Case Study 2:

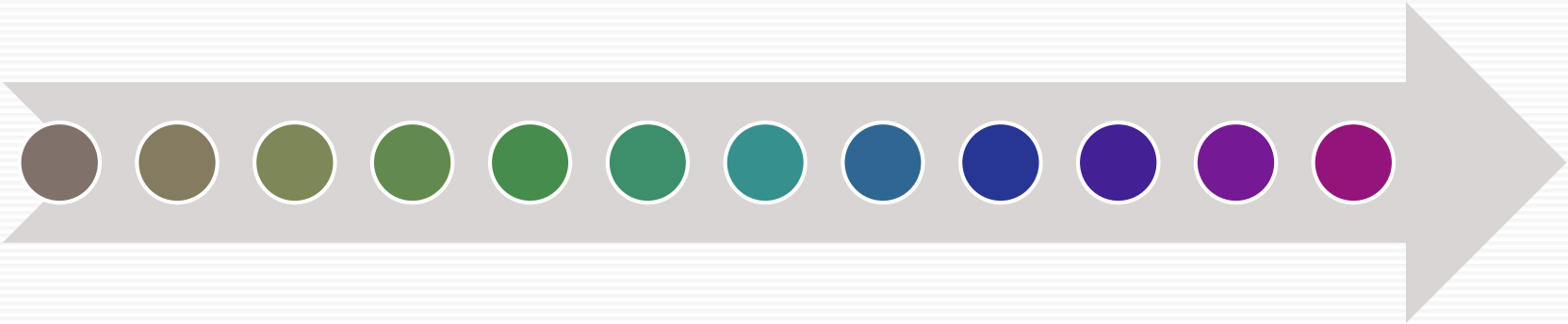
Leveraging Data and Technology to Improve Surgical Site Infection Rates

Presenter

Dr. John L. Flowers, MD *Chief of Surgery*

Local Problem (c. 2007)

Lack of standard work and availability of data lead to increased surgical site infection (SSI) rates at Greater Baltimore Medical Center.

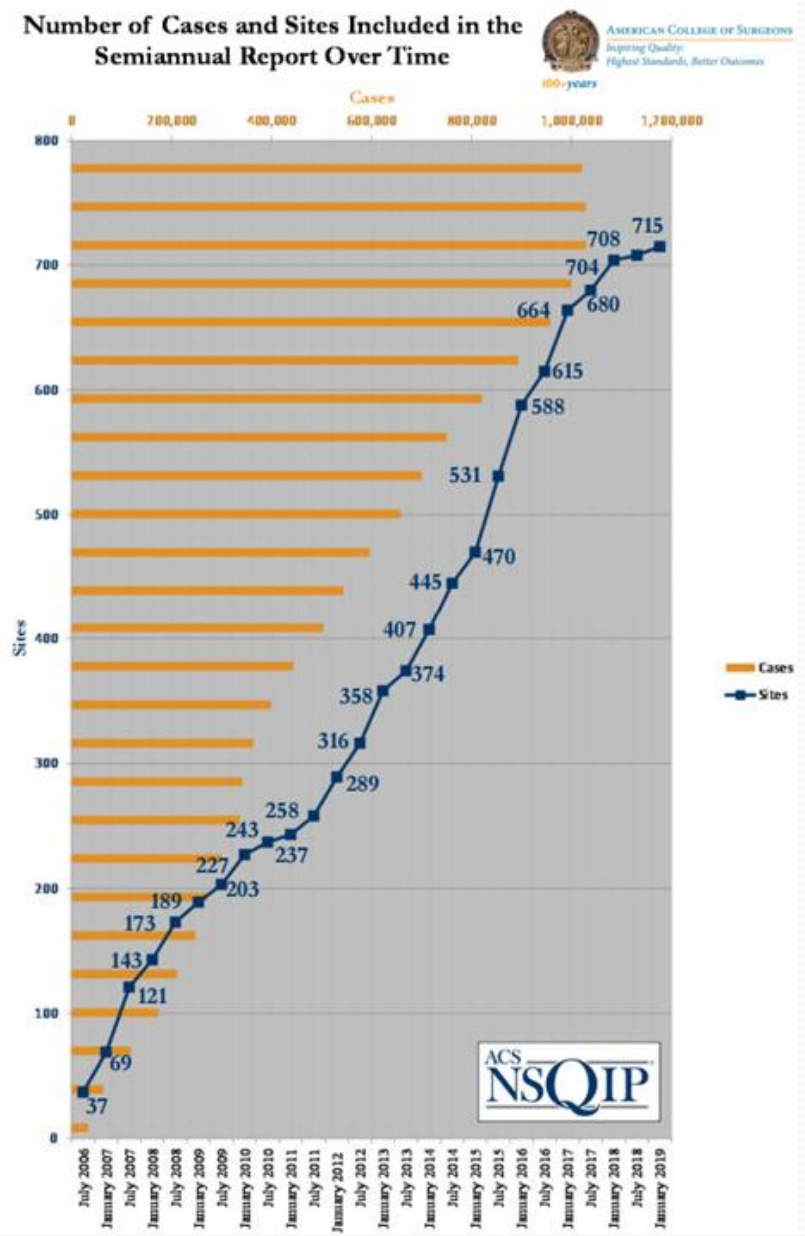


GBMC set goals to:

- Participate in the American College of Surgeon's National Surgical Quality Improvement Program(ACS-NSQIP).
- Use transparent availability of data and continuous comparison to national benchmarks to readily identify areas of improvement.
- Leverage repeated Plan-Do-Study-Act (PDSA) cycles to highlight problems, determine productive interventions, test them, and turn them into standard work.

Why ACS-NSQIP?

- Aligns with GBMC Four Aims
  - Better Care
  - Better Health
  - Least Waste
  - More Joy
- NSQIP proven in the VA health system as excellent change management tool
- ACS-NSQIP has the best quality data
- ACS-NSQIP continues to show growth over time
- Growth as of January 2019
  - 715 Participating Centers
  - >**1.1 million cases**



"To every patient, every time, we will provide the care that we would want for our own loved ones."

