HIMSS Davies Enterprise Award

Case Study - Empowering Providers With Data to Affect Behavior and Reduce Percutaneous Coronary Intervention (PCI) Costs

UNC Health Care

Leveraging IT to Improve Patient Outcomes

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Empowering Providers With Data to Affect Behavior and Reduce PCI Costs

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UNC Health Care System Overview

Providing care to patients in North Carolina
Who we are, Who we serve (1 of 3)

UNC Health Care System Overview

Integrated, not-for-profit health care system, owned by the State of North Carolina and based in Chapel Hill. We provide comprehensive patient care, facilitate physician education and research excellence, and promote the health and well-being of all North Carolinians
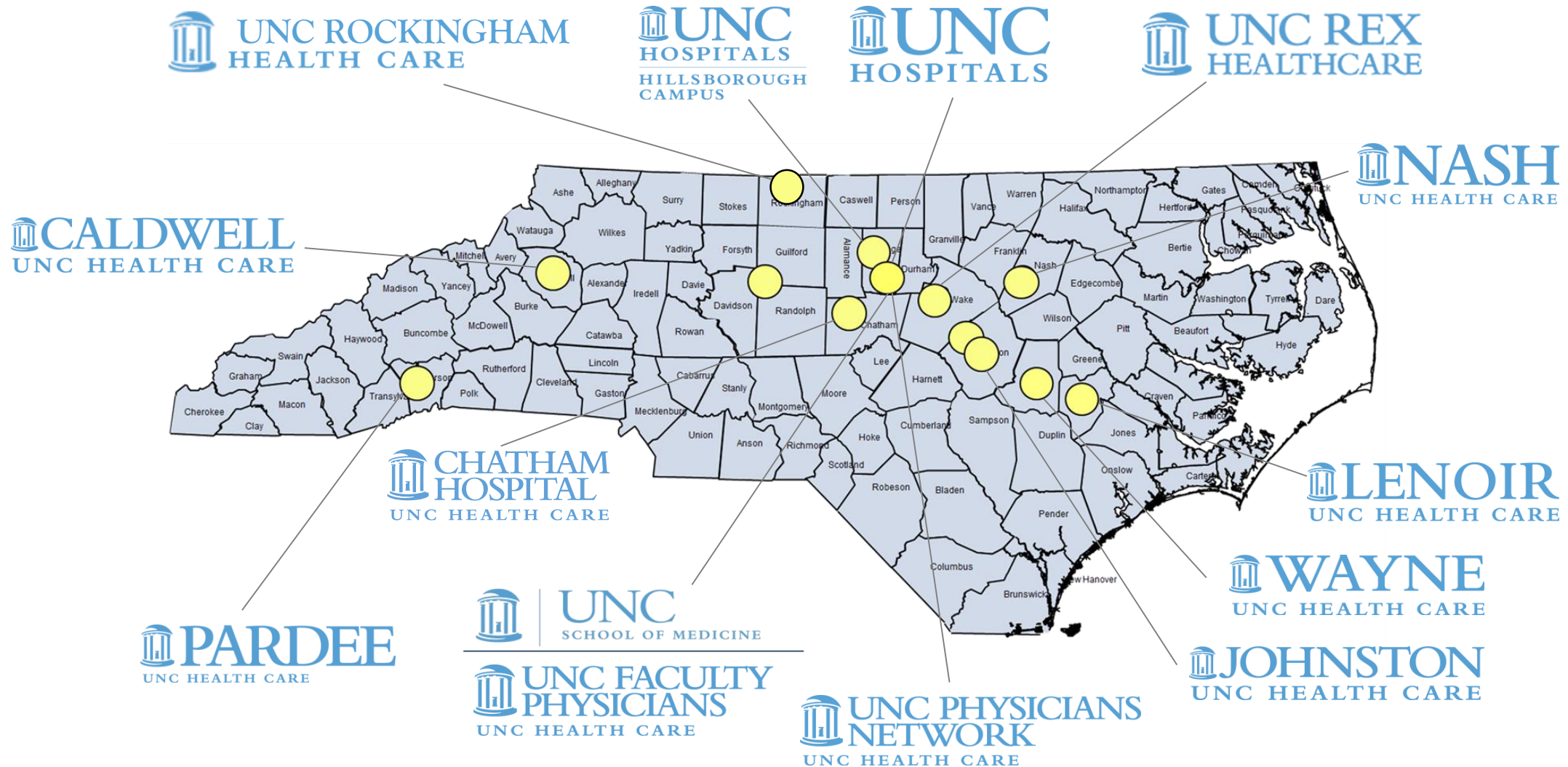

Key Stats	2011	2017
Net patient revenues	$2.0B	$4.9B
Licensed beds	1,530	>3,400
Employees	14,000	>31,500
Medical staff	3,186	>5,400
Employed MDs	2,110	>3,200
Surgeries	60,000	>120,000
ED visits	151,000	>510,000
Clinic visits	1.1M	>3.5M

UNC HEALTH CARE SYSTEM

Delivering High Quality Care Across the State

As a system, a success for one is a success for all
Who we are, Who we serve (3 of 3)

Nobel Prizes for Science

2016 HOSPITAL RANKINGS:
8 nationally recognized adult specialties
2 high performing adult specialties
7 nationally recognized children's specialties

"BEST HOSPITALS IN THE REGION":
UNC Hospitals
UNC Rex
High Point Regional

2016 SCHOOL RANKINGS
#2 for Primary Care
#2 School of Public Health

Local Problem

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Background and Importance (Continued)

Rising pharmaceutical costs threaten patient access to drug therapies, but also challenge providers' ability to deliver value-based care to their patients

The American Hospital Association (AHA) and the Federation of American Hospitals (FAH) commissioned a study at the University of Chicago in 2016 to better understand how drug prices are changing in the inpatient hospital setting [1]

Key Findings From This Study:

23 Percent

Increase in annual inpatient drug spending from FY13 - FY15 (5.2 to 6.5M)

American Hospital Association™
Advancing Health in America

Federation of American Hospitals®

90 Percent

Of hospitals reported that inpatient drug **prices increases had a moderate or severe effect on their ability to manage costs**

Sources : [1] Trends in Hospital Inpatient Drug Costs, https://www.aha.org/system/files/2018-01/aha-fah-rx-report.pdf, – American Hospital Association and Federation of American Hospitals (2016)
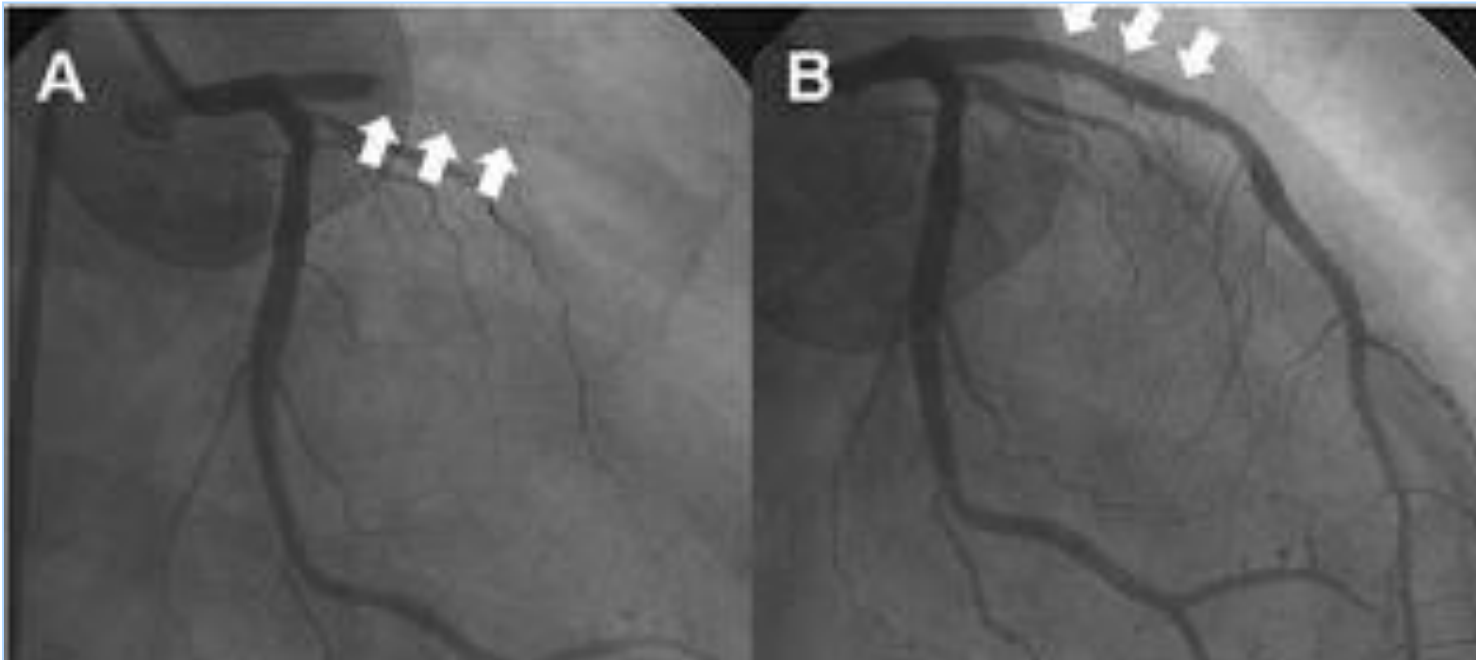
Patient: 57 year old male presents to ER with crushing chest pains

Exam: Diaphoretic and Restless BP 90/69 HR 110

EKG: ST elevation anterior leads

DX: STEMI (acute heart attack)

Background and Importance

In *2008*, the *New England Journal of Medicine* "HORIZONS-AMI" study suggested that bivalirudin decreased bleeding and possibly improved survival with AMI patients requiring PCI [2]. As a result, from 2008-2013 there was a nationwide increase in bivalirudin use for all PCI.

