

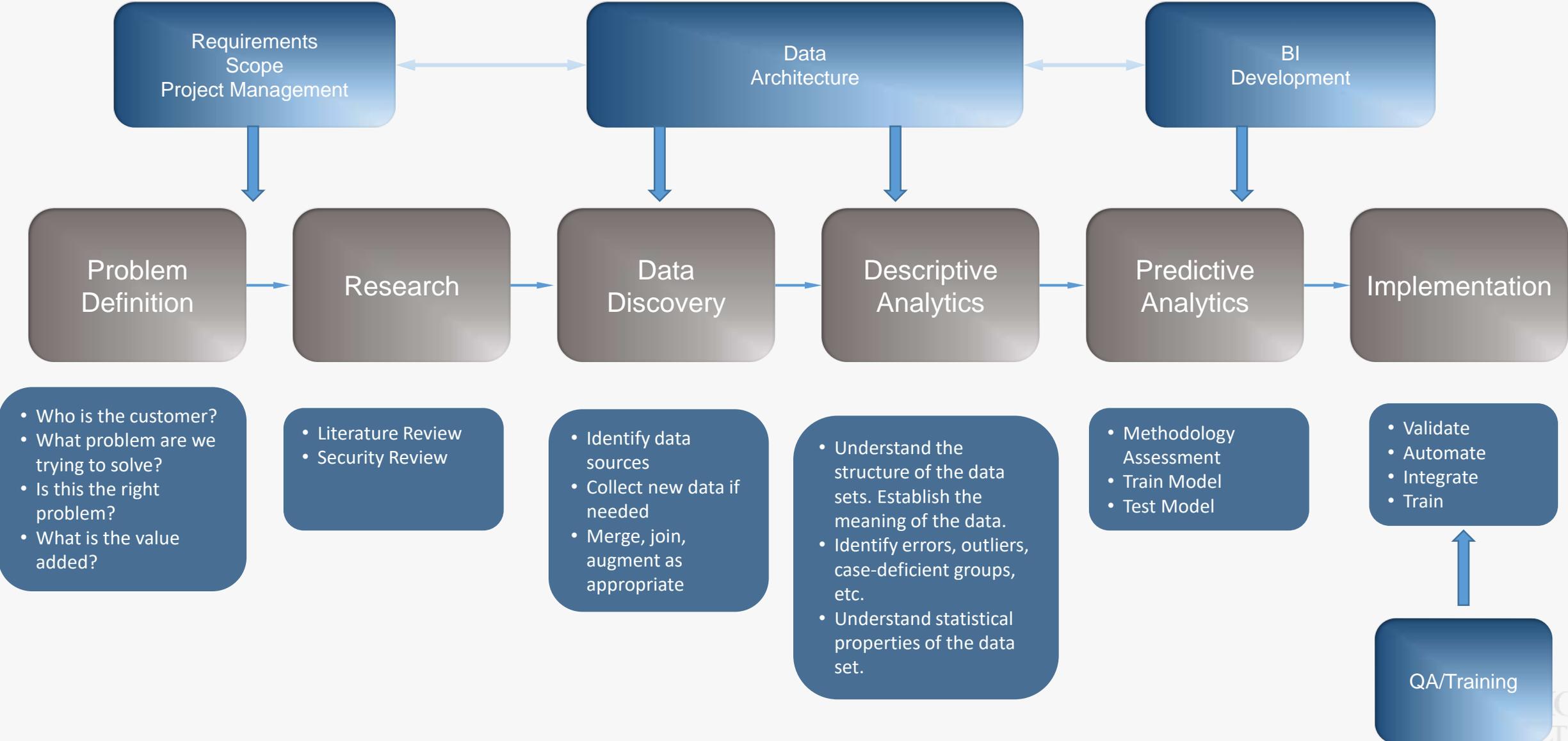
Quality Renal Care - A Data Analytics Approach

Speakers:

Janakiraman Pandian, Senior Data Architect

Terry Richardson, Director

Clinical and Business Analytics: Processes and Collaborative Work



- Who is the customer?
- What problem are we trying to solve?
- Is this the right problem?
- What is the value added?

- Literature Review
- Security Review

- Identify data sources
- Collect new data if needed
- Merge, join, augment as appropriate

- Understand the structure of the data sets. Establish the meaning of the data.
- Identify errors, outliers, case-deficient groups, etc.
- Understand statistical properties of the data set.

- Methodology Assessment
- Train Model
- Test Model

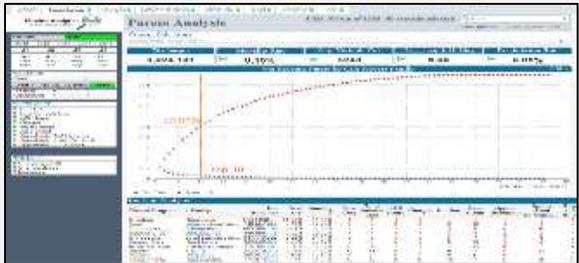
- Validate
- Automate
- Integrate
- Train

QA/Training

Clinical and Business Analytics: Software Development

Currently

- 50+ Applications in Production
- 10 Applications currently in Development
- 50+ Additional Care Process Models (CPMs)



Clinical and Business Analytics:

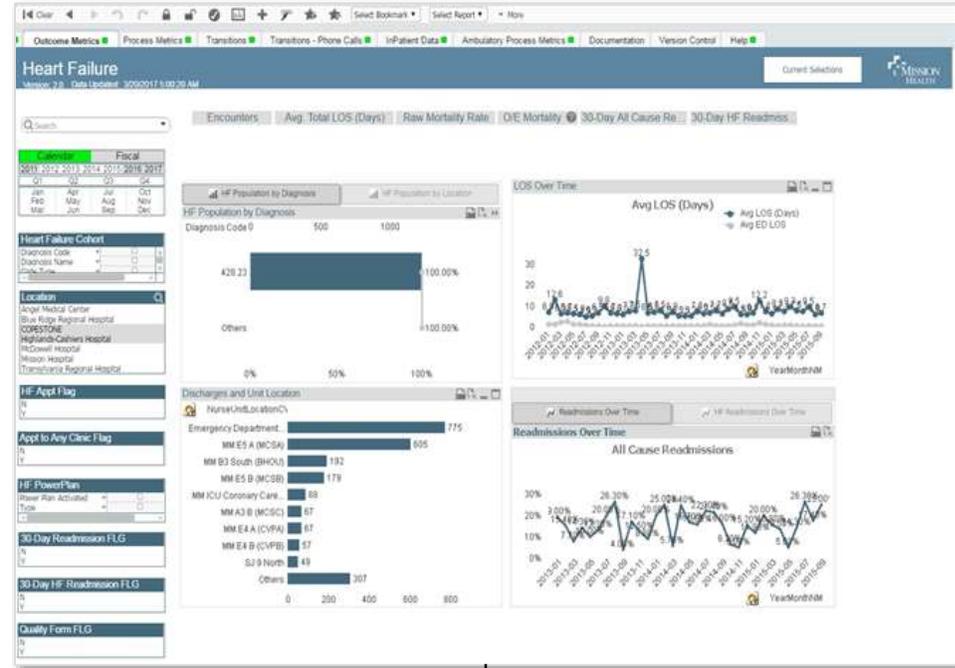
Business Intelligence

We build Analytics applications that help users get information from their data so they can...
Measure What Matters.