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Baseline Data:

GBMC Surgical Site Infection Data in 2007

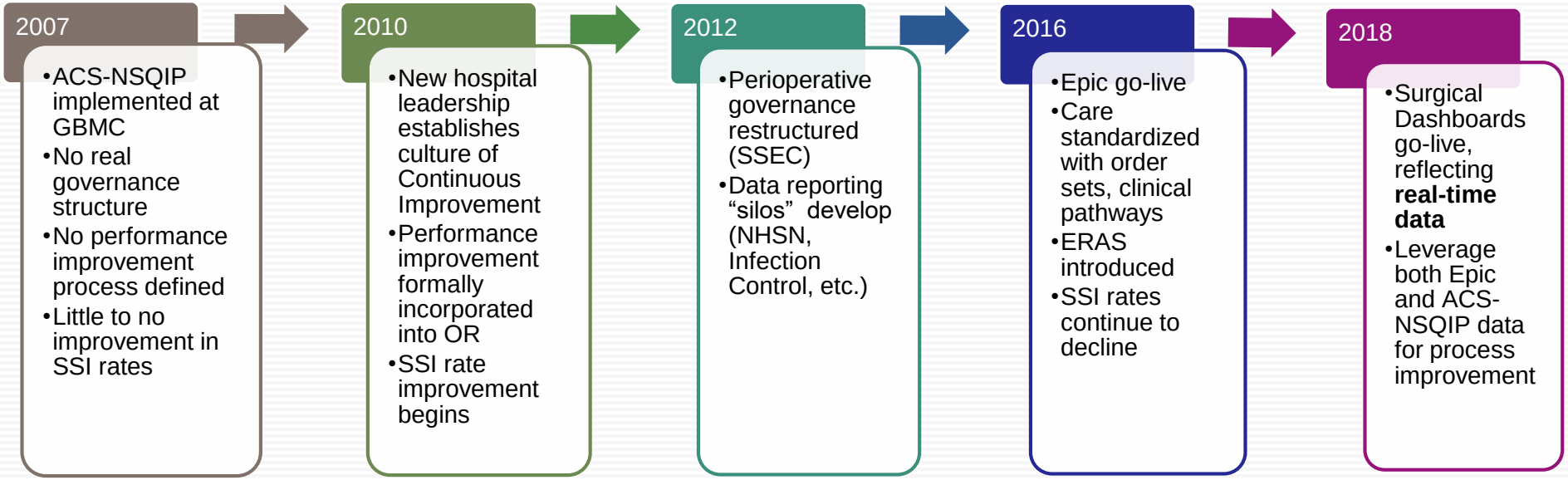
- 3.8%

Baseline Surgical Site Infection Rate

- 61

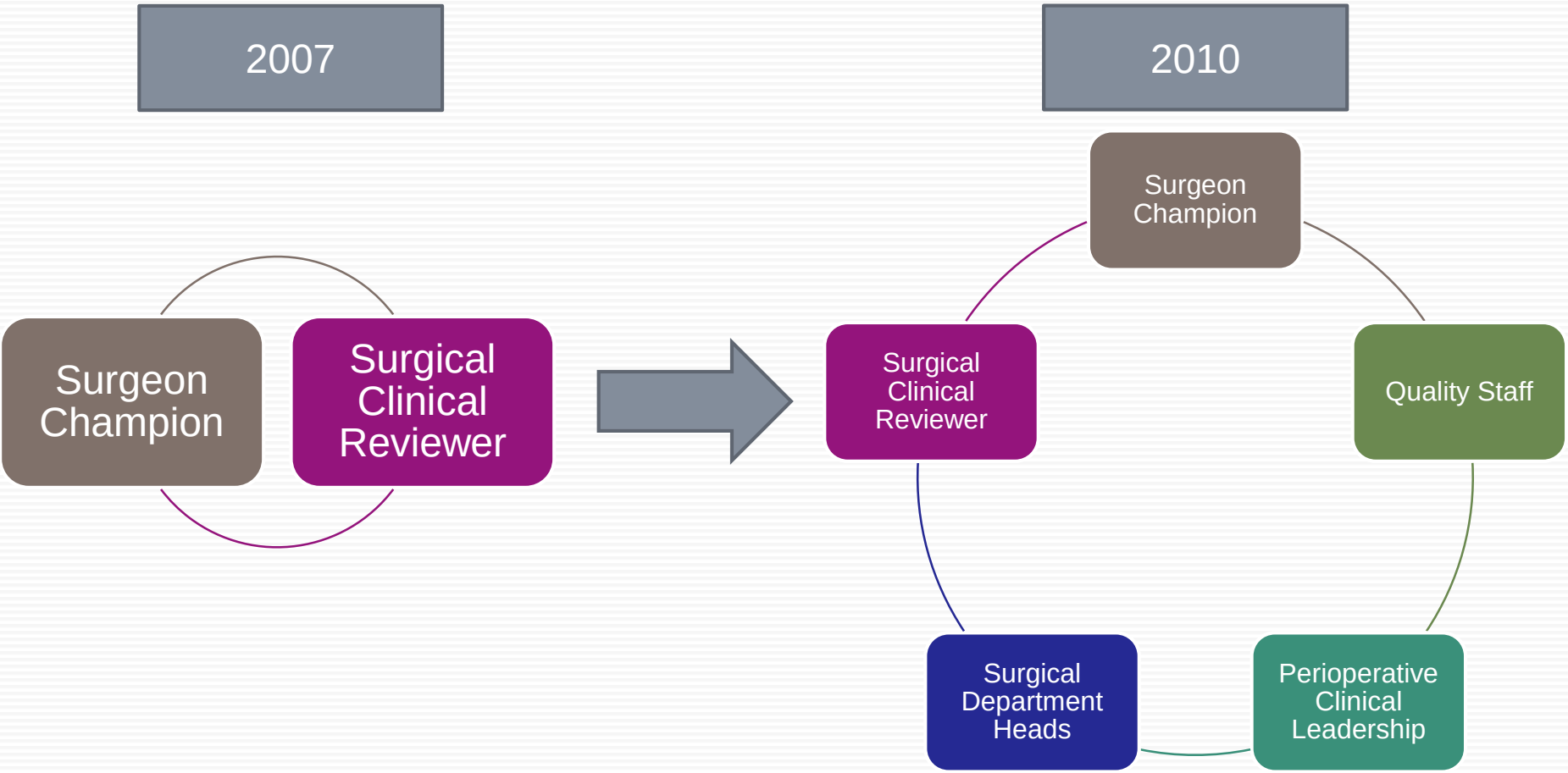
Baseline Number of Surgical Site Infections

Design and Implementation
Timeline



Design and Implementation

ACS-NSQIP Governance Strategy Transition



Design and Implementation:
Plan-Do-Study-Act

- Assemble an accountable groups with expertise and authority to act (PIT's)
- Identify opportunities for improvement based on data
- Develop a mechanism for follow-up and auditing
- Implement & disseminate "standard work" in clinical areas (ex. ERAS)

GBMC's Model for Improvement

Design and Implementation

Transparent Availability of Data

1. Average Length Of Stay, 30-day Readmission, Case Volume, Mortality Rate and Surgical Site Infection rates are visible for all surgeons
2. Surgeons can see how their work compares to others around the nation/organization
3. Competition is beneficial: "Public shaming is strong motivator"
4. Surgeons with exceptional data share their best practice
5. Standard work is developed