2008 - 2014, two things happened that changed Angiomax usage: (1) Transradial PCI becomes more widespread reducing bleeding risk & (2) Sporadic cases of stent thrombosis with Bivalirudin reported in the literature

In 2014, a subsequent study, "HEAT-PPCI" challenged using bivalirudin suggesting heparin strategy reduced the incidence of major adverse ischaemic events with no increase in bleeding complications [3].

The study showed <u>bivalirudin was about 300 times more expensive than heparin</u>. It was estimated that switching to heparin would reduce the cost of their annual 1000 PPCI cases by £500 000, ~ $640,000 (US dollars)

Today's focus

Despite the new information from the "HEAT-PPCI" study and our own cost data, many physicians were reluctant to stop using the bivalirudin.

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At UNC MC and UNC REX, Bivalirudin was the primary anticoagulant used for PCIs
Local Problem (3 of 3)

Baseline – Percentage of PCI Cases using Bivalirudin – By Hospital

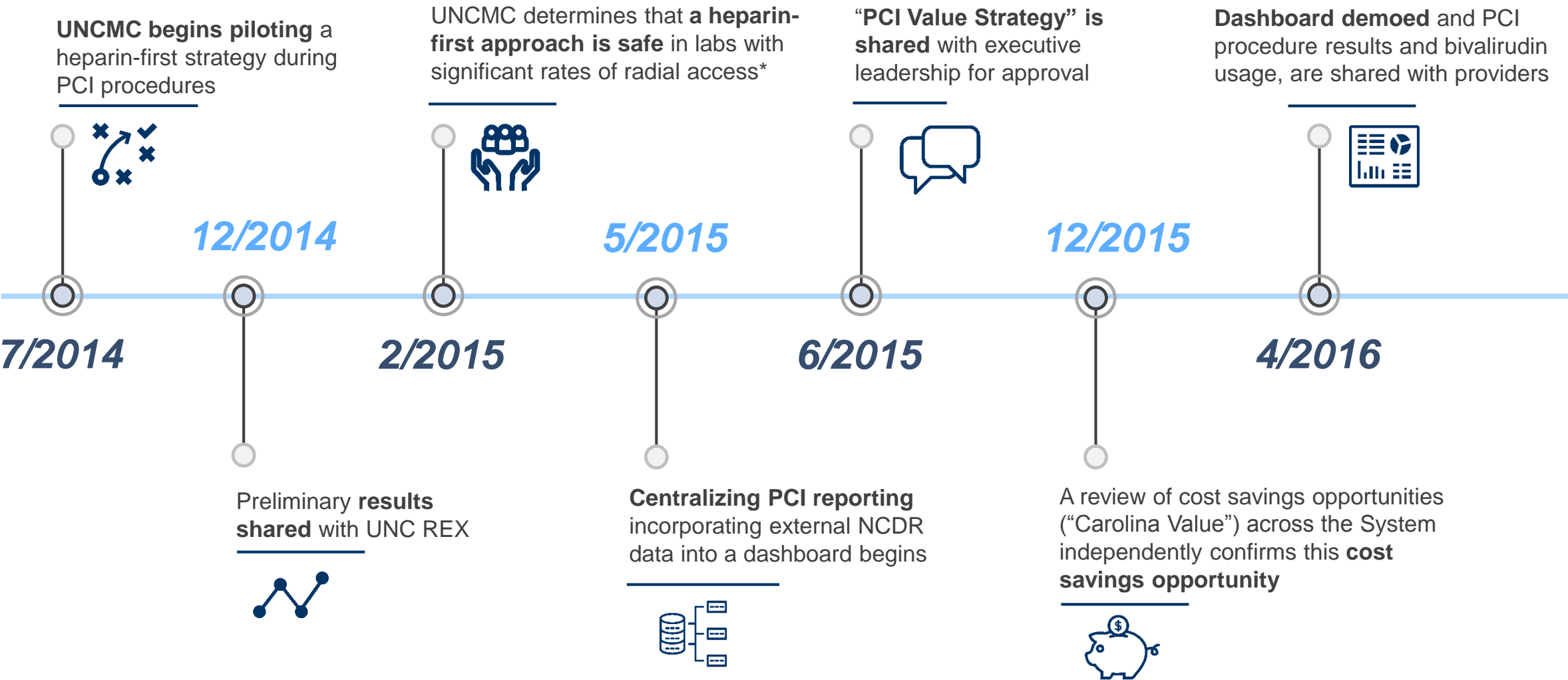**PCI Cases Using Bivalirudin was 88.24% (UNC Medical Center) and 77.47% (UNC REX).**
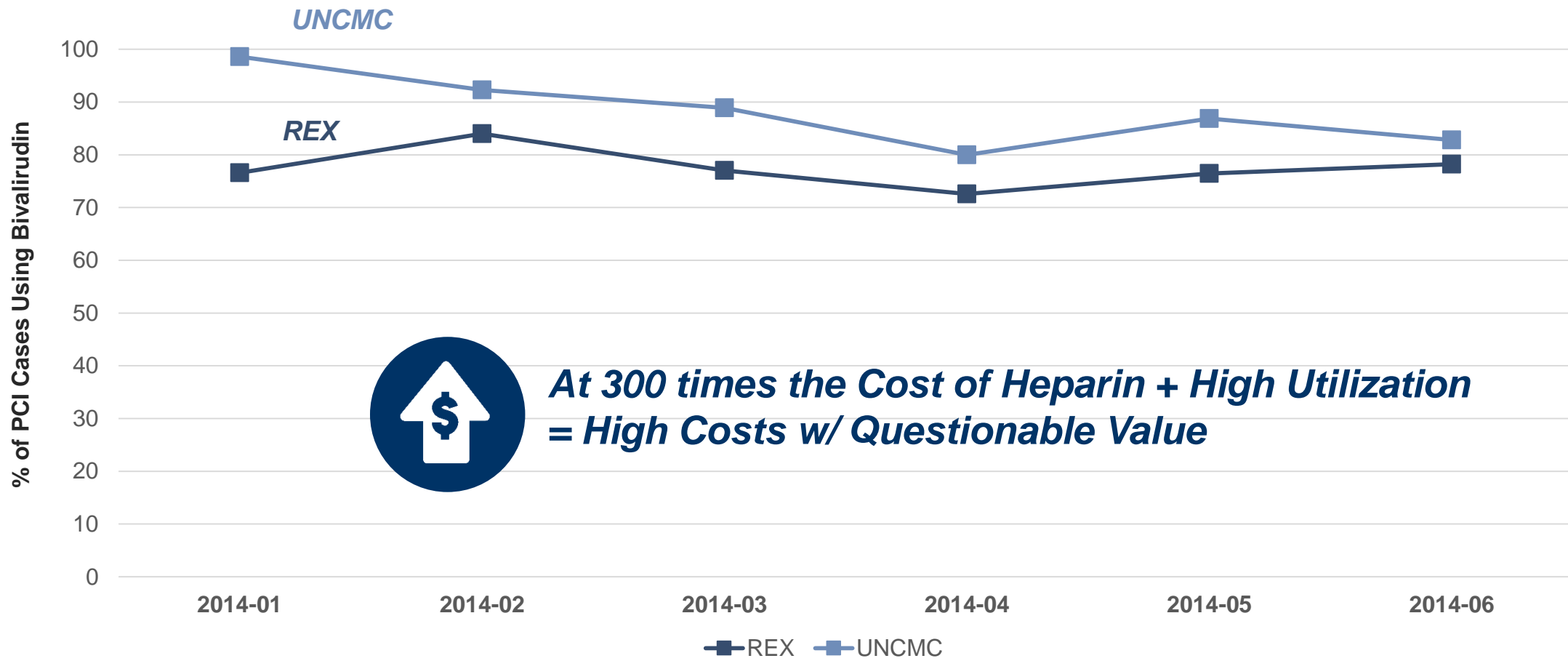
At 300 times the Cost of Heparin + High Utilization = High Costs w/ Questionable Value

Design and Implementation

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Overview

UNCMC begins piloting a heparin-first strategy during PCI procedures

UNCMC determines that **a heparin-first approach is safe** in labs with significant rates of radial access*

"PCI Value Strategy" is shared with executive leadership for approval

Dashboard demoed and PCI procedure results and bivalirudin usage, are shared with providers

12/2014

5/2015

12/2015

7/2014

2/2015

6/2015

4/2016

Preliminary **results shared** with UNC REX

Centralizing PCI reporting incorporating external NCDR data into a dashboard begins

A review of cost savings opportunities ("Carolina Value") across the System independently confirms this **cost savings opportunity**

