Using Predictive Analytics to Increase Your Hospital's Profitability

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Optimizing Hospital Profitability

› As payers shift to value-based reimbursement, hospitals will depend on advanced analytics to manage risk and improve their bottom line

› Predictive Analytics improves outcomes while optimizing costs

- Block Time & Scheduling Efficiency

- Labor & Productivity

- Anesthesia Costs

- Nursing Costs

- Clinical Outcomes

SURGICAL
DIRECTIONS

Why Focus on Perioperative Services?

› Perioperative Services **are key** to a hospital's success!

- Over 68% of high performing hospitals' revenue

- 60% of margin is derived from better performing perioperative services

- Successful system under Value-Based Purchasing/ACO provides both surgeons and payers more value for surgical services

$$Value = \frac{Outcomes}{Cost}$$

SURGICAL
DIRECTIONS

Why is Efficient Block Scheduling Important?

> Establishes "draw down" and optimizes room utilization

- 2.5 FTE/Room
- Approximately $300,000 Anesthesia cost

> Reduces costs from having under-utilized rooms
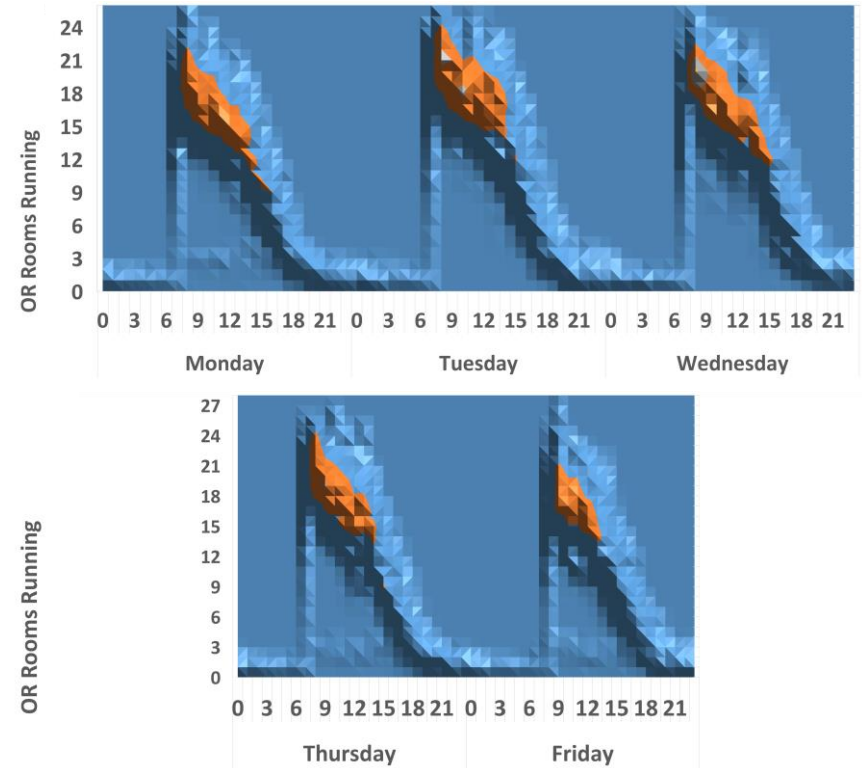
> Reduces the cost per occupied bed

Figure 1. *Heatmapping the operating room aids in visualizing peak operating hours and helps to minimize non-productive time.*

SURGICAL DIRECTIONS

Effective Block Design

> The goal is to maximize access for the most productive surgeons

> Block forecasting correlates physician practice patterns to precisely match demand for block

> Predictive models also allocate appropriate time for urgent, emergent, and electively scheduled cases

- Drastically reduces overtime expense and improves throughput
- Minimizes need for additional resources after hours

> Hospitals use this schedule to forecast ICU admissions and efficiently manage beds