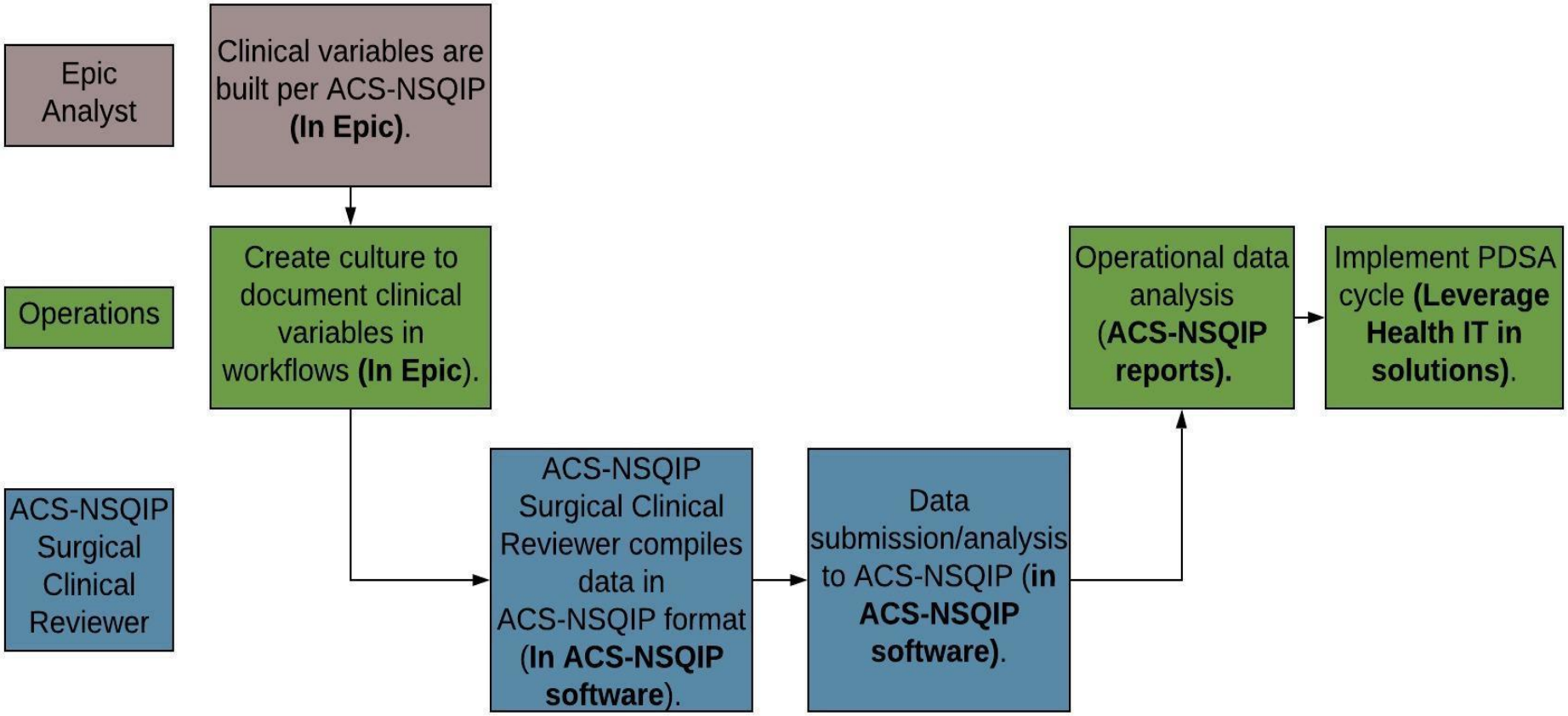
- ACS-NSQIP data for comparison (2007-2018)
- Transparent availability of data via Epic Dashboards and ACS-NSQIP (2018-present)

  - Intended Outcome: Improved Surgical Site Infection rates through the use of data transparency and development of standard work.