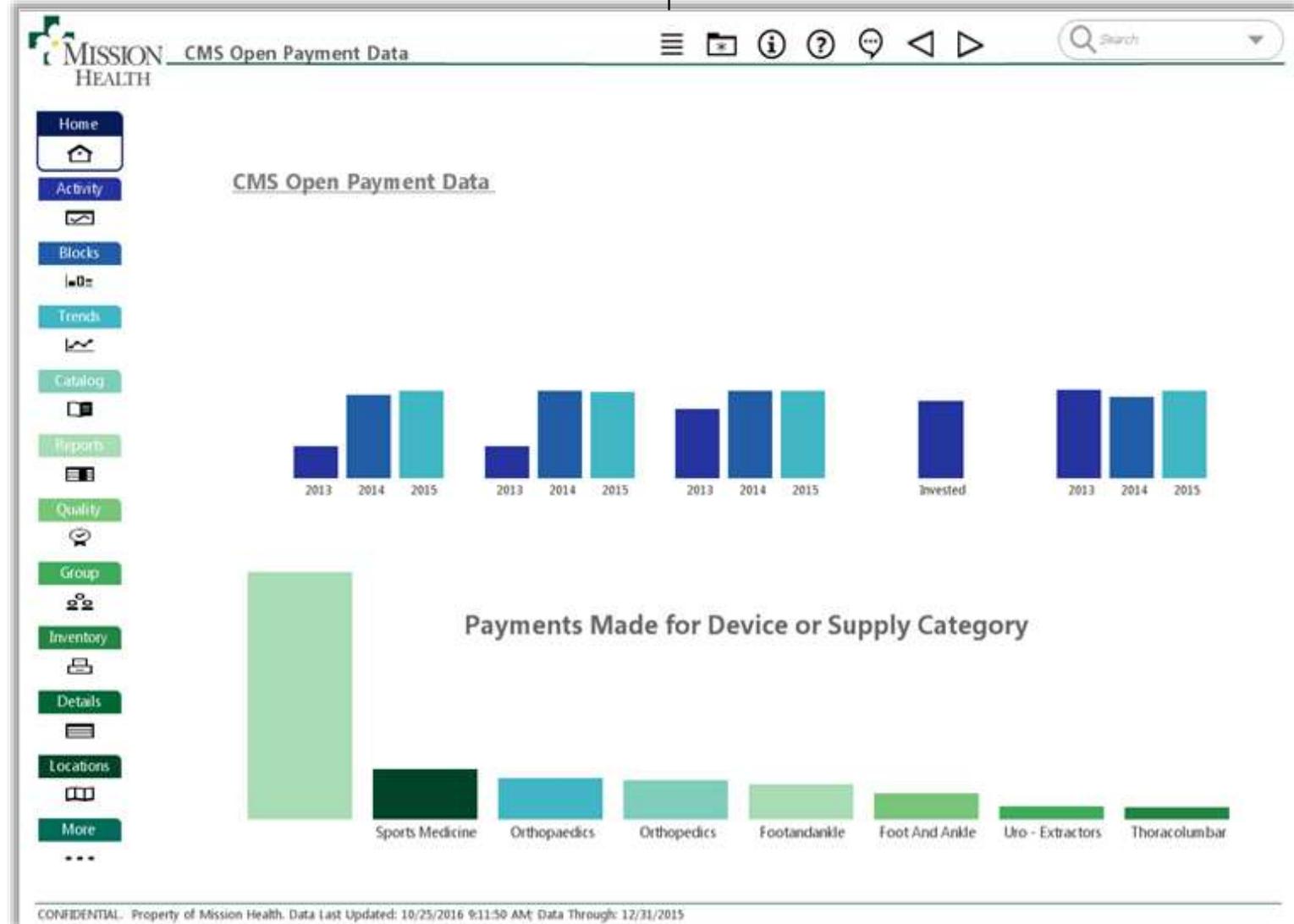
- Mission Analytics builds applications through collaborative work with customers and partners.
- Deliver new ways to analyze large amounts of data.
- Create displays that are pleasing, appropriate, and easily interpreted.
- Key to getting predictive analytics recommendations integrated into the workflow.
- Our projects are organized, and end-user focused because of project management and collaboration.
- Our data is validated, reliable, and regularly refreshed because of our Data Architects and Sourcing teams.
- Our work is forward-thinking because of the work and research of our Data Scientists.
- Our work pushes limits because the Training and Quality Assurance team teaches users how to get the most out of our applications.

Clinical and Business Analytics: Business Intelligence

Data Presentation
User Experience
Guided Analytics



Data Presentation



Clinical and Business Analytics: Training and Quality Assurance Materials

User Guides

Applications Training Classes

Quick Reference Guides

Use Case Scenarios

Application Quality Assurance

This row contains five document thumbnails:

- 1. A table titled "Dashboard Training Sign Up Sheet" with columns for Name (First/Last), Area/Department, and Title/Function.
- 2. A document titled "How to connect to the Mission Analytics Dashboard Access Point at Mission Health System" with numbered steps and screenshots.
- 3. A document titled "User Quick Guide to Dashboard Navigation" with the Mission Analytics logo.
- 4. A document titled "Stroke Dashboard Mission Analytics Training" with the Mission Analytics logo and a red brain icon.
- 5. A document titled "Training On Mission Terms" with a table of metrics and a search bar.



A diagram titled "Diabetics - General Metrics Screen Overview". It shows a screenshot of a dashboard with several callout boxes explaining different parts of the interface:

- Navigation Bar:** Contains MI, HbA1c, and other tabs.
- Application Tabs:** Includes 'Diabetics' and 'Diabetes'.
- Additional Info:** Provides details about the dashboard's data sources.
- Filter LAM Boxes:** Allows for filtering data by race, gender, and year.
- Main Body (graphs, data, tables):** Displays various data visualizations.
- All a glucose high level alerts:** A specific alert or metric.

Scenario Description	Role	Tab's	Related App.
1. The Diabetes Improvement Team began focusing on reducing provider insulin-ordering variation 6 months ago by implementing a new order set with the goal to reduce the number of type 1 and type 2 insulin orders by 20%. The team has 5 months until they finish on the use of the new order set and they want to evaluate the use of the order set by provider, and also the incidence of hyper and hypoglycemia events throughout the system.	Ordering Provider	Diabetes Dashboard	Insulin Treatment, Medication, Diabetes Alerts
2. A hospital nurse that the Diabetes Improvement Team began focusing on reducing provider insulin-ordering variation 6 months ago by implementing a new order set with the goal to reduce the number of type 1 and type 2 insulin orders throughout the system by 20%. The hospital wants to know the total rate of entering an insulin order and within 6 hours of health patients being admitted and also wants to determine the degree of appropriate for health patients that health has admitted.	Ordering Provider	Diabetes Dashboard	Insulin Treatment, Medication, Diabetes Alerts
3. A nurse manager at Mission Hospital wants to evaluate the medication adherence and glucose monitoring compliance for patients with type 1 and type 2 diabetes. She is part of the daily rounding. Her role is to ensure the fall to report areas of success and areas for improvement.	Nurse Manager	Diabetes Dashboard	Insulin Treatment, Medication, Diabetes Alerts
4. Quality Managers will be able to filter hyper- and hypo- glucose. In ensure that they will be able to monitor the ability, and the frequency of each unit. The team will be able to monitor the ability, and the frequency of each unit. The team will be able to monitor the ability, and the frequency of each unit.	Quality Manager	Diabetes Dashboard	Insulin Treatment, Medication, Diabetes Alerts