Designing a Block Schedule by Forecasting Demand

› Helps to load balance the OR

- Reduces variance and improves predictability of the daily schedule

› Improves surgeon access

› Incorporates physician practice patterns into the model

- Minimizes interference with clinic schedule

› Reduces overtime cost

- Provides "wiggle room"
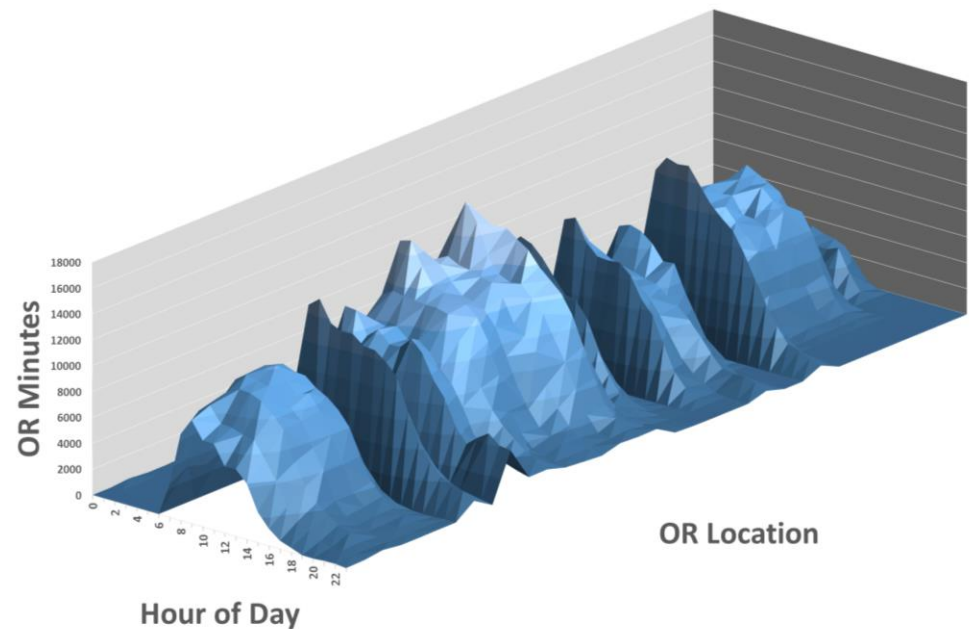
# Scheduling Accuracy is a Critical Component of an Efficient Block Schedule

> Helps control labor costs

- Reduces day-to-day variability in the schedule
- Provides sufficient notice of gaps or complex cases