Workflow and How Health Information Technology is Utilized

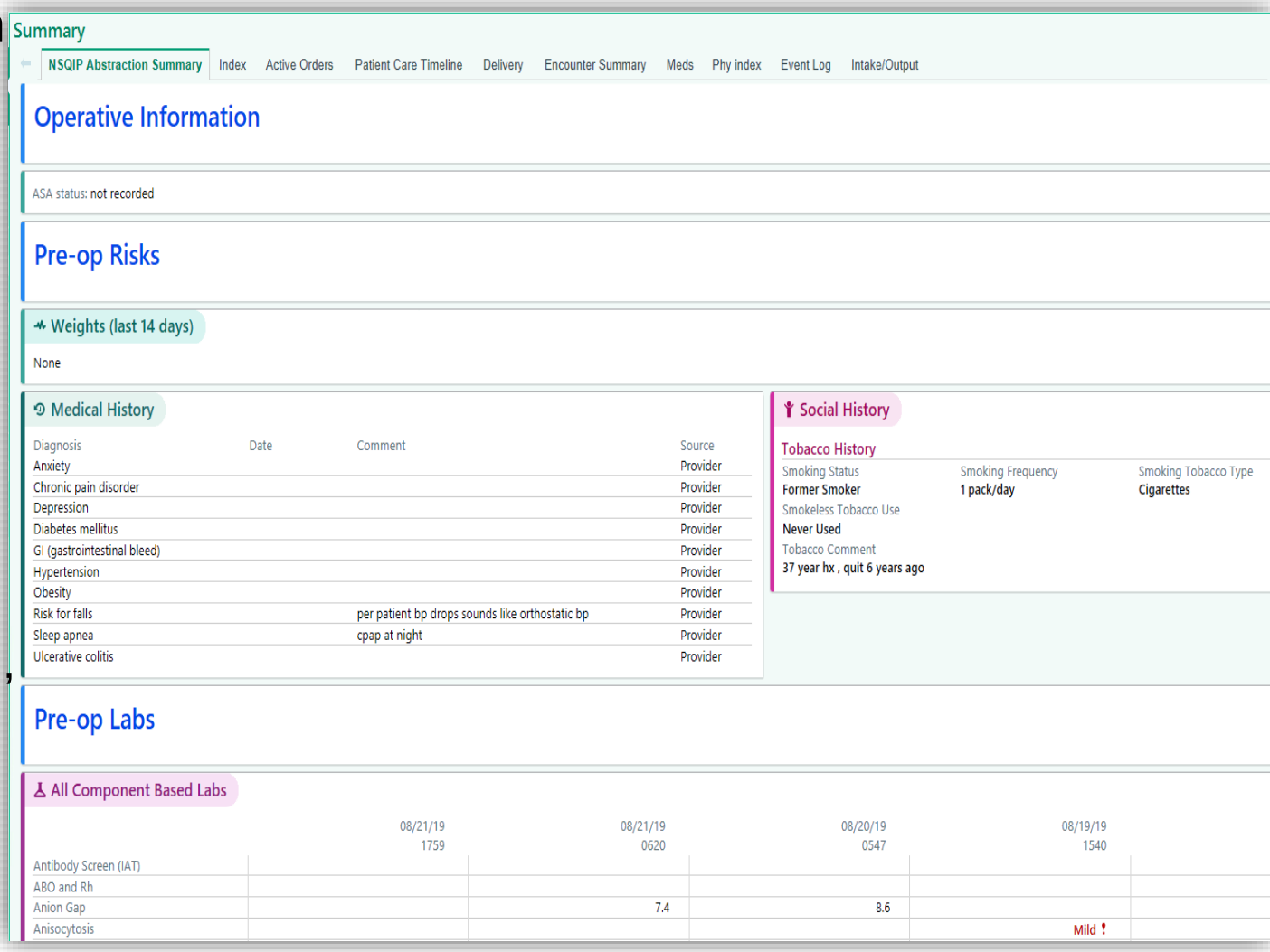
- The ACS-NSQIP workflow

Points in Workflow where Health Information Technology is Utilized



Data Abstraction Summary in Epic

- Collaboration with Epic to develop a more automated workflow
- Epic compiles ACS-NSQIP required data elements for abstraction
- Bi-directional feeding of data
- Oversight needed, but no longer manual
- **Repurposed 1 FTE**



Summary

NSQIP Abstraction Summary | Index | Active Orders | Patient Care Timeline | Delivery | Encounter Summary | Meds | Phy index | Event Log | Intake/Output

Operative Information

ASA status: not recorded

Pre-op Risks

Weights (last 14 days)

None

Medical History

Diagnosis	Date	Comment	Source
Anxiety			Provider
Chronic pain disorder			Provider
Depression			Provider
Diabetes mellitus			Provider
GI (gastrointestinal bleed)			Provider
Hypertension			Provider
Obesity			Provider
Risk for falls		per patient bp drops sounds like orthostatic bp	Provider
Sleep apnea		cpap at night	Provider
Ulcerative colitis			Provider

Social History

Tobacco History

Smoking Status	Smoking Frequency	Smoking Tobacco Type
Former Smoker	1 pack/day	Cigarettes

Smokeless Tobacco Use: Never Used

Tobacco Comment: 37 year hx , quit 6 years ago

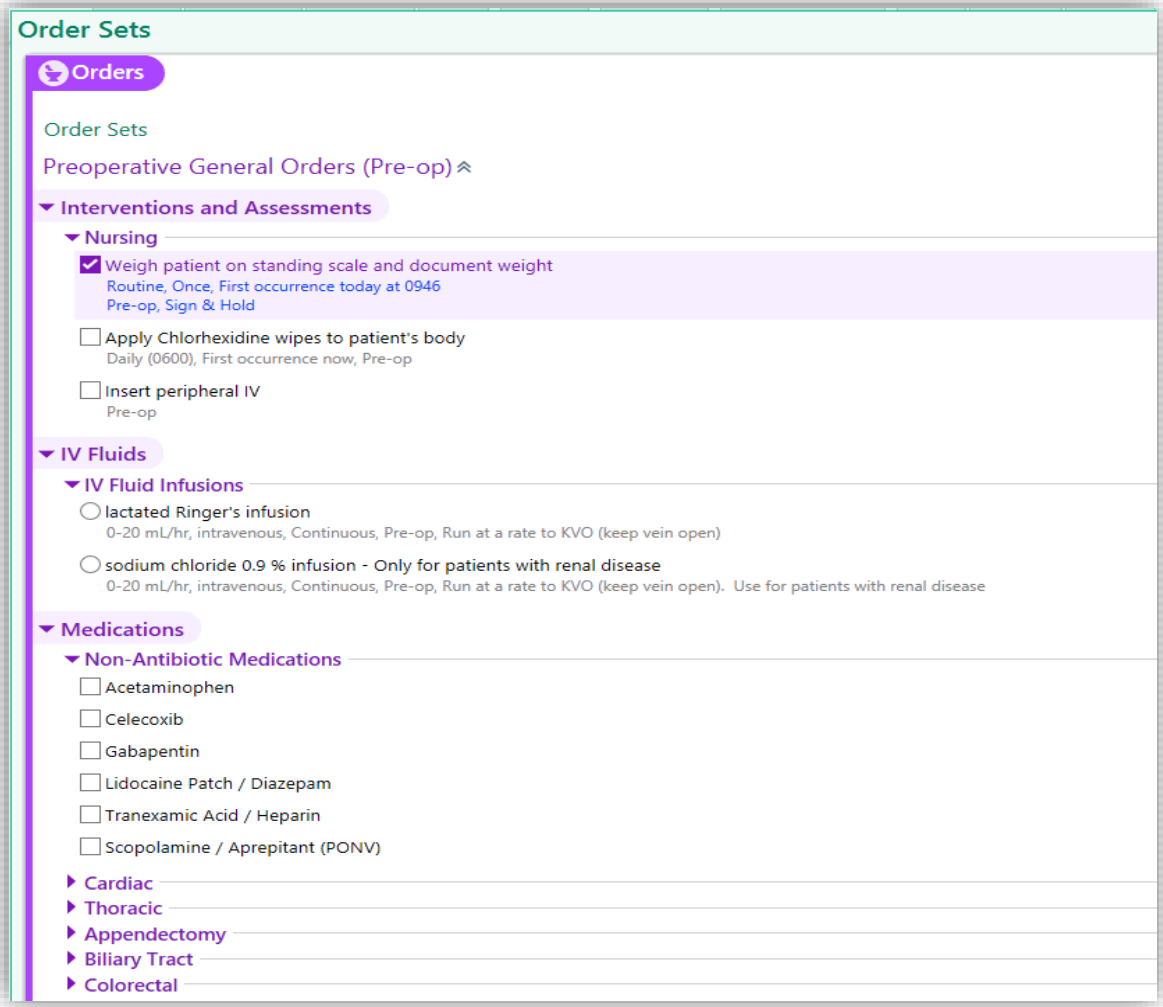
Pre-op Labs

All Component Based Labs

	08/21/19 1759	08/21/19 0620	08/20/19 0547	08/19/19 1540
Antibody Screen (IAT)				
ABO and Rh				
Anion Gap		7.4	8.6	
Anisocytosis				Mild !

