40,541	$41,324	-$1,841	0.00	-$2,691	-$991	-$2,554	-$1,129	-4.5%
Patients discharged to institutional PAC	9,318	9,182	88.1%	86.2%	87.7%	85.9%	-0.26 pp‡	0.67	-1.5 pp	0.9 pp	-1.3 pp	0.7 pp	-0.3%
Unplanned readmission rate, 90-day PDP	9,312	9,175	21.9%	20.5%	22.4%	21.8%	-0.87 pp	0.18	-2.1 pp	0.4 pp	-1.9 pp	0.2 pp	-4.0%
All-cause mortality rate, 90-day PDP	9,087	8,945	10.5%	9.5%	11.1%	10.5%	-0.46 pp	0.37	-1.5 pp	0.6 pp	-1.3 pp	0.4 pp	-4.4%
Number of days at a SNF (minimum one day), 90-day PDP	6,961	6,475	45.2	36.9	45.0	40.4	-3.8	0.00	-5.4	-2.2	-5.1	-2.5	-8.4%
Part A SNF allowed payment amount, 90-day PDP	9,318	9,182	$18,001	$15,989	$17,643	$16,985	-$1,354	0.00	-$2,199	-$509	-$2,062	-$646	-7.5%
Part A IRF allowed payment amount, 90-day PDP	9,318	9,182	$4,571	$3,806	$4,434	$4,789	-$1,120	0.00	-$1,731	-$509	-$1,632	-$608	-24.5%
Part A HH allowed payment amount, 90-day PDP	9,318	9,182	$2,005	$2,277	$2,054	$2,197	$129	0.01	$31	$227	$47	$211	6.4%

Exhibit E.13: Impact of BPCI Advanced on Major Joint Replacement of The Lower Extremity Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	20,707	22,563	$28,659	$25,484	$27,070	$25,057	-$1,162	0.00	-$1,691	-$634	-$1,605	-$719	-4.1%
Total paid payment amount, inpatient through 90-day PDP	20,707	22,563	$25,757	$22,753	$24,291	$22,360	-$1,073	0.00	-$1,575	-$570	-$1,494	-$652	-4.2%
Patients discharged to institutional PAC	20,707	22,563	48.0%	29.9%	44.7%	31.4%	-4.76 pp	0.00	-7.6 pp	-1.9 pp	-7.2 pp	-2.4 pp	-9.9%
Unplanned readmission rate, 90-day PDP	20,703	22,557	12.3%	11.6%	11.9%	11.8%	-0.63 pp	0.39	-2.1 pp	0.8 pp	-1.8 pp	0.6 pp	-5.1%
All-cause mortality rate, 90-day PDP	20,613	22,463	2.2%	1.6%	1.9%	1.3%	-0.06 pp	0.65	-0.3 pp	0.2 pp	-0.3 pp	0.2 pp	-2.7%
Number of days at a SNF (minimum one day), 90-day PDP	6,237	6,895	25.5	20.6	23.5	20.8	-2.2‡	0.00	-3.3	-1.2	-3.1	-1.4	-8.8%
Part A SNF allowed payment amount, 90-day PDP	20,707	22,563	$5,452	$3,531	$4,879	$3,619	-$661	0.00	-$1,064	-$257	-$999	-$322	-12.1%
Part A IRF allowed payment amount, 90-day PDP	20,707	22,563	$2,027	$1,165	$1,399	$1,069	-$532‡	0.00	-$833	-$230	-$784	-$279	-26.2%
Part A HH allowed payment amount, 90-day PDP	20,707	22,563	$2,295	$2,254	$2,356	$2,372	-$56	0.50	-$222	$110	-$195	$83	-2.5%

Exhibit E.14: Impact of BPCI Advanced on Renal Failure Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	18,951	18,683	$26,293	$26,210	$25,899	$26,171	-$355	0.18	-$873	$162	-$789	$79	-1.4%
Total paid payment amount, inpatient through 90-day PDP	18,951	18,683	$22,977	$22,982	$22,610	$22,869	-$254	0.27	-$702	$194	-$630	$122	-1.1%
Patients discharged to institutional PAC	18,951	18,683	32.0%	30.1%	31.3%	30.3%	-0.87 pp	0.13	-2.0 pp	0.3 pp	-1.8 pp	0.1 pp	-2.7%
Unplanned readmission rate, 90-day PDP	18,752	18,547	36.0%	34.8%	35.3%	34.1%	-0.06 pp	0.91	-1.1 pp	1.0 pp	-0.9 pp	0.8 pp	-0.2%
All-cause mortality rate, 90-day PDP	18,523	18,289	17.9%	16.0%	17.8%	16.8%	-0.92 pp	0.05	-1.8 pp	0.0 pp	-1.7 pp	-0.2 pp	-5.1%
Number of days at a SNF (minimum one day), 90-day PDP	6,675	6,221	35.4	30.9	36.1	32.9	-1.2	0.05	-2.4	0.0	-2.2	-0.2	-3.4%
Part A SNF allowed payment amount, 90-day PDP	18,951	18,683	$6,366	$5,760	$6,154	$5,981	-$432	0.01	-$767	-$98	-$713	-$152	-6.8%
Part A IRF allowed payment amount, 90-day PDP	18,951	18,683	$724	$817	$765	$891	-$32	0.64	-$164	$101	-$143	$80	-4.4%
Part A HH allowed payment amount, 90-day PDP	18,951	18,683	$1,382	$1,433	$1,357	$1,382	$25‡	0.30	-$23	$74	-$15	$66	1.8%

Exhibit E.15: Impact of BPCI Advanced on Sepsis Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	76,995	82,143	$31,738	$31,844	$31,535	$32,516	-$876	0.00	-$1,254	-$498	-$1,193	-$559	-2.8%
Total paid payment amount, inpatient through 90-day PDP	76,995	82,143	$28,097	$28,300	$27,880	$28,792	-$709	0.00	-$1,050	-$368	-$995	-$423	-2.5%
Patients discharged to institutional PAC	76,995	82,143	36.3%	33.3%	34.6%	32.4%	-0.70 pp‡	0.07	-1.5 pp	0.1 pp	-1.3 pp	-0.1 pp	-1.9%
Unplanned readmission rate, 90-day PDP	76,322	81,542	32.6%	31.8%	32.7%	32.0%	-0.18 pp‡	0.52	-0.7 pp	0.4 pp	-0.6 pp	0.3 pp	-0.5%
All-cause mortality rate, 90-day PDP	75,143	80,124	21.6%	20.0%	20.8%	19.0%	0.11 pp	0.69	-0.4 pp	0.7 pp	-0.3 pp	0.6 pp	0.5%
Number of days at a SNF (minimum one day), 90-day PDP	25,899	26,163	35.2	30.9	36.0	34.2	-2.5‡	0.00	-3.3	-1.8	-3.2	-1.9	-7.2%
Part A SNF allowed payment amount, 90-day PDP	76,995	82,143	$6,251	$5,692	$6,028	$6,164	-$695	0.00	-$882	-$508	-$851	-$538	-11.1%
Part A IRF allowed payment amount, 90-day PDP	76,995	82,143	$690	$789	$686	$793	-$8	0.86	-$94	$79	-$80	$65	-1.1%
Part A HH allowed payment amount, 90-day PDP	76,995	82,143	$1,178	$1,249	$1,175	$1,224	$23	0.13	-$7	$52	-$2	$47	1.9%

Exhibit E.16: Impact of BPCI Advanced on Simple Pneumonia and Respiratory Infections Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	38,481	36,466	$24,982	$23,918	$24,670	$23,851	-$245	0.17	-$596	$106	-$540	$49	-1.0%
Total paid payment amount, inpatient through 90-day PDP	38,481	36,466	$21,868	$20,935	$21,600	$20,812	-$145	0.36	-$457	$166	-$406	$116	-0.7%
Patients discharged to institutional PAC	38,481	36,466	29.2%	25.5%	29.0%	25.4%	-0.15 pp	0.72	-1.0 pp	0.7 pp	-0.8 pp	0.5 pp	-0.5%
Unplanned readmission rate, 90-day PDP	38,191	36,204	31.5%	29.6%	31.2%	29.1%	0.22 pp	0.59	-0.6 pp	1.0 pp	-0.5 pp	0.9 pp	0.7%
All-cause mortality rate, 90-day PDP	37,703	35,707	17.4%	14.9%	17.5%	14.2%	0.84 pp	0.01	0.2 pp	1.5 pp	0.3 pp	1.4 pp	4.9%
Number of days at a SNF (minimum one day), 90-day PDP	11,005	9,995	33.9	29.5	34.2	31.7	-1.9‡	0.00	-2.9	-1.0	-2.7	-1.2	-5.7%
Part A SNF allowed payment amount, 90-day PDP	38,481	36,466	$5,293	$4,447	$5,067	$4,703	-$481	0.00	-$682	-$281	-$649	-$313	-9.1%
Part A IRF allowed payment amount, 90-day PDP	38,481	36,466	$578	$615	$616	$650	$3	0.95	-$88	$94	-$73	$79	0.5%
Part A HH allowed payment amount, 90-day PDP	38,481	36,466	$1,259	$1,307	$1,240	$1,272	$16	0.44	-$24	$55	-$18	$49	1.2%
Hospice use, 90-day PDP	38,474	36,461	14.4%	13.9%	14.4%	12.9%	0.98 pp	0.00	0.3 pp	1.6 pp	0.4 pp	1.5 pp	6.8%

Exhibit E.17: Impact of BPCI Advanced on Stroke Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	27,078	28,734	$32,654	$31,963	$32,473	$32,685	-$903	0.00	-$1,400	-$405	-$1,320	-$485	-2.8%
Total paid payment amount, inpatient through 90-day PDP	27,078	28,734	$28,956	$28,430	$28,834	$29,074	-$767	0.00	-$1,228	-$306	-$1,154	-$380	-2.6%
Patients discharged to institutional PAC	27,078	28,734	50.4%	46.0%	50.8%	47.2%	-0.86 pp	0.16	-2.0 pp	0.3 pp	-1.8 pp	0.1 pp	-1.7%
Unplanned readmission rate, 90-day PDP	26,881	28,561	25.2%	24.6%	24.9%	23.6%	0.62 pp‡	0.16	-0.2 pp	1.5 pp	-0.1 pp	1.3 pp	2.4%
All-cause mortality rate, 90-day PDP	26,676	28,354	16.5%	15.5%	16.1%	15.2%	-0.02 pp	0.95	-0.8 pp	0.7 pp	-0.6 pp	0.6 pp	-0.1%
Number of days at a SNF (minimum one day), 90-day PDP	8,758	8,777	40.6	34.9	40.8	37.5	-2.5	0.00	-3.6	-1.5	-3.4	-1.7	-6.3%
Part A SNF allowed payment amount, 90-day PDP	27,078	28,734	$7,800	$6,392	$7,571	$6,766	-$604	0.00	-$944	-$265	-$889	-$320	-7.7%
Part A IRF allowed payment amount, 90-day PDP	27,078	28,734	$6,192	$5,970	$6,517	$6,628	-$333	0.06	-$674	$9	-$619	-$47	-5.4%
Part A HH allowed payment amount, 90-day PDP	27,078	28,734	$1,615	$1,665	$1,629	$1,651	$28	0.31	-$26	$81	-$17	$73	1.7%

Exhibit E.18: Impact of BPCI Advanced on Urinary Tract Infection Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	20,454	22,031	$24,659	$24,486	$24,238	$25,078	-$1,014	0.00	-$1,517	-$511	-$1,436	-$592	-4.1%
Total paid payment amount, inpatient through 90-day PDP	20,454	22,031	$21,196	$21,191	$20,780	$21,556	-$782	0.00	-$1,209	-$354	-$1,140	-$423	-3.7%
Patients discharged to institutional PAC	20,454	22,031	36.4%	34.5%	36.8%	35.7%	-0.86 pp	0.22	-2.2 pp	0.5 pp	-2.0 pp	0.3 pp	-2.4%
Unplanned readmission rate, 90-day PDP	20,362	21,930	32.9%	32.5%	32.4%	31.6%	0.46 pp	0.37	-0.6 pp	1.5 pp	-0.4 pp	1.3 pp	1.4%
All-cause mortality rate, 90-day PDP	20,034	21,530	11.8%	10.8%	11.4%	11.0%	-0.64 pp	0.08	-1.4 pp	0.1 pp	-1.2 pp	-0.0 pp	-5.4%
Number of days at a SNF (minimum one day), 90-day PDP	8,078	8,743	37.9	32.3	38.7	35.9	-2.8	0.00	-4.0	-1.6	-3.8	-1.8	-7.4%
Part A SNF allowed payment amount, 90-day PDP	20,454	22,031	$7,650	$6,710	$7,689	$7,658	-$909	0.00	-$1,333	-$485	-$1,265	-$554	-11.9%
Part A IRF allowed payment amount, 90-day PDP	20,454	22,031	$691	$754	$727	$906	-$116	0.08	-$246	$14	-$225	-$7	-16.8%
Part A HH allowed payment amount, 90-day PDP	20,454	22,031	$1,539	$1,606	$1,491	$1,518	$40	0.10	-$8	$89	-$1	$81	2.6%

Exhibit E.19: Impact of BPCI Advanced on Percutaneous Coronary Intervention (Outpatient) Episodes, Hospital EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	7,643	7,282	$16,919	$17,765	$17,071	$18,181	-$264	0.35	-$825	$297	-$734	$205	-1.6%
Total paid payment amount, inpatient through 90-day PDP	7,643	7,282	$14,077	$14,549	$14,169	$14,913	-$271	0.30	-$791	$250	-$706	$165	-1.9%
Patients discharged to institutional PAC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unplanned readmission rate, 90-day PDP	7,643	7,282	13.3%	13.7%	13.1%	14.0%	-0.52 pp	0.48	-1.9%	0.9%	-1.7%	0.7%	-3.9%
All-cause mortality rate, 90-day PDP	7,642	7,279	0.9%	1.0%	0.9%	0.9%	0.09 pp	0.59	-0.2%	0.4%	-0.2%	0.4%	10.0%
Number of days at a SNF (minimum one day), 90-day PDP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Part A SNF allowed payment amount, 90-day PDP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Part A IRF allowed payment amount, 90-day PDP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Part A HH allowed payment amount, 90-day PDP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

C. Physician Group Practice Clinical Episodes

Exhibit E.20: Impact of BPCI Advanced on Acute Myocardial Infarction Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	5,769	5,158	$26,075	$26,072	$25,240	$25,769	-$533	0.26	-$1,457	$391	-$1,307	$241	-2.0%
Total paid payment amount, inpatient through 90-day PDP	5,769	5,158	$23,036	$23,017	$22,291	$22,744	-$472	0.27	-$1,320	$375	-$1,182	$237	-2.1%
Patients discharged to institutional PAC	5,769	5,158	21.3%	18.9%	21.4%	18.8%	0.12 pp	0.91	-1.9 pp	2.1 pp	-1.6 pp	1.8 pp	0.6%
Unplanned readmission rate, 90-day PDP	5,688	5,091	34.5%	32.9%	34.2%	33.4%	-0.92 pp	0.33	-2.8 pp	0.9 pp	-2.5 pp	0.6 pp	-2.7%
All-cause mortality rate, 90-day PDP	5,629	5,043	17.7%	16.2%	17.3%	15.7%	0.13 pp	0.87	-1.4 pp	1.7 pp	-1.2 pp	1.4 pp	0.7%
Number of days at a SNF (minimum one day), 90-day PDP	1,327	1,149	31.9	29.6	30.7	27.9	0.4	0.72	-2.0	2.9	-1.6	2.5	1.4%
Part A SNF allowed payment amount, 90-day PDP	5,769	5,158	$4,046	$3,631	$3,696	$3,326	-$44	0.85	-$512	$424	-$436	$348	-1.1%
Part A IRF allowed payment amount, 90-day PDP	5,769	5,158	$521	$624	$556	$690	-$30	0.77	-$235	$174	-$201	$141	-5.8%
Part A HH allowed payment amount, 90-day PDP	5,769	5,158	$1,068	$1,111	$1,027	$1,084	-$13	0.76	-$98	$72	-$85	$58	-1.3%

Exhibit E.21: Impact of BPCI Advanced on Cellulitis Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	4,294	3,196	$21,008	$20,607	$20,779	$20,712	-$335	0.41	-$1,146	$476	-$1,014	$344	-1.6%
Total paid payment amount, inpatient through 90-day PDP	4,294	3,196	$18,058	$17,726	$17,883	$17,775	-$224	0.54	-$950	$501	-$831	$383	-1.2%
Patients discharged to institutional PAC	4,281	3,194	23.7%	19.8%	22.4%	20.5%	-1.99 pp	0.07	-4.1 pp	0.1 pp	-3.8 pp	-0.2 pp	-8.4%
Unplanned readmission rate, 90-day PDP	4,191	3,166	29.7%	28.3%	30.1%	27.9%	0.72 pp	0.47	-1.2 pp	2.7 pp	-0.9 pp	2.4 pp	2.4%
All-cause mortality rate, 90-day PDP	4,176	3,146	6.7%	6.0%	6.6%	6.2%	-0.29 pp	0.66	-1.6 pp	1.0 pp	-1.4 pp	0.8 pp	-4.3%
Number of days at a SNF (minimum one day), 90-day PDP	1,100	841	35.2	32.4	34.5	33.1	-1.4	0.27	-3.8	1.1	-3.4	0.7	-3.9%
Part A SNF allowed payment amount, 90-day PDP	4,294	3,196	$4,872	$4,258	$4,564	$4,471	-$521	0.10	-$1,152	$110	-$1,049	$7	-10.7%
Part A IRF allowed payment amount, 90-day PDP	4,294	3,196	$373	$426	$456	$458	$52	0.69	-$211	$315	-$168	$272	14.0%
Part A HH allowed payment amount, 90-day PDP	4,294	3,196	$1,395	$1,387	$1,412	$1,435	-$31‡	0.57	-$140	$77	-$122	$60	-2.2%

Exhibit E.22: Impact of BPCI Advanced on Cervical Spinal Fusion Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	1,418	762	$30,159	$30,478	$30,200	$31,978	-$1,459	0.10	-$3,182	$263	-$2,898	-$21	-4.8%
Total paid payment amount, inpatient through 90-day PDP	1,418	762	$26,956	$27,254	$27,011	$28,657	-$1,349	0.09	-$2,910	$212	-$2,653	-$45	-5.0%
Patients discharged to institutional PAC	1,418	762	15.1%	12.5%	15.6%	15.6%	-2.58 pp	0.11	-5.8 pp	0.6 pp	-5.3 pp	0.1 pp	-17.1%
Unplanned readmission rate, 90-day PDP	1,417	760	14.5%	13.1%	15.9%	13.2%	1.31 pp	0.42	-1.9 pp	4.5 pp	-1.4 pp	4.0 pp	9.0%
All-cause mortality rate, 90-day PDP	1,417	760	1.2%	0.8%	1.3%	1.0%	-0.20 pp	0.64	-1.0 pp	0.6 pp	-0.9 pp	0.5 pp	-15.8%
Number of days at a SNF (minimum one day), 90-day PDP	163	64	30.4	30.3	33.6	31.6	1.9	0.65	-6.5	10.4	-5.2	9.0	6.4%
Part A SNF allowed payment amount, 90-day PDP	1,418	762	$1,759	$1,562	$1,723	$1,503	$23	0.95	-$656	$703	-$544	$591	1.3%
Part A IRF allowed payment amount, 90-day PDP	1,418	762	$2,002	$1,754	$2,327	$2,751	-$673	0.12	-$1,529	$184	-$1,388	$43	-33.6%
Part A HH allowed payment amount, 90-day PDP	1,418	762	$764	$801	$797	$829	$5	0.97	-$241	$251	-$201	$210	0.6%

Exhibit E.23: Impact of BPCI Advanced on Chronic Obstructive Pulmonary Disease, Bronchitis, Asthma Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	10,185	7,273	$19,492	$19,423	$19,106	$19,296	-$260	0.37	-$832	$313	-$739	$220	-1.3%
Total paid payment amount, inpatient through 90-day PDP	10,185	7,273	$16,925	$16,837	$16,533	$16,705	-$260	0.33	-$786	$266	-$701	$180	-1.5%
Patients discharged to institutional PAC	10,185	7,273	13.0%	10.9%	12.9%	11.7%	-0.92 pp	0.13	-2.1 pp	0.3 pp	-1.9 pp	0.1 pp	-7.1%
Unplanned readmission rate, 90-day PDP	10,049	7,179	34.0%	33.5%	34.1%	33.2%	0.48 pp	0.58	-1.2 pp	2.2 pp	-0.9 pp	1.9 pp	1.4%
All-cause mortality rate, 90-day PDP	9,971	7,125	8.5%	7.5%	8.6%	7.5%	0.20 pp	0.66	-0.7 pp	1.1 pp	-0.5 pp	0.9 pp	2.4%
Number of days at a SNF (minimum one day), 90-day PDP	1,592	1,144	29.5	26.7	30.1	26.9	0.5	0.56	-1.2	2.2	-0.9	1.9	1.7%
Part A SNF allowed payment amount, 90-day PDP	10,185	7,273	$2,606	$2,211	$2,548	$2,166	-$12	0.93	-$288	$263	-$243	$218	-0.5%
Part A IRF allowed payment amount, 90-day PDP	10,185	7,273	$326	$349	$277	$440	-$141	0.04	-$276	-$5	-$254	-$27	-43.1%
Part A HH allowed payment amount, 90-day PDP	10,185	7,273	$1,124	$1,065	$1,048	$1,081	-$92	0.04	-$180	-$4	-$166	-$18	-8.2%

Exhibit E.24: Impact of BPCI Advanced on Congestive Heart Failure Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	16,857	12,478	$26,280	$25,503	$25,838	$25,537	-$476	0.13	-$1,090	$138	-$991	$38	-1.8%
Total paid payment amount, inpatient through 90-day PDP	16,857	12,478	$23,244	$22,459	$22,901	$22,544	-$428	0.12	-$974	$117	-$885	$29	-1.8%
Patients discharged to institutional PAC	16,822	12,455	24.2%	20.4%	23.8%	21.3%	-1.29 pp	0.05	-2.6 pp	0.0 pp	-2.4 pp	-0.2 pp	-5.3%
Unplanned readmission rate, 90-day PDP	16,693	12,352	40.1%	38.3%	39.6%	39.1%	-1.42 pp	0.04	-2.8 pp	-0.1 pp	-2.5 pp	-0.3 pp	-3.5%
All-cause mortality rate, 90-day PDP	16,506	12,244	18.2%	15.6%	18.9%	16.0%	0.30 pp	0.59	-0.8 pp	1.4 pp	-0.6 pp	1.2 pp	1.6%
Number of days at a SNF (minimum one day), 90-day PDP	4,478	3,310	31.8	29.5	30.4	29.3	-1.2	0.14	-2.7	0.4	-2.5	0.1	-3.7%
Part A SNF allowed payment amount, 90-day PDP	16,857	12,478	$4,710	$4,142	$4,272	$4,156	-$453	0.01	-$785	-$121	-$731	-$175	-9.6%
Part A IRF allowed payment amount, 90-day PDP	16,857	12,478	$504	$590	$532	$671	-$54	0.48	-$205	$97	-$180	$73	-10.6%
Part A HH allowed payment amount, 90-day PDP	16,857	12,478	$1,498	$1,484	$1,485	$1,484	-$13‡	0.71	-$81	$55	-$70	$44	-0.9%

Exhibit E.25: Impact of BPCI Advanced on Gastrointestinal Hemorrhage Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	7,452	4,415	$21,099	$21,460	$21,115	$21,992	-$515	0.22	-$1,341	$310	-$1,206	$175	-2.4%
Total paid payment amount, inpatient through 90-day PDP	7,452	4,415	$18,324	$18,659	$18,326	$19,104	-$443	0.24	-$1,185	$298	-$1,064	$177	-2.4%
Patients discharged to institutional PAC	7,437	4,402	17.8%	15.8%	17.7%	17.4%	-1.67 pp	0.04	-3.2 pp	-0.1 pp	-3.0 pp	-0.4 pp	-9.4%
Unplanned readmission rate, 90-day PDP	7,375	4,367	29.1%	28.6%	29.7%	28.1%	1.13 pp	0.17	-0.5 pp	2.7 pp	-0.2 pp	2.5 pp	3.9%
All-cause mortality rate, 90-day PDP	7,318	4,327	10.6%	9.6%	10.3%	9.4%	-0.10 pp	0.89	-1.4 pp	1.3 pp	-1.2 pp	1.0 pp	-0.9%
Number of days at a SNF (minimum one day), 90-day PDP	1,517	912	32.8	29.9	32.9	30.0	0.0	0.99	-2.0	2.0	-1.7	1.7	0.0%
Part A SNF allowed payment amount, 90-day PDP	7,452	4,415	$3,450	$3,132	$3,256	$3,209	-$272	0.15	-$642	$99	-$582	$38	-7.9%
Part A IRF allowed payment amount, 90-day PDP	7,452	4,415	$366	$502	$435	$628	-$57	0.58	-$259	$146	-$226	$113	-15.5%
Part A HH allowed payment amount, 90-day PDP	7,452	4,415	$980	$1,014	$905	$954	-$15	0.77	-$112	$83	-$96	$67	-1.5%

Exhibit E.26: Impact of BPCI Advanced on Gastrointestinal Obstruction Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	3,339	2,864	$17,728	$17,105	$17,485	$17,246	-$384	0.39	-$1,272	$503	-$1,127	$358	-2.2%
Total paid payment amount, inpatient through 90-day PDP	3,339	2,864	$15,172	$14,582	$14,998	$14,710	-$302	0.46	-$1,101	$498	-$970	$367	-2.0%
Patients discharged to institutional PAC	3,339	2,864	13.0%	10.5%	12.1%	11.3%	-1.73 pp	0.09	-3.7 pp	0.3 pp	-3.4 pp	-0.0 pp	-13.3%
Unplanned readmission rate, 90-day PDP	3,297	2,836	27.1%	26.9%	28.9%	27.1%	1.59 pp	0.22	-1.0 pp	4.1 pp	-0.6 pp	3.7 pp	5.9%
All-cause mortality rate, 90-day PDP	3,266	2,809	8.5%	6.7%	8.4%	6.8%	-0.10 pp	0.88	-1.4 pp	1.2 pp	-1.2 pp	1.0 pp	-1.2%
Number of days at a SNF (minimum one day), 90-day PDP	409	391	34.6	28.8	32.6	29.3	-2.4	0.23	-6.4	1.6	-5.8	0.9	-7.0%
Part A SNF allowed payment amount, 90-day PDP	3,339	2,864	$2,730	$2,054	$2,220	$2,099	-$555	0.02	-$1,031	-$78	-$953	-$156	-20.3%
Part A IRF allowed payment amount, 90-day PDP	3,339	2,864	$302	$298	$190	$295	-$110	0.18	-$272	$53	-$246	$26	-36.3%
Part A HH allowed payment amount, 90-day PDP	3,339	2,864	$724	$745	$751	$821	-$50	0.34	-$152	$53	-$136	$36	-6.9%

