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ICD-10 Procedure Code Request for Real Time Renal Function Monitoring using the Transdermal Glomerular Filtration Rate (GFR) Measurement System™

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Kidney Disease is a Hidden Global Epidemic*

850 Million - people worldwide have some form of kidney disease

10-12% - of adults worldwide have Chronic Kidney Disease

13.3 Million - patients experience Acute Kidney Injury (AKI) annually potentially leading to Chronic Kidney Disease

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*Joint global press release by American Society of Nephrology, European Radiology Association and the International Society of Nephrology on **June 27, 2018**

Increased Burden of Chronic Kidney Disease (CKD)*

"During the 15-year period covered by study, health loss due to kidney disease increased by 18%, while the burden of cardiovascular disease and cancer have decreased by 22% and 13%, respectively."*

*Changes in the US Burden of Chronic Kidney Disease From 2002 to 2016, An Analysis of the Global Burden of Disease Study
Benjamin Bowe, MPH; Yan Xie, MPH; Tingting Li, MD; Ali H. Mokdad, PhD; Hong Xian, PhD; Yan Yan, MD, PhD; Geetha Maddukuri, MD; Ziyad Al-Aly,MD Published Journal of the American Medical Association Open Network on **November 30, 2018**

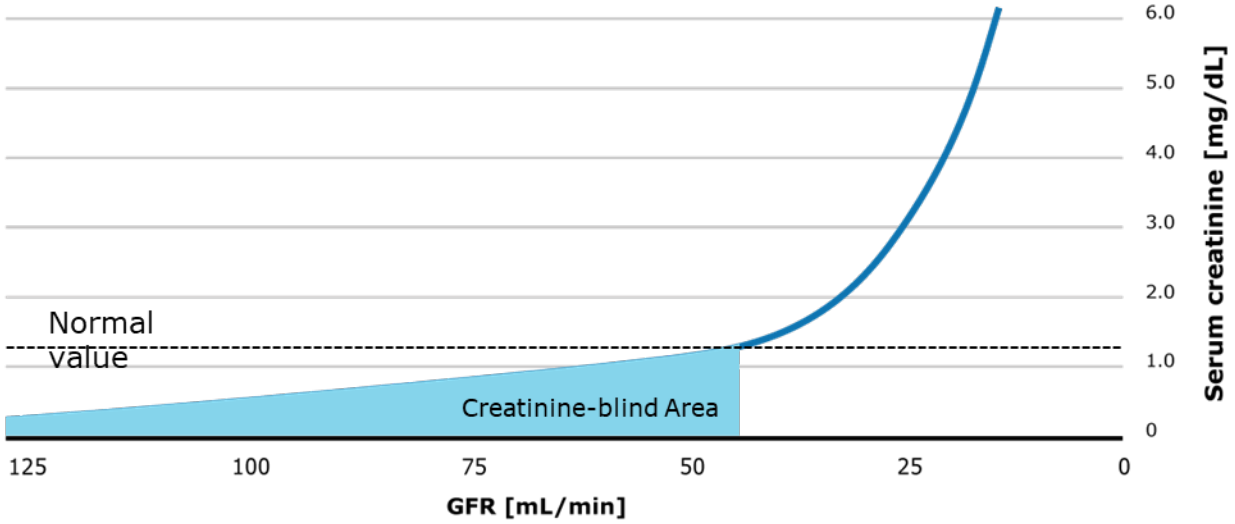
Real time dynamic GFR measurement has the potential to improve kidney related health

Current Standard of Kidney Function Assessment

- Clinicians rely on equations that use Serum Creatinine (SCr) to calculate an estimated Glomerular Filtration Rate (eGFR)
- Estimated GFR calculations are poor surrogates for true GFR
  - Dependent on muscle mass
  - Time delayed in the critical care setting