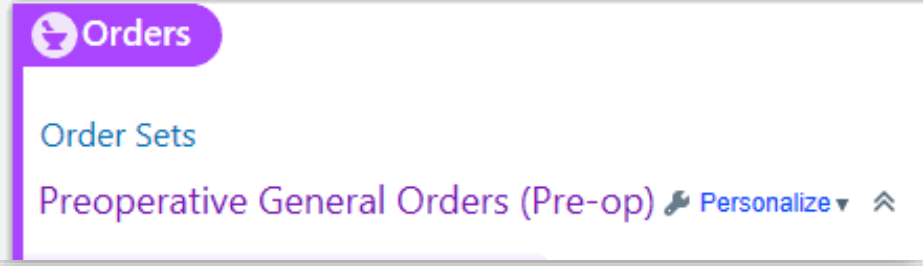
Success & Change Management Strategy for Workflow Improvements/PDSA

Using the EMR to Create Standard Work:
Evidenced-Based Order Sets

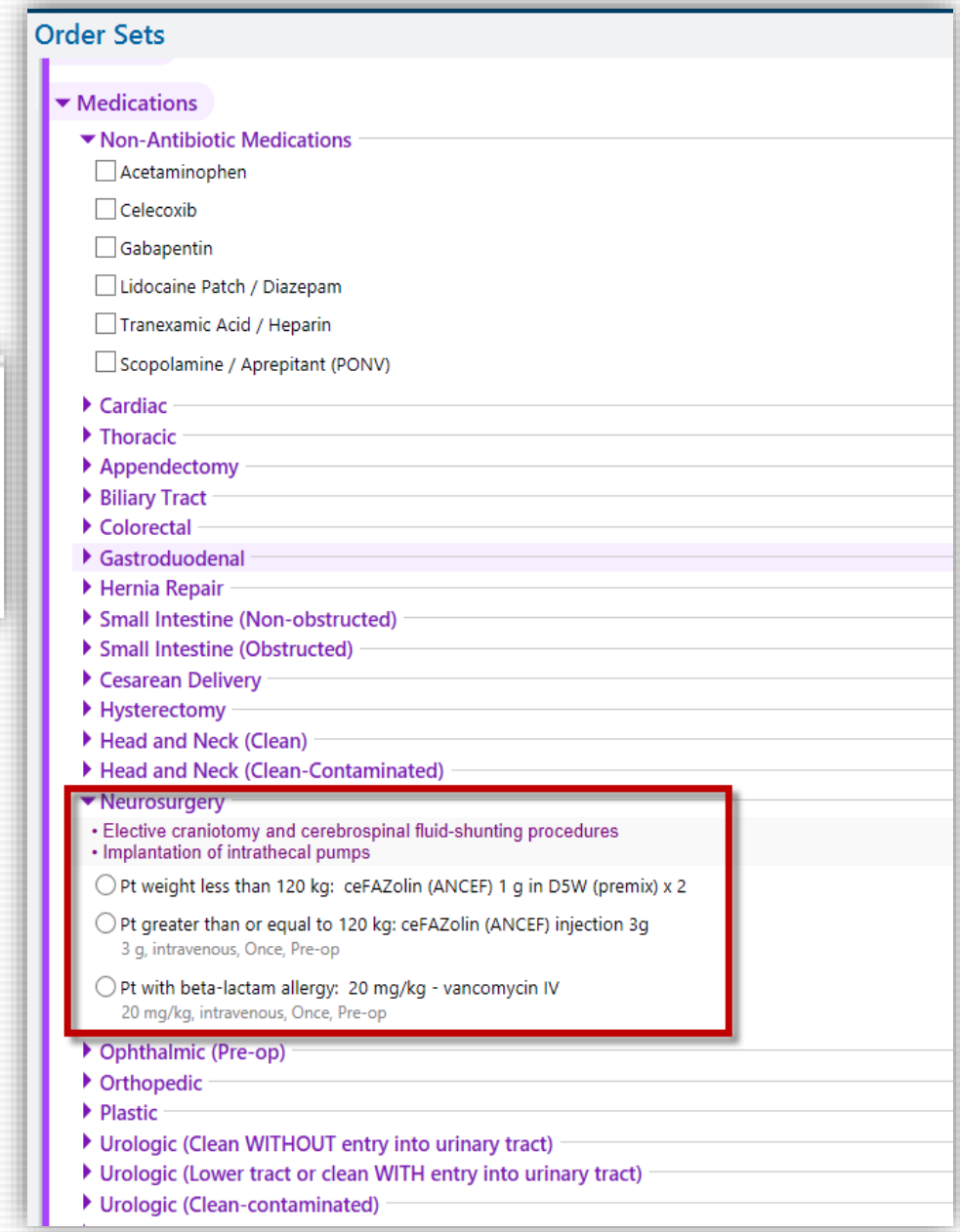


Using the EMR to Optimize Clinical Choices:

Pre-op Antibiotic/Vancomycin Administration



- EMR allows transparent data availability
- Surgeons can order pre-op antibiotics the night before surgery
- Pharmacy can pre-mix antibiotics
- Infection control can review patients for OR the next day and order appropriate antibiotics



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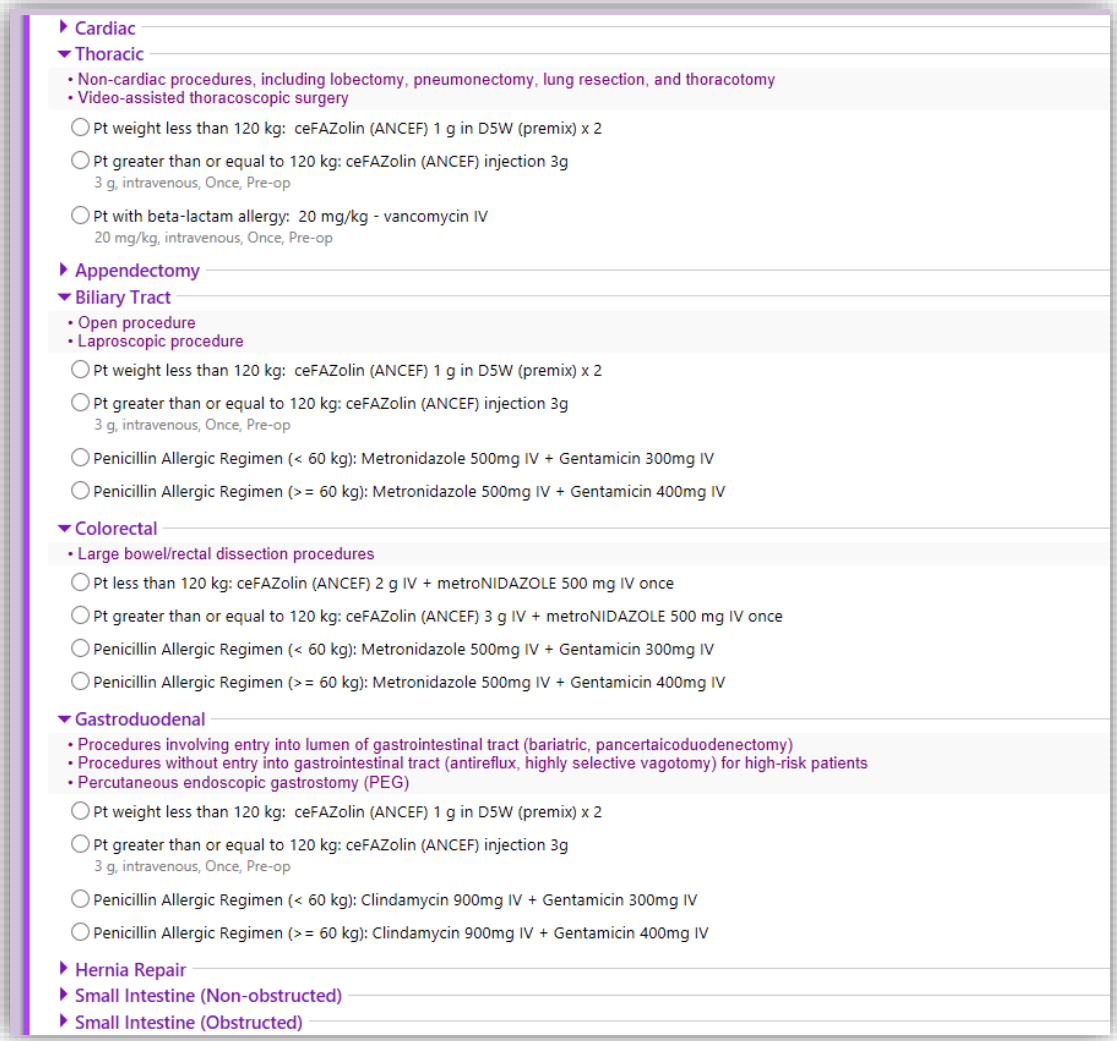
Improved Dosing and Redosing of Antibiotic Prophylaxis