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Governance Committee

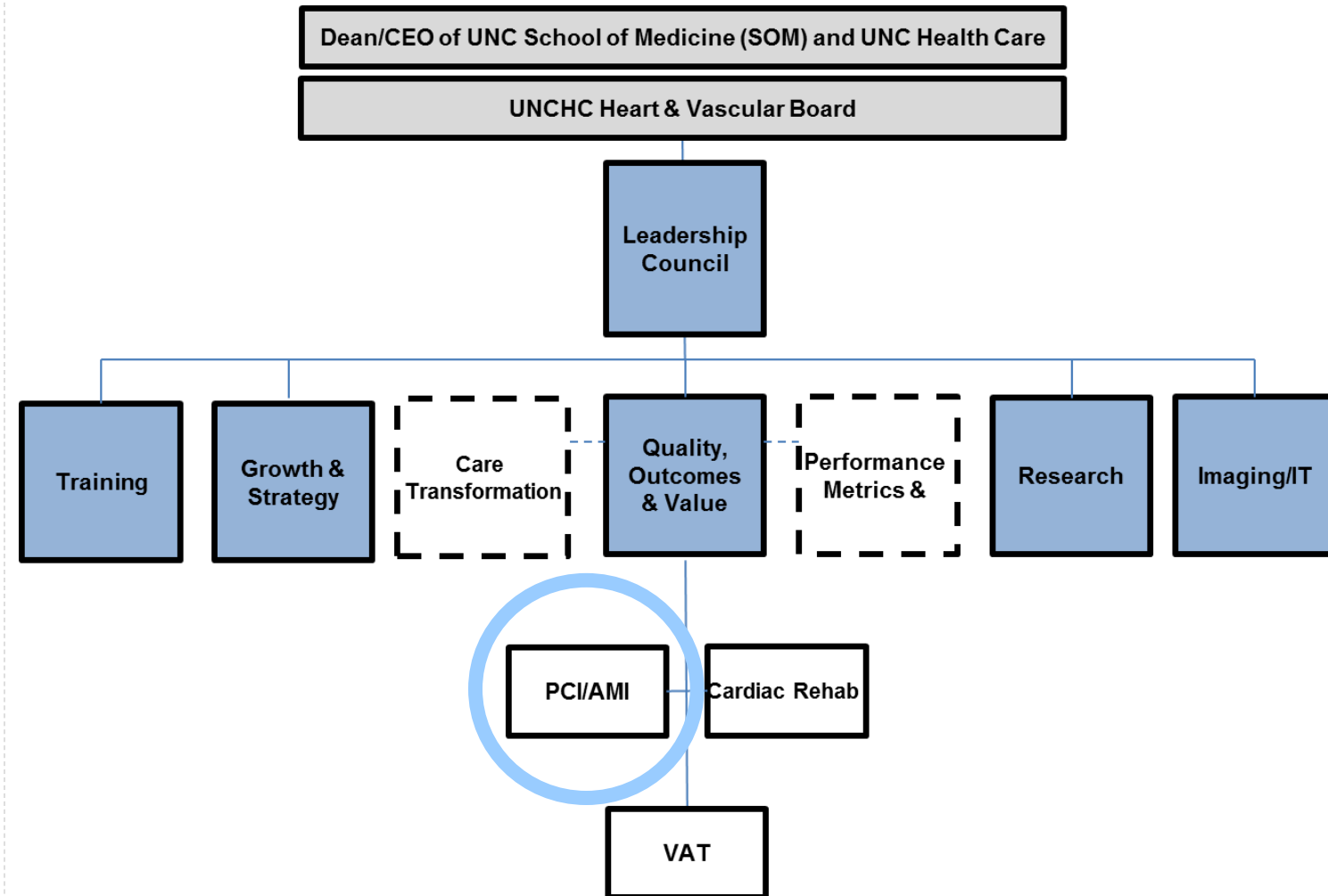**Core Multidisciplinary Committee (e.g. Physician and Operational Leaders, Analysts, etc.)**

Initial work identified opportunities to:

1) Standardize best practices

2) Improve quality

3) Reduce direct costs, improve current contribution margin, and position UNCHCS for bundle payment success

4) Improve operational efficiency and throughput
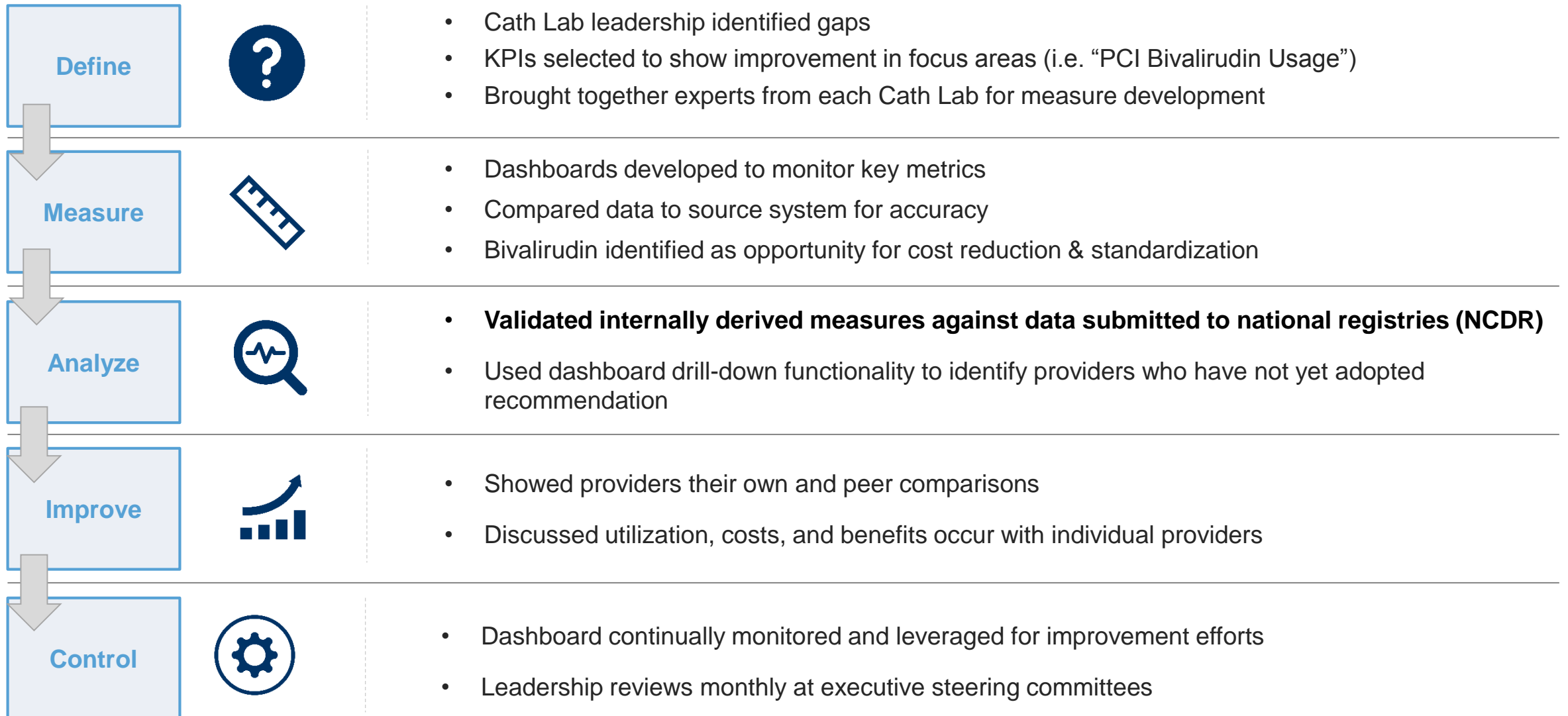
Selected opportunities included:

✓ 1) *Reduce use of bivalirudin & substitute heparin*

2) Utilize lower cost routine supplies

3) Reduce variation in supply usage

Structure and Focus

Dean/CEO of UNC School of Medicine (SOM) and UNC Health Care

UNCHC Heart & Vascular Board

Leadership Council

Training | Growth & Strategy | Care Transformation | Quality, Outcomes & Value | Performance Metrics & | Research | Imaging/IT

PCI/AMI — Cardiac Rehab

VAT

┌ ┐ UNC Health Alliance Committee
└ ┘

This project was well-suited for the DMAIC methodology
Design and Implementation (3 of 7)

Define
- Cath Lab leadership identified gaps
- KPIs selected to show improvement in focus areas (i.e. "PCI Bivalirudin Usage")
- Brought together experts from each Cath Lab for measure development

Measure
- Dashboards developed to monitor key metrics
- Compared data to source system for accuracy
- Bivalirudin identified as opportunity for cost reduction & standardization

Analyze
- **Validated internally derived measures against data submitted to national registries (NCDR)**
- Used dashboard drill-down functionality to identify providers who have not yet adopted recommendation

Improve
- Showed providers their own and peer comparisons
- Discussed utilization, costs, and benefits occur with individual providers

Control
- Dashboard continually monitored and leveraged for improvement efforts
- Leadership reviews monthly at executive steering committees

To create our PCI dashboard, we used our standard development process/approach

Design and Implementation (4 of 7)

| Goals | Requirements | Build | Iterate | Test | Distribute/Share |

- Create a system-wide solution

- Centralize key metrics pulled from multiple systems

- Create a shared understanding of performance and opportunities

- Near real-time data so progress and initiatives can be regularly monitored

- Opportunities should be easily identifiable and visible

- Source systems identified, data mapped to data model, and ETL to move the data into our data warehouse

- Reporting layer created within BI tool to simplify reporting efforts

- Metric logic built into objects to pre-calculate values

- Results are validated against data submissions to national registries

- Source system validation to ensure data matches what is shown

- Metric calculation documentation created

- Made dashboard accessible to executive and analysts supporting these departments

- Providers review their own data to understand performance and opportunities

After gathering initial requirements, we married disparate data sources
Design and Implementation (5 of 7)

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To gain a comprehensive view of our PCI events, we married data elements stored across multiple databases