Exhibit E.27: Impact of BPCI Advanced on Hip & Femur Procedures Except Major Joint Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	11,515	9,240	$45,471	$43,859	$45,180	$46,030	-$2,463	0.00	-$3,335	-$1,591	-$3,193	-$1,732	-5.4%
Total paid payment amount, inpatient through 90-day PDP	11,515	9,240	$39,953	$38,843	$39,686	$40,721	-$2,145	0.00	-$2,903	-$1,387	-$2,780	-$1,510	-5.4%
Patients discharged to institutional PAC	11,513	9,222	87.1%	84.3%	87.1%	86.4%	-2.05 pp	0.00	-3.2 pp	-0.9 pp	-3.0 pp	-1.1 pp	-2.4%
Unplanned readmission rate, 90-day PDP	11,511	9,237	22.1%	20.4%	21.7%	20.5%	-0.50 pp	0.45	-1.8 pp	0.8 pp	-1.6 pp	0.6 pp	-2.3%
All-cause mortality rate, 90-day PDP	11,236	8,988	10.8%	10.0%	10.8%	10.5%	-0.58 pp	0.22	-1.5 pp	0.3 pp	-1.3 pp	0.2 pp	-5.3%
Number of days at a SNF (minimum one day), 90-day PDP	8,660	6,812	44.6	36.9	44.5	40.0	-3.2	0.00	-4.8	-1.6	-4.6	-1.9	-7.2%
Part A SNF allowed payment amount, 90-day PDP	11,515	9,240	$17,921	$16,278	$18,187	$17,262	-$719	0.06	-$1,462	$24	-$1,342	-$96	-4.0%
Part A IRF allowed payment amount, 90-day PDP	11,515	9,240	$4,084	$3,086	$3,447	$4,075	-$1,626	0.00	-$2,337	-$915	-$2,222	-$1,030	-39.8%
Part A HH allowed payment amount, 90-day PDP	11,515	9,240	$2,016	$2,175	$2,052	$2,244	-$33	0.53	-$139	$72	-$122	$55	-1.7%

Exhibit E.28: Impact of BPCI Advanced on Lower Extremity and Humerus Procedure Except Hip, Foot, Femur Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	2,114	1,518	$38,798	$40,138	$38,421	$40,852	-$1,091	0.22	-$2,848	$666	-$2,560	$378	-2.8%
Total paid payment amount, inpatient through 90-day PDP	2,114	1,518	$34,001	$35,480	$33,593	$36,045	-$973	0.22	-$2,547	$600	-$2,289	$343	-2.9%
Patients discharged to institutional PAC	2,108	1,517	64.3%	63.9%	63.4%	63.3%	-0.25 pp	0.90	-4.0 pp	3.5 pp	-3.4 pp	2.9 pp	-0.4%
Unplanned readmission rate, 90-day PDP	2,109	1,516	20.4%	18.7%	21.3%	20.0%	-0.30 pp	0.83	-3.1 pp	2.5 pp	-2.7 pp	2.1 pp	-1.5%
All-cause mortality rate, 90-day PDP	2,101	1,506	4.0%	3.3%	4.0%	3.6%	-0.38 pp‡	0.63	-1.9 pp	1.2 pp	-1.7 pp	0.9 pp	-9.3%
Number of days at a SNF (minimum one day), 90-day PDP	1,275	887	43.8	38.0	43.0	41.0	-3.8	0.01	-6.7	-0.8	-6.3	-1.3	-8.6%
Part A SNF allowed payment amount, 90-day PDP	2,114	1,518	$13,552	$13,074	$13,341	$13,086	-$223	0.71	-$1,433	$987	-$1,235	$789	-1.6%
Part A IRF allowed payment amount, 90-day PDP	2,114	1,518	$2,297	$2,078	$1,711	$2,422	-$931	0.03	-$1,785	-$76	-$1,645	-$216	-40.5%
Part A HH allowed payment amount, 90-day PDP	2,114	1,518	$2,084	$2,140	$2,081	$2,180	-$44	0.67	-$245	$158	-$212	$125	-2.1%

Exhibit E.29: Impact of BPCI Advanced on Major Joint Replacement of the Lower Extremity Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	50,136	38,010	$26,298	$22,902	$26,054	$24,030	-$1,373	0.00	-$1,775	-$970	-$1,710	-$1,035	-5.2%
Total paid payment amount, inpatient through 90-day PDP	50,136	38,010	$23,574	$20,312	$23,318	$21,366	-$1,309	0.00	-$1,689	-$930	-$1,627	-$991	-5.6%
Patients discharged to institutional PAC	50,136	38,010	42.2%	23.7%	39.6%	27.2%	-6.04 pp	0.00	-8.2 pp	-3.9 pp	-7.8 pp	-4.2 pp	-14.3%
Unplanned readmission rate, 90-day PDP	50,324	38,039	11.2%	10.2%	10.7%	10.3%	-0.63 pp	0.18	-1.6 pp	0.3 pp	-1.4 pp	0.1 pp	-5.6%
All-cause mortality rate, 90-day PDP	50,134	37,931	1.9%	1.4%	1.8%	1.2%	0.12 pp	0.20	-0.1 pp	0.3 pp	0.0 pp	0.3 pp	6.2%
Number of days at a SNF (minimum one day), 90-day PDP	12,098	10,355	23.5	18.3	23.6	20.5	-2.0	0.00	-2.9	-1.1	-2.8	-1.2	-8.5%
Part A SNF allowed payment amount, 90-day PDP	50,136	38,010	$4,598	$2,684	$4,631	$3,281	-$564	0.00	-$840	-$289	-$795	-$333	-12.3%
Part A IRF allowed payment amount, 90-day PDP	50,136	38,010	$1,251	$578	$1,063	$830	-$439	0.00	-$635	-$243	-$603	-$275	-35.1%
Part A HH allowed payment amount, 90-day PDP	50,136	38,010	$2,168	$1,690	$2,052	$1,944	-$371	0.00	-$503	-$239	-$481	-$260	-17.1%

Exhibit E.30: Impact of BPCI Advanced on Major Joint Replacement of the Upper Extremity Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	8,576	7,012	$23,891	$22,720	$23,784	$23,421	-$807	0.00	-$1,274	-$341	-$1,198	-$417	-3.4%
Total paid payment amount, inpatient through 90-day PDP	8,576	7,012	$21,253	$20,128	$21,155	$20,786	-$757	0.00	-$1,179	-$334	-$1,111	-$403	-3.6%
Patients discharged to institutional PAC	8,681	7,016	16.9%	10.0%	16.4%	12.3%	-2.77 pp	0.00	-4.5 pp	-1.1 pp	-4.2 pp	-1.3 pp	-16.4%
Unplanned readmission rate, 90-day PDP	8,679	7,014	8.7%	9.4%	8.5%	11.3%	-2.10 pp	0.19	-5.2 pp	1.0 pp	-4.7 pp	0.5 pp	-24.2%
All-cause mortality rate, 90-day PDP	8,678	7,013	0.5%	0.4%	0.5%	0.5%	-0.04 pp	0.75	-0.3 pp	0.2 pp	-0.3 pp	0.2 pp	-7.9%
Number of days at a SNF (minimum one day), 90-day PDP	888	802	28.5	23.6	28.8	26.0	-2.0	0.09	-4.3	0.3	-3.9	-0.1	-6.9%
Part A SNF allowed payment amount, 90-day PDP	8,576	7,012	$2,476	$1,496	$2,498	$1,803	-$286	0.06	-$589	$17	-$539	-$32	-11.5%
Part A IRF allowed payment amount, 90-day PDP	8,576	7,012	$454	$203	$351	$362	-$262	0.00	-$429	-$94	-$402	-$122	-57.7%
Part A HH allowed payment amount, 90-day PDP	8,576	7,012	$1,210	$836	$1,211	$1,059	-$222	0.01	-$381	-$64	-$355	-$90	-18.4%

Exhibit E.31: Impact of BPCI Advanced on Percutaneous Coronary Intervention Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	5,611	4,595	$28,356	$28,625	$27,287	$28,257	-$701‡	0.09	-$1,517	$114	-$1,383	-$20	-2.5%
Total paid payment amount, inpatient through 90-day PDP	5,611	4,595	$25,510	$25,733	$24,533	$25,413	-$656‡	0.09	-$1,412	$99	-$1,288	-$24	-2.6%
Patients discharged to institutional PAC	5,506	4,595	9.2%	7.4%	8.2%	7.0%	-0.63 pp	0.34	-1.9 pp	0.6 pp	-1.7 pp	0.4 pp	-6.8%
Unplanned readmission rate, 90-day PDP	5,593	4,582	25.4%	24.1%	24.9%	24.1%	-0.50 pp	0.60	-2.4 pp	1.4 pp	-2.1 pp	1.1 pp	-2.0%
All-cause mortality rate, 90-day PDP	5,585	4,577	4.2%	4.1%	4.0%	3.6%	0.34 pp	0.43	-0.5 pp	1.2 pp	-0.4 pp	1.1 pp	8.2%
Number of days at a SNF (minimum one day), 90-day PDP	474	404	28.7	26.0	27.6	27.3	-2.5	0.07	-5.1	0.2	-4.7	-0.3	-8.6%
Part A SNF allowed payment amount, 90-day PDP	5,611	4,595	$1,534	$1,271	$1,556	$1,322	-$29	0.81	-$269	$210	-$230	$171	-1.9%
Part A IRF allowed payment amount, 90-day PDP	5,611	4,595	$477	$403	$276	$323	-$121	0.13	-$279	$38	-$253	$12	-25.3%
Part A HH allowed payment amount, 90-day PDP	5,611	4,595	$723	$663	$696	$678	-$43‡	0.19	-$108	$22	-$98	$11	-6.0%

Exhibit E.32: Impact of BPCI Advanced on Renal Failure Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	8,197	6,881	$24,865	$25,260	$24,813	$25,371	-$163	0.65	-$878	$552	-$761	$436	-0.7%
Total paid payment amount, inpatient through 90-day PDP	8,197	6,881	$21,724	$22,118	$21,667	$22,197	-$136	0.67	-$774	$501	-$670	$397	-0.6%
Patients discharged to institutional PAC	8,186	6,876	30.4%	29.0%	30.1%	29.2%	-0.55 pp	0.52	-2.2 pp	1.1 pp	-2.0 pp	0.9 pp	-1.8%
Unplanned readmission rate, 90-day PDP	8,113	6,813	34.0%	32.4%	34.2%	32.2%	0.46 pp	0.63	-1.4 pp	2.4 pp	-1.1 pp	2.1 pp	1.4%
All-cause mortality rate, 90-day PDP	8,011	6,742	18.1%	15.9%	17.3%	16.3%	-1.16 pp	0.10	-2.5 pp	0.2 pp	-2.3 pp	-0.0 pp	-6.4%
Number of days at a SNF (minimum one day), 90-day PDP	2,686	2,322	34.4	31.6	34.2	31.7	-0.2	0.80	-2.2	1.7	-1.9	1.4	-0.7%
Part A SNF allowed payment amount, 90-day PDP	8,197	6,881	$5,841	$5,591	$5,677	$5,615	-$188	0.37	-$606	$230	-$538	$161	-3.2%
Part A IRF allowed payment amount, 90-day PDP	8,197	6,881	$638	$777	$623	$766	-$4	0.97	-$207	$199	-$174	$166	-0.6%
Part A HH allowed payment amount, 90-day PDP	8,197	6,881	$1,313	$1,365	$1,299	$1,373	-$23	0.55	-$99	$53	-$87	$41	-1.7%

Exhibit E.33: Impact of BPCI Advanced on Sepsis Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	19,056	11,601	$30,173	$30,613	$29,787	$30,812	-$585	0.22	-$1,525	$355	-$1,371	$202	-1.9%
Total paid payment amount, inpatient through 90-day PDP	19,056	11,601	$26,694	$27,182	$26,428	$27,410	-$494	0.25	-$1,347	$359	-$1,208	$220	-1.9%
Patients discharged to institutional PAC	19,106	11,606	34.2%	30.1%	32.1%	30.3%	-2.23 pp	0.01	-4.0 pp	-0.5 pp	-3.7 pp	-0.8 pp	-6.5%
Unplanned readmission rate, 90-day PDP	18,901	11,514	31.0%	30.4%	30.8%	29.7%	0.45 pp	0.43	-0.7 pp	1.6 pp	-0.5 pp	1.4 pp	1.5%
All-cause mortality rate, 90-day PDP	18,636	11,314	20.2%	19.2%	19.7%	18.0%	0.70 pp	0.36	-0.8 pp	2.2 pp	-0.6 pp	2.0 pp	3.5%
Number of days at a SNF (minimum one day), 90-day PDP	5,855	3,512	35.4	32.5	35.0	32.3	0.0	0.96	-1.9	1.8	-1.6	1.5	-0.1%
Part A SNF allowed payment amount, 90-day PDP	19,056	11,601	$5,947	$5,511	$5,490	$5,310	-$256	0.27	-$714	$202	-$639	$128	-4.3%
Part A IRF allowed payment amount, 90-day PDP	19,056	11,601	$565	$745	$572	$712	$41	0.76	-$226	$307	-$182	$263	7.2%
Part A HH allowed payment amount, 90-day PDP	19,056	11,601	$1,170	$1,210	$1,169	$1,183	$25	0.55	-$59	$109	-$45	$96	2.2%

Exhibit E.34: Impact of BPCI Advanced on Simple Pneumonia and Respiratory Infections Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	15,048	10,624	$23,455	$22,528	$23,351	$22,971	-$546	0.15	-$1,287	$195	-$1,167	$74	-2.3%
Total paid payment amount, inpatient through 90-day PDP	15,048	10,624	$20,510	$19,683	$20,441	$20,102	-$489	0.14	-$1,145	$168	-$1,038	$61	-2.4%
Patients discharged to institutional PAC	15,031	10,545	27.3%	23.6%	26.4%	24.3%	-1.50 pp	0.09	-3.2 pp	0.2 pp	-2.9 pp	-0.1 pp	-5.5%
Unplanned readmission rate, 90-day PDP	14,934	10,563	29.2%	28.0%	29.5%	27.9%	0.46 pp	0.53	-1.0 pp	1.9 pp	-0.8 pp	1.7 pp	1.6%
All-cause mortality rate, 90-day PDP	14,729	10,345	16.9%	14.9%	17.2%	14.9%	0.31 pp	0.61	-0.9 pp	1.5 pp	-0.7 pp	1.3 pp	1.8%
Number of days at a SNF (minimum one day), 90-day PDP	3,877	2,973	34.0	30.2	33.0	29.4	-0.2‡	0.86	-2.1	1.8	-1.8	1.5	-0.5%
Part A SNF allowed payment amount, 90-day PDP	15,048	10,624	$4,919	$4,168	$4,585	$4,203	-$370‡	0.05	-$738	-$1	-$678	-$61	-7.5%
Part A IRF allowed payment amount, 90-day PDP	15,048	10,624	$432	$544	$433	$511	$33	0.69	-$135	$202	-$107	$174	7.7%
Part A HH allowed payment amount, 90-day PDP	15,048	10,624	$1,238	$1,283	$1,188	$1,247	-$13	0.75	-$95	$68	-$81	$55	-1.1%

Exhibit E.35: Impact of BPCI Advanced on Spinal Fusion (Non-Cervical) Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	4,960	4,275	$40,257	$39,229	$41,213	$41,661	-$1,475	0.01	-$2,531	-$420	-$2,360	-$591	-3.7%
Total paid payment amount, inpatient through 90-day PDP	4,960	4,275	$37,051	$36,086	$37,982	$38,381	-$1,364	0.01	-$2,340	-$388	-$2,182	-$546	-3.7%
Patients discharged to institutional PAC	4,960	4,275	30.2%	20.0%	32.5%	27.1%	-4.76 pp	0.00	-8.0 pp	-1.5 pp	-7.5 pp	-2.0 pp	-15.8%
Unplanned readmission rate, 90-day PDP	4,959	4,279	13.2%	11.8%	12.6%	12.7%	-1.38 pp	0.10	-3.0 pp	0.3 pp	-2.8 pp	0.0 pp	-10.5%
All-cause mortality rate, 90-day PDP	4,956	4,279	0.6%	0.5%	0.6%	0.7%	-0.20 pp	0.16	-0.5 pp	0.1 pp	-0.4 pp	0.0 pp	-33.6%
Number of days at a SNF (minimum one day), 90-day PDP	908	861	22.8	20.4	22.5	22.1	-2.0	0.06	-4.1	0.1	-3.7	-0.2	-8.7%
Part A SNF allowed payment amount, 90-day PDP	4,960	4,275	$2,780	$1,969	$2,802	$2,515	-$523	0.03	-$985	-$61	-$910	-$136	-18.8%
Part A IRF allowed payment amount, 90-day PDP	4,960	4,275	$2,078	$1,382	$2,448	$2,507	-$757	0.01	-$1,300	-$213	-$1,212	-$301	-36.4%
Part A HH allowed payment amount, 90-day PDP	4,960	4,275	$1,248	$1,101	$1,281	$1,406	-$273	0.00	-$441	-$104	-$414	-$131	-21.9%

Exhibit E.36: Impact of BPCI Advanced on Stroke Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	9,154	6,407	$31,877	$31,245	$30,571	$30,710	-$770	0.26	-$2,120	$579	-$1,900	$360	-2.4%
Total paid payment amount, inpatient through 90-day PDP	9,154	6,407	$28,255	$27,749	$26,975	$27,206	-$738	0.25	-$2,002	$527	-$1,796	$321	-2.6%
Patients discharged to institutional PAC	9,182	6,411	50.7%	45.9%	49.4%	45.1%	-0.43 pp	0.74	-2.9 pp	2.1 pp	-2.5 pp	1.7 pp	-0.8%
Unplanned readmission rate, 90-day PDP	9,129	6,372	23.6%	22.8%	23.4%	23.5%	-0.85 pp	0.29	-2.4 pp	0.7 pp	-2.2 pp	0.5 pp	-3.6%
All-cause mortality rate, 90-day PDP	9,040	6,337	15.8%	14.7%	15.6%	14.6%	-0.04 pp	0.95	-1.4 pp	1.3 pp	-1.2 pp	1.1 pp	-0.3%
Number of days at a SNF (minimum one day), 90-day PDP	2,818	2,078	40.8	36.7	40.3	36.1	0.1	0.96	-2.1	2.2	-1.7	1.8	0.1%
Part A SNF allowed payment amount, 90-day PDP	9,154	6,407	$7,820	$6,669	$7,719	$6,608	-$39	0.91	-$693	$614	-$586	$508	-0.5%
Part A IRF allowed payment amount, 90-day PDP	9,154	6,407	$6,381	$6,245	$5,378	$5,422	-$180	0.71	-$1,128	$768	-$973	$614	-2.8%
Part A HH allowed payment amount, 90-day PDP	9,154	6,407	$1,538	$1,522	$1,502	$1,486	$0	1.00	-$105	$106	-$88	$88	0.0%

Exhibit E.37: Impact of BPCI Advanced on Urinary Tract Infection Episodes, PGP EIs, October 1, 2018 – December 31, 2019

Outcome	# of BPCI Adv Int Episodes	# of Comp Int Episodes	BPCI Adv Baseline	BPCI Adv Int	Comp Baseline	Comp Int	DiD	P-value	95% LCI	95% UCI	90% LCI	90% UCI	% Change
Total allowed payment amount, inpatient through 90-day PDP	9,683	7,673	$23,438	$23,892	$23,035	$23,701	-$212	0.44	-$754	$331	-$666	$242	-0.9%
Total paid payment amount, inpatient through 90-day PDP	9,683	7,673	$20,177	$20,650	$19,798	$20,433	-$162	0.50	-$638	$314	-$560	$237	-0.8%
Patients discharged to institutional PAC	9,672	7,652	34.9%	33.8%	35.0%	34.1%	-0.20 pp	0.82	-1.9 pp	1.5 pp	-1.7 pp	1.2 pp	-0.6%
Unplanned readmission rate, 90-day PDP	9,632	7,626	30.9%	31.3%	31.1%	29.5%	2.06 pp	0.01	0.6 pp	3.5 pp	0.8 pp	3.3 pp	6.7%
All-cause mortality rate, 90-day PDP	9,487	7,536	12.1%	11.8%	12.7%	12.1%	0.30 pp	0.65	-1.0 pp	1.6 pp	-0.8 pp	1.4 pp	2.4%
Number of days at a SNF (minimum one day), 90-day PDP	3,687	2,938	36.9	32.9	36.5	33.4	-0.98	0.24	-2.6	0.7	-2.4	0.4	-2.7%
Part A SNF allowed payment amount, 90-day PDP	9,683	7,673	$7,084	$6,562	$6,943	$6,737	-$316	0.18	-$778	$146	-$703	$71	-4.5%
Part A IRF allowed payment amount, 90-day PDP	9,683	7,673	$673	$814	$499	$643	-$3	0.98	-$206	$200	-$173	$167	-0.4%
Part A HH allowed payment amount, 90-day PDP	9,683	7,673	$1,541	$1,571	$1,498	$1,544	-$15	0.74	-$106	$76	-$92	$61	-1.0%

Appendix F: Tables of Parallel Trends Tests Results

The following tables display risk-adjusted parallel trends tests results for all payment, utilization, and quality measures assessed in this report. As noted in **Appendix C**, we tested the null hypothesis that BPCI Advanced participants and comparison hospitals had parallel trends during the baseline period. We rejected the null hypothesis that there were parallel trends in the baseline at the 10% level of significance. Based on this threshold, we anticipate that for one in 10 outcome measures, we would fail to reject the null hypothesis of parallel trends based on chance.

Results reflect the BPCI Advanced evaluation team's analysis of Medicare claims and enrollment data for episodes with anchor stays/procedures beginning April 1, 2013 and ending on or before December 31, 2017 (baseline period for BPCI Advanced EIs and matched comparison providers). Results are presented by clinical episode (CE). Please refer to the following abbreviations, which are used throughout this appendix:

- EI = episode initiator
- HH = home health
- IRF = inpatient rehabilitation facility
- PAC = post-acute care
- PDP = post-anchor/procedure discharge period
- pp = percentage points
- SNF = skilled nursing facility
- ‡ = denotes results where we reject the null hypothesis that BPCI Advanced and matched comparison providers had parallel trends in the baseline period for this outcome at the 10% level of significance

A. Hospitals

Exhibit F.1: Acute Myocardial Infarction Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$55.85‡	0.01
Patients discharged to institutional PAC	-0.180 pp	0.59
Unplanned readmission rate, 90-day PDP	-0.045 pp	0.86
All-cause mortality rate, 90-day PDP	-0.304 pp	0.38
Number of days at a SNF (minimum one day), 90-day PDP	-0.17‡	0.00
Part A SNF allowed payment amount, 90-day PDP	-$22.12‡	0.06
Part A IRF allowed payment amount, 90-day PDP	$1.64	0.71
Part A HH allowed payment amount, 90-day PDP	-$4.28‡	0.06

Exhibit F.2: Cardiac Arrhythmia Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$16.58	0.19
Patients discharged to institutional PAC	-0.285 pp	0.29
Unplanned readmission rate, 90-day PDP	-0.034 pp	0.86
All-cause mortality rate, 90-day PDP	-0.205 pp	0.54
Number of days at a SNF (minimum one day), 90-day PDP	-0.06	0.19
Part A SNF allowed payment amount, 90-day PDP	-$13.38‡	0.04
Part A IRF allowed payment amount, 90-day PDP	$1.78	0.55
Part A HH allowed payment amount, 90-day PDP	-$0.86	0.54

Exhibit F.3: Chronic Obstructive Pulmonary Disease, Bronchitis, Asthma Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$10.90	0.43
Patients discharged to institutional PAC	0.230 pp	0.46
Unplanned readmission rate, 90-day PDP	-0.070 pp	0.69
All-cause mortality rate, 90-day PDP	0.403 pp	0.16
Number of days at a SNF (minimum one day), 90-day PDP	-0.15‡	0.00
Part A SNF allowed payment amount, 90-day PDP	-$7.73	0.36
Part A IRF allowed payment amount, 90-day PDP	-$1.01	0.75
Part A HH allowed payment amount, 90-day PDP	-$0.56	0.74

Exhibit F.4: Congestive Heart Failure Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$9.59	0.40
Patients discharged to institutional PAC	-0.093 pp	0.59
Unplanned readmission rate, 90-day PDP	-0.036 pp	0.79
All-cause mortality rate, 90-day PDP	-0.440 pp‡	0.00
Number of days at a SNF (minimum one day), 90-day PDP	-0.04	0.12
Part A SNF allowed payment amount, 90-day PDP	-$9.11	0.14
Part A IRF allowed payment amount, 90-day PDP	-$1.88	0.57
Part A HH allowed payment amount, 90-day PDP	$1.45	0.29

Exhibit F.5: Gastrointestinal Hemorrhage Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$34.19	0.10
Patients discharged to institutional PAC	-0.480 pp	0.17
Unplanned readmission rate, 90-day PDP	-0.373 pp	0.16
All-cause mortality rate, 90-day PDP	0.029 pp	0.95
Number of days at a SNF (minimum one day), 90-day PDP	-0.10	0.13
Part A SNF allowed payment amount, 90-day PDP	-$23.08‡	0.05
Part A IRF allowed payment amount, 90-day PDP	-$0.94	0.81
Part A HH allowed payment amount, 90-day PDP	-$3.26	0.14

Exhibit F.6: Hip and Femur Procedures Except Major Joint Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	$15.65	0.65
Patients discharged to institutional PAC	0.877 pp‡	0.08
Unplanned readmission rate, 90-day PDP	-0.254 pp	0.49
All-cause mortality rate, 90-day PDP	0.373 pp	0.50
Number of days at a SNF (minimum one day), 90-day PDP	-0.05	0.40
Part A SNF allowed payment amount, 90-day PDP	$16.81	0.65
Part A IRF allowed payment amount, 90-day PDP	$0.61	0.98
Part A HH allowed payment amount, 90-day PDP	-$1.09	0.77

Exhibit F.7: Major Joint Replacement of the Lower Extremity Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$21.75	0.33
Patients discharged to institutional PAC	-0.196 pp	0.76
Unplanned readmission rate, 90-day PDP	-0.363 pp	0.57
All-cause mortality rate, 90-day PDP	-0.298 pp	0.66
Number of days at a SNF (minimum one day), 90-day PDP	-0.10‡	0.02
Part A SNF allowed payment amount, 90-day PDP	-$1.32	0.94
Part A IRF allowed payment amount, 90-day PDP	-$27.70‡	0.06
Part A HH allowed payment amount, 90-day PDP	-$3.36	0.61

Exhibit F.8: Renal Failure Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$20.60	0.32
Patients discharged to institutional PAC	-0.171 pp	0.51
Unplanned readmission rate, 90-day PDP	-0.214 pp	0.31
All-cause mortality rate, 90-day PDP	0.028 pp	0.93
Number of days at a SNF (minimum one day), 90-day PDP	-0.01	0.86
Part A SNF allowed payment amount, 90-day PDP	-$15.96	0.25
Part A IRF allowed payment amount, 90-day PDP	$1.84	0.72
Part A HH allowed payment amount, 90-day PDP	-$3.72‡	0.10

Exhibit F.9: Sepsis Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$13.35	0.41
Patients discharged to institutional PAC	0.367 pp‡	0.03
Unplanned readmission rate, 90-day PDP	-0.270 pp‡	0.03
All-cause mortality rate, 90-day PDP	0.048 pp	0.78
Number of days at a SNF (minimum one day), 90-day PDP	-0.09‡	0.00
Part A SNF allowed payment amount, 90-day PDP	-$5.17	0.52
Part A IRF allowed payment amount, 90-day PDP	-$0.41	0.90
Part A HH allowed payment amount, 90-day PDP	-$0.68	0.58