▸ Cardiac

▾ Thoracic

- Non-cardiac procedures, including lobectomy, pneumonectomy, lung resection, and thoracotomy
- Video-assisted thoracoscopic surgery

○ Pt weight less than 120 kg: ceFAZolin (ANCEF) 1 g in D5W (premix) x 2

○ Pt greater than or equal to 120 kg: ceFAZolin (ANCEF) injection 3g
3 g, intravenous, Once, Pre-op

○ Pt with beta-lactam allergy: 20 mg/kg - vancomycin IV
20 mg/kg, intravenous, Once, Pre-op

▸ Appendectomy

▾ Biliary Tract

- Open procedure
- Laproscopic procedure

○ Pt weight less than 120 kg: ceFAZolin (ANCEF) 1 g in D5W (premix) x 2

○ Pt greater than or equal to 120 kg: ceFAZolin (ANCEF) injection 3g
3 g, intravenous, Once, Pre-op

○ Penicillin Allergic Regimen (< 60 kg): Metronidazole 500mg IV + Gentamicin 300mg IV

○ Penicillin Allergic Regimen (>= 60 kg): Metronidazole 500mg IV + Gentamicin 400mg IV

▾ Colorectal

- Large bowel/rectal dissection procedures

○ Pt less than 120 kg: ceFAZolin (ANCEF) 2 g IV + metroNIDAZOLE 500 mg IV once

○ Pt greater than or equal to 120 kg: ceFAZolin (ANCEF) 3 g IV + metroNIDAZOLE 500 mg IV once

○ Penicillin Allergic Regimen (< 60 kg): Metronidazole 500mg IV + Gentamicin 300mg IV

○ Penicillin Allergic Regimen (>= 60 kg): Metronidazole 500mg IV + Gentamicin 400mg IV

▾ Gastroduodenal

- Procedures involving entry into lumen of gastrointestinal tract (bariatric, pancertaicoduodenectomy)
- Procedures without entry into gastrointestinal tract (antireflux, highly selective vagotomy) for high-risk patients
- Percutaneous endoscopic gastrostomy (PEG)

○ Pt weight less than 120 kg: ceFAZolin (ANCEF) 1 g in D5W (premix) x 2

○ Pt greater than or equal to 120 kg: ceFAZolin (ANCEF) injection 3g
3 g, intravenous, Once, Pre-op

○ Penicillin Allergic Regimen (< 60 kg): Clindamycin 900mg IV + Gentamicin 300mg IV

○ Penicillin Allergic Regimen (>= 60 kg): Clindamycin 900mg IV + Gentamicin 400mg IV

▸ Hernia Repair

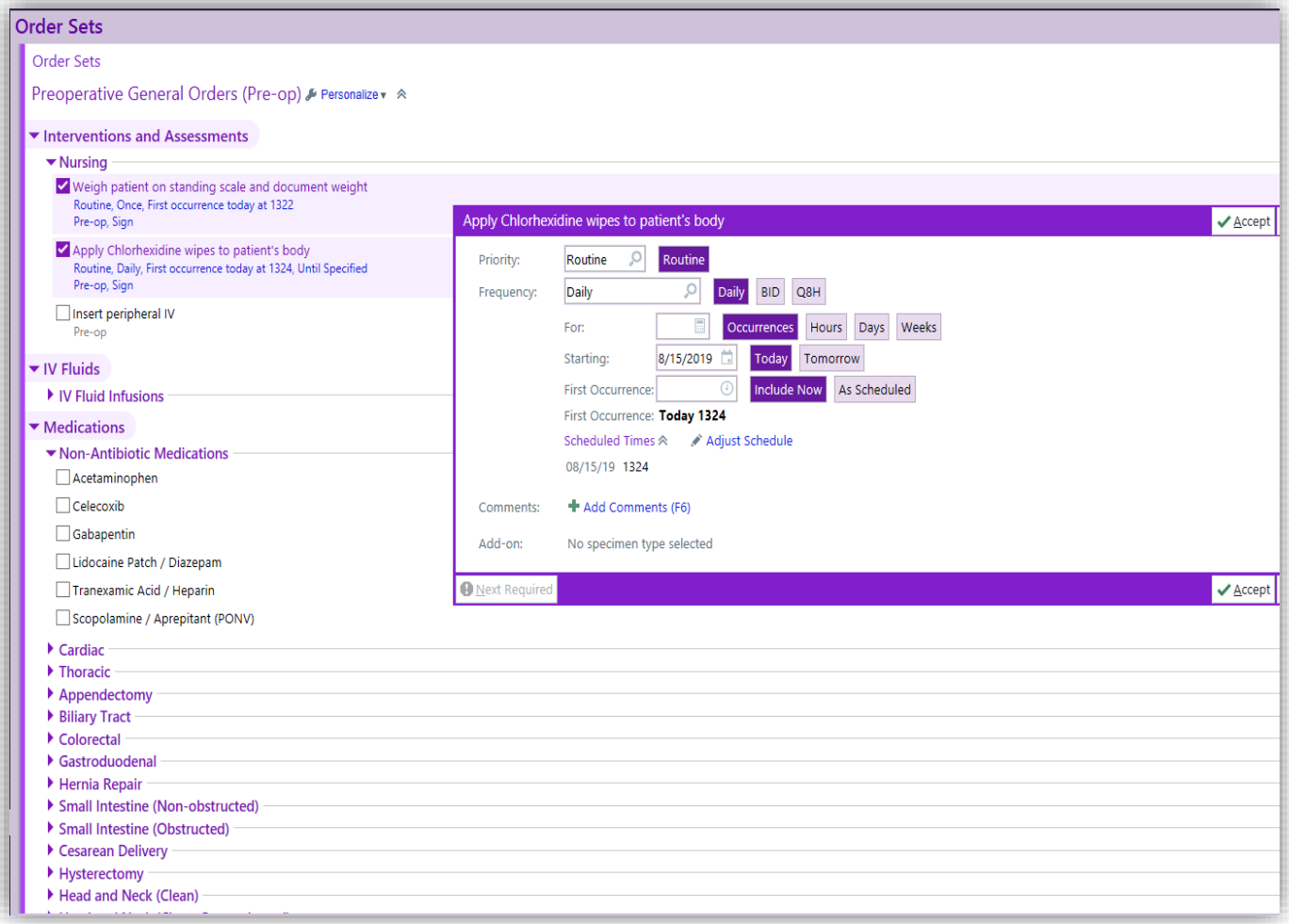
▸ Small Intestine (Non-obstructed)