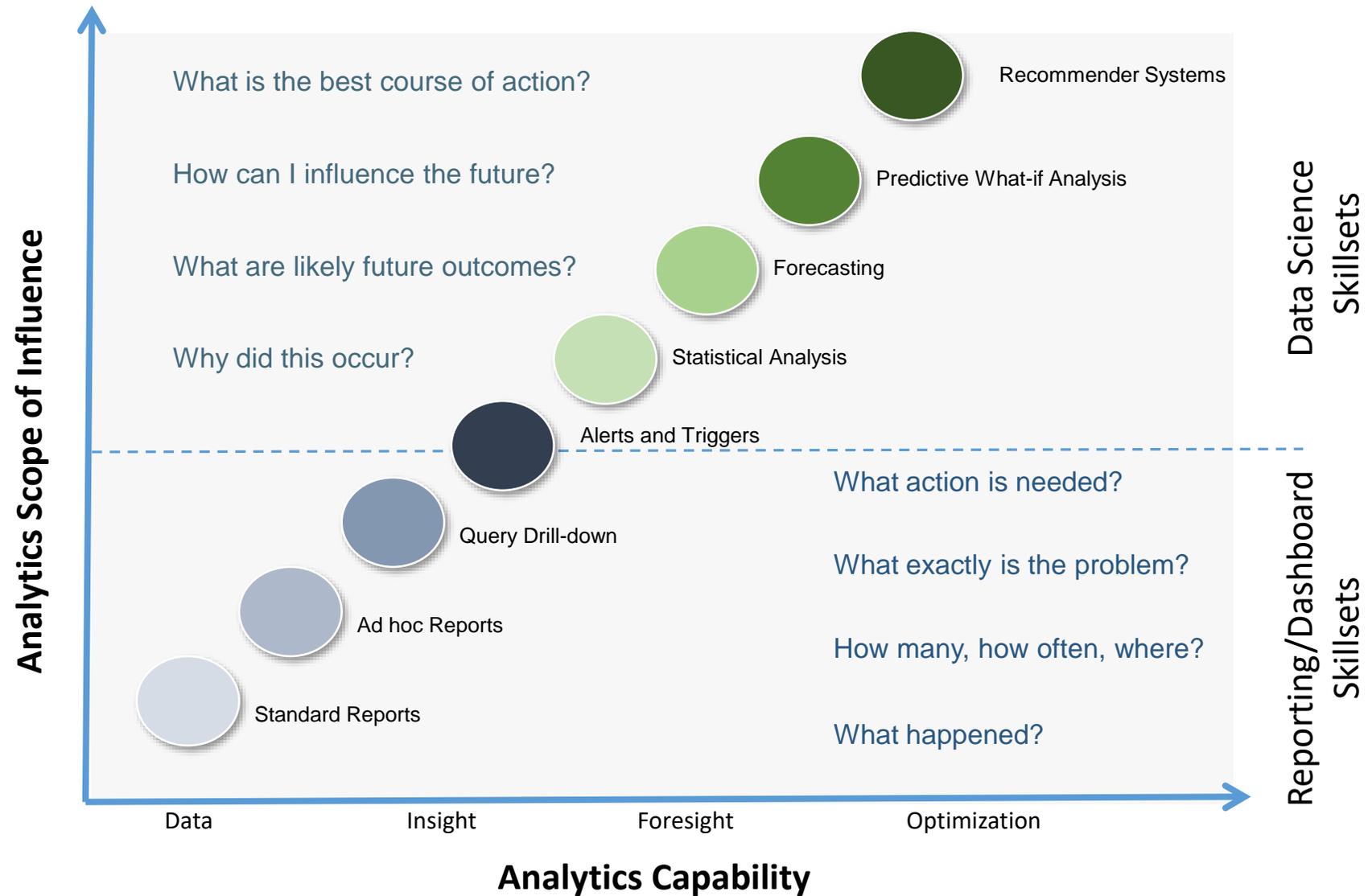
A document titled "Dashboard: Tips & Reminders" providing instructions for users:

- Date Range Selection:** Current DMX can be viewed by calendar, Real, quarter, month or past month.
- Filters will be active in all your tabs. Check Current Selections:** To see what your filters are. Current Selection will allow you to stress or change your filters.
- Glucose Metrics I tab shows:** Cases Requiring Insulin, Avg. Time to Insulin Dose (min), Avg. time back to Glucose, and Distribution of Glucose results. (Only - result, Blue - Diabetic)
- Glucose Metrics II tab shows:** Glucose Tests results by facility, patient day, result by Date, and hour of Reportback time. Also see Patient stay weight change by discharge date. Note: Each graph is color coded to see the legend. Ex.
- Powerplan tab shows:** Summary of Powerplan, by provider, orders and possible by date.
- Cross Cohort tab:** Compare one group to a second grouping using filters. Choose the filters. Click on the filters to see the results.

A document titled "Diabetics Advanced Dashboard Overview Training". It includes a diagram of the dashboard interface with callouts explaining various features and navigation options.

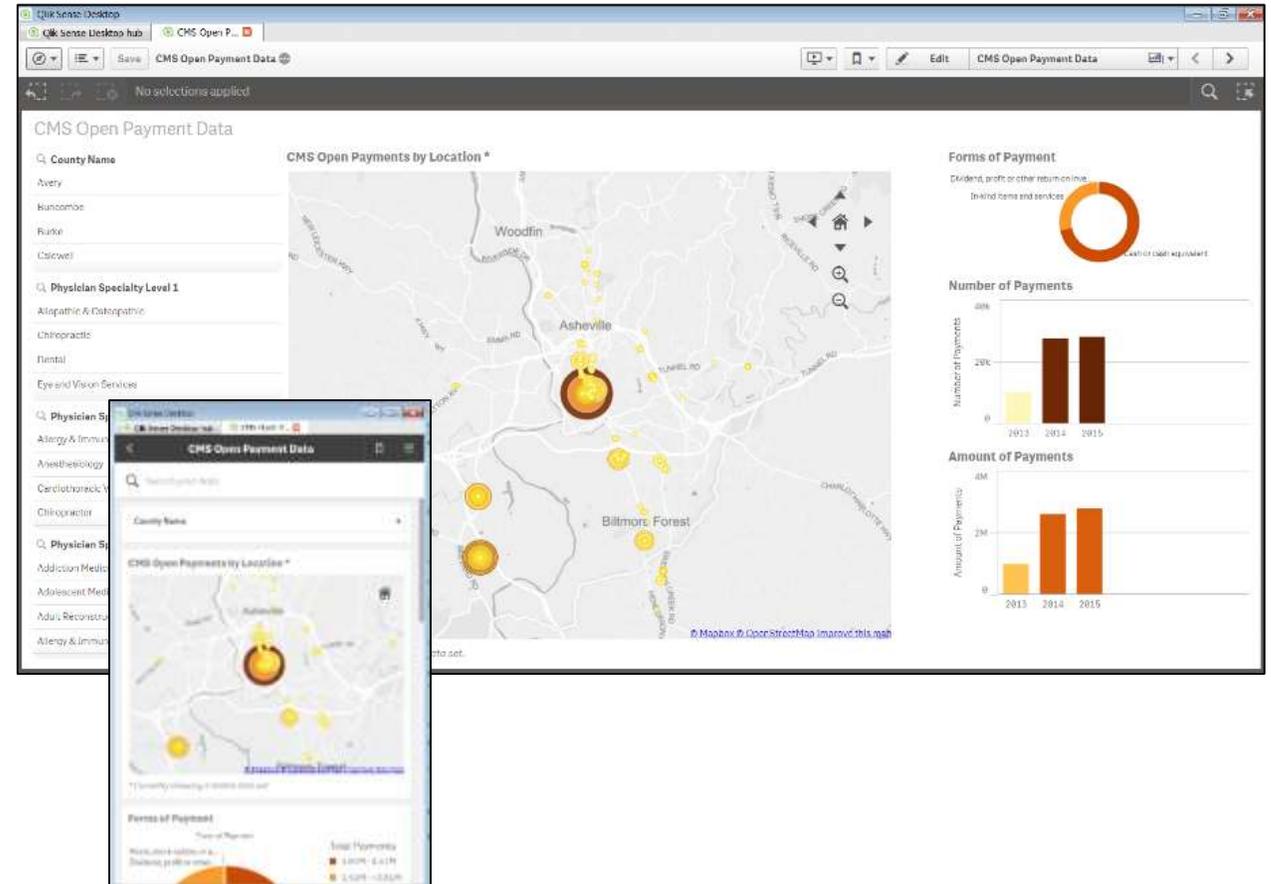
Scenario Description	Role	Tab's	Related App.
5. The TBCA will be able to monitor glycosylated trends for their family unit. They will be able to filter hyper- and hypo-glucose to ensure that they will be able to monitor the frequency of each unit. The team will be able to monitor the ability, and the frequency of each unit. The team will be able to monitor the ability, and the frequency of each unit.	Diabetes Department	Diabetes Dashboard	Insulin Treatment, Medication, Diabetes Alerts
6. By filtering down to each location and getting the glycosylated the Diabetes Team will be able to monitor the ability, and the frequency of each unit. The team will be able to monitor the ability, and the frequency of each unit. The team will be able to monitor the ability, and the frequency of each unit.	Diabetes Department	Diabetes Dashboard	Insulin Treatment, Medication, Diabetes Alerts