Exhibit F.10: Simple Pneumonia and Respiratory Infections Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$12.03	0.40
Patients discharged to institutional PAC	0.126 pp	0.54
Unplanned readmission rate, 90-day PDP	-0.094 pp	0.57
All-cause mortality rate, 90-day PDP	-0.018 pp	0.93
Number of days at a SNF (minimum one day), 90-day PDP	-0.08‡	0.05
Part A SNF allowed payment amount, 90-day PDP	-$11.89	0.16
Part A IRF allowed payment amount, 90-day PDP	$0.34	0.93
Part A HH allowed payment amount, 90-day PDP	$0.04	0.98

Exhibit F.11: Stroke Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$24.08	0.26
Patients discharged to institutional PAC	-0.144 pp	0.45
Unplanned readmission rate, 90-day PDP	-0.396 pp‡	0.06
All-cause mortality rate, 90-day PDP	-0.167 pp	0.53
Number of days at a SNF (minimum one day), 90-day PDP	-0.03	0.44
Part A SNF allowed payment amount, 90-day PDP	-$19.34	0.12
Part A IRF allowed payment amount, 90-day PDP	$7.40	0.57
Part A HH allowed payment amount, 90-day PDP	$2.20	0.28

Exhibit F.12 Urinary Tract Infection Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$8.83	0.64
Patients discharged to institutional PAC	0.317 pp	0.21
Unplanned readmission rate, 90-day PDP	-0.196 pp	0.32
All-cause mortality rate, 90-day PDP	-0.326 pp	0.29
Number of days at a SNF (minimum one day), 90-day PDP	-0.05	0.26
Part A SNF allowed payment amount, 90-day PDP	$1.02	0.94
Part A IRF allowed payment amount, 90-day PDP	$0.03	1.00
Part A HH allowed payment amount, 90-day PDP	-$2.14	0.29

Exhibit F.13: Percutaneous Coronary Intervention (Outpatient) Episodes, Hospital EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$9.37	0.67
Patients discharged to institutional PAC	N/A	N/A
Unplanned readmission rate, 90-day PDP	-0.348 pp	0.48
All-cause mortality rate, 90-day PDP	0.071 pp	0.97
Number of days at a SNF (minimum one day), 90-day PDP	N/A	N/A
Part A SNF allowed payment amount, 90-day PDP	N/A	N/A
Part A IRF allowed payment amount, 90-day PDP	N/A	N/A
Part A HH allowed payment amount, 90-day PDP	N/A	N/A

B. Physician Group Practices

Exhibit F.14: Acute Myocardial Infarction Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$0.39	0.99
Patients discharged to institutional PAC	-0.229 pp	0.77
Unplanned readmission rate, 90-day PDP	0.344 pp	0.52
All-cause mortality rate, 90-day PDP	-1.002 pp	0.12
Number of days at a SNF (minimum one day), 90-day PDP	-0.09	0.39
Part A SNF allowed payment amount, 90-day PDP	-$11.29	0.64
Part A IRF allowed payment amount, 90-day PDP	-$7.15	0.40
Part A HH allowed payment amount, 90-day PDP	-$0.61	0.88

Exhibit F.15: Cellulitis Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	$0.65	0.99
Patients discharged to institutional PAC	-0.064 pp	0.92
Unplanned readmission rate, 90-day PDP	0.068 pp	0.89
All-cause mortality rate, 90-day PDP	0.682 pp	0.53
Number of days at a SNF (minimum one day), 90-day PDP	-0.09	0.43
Part A SNF allowed payment amount, 90-day PDP	-$18.24	0.44
Part A IRF allowed payment amount, 90-day PDP	-$1.68	0.87
Part A HH allowed payment amount, 90-day PDP	$10.01‡	0.06

Exhibit F.16: Cervical Spinal Fusion Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$12.21	0.86
Patients discharged to institutional PAC	0.775 pp	0.65
Unplanned readmission rate, 90-day PDP	1.029 pp	0.36
All-cause mortality rate, 90-day PDP	-2.203 pp	0.44
Number of days at a SNF (minimum one day), 90-day PDP	-0.32	0.23
Part A SNF allowed payment amount, 90-day PDP	-$6.17	0.80
Part A IRF allowed payment amount, 90-day PDP	-$15.31	0.69
Part A HH allowed payment amount, 90-day PDP	-$0.74	0.91

Exhibit F.17: Chronic Obstructive Pulmonary Disease, Bronchitis, Asthma Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$11.48	0.68
Patients discharged to institutional PAC	-0.258 pp	0.66
Unplanned readmission rate, 90-day PDP	0.262 pp	0.45
All-cause mortality rate, 90-day PDP	0.352 pp	0.52
Number of days at a SNF (minimum one day), 90-day PDP	0.00	0.98
Part A SNF allowed payment amount, 90-day PDP	-$13.13	0.32
Part A IRF allowed payment amount, 90-day PDP	$0.34	0.95
Part A HH allowed payment amount, 90-day PDP	$3.27	0.39

Exhibit F.18: Congestive Heart Failure Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$23.13	0.45
Patients discharged to institutional PAC	0.117 pp	0.79
Unplanned readmission rate, 90-day PDP	0.002 pp	0.99
All-cause mortality rate, 90-day PDP	0.223 pp	0.61
Number of days at a SNF (minimum one day), 90-day PDP	-0.06	0.38
Part A SNF allowed payment amount, 90-day PDP	-$15.50	0.28
Part A IRF allowed payment amount, 90-day PDP	$2.94	0.67
Part A HH allowed payment amount, 90-day PDP	-$8.62‡	0.03

Exhibit F.19: Gastrointestinal Hemorrhage Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$19.26	0.45
Patients discharged to institutional PAC	-0.732 pp	0.23
Unplanned readmission rate, 90-day PDP	-0.099 pp	0.81
All-cause mortality rate, 90-day PDP	-0.370 pp	0.59
Number of days at a SNF (minimum one day), 90-day PDP	0.11	0.28
Part A SNF allowed payment amount, 90-day PDP	-$1.44	0.91
Part A IRF allowed payment amount, 90-day PDP	-$3.67	0.63
Part A HH allowed payment amount, 90-day PDP	-$3.49	0.42

Exhibit F.20: Gastrointestinal Obstruction Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$4.46	0.92
Patients discharged to institutional PAC	-1.015 pp	0.27
Unplanned readmission rate, 90-day PDP	-0.691 pp	0.20
All-cause mortality rate, 90-day PDP	0.930 pp	0.38
Number of days at a SNF (minimum one day), 90-day PDP	0.03	0.85
Part A SNF allowed payment amount, 90-day PDP	-$14.77	0.48
Part A IRF allowed payment amount, 90-day PDP	$5.82	0.29
Part A HH allowed payment amount, 90-day PDP	-$5.33	0.17

Exhibit F.21: Hip and Femur Procedures Except Major Joint Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$59.63	0.11
Patients discharged to institutional PAC	-0.319 pp	0.55
Unplanned readmission rate, 90-day PDP	0.112 pp	0.77
All-cause mortality rate, 90-day PDP	-0.214 pp	0.66
Number of days at a SNF (minimum one day), 90-day PDP	-0.06	0.31
Part A SNF allowed payment amount, 90-day PDP	-$13.42	0.72
Part A IRF allowed payment amount, 90-day PDP	-$25.23	0.26
Part A HH allowed payment amount, 90-day PDP	-$1.30	0.71

Exhibit F.22: Lower Extremity and Humerus Procedure Except Hip, Foot, Femur Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$27.83	0.63
Patients discharged to institutional PAC	-0.417 pp	0.62
Unplanned readmission rate, 90-day PDP	-0.401 pp	0.66
All-cause mortality rate, 90-day PDP	-3.812 pp‡	0.03
Number of days at a SNF (minimum one day), 90-day PDP	0.09	0.44
Part A SNF allowed payment amount, 90-day PDP	$52.78	0.30
Part A IRF allowed payment amount, 90-day PDP	-$12.11	0.59
Part A HH allowed payment amount, 90-day PDP	$0.87	0.92

Exhibit F.23: Major Joint Replacement of the Lower Extremity Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$1.98	0.92
Patients discharged to institutional PAC	-0.188 pp	0.72
Unplanned readmission rate, 90-day PDP	0.355 pp	0.25
All-cause mortality rate, 90-day PDP	0.256 pp	0.65
Number of days at a SNF (minimum one day), 90-day PDP	-0.02	0.63
Part A SNF allowed payment amount, 90-day PDP	$8.09	0.53
Part A IRF allowed payment amount, 90-day PDP	-$2.29	0.81
Part A HH allowed payment amount, 90-day PDP	-$5.60	0.28

Exhibit F.24: Major Joint Replacement of The Upper Extremity Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	$7.47	0.74
Patients discharged to institutional PAC	0.140 pp	0.85
Unplanned readmission rate, 90-day PDP	-0.296 pp	0.72
All-cause mortality rate, 90-day PDP	-2.176 pp	0.43
Number of days at a SNF (minimum one day), 90-day PDP	-0.03	0.77
Part A SNF allowed payment amount, 90-day PDP	$4.26	0.78
Part A IRF allowed payment amount, 90-day PDP	$0.03	1.00
Part A HH allowed payment amount, 90-day PDP	-$4.98	0.52

Exhibit F.25: Percutaneous Coronary Intervention (Inpatient) Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	$58.59‡	0.09
Patients discharged to institutional PAC	-0.019 pp	0.98
Unplanned readmission rate, 90-day PDP	0.783 pp	0.15
All-cause mortality rate, 90-day PDP	0.132 pp	0.90
Number of days at a SNF (minimum one day), 90-day PDP	0.06	0.60
Part A SNF allowed payment amount, 90-day PDP	$11.04	0.34
Part A IRF allowed payment amount, 90-day PDP	-$2.12	0.74
Part A HH allowed payment amount, 90-day PDP	-$6.61‡	0.06

Exhibit F.26: Renal Failure Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$56.90	0.11
Patients discharged to institutional PAC	0.485 pp	0.26
Unplanned readmission rate, 90-day PDP	-0.065 pp	0.86
All-cause mortality rate, 90-day PDP	-0.143 pp	0.81
Number of days at a SNF (minimum one day), 90-day PDP	-0.05	0.52
Part A SNF allowed payment amount, 90-day PDP	-$13.37	0.52
Part A IRF allowed payment amount, 90-day PDP	-$0.08	0.99
Part A HH allowed payment amount, 90-day PDP	-$1.66	0.71

Exhibit F.27: Sepsis Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$23.16	0.60
Patients discharged to institutional PAC	-0.342 pp	0.55
Unplanned readmission rate, 90-day PDP	-0.326 pp	0.31
All-cause mortality rate, 90-day PDP	-0.373 pp	0.41
Number of days at a SNF (minimum one day), 90-day PDP	0.00	0.98
Part A SNF allowed payment amount, 90-day PDP	-$21.20	0.36
Part A IRF allowed payment amount, 90-day PDP	$1.80	0.82
Part A HH allowed payment amount, 90-day PDP	$1.61	0.66

Exhibit F.28: Simple Pneumonia and Respiratory Infections Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$47.49	0.10
Patients discharged to institutional PAC	-0.527 pp	0.22
Unplanned readmission rate, 90-day PDP	0.056 pp	0.84
All-cause mortality rate, 90-day PDP	-0.150 pp	0.78
Number of days at a SNF (minimum one day), 90-day PDP	-0.15‡	0.06
Part A SNF allowed payment amount, 90-day PDP	-$29.32‡	0.06
Part A IRF allowed payment amount, 90-day PDP	-$2.57	0.66
Part A HH allowed payment amount, 90-day PDP	-$1.79	0.62

Exhibit F.29: Spinal Fusion (Non-Cervical) Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$36.74	0.40
Patients discharged to institutional PAC	-0.983 pp	0.15
Unplanned readmission rate, 90-day PDP	0.218 pp	0.73
All-cause mortality rate, 90-day PDP	-3.681 pp	0.13
Number of days at a SNF (minimum one day), 90-day PDP	-0.06	0.40
Part A SNF allowed payment amount, 90-day PDP	-$22.87	0.15
Part A IRF allowed payment amount, 90-day PDP	-$5.94	0.79
Part A HH allowed payment amount, 90-day PDP	-$2.36	0.66

Exhibit F.30: Stroke Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	$5.64	0.91
Patients discharged to institutional PAC	-0.027 pp	0.95
Unplanned readmission rate, 90-day PDP	0.394 pp	0.30
All-cause mortality rate, 90-day PDP	-0.654 pp	0.31
Number of days at a SNF (minimum one day), 90-day PDP	-0.07	0.44
Part A SNF allowed payment amount, 90-day PDP	$6.61	0.79
Part A IRF allowed payment amount, 90-day PDP	$5.60	0.88
Part A HH allowed payment amount, 90-day PDP	-$5.85	0.28

Exhibit F.31: Urinary Tract Infection Episodes, PGP EIs, April 1, 2013 – December 31, 2017

Outcome	Linear Trend Coefficient	P-value
Total allowed payment amount, inpatient through 90-day PDP	-$14.52	0.67
Patients discharged to institutional PAC	-0.007 pp	0.99
Unplanned readmission rate, 90-day PDP	-0.013 pp	0.97
All-cause mortality rate, 90-day PDP	0.103 pp	0.86
Number of days at a SNF (minimum one day), 90-day PDP	-0.08	0.35
Part A SNF allowed payment amount, 90-day PDP	-$41.85	0.12
Part A IRF allowed payment amount, 90-day PDP	$10.88	0.24
Part A HH allowed payment amount, 90-day PDP	$0.34	0.93

Appendix G: Tables of Impact Estimate Sensitivity Results

The exhibits in this appendix display the risk-adjusted difference-in-differences (DiD) results for the BPCI Advanced impact estimates and the sensitivity tests to understand whether the reported impact estimates were robust with respect to the episode sample used. In all exhibits, the main DiD impact estimates that are statistically significant at the 1%, 5% or 10% significance level are indicated by brown, medium, and light orange shaded cells, respectively. Medicare payments were risk adjusted and standardized to remove the effects of geographic differences in wages, extra amounts to account for teaching programs and other policy factors. Results reflect the BPCI Advanced evaluation team's analysis of Medicare claims and enrollment data for episodes with anchor stays/procedures beginning April 1, 2013 and ending on or before December 31, 2017 (baseline period) and episodes with anchor stays/procedures beginning October 1, 2018 and ending on or before December 31, 2019 (intervention period) for BPCI Advanced episode initiators (EIs) and matched comparison providers.

Please refer to the following abbreviations, which are used throughout this appendix:

- DiD = difference-in-differences
- EI = episode initiator
- AMI = acute myocardial infarction
- COPD = chronic obstructive pulmonary disease
- CHF = congestive heart failure
- GI = gastrointestinal
- Hip & Femur Procedures = hip & femur procedures except major joint
- LE & Humerus Procedures = lower extremity and humerus procedures except hip, foot, femur
- MJRLE = major joint replacement of the lower extremity
- MJRUE = major joint replacement of the upper extremity
- PCI = percutaneous coronary intervention
- SPRI = simple pneumonia and respiratory infections
- UTI = urinary tract infection
- ‡ = denotes results where we reject the null hypothesis that BPCI Advanced and matched comparison providers had parallel trends in the baseline period for this outcome at the 10% level of significance
- * symbol indicates that the sensitivity test DiD result was statistically significant at the 10% level

A. Hospitals

We conducted the following four sensitivity tests for hospital EIs:

- **Sensitivity test #1:** Excluding episodes that were treated by a BPCI participant (impacts baseline period observations only)
- **Sensitivity test #2:** Excluding episodes attributed to BPCI Advanced PGPs
- **Sensitivity test #3:** Excluding episodes aligned with Medicare Shared Savings Program (MSSP) Track 3, MSSP Enhanced, Comprehensive End Stage Renal Disease Care Model, Next Generation Accountable Care Organization (ACO) and Vermont ACO
- **Sensitivity test #4:** Including the comparison sample selected under the propensity score model with no caliper selected, and all BPCI Advanced hospital EIs

Exhibit G.1: BPCI Advanced Impact Estimate and Sensitivity Test Results, Total Payments by Clinical Episode, Hospital EIs, October 1, 2018 – December 31, 2019

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
AMI	BPCI Advanced impact estimate	66,491	65,792	$26,985	$26,926	$26,547	$26,701	-$213
	Sensitivity test #1	61,909	63,930	$27,008	$26,938	$26,557	$26,724	-$237
	Sensitivity test #2	62,558	65,445	$26,971	$26,895	$26,552	$26,647	-$171
	Sensitivity test #3	63,202	62,279	$27,005	$26,912	$26,571	$26,701	-$224
	Sensitivity test #4	73,417	72,925	$27,160	$27,010	$26,669	$26,709	-$191
Cardiac Arrhythmia	BPCI Advanced impact estimate	132,309	138,406	$19,274	$19,653	$19,046	$19,754	-$329
	Sensitivity test #1	124,548	136,846	$19,244	$19,632	$19,021	$19,733	-$324*
	Sensitivity test #2	121,862	137,969	$19,247	$19,671	$19,041	$19,758	-$292
	Sensitivity test #3	125,976	132,263	$19,281	$19,642	$19,053	$19,819	-$405*
	Sensitivity test #4	146,020	156,885	$19,453	$19,775	$19,071	$19,767	-$374*
COPD, Bronchitis, & Asthma	BPCI Advanced impact estimate	151,533	160,134	$20,637	$20,558	$20,139	$20,300	-$239
	Sensitivity test #1	135,109	156,306	$20,634	$20,563	$20,135	$20,303	-$240
	Sensitivity test #2	140,867	159,943	$20,678	$20,578	$20,181	$20,345	-$263
	Sensitivity test #3	145,889	152,896	$20,621	$20,521	$20,124	$20,320	-$296
	Sensitivity test #4	173,469	179,670	$20,839	$20,671	$20,221	$20,389	-$336*
CHF	BPCI Advanced impact estimate	270,186	288,693	$26,675	$25,991	$26,406	$26,195	-$473
	Sensitivity test #1	243,278	279,088	$26,742	$26,028	$26,440	$26,239	-$513*
	Sensitivity test #2	247,543	288,253	$26,673	$26,080	$26,419	$26,210	-$384*
	Sensitivity test #3	256,729	271,879	$26,646	$25,942	$26,388	$26,152	-$468*
	Sensitivity test #4	315,810	333,181	$27,043	$26,305	$26,478	$26,254	-$514*
GI Hemorrhage	BPCI Advanced impact estimate	56,461	63,966	$22,295	$22,976	$21,995	$22,682	-$5
	Sensitivity test #1	54,078	62,805	$22,325	$22,984	$21,990	$22,703	-$53
	Sensitivity test #2	50,192	63,699	$22,407	$23,123	$22,078	$22,760	$34
	Sensitivity test #3	54,825	61,641	$22,311	$22,988	$21,996	$22,664	$10
	Sensitivity test #4	65,714	70,102	$22,640	$23,290	$22,134	$22,797	-$13

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
Hip & Femur Procedures	BPCI Advanced impact estimate	44,868	44,001	$46,611	$44,940	$46,042	$46,640	-$2,269
	Sensitivity test #1	41,572	43,063	$46,740	$45,040	$46,151	$46,760	-$2,309*
	Sensitivity test #2	37,027	43,853	$46,675	$45,279	$46,134	$46,770	-$2,032*
	Sensitivity test #3	43,135	41,611	$46,639	$44,858	$46,108	$46,931	-$2,604*
	Sensitivity test #4	52,708	52,645	$46,989	$45,390	$46,044	$46,667	-$2,222*
MJRLE	BPCI Advanced impact estimate	114,085	125,153	$28,659	$25,484	$27,070	$25,057	-$1,162
	Sensitivity test #1	93,040	112,835	$28,977	$25,834	$27,368	$25,376	-$1,150*
	Sensitivity test #2	91,796	124,490	$28,733	$25,621	$27,303	$25,306	-$1,115*
	Sensitivity test #3	108,830	115,838	$28,725	$25,466	$27,129	$24,975	-$1,104*
	Sensitivity test #4	141,221	141,538	$28,660	$25,603	$27,106	$25,140	-$1,091*
Renal Failure	BPCI Advanced impact estimate	100,356	95,012	$26,293	$26,210	$25,899	$26,171	-$355
	Sensitivity test #1	94,522	93,349	$26,323	$26,239	$25,936	$26,202	-$350
	Sensitivity test #2	90,422	94,526	$26,406	$26,320	$25,977	$26,264	-$372
	Sensitivity test #3	96,036	91,196	$26,276	$26,164	$25,874	$26,228	-$465*
	Sensitivity test #4	112,881	113,233	$26,572	$26,466	$25,871	$26,129	-$362
Sepsis	BPCI Advanced impact estimate	330,668	347,069	$31,738	$31,844	$31,535	$32,516	-$876
	Sensitivity test #1	300,782	341,413	$31,741	$31,852	$31,576	$32,555	-$868*
	Sensitivity test #2	303,767	345,351	$31,846	$31,931	$31,649	$32,638	-$904*
	Sensitivity test #3	312,633	328,123	$31,840	$31,981	$31,623	$32,575	-$811*
	Sensitivity test #4	409,974	408,701	$32,471	$32,480	$31,632	$32,731	-$1,090*
SPRI	BPCI Advanced impact estimate	202,098	192,019	$24,982	$23,918	$24,670	$23,851	-$245
	Sensitivity test #1	181,381	187,659	$25,084	$24,011	$24,739	$23,936	-$270
	Sensitivity test #2	185,547	191,450	$25,063	$24,024	$24,738	$23,935	-$237
	Sensitivity test #3	192,212	182,500	$25,006	$23,835	$24,693	$23,883	-$361*
	Sensitivity test #4	223,454	230,313	$25,318	$24,118	$24,701	$23,874	-$373*
Stroke	BPCI Advanced impact estimate	136,211	140,534	$32,654	$31,963	$32,473	$32,685	-$903
	Sensitivity test #1	128,267	137,438	$32,698	$31,968	$32,435	$32,691	-$988*
	Sensitivity test #2	126,266	139,852	$32,718	$31,974	$32,515	$32,724	-$953*
	Sensitivity test #3	130,128	133,691	$32,670	$31,920	$32,509	$32,688	-$929*
	Sensitivity test #4	137,609	143,977	$32,733	$32,005	$32,479	$32,707	-$956*

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
UTI	BPCI Advanced impact estimate	109,138	113,918	$24,659	$24,486	$24,238	$25,078	-$1,014
	Sensitivity test #1	99,953	111,909	$24,737	$24,539	$24,272	$25,132	-$1,057*
	Sensitivity test #2	98,915	113,567	$24,740	$24,523	$24,284	$25,137	-$1,071*
	Sensitivity test #3	104,422	108,084	$24,677	$24,563	$24,246	$25,102	-$970*
	Sensitivity test #4	126,563	133,132	$24,969	$24,691	$24,285	$25,266	-$1,257*
PCI (Outpatient)	BPCI Advanced impact estimate	35,092	33,374	$16,919	$17,765	$17,071	$18,181	-$264
	Sensitivity test #1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #2	33,485	33,368	$16,922	$17,760	$17,080	$18,199	-$281
	Sensitivity test #3	33,542	32,343	$16,922	$17,738	$17,034	$18,160	-$310
	Sensitivity test #4	35,688	33,464	$16,930	$17,772	$17,073	$18,192	-$277

Exhibit G.2: BPCI Advanced Impact Estimate and Sensitivity Test Results, First Discharge to Institutional PAC by Clinical Episode, Hospital EIs, October 1, 2018 – December 31, 2019

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
AMI	BPCI Advanced impact estimate	66,491	65,792	24.0%	21.0%	23.5%	20.8%	-0.28 pp
	Sensitivity test #1	61,909	63,930	24.0%	21.0%	23.4%	20.8%	-0.31 pp
	Sensitivity test #2	62,558	65,445	24.1%	21.1%	23.6%	20.8%	-0.26 pp
	Sensitivity test #3	63,202	62,279	24.0%	20.9%	23.4%	20.8%	-0.43 pp
	Sensitivity test #4	73,417	72,925	24.1%	21.1%	23.7%	20.8%	-0.14 pp
Cardiac Arrhythmia	BPCI Advanced impact estimate	132,309	138,406	15.1%	13.7%	14.8%	13.8%	-0.33 pp
	Sensitivity test #1	124,548	136,846	15.0%	13.6%	14.8%	13.7%	-0.32 pp
	Sensitivity test #2	121,862	137,969	15.1%	13.8%	14.8%	13.8%	-0.25 pp
	Sensitivity test #3	125,976	132,263	15.1%	13.6%	14.9%	13.7%	-0.33pp
	Sensitivity test #4	146,020	156,885	15.3%	13.8%	14.9%	13.8%	-0.31 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
COPD, Bronchitis, & Asthma	BPCI Advanced impact estimate	151,533	160,134	16.2%	13.9%	14.9%	13.1%	-0.51 pp
	Sensitivity test #1	135,109	156,306	16.2%	14.0%	14.8%	13.1%	-0.50 pp
	Sensitivity test #2	140,867	159,943	16.3%	14.0%	14.9%	13.2%	-0.53 pp
	Sensitivity test #3	145,889	152,896	16.1%	13.9%	14.9%	13.1%	-0.41 pp
	Sensitivity test #4	173,469	179,670	16.0%	13.8%	15.0%	13.3%	-0.49 pp
CHF	BPCI Advanced impact estimate	270,186	288,693	25.0%	21.5%	24.7%	21.8%	-0.66 pp
	Sensitivity test #1	243,278	279,088	25.1%	21.5%	24.7%	21.9%	-0.73 pp*
	Sensitivity test #2	247,543	288,253	25.0%	21.5%	24.7%	21.9%	-0.63 pp*
	Sensitivity test #3	256,729	271,879	25.0%	21.3%	24.7%	21.7%	-0.61 pp*
	Sensitivity test #4	315,810	333,181	25.1%	21.5%	24.5%	21.6%	-0.73 pp*
GI Hemorrhage	BPCI Advanced impact estimate	56,461	63,966	19.9%	18.7%	19.9%	18.4%	0.20 pp
	Sensitivity test #1	54,078	62,805	20.0%	18.7%	19.9%	18.4%	0.18 pp
	Sensitivity test #2	50,192	63,699	20.2%	18.7%	20.1%	18.5%	0.03 pp
	Sensitivity test #3	54,825	61,641	20.0%	18.8%	19.9%	18.3%	0.50 pp
	Sensitivity test #4	65,714	70,102	20.5%	19.1%	20.1%	18.6%	0.08 pp
Hip & Femur Procedures	BPCI Advanced impact estimate	44,868	44,001	88.1%	86.2%	87.7%	85.9%	-0.26 pp
	Sensitivity test #1	41,572	43,063	88.2%	86.1%	87.6%	85.9%	-0.35 pp
	Sensitivity test #2	37,027	43,853	88.3%	86.2%	87.8%	86.1%	-0.42 pp
	Sensitivity test #3	43,135	41,611	88.1%	86.0%	87.7%	86.0%	-0.40 pp
	Sensitivity test #4	52,708	52,645	88.5%	86.7%	87.9%	86.2%	-0.09 pp
MJRLE	BPCI Advanced impact estimate	114,085	125,153	48.0%	29.9%	44.7%	31.4%	-4.76 pp
	Sensitivity test #1	93,040	112,835	49.5%	31.4%	46.6%	33.0%	-4.47 pp*
	Sensitivity test #2	91,796	124,490	48.2%	30.1%	45.6%	32.2%	-4.65 pp*
	Sensitivity test #3	108,830	115,838	48.2%	29.7%	44.9%	30.8%	-4.32 pp*
	Sensitivity test #4	141,221	141,538	48.9%	31.5%	46.2%	32.3%	-3.44 pp*
Renal Failure	BPCI Advanced impact estimate	100,356	95,012	32.0%	30.1%	31.3%	30.3%	-0.87 pp
	Sensitivity test #1	94,522	93,349	32.1%	30.2%	31.4%	30.4%	-0.92 pp
	Sensitivity test #2	90,422	94,526	32.2%	30.2%	31.4%	30.5%	-1.08 pp*
	Sensitivity test #3	96,036	91,196	32.0%	30.0%	31.3%	30.4%	-1.06 pp*
	Sensitivity test #4	112,881	113,233	32.4%	30.3%	31.5%	30.4%	-0.95 pp*