▸ Small Intestine (Obstructed)

- EMR prompts staff to re-dose, even in the OR

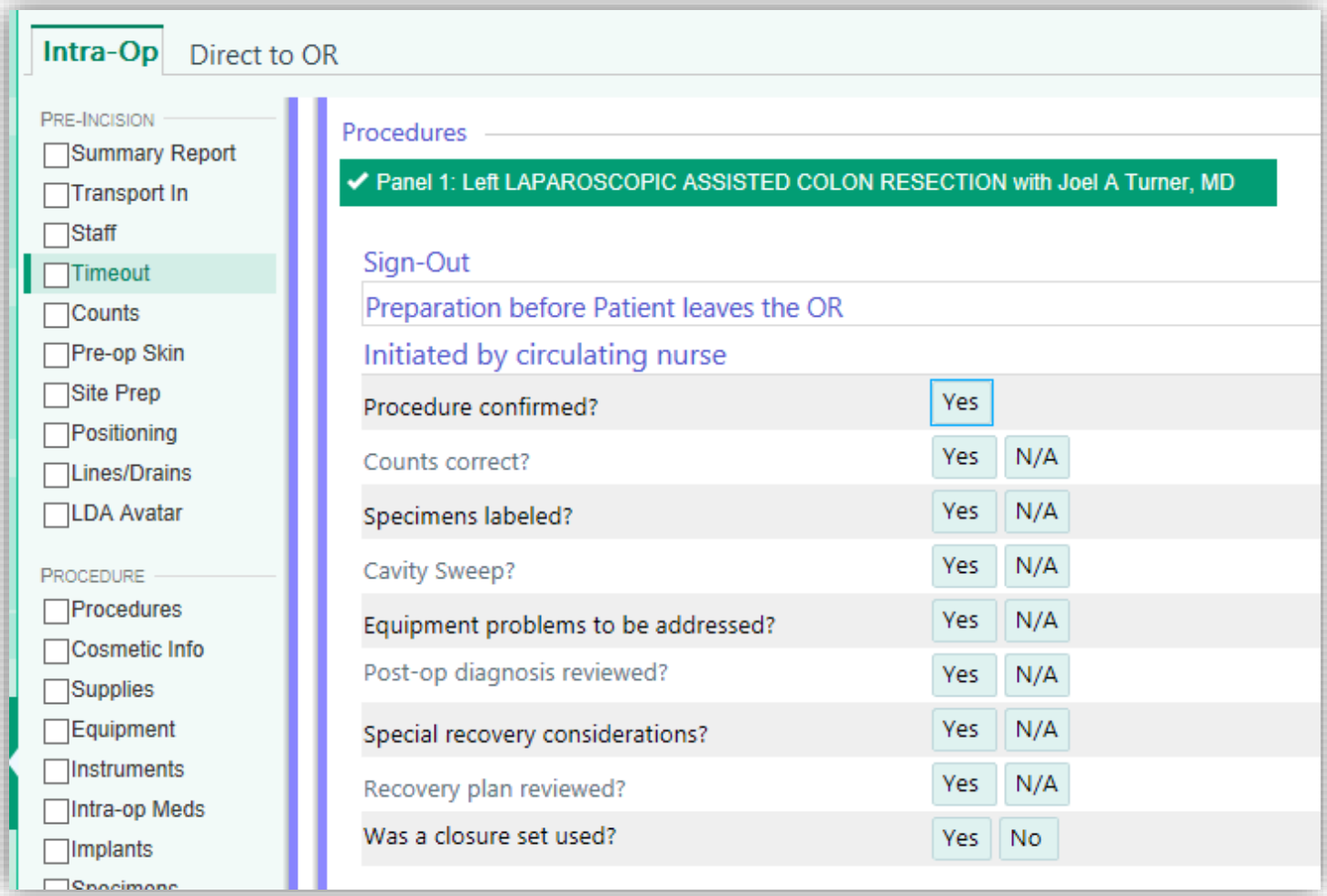
CHG Wipes added to Pre-Op Order Set

- EMR allows rapid change to introduce "Best Practices"