Integrating Data Into the Data Warehouse
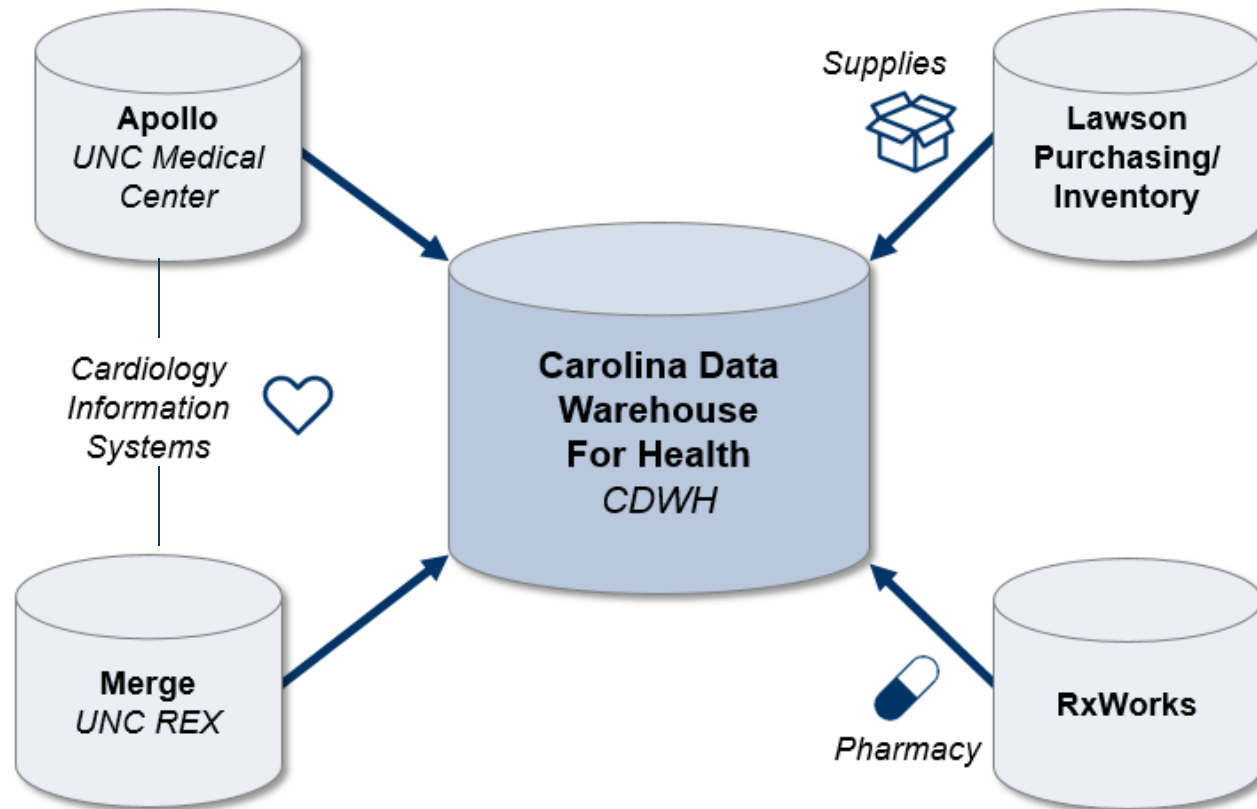
Data Elements

Carolina Data Warehouse for Health

o Enterprise Data Warehouse contains a data mart with cardiac data curated for analytics

Lawson (Supplies)

o Item number, Manufacturer, Last purchase price

RxWorks (Pharmacy)

o NDC code, Lot number, Last purchase price

Apollo and Merge (Cardiology Systems)

o Supply usage/waste, event timestamps, interventionalists, patient encounter information

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Original Dashboard Mock-Ups
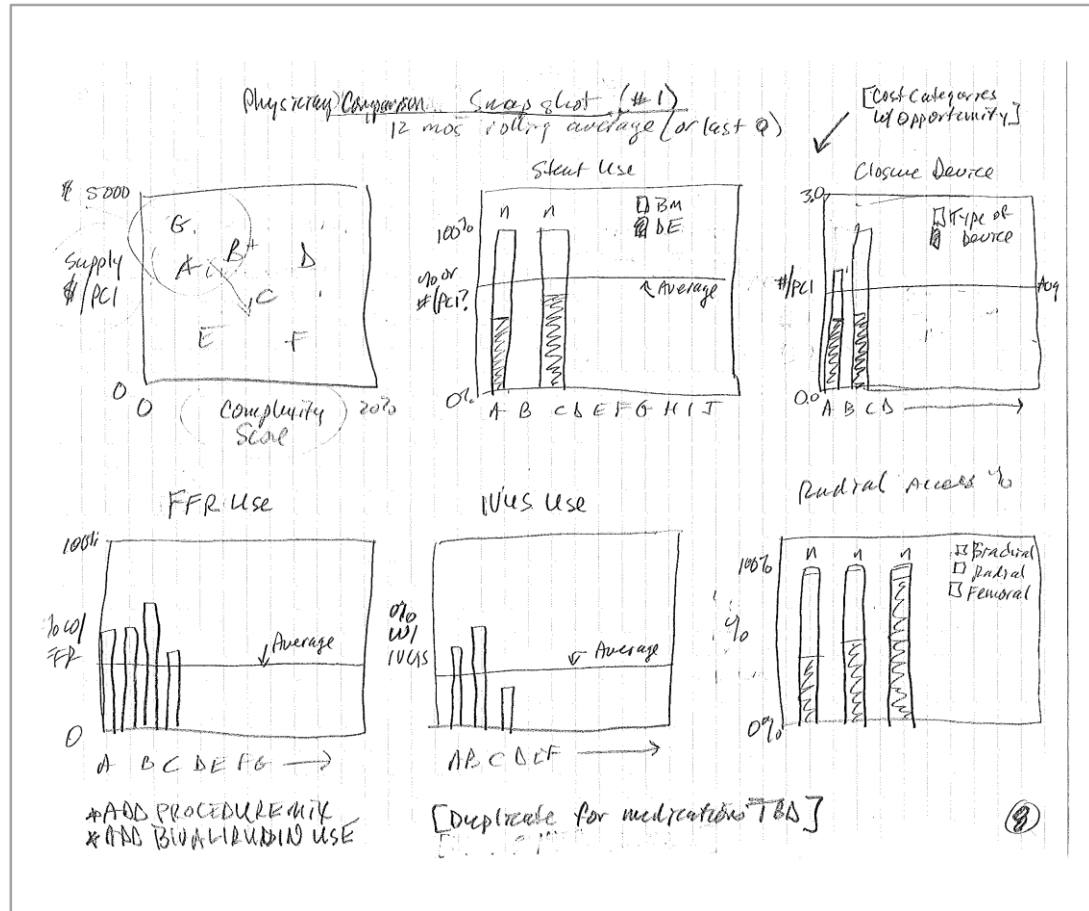
Actual PCI Dashboard
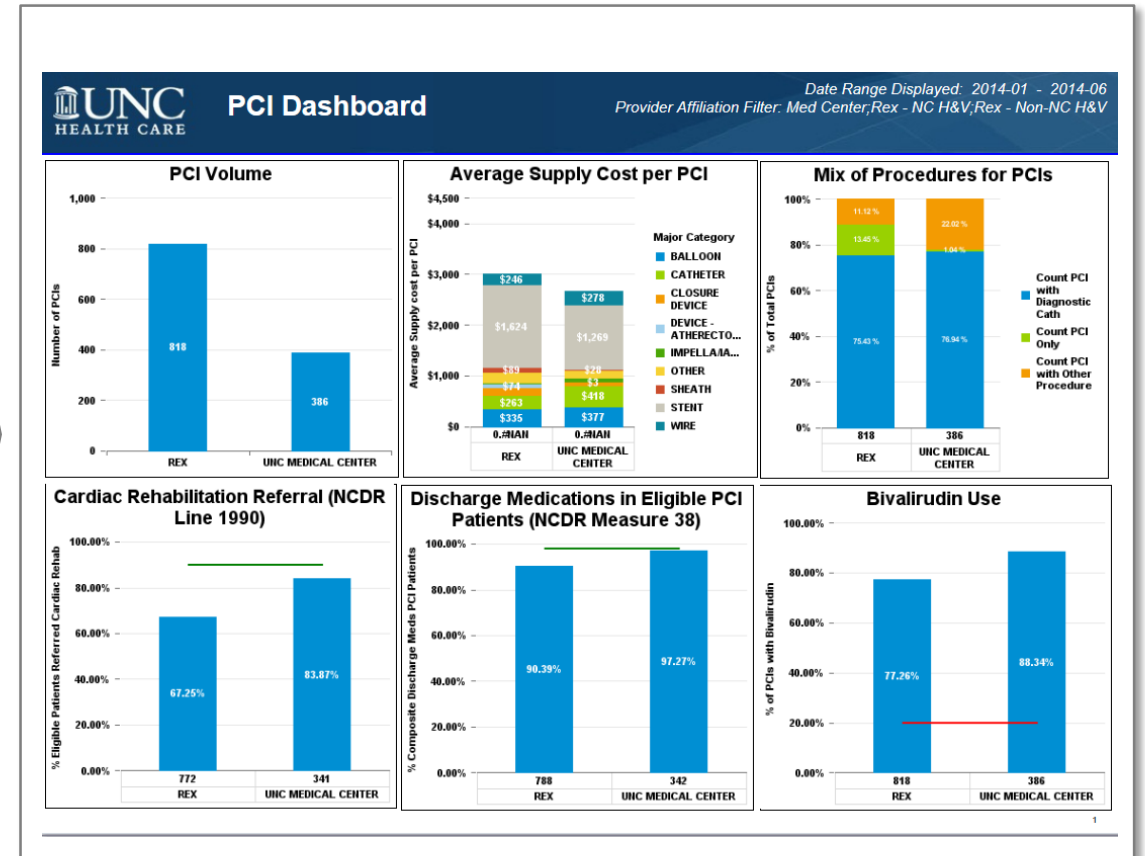
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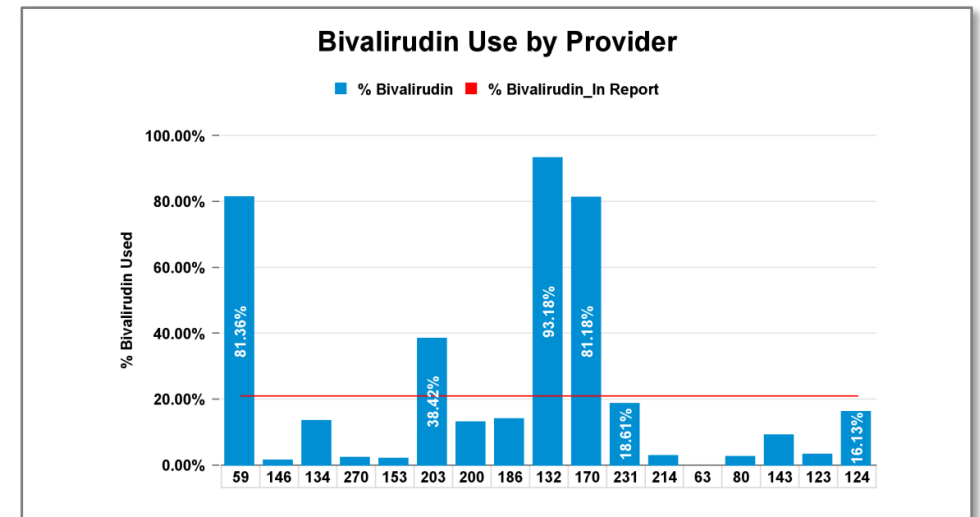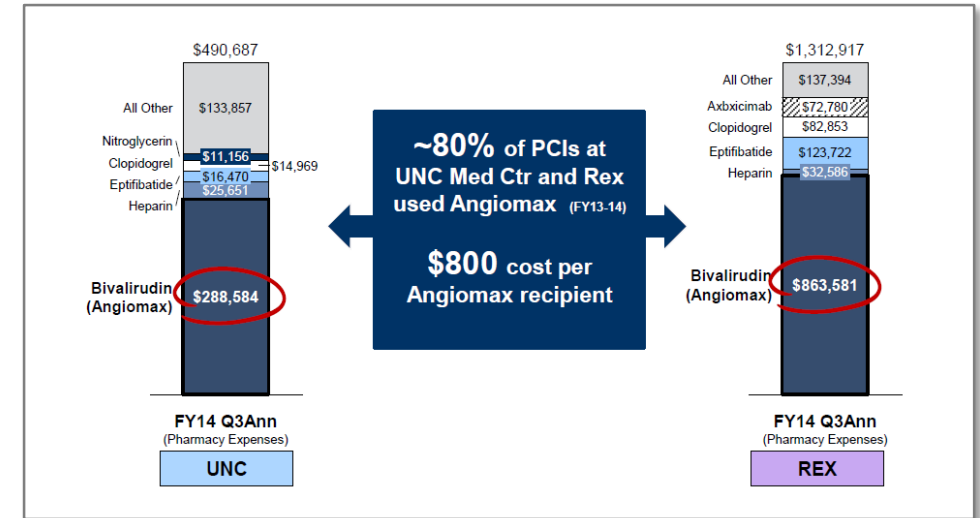## Intended Goals and Outcomes