Capability – Influence Model

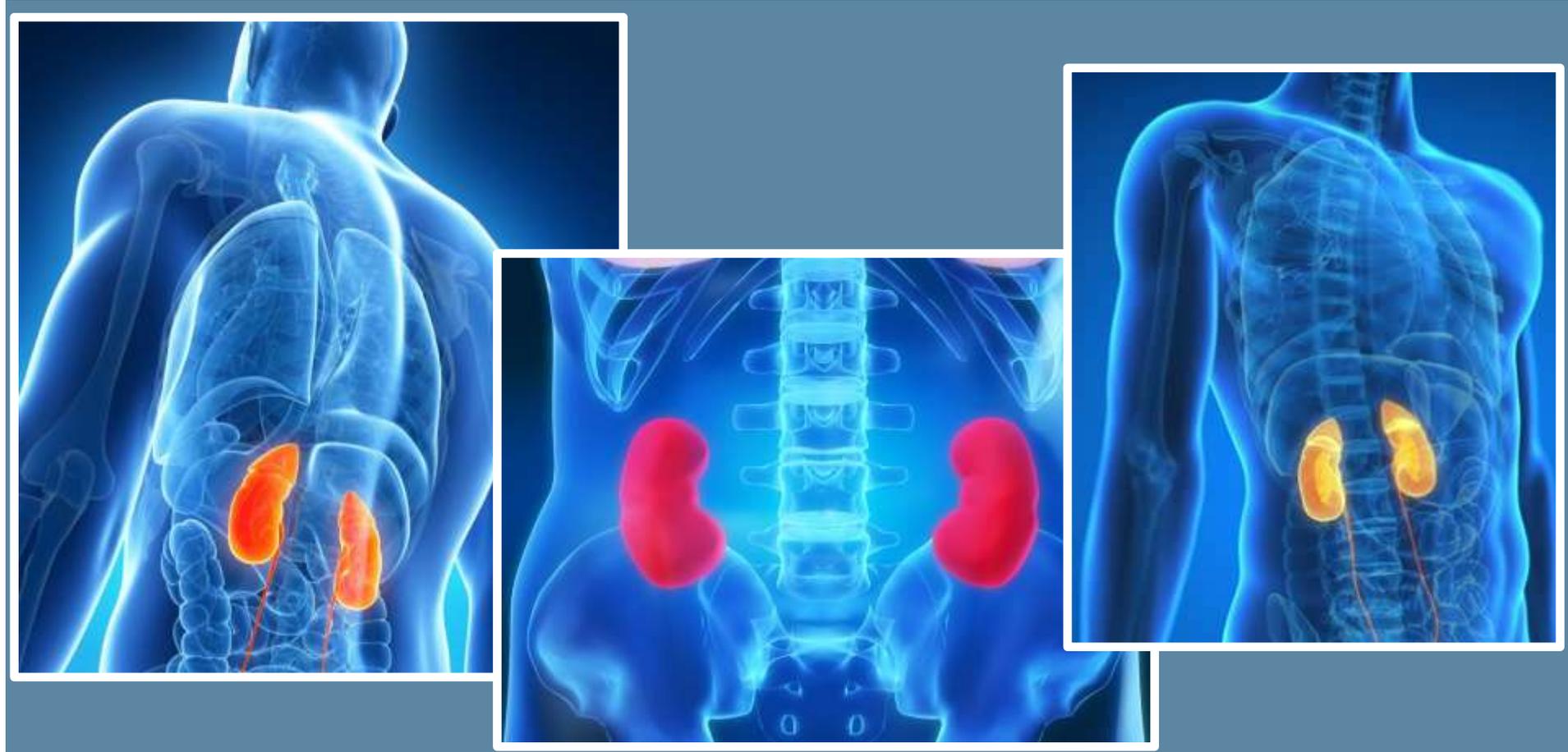


Clinical and Business Analytics: Working towards the future

- Mobile-Friendly Applications
- Device-Adaptive Designs
- Larger Datasets
- Faster Rendering of Data
- Custom and self serve reporting
- Predictive Analytics
- Recommender Systems
- Geo-Analytics



Quality Renal Care



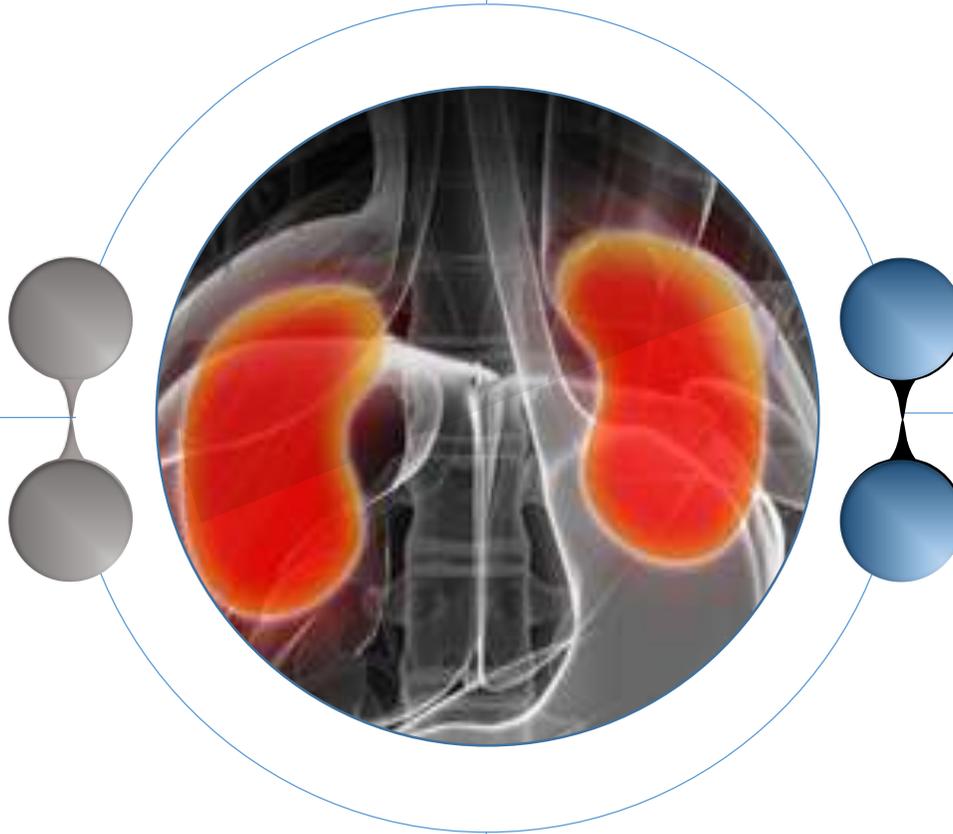
A Data Analytics Approach

About Kidneys

The kidneys are two bean shaped organs located on both sides of the spine, behind the stomach. Kidneys are vital to your health, although you need just one functioning kidney to live a normal, healthy life. Each kidney is made up of about a million filtering units called nephrons. The nephron includes a filter, called the glomerulus, and a tubule.

Anatomy

Each kidney is made up of about a million filtering units called nephrons. The nephron includes a filter, called the glomerulus, and a tubule.