Creatinine Blind Range

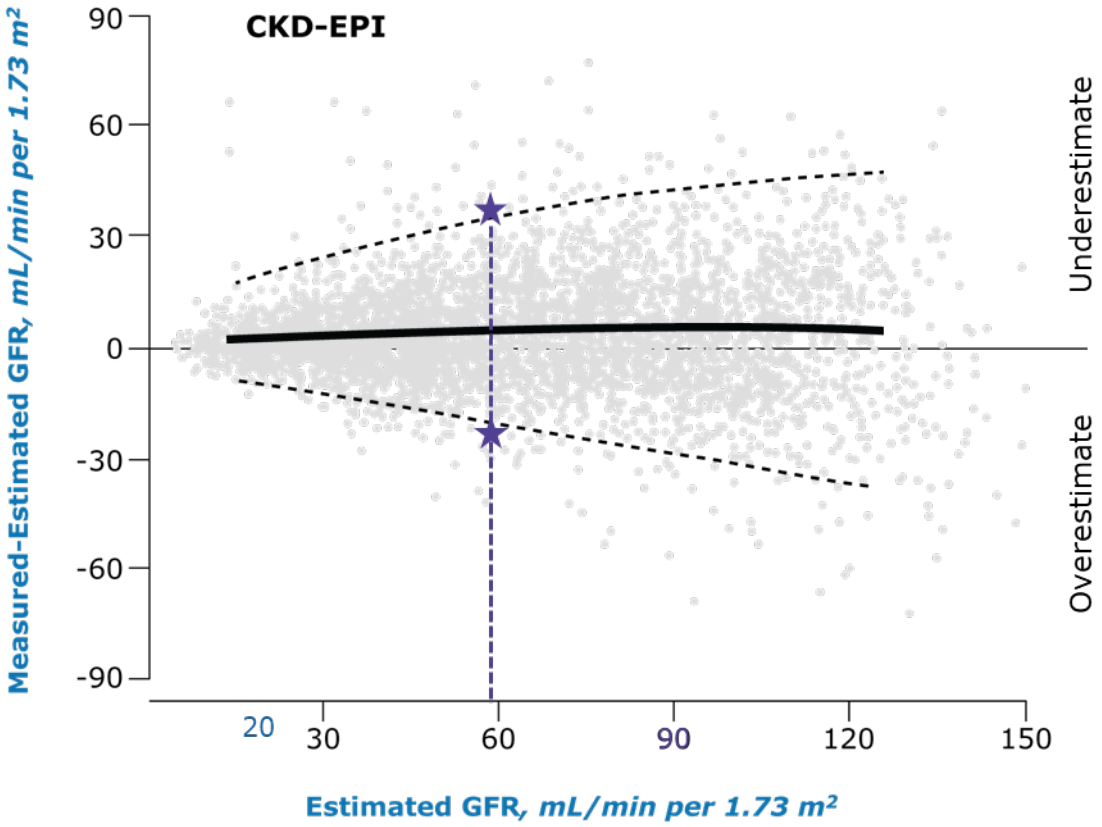
- GFR estimates of >60 mL/min unreliable
- SCr does not rise significantly until GFR <60mL/min
- 50% renal function loss before SCr rises above ‘normal’ range



*In creatinine-blind ranges **eGFR values are unreliable** and should be replaced by mGFR.*

Zitta et al, “Glomerular Filtration Rate (GFR) determination via individual kinetics of the inulin-like polyfructosan sinistrin versus creatinine-based population-derived regression formulae,” BMC Nephrology 2013, 14:159

Estimated GFR using CKD-EPI equation



- **Estimated eGFR is 59mL/min**
- **Measured mGFR is 90mL/min or 30mL/min**

eGFR extremely inaccurate for individual patients

Levey et al, "A New Equation to Estimate Glomerular Filtration Rate," Annals of Internal Medicine, (May 2009), Vol. 150, No. 9

The Transdermal GFR Monitor

- Patented fluorescent tracer agent
- Sensor on patient's skin
- Display monitor

Lumitrace™
(relmapirazin)

Innovation:

Fluorescent tracer agent coupled with transdermal fluorescence detection enables point of care measured GFR.