Primary Goal: To understand and share the ordering practice patterns and behaviors to help shift the mindset of our providers

Educate providers about the cost of drugs

Demonstrate maintained or improved outcomes as a result of the switch from bivalirudin to heparin

Minimize case-complexity and population differences by using statistical clustering

Educate providers about their peer's usage

$490,687

All Other	$133,857
Nitroglycerin	
Clopidogrel	$11,156
	$14,969
Eptifibatide	$16,470
Heparin	$25,651
Bivalirudin (Angiomax)	$288,584

FY14 Q3Ann
(Pharmacy Expenses)
UNC

~80% of PCIs at UNC Med Ctr and Rex used Angiomax (FY13-14)

$800 cost per Angiomax recipient

$1,312,917

All Other	$137,394
Axbxicimab	$72,780
Clopidogrel	$82,853
Eptifibatide	$123,722
Heparin	$32,586
Bivalirudin (Angiomax)	$863,581

FY14 Q3Ann
(Pharmacy Expenses)
REX

Bivalirudin Use by Provider

■ % Bivalirudin ■ % Bivalirudin_In Report

% Bivalirudin Used

Providers: 59, 146, 134, 270, 153, 203, 200, 186, 132, 170, 231, 214, 63, 80, 143, 123, 124

Values shown: 81.36%, 38.42%, 93.18%, 81.18%, 18.61%, 16.13%

Leveraging Health IT

Using the PCI dashboard - Functionality
How Health IT Was Utilized (1 of 4)

Provides end-users with a flexible interface to review and compare trends for ongoing improvement and monitoring

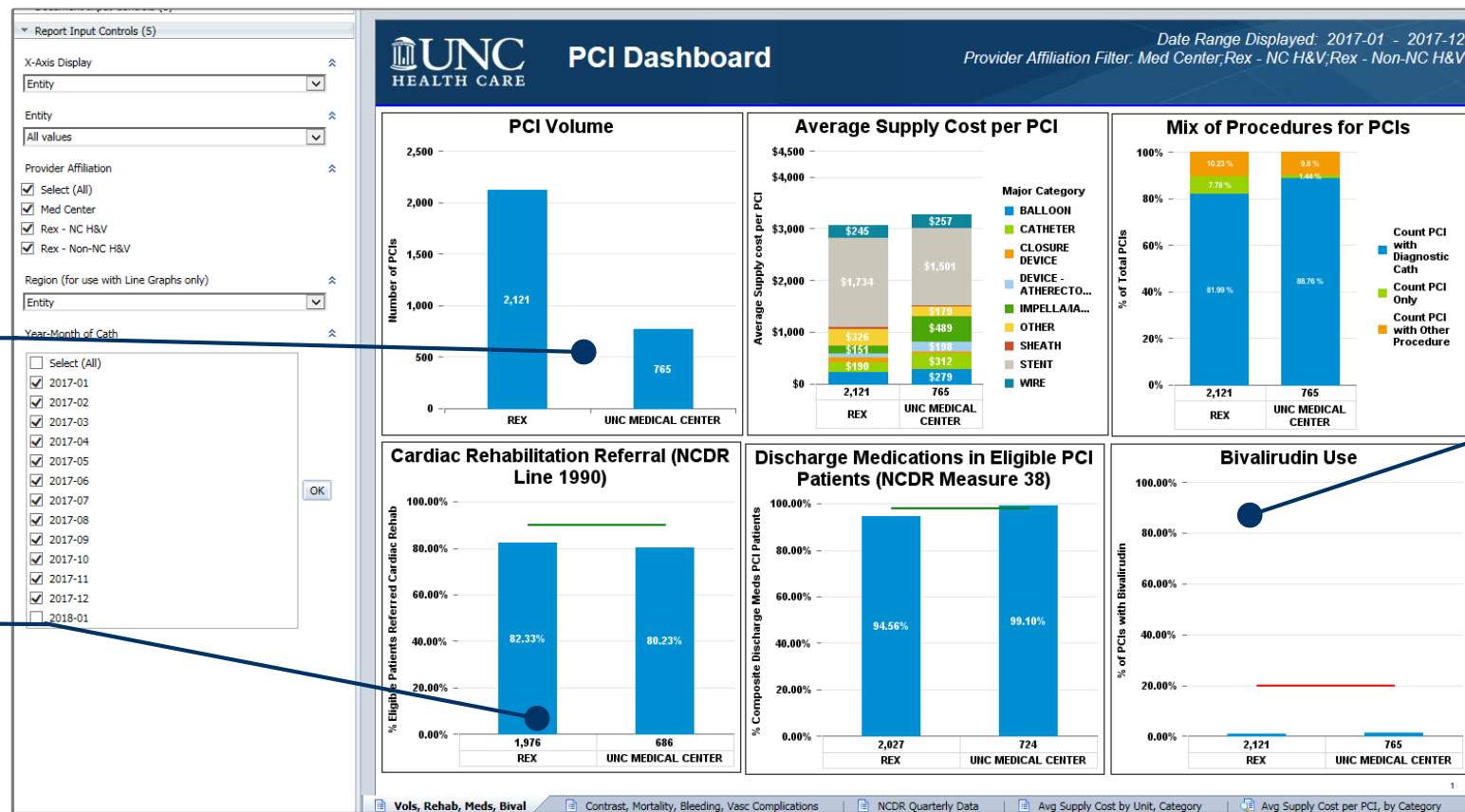UNC HEALTH CARE SYSTEM

Input Controls
Change chart types and filters to drill into data and find opportunities

Comparison
Review results by cath lab location, provider, date ranges, etc.