Function

The kidneys perform many important functions for your body. Some of these functions include:

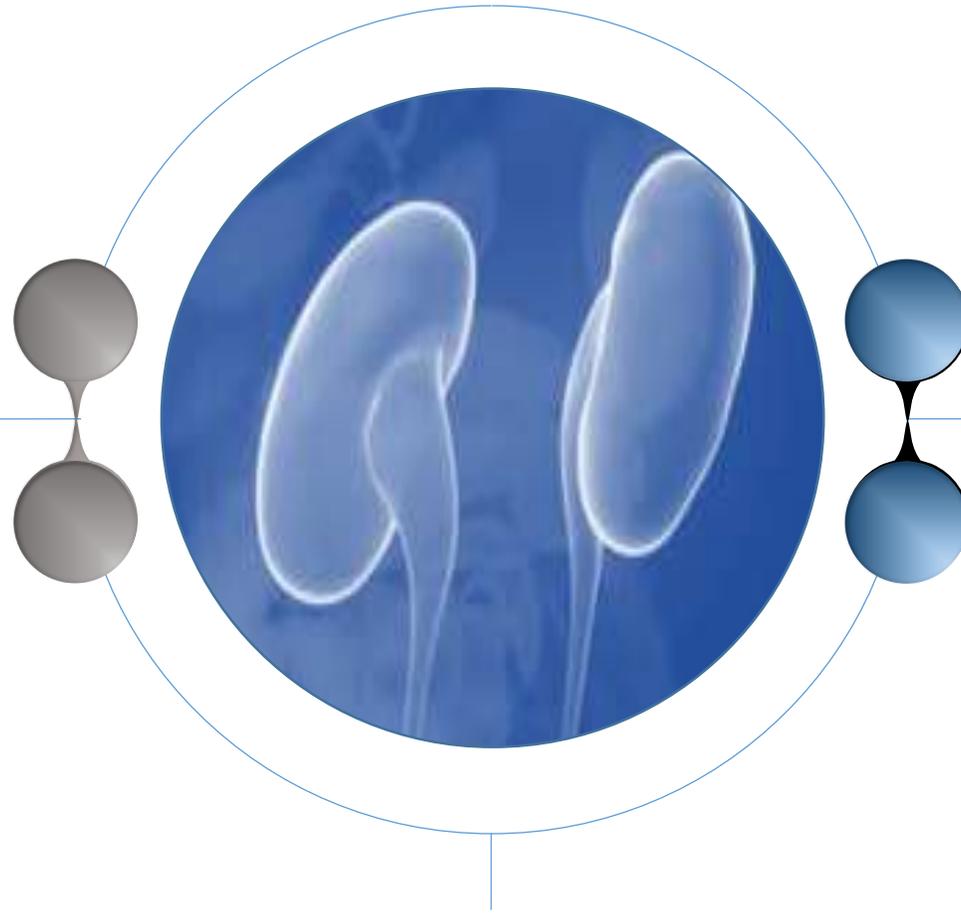
- Filtering extra water and toxins from the blood
- Produce hormones
- Absorb minerals
- Balancing electrolytes
- Maintaining a normal pH level
- Controlling blood pressure
- Red blood cell production

Did you know

One fifth of the blood pumped by your heart goes to the kidneys, where it is processed and filtered. Excess water, salt, minerals and waste are sent to the bladder as urine and 'clean' blood is returned to circulation. It takes just five minutes for all of your blood to be filtered by the kidney which means in 24 hours, your kidneys will filter all of your blood 288 times.

Classification Systems for Acute Kidney Injury

Acute kidney injury (AKI), formerly called acute renal failure (ARF), is commonly defined as an abrupt decline in renal function, clinically manifesting as a reversible acute increase in nitrogen waste products—measured by blood urea nitrogen (BUN) and serum creatinine levels—over the course of hours to weeks. The vague nature of this definition has historically made it difficult to compare between scholarly works and to generalize findings on epidemiologic studies of AKI to patient populations. Several classification systems have been developed to streamline research and clinical practice with respect to AKI.



Classification Systems for Acute Kidney Injury

Rifle Classification

In 2002, the Acute Dialysis Quality Initiative (ADQI) was created with the primary goal of developing consensus and evidence-based guidelines for the treatment and prevention of acute kidney injury (AKI). The first order of business was to create a uniform, accepted definition of AKI; hence, the RIFLE criteria were born. **RIFLE is an acronym of Risk, Injury, and Failure; and Loss; and End-stage kidney disease.**

Acute Kidney Injury Network (AKIN)

AKIN was formed in September 2004. AKIN advised that the term acute kidney injury (AKI) be used to represent the full spectrum of renal injury, from mild to severe, with the latter having increased likelihood for unfavorable outcomes.

Risk, Injury and Failure; and Loss; and End-stage kidney disease (RIFLE)		
	GFR / Serum CR (SCr)	Urine output
Risk	SCr x 1.5; or GFR ↓ by > 25%	< 0.5ml/kg/hr for 6 hours
Injury	SCr x 2; or GFR ↓ by > 50%	< 0.5ml/kg/hr for 12 hours
Failure	SCr x 3; or SCr ≥ 4mg/dL; or GFR ↓ by > 75%	< 0.3ml/kg/hr for 24 hours; or anuria for 12 hours
Loss of function	Complete loss of kidney function for > 4 weeks	
End-stage kidney disease	Complete loss of kidney function for > 3 months	
Acute Kidney Injury Network (AKIN)		
1	Serum creatinine increase ≥26.5 μmol/l (≥0.3 mg/dl) OR increase to 1.5–2.0-fold from baseline	<0.5 ml/kg/h for 6 h
2	Serum creatinine increase >2.0–3.0-fold from baseline	<0.5 ml/kg/h for 12 h
3	Serum creatinine increase >3.0-fold from baseline OR serum creatinine ≥354 μmol/l (≥4.0 mg/dl) with an acute increase of at least 44 μmol/l (0.5 mg/dl) OR need for RRT	<0.3 ml/kg/h for 24 h OR anuria for 12h OR need for RRT

Outcomes

1

Increased patient satisfaction

2

Efficient and Effective Care

3

Patient Education and understanding

Encounters
Mortality Rate
30-Day Readmit ?
Avg. Total LOS (Days)
O/E LOS ?
Cost per Case
(Most Recent) > 90 Day CVC Rate ?

Search ▼

Calendar		Fiscal	
2014	2015	2016	2017
Q1	Q2	Q3	Q4
Jan	Apr	Jul	Oct
Feb	May	Aug	Nov
Mar	Jun	Sep	Dec

Year-Month ○

Renal Primary Cohort

AKI MS-DRG
AKI ICD DX
CKD ICD DX
Hemodialysis Powerplan

Renal Secondary Cohort

AKI & CKD DX-MSDRG
AKI ICD DX-MSDRG
AKI ICD Primary DX
All ICD AKI DX
ANY DX NOT Included in DRG
CKD ICD DX-MSDRG

Primary DX

N Y

Dialysis Flags

Hemo Access ○
Renal Dx ○
CVC Reason ○

Renal Cohort Flags

ED Patient ○
Expired In Hospital ○
DRGs ○
Encounter Type ○
Readmitted ○
Nursing Unit ○
Patient on Dialysis ○
Still In Hospital ○

Patient Details

Age ○
Loc. ○
Mode ○
Disp. ○
DRG ○
DX ○
Sour ○
High Util ○

GFR Alert Fired Indicator Flags

GFR Alert Fired ○
GFRAlertPrev Visit ○
GFRAlertCurr Visit ○

Patient Count by Access

Access Type

AV Fistula	2000
Tunneled CVC	1000
Hemodialysis Catheter	800
Non-Tunneled CVC	400
AV Graft	100
CVC	50
Tunneled CVC, access ordered inc...	0
Non-Tunneled CVC, femoral VC	0
Tunneled CVC, may try to use LU...	0
Non-Tunneled CVC, pls assess L...	0
Tunneled CVC, refuses AVF	0