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
Sepsis	BPCI Advanced impact estimate	330,668	347,069	36.3%	33.3%	34.6%	32.4%	-0.70 pp
	Sensitivity test #1	300,782	341,413	36.3%	33.4%	34.7%	32.5%	-0.67 pp*
	Sensitivity test #2	303,767	345,351	36.4%	33.5%	34.8%	32.5%	-0.63 pp
	Sensitivity test #3	312,633	328,123	36.4%	33.5%	34.8%	32.3%	-0.47 pp
	Sensitivity test #4	409,974	408,701	36.4%	33.4%	34.5%	32.4%	-0.95 pp*
SPRI	BPCI Advanced impact estimate	202,098	192,019	29.2%	25.5%	29.0%	25.4%	-0.15 pp
	Sensitivity test #1	181,381	187,659	29.2%	25.5%	29.0%	25.5%	-0.24 pp
	Sensitivity test #2	185,547	191,450	29.3%	25.7%	29.1%	25.6%	-0.13 pp
	Sensitivity test #3	192,212	182,500	29.3%	25.4%	29.0%	25.6%	-0.37 pp
	Sensitivity test #4	223,454	230,313	29.3%	25.5%	28.9%	25.2%	-0.21 pp
Stroke	BPCI Advanced impact estimate	136,211	140,534	50.4%	46.0%	50.8%	47.2%	-0.85 pp
	Sensitivity test #1	128,267	137,438	50.4%	46.0%	50.7%	47.2%	-0.92 pp
	Sensitivity test #2	126,266	139,852	50.6%	46.0%	50.8%	47.3%	-1.06 pp*
	Sensitivity test #3	130,128	133,691	50.5%	45.8%	50.9%	47.2%	-1.00 pp
	Sensitivity test #4	137,609	143,977	50.5%	46.0%	50.8%	47.3%	-0.95 pp
UTI	BPCI Advanced impact estimate	109,138	113,918	36.4%	34.5%	36.8%	35.7%	-0.86 pp
	Sensitivity test #1	99,953	111,909	36.5%	34.6%	36.9%	35.8%	-0.85 pp
	Sensitivity test #2	98,915	113,567	36.5%	34.7%	36.8%	35.8%	-0.79 pp
	Sensitivity test #3	104,422	108,084	36.5%	34.3%	36.8%	35.7%	-1.06 pp
	Sensitivity test #4	126,563	133,132	36.8%	34.5%	36.5%	35.6%	-1.34 pp*
PCI (Outpatient)	BPCI Advanced impact estimate	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #4	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Exhibit G.3: BPCI Advanced Impact Estimate and Sensitivity Test Results, Mortality Rate by Clinical Episode, Hospital EIs, October 1, 2018 – December 31, 2019

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
AMI	BPCI Advanced impact estimate	65,075	64,551	18.1%	16.5%	18.4%	16.2%	0.60 pp
	Sensitivity test #1	60,597	62,722	18.0%	16.4%	18.4%	16.2%	0.62 pp
	Sensitivity test #2	61,236	64,211	18.1%	16.4%	18.4%	16.2%	0.52 pp
	Sensitivity test #3	61,834	61,087	18.1%	16.4%	18.5%	16.2%	0.55 pp
	Sensitivity test #4	71,795	71,487	18.1%	16.4%	18.3%	16.3%	0.40 pp
Cardiac Arrhythmia	BPCI Advanced impact estimate	130,494	136,570	8.6%	7.9%	8.8%	8.0%	0.02 pp
	Sensitivity test #1	122,852	135,036	8.6%	7.9%	8.8%	8.0%	0.00 pp
	Sensitivity test #2	120,176	136,139	8.6%	7.9%	8.7%	8.0%	0.04 pp
	Sensitivity test #3	124,240	130,503	8.7%	7.8%	8.8%	8.0%	0.01 pp
	Sensitivity test #4	143,849	154,801	8.7%	7.9%	8.8%	8.0%	-0.09 pp
COPD, Bronchitis, & Asthma	BPCI Advanced impact estimate	148,484	157,217	8.4%	6.9%	8.3%	6.9%	-0.09 pp
	Sensitivity test #1	132,404	153,469	8.4%	6.9%	8.3%	6.9%	-0.09 pp
	Sensitivity test #2	137,990	157,031	8.4%	6.9%	8.3%	6.9%	-0.12 pp
	Sensitivity test #3	142,940	150,085	8.4%	6.9%	8.3%	6.9%	-0.06 pp
	Sensitivity test #4	169,889	176,386	8.3%	6.9%	8.2%	6.9%	-0.14 pp
CHF	BPCI Advanced impact estimate	265,514	284,067	18.3%	15.5%	18.2%	15.4%	-0.06 pp
	Sensitivity test #1	239,038	274,651	18.4%	15.5%	18.2%	15.4%	-0.10 pp
	Sensitivity test #2	243,265	283,636	18.3%	15.5%	18.2%	15.4%	-0.02 pp
	Sensitivity test #3	252,256	267,481	18.4%	15.4%	18.3%	15.3%	-0.03 pp
	Sensitivity test #4	310,113	327,825	18.2%	15.3%	18.3%	15.4%	-0.01 pp
GI Hemorrhage	BPCI Advanced impact estimate	55,358	62,848	10.5%	9.6%	10.8%	9.6%	0.32 pp
	Sensitivity test #1	53,019	61,701	10.5%	9.6%	10.8%	9.6%	0.34 pp
	Sensitivity test #2	49,180	62,585	10.5%	9.7%	10.9%	9.6%	0.41 pp
	Sensitivity test #3	53,752	60,563	10.5%	9.5%	10.9%	9.7%	0.19 pp
	Sensitivity test #4	64,371	68,846	10.7%	9.8%	10.9%	9.7%	0.24 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
Hip & Femur Procedures	BPCI Advanced impact estimate	43,847	42,936	10.5%	9.5%	11.1%	10.5%	-0.46 pp
	Sensitivity test #1	40,616	42,027	10.5%	9.4%	11.1%	10.5%	-0.48 pp
	Sensitivity test #2	36,200	42,790	10.5%	9.5%	11.0%	10.5%	-0.49 pp
	Sensitivity test #3	42,157	40,593	10.6%	9.5%	11.1%	10.4%	-0.41 pp
	Sensitivity test #4	51,558	51,383	10.4%	9.5%	11.0%	10.2%	-0.14 pp
MJRLE	BPCI Advanced impact estimate	113,637	124,763	2.2%	1.6%	1.9%	1.3%	-0.06 pp
	Sensitivity test #1	92,662	112,482	2.3%	1.6%	2.0%	1.4%	-0.05 pp
	Sensitivity test #2	91,442	124,105	2.2%	1.6%	1.9%	1.3%	0.02 pp
	Sensitivity test #3	108,395	115,461	2.3%	1.6%	2.0%	1.4%	-0.09 pp
	Sensitivity test #4	140,721	141,084	2.1%	1.5%	1.9%	1.3%	-0.06 pp
Renal Failure	BPCI Advanced impact estimate	98,401	93,136	17.9%	16.0%	17.8%	16.8%	-0.92 pp
	Sensitivity test #1	92,695	91,514	18.0%	16.1%	17.8%	16.8%	-0.92 pp*
	Sensitivity test #2	88,657	92,661	17.9%	16.2%	17.8%	16.8%	-0.78 pp
	Sensitivity test #3	94,159	89,386	18.0%	16.1%	17.8%	16.7%	-0.77 pp
	Sensitivity test #4	110,558	111,024	17.9%	16.1%	18.0%	17.0%	-0.77 pp*
Sepsis	BPCI Advanced impact estimate	323,230	339,177	21.6%	20.0%	20.8%	19.0%	0.11 pp
	Sensitivity test #1	294,021	333,688	21.7%	20.0%	20.8%	19.1%	0.10 pp
	Sensitivity test #2	296,828	337,498	21.7%	20.0%	20.9%	19.1%	0.10 pp
	Sensitivity test #3	305,504	320,540	21.9%	20.0%	21.0%	19.1%	0.02 pp
	Sensitivity test #4	400,257	399,570	21.9%	20.1%	21.2%	19.4%	-0.01 pp
SPRI	BPCI Advanced impact estimate	198,328	188,187	17.4%	14.9%	17.5%	14.2%	0.84 pp
	Sensitivity test #1	178,007	183,922	17.4%	15.0%	17.6%	14.3%	0.86 pp*
	Sensitivity test #2	182,059	187,635	17.4%	15.0%	17.6%	14.2%	0.87 pp*
	Sensitivity test #3	188,592	178,829	17.5%	14.9%	17.7%	14.2%	0.94 pp*
	Sensitivity test #4	219,087	225,791	17.3%	14.9%	17.4%	14.4%	0.60 pp*
Stroke	BPCI Advanced impact estimate	134,517	138,823	16.5%	15.5%	16.1%	15.2%	-0.02 pp
	Sensitivity test #1	126,644	135,763	16.5%	15.6%	16.2%	15.2%	0.07 pp
	Sensitivity test #2	124,707	138,150	16.5%	15.6%	16.2%	15.2%	0.09 pp
	Sensitivity test #3	128,498	132,054	16.6%	15.4%	16.3%	15.3%	-0.22 pp
	Sensitivity test #4	135,884	142,231	16.6%	15.5%	16.1%	15.2%	-0.11 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
UTI	BPCI Advanced impact estimate	107,060	111,640	11.8%	10.8%	11.4%	11.0%	-0.64 pp
	Sensitivity test #1	98,067	109,661	11.9%	10.8%	11.4%	11.0%	-0.68 pp*
	Sensitivity test #2	97,023	111,297	11.8%	10.8%	11.3%	10.9%	-0.54 pp
	Sensitivity test #3	102,422	105,898	11.9%	10.7%	11.5%	11.0%	-0.68 pp*
	Sensitivity test #4	124,069	130,509	11.7%	10.5%	11.4%	11.0%	-0.67 pp*
PCI (Outpatient)	BPCI Advanced impact estimate	35,071	33,363	0.9%	1.0%	0.9%	0.9%	0.09 pp
	Sensitivity test #1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #2	33,464	33,357	0.9%	1.0%	0.9%	0.9%	0.09 pp
	Sensitivity test #3	33,521	32,332	0.9%	1.0%	0.8%	0.9%	0.04 pp
	Sensitivity test #4	35,667	33,453	0.9%	1.0%	0.9%	0.9%	0.08 pp

Exhibit G.4: BPCI Advanced Impact Estimate and Sensitivity Test Results, Readmission Rate by Clinical Episode, Hospital EIs, October 1, 2018 – December 31, 2019

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
AMI	BPCI Advanced impact estimate	65,636	65,034	36.4%	35.4%	35.5%	34.0%	0.57 pp
	Sensitivity test #1	61,118	63,194	36.5%	35.5%	35.5%	33.9%	0.55 pp
	Sensitivity test #2	61,755	64,690	36.5%	35.6%	35.5%	33.9%	0.69 pp
	Sensitivity test #3	62,374	61,552	36.5%	35.3%	35.5%	33.8%	0.54 pp
	Sensitivity test #4	72,430	72,037	36.6%	35.6%	35.6%	34.1%	0.50 pp
Cardiac Arrhythmia	BPCI Advanced impact estimate	131,158	137,287	31.3%	29.4%	30.7%	29.5%	-0.66 pp
	Sensitivity test #1	123,468	135,740	31.3%	29.4%	30.7%	29.5%	-0.64 pp
	Sensitivity test #2	120,789	136,854	31.3%	29.4%	30.8%	29.6%	-0.66 pp
	Sensitivity test #3	124,874	131,194	31.2%	29.1%	30.7%	29.5%	-0.94 pp*
	Sensitivity test #4	144,631	155,632	31.3%	29.5%	30.7%	29.5%	-0.58 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
COPD, Bronchitis, & Asthma	BPCI Advanced impact estimate	149,571	158,423	36.0%	34.8%	35.8%	34.2%	0.31 pp
	Sensitivity test #1	133,373	154,638	36.0%	34.8%	35.8%	34.3%	0.38 pp
	Sensitivity test #2	139,022	158,236	36.1%	34.7%	35.9%	34.3%	0.16 pp
	Sensitivity test #3	143,986	151,239	36.0%	34.7%	35.8%	34.1%	0.36 pp
	Sensitivity test #4	171,137	177,720	36.5%	35.1%	35.8%	34.4%	0.06 pp
CHF	BPCI Advanced impact estimate	268,010	286,662	41.3%	40.2%	41.0%	40.4%	-0.47 pp
	Sensitivity test #1	241,299	277,132	41.4%	40.3%	41.0%	40.4%	-0.43 pp
	Sensitivity test #2	245,540	286,226	41.4%	40.5%	41.0%	40.4%	-0.28 pp
	Sensitivity test #3	254,647	269,966	41.3%	40.2%	41.0%	40.3%	-0.47 pp
	Sensitivity test #4	313,118	330,834	41.8%	40.7%	41.1%	40.4%	-0.39 pp
GI Hemorrhage	BPCI Advanced impact estimate	55,882	63,387	31.4%	30.9%	30.7%	30.5%	-0.30 pp
	Sensitivity test #1	53,522	62,233	31.4%	30.9%	30.7%	30.5%	-0.33 pp
	Sensitivity test #2	49,654	63,120	31.6%	31.0%	30.8%	30.6%	-0.43 pp
	Sensitivity test #3	54,267	61,082	31.4%	30.7%	30.7%	30.5%	-0.52 pp
	Sensitivity test #4	65,005	69,461	31.7%	31.3%	30.8%	30.6%	-0.15 pp
Hip & Femur Procedures	BPCI Advanced impact estimate	44,846	43,977	21.9%	20.5%	22.4%	21.8%	-0.87 pp
	Sensitivity test #1	41,551	43,039	21.9%	20.4%	22.3%	21.7%	-0.93 pp
	Sensitivity test #2	37,009	43,829	21.8%	20.7%	22.3%	21.7%	-0.49 pp
	Sensitivity test #3	43,113	41,589	21.9%	20.3%	22.4%	21.7%	-0.98 pp
	Sensitivity test #4	52,680	52,616	22.2%	20.8%	22.5%	21.4%	-0.36 pp
MJRLE	BPCI Advanced impact estimate	114,051	125,120	12.3%	11.6%	11.9%	11.8%	-0.63 pp
	Sensitivity test #1	93,010	112,806	12.3%	11.7%	12.2%	12.0%	-0.43 pp
	Sensitivity test #2	91,768	124,457	12.4%	12.0%	11.9%	11.9%	-0.31 pp
	Sensitivity test #3	108,798	115,806	12.4%	11.6%	11.9%	12.0%	-0.93 pp
	Sensitivity test #4	141,179	141,498	12.5%	11.9%	11.8%	11.5%	-0.30 pp
Renal Failure	BPCI Advanced impact estimate	99,460	94,305	36.0%	34.8%	35.3%	34.1%	-0.06 pp
	Sensitivity test #1	93,689	92,654	36.0%	34.7%	35.4%	34.1%	-0.02 pp
	Sensitivity test #2	89,593	93,826	36.2%	34.9%	35.5%	34.4%	-0.06 pp
	Sensitivity test #3	95,173	90,519	36.0%	34.7%	35.3%	34.0%	-0.01 pp
	Sensitivity test #4	111,786	112,414	36.1%	34.8%	35.2%	34.2%	-0.28 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
Sepsis	BPCI Advanced impact estimate	328,098	344,709	32.6%	31.8%	32.7%	32.0%	-0.18 pp
	Sensitivity test #1	298,441	339,103	32.6%	31.8%	32.8%	32.1%	-0.12 pp
	Sensitivity test #2	301,374	343,002	32.8%	31.9%	32.8%	32.2%	-0.24 pp
	Sensitivity test #3	310,188	325,858	32.7%	31.9%	32.7%	32.0%	-0.08 pp
	Sensitivity test #4	406,580	405,957	33.0%	32.2%	32.8%	32.1%	-0.08 pp
SPRI	BPCI Advanced impact estimate	200,768	190,724	31.5%	29.6%	31.2%	29.1%	0.22 pp
	Sensitivity test #1	180,185	186,400	31.7%	29.8%	31.3%	29.3%	0.16 pp
	Sensitivity test #2	184,311	190,162	31.6%	29.7%	31.4%	29.3%	0.09 pp
	Sensitivity test #3	190,945	181,266	31.5%	29.6%	31.2%	29.2%	0.13 pp
	Sensitivity test #4	221,909	228,805	31.6%	29.7%	31.2%	29.2%	0.10 pp
Stroke	BPCI Advanced impact estimate	135,368	139,728	25.2%	24.6%	24.9%	23.6%	0.62 pp
	Sensitivity test #1	127,458	136,643	25.2%	24.6%	24.9%	23.6%	0.61 pp
	Sensitivity test #2	125,477	139,049	25.3%	24.6%	25.1%	23.8%	0.61 pp
	Sensitivity test #3	129,318	132,918	25.2%	24.5%	24.9%	23.5%	0.61 pp
	Sensitivity test #4	136,747	143,149	25.3%	24.6%	24.9%	23.6%	0.64 pp
UTI	BPCI Advanced impact estimate	108,598	113,442	32.9%	32.5%	32.4%	31.6%	0.46 pp
	Sensitivity test #1	99,467	111,441	32.9%	32.5%	32.5%	31.6%	0.46 pp
	Sensitivity test #2	98,406	113,092	33.0%	32.4%	32.5%	31.7%	0.17 pp
	Sensitivity test #3	103,895	107,628	32.8%	32.6%	32.4%	31.6%	0.58 pp
	Sensitivity test #4	125,922	132,567	33.1%	32.8%	32.5%	31.8%	0.41 pp
PCI (Outpatient)	BPCI Advanced impact estimate	35,092	33,374	13.3%	13.7%	13.1%	14.0%	-0.52 pp
	Sensitivity test #1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #2	33,485	33,368	13.4%	13.6%	13.2%	14.1%	-0.61 pp
	Sensitivity test #3	33,542	32,343	13.4%	13.6%	13.1%	14.0%	-0.71 pp
	Sensitivity test #4	35,688	33,464	13.4%	13.7%	13.1%	14.0%	-0.53 pp

B. Physician Group Practices

We conducted the following four sensitivity tests for PGP EIs:

- **Sensitivity test #1:** Excluding episodes that were treated by a BPCI participant (impacts baseline period observations only)
- **Sensitivity test #2:** Excluding Comprehensive Care for Joint Replacement (CJR) metropolitan statistical areas (MSAs) and episodes that occurred at a hospital that participated in CJR at any point (MJRLE only)
- **Sensitivity test #3:** Excluding episodes aligned with Medicare Shared Savings Program (MSSP) Track 3, MSSP Enhanced, Comprehensive End Stage Renal Disease Care Model, Next Generation Accountable Care Organization (ACO) and Vermont ACO
- **Sensitivity test #4:** Including the comparison sample selected under the propensity score model with no caliper selected, and all BPCI Advanced PGP EIs

Exhibit G.5: BPCI Advanced Impact Estimate and Sensitivity Test Results, Total Payments by Clinical Episode, PGP EIs, October 1, 2018 – December 31, 2019

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
AMI	BPCI Advanced impact estimate	20,816	20,817	$26,075	$26,072	$25,240	$25,769	-$533
	Sensitivity test #1	18,018	20,246	$26,170	$26,130	$25,236	$25,794	-$598
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	19,974	19,982	$26,065	$26,093	$25,239	$25,713	-$445
	Sensitivity test #4	27,787	22,263	$26,464	$26,331	$25,456	$25,947	-$624
Cellulitis	BPCI Advanced impact estimate	19,228	17,472	$21,008	$20,607	$20,779	$20,712	-$335
	Sensitivity test #1	15,482	17,311	$21,126	$20,685	$20,858	$20,773	-$357
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	18,219	16,864	$20,987	$20,446	$20,713	$20,666	-$494
	Sensitivity test #4	23,256	17,681	$21,219	$20,623	$20,836	$20,775	-$535
Cervical Spinal Fusion	BPCI Advanced impact estimate	7,333	6,183	$30,159	$30,478	$30,200	$31,978	-$1,459
	Sensitivity test #1	6,795	6,177	$30,211	$30,510	$30,303	$32,055	-$1,452*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	7,135	5,887	$30,091	$30,026	$30,164	$32,310	-$2,212*
	Sensitivity test #4	8,663	6,532	$30,058	$30,513	$30,402	$32,029	-$1,172
COPD, Bronchitis, & Asthma	BPCI Advanced impact estimate	49,118	44,712	$19,492	$19,423	$19,106	$19,296	-$260
	Sensitivity test #1	42,898	43,722	$19,507	$19,417	$19,126	$19,317	-$280
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	46,743	43,489	$19,489	$19,379	$19,085	$19,224	-$250
	Sensitivity test #4	56,968	47,259	$19,577	$19,504	$19,183	$19,376	-$266
CHF	BPCI Advanced impact estimate	62,301	55,873	$26,280	$25,503	$25,838	$25,537	-$476
	Sensitivity test #1	55,225	54,372	$26,321	$25,533	$25,803	$25,523	-$508
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	58,361	51,872	$26,218	$25,390	$25,826	$25,542	-$544*
	Sensitivity test #4	98,789	59,725	$26,067	$25,312	$25,909	$25,583	-$429

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
GI Hemorrhage	BPCI Advanced impact estimate	28,890	24,126	$21,099	$21,460	$21,115	$21,992	-$515
	Sensitivity test #1	26,005	23,908	$21,122	$21,452	$21,062	$21,965	-$574
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	27,184	23,144	$21,084	$21,456	$21,065	$22,047	-$610
	Sensitivity test #4	41,576	27,224	$21,168	$21,533	$21,101	$22,068	-$601*
GI Obstruction	BPCI Advanced impact estimate	12,467	12,645	$17,728	$17,105	$17,485	$17,246	-$384
	Sensitivity test #1	11,072	12,576	$17,772	$17,156	$17,501	$17,257	-$372
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	11,760	12,059	$17,682	$17,215	$17,556	$17,280	-$191
	Sensitivity test #4	18,194	13,273	$17,806	$17,111	$17,429	$17,115	-$381
Hip & Femur Procedures	BPCI Advanced impact estimate	48,599	42,942	$45,471	$43,859	$45,180	$46,030	-$2,463
	Sensitivity test #1	45,246	41,739	$45,476	$43,872	$45,234	$46,046	-$2,416*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	46,459	40,650	$45,420	$43,912	$45,185	$46,022	-$2,345*
	Sensitivity test #4	87,436	51,600	$45,300	$43,756	$45,213	$46,056	-$2,387*
LE & Humerus Procedures	BPCI Advanced impact estimate	8,915	7,075	$38,798	$40,138	$38,421	$40,852	-$1,091
	Sensitivity test #1	8,540	6,962	$38,727	$40,053	$38,413	$40,800	-$1,061
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	8,605	6,505	$38,739	$39,756	$38,430	$41,298	-$1,850*
	Sensitivity test #4	12,276	8,101	$39,225	$40,622	$38,834	$41,418	-$1,187
MJRLE	BPCI Advanced impact estimate	238,141	198,239	$26,298	$22,902	$26,054	$24,030	-$1,373
	Sensitivity test #1	196,544	180,242	$26,671	$23,190	$26,245	$24,353	-$1,589*
	Sensitivity test #2	197,978	168,896	$26,192	$22,542	$26,234	$24,346	-$1,762*
	Sensitivity test #3	225,566	186,564	$26,328	$22,845	$26,100	$23,988	-$1,370*
	Sensitivity test #4	497,213	240,718	$25,895	$22,082	$25,807	$23,786	-$1,792*
MJRUE	BPCI Advanced impact estimate	30,670	27,171	$23,891	$22,720	$23,784	$23,421	-$807
	Sensitivity test #1	28,293	26,935	$23,913	$22,755	$23,864	$23,488	-$781*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	28,447	25,179	$23,904	$22,651	$23,826	$23,345	-$773*
	Sensitivity test #4	45,411	29,889	$23,760	$22,419	$23,749	$23,342	-$934*

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
PCI (Inpatient)	BPCI Advanced impact estimate	21,089	22,010	$28,356	$28,625	$27,287	$28,257	-$701
	Sensitivity test #1	19,340	21,761	$28,352	$28,590	$27,338	$28,293	-$717*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	19,973	21,101	$28,302	$28,676	$27,246	$28,274	-$654
	Sensitivity test #4	23,769	22,205	$28,632	$28,925	$27,411	$28,363	-$659*
Renal Failure	BPCI Advanced impact estimate	32,437	34,984	$24,865	$25,260	$24,813	$25,371	-$163
	Sensitivity test #1	28,734	34,227	$24,867	$25,239	$24,742	$25,344	-$229
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	30,876	33,089	$24,865	$25,210	$24,731	$25,338	-$262
	Sensitivity test #4	56,612	41,852	$25,215	$25,316	$24,742	$25,354	-$510*
Sepsis	BPCI Advanced impact estimate	63,382	53,904	$30,173	$30,613	$29,787	$30,812	-$585
	Sensitivity test #1	51,955	53,014	$30,320	$30,716	$29,945	$30,979	-$638
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	60,410	51,140	$30,230	$30,629	$29,786	$30,940	-$756
	Sensitivity test #4	163,364	74,384	$29,712	$29,824	$29,352	$30,268	-$804*
SPRI	BPCI Advanced impact estimate	55,759	53,019	$23,455	$22,528	$23,351	$22,971	-$546
	Sensitivity test #1	45,581	52,074	$23,598	$22,608	$23,305	$22,960	-$644*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	52,525	51,653	$23,427	$22,463	$23,321	$22,976	-$618
	Sensitivity test #4	79,504	56,409	$23,654	$22,566	$23,337	$22,938	-$688*
Spinal Fusion (Non-Cervical)	BPCI Advanced impact estimate	30,956	29,268	$40,257	$39,229	$41,213	$41,661	-$1,475
	Sensitivity test #1	28,388	28,298	$40,455	$39,289	$41,116	$41,674	-$1,724*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	29,756	27,743	$40,219	$39,085	$41,207	$41,464	-$1,392*
	Sensitivity test #4	35,526	30,383	$40,396	$39,263	$41,285	$41,761	-$1,609*
Stroke	BPCI Advanced impact estimate	36,709	37,006	$31,877	$31,245	$30,571	$30,710	-$770
	Sensitivity test #1	31,570	36,249	$31,957	$31,292	$30,607	$30,710	-$769
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	34,610	35,719	$31,870	$31,371	$30,550	$30,692	-$640
	Sensitivity test #4	48,121	39,865	$31,977	$31,698	$30,636	$31,129	-$773

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
UTI	BPCI Advanced impact estimate	40,024	38,673	$23,438	$23,892	$23,035	$23,701	-$212
	Sensitivity test #1	34,060	38,363	$23,505	$23,924	$23,026	$23,694	-$249
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	37,909	35,926	$23,468	$23,871	$23,119	$23,801	-$280
	Sensitivity test #4	48,390	39,589	$23,407	$23,997	$23,040	$23,702	-$73

Exhibit G.6: BPCI Advanced Impact Estimate and Sensitivity Test Results, First Discharge to Institutional PAC by Clinical Episode, PGP EIs, October 1, 2018 – December 31, 2019