Standardized Data
Data from multiple system is normalized and loaded into a single source for common reporting to occur

Filters Currently Applied
Summary of filters applied shows on the report

Bivalirudin Usage
Key metrics are posted on the front page of the dashboard for ongoing monitoring

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Multiple graphs show PCI volume, procedure mix, bivalirudin usage, supply costs, rehab referrals, etc.

1. PCI Volume

2. Average Supply Cost Per PCI

3. PCI Procedure Mix

4. Cardiac Rehabilitation

5. Discharge Medication in Eligible Patients

6. Bivalirudin Use
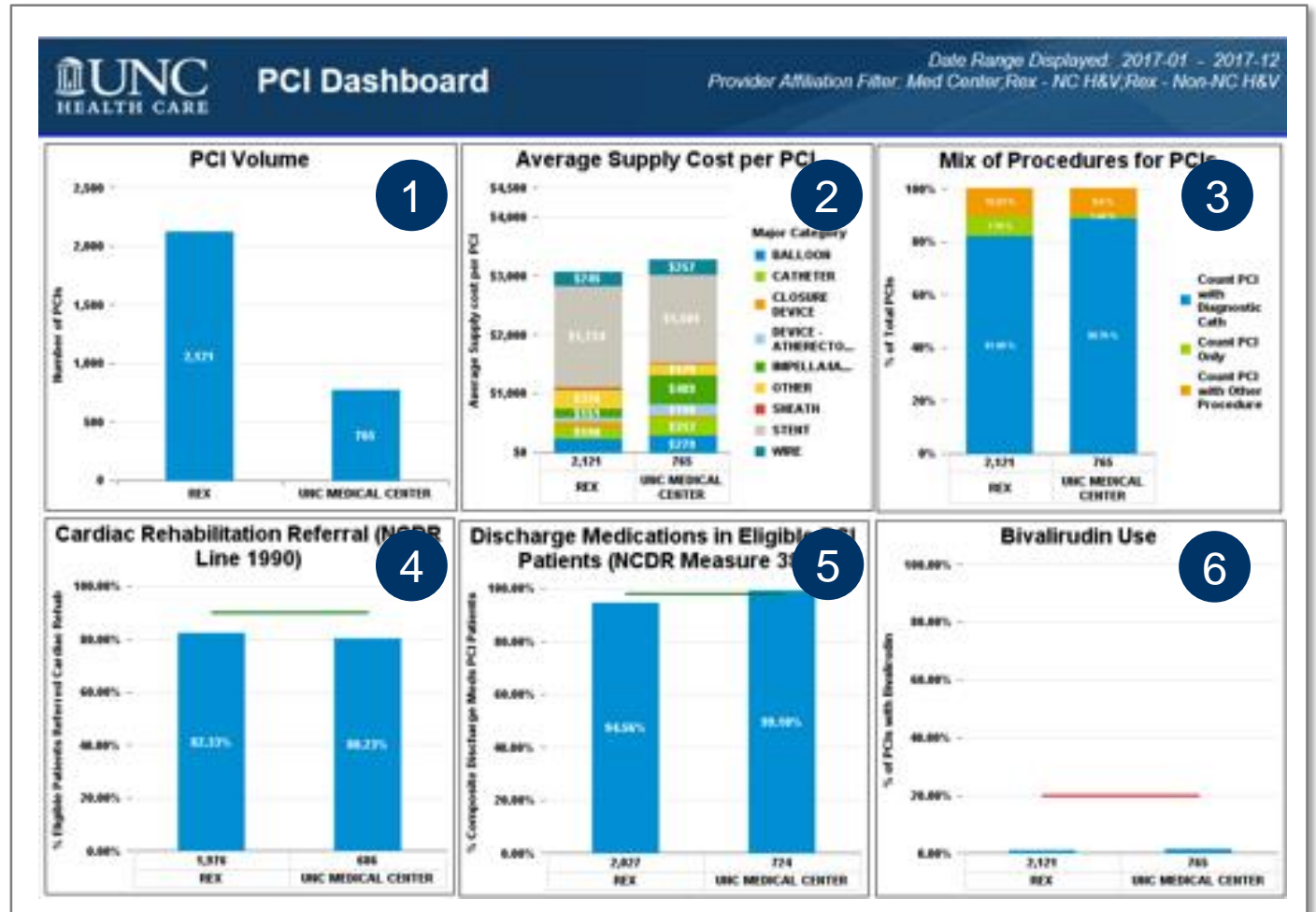
Using the PCI dashboard – Quality Measures
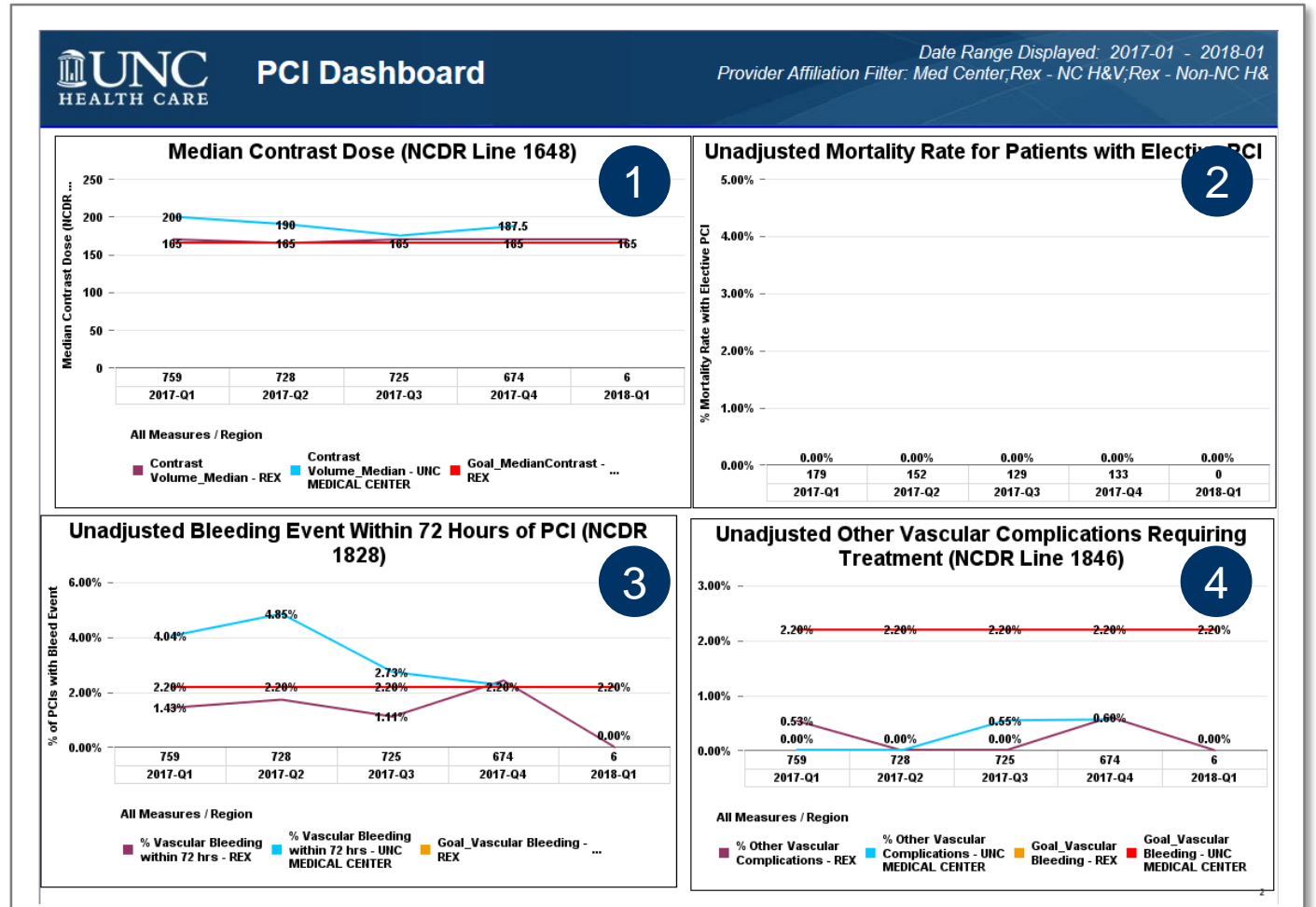## How Health IT Was Utilized (3 of 4)

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The dashboard includes trends in key PCI quality data (e.g., mortality, bleeding events, vascular complications, etc.) to identify any significant increase in complications

1 **Median Contrast Dose (NCDR 1648)**

2 **Unadjusted Mortality Rate**

3 **Bleeding Events Within 72 Hours of PCI**

4 **Unadjusted Vascular Complication**

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Sharing Data With Colleagues

The dashboard was shared at many meetings and other forums to maximize awareness

Physicians received un-blinded dashboards and had access to their colleagues information, while staff received blinded dashboards

✓ **Overall, it was very well received by physicians and cath lab staff**

> *The cardiologists received the information in an extremely positive fashion. After training, most doctors and us interventional cardiologists work independently during cases and patient care with limited exposure to our partners. Being able to share practice patterns and understand cost/quality among peers resulted in positive change in behavior.*
>
> **- Dr. Joel Schneider, UNC REX Physician Champion**

Value Derived

Significant reduction in the percentage of PCI cases using Bivalirudin
Value Derived (1 of 7)

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Bivalirudin usage declined significantly during this initiative and has consistently remained very low