Patients vs Mortality Rate Over Time

All Patients Non-RMED RMED

Mortality Rate

Patients

Legend: All Patients (orange), Non-RMED Patients (blue), RMED Patients (grey), All Patient Mortality Rate (orange line), Non-RMED Mortality Rate (blue line), RMED Mortality Rate (grey line)

Patients

Facility

Mission Hospital	1800
Angel Medical Center	300
McDowell Hospital	200
Transylvania Regional Ho...	200
Blue Ridge Regional Hos...	200
COPESTONE	0
ASHEVILLE SPECIALTY...	0

Expired No Yes

Median Total LOS (days)

Select a metric

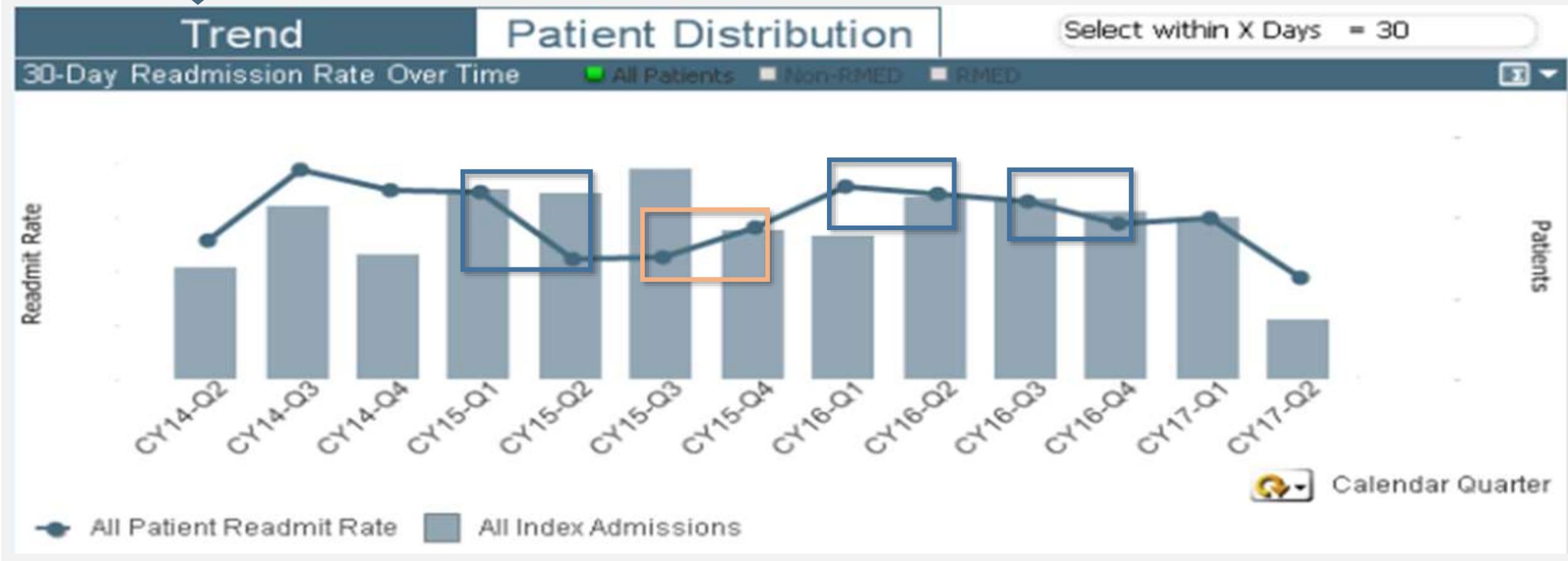
Total LOS
ED LOS
ICU LOS

days

Legend: Total LOS (green), ED LOS (grey), ICU LOS (blue)

Outcome Metrics

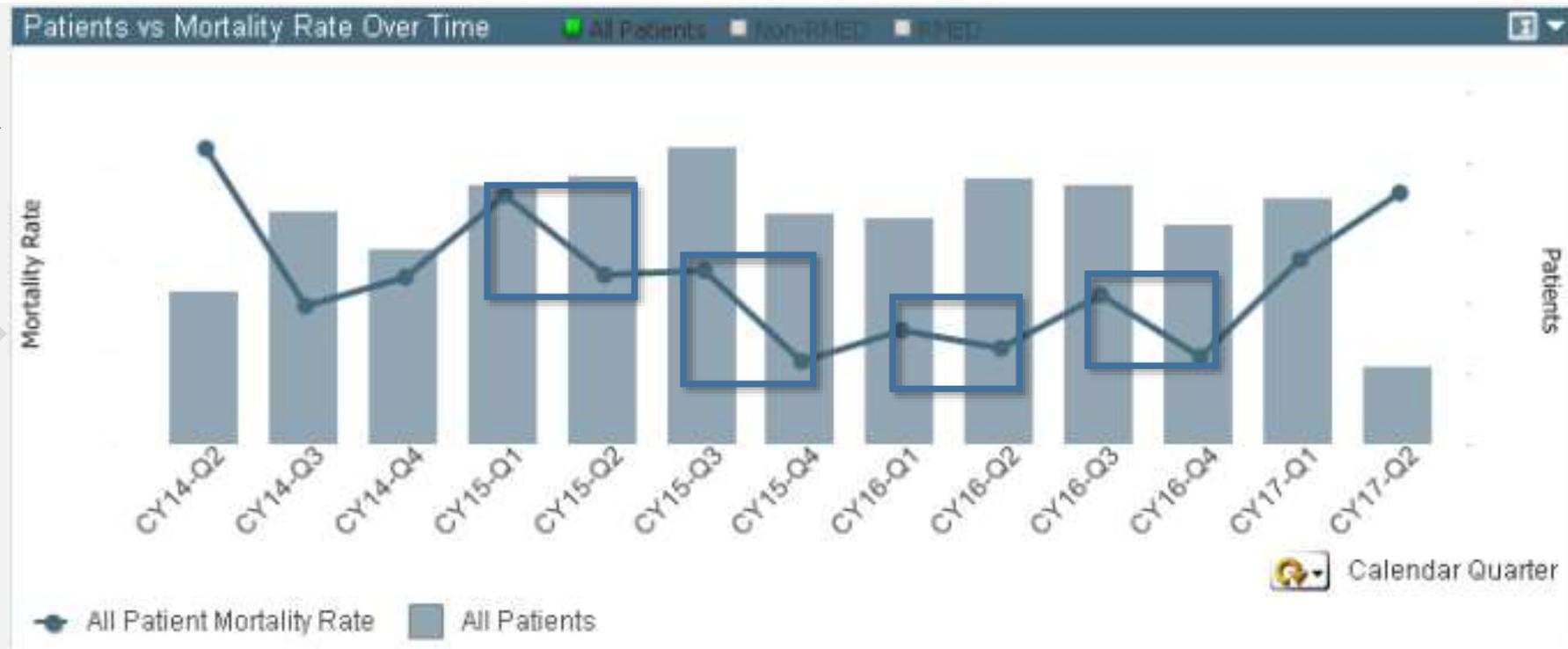
What are Readmissions and why Readmission is increasingly an important metric ?