Distribution of Procedure Time by Service
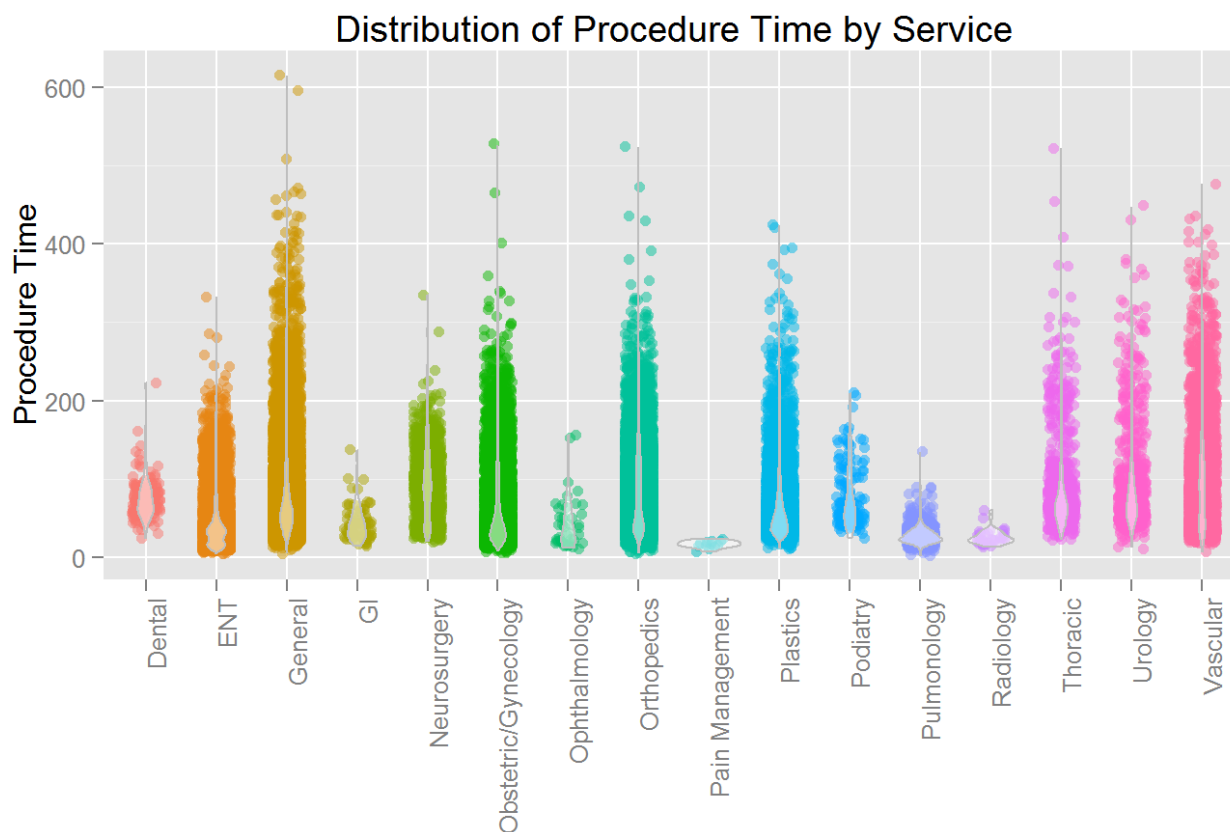
Scheduling Accuracy, cont.

> Case Time T_C is non-Gaussian

- Log-normally distributed

> Several effective approaches

- How to best handle outliers?

  - Use the expectation value: $E[T_C]$ (with some guidelines)

$$N(\ln T_C; \mu, \sigma) = \frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(\ln T_C - \mu)^2}{2\sigma^2}}$$

Distribution of Procedure Time
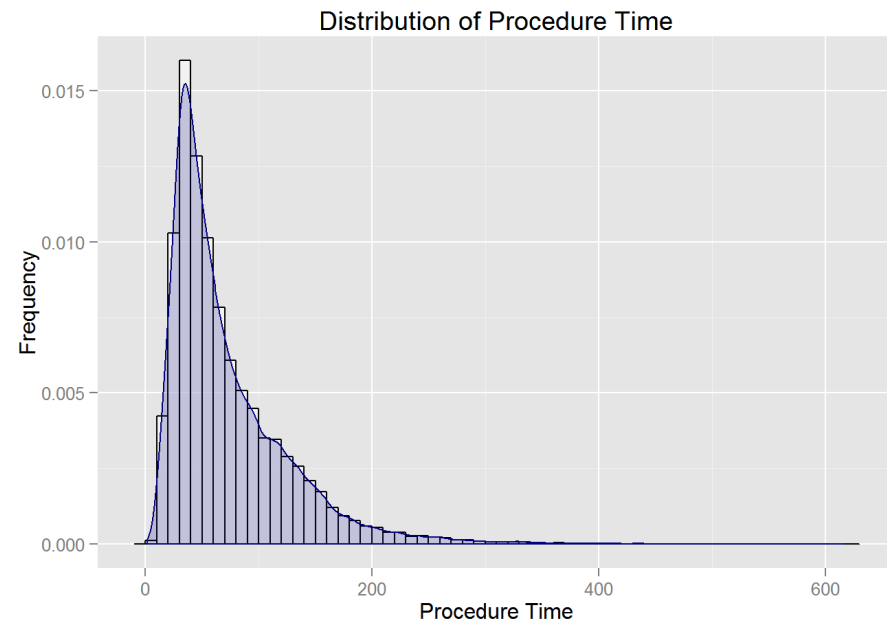
Case Study – East Coast Community Hospital