There's been a 90% percent reduction in Bivalirudin usage since the start of this effort
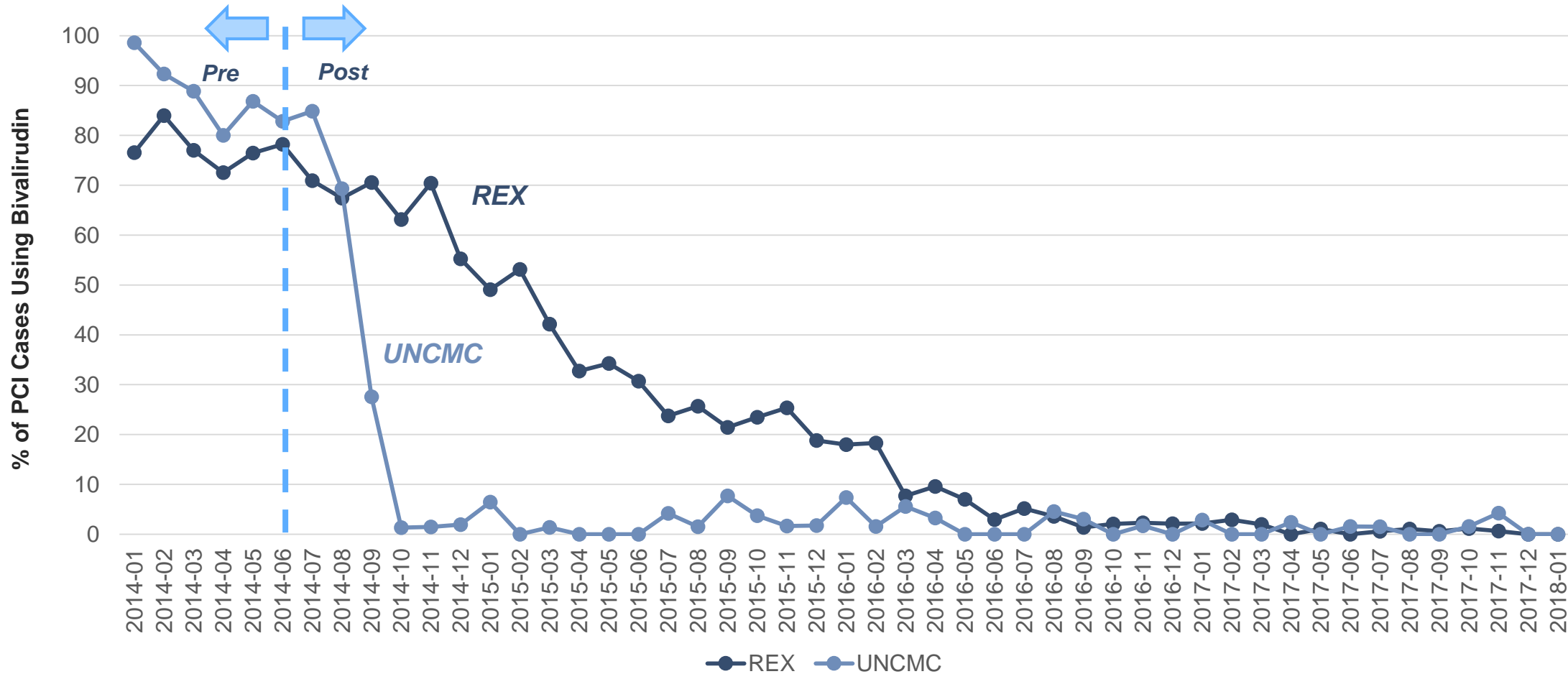
Bivalirudin usage declined significantly during this initiative and has consistently remained very low

Provider Education Starts April 2016
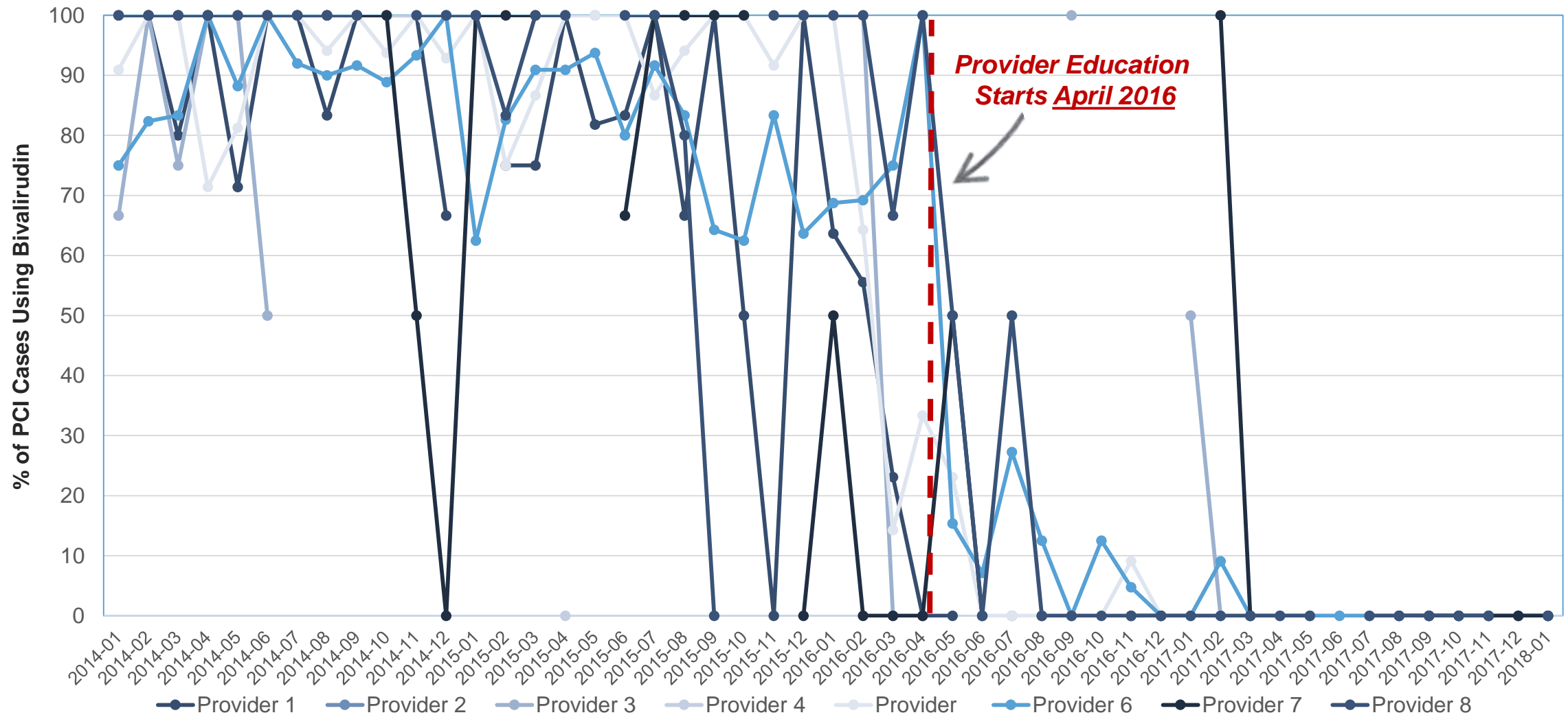
This reduction represents a total savings of ~$1.6 million annually
Value Derived (3 of 7)

The savings amount is calculated as the cost difference between Heparin and Bivalirudin per administration multiplied by the number of cases

ROI – Savings for CY17

Item	Amount
Additional Hardware Infrastructure Required	+ $0
Heparin Medication Cost Per Administration	+ $4.68
Bivalirudin Medication Savings Per Administration	- $727.65
Total Savings from Education in CY17 (284 cases during CY17 – Providers on previous slide)	- $ 176K
Total Savings from overall initiative in CY17 (2,886 cases during CY17)	- $ 1.6 Million