Regulatory Plan

- Pilot Studies completed on over 160 subjects with
  - Normal to stage 4 CKD
  - Range of skin colors
- FDA Granted Breakthrough Device Status for TGFR
  *"The Transdermal GFR Measurement System is intended to measure Glomerular Filtration Rate (GFR) in patients with impaired or normal renal function."**
- Multi Site Pivotal Study to be conducted in 2019

*US Food and Drug Administration, Center for Devices and Radiological Health, Letter Re: Q181592 dated **October 16, 2018**
Food and Drug Administration. https://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM581664.pdf

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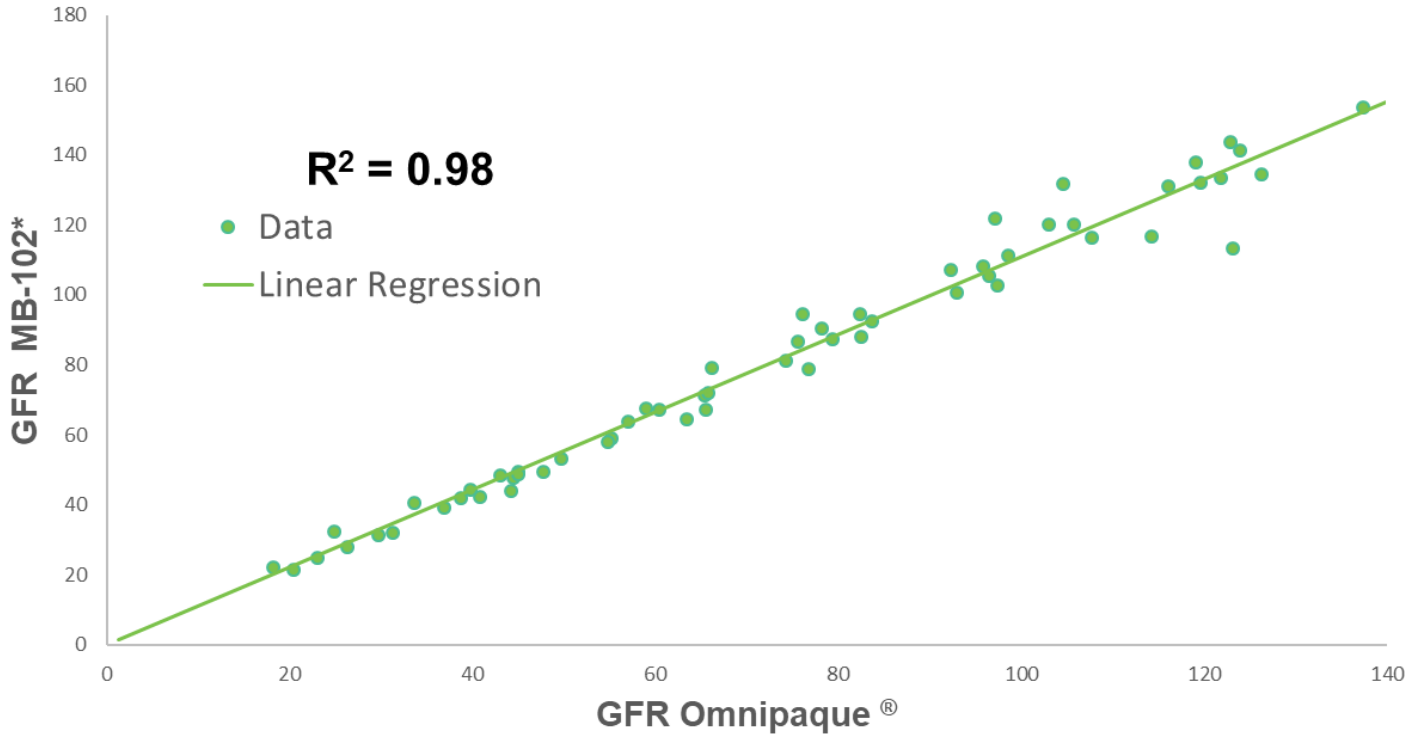
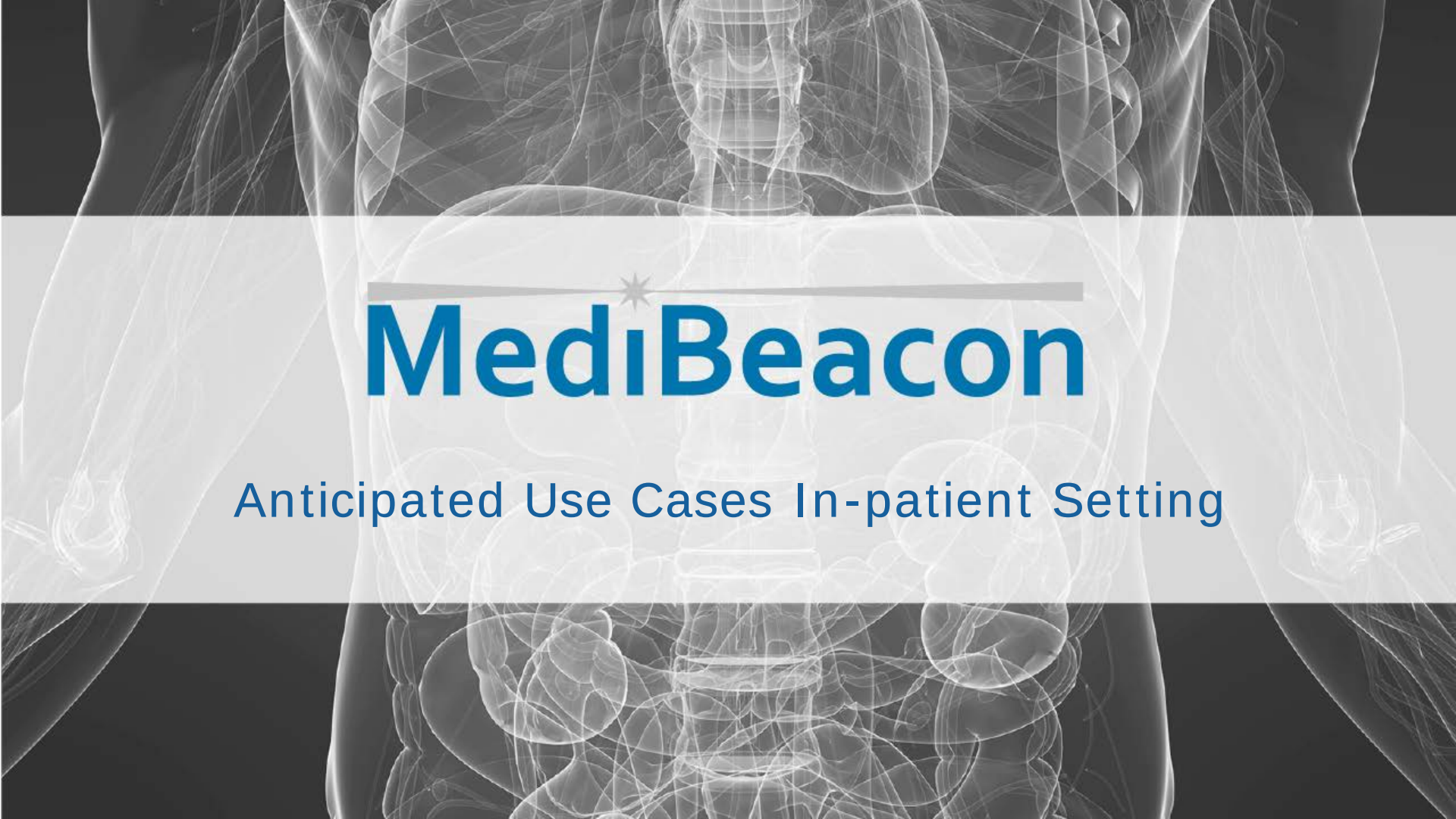
MB-102 plasma-derived GFR Correlates with Omnipaque® (Iohexol) plasma-derived GFR:

(MB-102 is a GFR agent over range of GFR values)



*Lumitrace™
(relmapirazin)



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Anticipated Use Cases In-patient Setting

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Relevant ICU Conditions for TGFR System

- Septicemia or Severe Sepsis
- Heart Failure
- Circulatory disorder except AMI with Cardiac Catheterization
- Renal Failure
- Open Heart Surgery
- Transplant procedures (Kidney, Heart, Lung, Liver)

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Heart Failure and Cardiorenal Syndrome

Cardiology

Market Adoption Case

Hypothesis	Outcome Measures
GFR monitoring in heart failure patients will reduce time to detection of kidney function improvement after rehydration or diuretic administration	More rapid clinical response assessment Avoid unnecessary hospitalization Decrease patient morbidity from volume overload Decrease hospitalization days

Empowers the clinician to precisely adjust course of therapy

Assess response to therapy, whether afterload reduction or fluid/vasoactive medications within 1-2 hours

Drug Dosing on CRRT

ICU

Market Adoption Case

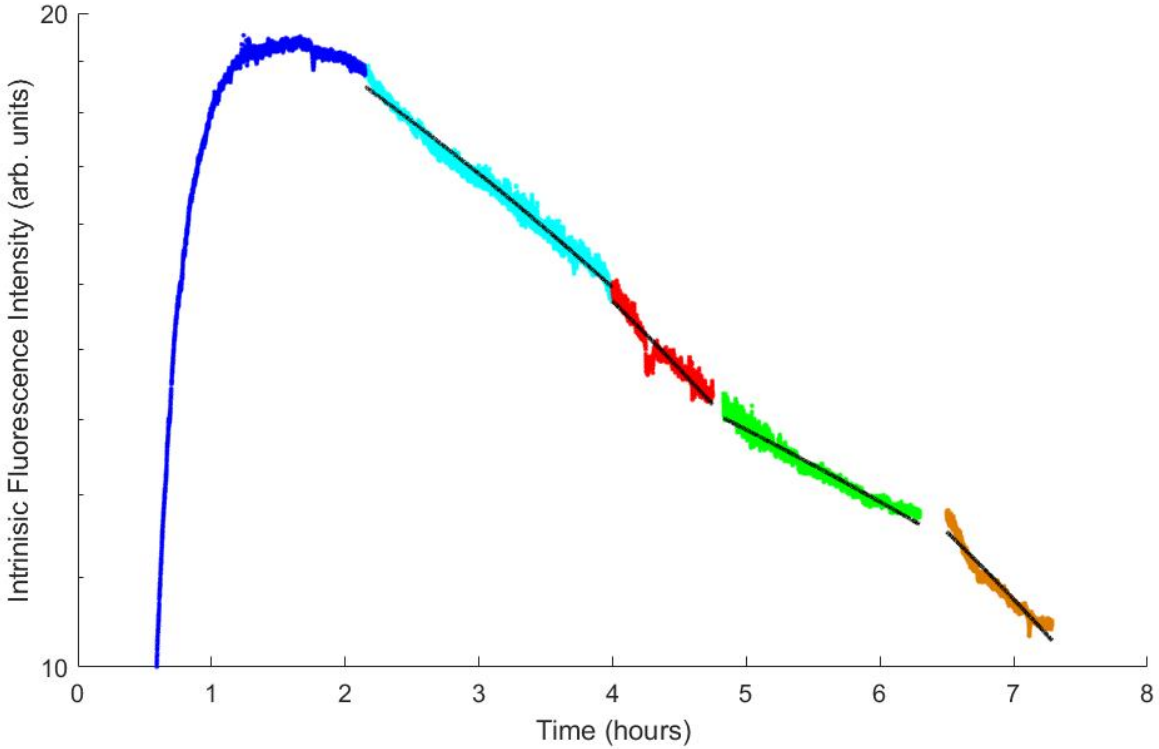
Hypothesis	Outcome Measures
Real-time GFR assessment in critically ill patients receiving CRRT enables new standard of care for drug dosing based on measured clearance	Achieve optimal drug dosing Reduce nephrotoxic medication associated AKI during renal recovery

- Optimal drug dosing on CRRT is a significant gap noted by FDA, ASN, and KHI.[1]
- Lack of reliable clinical data to guide antibiotic use and associated under-dosing risk during CRRT are known to be major problems.[2]
  (Problem extends to any drugs with renal excretion and/or CRRT clearance)
- Dosing continues to be done largely on an **empiric** basis.*