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
AMI	BPCI Advanced impact estimate	20,816	20,817	21.3%	18.9%	21.4%	18.8%	0.12 pp
	Sensitivity test #1	18,018	20,246	21.3%	18.8%	21.2%	18.8%	-0.05 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	19,974	19,982	21.3%	19.0%	21.4%	19.0%	0.11 pp
	Sensitivity test #4	27,787	22,263	22.0%	19.3%	22.0%	19.5%	-0.28 pp
Cellulitis	BPCI Advanced impact estimate	19,134	17,426	23.7%	19.8%	22.4%	20.5%	-1.99 pp
	Sensitivity test #1	15,390	17,267	24.0%	20.0%	22.8%	20.8%	-2.07 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	18,126	16,818	23.7%	19.6%	22.3%	20.6%	-2.42 pp*
	Sensitivity test #4	23,127	17,635	23.6%	19.2%	22.4%	20.5%	-2.52 pp*
Cervical Spinal Fusion	BPCI Advanced impact estimate	7,332	6,183	15.1%	12.5%	15.6%	15.6%	-2.58 pp
	Sensitivity test #1	6,795	6,177	15.3%	12.7%	15.9%	15.9%	-2.60 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	7,134	5,887	15.2%	12.2%	15.7%	15.5%	-2.86 pp
	Sensitivity test #4	8,662	6,532	15.5%	12.8%	15.9%	16.0%	-2.72 pp*

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
COPD, Bronchitis, & Asthma	BPCI Advanced impact estimate	49,118	44,712	13.0%	10.9%	12.9%	11.7%	-0.92 pp
	Sensitivity test #1	42,898	43,722	13.0%	10.8%	12.9%	11.7%	-0.98 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	46,743	43,489	13.1%	10.8%	12.8%	11.5%	-0.92 pp
	Sensitivity test #4	56,968	47,259	13.3%	11.0%	13.1%	12.0%	-1.11 pp*
CHF	BPCI Advanced impact estimate	62,149	55,777	24.2%	20.4%	23.8%	21.3%	-1.29 pp
	Sensitivity test #1	55,074	54,277	24.2%	20.4%	23.7%	21.2%	-1.32 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	58,211	51,801	24.1%	20.0%	23.9%	21.2%	-1.42 pp*
	Sensitivity test #4	98,403	59,629	23.9%	19.9%	23.3%	20.6%	-1.25 pp*
GI Hemorrhage	BPCI Advanced impact estimate	28,803	24,107	17.8%	15.8%	17.7%	17.4%	-1.67 pp
	Sensitivity test #1	25,919	23,889	17.9%	15.9%	17.7%	17.4%	-1.72 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	27,097	23,126	17.8%	15.7%	17.7%	17.5%	-1.90 pp*
	Sensitivity test #4	41,444	27,204	17.3%	15.5%	17.4%	16.8%	-1.21 pp
GI Obstruction	BPCI Advanced impact estimate	12,467	12,645	13.0%	10.5%	12.1%	11.3%	-1.73 pp
	Sensitivity test #1	11,072	12,576	13.0%	10.6%	12.1%	11.4%	-1.72 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	11,760	12,059	12.9%	10.7%	12.1%	11.2%	-1.37 pp
	Sensitivity test #4	18,194	13,273	12.9%	10.0%	12.0%	11.2%	-2.01 pp*
Hip & Femur Procedures	BPCI Advanced impact estimate	48,446	42,862	87.1%	84.3%	87.1%	86.4%	-2.05 pp
	Sensitivity test #1	45,094	41,659	87.0%	84.2%	87.0%	86.3%	-1.99 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	46,306	40,572	87.0%	84.3%	87.1%	86.2%	-1.82 pp*
	Sensitivity test #4	87,163	51,505	87.1%	84.1%	86.7%	85.8%	-2.14 pp*
LE & Humerus Procedures	BPCI Advanced impact estimate	8,856	7,069	64.3%	63.9%	63.4%	63.3%	-0.25 pp
	Sensitivity test #1	8,481	6,957	64.0%	63.6%	63.2%	63.0%	-0.18 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	8,547	6,499	64.1%	63.3%	63.2%	63.1%	-0.63 pp
	Sensitivity test #4	12,200	8,095	64.8%	64.1%	63.9%	63.6%	-0.51 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
MJRLE	BPCI Advanced impact estimate	238,141	198,239	42.2%	23.7%	39.6%	27.2%	-6.04 pp
	Sensitivity test #1	196,544	180,242	43.1%	24.4%	40.8%	28.3%	-6.19 pp*
	Sensitivity test #2	197,978	168,896	42.1%	22.6%	40.6%	28.6%	-7.53 pp*
	Sensitivity test #3	225,566	186,564	42.2%	23.5%	39.8%	26.9%	-5.82 pp*
	Sensitivity test #4	497,213	240,718	41.2%	22.2%	38.0%	26.2%	-7.21 pp*
MJRUE	BPCI Advanced impact estimate	30,994	27,254	16.9%	10.0%	16.4%	12.3%	-2.77 pp
	Sensitivity test #1	28,612	27,018	16.9%	10.1%	16.6%	12.5%	-2.67 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	28,732	25,262	16.8%	9.8%	16.5%	11.9%	-2.44 pp*
	Sensitivity test #4	45,796	29,972	16.3%	9.6%	16.0%	12.0%	-2.69 pp*
PCI (Inpatient)	BPCI Advanced impact estimate	20,857	22,008	9.2%	7.4%	8.2%	7.0%	-0.63 pp
	Sensitivity test #1	19,108	21,759	9.3%	7.3%	8.2%	7.0%	-0.76 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	19,741	21,099	9.3%	7.4%	8.2%	7.0%	-0.63 pp
	Sensitivity test #4	23,537	22,203	9.5%	7.6%	8.3%	7.1%	-0.65 pp
Renal Failure	BPCI Advanced impact estimate	32,409	34,950	30.4%	29.0%	30.1%	29.2%	-0.55 pp
	Sensitivity test #1	28,706	34,193	30.5%	29.0%	30.0%	29.2%	-0.67 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	30,851	33,055	30.3%	29.0%	30.0%	29.2%	-0.39 pp
	Sensitivity test #4	56,527	41,809	30.3%	27.9%	29.8%	29.0%	-1.65 pp*
Sepsis	BPCI Advanced impact estimate	63,647	53,925	34.2%	30.1%	32.1%	30.3%	-2.23 pp
	Sensitivity test #1	52,199	53,035	34.5%	30.3%	32.4%	30.6%	-2.30 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	60,671	51,161	34.2%	30.0%	32.2%	30.5%	-2.60 pp*
	Sensitivity test #4	163,923	74,441	33.7%	29.5%	31.7%	29.2%	-1.77 pp*
SPRI	BPCI Advanced impact estimate	55,617	52,711	27.3%	23.6%	26.4%	24.3%	-1.50 pp
	Sensitivity test #1	45,439	51,768	27.7%	23.8%	26.4%	24.4%	-1.87 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	52,385	51,348	27.3%	23.5%	26.4%	24.4%	-1.72 pp*
	Sensitivity test #4	79,212	56,101	27.0%	23.0%	26.1%	23.8%	-1.81 pp*

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
Spinal Fusion (Non-Cervical)	BPCI Advanced impact estimate	30,956	29,268	30.2%	20.0%	32.5%	27.1%	-4.76 pp
	Sensitivity test #1	28,388	28,298	30.5%	20.3%	32.9%	27.4%	-4.68 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	29,756	27,743	30.2%	19.7%	32.5%	26.5%	-4.57 pp*
	Sensitivity test #4	35,526	30,383	30.1%	19.9%	32.8%	27.3%	-4.70 pp*
Stroke	BPCI Advanced impact estimate	36,801	37,014	50.7%	45.9%	49.4%	45.1%	-0.43 pp
	Sensitivity test #1	31,661	36,258	50.9%	46.0%	49.4%	45.1%	-0.58 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	34,702	35,727	50.7%	46.2%	49.5%	44.7%	0.25 pp
	Sensitivity test #4	48,274	39,894	50.5%	45.9%	49.5%	45.6%	-0.66 pp
UTI	BPCI Advanced impact estimate	39,956	38,639	34.9%	33.8%	35.0%	34.1%	-0.20 pp
	Sensitivity test #1	33,994	38,330	34.8%	33.7%	34.9%	34.1%	-0.23 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	37,844	35,897	34.8%	33.8%	34.9%	34.0%	-0.08 pp
	Sensitivity test #4	48,257	39,555	34.7%	33.5%	35.0%	34.0%	-0.29 pp

Exhibit G.7: BPCI Advanced Impact Estimate and Sensitivity Test Results, Mortality Rate by Clinical Episode, PGP EIs, October 1, 2018 – December 31, 2019

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
AMI	BPCI Advanced impact estimate	20,289	20,406	17.7%	16.2%	17.3%	15.7%	0.13 pp
	Sensitivity test #1	17,544	19,844	17.7%	16.2%	17.1%	15.6%	0.04 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	19,468	19,581	17.7%	16.3%	17.4%	15.6%	0.39 pp
	Sensitivity test #4	27,088	21,823	17.6%	16.4%	17.7%	15.9%	0.61 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
Cellulitis	BPCI Advanced impact estimate	18,764	17,178	6.7%	6.0%	6.6%	6.2%	-0.29 pp
	Sensitivity test #1	15,114	17,018	6.8%	6.0%	6.6%	6.2%	-0.31 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	17,764	16,580	6.7%	6.0%	6.7%	6.2%	-0.26 pp
	Sensitivity test #4	22,688	17,383	6.8%	6.1%	6.7%	6.3%	-0.31 pp
Cervical Spinal Fusion	BPCI Advanced impact estimate	7,324	6,189	1.2%	0.8%	1.3%	1.0%	-0.20 pp
	Sensitivity test #1	6,787	6,183	1.2%	0.8%	1.3%	1.0%	-0.18 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	7,126	5,893	1.3%	0.8%	1.3%	1.1%	-0.33 pp
	Sensitivity test #4	8,652	6,538	1.3%	0.9%	1.4%	1.0%	-0.06 pp
COPD, Bronchitis, & Asthma	BPCI Advanced impact estimate	48,122	43,898	8.5%	7.5%	8.6%	7.5%	0.20 pp
	Sensitivity test #1	42,029	42,927	8.5%	7.5%	8.6%	7.4%	0.18 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	45,786	42,706	8.5%	7.5%	8.7%	7.4%	0.30 pp
	Sensitivity test #4	55,775	46,413	8.6%	7.6%	8.7%	7.5%	0.20 pp
CHF	BPCI Advanced impact estimate	61,051	54,850	18.2%	15.6%	18.9%	16.0%	0.30 pp
	Sensitivity test #1	54,080	53,382	18.2%	15.6%	18.8%	16.0%	0.22 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	57,174	50,923	18.4%	15.4%	19.1%	15.8%	0.29 pp
	Sensitivity test #4	96,681	58,621	18.1%	15.7%	19.0%	16.3%	0.40 pp
GI Hemorrhage	BPCI Advanced impact estimate	28,309	23,756	10.6%	9.6%	10.3%	9.4%	-0.10 pp
	Sensitivity test #1	25,463	23,543	10.6%	9.6%	10.3%	9.5%	-0.10 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	26,618	22,781	10.6%	9.5%	10.4%	9.6%	-0.30 pp
	Sensitivity test #4	40,700	26,802	10.6%	9.4%	10.2%	9.3%	-0.32 pp
GI Obstruction	BPCI Advanced impact estimate	12,200	12,417	8.5%	6.7%	8.4%	6.8%	-0.10 pp
	Sensitivity test #1	10,819	12,350	8.4%	6.7%	8.5%	6.8%	-0.04 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	11,506	11,836	8.6%	6.5%	8.5%	7.0%	-0.53 pp
	Sensitivity test #4	17,803	13,031	8.4%	6.6%	8.5%	6.7%	0.04 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
Hip & Femur Procedures	BPCI Advanced impact estimate	47,339	41,829	10.8%	10.0%	10.8%	10.5%	-0.58 pp
	Sensitivity test #1	44,071	40,642	10.9%	10.0%	10.8%	10.5%	-0.58 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	45,236	39,583	10.9%	10.1%	10.8%	10.6%	-0.60 pp
	Sensitivity test #4	85,106	50,288	10.8%	10.3%	10.8%	10.5%	-0.14 pp
LE & Humerus Procedures	BPCI Advanced impact estimate	8,857	7,017	4.0%	3.3%	4.0%	3.6%	-0.38 pp
	Sensitivity test #1	8,490	6,916	4.1%	3.3%	4.0%	3.6%	-0.38 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	8,549	6,451	4.1%	3.2%	4.0%	3.8%	-0.67 pp
	Sensitivity test #4	12,183	8,040	4.2%	3.3%	4.0%	3.6%	-0.46 pp
MJRLE	BPCI Advanced impact estimate	238,327	198,636	1.9%	1.4%	1.8%	1.2%	0.12 pp
	Sensitivity test #1	196,815	180,684	1.9%	1.4%	1.9%	1.3%	0.09 pp
	Sensitivity test #2	198,161	169,340	1.9%	1.3%	1.8%	1.3%	-0.03 pp
	Sensitivity test #3	225,772	186,977	1.9%	1.4%	1.9%	1.2%	0.08 pp
	Sensitivity test #4	498,068	241,113	1.9%	1.2%	1.8%	1.2%	0.03 pp
MJRUE	BPCI Advanced impact estimate	30,847	27,232	0.5%	0.4%	0.5%	0.5%	-0.04 pp
	Sensitivity test #1	28,591	27,002	0.5%	0.4%	0.5%	0.5%	-0.05 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	28,586	25,243	0.5%	0.5%	0.5%	0.5%	-0.05 pp
	Sensitivity test #4	45,531	29,946	0.5%	0.4%	0.5%	0.5%	-0.12 pp
PCI (Inpatient)	BPCI Advanced impact estimate	20,977	21,906	4.2%	4.1%	4.0%	3.6%	0.34 pp
	Sensitivity test #1	19,237	21,659	4.2%	4.1%	4.0%	3.6%	0.34 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	19,864	21,000	4.2%	4.1%	4.0%	3.7%	0.29 pp
	Sensitivity test #4	23,632	22,101	4.3%	4.2%	4.1%	3.6%	0.40 pp
Renal Failure	BPCI Advanced impact estimate	31,789	34,342	18.1%	15.9%	17.3%	16.3%	-1.16 pp
	Sensitivity test #1	28,152	33,597	18.1%	16.0%	17.4%	16.3%	-0.98 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	30,250	32,471	18.1%	15.7%	17.4%	16.4%	-1.41 pp*
	Sensitivity test #4	55,369	41,077	17.6%	16.1%	17.6%	16.9%	-0.75 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
Sepsis	BPCI Advanced impact estimate	62,042	52,776	20.2%	19.2%	19.7%	18.0%	0.70 pp
	Sensitivity test #1	50,870	51,907	20.3%	19.4%	19.8%	18.2%	0.79 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	59,126	50,052	20.4%	19.4%	19.9%	18.2%	0.68 pp
	Sensitivity test #4	159,819	72,797	19.5%	18.3%	19.3%	18.2%	-0.10 pp
SPRI	BPCI Advanced impact estimate	54,560	51,845	16.9%	14.9%	17.2%	14.9%	0.31 pp
	Sensitivity test #1	44,547	50,918	17.2%	15.0%	17.1%	14.9%	-0.02 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	51,368	50,502	17.0%	15.0%	17.3%	14.9%	0.31 pp
	Sensitivity test #4	77,710	55,189	17.0%	15.0%	17.3%	15.1%	0.19 pp
Spinal Fusion (Non-Cervical)	BPCI Advanced impact estimate	31,286	29,272	0.6%	0.5%	0.6%	0.7%	-0.20 pp
	Sensitivity test #1	28,719	28,302	0.6%	0.5%	0.6%	0.7%	-0.22 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	30,089	27,749	0.6%	0.5%	0.6%	0.7%	-0.15 pp
	Sensitivity test #4	35,952	30,386	0.6%	0.5%	0.6%	0.7%	-0.20 pp
Stroke	BPCI Advanced impact estimate	36,292	36,647	15.8%	14.7%	15.6%	14.6%	-0.04 pp
	Sensitivity test #1	31,196	35,895	15.6%	14.7%	15.7%	14.6%	0.09 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	34,212	35,374	15.8%	14.8%	15.7%	14.6%	0.10 pp
	Sensitivity test #4	47,540	39,475	15.6%	14.5%	15.8%	14.5%	0.28 pp
UTI	BPCI Advanced impact estimate	39,269	37,963	12.1%	11.8%	12.7%	12.1%	0.30 pp
	Sensitivity test #1	33,396	37,656	12.2%	11.9%	12.8%	12.2%	0.31 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	37,185	35,261	12.3%	11.8%	12.8%	12.4%	-0.11 pp
	Sensitivity test #4	47,473	38,876	12.3%	11.8%	12.8%	12.2%	0.11 pp

Exhibit G.8: BPCI Advanced Impact Estimate and Sensitivity Test Results, Readmission Rate by Clinical Episode, PGP EIs, October 1, 2018 – December 31, 2019

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
AMI	BPCI Advanced impact estimate	20,532	20,567	34.5%	32.9%	34.2%	33.4%	-0.92 pp
	Sensitivity test #1	17,773	20,001	34.7%	32.9%	34.2%	33.5%	-1.03 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	19,699	19,736	34.5%	33.0%	34.1%	33.2%	-0.52 pp
	Sensitivity test #4	27,414	22,003	34.6%	32.1%	34.5%	33.7%	-1.63 pp*
Cellulitis	BPCI Advanced impact estimate	18,778	17,238	29.7%	28.3%	30.1%	27.9%	0.72 pp
	Sensitivity test #1	15,114	17,080	29.9%	28.4%	30.1%	27.8%	0.74 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	17,777	16,636	29.7%	28.0%	30.0%	27.9%	0.42 pp
	Sensitivity test #4	22,700	17,446	29.7%	27.9%	30.2%	28.1%	0.30 pp
Cervical Spinal Fusion	BPCI Advanced impact estimate	7,326	6,192	14.5%	13.1%	15.9%	13.2%	1.31 pp
	Sensitivity test #1	6,789	6,186	14.4%	13.0%	15.9%	13.1%	1.38 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	7,128	5,896	14.3%	12.6%	15.9%	13.8%	0.44 pp
	Sensitivity test #4	8,655	6,541	15.0%	13.2%	16.2%	13.1%	1.28 pp
COPD, Bronchitis, & Asthma	BPCI Advanced impact estimate	48,483	44,223	34.0%	33.5%	34.1%	33.2%	0.48 pp
	Sensitivity test #1	42,357	43,246	34.0%	33.5%	34.2%	33.2%	0.54 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	46,129	43,021	34.0%	33.4%	34.2%	33.3%	0.27 pp
	Sensitivity test #4	56,222	46,757	33.8%	33.3%	34.1%	33.2%	0.35 pp
CHF	BPCI Advanced impact estimate	61,681	55,416	40.1%	38.3%	39.6%	39.1%	-1.42 pp
	Sensitivity test #1	54,659	53,922	40.1%	38.2%	39.6%	39.1%	-1.40 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	57,765	51,460	40.1%	38.2%	39.5%	39.4%	-1.66 pp*
	Sensitivity test #4	97,637	59,232	39.7%	38.0%	39.8%	39.2%	-1.08 pp*

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
GI Hemorrhage	BPCI Advanced impact estimate	28,558	23,935	29.1%	28.6%	29.7%	28.1%	1.13 pp
	Sensitivity test #1	25,696	23,718	29.1%	28.6%	29.6%	28.0%	1.02 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	26,859	22,956	29.0%	28.6%	29.5%	28.2%	0.82 pp
	Sensitivity test #4	41,076	27,014	29.2%	28.4%	29.7%	28.4%	0.51 pp
GI Obstruction	BPCI Advanced impact estimate	12,328	12,546	27.1%	26.9%	28.9%	27.1%	1.59 pp
	Sensitivity test #1	10,943	12,479	27.1%	26.9%	28.7%	27.0%	1.52 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	11,628	11,963	26.9%	27.2%	28.8%	27.4%	1.76 pp
	Sensitivity test #4	17,988	13,165	26.8%	26.6%	28.6%	26.8%	1.59 pp
Hip & Femur Procedures	BPCI Advanced impact estimate	48,566	42,923	22.1%	20.4%	21.7%	20.5%	-0.50 pp
	Sensitivity test #1	45,215	41,721	22.0%	20.3%	21.6%	20.4%	-0.47 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	46,427	40,631	21.9%	20.3%	21.7%	20.3%	-0.19 pp
	Sensitivity test #4	87,373	51,578	21.9%	20.5%	21.7%	20.6%	-0.33 pp
LE & Humerus Procedures	BPCI Advanced impact estimate	8,893	7,061	20.4%	18.7%	21.3%	20.0%	-0.30 pp
	Sensitivity test #1	8,519	6,949	20.3%	18.6%	21.2%	19.9%	-0.29 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	8,583	6,493	20.3%	18.6%	21.4%	20.2%	-0.49 pp
	Sensitivity test #4	12,248	8,085	20.6%	20.1%	21.7%	20.3%	0.89 pp
MJRLE	BPCI Advanced impact estimate	239,144	199,104	11.2%	10.2%	10.7%	10.3%	-0.63 pp
	Sensitivity test #1	197,523	181,111	11.5%	10.4%	10.7%	10.5%	-0.90 pp*
	Sensitivity test #2	198,759	169,792	11.0%	9.5%	10.6%	10.5%	-1.39 pp*
	Sensitivity test #3	226,571	187,428	11.2%	10.1%	10.7%	10.3%	-0.67 pp
	Sensitivity test #4	499,545	241,748	11.2%	10.1%	10.6%	10.1%	-0.57 pp
MJRUE	BPCI Advanced impact estimate	30,979	27,242	8.7%	9.4%	8.5%	11.3%	-2.10 pp
	Sensitivity test #1	28,603	27,006	8.7%	9.4%	8.6%	11.3%	-2.08 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	28,718	25,252	8.8%	9.2%	8.5%	11.7%	-2.74 pp
	Sensitivity test #4	45,773	29,959	8.8%	10.2%	8.8%	12.5%	-2.22 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
PCI (Inpatient)	BPCI Advanced impact estimate	21,011	21,929	25.4%	24.1%	24.9%	24.1%	-0.50 pp
	Sensitivity test #1	19,269	21,682	25.4%	24.1%	25.1%	24.2%	-0.52 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	19,897	21,023	25.4%	24.3%	25.0%	24.2%	-0.28 pp
	Sensitivity test #4	23,680	22,124	25.4%	23.6%	25.1%	24.1%	-0.93 pp
Renal Failure	BPCI Advanced impact estimate	32,130	34,700	34.0%	32.4%	34.2%	32.2%	0.46 pp
	Sensitivity test #1	28,465	33,947	34.0%	32.4%	34.1%	32.1%	0.48 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	30,584	32,815	33.9%	32.2%	34.0%	32.2%	0.17 pp
	Sensitivity test #4	56,037	41,507	33.7%	32.4%	33.8%	32.1%	0.40 pp
Sepsis	BPCI Advanced impact estimate	62,849	53,568	31.0%	30.4%	30.8%	29.7%	0.45 pp
	Sensitivity test #1	51,531	52,683	31.1%	30.4%	30.9%	29.8%	0.43 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	59,897	50,813	31.1%	30.5%	30.7%	29.7%	0.38 pp
	Sensitivity test #4	162,060	73,860	30.1%	29.5%	30.4%	29.1%	0.61 pp
SPRI	BPCI Advanced impact estimate	55,359	52,755	29.2%	28.0%	29.5%	27.9%	0.46 pp
	Sensitivity test #1	45,256	51,819	29.3%	28.1%	29.4%	27.9%	0.34 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	52,137	51,394	29.1%	27.9%	29.6%	27.8%	0.47 pp
	Sensitivity test #4	78,958	56,124	29.1%	28.0%	29.5%	27.9%	0.45 pp
Spinal Fusion (Non-Cervical)	BPCI Advanced impact estimate	31,292	29,277	13.2%	11.8%	12.6%	12.7%	-1.38 pp
	Sensitivity test #1	28,724	28,307	13.2%	11.9%	12.7%	12.7%	-1.38 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	30,093	27,754	13.1%	11.9%	12.6%	12.6%	-1.30 pp
	Sensitivity test #4	35,958	30,391	13.1%	12.2%	12.7%	12.7%	-0.88 pp
Stroke	BPCI Advanced impact estimate	36,593	36,848	23.6%	22.8%	23.4%	23.5%	-0.85 pp
	Sensitivity test #1	31,476	36,094	23.4%	22.7%	23.4%	23.4%	-0.76 pp
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	34,499	35,567	23.5%	22.8%	23.4%	23.5%	-0.84 pp
	Sensitivity test #4	47,992	39,706	23.5%	22.5%	23.4%	23.5%	-1.05 pp

Clinical Episode	Result	Number of BPCI Advanced Episodes	Number of Comparison Episodes	BPCI Advanced Baseline	BPCI Advanced Intervention	Comparison Baseline	Comparison Intervention	DiD
UTI	BPCI Advanced impact estimate	39,799	38,491	30.9%	31.3%	31.1%	29.5%	2.06 pp
	Sensitivity test #1	33,860	38,184	30.9%	31.3%	31.1%	29.4%	2.06 pp*
	Sensitivity test #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sensitivity test #3	37,691	35,760	30.8%	31.1%	31.3%	29.3%	2.21 pp*
	Sensitivity test #4	48,058	39,404	30.4%	30.9%	31.1%	29.5%	2.02 pp*

Appendix H: Supplemental Medicare Program Savings Results

The following tables display Medicare program savings results assessed in this report. The estimate of the reduction in non-standardized payments is based on difference-in-differences (DiD) models of standardized Medicare paid amounts during the episode. In all exhibits, estimates and relevant calculations that are statistically different from zero at the 1%, 5% or 10% significance level are indicated by brown, medium orange, and light orange shaded cells, respectively. Net savings to Medicare is the estimated reduction in non-standardized payments minus reconciliation payments. Net savings and reductions in non-standardized payments are reported such that a positive value indicates savings to Medicare and a negative value indicates losses to Medicare. Lower and upper bounds are calculated from the 90% and 95% confidence intervals of the DiD estimate. Results expressed as a percent are calculated as a percentage of the BPCI Advanced counterfactual, which is an estimate of what payments would have been absent the BPCI Advanced Model, and is calculated as the average BPCI Advanced episode payments in the baseline plus the change in the average episode payments for the comparison group from baseline to intervention. The sample size in Exhibit H.1 represents the number of episodes used to estimate the reduction in non-standardized payments. The sample size for all subsequent tables represents the share of episodes for the given row out of all BPCI Advanced episodes presented in Exhibit H.1. The share of episodes for these subsequent tables may not add up to 100% due to the use of different weights to resolve overlap among episodes in different clinical episodes. Results are based on clinical episodes with sufficient sample size for evaluation.