Situation

> Surgeons unhappy with OR efficiency

> 8% same-day cancellations

> 50% first case on-time starts

> Long turnover times

Intervention

> Strengthen OR governance

> Utilize predictive analytics to redesign block to match surgeon demand

> Upgrade PAT

> Establish daily huddle

> Foster operational leadership in Anesthesia group

> Improve OR processes

> Upgrade Sterile Processing

Outcome

> Turnover reduced from 53 to 31 minutes (average)

> OR utilization increased from 62 to 72% (average)

> Volume increased by 14% average

> Increased surgeon satisfaction

SURGICAL DIRECTIONS

Case Study – OR Performance Scorecard

Metric	Benchmark	Client	Rating
Governance	• Collaborative • Multi-Disciplinary Daily Huddle	• Nurse Driven • No Daily Huddle	
Block Schedule	• 8+ hr blocks • 20% Open Time • 75% utilization	• Some 8 hr blocks • Partial (2-4 hr) blocks • < 5% Open Time • 62% Block Utilization	
Cases/OR/Year	• 1105 Cases/OR/Year	• 938 Cases/OR/Year	
Day of Surgery Cancellations	• <1%	• 5.8%	
Turnover Time	• IP: 20-30 minutes • OP: 10 – 20 minutes	• 53 minutes (average)	
First Case On-Time Starts	• ≤ 90%	• 50%	

Case Study – Problems Impacting Utilization

> Surgeons doing excessively long cases in flip rooms resulting in < 50% utilization

> Inefficient nursing leadership

> Poor nursing morale

> "Broken" Central Sterile Processing

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DIRECTIONS

Case Study - Intervention

> Established a collaborative governance structure

- Surgical Services Executive Committee (SSEC)
- Daily Huddle

> Redesigned Block Scheduling System

> Enhanced Anesthesia's role in daily operational leadership

> Upgraded PAT

> Upgraded Sterile Processing

SURGICAL
DIRECTIONS
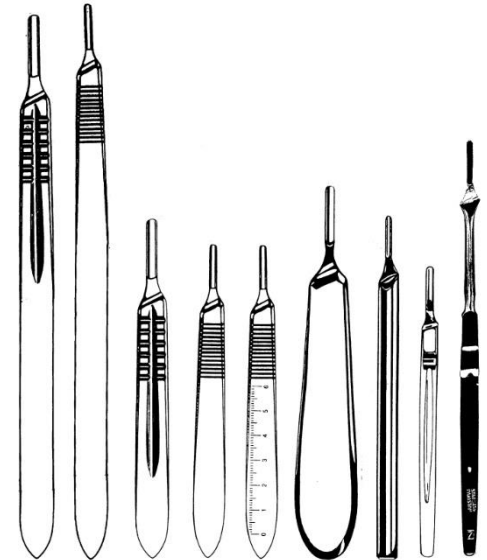
Case Study - Collaborative Governance

**Create a Perioperative governing body to align incentives.
An Operations Committee for all aspects of Perioperative Services**

Surgical Leadership	OR Nursing Leadership	Anesthesia Leadership	Hospital Leadership

Surgical Services Executive Committee (SSEC)

- Chaired by Medical Director(s) of Perioperative Services
- Administration-sponsored Surgery Board of Directors
- Controls access and operations of OR
- Sponsors and directs Perioperative team activity

SURGICAL DIRECTIONS

Case Study - What is the Daily Huddle?