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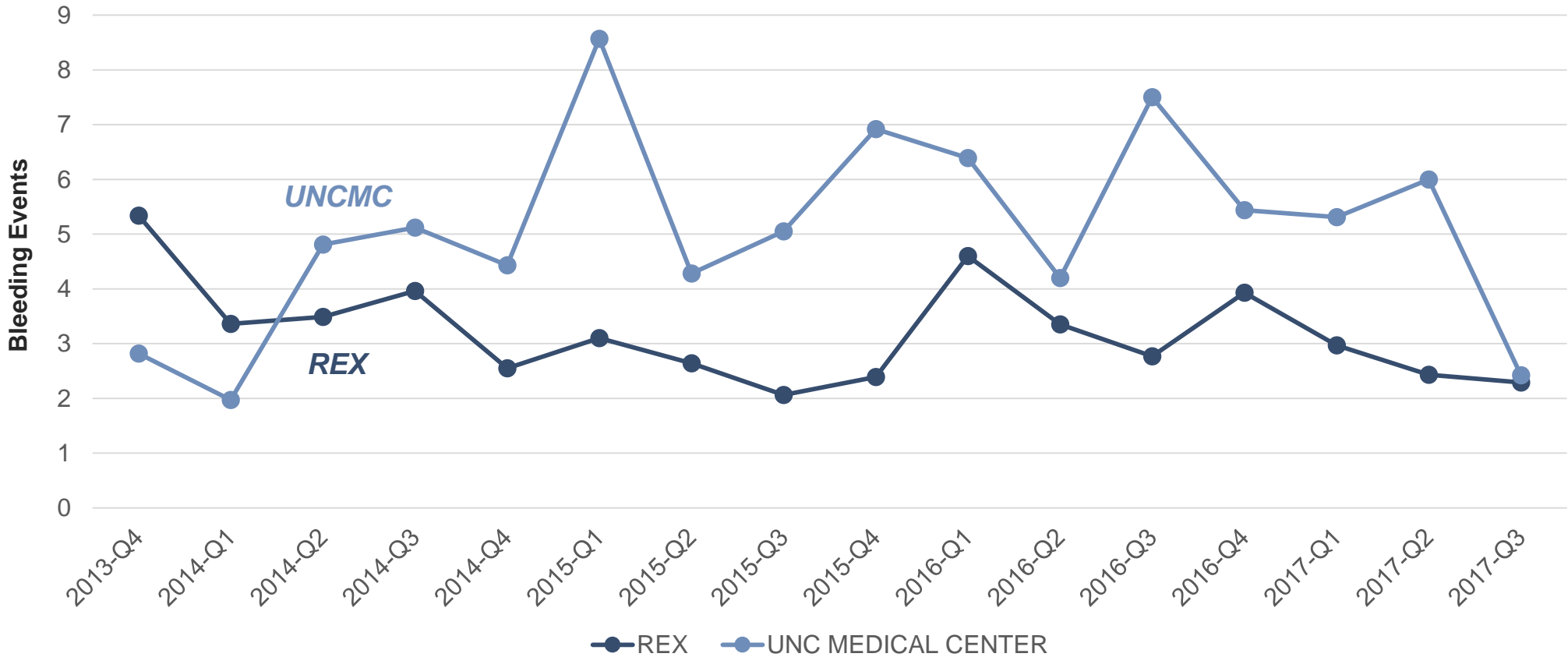
Adverse events and vascular complications are the primary measures monitored to ensure that anticoagulation medications are working correctly and preventing harm
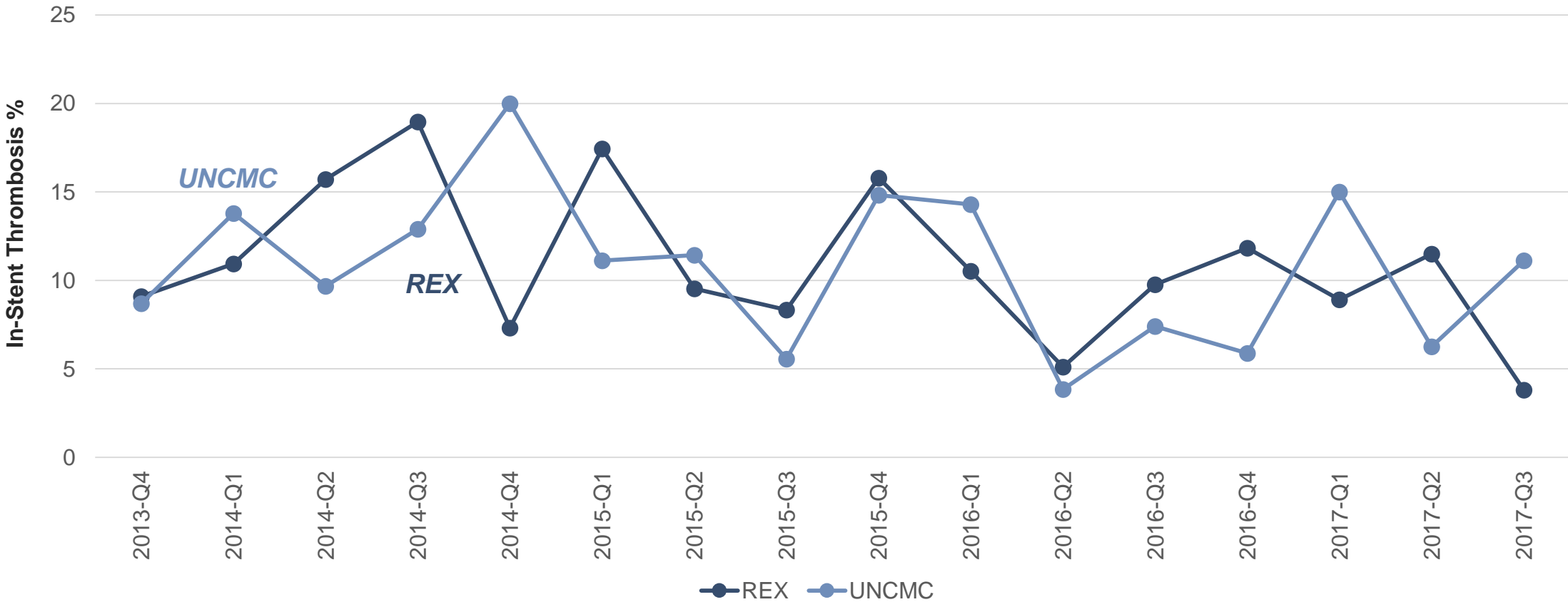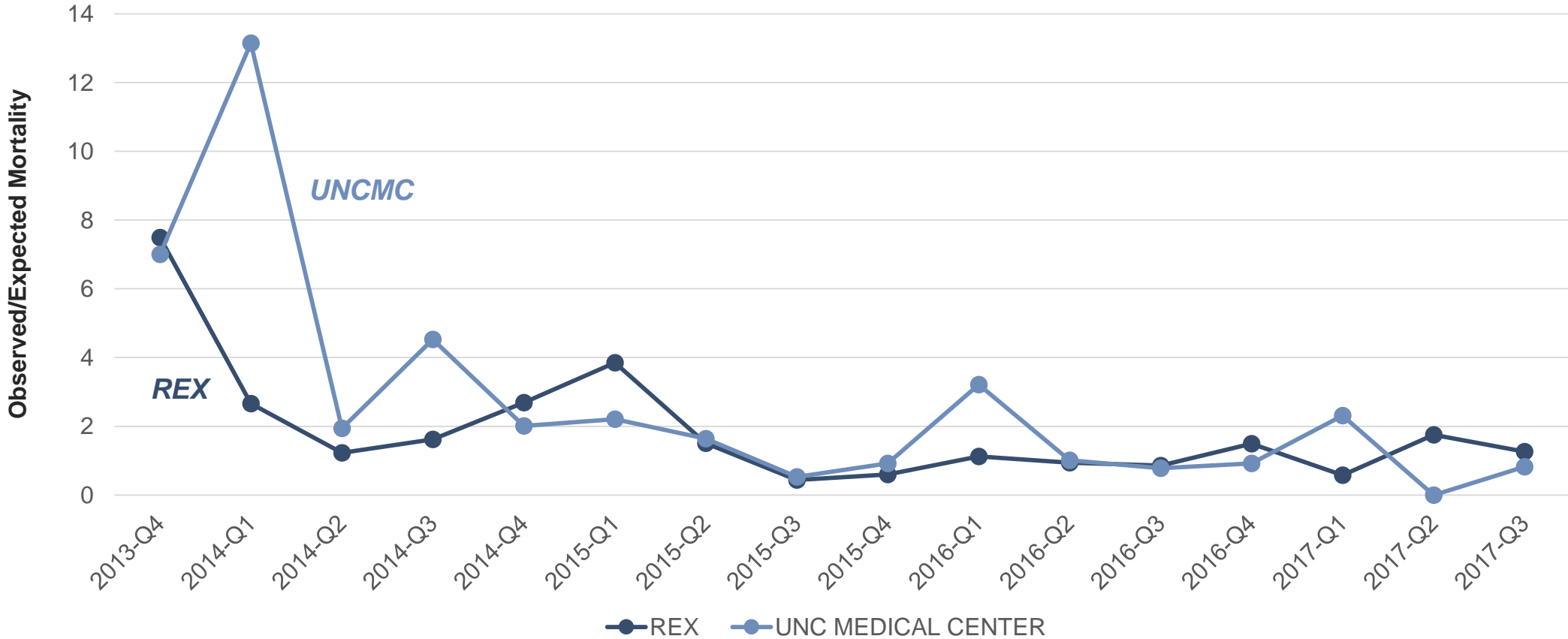
In-Stent Thrombosis (%)

Adverse events and vascular complications are the primary measures monitored to ensure that anticoagulation medications are working correctly and preventing harm

Observed vs Expected Mortality Ratio

Overwhelming physicians with additional disruptive prompts that could increase to alert fatigue and lead to patient safety events [1]

UNC has taken an education-first approach to change influence provider behavior

Un-blinding data and showing individual provider's performance against their peers has proven effective for many of our quality and utilization initiatives for several reasons:

- **They may not be aware of the process or don't otherwise know the numbers**
  I didn't realize practice recommendations had changed for bivalirudin usage

- **Drives information sharing about best practices between providers**
  How is your average price per stent so low, what product are you using?

- **Providers are competitive**
  I have to make sure my patient gets their discharge meds so that I can beat Dr X this month!

This method works best when providers know that leadership is also reviewing the same data at regular meetings

Intrusive provider alerts are only used as a means of last resort or when the prevention of adverse events warrants such an interruption

Sources : [1] Patient Safety Primer – Alert Fatigue, https://psnet.ahrq.gov/primers/primer/28/alert-fatigue, – Agency for Healthcare Research and Quality (2018)

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Next Steps

Next Steps
Continuous Improvement

1 The PCI dashboard allows continued monitoring for adverse events as well as other supply cost opportunities for savings and standardization

2 The translational model of moving positive findings from one institution (UNCMC) to another (UNC REX) by leveraging comparative can lead to other value-added opportunities at other hospitals across the health care system

3 Analyzing and sharing practice patterns through the dashboard can identify new opportunities and influence individual physicians to adopt best practices

4 Scale this concept to other procedures and entities in cardiology such as AICD implantation, STEMI management, stress testing, etc.

Questions