Results reflect the BPCI Advanced evaluation team's analysis of Medicare claims and enrollment data for episodes with anchor stays/procedures beginning April 1, 2013, and ending on or before December 31, 2017 (baseline period) and episodes with anchor stays/procedures beginning October 1, 2018 and ending on or before December 31, 2019 (intervention period) for BPCI Advanced EIs and matched comparison providers. Please refer to the following abbreviations, which are used throughout this appendix:

- AMI = acute myocardial infarction
- CHF = congestive heart failure
- CI = confidence interval
- COPD = chronic obstructive pulmonary disease
- GI = gastrointestinal
- Hip & Femur = hip and femur procedures except major joint
- LE & Humerus = lower extremity and humerus procedure except hip, foot, femur
- LCI = lower confidence interval
- MJRLE = major joint replacement of the lower extremity
- MJRUE = major joint replacement of the upper extremity
- NC = non-cervical
- PCI = percutaneous coronary intervention
- SPRI = simple pneumonia and respiratory infections

- UCI = upper confidence interval
- UTI = urinary tract infection

Exhibit H.1: Model Medicare Savings and Components, BPCI Advanced Hospitals and PGPs, October 1, 2018 – December 31, 2019

	Reduction in Non-standardized Payments	Reconciliation Payments	Savings to Medicare	Reduction in Non-standardized Payments as a Percentage (%)	Reconciliation Payments as a Percentage (%)	Savings as a Percentage (%)
Estimate (n=687,454)	$550,715,186	$616,464,595	-$65,749,409	3.0%	3.4%	-0.4%
Lower Bound (95% CI)	$447,943,062	N/A	-$168,521,533	2.5%	N/A	-0.9%
Upper Bound (95% CI)	$653,487,310	N/A	$37,022,714	3.6%	N/A	0.2%
Lower Bound (90% CI)	$464,466,101	N/A	-$151,998,494	2.6%	N/A	-0.8%
Upper Bound (90% CI)	$636,964,271	N/A	$20,499,676	3.5%	N/A	0.1%

Exhibit H.2: Medicare Savings and Components, BPCI Advanced Medical Clinical Episodes, October 1, 2018 – December 31, 2019

	Reduction in Non-standardized Payments	Reconciliation Payments	Savings to Medicare	Reduction in Non-standardized Payments as a Percentage (%)	Reconciliation Payments as a Percentage (%)	Savings as a Percentage (%)
Estimate (n=70%)	$252,458,853	$527,476,039	-$275,017,186	2.0%	4.2%	-2.2%
Lower Bound (95% CI)	$171,544,055	N/A	-$355,931,984	1.4%	N/A	-2.9%
Upper Bound (95% CI)	$333,373,650	N/A	-$194,102,389	2.7%	N/A	-1.6%
Lower Bound (90% CI)	$184,553,014	N/A	-$342,923,025	1.5%	N/A	-2.8%
Upper Bound (90% CI)	$320,364,691	N/A	-$207,111,348	2.6%	N/A	-1.7%

Exhibit H.3: Medicare Savings and Components, BPCI Advanced Surgical Clinical Episodes, October 1, 2018 – December 31, 2019

	Reduction in Non-standardized Payments	Reconciliation Payments	Savings to Medicare	Reduction in Non-standardized Payments as a Percentage (%)	Reconciliation Payments as a Percentage (%)	Savings as a Percentage (%)
Estimate (n=30%)	$293,384,991	$88,988,556	$204,396,435	5.2%	1.6%	3.6%
Lower Bound (95% CI)	$233,219,311	N/A	$144,230,755	4.1%	N/A	2.6%
Upper Bound (95% CI)	$353,550,671	N/A	$264,562,115	6.3%	N/A	4.7%
Lower Bound (90% CI)	$242,892,361	N/A	$153,903,804	4.3%	N/A	2.7%
Upper Bound (90% CI)	$343,877,622	N/A	$254,889,065	6.1%	N/A	4.5%

Exhibit H.4: Medicare Savings and Components, BPCI Advanced Hospitals, Medical Clinical Episodes, October 1, 2018 – December 31, 2019

	Reduction in Non-standardized Payments	Reconciliation Payments	Savings to Medicare	Reduction in Non-standardized Payments as a Percentage (%)	Reconciliation Payments as a Percentage (%)	Savings as a Percentage (%)
Estimate (n=48%)	$164,218,739	$406,149,799	-$241,931,060	1.9%	4.7%	-2.8%
Lower Bound (95% CI)	$105,008,363	N/A	-$301,141,436	1.2%	N/A	-3.4%
Upper Bound (95% CI)	$223,429,115	N/A	-$182,720,684	2.6%	N/A	-2.1%
Lower Bound (90% CI)	$114,527,825	N/A	-$291,621,974	1.3%	N/A	-3.3%
Upper Bound (90% CI)	$213,909,653	N/A	-$192,240,146	2.5%	N/A	-2.2%

Exhibit H.5: Medicare Savings and Components, BPCI Advanced PGPs, Medical Clinical Episodes, October 1, 2018 – December 31, 2019

	Reduction in Non-standardized Payments	Reconciliation Payments	Savings to Medicare	Reduction in Non-standardized Payments as a Percentage (%)	Reconciliation Payments as a Percentage (%)	Savings as a Percentage (%)
Estimate (n=22%)	$72,984,922	$121,326,240	-$48,341,318	2.0%	3.3%	-1.3%
Lower Bound (95% CI)	$18,726,744	N/A	-$102,599,496	0.5%	N/A	-2.8%
Upper Bound (95% CI)	$127,243,099	N/A	$5,916,859	3.4%	N/A	0.2%
Lower Bound (90% CI)	$27,450,024	N/A	-$93,876,216	0.7%	N/A	-2.5%
Upper Bound (90% CI)	$118,519,819	N/A	-$2,806,421	3.2%	N/A	-0.1%

Exhibit H.6: Medicare Savings and Components, BPCI Advanced Hospitals, Surgical Clinical Episodes, October 1, 2018 – December 31, 2019

	Reduction in Non-standardized Payments	Reconciliation Payments	Savings to Medicare	Reduction in Non-standardized Payments as a Percentage (%)	Reconciliation Payments as a Percentage (%)	Savings as a Percentage (%)
Estimate (n=5%)	$43,810,358	$2,334,773	$41,475,585	4.2%	0.2%	3.9%
Lower Bound (95% CI)	$29,362,235	N/A	$27,027,463	2.8%	N/A	2.6%
Upper Bound (95% CI)	$58,258,480	N/A	$55,923,707	5.5%	N/A	5.3%
Lower Bound (90% CI)	$31,685,111	N/A	$29,350,339	3.0%	N/A	2.8%
Upper Bound (90% CI)	$55,935,604	N/A	$53,600,832	5.3%	N/A	5.1%

Exhibit H.7: Medicare Savings and Components, BPCI Advanced PGPs, Surgical Clinical Episodes, October 1, 2018 – December 31, 2019

	Reduction in Non-standardized Payments	Reconciliation Payments	Savings to Medicare	Reduction in Non-standardized Payments as a Percentage (%)	Reconciliation Payments as a Percentage (%)	Savings as a Percentage (%)
Estimate (n=25%)	$243,758,348	$86,653,784	$157,104,565	5.4%	1.9%	3.5%
Lower Bound (95% CI)	$186,654,021	N/A	$100,000,237	4.1%	N/A	2.2%
Upper Bound (95% CI)	$300,862,676	N/A	$214,208,893	6.6%	N/A	4.7%
Lower Bound (90% CI)	$195,834,886	N/A	$109,181,102	4.3%	N/A	2.4%
Upper Bound (90% CI)	$291,681,811	N/A	$205,028,027	6.4%	N/A	4.5%

Exhibit H.8: Medicare Savings by Clinical Episode, BPCI Advanced Hospitals, October 1, 2018 – December 31, 2019

Clinical Episode	Reduction in Non-standardized Payments	Reconciliation Payments	Savings to Medicare	95% LCI	95% UCI	90% LCI	90% UCI	Savings as a Percentage (%)
AMI (n=2%)	$2,582,241	$11,328,989	-$8,746,748	-$17,371,421	-$122,073	-$15,979,767	-$1,513,729	-2.2%
Cardiac Arrhythmia (4%)	$7,204,551	$20,344,342	-$13,139,791	-$21,568,967	-$4,710,616	-$20,209,841	-$6,069,741	-2.9%
COPD (4%)	$5,285,887	$22,859,082	-$17,573,195	-$26,626,289	-$8,520,100	-$25,165,822	-$9,980,568	-3.4%
CHF (9%)	$26,356,867	$115,720,648	-$89,363,781	-$109,453,937	-$69,273,624	-$106,216,469	-$72,511,093	-5.7%
GI Hemorrhage (2%)	-$939,117	$525,491	-$1,464,608	-$7,198,211	$4,268,996	-$6,270,757	$3,341,542	-0.6%
Hip & Femur Procedures (1%)	$17,660,785	$8,829,020	$8,831,765	$680,282	$16,983,250	$1,998,780	$15,664,750	2.2%
MJRLE (3%)	$24,241,393	-$8,975,210	$33,216,603	$21,862,745	$44,570,460	$23,698,790	$42,734,415	6.2%
PCI (Outpatient) (1%)	$2,203,689	$2,480,963	-$277,274	-$4,517,027	$3,962,479	-$3,825,301	$3,270,753	-0.2%
Renal Failure (3%)	$5,447,894	$17,902,838	-$12,454,944	-$22,063,030	-$2,846,859	-$20,511,875	-$4,398,013	-2.5%
Sepsis (13%)	$71,336,739	$139,654,656	-$68,317,917	-$102,612,995	-$34,022,833	-$97,083,896	-$39,551,935	-2.3%
SPRI (6%)	$6,101,083	$37,275,800	-$31,174,717	-$44,257,969	-$18,091,465	-$42,148,219	-$20,201,215	-3.5%
Stroke (4%)	$21,025,545	$32,316,544	-$11,290,999	-$23,931,833	$1,349,837	-$21,892,799	-$689,199	-1.4%
UTI (3%)	$18,380,993	$8,221,410	$10,159,584	$111,052	$20,208,115	$1,732,400	$18,586,767	2.0%

Exhibit H.9: Medicare Savings by Clinical Episode, Expressed as a Percentage of the BPCI Advanced Counterfactual, BPCI Advanced Hospitals, October 1, 2018 – December 31, 2019

Clinical Episode	Reduction in Non-standardized Payments (%)	Reconciliation Payments (%)	Savings to Medicare (%)	95% LCI (%)	95% UCI (%)	90% LCI (%)	90% UCI (%)
AMI (n=2%)	0.6%	2.8%	-2.2%	-4.3%	-0.0%	-4.0%	-0.4%
Cardiac Arrhythmia (4%)	1.6%	4.4%	-2.9%	-4.7%	-1.0%	-4.4%	-1.3%
COPD (4%)	1.0%	4.4%	-3.4%	-5.1%	-1.6%	-4.8%	-1.9%
CHF (9%)	1.7%	7.3%	-5.7%	-6.9%	-4.4%	-6.7%	-4.6%
GI Hemorrhage (2%)	-0.4%	0.2%	-0.6%	-2.9%	1.7%	-2.6%	1.4%
Hip & Femur Procedures (1%)	4.4%	2.2%	2.2%	0.2%	4.2%	0.5%	3.9%
MJRLE (3%)	4.5%	-1.7%	6.2%	4.1%	8.3%	4.4%	7.9%
PCI (Outpatient) (1%)	1.8%	2.1%	-0.2%	-3.7%	3.3%	-3.2%	2.7%
Renal Failure (3%)	1.1%	3.6%	-2.5%	-4.4%	-0.6%	-4.1%	-0.9%
Sepsis (13%)	2.4%	4.8%	-2.3%	-3.5%	-1.2%	-3.3%	-1.4%
SPRI (6%)	0.7%	4.2%	-3.5%	-5.0%	-2.0%	-4.8%	-2.3%
Stroke (4%)	2.6%	4.0%	-1.4%	-3.0%	0.2%	-2.7%	-0.1%
UTI (3%)	3.6%	1.6%	2.0%	0.0%	3.9%	0.3%	3.6%

Exhibit H.10: Medicare Savings by Clinical Episode, BPCI Advanced PGPs, October 1, 2018 – December 31, 2019

Clinical Episode	Reduction in Non-standardized Payments	Reconciliation Payments	Savings to Medicare	95% LCI	95% UCI	90% LCI	90% UCI	Savings as a Percentage (%)
AMI (n=1%)	$3,647,966	$6,776,122	-$3,128,155	-$9,672,972	$3,416,661	-$8,607,541	$2,351,231	-1.7%
Cellulitis (1%)	$1,268,934	-$45,792	$1,314,726	-$2,793,156	$5,422,607	-$2,121,616	$4,751,067	1.3%
Cervical Spinal Fusion (<1%)	$3,122,957	$42,291	$3,080,666	-$533,856	$6,695,188	$61,575	$6,099,757	4.7%
COPD (2%)	$3,154,094	$5,997,881	-$2,843,787	-$9,215,379	$3,527,807	-$8,178,361	$2,490,788	-1.4%
CHF (3%)	$10,848,165	$43,135,064	-$32,286,899	-$46,109,126	-$18,464,672	-$43,864,343	-$20,709,455	-5.6%
GI Hemorrhage (1%)	$4,478,481	$422,738	$4,055,743	-$3,436,882	$11,548,368	-$2,214,791	$10,326,278	2.1%
GI Obstruction (1%)	$1,380,266	$4,212,610	-$2,832,344	-$6,490,410	$825,722	-$5,892,624	$227,935	-4.2%
Hip & Femur Procedures (3%)	$42,586,205	$26,277,314	$16,308,891	$1,256,826	$31,360,954	$3,694,370	$28,923,415	2.0%
LE & Humerus Procedures (<1%)	$3,009,349	$883,857	$2,125,492	-$2,740,609	$6,991,594	-$1,943,047	$6,194,031	1.9%
MJRLE (18%)	$170,247,890	$35,453,884	$134,794,006	$85,459,101	$184,128,920	$93,420,825	$176,167,188	4.8%
MJRUE (2%)	$10,944,498	$7,897,777	$3,046,721	-$3,062,670	$9,156,113	-$2,072,083	$8,165,524	1.0%
PCI (Inpatient) (1%)	$4,594,762	$4,891,196	-$296,434	-$5,587,104	$4,994,236	-$4,719,955	$4,127,087	-0.2%
Renal Failure (2%)	$1,724,095	$6,334,540	-$4,610,445	-$12,674,062	$3,453,172	-$11,359,201	$2,138,309	-1.6%
Sepsis (6%)	$21,205,406	$28,101,080	-$6,895,674	-$43,519,959	$29,728,612	-$37,549,544	$23,758,194	-0.6%
SPRI (3%)	$9,512,138	$16,582,330	-$7,070,192	-$19,848,163	$5,707,781	-$17,766,659	$3,626,275	-1.8%
Spinal Fusion (NC) (1%)	$9,231,423	$11,207,465	-$1,976,042	-$8,582,846	$4,630,762	-$7,510,939	$3,558,853	-0.8%
Stroke (2%)	$8,667,885	$11,056,937	-$2,389,052	-$17,247,135	$12,469,032	-$14,826,784	$10,048,681	-0.7%
UTI (2%)	$1,813,051	-$1,247,270	$3,060,320	-$2,270,839	$8,391,479	-$1,403,661	$7,524,301	1.3%

Exhibit H.11: Medicare Savings by Clinical Episode, Expressed as a Percentage of the BPCI Advanced Counterfactual, BPCI Advanced PGPs, October 1, 2018 – December 31, 2019

Clinical Episode	Reduction in Non-standardized Payments (%)	Reconciliation Payments (%)	Savings to Medicare (%)	95% LCI (%)	95% UCI (%)	90% LCI (%)	90% UCI (%)
AMI (n=1%)	2.0%	3.7%	-1.7%	-5.3%	1.9%	-4.7%	1.3%
Cellulitis (1%)	1.2%	-0.0%	1.3%	-2.7%	5.3%	-2.1%	4.7%
Cervical Spinal Fusion (<1%)	4.7%	0.1%	4.7%	-0.8%	10.1%	0.1%	9.2%
COPD (2%)	1.5%	2.9%	-1.4%	-4.5%	1.7%	-3.9%	1.2%
CHF (3%)	1.9%	7.4%	-5.6%	-8.0%	-3.2%	-7.6%	-3.6%
GI Hemorrhage (1%)	2.3%	0.2%	2.1%	-1.8%	6.0%	-1.1%	5.4%
GI Obstruction (1%)	2.0%	6.2%	-4.2%	-9.5%	1.2%	-8.6%	0.3%
Hip & Femur Procedures (3%)	5.2%	3.2%	2.0%	0.2%	3.9%	0.5%	3.6%
LE & Humerus Procedures (<1%)	2.7%	0.8%	1.9%	-2.4%	6.2%	-1.7%	5.5%
MJRLE (18%)	6.1%	1.3%	4.8%	3.0%	6.5%	3.3%	6.3%
MJRUE (2%)	3.6%	2.6%	1.0%	-1.0%	3.0%	-0.7%	2.7%
PCI (Inpatient) (1%)	2.5%	2.6%	-0.2%	-3.0%	2.7%	-2.6%	2.2%
Renal Failure (2%)	0.6%	2.3%	-1.6%	-4.5%	1.2%	-4.0%	0.8%
Sepsis (6%)	1.8%	2.4%	-0.6%	-3.7%	2.5%	-3.2%	2.0%
SPRI (3%)	2.4%	4.2%	-1.8%	-5.1%	1.5%	-4.5%	0.9%
Spinal Fusion (NC) (1%)	3.6%	4.4%	-0.8%	-3.4%	1.8%	-3.0%	1.4%
Stroke (2%)	2.6%	3.3%	-0.7%	-5.2%	3.7%	-4.4%	3.0%
UTI (2%)	0.8%	-0.5%	1.3%	-1.0%	3.6%	-0.6%	3.2%

Appendix I: Supplemental COVID-19 Descriptive Results

The following tables display the full results for the COVID-19 descriptive analyses. Below is a list of acronyms and abbreviated clinical episode names that are used throughout this appendix:

- CE = clinical episode
- COVID-19 = Coronavirus Disease 2019
- EI = episode initiator
- PDP = post-anchor/procedure discharge period
- PAC = post-acute care
- SNF = skilled nursing facility
- IRF = inpatient rehabilitation facility
- HH = home health
- SNF = skilled nursing facility
- Adv = advanced
- OP = outpatient
- AMI = acute myocardial infarction
- COPD, Bronchitis, & Asthma = chronic obstructive pulmonary disease, bronchitis, and asthma
- CHF = congestive heart failure
- CABG = coronary artery bypass graft
- GI = gastrointestinal
- Hip & Femur Procedures = hip and femur procedures except major joint
- LE & Humerus Procedures = lower extremity and humerus procedures except hip, foot, femur
- MJRLE = major joint replacement of the lower extremity
- MJRUE = major joint replacement of the upper extremity
- PCI = percutaneous coronary intervention
- SPRI = simple pneumonia and respiratory infections
- UTI = urinary tract infection

A detailed discussion of the methods can be found in **Appendix C**.

A. Amendment Selection, Geographic Distribution

Exhibit I.1: EI Level COVID-19 Waiver Amendment Selection, BPCI Advanced EIs, Model Year 3

EIs by Region (n = 1,602)	Amendment 1: Withdraw from Reconciliation	Amendment 2: Exclude Episodes with a COVID-19 Diagnosis	No Amendment Selected
Northeast (n = 236 EIs under 208 participants)	29.4%	66.8%	3.9%
South (n = 673 EIs under 510 participants)	25.0%	66.5%	8.5%
Midwest (n = 361 EIs under 286 participants)	24.5%	69.5%	5.9%
West (n = 332 EIs under 291 participants)	31.0%	60.8%	8.1%

Note: Sample includes BPCI Advanced EIs that had not withdrawn from the model prior to June 28, 2020. PGPs were required to have initiated at least one episode with a start date and anchor end date during the period of January 1, 2013 through June 30, 2020 to be included in the sample. An episode had a COVID-19 diagnosis if an ICD-10 diagnosis code for COVID-19 appeared at any time during the episode (anchor stay or procedure and 90-day post-discharge period). EI = episode initiator.

Source: The BPCI Advanced evaluation team's analysis of BPCI Advanced programmatic data and amendment selection data, and Medicare claims data for episodes with anchor stays/procedures beginning January 1, 2013 and ending on or before June 30, 2020.

B. Geographic Analysis of COVID-19 Incidence

Our geographic analysis compares the proportion of episodes that occurred in counties with varying levels of COVID-19 incidences over time by BPCI Advanced status. The analysis sample included all eligible episodes with anchor stays or procedures beginning March 1, 2020 where the anchor stay/procedure ended by June 30, 2020. Episodes were assigned to a month by the start date of the anchor stay/procedure. All CEs were included in this analysis.

Exhibits I.2 – I.6 show the proportion of episodes occurring in counties of each COVID-19 incidence category in the aggregate for March 2020 through June 2020 and by month. We assigned a COVID-19 incidence category to the episode based on the average daily COVID-19 incidence in the county during the month that the anchor stay/procedure was initiated. The categories for county-level COVID-19 incidence were adapted from the *Testing, Tracing, and Supported Isolation Technical Handbook for States and Municipalities*.[1] Following the handbook, we assigned COVID-19 incidence categories as low (<1 confirmed new COVID-19 case per day per 100K residents), medium (1 to 9.9 confirmed new COVID-19 cases per day per 100K residents), high (10 to 24.9 confirmed new COVID-19 cases per day per 100K residents), and very high (25+ confirmed new cases per day per 100K residents).[2] P-values were estimated from a two-sample tests of proportions for a binary indicators of each COVID-19 category. In the tables below, "BPCI

[1] https://ethics.harvard.edu/ttsi-technical-handbook

[2] In the handbook, the corresponding COVID-19 categories are labeled green ("On track for containment", our "low"), yellow ("Strategic choices must be made," our "medium"), orange ("Stay at home orders are advised, unless testing and contact tracing capacity are implementable," our "high"), and red ("Stay at home orders n ecessary," our "very high").

Advanced" refers to episodes attributed to BPCI Advanced EIs, while "Non-Participant" refers to episodes attributed to non-participating PGPs and hospitals.

Exhibit I.7 presents the proportion of episodes occurring in counties of each COVID-19 incidence category by month and CE. CEs with fewer than 60 episodes without a COVID-19 diagnosis in each month were excluded in the CE-level analysis.

Exhibit I.2: Proportion of Episodes by COVID-19 Incidence Category, March 2020 – June 2020

County-Level COVID-19 Incidence (March)	BPCI Advanced Episodes	Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	P-value
Low	37,143	190,204	22.9%	25.3%	0.00
Medium	92,218	411,543	56.8%	54.8%	0.00
High	27,284	118,265	16.8%	15.8%	0.00
Very High	5,831	30,769	3.6%	4.1%	0.00

Exhibit I.3: Proportion of Episodes by COVID-19 Incidence Category, March 2020

County-Level COVID-19 Incidence (March)	BPCI Advanced Episodes	Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	P-value
Low	30,284	141,515	63.0%	65.0%	0.00
Medium	16,980	65,689	35.3%	30.2%	0.00
High	619	9,722	1.3%	4.5%	0.00
Very High	164	922	0.3%	0.4%	0.01

Exhibit I.4: Proportion of Episodes by COVID-19 Incidence Category, April 2020

County-Level COVID-19 Incidence (April)	BPCI Advanced Episodes	Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	P-value
Low	1,942	15,070	5.7%	10.0%	0.00
Medium	22,784	96,360	66.5%	63.8%	0.00
High	6,497	21,315	19.0%	14.1%	0.00
Very High	3,015	18,194	8.8%	12.1%	0.00

Exhibit I.5: Proportion of Episodes by COVID-19 Incidence Category, May 2020

County-Level COVID-19 Incidence (May)	BPCI Advanced Episodes	Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	P-value
Low	4,162	25,825	10.0%	13.5%	0.00
Medium	28,082	119,418	67.6%	62.4%	0.00
High	7,703	40,517	18.5%	21.2%	0.00
Very High	1,579	5,687	3.8%	3.0%	0.00

Exhibit I.6: Proportion of Episodes by COVID-19 Incidence Category, June 2020

County-Level COVID-19 Incidence (June)	BPCI Advanced Episodes	Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	P-value
Low	755	7,794	2.0%	4.1%	0.00
Medium	24,372	130,076	63.0%	68.3%	0.00
High	12,465	46,711	32.2%	24.5%	0.00
Very High	1,073	5,966	2.8%	3.1%	0.00

Exhibit I.7: Proportion of Episodes by COVID-19 Incidence Category and Clinical Episode, March 2020 - June 2020

	County COVID Incidence	March 2020		April 2020		May 2020		June 2020	
		Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes
AMI	Low	65.5%	68.5%	6.9%	13.5%	12.9%	17.0%	1.5%	6.2%
	Medium	32.5%	28.0%	73.2%	67.7%	66.1%	60.9%	66.0%	69.6%
	High	1.8%	3.3%	14.9%	11.7%	17.2%	19.6%	30.9%	21.8%
	Very High	0.1%	0.2%	5.0%	7.1%	3.9%	2.5%	1.6%	2.4%
Cardiac Arrhythmia	Low	68.1%	67.4%	6.7%	12.8%	10.3%	15.5%	1.8%	4.9%
	Medium	31.8%	28.6%	78.1%	67.5%	72.0%	62.0%	62.1%	70.9%
	High	0.1%	3.6%	12.1%	12.3%	14.1%	20.2%	34.2%	21.0%
	Very High	0.0%	0.4%	3.2%	7.3%	3.6%	2.3%	1.9%	3.2%
Cellulitis	Low	68.9%	64.2%	6.0%	11.4%	11.0%	13.1%	3.8%	4.7%
	Medium	31.1%	31.6%	78.1%	67.0%	69.6%	60.4%	66.1%	70.3%
	High	0.0%	3.6%	12.6%	13.9%	16.3%	23.4%	28.2%	22.1%
	Very High	0.0%	0.6%	3.3%	7.7%	3.1%	3.1%	2.0%	2.9%
COPD, Bronchitis, & Asthma	Low	59.7%	68.3%	8.2%	11.0%	10.8%	15.4%	2.7%	4.5%
	Medium	38.6%	27.7%	69.4%	69.1%	70.2%	60.0%	66.0%	69.9%
	High	1.0%	3.6%	17.7%	13.0%	15.1%	21.4%	30.0%	22.2%
	Very High	0.6%	0.3%	4.7%	6.9%	3.9%	3.2%	1.4%	3.4%
CHF	Low	61.5%	65.3%	7.3%	12.1%	10.2%	13.4%	2.8%	4.3%
	Medium	37.6%	31.1%	72.7%	68.1%	66.6%	62.5%	65.9%	70.4%
	High	0.8%	3.2%	14.8%	13.5%	19.3%	21.1%	29.5%	22.6%
	Very High	0.1%	0.4%	5.3%	6.4%	4.0%	3.0%	1.9%	2.7%
CABG	Low	57.9%	69.3%	3.5%	12.6%	5.4%	15.7%	1.0%	3.6%
	Medium	42.1%	28.0%	86.1%	74.2%	76.1%	65.4%	54.4%	66.3%
	High	0.0%	2.4%	9.0%	9.2%	12.7%	17.4%	42.2%	27.1%
	Very High	0.0%	0.3%	1.4%	4.0%	5.9%	1.5%	2.5%	3.0%
GI Hemorrhage	Low	59.0%	64.5%	8.7%	10.4%	11.9%	13.9%	3.1%	4.0%
	Medium	40.6%	31.0%	75.6%	67.3%	68.0%	61.5%	58.2%	71.1%
	High	0.4%	4.0%	10.2%	14.0%	17.2%	21.7%	35.9%	22.5%
	Very High	0.0%	0.5%	5.5%	8.3%	2.9%	2.8%	2.9%	2.4%