1) Nolin et al. CJASN, Vol 10 January, 2015, Pharmacokinetic Assessment in Patients Receiving Continuous RRT: Perspectives from the Kidney Health Initiative
2) Clark et al. Critical Care (2017) 21:92, The future of critical care: renal support in 2027, DOI 10.1186/s13054-017-1665-6

***Empiric Therapy - therapy begun on the basis of a clinical educated guess in the absence of complete or perfect information.**

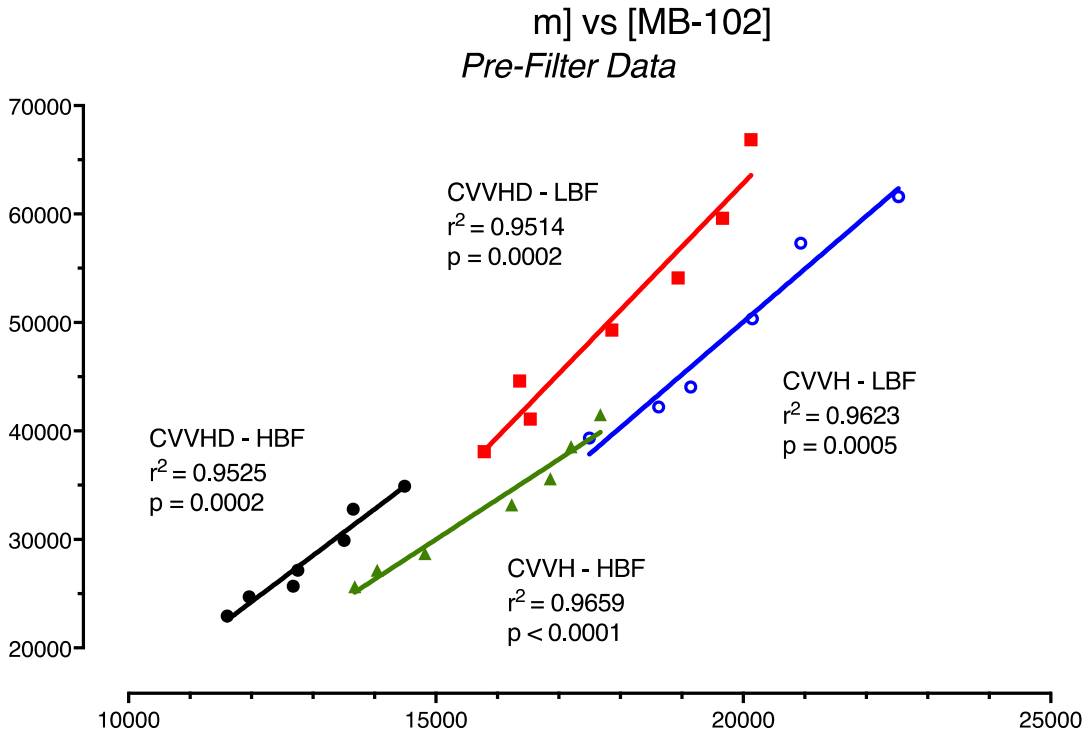
Transdermal fluorescence response *(CVVH)*



Distribution ●
Low Blood Flow, Low UF Flow ●
Low Blood Flow, High UF Flow ●
High Blood Flow, Low UF Flow ●
High Blood Flow, High UF Flow ●

CRRT Update

- Meropenem concentrations over time tightly correlated to MB-102 concentrations
- MB-102 clearance by CRRT can be used to predict meropenem clearance and guide dosing