Outcome Metrics

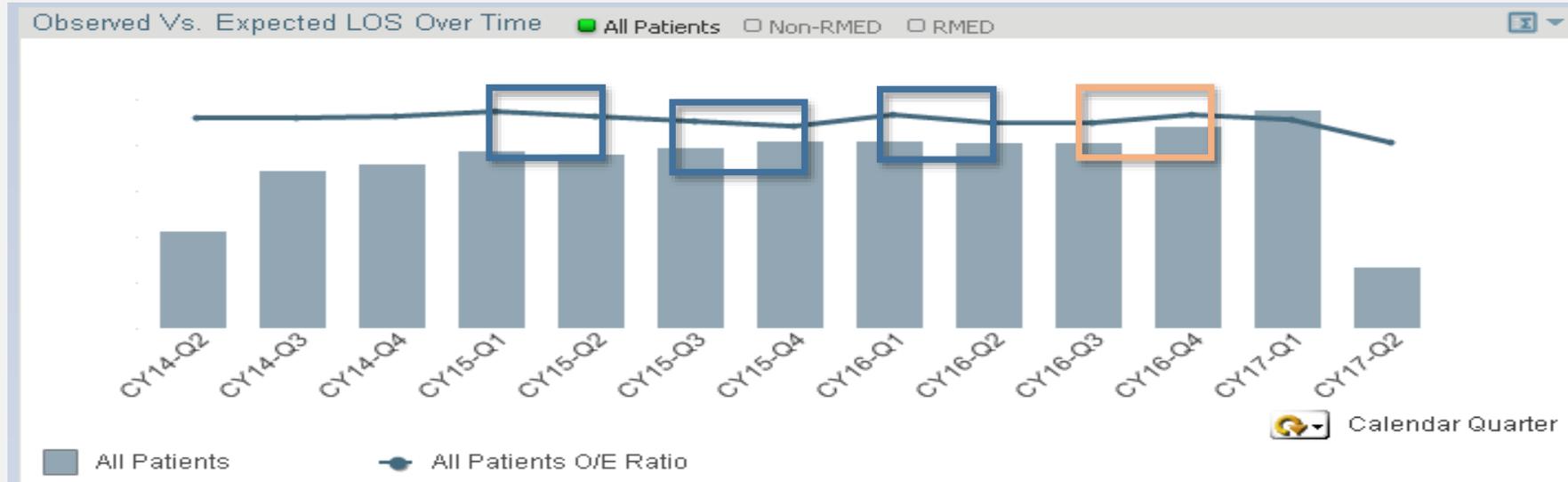
Interventions effected Mortality Rates

Mortality Rate Criteria



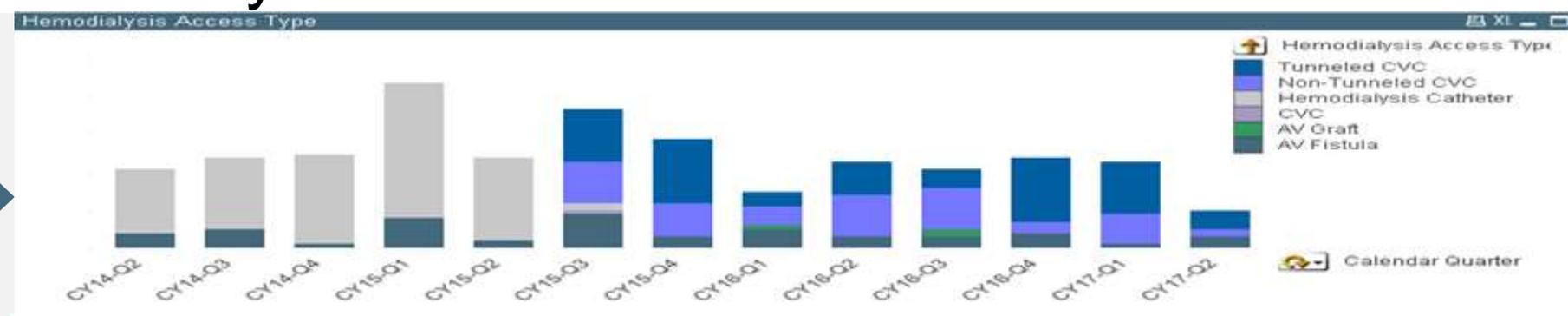
Interventions and variations for O/E LOS

O/E LOS Criteria

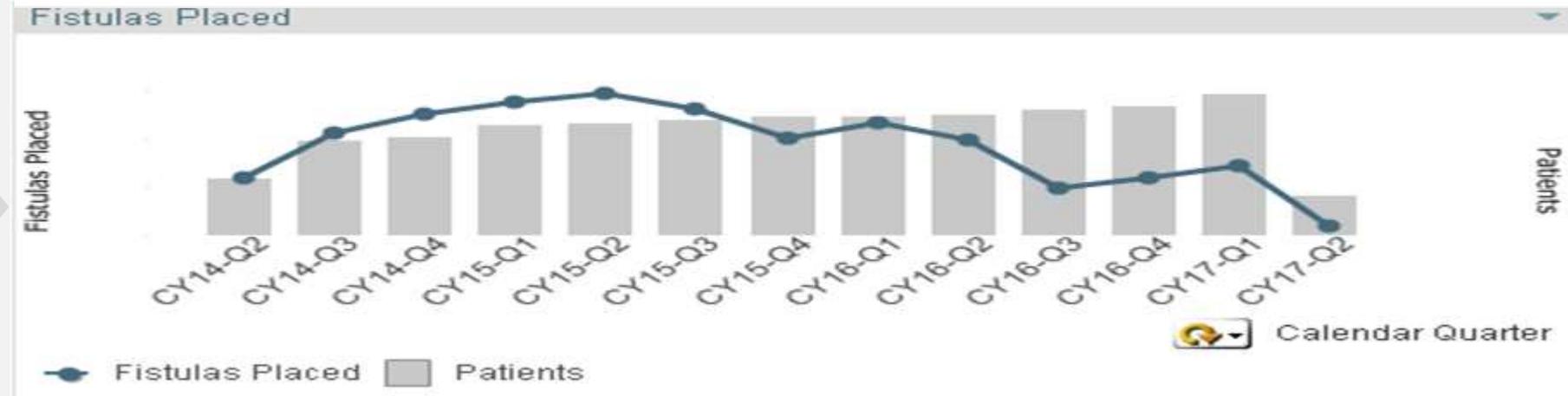


Process Metrics - Hemodialysis

Hemodialysis and ways to perform that? How does this measure help Physicians?



AV Fistulas Care



AVF Care Maintenance

Vein Mapping Procedures		Encounters	
Mapping Type	Encounters	CVC Access Reason	Encounters
US Ext Venous Mapping Upper Bilat		ARF	
US Ext Venous Mapping Upper RT		Needs Referral for AV Access	
US Ext Venous Mapping Upper LT		Referred for AV access	
US Ext Venous Mapping Lower Bilat		AV access in place but immature	
US Ext Venous Mapping Lower RT		Transitioning to PD	
US Ext Venous Mapping Lower LT		Exhausted access	
		Needs Referral for AV Access, PD back up	

Process Metrics – AV Fistula

Patients Needing Placement

New Start ESRD Needing Referral/Referred for AV Access Placement

Patient Name	CVC Access Reason	CVC Reason Date	Vascular Appointment	Vascular Consult In-Hospital	Recent Vein Mapping Date	Fistula Procedure Date
	Needs Referral for AV Access	2017-02-02	2017-02-06	No	2017-02-06	2017-02-20
	Referred for AV access	2017-01-27	No	No	2017-01-22	No
	Referred for AV access	2017-02-11	2017-03-08	No	No	2017-02-02
	Needs Referral for AV Access	2017-01-23	No	No	No	No

Fistula Monitoring

Patients With Fistulagram Performed within 180 Days

Patient Name	Fistulagram Performed Within 180 Days	Recent Fistulagram Date	Fistula Surgeon	Carolina Vascular Appt Scheduled	Carolina Vascular In-Hospital Consult	Fistulagrams within 180 days	Fistulagrams within 90 days	Declot within 90 Days	Declot within 180 Days
	Y	2017-04-13		-	N	3	2	-	-
	Y	2017-04-05		No	N	3	2	-	-
	Y	2017-04-04		-	N	3	3	-	-
	Y	2017-03-31		No	N	1	1	-	-
	Y	2017-03-29		No	N	2	1	-	-
	Y	2017-03-27		No	N	1	1	-	-