> H   Healthcare
> U   United
> D   Daily (to make)
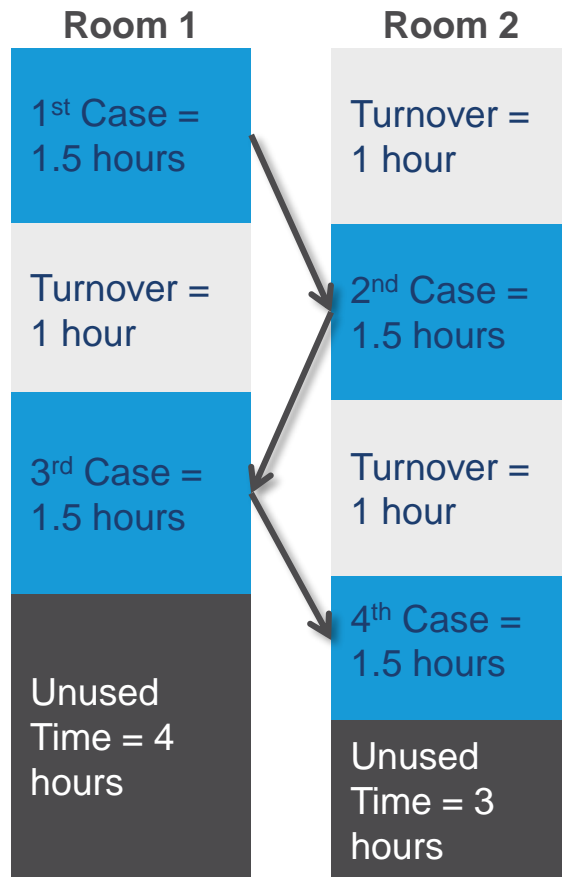> D   Decisions
> L   Leading to
> E   Excellence

> Recap of previous day
> Total case review for next days out – PAT and scheduling completion
> Review of schedule
> Total number of anesthesia providers to start the day
> PAT problem review
> Antibiotics review
> Review pending action items

SURGICAL DIRECTIONS

Case Study - Solution for Room Flipping & Calculation for Adjusted Utilization

Flip Room

- **Avg. Duration 1.5 hours**
- **Avg. Turnover -15 minutes**

Room 1

1st Case = 1.5 hours

Turnover = 1 hour

3rd Case = 1.5 hours

Unused Time = 4 hours

Room 2

Turnover = 1 hour

2nd Case = 1.5 hours

Turnover = 1 hour

4th Case = 1.5 hours

Unused Time = 3 hours

Calculating Utilization

With a negative turnover:

| 1.25 | 1.25 | 1.25 | 1.25 |

Utilized

= 1.25 x 4 = 5/8
'unadjusted' for flip = 62%

Adding 30 min adjusted turnover between each case:
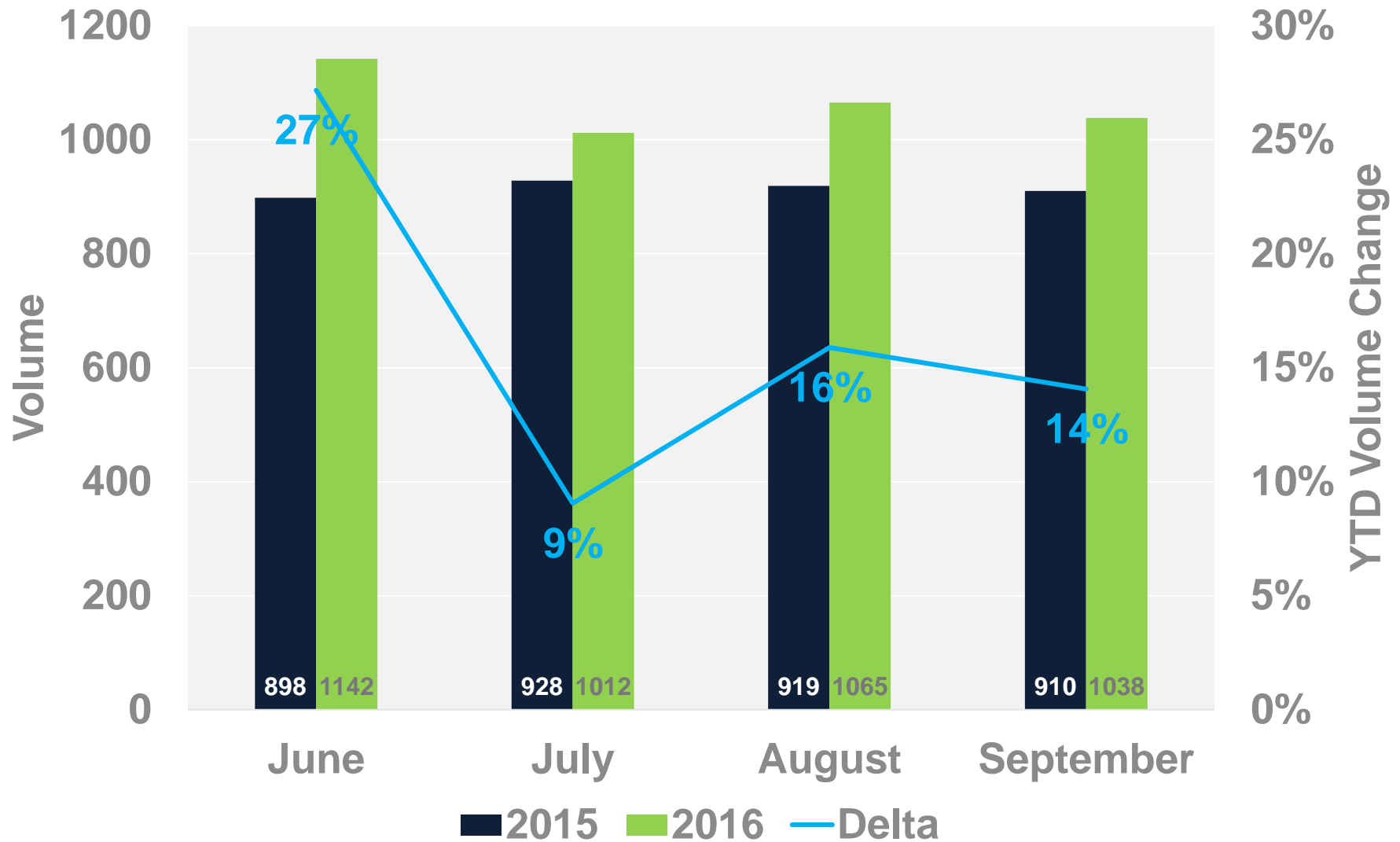
| 1.50 | .5 | 1.50 | .5 | 1.50 | .5 | 1.50 |