	County COVID Incidence	March 2020		April 2020		May 2020		June 2020	
		Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes
GI Obstruction	Low	66.8%	66.5%	8.8%	11.6%	14.0%	14.7%	1.0%	4.8%
	Medium	32.6%	30.2%	75.5%	68.6%	76.3%	60.6%	64.6%	68.9%
	High	0.6%	2.9%	12.6%	13.1%	8.0%	21.9%	31.2%	23.9%
	Very High	0.0%	0.4%	3.1%	6.7%	1.7%	2.9%	3.3%	2.4%
Hip & Femur Procedures	Low	68.9%	67.0%	6.5%	11.8%	11.0%	15.0%	3.3%	4.7%
	Medium	30.2%	28.7%	75.5%	67.1%	68.1%	62.6%	61.7%	67.8%
	High	0.8%	3.8%	10.0%	12.4%	17.7%	19.9%	32.1%	24.1%
	Very High	0.1%	0.5%	8.0%	8.6%	3.1%	2.6%	2.8%	3.4%
LE & Humerus Procedures	Low	76.2%	64.5%	7.1%	13.5%	8.3%	14.3%	0.6%	3.9%
	Medium	23.3%	32.2%	81.1%	68.7%	69.4%	65.2%	59.4%	67.8%
	High	0.5%	3.0%	8.3%	11.2%	18.7%	18.3%	38.3%	25.1%
	Very High	0.0%	0.3%	3.6%	6.6%	3.6%	2.1%	1.7%	3.2%
MJRLE	Low	73.8%	65.6%	8.2%	12.1%	14.0%	14.6%	1.8%	4.1%
	Medium	25.8%	30.1%	76.6%	70.6%	68.3%	69.9%	64.4%	69.6%
	High	0.0%	4.0%	12.4%	10.1%	12.6%	14.2%	29.6%	23.7%
	Very High	0.4%	0.3%	2.8%	7.2%	5.1%	1.3%	4.2%	2.6%
MJRUE	Low	74.3%	67.2%	5.7%	14.0%	15.1%	13.4%	0.5%	4.3%
	Medium	25.7%	30.0%	85.8%	73.9%	73.5%	71.1%	64.4%	66.4%
	High	0.0%	2.5%	2.8%	8.0%	9.6%	13.4%	32.6%	25.7%
	Very High	0.0%	0.3%	5.7%	4.1%	1.8%	2.1%	2.5%	3.5%
Pacemaker	Low	74.2%	65.4%	8.2%	10.7%	5.8%	14.5%	5.7%	4.2%
	Medium	25.4%	31.2%	76.0%	71.4%	78.8%	63.7%	63.4%	70.1%
	High	0.4%	3.1%	13.1%	11.8%	14.7%	19.5%	27.9%	23.2%
	Very High	0.0%	0.3%	2.7%	6.1%	0.7%	2.3%	3.1%	2.5%
PCI (Inpatient)	Low	62.3%	68.8%	6.6%	11.9%	6.1%	16.6%	3.7%	4.8%
	Medium	37.7%	27.7%	72.5%	71.8%	77.2%	63.2%	60.6%	69.5%
	High	0.0%	3.3%	18.7%	10.3%	12.1%	18.2%	34.2%	23.1%
	Very High	0.0%	0.1%	2.2%	6.0%	4.6%	2.0%	1.5%	2.6%

	County COVID Incidence	March 2020		April 2020		May 2020		June 2020	
		Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes	Proportion of BPCI Advanced Episodes	Proportion of Non-Participant Episodes
Renal Failure	Low	63.1%	65.5%	7.5%	11.3%	11.8%	12.9%	1.9%	3.9%
	Medium	35.5%	30.6%	72.3%	65.9%	70.3%	59.8%	64.8%	68.9%
	High	1.0%	3.7%	12.3%	15.0%	15.8%	23.5%	31.2%	24.1%
	Very High	0.4%	0.2%	7.9%	7.8%	2.0%	3.8%	2.1%	3.1%
Sepsis	Low	61.1%	65.6%	4.4%	10.6%	9.0%	14.6%	1.7%	4.6%
	Medium	36.2%	27.7%	65.3%	62.5%	65.2%	59.2%	62.4%	69.2%
	High	2.2%	6.1%	21.5%	13.8%	22.8%	22.6%	34.3%	22.6%
	Very High	0.4%	0.6%	8.8%	13.0%	3.0%	3.6%	1.7%	3.5%
SPRI	Low	56.9%	58.3%	3.8%	4.5%	7.1%	8.6%	1.6%	3.5%
	Medium	40.2%	32.2%	46.7%	42.9%	59.5%	52.8%	59.2%	59.4%
	High	2.0%	8.7%	30.0%	21.3%	26.2%	32.3%	34.9%	31.2%
	Very High	0.9%	0.8%	19.5%	31.2%	7.3%	6.4%	4.4%	5.9%
Stroke	Low	61.6%	66.8%	6.9%	10.3%	11.0%	12.4%	1.8%	3.7%
	Medium	38.0%	29.5%	69.8%	69.4%	63.7%	64.1%	71.5%	67.3%
	High	0.4%	3.3%	16.5%	12.4%	21.0%	20.8%	23.3%	26.4%
	Very High	0.0%	0.4%	6.8%	7.8%	4.3%	2.7%	3.4%	2.6%
UTI	Low	64.7%	64.6%	7.0%	10.8%	9.9%	12.9%	1.8%	3.9%
	Medium	33.6%	31.2%	74.6%	67.6%	71.3%	62.6%	63.0%	67.9%
	High	0.9%	3.8%	12.4%	13.3%	15.2%	21.3%	31.9%	25.3%
	Very High	0.7%	0.4%	6.0%	8.3%	3.6%	3.2%	3.3%	3.0%
PCI (Outpatient)	Low	60.1%	70.0%	4.9%	11.1%	6.3%	15.7%	2.0%	3.4%
	Medium	39.9%	25.6%	77.2%	75.6%	75.8%	66.6%	55.4%	68.5%
	High	0.0%	4.2%	14.5%	8.5%	14.1%	16.0%	35.3%	25.4%
	Very High	0.0%	0.2%	3.4%	4.8%	3.8%	1.7%	7.2%	2.7%
Spinal Fusion	Low	58.9%	67.2%	5.6%	8.4%	6.3%	13.0%	1.5%	2.8%
	Medium	38.9%	30.7%	77.1%	79.8%	79.0%	68.9%	63.1%	66.1%
	High	2.2%	1.9%	15.4%	9.4%	12.5%	16.6%	32.9%	27.4%
	Very High	0.0%	0.2%	1.9%	2.3%	2.1%	1.5%	2.5%	3.7%

C. Episode Volume Analysis

The COVID-19 volume analysis consists of the following:

- The percentage change in episode volume by CE between April/June 2020 compared to April/June 2019.
- The percentage of episode volume by CE with a COVID-19 diagnosis from February 2020 through June 2020.
- Graphs comparing the episode volume by CE during the period of October 2018 through June 2019 and October 2019 through June 2020.

The sample includes episodes attributed to BPCI Advanced EIs that had participated in the CE in Model Years 1, 2, and 3. CEs introduced in Model Year 3 were not included in the analysis.[3] Exhibit I.12 presents graphs of volume over time by CE. CEs with fewer than 60 episodes without a COVID-19 diagnosis in each month were excluded from the CE-level analysis.

The CEs with the largest proportional declines in volume in April were in MJRUE and MJRLE. Both CEs experienced a reduction of volume of 88% compared to 2019. MJRLE volume mostly recovered by June (a reduction of 14% compared to the prior year), while the volume in MJRUE in June 2020 was slightly higher than it was in June 2019.

[3] We used Model Year 3 CE definitions for the COVID-19 volume analysis. The spinal fusion episode combines and replaces three clinical episodes, cervical spinal fusion, combined anterior posterior spinal fusion, and spinal fusion (non-cervical), which were separate CEs in Model Years 1 and 2. MJRLE includes total knee arthroplasty episodes initiated in an outpatient setting, which were not included in the Model Years 1 and 2 definitions. A new CE, endovascular cardiac valve replacement, was introduced in Model Year 3. Per model rules, endovascular cardiac valve replacement episodes take precedence over PCI (inpatient) procedures. Thus, some episodes that would have been PCI (inpatient) during Model Years 1 and 2 were reassigned to endovascular cardiac valve replacement under the Model Year 3 definition. To maintain consistency, endovascular cardiac valve replacement episodes were included in the grouped surgical volume analysis and were excluded from the PCI (Inpatient) CE.

Exhibit I.8: Percent Change in Episode Volume by Clinical Episode, April 2019/2020 and June 2019/2020

Clinical Episode Name	April 2019 (N)	June 2019 (N)	April 2020 (N)	June 2020 (N)	April % Change	June % Change
AMI	983	883	549	640	-44.2%	-27.5%
Cardiac Arrhythmia	1,689	1,621	699	1,097	-58.6%	-32.3%
Cellulitis	433	437	199	257	-54.0%	-41.2%
COPD, Bronchitis, & Asthma	2,063	1,618	547	596	-73.5%	-63.2%
CHF	3,302	3,007	1,552	1,919	-53.0%	-36.2%
CABG	193	176	69	104	-64.2%	-40.9%
GI Hemorrhage	878	818	556	614	-36.7%	-24.9%
GI Obstruction	377	412	206	259	-45.4%	-37.1%
Hip & Femur Procedures	1,095	1,077	954	889	-12.9%	-17.5%
LE & Humerus Procedures	148	154	121	125	-18.2%	-18.8%
MJRLE	5,617	5,096	683	4,379	-87.8%	-14.1%
MJRUE	635	588	78	615	-87.7%	4.6%
Pacemaker	206	195	92	126	-55.3%	-35.4%
PCI (Inpatient)	338	323	173	230	-48.8%	-28.8%
Renal Failure	1,446	1,395	839	903	-42.0%	-35.3%
Sepsis	7,752	7,430	6,540	4,802	-15.6%	-35.4%
SPRI	3,035	2,458	3,687	1,767	21.5%	-28.1%
Stroke	1,462	1,481	1,015	1,053	-30.6%	-28.9%
UTI	1,079	1,133	525	705	-51.3%	-37.8%
PCI (Outpatient)	452	442	153	426	-66.2%	-3.6%
Spinal Fusion	1,001	913	257	817	-74.3%	-10.5%

Exhibit I.9: Percent of Episode Volume with COVID-19 Diagnosis by Episode Type, February – June 2020

Clinical Episode Type	February	March	April	May	June
All CEs Pooled	3.2%	9.4%	26.5%	15.5%	10.7%
Medical	3.9%	11.5%	29.9%	19.5%	14.9%
Surgical	1.2%	2.1%	4.5%	3.2%	2.4%

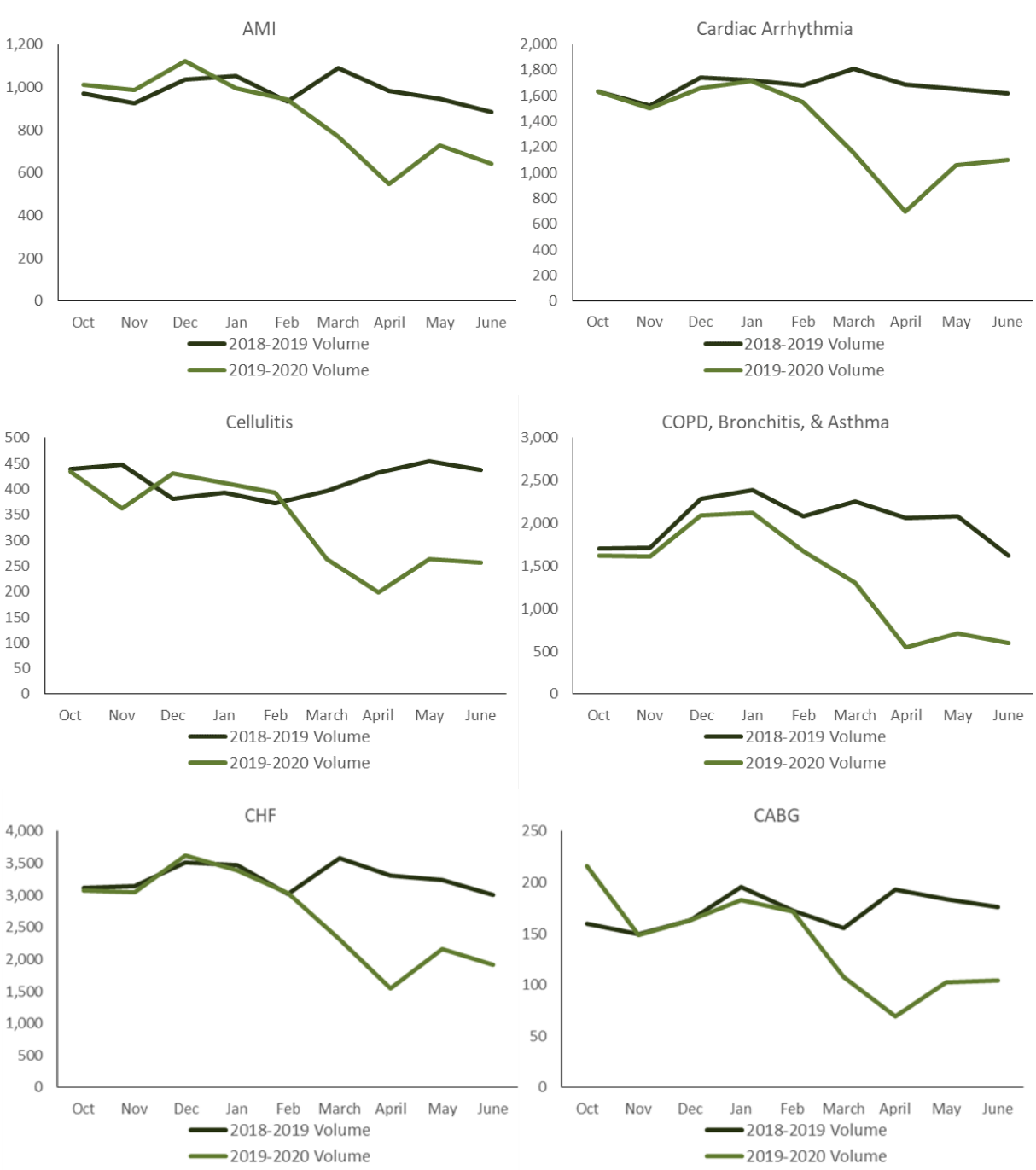
Exhibit I.10: Percent of Episode Volume with COVID-19 Diagnosis by Clinical Episode, February – June 2020

Clinical Episode Name	February	March	April	May	June
AMI	2.6%	5.1%	7.3%	5.8%	5.6%
Cardiac Arrhythmia	1.5%	3.0%	5.2%	4.1%	5.2%
Cellulitis	2.3%	4.6%	5.0%	6.5%	3.9%
COPD, Bronchitis, & Asthma	3.8%	7.0%	10.1%	10.3%	7.2%
CHF	3.3%	5.5%	8.5%	8.3%	6.8%
CABG	1.2%	1.9%	2.9%	1.9%	2.9%
GI Hemorrhage	3.4%	3.3%	7.2%	7.8%	7.7%
GI Obstruction	1.9%	2.6%	6.3%	3.3%	1.9%
Hip & Femur Procedures	4.5%	6.5%	8.0%	8.5%	8.0%
LE & Humerus Procedures	4.2%	3.5%	3.3%	4.5%	9.6%
MJRLE	0.6%	1.3%	3.1%	1.9%	1.5%
MJRUE	0.3%	0.5%	1.3%	1.8%	1.3%
Pacemaker	1.2%	2.1%	1.1%	4.7%	4.0%
PCI (Inpatient)	1.4%	1.3%	2.3%	2.4%	2.6%
Renal Failure	4.0%	7.1%	10.8%	10.1%	8.4%
Sepsis	4.8%	14.5%	34.1%	23.9%	17.7%
SPRI	3.7%	23.4%	65.0%	50.3%	43.3%
Stroke	2.1%	4.6%	6.3%	5.8%	4.9%
UTI	4.5%	7.8%	8.0%	9.4%	10.6%
PCI (Outpatient)	0.3%	0.7%	2.0%	1.1%	1.2%
Spinal Fusion	0.7%	1.5%	1.9%	2.6%	1.5%

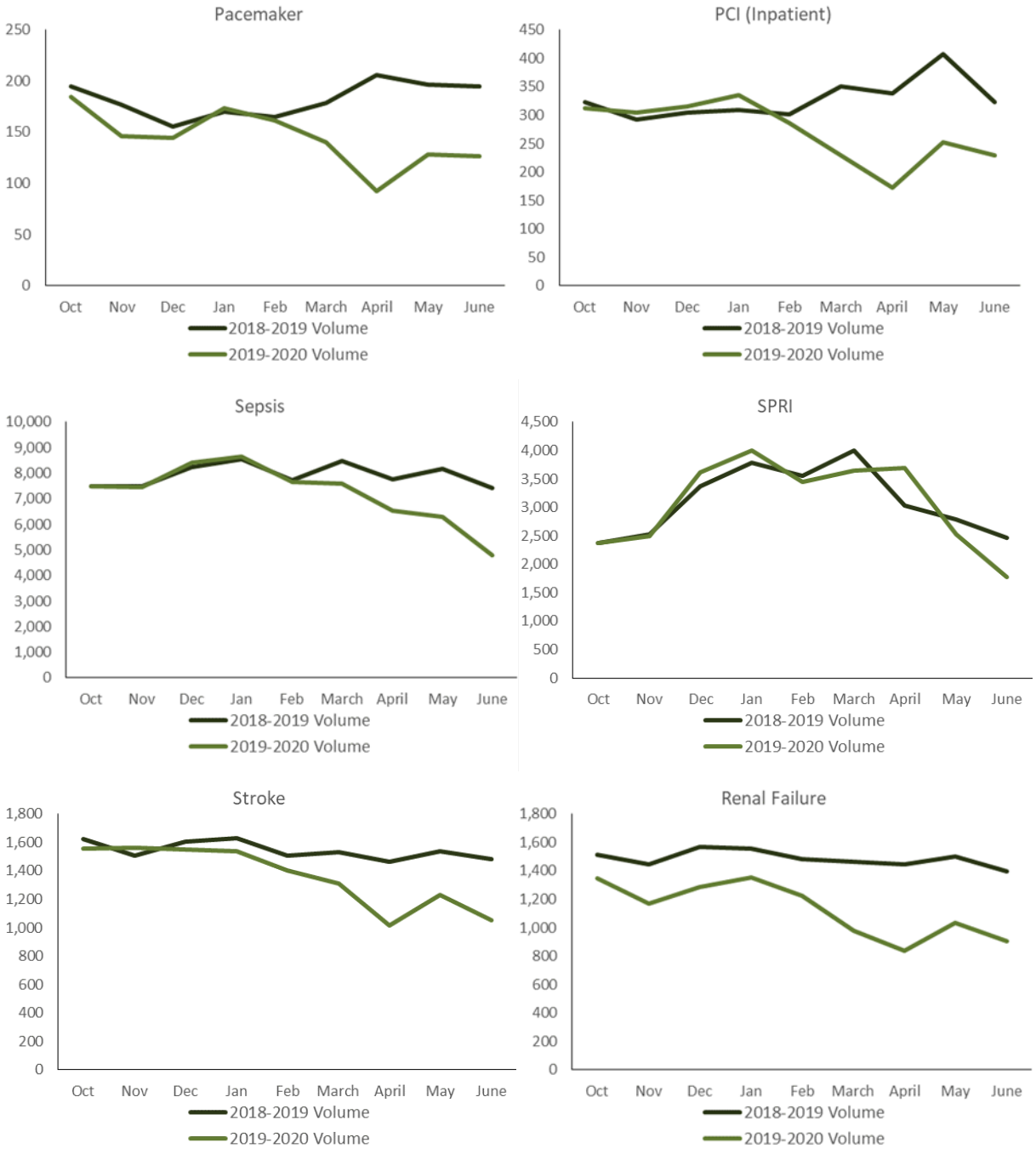
Exhibit I.11: Percent of COVID-19 Volume by Episode Type, February – June 2020

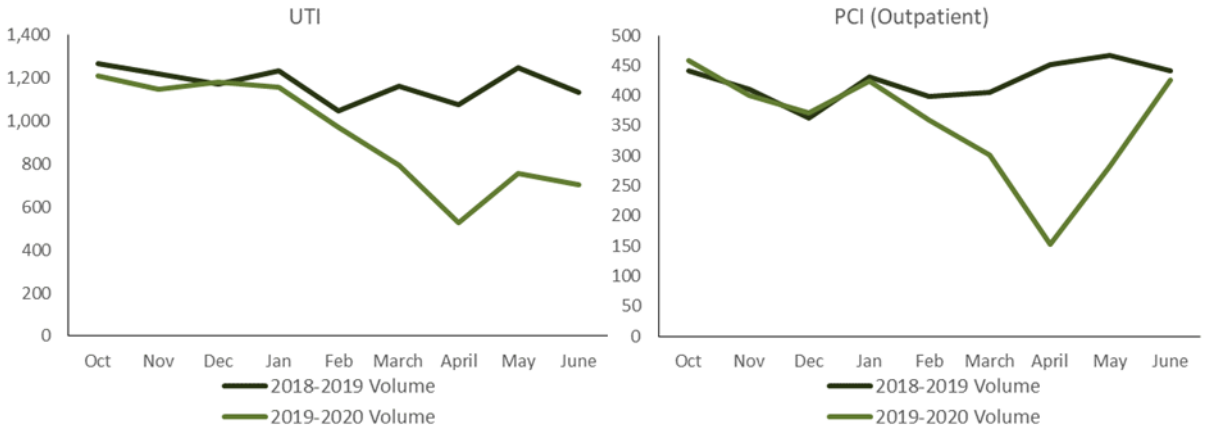
Episodes with a COVID-19 Diagnosis	February	March	April	May	June	Total (February through June)
Total	1,113	2,808	5,646	3,970	2,556	16,093
In Medical CEs (N)	1,002	2,663	5,518	3,769	2,362	15,314
In Medical CEs (%)	90.0%	94.8%	97.7%	94.9%	92.4%	95.2%
In Surgical CEs (N)	111	145	128	201	194	779
In Surgical CEs (%)	10.0%	5.2%	2.3%	5.1%	7.6%	4.8%

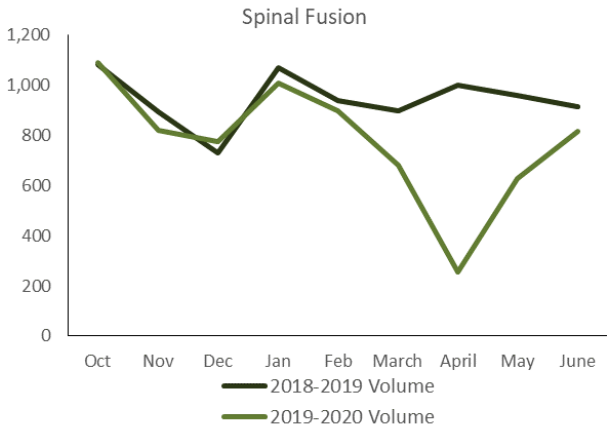
Exhibit I.12: Episode Volume by Clinical Episode, 2018-2019 vs. 2019-2020



GI Hemorrhage
1,000
900
800
700
600
500
400
300
200
100
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
GI Obstruction
450
400
350
300
250
200
150
100
50
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
Hip & Femur Procedures
1,400
1,200
1,000
800
600
400
200
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
LE & Humerus Procedures
200
180
160
140
120
100
80
60
40
20
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
MJRLE
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
MJRUE
900
800
700
600
500
400
300
200
100
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume


Pacemaker
250
200
150
100
50
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
PCI (Inpatient)
450
400
350
300
250
200
150
100
50
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
Sepsis
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
SPRI
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
Stroke
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
Renal Failure
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume


UTI
1,400
1,200
1,000
800
600
400
200
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume
PCI (Outpatient)
500
450
400
350
300
250
200
150
100
50
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume


Spinal Fusion
1,200
1,000
800
600
400
200
0
Oct Nov Dec Jan Feb March April May June
2018-2019 Volume
2019-2020 Volume

D. Patient Characteristic and Outcome Analysis

In our outcome and patient characteristics analyses, we compared mean values of outcomes and patient characteristics in April/June 2020 to April/June 2019. The sample includes episodes attributed to BPCI Advanced Model Year 3 participants from the analysis of Medicare claims and enrollment data for episodes with anchor stays/procedures that began during the months April 2019, June 2019, April 2020, and June 2020 and ended by June 30th, 2020.[4] CEs with fewer than 60 episodes without a COVID-19 diagnosis in each month of the analysis were excluded. We test for significant changes using a two-sample t-test (continuous outcomes) and a two-sample test of proportions (binary outcomes). In the tables below, an asterisk (*) on the 2020 values denotes statistically significant differences at the 10% level between 2019 and 2020 for the corresponding month (e.g., if the proportion of beneficiaries with a characteristic or outcome was statistically different in June 2020 compared to June 2019).

[4] Like the volume analysis, we used Model Year 3 CE definitions.