Fistulas Placed

Recent Fistula Surgeon

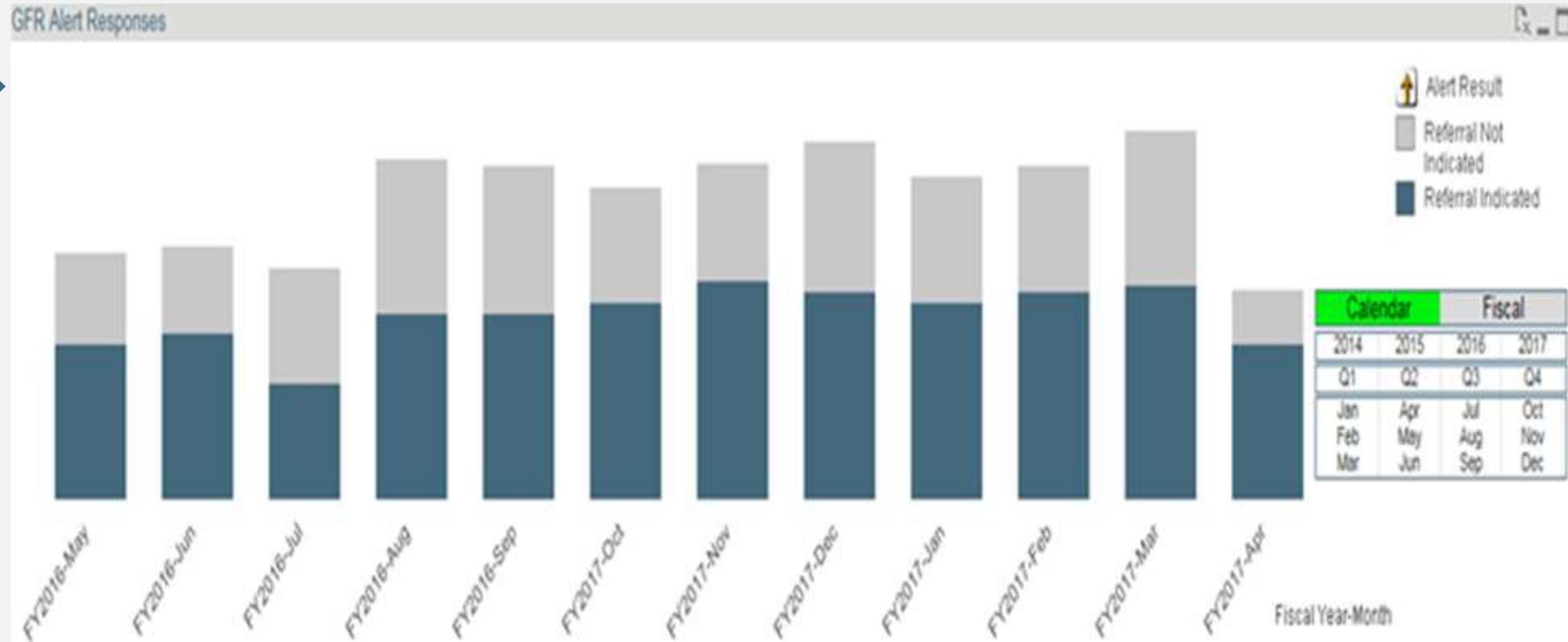
At Risk Fistulas

Patients With >2 Fistulagrams Performed within 180 Days

Patient Name	Fistulagram Performed Within 180 Days	Recent Fistulagram Date	Fistula Surgeon	Carolina Vascular Appt Scheduled	Fistulagrams within 180 days	Fistulagrams within 90 days	Declot within 90 Days	Declot within 180 Days	Total Fistulagrams
	Y	2017-01-27		No	3	1	-	-	8
	Y	2017-04-05		No	3	2	-	-	4
	Y	2016-12-30		-	3	-	-	-	3
	Y	2017-04-13		-	3	2	-	-	14

GFR Alert

How an Alert is fired?



Approaches to the “Alert fired” patients

Patient List & Rothman Index

Holistic view of Patient details

Patient List XL

MRN	FIN	EncounterID	Patient Name	Arrive Date	DischargeDTS	Age	Palliative Care	Admit Mode	Adm it...
-----	-----	-------------	--------------	-------------	--------------	-----	-----------------	------------	-----------

General

Patient Age

Patient Name

Gender

Race

Location

Mode of Arrival

Admit Source

All Diagnosis Codes XL

Priority **Diagnosis Codes**

3 A41.9_SEPSIS, UNSPECIFIED ORGANISM

4 R65.21_SEVERE SEPSIS WITH SEPTIC SHOCK

5 T81.11XA_POSTPROCEDURAL CARDIOGENIC SHOCK, INITIAL E...

6 I95.01 ACUTE RESPIRATORY FAILURE WITH HYPOXIA

Dialysis

Patient on Dialysis

Hemodialysis Access

CVC Access Reason

Renal Diagnosis

Patient Milestones **if needed

Dialysis Education/ Arm Protection:

Nephrologist Consult Needed:

Vein Mapping, Fistula/Graft Placement:

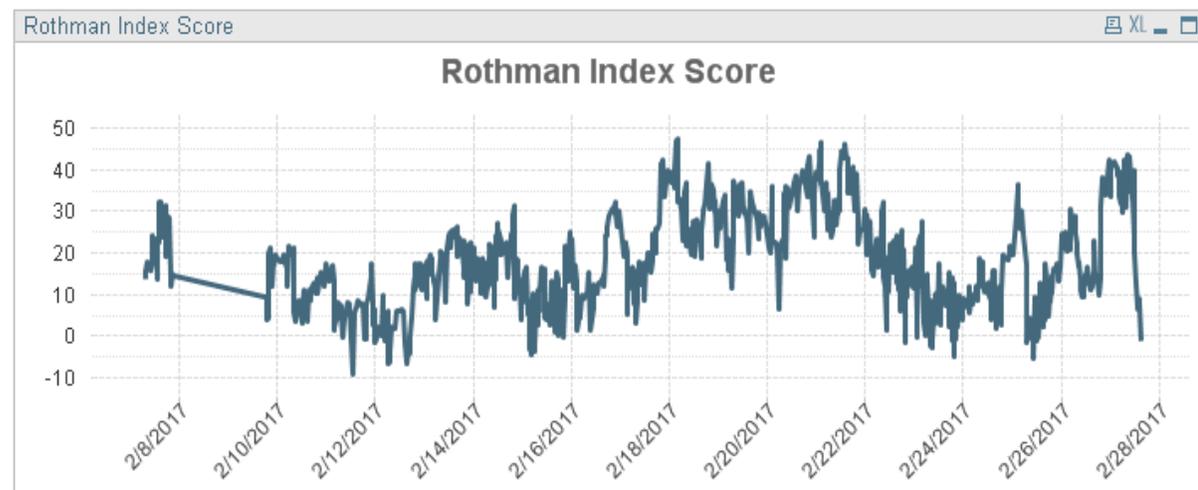
Referral for transplant:

Patient Flow
Labs
Procedures
Rothman Index

CRRT Power Plan Date and Time

Rothman Index for SMITH, EDISON E XL

Score Date and Time	Rothman Index Score
2017-02-07 07:25:00.0000000	13.56%
2017-02-07 07:38:00.0000000	14.71%
2017-02-07 07:57:00.0000000	15.76%
2017-02-07 08:31:00.0000000	17.68%
2017-02-07 09:00:00.0000000	17.68%
2017-02-07 09:30:00.0000000	16.08%
2017-02-07 10:40:00.0000000	15.95%
2017-02-07 10:42:00.0000000	17.48%



Rothman Index

Scope of current Renal Analytics

- How to incorporate Heart Failure Patients data who are part of Renal Dialysis Cohort?
- Care for Renal Patients, who are either chronic or AKI, having a Sepsis infection
- Application to be widely expanded to the Ambulatory settings

Questions?