Utilized

= 1.5 x 4 + .5 x 3 = 7.5/8.0
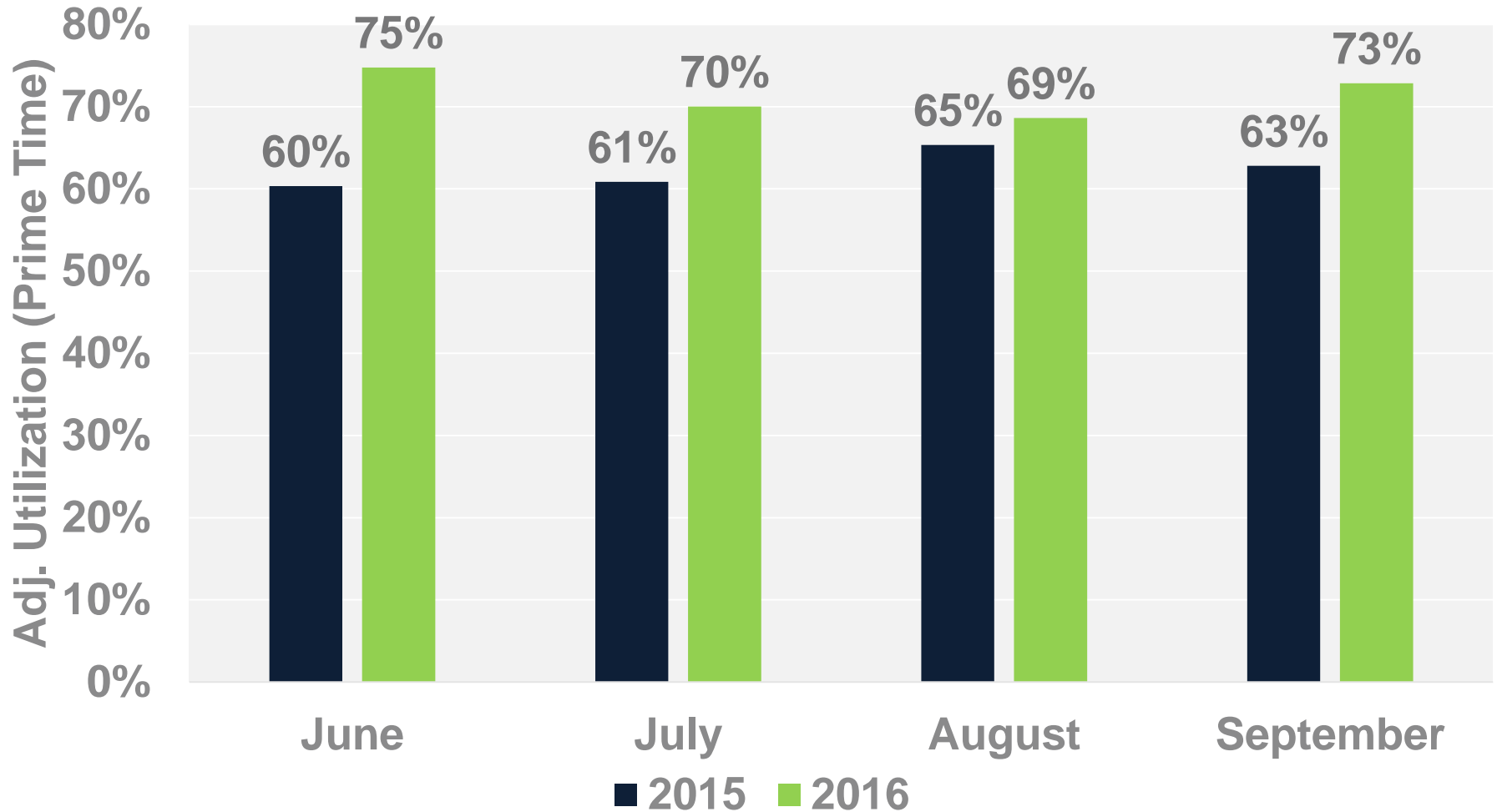Is the Adj. Util. = 94%

Case Study – Impact

> Surgeons engaged

> Anesthesia engaged

> OR built strong leadership with Co-medical Directors and Nursing Director

> Hospital well-positioned and functioning efficiently
  - $20M improvement

SURGICAL
DIRECTIONS

Case Study – OR Utilization Snapshot 2015 & 2016

Leveraging Analytics to Improve Clinical Outcomes

> Bundled Payment & ACO Strategy

- Using analytics to stratify the risk of patients and measure outcomes

- Models provide clinical decision support and risk intervention protocols

- Better understanding of the patient population during the continuum of care reduces costs

Sample Quality Metrics

SSI	VTE	Mortality	Morbidity
Pneumonia (not POA)	Renal Failure (not POA)	UTI (not POA)	Readmissions
LOS			

SURGICAL DIRECTIONS

Complications Have Financial Implications

Hospital Acquired Complications (HAC)	Cost per HAC ($)
Pressure Injury	$15,000
Pneumothorax	$5,000
Venous thromboembolism	$20,000
Postoperative sepsis	$50,000
Accidental puncture/laceration	$2,000
CLABSI	$25,000
CAUTI	$1,000
SSI	$100,000
MRSA	$40,000
C. difficile infection	$15,000

Example: Discharge Disposition

> 40-50% of cost post discharge

> Need to discharge greater percentage of patients to home for success

Based on Medicare claims data
Fiscal Year: Sept.1 – Aug. 31

SURGICAL DIRECTIONS