Exhibit I.13: Sample Size by Clinical Episode, April 2019/2020 and June 2019/2020

Clinical Episode	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	983	883	549	640	509	604
Cardiac Arrhythmia	1,689	1,621	699	1,097	663	1,040
Cellulitis	433	437	199	257	189	247
COPD, Bronchitis, & Asthma	2,063	1,618	547	596	492	553
CHF	3,302	3,007	1,552	1,919	1,420	1,788
CABG	193	176	69	104	67	101
GI Hemorrhage	878	818	556	614	516	567
GI Obstruction	377	412	206	259	193	254
Hip & Femur Procedures	1,095	1,077	954	889	878	818
LE & Humerus Procedures	148	154	121	125	117	113
MJRLE	5,617	5,096	683	4,379	662	4,313
MJRUE	635	588	78	615	77	607
Pacemaker	206	195	92	126	91	121
PCI	338	323	173	230	169	224
Renal Failure	1,446	1,395	839	903	748	827
Sepsis	7,752	7,430	6,540	4,802	4,313	3,951
SPRI	3,035	2,458	3,687	1,767	1,290	1,002
Stroke	1,462	1,481	1,015	1,053	951	1,001
UTI	1,079	1,133	525	705	483	630
PCI (Outpatient)	452	442	153	426	150	421
Spinal Fusion	1,001	913	257	817	252	805

Exhibit I.14: Mean Beneficiary Age by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Mean Age					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	78.28	78.43	78.44	78.60	78.18	78.41
Cardiac Arrhythmia	77.52	77.47	77.32	77.18	77.15	77.09
Cellulitis	74.36	72.55	74.04	73.14	73.60	72.62
COPD, Bronchitis, & Asthma	73.28	73.28	72.80	72.05*	73.00	71.97*
CHF	79.22	78.40	78.51*	78.29	78.50*	78.37
CABG	72.38	72.10	70.61*	71.79	70.60*	71.68
GI Hemorrhage	77.65	77.87	78.16	77.86	77.95	77.87
GI Obstruction	74.68	75.75	74.71	73.92	74.55	74.11*
Hip & Femur Procedures	81.41	80.67	81.77	80.45	81.65	80.23
LE & Humerus Procedures	74.57	71.29	71.45*	73.85*	71.24*	73.12
MJRLE	73.54	73.69	79.45*	73.57	79.35*	73.52
MJRUE	73.02	73.62	74.60*	73.82	74.62*	73.82
Pacemaker	80.17	80.17	78.18*	79.48	78.26*	79.45
PCI (Inpatient)	73.84	73.83	73.79	72.77	73.93	72.81
Renal Failure	76.47	76.65	76.83	76.95	76.91	76.75
Sepsis	75.01	75.34	75.07	74.94*	75.16	74.91*
SPRI	77.88	77.71	76.32*	76.37*	76.92*	77.38
Stroke	78.11	77.91	77.79	78.05	77.74	77.90
UTI	79.28	79.00	79.26	79.47	79.45	79.80
PCI (Outpatient)	73.29	74.00	73.42	73.16*	73.30	73.22
Spinal Fusion	70.20	70.45	70.02	70.88	70.04	70.85

Exhibit I.15: Mean Beneficiary HCC Score by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Mean HCC Score					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	2.05	2.05	1.87*	2.06	1.86*	2.03
Cardiac Arrhythmia	1.82	1.78	1.82	1.67*	1.80	1.64*
Cellulitis	1.99	2.19	2.10	2.15	2.03	2.16
COPD, Bronchitis, & Asthma	2.12	2.21	2.27*	2.23	2.21	2.20
CHF	2.63	2.70	2.61	2.57*	2.58	2.53*
CABG	1.21	1.28	1.14	1.27	1.13	1.21
GI Hemorrhage	2.01	2.15	2.17*	1.81*	2.09	1.75*
GI Obstruction	1.90	1.95	1.63*	1.83	1.63*	1.83
Hip & Femur Procedures	1.59	1.53	1.56	1.51	1.55	1.50
LE & Humerus Procedures	1.45	1.45	1.39	1.24	1.35	1.20*
MJRLE	0.88	0.89	1.35*	0.84*	1.31*	0.83*
MJRUE	1.02	1.00	1.01	0.90*	0.98	0.90*
Pacemaker	1.57	1.56	1.46	1.62	1.46	1.61
PCI (Inpatient)	1.56	1.36	1.24*	1.34	1.25*	1.33
Renal Failure	2.45	2.30	2.32*	2.33	2.30*	2.30
Sepsis	2.44	2.45	2.37*	2.32*	2.49	2.29*
SPRI	2.19	2.35	2.00*	1.98*	2.37*	2.21*
Stroke	1.50	1.49	1.42	1.46	1.40*	1.44
UTI	2.00	1.98	2.06	1.89	2.05	1.83*
PCI (Outpatient)	1.34	1.37	1.23*	1.24	1.21	1.22*
Spinal Fusion	1.02	1.01	1.05	0.99	1.05	0.97

Exhibit I.16: Proportion Dual Eligible Beneficiaries by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Proportion Dual Eligible					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	20.4%	21.7%	18.9%	20.9%	18.1%	19.4%
Cardiac Arrhythmia	14.6%	15.5%	13.6%	13.9%	13.1%	12.4%*
Cellulitis	30.0%	31.1%	26.6%	28.4%	25.4%	28.7%
COPD, Bronchitis, & Asthma	32.2%	32.3%	32.0%	34.6%	31.1%	33.1%
CHF	22.1%	23.5%	22.0%	20.2%*	21.1%	19.1%*
CABG	9.8%	9.1%	7.2%	10.6%	7.5%	9.9%
GI Hemorrhage	21.4%	22.2%	23.0%	19.2%	22.1%	16.9%*
GI Obstruction	21.5%	22.3%	19.9%	21.2%	20.7%	20.5%
Hip & Femur Procedures	17.5%	17.8%	17.5%	13.4%*	16.9%	13.0%*
LE & Humerus Procedures	16.9%	23.4%	14.9%	21.6%	14.5%	21.2%
MJRLE	6.8%	8.0%	11.9%*	6.2%*	11.9%*	6%*
MJRUE	8.7%	8.2%	6.4%	4.9%*	6.5%	4.8%*
Pacemaker	8.3%	7.7%	12.0%	13.5%*	11.0%	10.7%
PCI (Inpatient)	19.5%	15.8%	13.9%	17.0%	13.6%*	16.5%
Renal Failure	28.4%	24.6%	28.4%	29.2%*	27.1%	28.1%*
Sepsis	31.7%	30.2%	36.4%*	31.0%	28.3%*	27.4%*
SPRI	24.9%	24.0%	37.4%*	33.9%*	25.0%	24.5%
Stroke	18.7%	16.5%	16.1%*	18.5%	14.9%*	17.5%
UTI	30.7%	28.2%	26.5%*	26.8%	24.6%*	23.8%*
PCI (Outpatient)	8.4%	10.4%	6.5%	8.2%	6.7%	8.1%
Spinal Fusion	13.1%	8.9%	10.1%	8.4%	9.9%	8.3%

Exhibit I.17: Proportion Black or African American Beneficiaries by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Proportion Black or African American Beneficiaries					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	11.5%	11.0%	9.8%	12.3%	8.8%	12.1%
Cardiac Arrhythmia	6.9%	7.4%	7.6%	8.1%	7.7%	8.1%
Cellulitis	6.9%	5.9%	6.0%	7.0%	5.3%	6.9%
COPD, Bronchitis, & Asthma	10.2%	10.4%	14.4%*	12.8%	13.4%*	12.5%
CHF	13.2%	13.0%	13.1%	13.1%	12.7%	12.4%
CABG	5.2%	7.4%	7.2%	3.8%	7.5%	3.0%
GI Hemorrhage	10.8%	11.4%	9.2%	10.4%	8.3%	9.9%
GI Obstruction	8.5%	10.7%	10.7%	10.8%	9.3%	10.2%
Hip & Femur Procedures	2.1%	2.1%	4.0%*	2.0%	4.1%*	2.1%
LE & Humerus Procedures	6.1%	4.5%	5.8%	2.4%	5.1%	2.7%
MJRLE	5.0%	5.4%	3.7%	4.6%*	3.8%	4.6%*
MJRUE	3.8%	2.6%	1.3%	1.8%	1.3%	1.8%
Pacemaker	5.3%	4.6%	7.6%	6.3%	7.7%	6.6%
PCI (Inpatient)	10.1%	7.4%	5.8%	7.8%	5.9%	8.0%
Renal Failure	15.5%	13.8%	13.0%	14.6%	11.9%*	14.4%
Sepsis	11.0%	10.2%	16.4%*	11.3%*	11.2%	10.3%
SPRI	7.4%	7.6%	18.3%*	11.3%*	7.7%	7.9%
Stroke	10.3%	11.1%	11.0%	10.0%	10.5%	9.4%
UTI	9.2%	10.0%	7.8%	8.2%	7.2%	8.4%
PCI (Outpatient)	4.2%	5.2%	2.6%	3.5%	2.7%	3.3%
Spinal Fusion	7.5%	8.5%	7.0%	7.1%	6.7%	7.1%

Exhibit I.18: Proportion Hispanic Beneficiaries by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Proportion Hispanic Beneficiaries					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	1.4%	1.1%	1.6%	1.9%	1.2%	1.3%
Cardiac Arrhythmia	1.7%	1.9%	1.9%	0.5%*	1.7%	0.4%*
Cellulitis	2.8%	2.1%	1.5%	1.2%	1.6%	1.2%
COPD, Bronchitis, & Asthma	2.1%	2.3%	2.7%	1.8%	2.8%	1.4%
CHF	2.4%	2.5%	1.9%	1.9%	1.5%*	1.8%
CABG	1.0%	1.1%	1.4%	1.0%	1.5%	1.0%
GI Hemorrhage	2.5%	1.8%	2.3%	1.1%	2.3%	0.9%
GI Obstruction	2.4%	2.2%	2.4%	1.9%	2.6%	2.0%
Hip & Femur Procedures	2.0%	1.7%	1.6%	0.6%*	1.7%	0.6%*
LE & Humerus Procedures	2.0%	1.3%	2.5%	2.4%	2.6%	2.7%
MJRLE	0.7%	0.7%	0.4%	0.6%	0.5%	0.6%
MJRUE	0.8%	0.7%	0.0%	0.5%	0.0%	0.5%
Pacemaker	1.0%	0.0%	1.1%	0.8%	1.1%	0.8%
PCI (Inpatient)	2.4%	1.2%	0.0%*	0.4%	0.0%*	0.4%
Renal Failure	2.9%	3.5%	2.4%	2.3%	2.3%	2.3%
Sepsis	3.2%	2.9%	2.7%*	3.4%	2.2%*	2.9%
SPRI	2.0%	2.3%	3.8%*	5.3%*	1.5%	2.0%
Stroke	2.2%	1.7%	2.7%	1.8%	2.5%	1.8%
UTI	3.2%	3.6%	1.5%*	2.4%	1.4%*	2.4%
PCI (Outpatient)	0.0%	0.9%	0.7%*	0.9%	0.7%*	1.0%
Spinal Fusion	0.8%	0.2%	1.2%	0.6%	0.8%	0.5%

Exhibit I.19: Proportion White Beneficiaries by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Proportion White Beneficiaries					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	83.6%	84.1%	83.8%	81.3%	85.1%	81.8%
Cardiac Arrhythmia	87.5%	87.4%	87.8%	87.8%	87.9%	88.0%
Cellulitis	86.4%	86.7%	88.4%	86.4%	88.9%	86.2%
COPD, Bronchitis, & Asthma	84.5%	83.1%	80.1%*	81.0%	81.1%*	81.4%
CHF	80.6%	80.4%	80.7%	80.9%	81.2%	81.7%
CABG	87.0%	86.9%	87.0%	89.4%	86.6%	90.1%
GI Hemorrhage	82.5%	80.2%	82.0%	82.9%	83.1%	84.7%*
GI Obstruction	85.4%	82.3%	80.1%*	83.8%	80.8%	84.3%
Hip & Femur Procedures	94.0%	93.7%	91.5%*	95.2%	91.1%*	95.4%
LE & Humerus Procedures	89.2%	92.2%	90.1%	93.6%	90.6%	93.8%
MJRLE	90.2%	90.0%	92.2%*	91.0%*	92.0%	91.0%*
MJRUE	92.1%	93.2%	94.9%	94.5%	94.8%	94.4%
Pacemaker	90.3%	92.8%	87.0%	88.9%	86.8%	88.4%
PCI (Inpatient)	83.4%	84.2%	89.0%*	87.0%	88.8%	86.6%
Renal Failure	76.1%	77.9%	79.1%*	75.3%	80.5%*	75.2%
Sepsis	80.6%	81.8%	75.3%*	80.2%*	81.4%	82.1%
SPRI	86.1%	85.8%	72.2%*	77.0%*	87.1%	85.8%
Stroke	82.3%	82.2%	80.2%	83.3%	81.3%	83.7%
UTI	82.5%	81.7%	84.8%	83.8%	85.3%	83.8%
PCI (Outpatient)	90.7%	88.2%	92.8%	90.6%	92.7%	90.7%

Exhibit I.20: Proportion Male Beneficiaries by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Proportion Male Beneficiaries					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	50.5%	45.9%	48.3%	47.5%	49.1%	47.2%
Cardiac Arrhythmia	43.6%	44.0%	45.9%	43.6%	46.2%	43.6%
Cellulitis	50.8%	44.9%	48.2%	45.9%	50.3%	45.7%
COPD, Bronchitis, & Asthma	37.3%	38.4%	46.3%*	38.4%	45.3%*	37.8%
CHF	45.2%	47.0%	48.8%*	46.6%	49.6%*	47.0%
CABG	72.0%	77.3%	82.6%*	71.2%	83.6%*	73.3%
GI Hemorrhage	45.4%	47.4%	48.2%	43.3%	48.1%	43.2%
GI Obstruction	48.0%	36.4%	42.7%	42.5%	42.0%	42.9%*
Hip & Femur Procedures	23.5%	26.9%	27.3%*	25.4%	26.8%*	25.9%
LE & Humerus Procedures	23.0%	36.4%	26.4%	32.8%	26.5%	31.9%
MJRLE	36.3%	33.5%	30.2%*	37.0%*	30.1%*	37.1%*
MJRUE	38.6%	37.8%	29.5%	41.5%	29.9%	41.4%
Pacemaker	51.0%	45.6%	51.1%	48.4%	51.6%	48.8%
PCI (Inpatient)	62.1%	64.7%	68.2%	60.0%	69.2%	59.8%
Renal Failure	47.4%	47.6%	47.8%	48.5%	48.1%	48.7%
Sepsis	47.7%	47.5%	48.4%	47.6%	48.0%	47.6%
SPRI	45.7%	46.6%	46.8%	47.5%	48.8%*	49.2%
Stroke	43.8%	46.7%	44.6%	46.2%	45.4%	46.8%
UTI	29.6%	28.2%	28.4%	28.2%	28.4%	28.3%
PCI (Outpatient)	67.5%	68.3%	69.9%	69.7%	70.0%	69.8%
Spinal Fusion	41.7%	43.9%	48.2%*	44.9%	47.6%*	45.0%

Exhibit I.21: Mean Total Allowed Payments by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Mean Payments					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	$28,069	$27,120	$27,610	$28,222	$26,645	$27,435
Cardiac Arrhythmia	$20,454	$19,778	$21,300	$19,898	$20,360	$18,852
Cellulitis	$21,180	$22,986	$25,382*	$23,421	$23,198	$22,933
COPD, Bronchitis, & Asthma	$19,830	$21,246	$22,343*	$22,050	$21,557*	$20,922
CHF	$26,886	$27,348	$27,158	$26,270*	$25,926	$25,429*
CABG	$57,731	$54,438	$53,969	$53,858	$52,180	$52,659
GI Hemorrhage	$22,387	$23,224	$23,807	$21,318*	$22,712	$20,374*
GI Obstruction	$16,598	$18,072	$17,616	$15,249*	$16,888	$15,060*
Hip & Femur Procedures	$43,797	$43,883	$44,193	$43,433	$42,651	$42,216*
LE & Humerus Procedures	$41,118	$42,944	$39,988	$41,588	$39,805	$38,831
MJRLE	$22,563	$22,770	$36,750*	$21,560*	$35,795*	$21,313*
MJRUE	$22,518	$22,931	$26,156*	$21,736*	$25,476*	$21,670*
Pacemaker	$30,191	$33,064	$29,090	$29,583	$28,723	$28,868*
PCI (Inpatient)	$28,866	$29,721	$26,748	$28,497	$26,582	$28,582
Renal Failure	$26,339	$26,126	$28,910*	$26,201	$27,172	$24,943
Sepsis	$31,444	$31,479	$35,380*	$30,757	$31,856	$28,793*
SPRI	$23,991	$24,109	$30,509*	$25,849*	$24,828	$23,056
Stroke	$32,338	$31,975	$32,178	$29,313*	$30,803	$28,488*
UTI	$24,761	$24,696	$24,846	$23,924	$24,015	$22,658*
PCI (Outpatient)	$17,640	$18,160	$18,899	$18,015	$18,398	$18,014
Spinal Fusion	$45,730	$45,880	$50,439*	$45,479	$49,131*	$45,219

Exhibit I.22: Mean PAC Use by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Mean PAC Use					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	43.4%	40.5%	41.8%	37.0%	40.8%	36.3%
Cardiac Arrhythmia	32.9%	31.7%	36.7%*	31.8%	35.8%	30.2%
Cellulitis	49.4%	50.6%	56.1%	51.6%	54.3%	50.0%
COPD, Bronchitis, & Asthma	36.9%	37.7%	39.7%	34.8%	39.0%	34.1%
CHF	53.5%	51.0%	52.4%	50.2%	50.5%*	49.7%
CABG	70.6%	70.9%	70.6%	71.9%	69.7%	71.0%
GI Hemorrhage	37.1%	37.6%	40.7%	31.9%*	38.9%	29.7%*
GI Obstruction	27.3%	26.4%	23.3%	20.2%*	22.3%	19.8%*
Hip & Femur Procedures	93.2%	92.3%	92.8%	92.9%	92.3%	92.4%
LE & Humerus Procedures	79.5%	81.9%	79.2%	82.3%	80.2%	80.4%
MJRLE	63.1%	62.8%	79.1%*	54.3%*	78.4%*	54.0%*
MJRUE	29.3%	27.0%	38.7%*	18.6%*	37.8%	18.7%*
Pacemaker	42.0%	48.4%	35.6%	38.9%*	36.0%	38.0%*
PCI (Inpatient)	27.3%	19.2%	13.0%*	19.5%	13.3%*	19.5%
Renal Failure	54.8%	51.4%	56.7%	48.1%	55.0%	46.0%*
Sepsis	52.8%	51.7%	55.5%*	49.9%*	52.2%	48.2%*
SPRI	47.6%	48.5%	53.0%*	45.4%*	45.5%	41.5%*
Stroke	60.3%	61.2%	64.1%*	57.0%*	63.9%*	56.0%*
UTI	57.0%	58.1%	57.5%	54.3%	56.1%	52.6%*
PCI (Outpatient)	3.6%	3.2%	0.7%*	2.2%	0.7%*	2.2%
Spinal Fusion	49.6%	48.0%	44.4%	44.0%	43.7%*	43.8%*

Exhibit I.23: Mean HH Use by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Mean HH Use					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	35.5%	32.6%	40.0%*	33.7%	39.8%	33.6%
Cardiac Arrhythmia	30.4%	30.4%	34.8%*	30.6%	34.3%*	29.9%
Cellulitis	45.9%	45.2%	53.5%*	39.2%	53.2%*	40.0%
COPD, Bronchitis, & Asthma	36.9%	35.6%	39.0%	36.9%	39.2%	37.1%
CHF	47.7%	45.5%	48.1%	47.1%	48.0%	47.6%
CABG	59.9%	58.7%	61.8%	66.7%	62.1%	66.7%
GI Hemorrhage	32.8%	32.3%	34.1%	29.9%	33.6%	29.2%
GI Obstruction	25.4%	23.6%	23.8%	21.0%	23.8%	21.4%
Hip & Femur Procedures	59.1%	59.0%	62.2%	61.3%	64.6%*	62.6%
LE & Humerus Procedures	66.4%	57.0%	67.5%	62.1%	68.1%	63.4%
MJRLE	55.4%	55.3%	59.8%*	50.6%*	60.2%*	50.7%*
MJRUE	28.1%	25.6%	34.7%	18.1%*	35.1%	18.2%*
Pacemaker	38.0%	41.1%	31.1%	31.0%*	30.3%	32.2%
PCI (Inpatient)	24.8%	18.8%	16.0%*	18.6%	16.4%*	18.6%
Renal Failure	42.3%	41.1%	39.8%	39.3%	40.9%	39.6%
Sepsis	36.8%	36.7%	35.7%	36.1%	40.3%*	37.9%
SPRI	38.2%	37.6%	29.7%*	31.9%*	36.8%	36.4%
Stroke	39.9%	39.4%	46.8%*	39.6%	47.7%*	40.4%
UTI	43.2%	45.2%	42.9%	37.6%*	43.9%	38.5%*
PCI (Outpatient)	6.1%	4.9%	3.9%	4.8%	2.7%	4.7%
Spinal Fusion	42.7%	40.8%	41.2%	41.4%	41.2%	41.5%

Exhibit I.24: Mean SNF Use by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Mean SNF Use					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	24.9%	23.0%	19.5%*	17.3%*	17.0%*	16.1%*
Cardiac Arrhythmia	17.2%	15.2%	13.0%*	12.8%*	11.4%*	11.2%*
Cellulitis	25.5%	26.8%	24.2%	24.4%	21.8%	22.5%
COPD, Bronchitis, & Asthma	15.3%	18.2%	16.0%	12.8%*	13.8%	11.4%*
CHF	26.7%	26.1%	20.6%*	18.0%*	18.0%*	16.4%*
CABG	16.0%	19.2%	7.4%*	11.5%	7.6%*	10.8%*
GI Hemorrhage	19.1%	21.5%	17.8%	15.0%*	15.4%*	12.4%*
GI Obstruction	14.6%	14.9%	11.2%	7.9%*	9.3%*	6.9%*
Hip & Femur Procedures	75.6%	74.7%	58.9%*	59.3%*	56.1%*	57.0%*
LE & Humerus Procedures	55.5%	66.4%	40.8%*	38.7%*	41.4%*	33.9%*
MJRLE	20.3%	21.0%	40.1%*	10.3%*	38.6%*	9.7%*
MJRUE	9.7%	10.5%	10.7%	4.1%*	9.5%	4.0%*
Pacemaker	21.5%	26.3%	14.4%	15.9%*	13.5%	14.0%*
PCI (Inpatient)	9.2%	9.1%	1.8%*	5.8%	1.8%*	5.5%
Renal Failure	32.4%	32.5%	33.1%	25.9%*	29.8%	23.1%*
Sepsis	32.0%	32.3%	32.6%	27.1%*	25.0%*	23.2%*
SPRI	26.4%	27.2%	36.3%*	24.8%*	22.0%*	16.2%*
Stroke	31.5%	31.6%	25.9%*	22.7%*	24.2%*	20.5%*
UTI	37.9%	38.2%	34.5%	32.9%*	31.8%*	29.2%*
PCI (Outpatient)	1.8%	0.9%	0.7%	0.2%	0.7%	0.2%
Spinal Fusion	19.6%	17.1%	10.0%*	8.1%*	9.0%*	7.6%*

Exhibit I.25: Mean IRF Use by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Mean IRF Use					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	3.8%	4.4%	5.9%*	4.4%	5.6%	4.0%
Cardiac Arrhythmia	3.9%	3.4%	4.1%	4.1%	4.0%	3.9%
Cellulitis	2.1%	4.0%	4.5%*	3.6%	4.3%	3.8%
COPD, Bronchitis, & Asthma	2.1%	2.7%	2.4%	3.5%	2.3%	3.6%
CHF	4.0%	3.6%	5.2%*	3.8%	5.2%*	3.6%
CABG	18.2%	14.0%	7.4%*	8.3%	7.6%*	6.5%*
GI Hemorrhage	2.2%	1.7%	2.9%	2.7%	3.1%	2.5%
GI Obstruction	1.1%	1.0%	1.9%	1.2%	2.1%	1.2%
Hip & Femur Procedures	15.1%	14.6%	20.4%*	21.7%*	21.2%*	22.6%*
LE & Humerus Procedures	6.8%	8.1%	17.5%*	15.3%*	17.2%*	15.2%*
MJRLE	3.1%	3.0%	14.1%*	2.7%	13.9%*	2.7%
MJRUE	2.1%	1.4%	2.7%	0.3%*	2.7%	0.3%*
Pacemaker	3.9%	4.7%	2.2%	3.2%	2.2%	3.3%
PCI (Inpatient)	3.4%	1.9%	3.0%	4.4%*	3.0%	4.5%*
Renal Failure	3.7%	4.3%	6.7%*	5.7%	6.8%*	5.1%
Sepsis	3.8%	3.8%	4.5%*	4.2%	4.7%*	4.1%
SPRI	3.3%	3.4%	3.6%	3.0%	4.1%	4.0%
Stroke	25.8%	24.0%	25.4%	21.7%	25.2%	21.7%
UTI	4.3%	4.3%	5.3%	4.8%	5.1%	4.8%
PCI (Outpatient)	0.2%	1.2%	0.7%	0.5%	0.7%	0.5%
Spinal Fusion	10.6%	11.2%	15.2%*	9.5%	15.1%*	9.5%

Exhibit I.26: Mean Unplanned Readmission Rate by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Mean Unplanned Readmission Rate					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	34.2%	34.2%	36.5%	34.8%	35.0%	34.6%
Cardiac Arrhythmia	31.5%	28.9%	27.4%*	28.9%	25.4%*	26.6%
Cellulitis	29.1%	28.7%	31.3%	29.5%	28.6%	29.5%
COPD, Bronchitis, & Asthma	31.3%	35.5%	35.5%*	39.6%*	33.9%	38.3%
CHF	39.5%	40.2%	37.7%	38.7%	35.7%*	37.4%*
CABG	27.3%	19.2%	18.2%	14.7%	18.5%	12.0%
GI Hemorrhage	30.0%	31.6%	29.4%	28.8%	28.3%	26.9%*
GI Obstruction	29.3%	30.8%	24.8%	25.2%	23.3%	25.2%
Hip & Femur Procedures	22.3%	21.8%	20.7%	20.6%	18.8%*	18.5%*
LE & Humerus Procedures	19.9%	19.6%	21.7%	17.7%	19.8%	17.9%
MJRLE	9.1%	9.7%	18.3%*	8.4%*	16.7%*	7.9%*
MJRUE	10.2%	12.4%	21.3%*	15.4%	20.3%*	15.0%
Pacemaker	24.0%	26.5%	17.8%	15.9%*	16.9%	14.0%*
PCI (Inpatient)	22.7%	27.9%	23.8%	23.7%	22.6%	23.4%
Renal Failure	34.8%	32.3%	33.5%	36.0%*	32.0%	34.3%
Sepsis	31.1%	32.0%	29.8%*	29.5%*	29.7%	27.5%*
SPRI	29.2%	29.2%	24.6%*	29.7%	27.7%	30.7%
Stroke	25.0%	24.7%	23.5%	21.9%	21.5%*	20.9%*
UTI	31.4%	32.3%	31.9%	28.4%*	31.1%	27.0%*
PCI (Outpatient)	11.9%	12.3%	12.4%	11.9%	10.7%	11.8%
Spinal Fusion	16.1%	12.5%	17.2%	11.4%	15.5%	11.2%

Exhibit I.27: Mean Mortality Rate by Clinical Episode, BPCI Advanced Episodes with and without COVID-19 Diagnosis, April 2019/2020 and June 2019/2020

Clinical Episode	Mean Outcomes					
	April 2019	June 2019	April 2020	June 2020	April 2020 Excluding COVID-19	June 2020 Excluding COVID-19
AMI	15.9%	17.3%	19.8%*	16.7%	19.4%*	16.6%
Cardiac Arrhythmia	8.8%	9.0%	12.7%*	9.7%	12.2%*	8.7%
Cellulitis	6.7%	5.0%	6.3%	5.8%	5.5%	5.2%
COPD, Bronchitis, & Asthma	6.9%	7.1%	8.7%	8.7%	8.2%	7.5%
CHF	16.1%	16.3%	19.1%*	17.0%	18.5%*	16.6%
CABG	2.7%	2.3%	3.0%	1.1%	1.5%	1.1%
GI Hemorrhage	10.4%	9.7%	11.3%	11.0%	10.2%	9.5%
GI Obstruction	7.9%	8.1%	8.5%	8.6%	7.5%	8.8%
Hip & Femur Procedures	10.8%	9.2%	12.9%	10.8%	12.4%	9.8%
LE & Humerus Procedures	3.4%	4.1%	5.9%	3.2%	4.4%	2.7%
MJRLE	1.1%	1.5%	9.1%*	1.4%	8.8%*	1.3%
MJRUE	0.3%	0.5%	2.7%*	0.5%	2.7%*	0.5%
Pacemaker	2.9%	6.9%	8.9%*	4.0%	9.0%*	2.5%*
PCI (Inpatient)	5.2%	4.3%	2.4%	6.7%	2.5%	6.9%
Renal Failure	15.6%	14.4%	21.9%*	19.1%*	20.8%*	17.8%*
Sepsis	19.5%	18.9%	26.0%*	22.6%*	25.1%*	21.1%*
SPRI	14.4%	16.4%	20.8%*	20.7%*	20.5%*	21.1%*
Stroke	15.7%	15.1%	19.0%*	18.5%*	18.3%	18.2%*
UTI	10.2%	9.7%	16.6%*	14.4%*	15.9%*	14.1%*
PCI (Outpatient)	1.6%	0.5%	0.0%	0.2%	0.0%	0.2%
Spinal Fusion	1.2%	0.7%	4.0%*	1.0%	3.7%*	0.9%