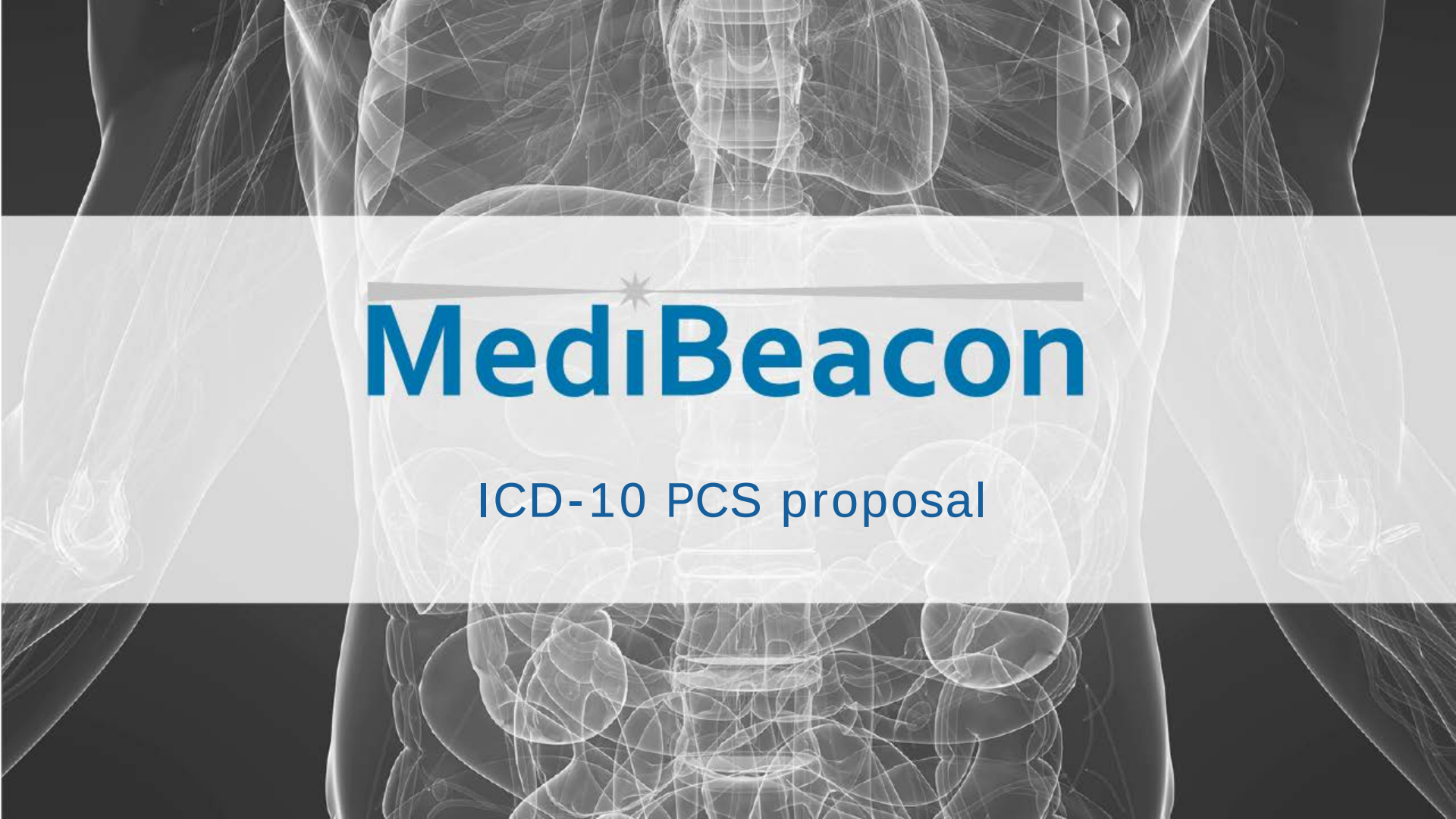


MediBeacon Status: Preclinical System

System Currently Used By:

- >100 Academic Centers
- >25 Pharmaceutical Companies
- Over 125 Published Research Articles and Poster Abstracts

State of The Art Technique for Preclinical Renal Function Assessment



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ICD-10 PCS proposal

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- The existing ICD-10 PCS coding system does not support accurate reporting and tracking of real time renal function monitoring.
- Having a procedure specific code enables physicians, hospitals, payers, researchers etc. to conduct comprehensive analyses about the utility of the procedure in inpatient care management including patient outcomes, costs, and other endpoints of interest associated with the use real time renal functioning monitoring.
- MediBeacon requests the addition of an ICD-10 PCS code so that hospital coders can accurately report the use of real-time renal function monitoring in the inpatient setting.

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Thank You