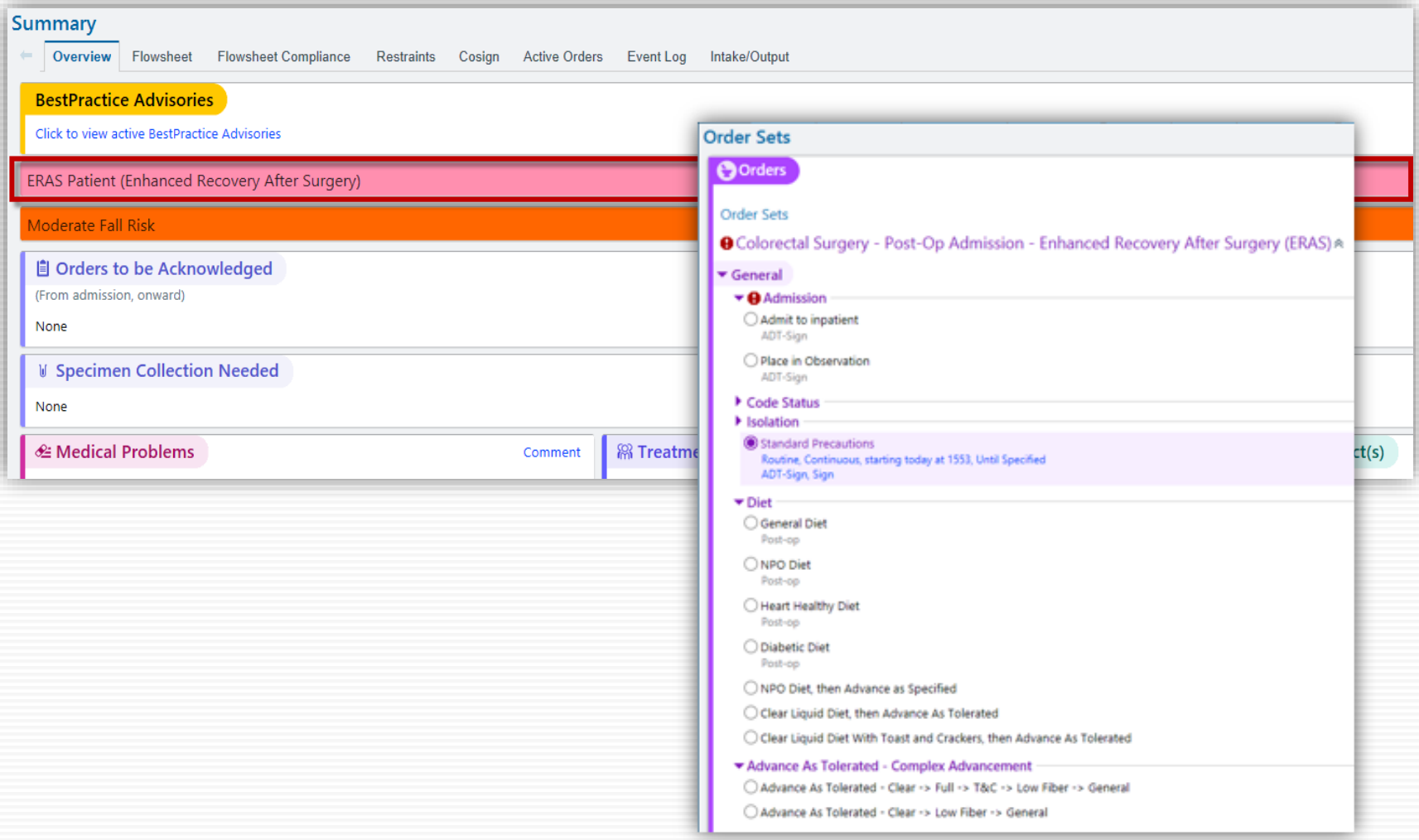


Introduction of Separate Closing Set Intra-Operatively

- EMR encourages use of standard work & creates auditing tool



Enhanced Recovery After Surgery (ERAS) Program



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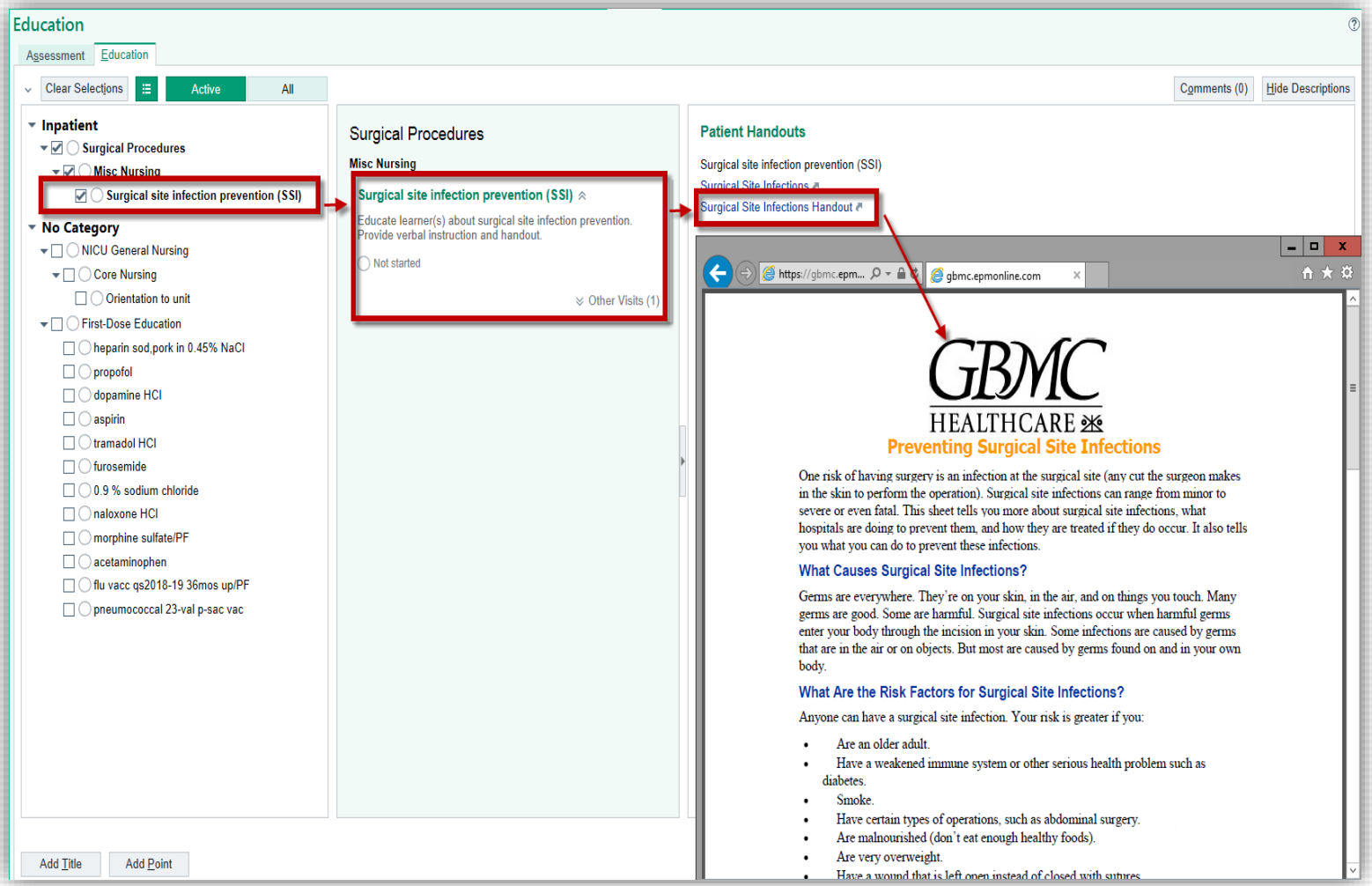
Surgical Site Infection Education

Automatically adds to every patient when a surgical site is documented. Nurse provides teaching.

EMR:

- Corrects discharge education deficiency
- standardizes work
- provides teaching tool for nursing staff



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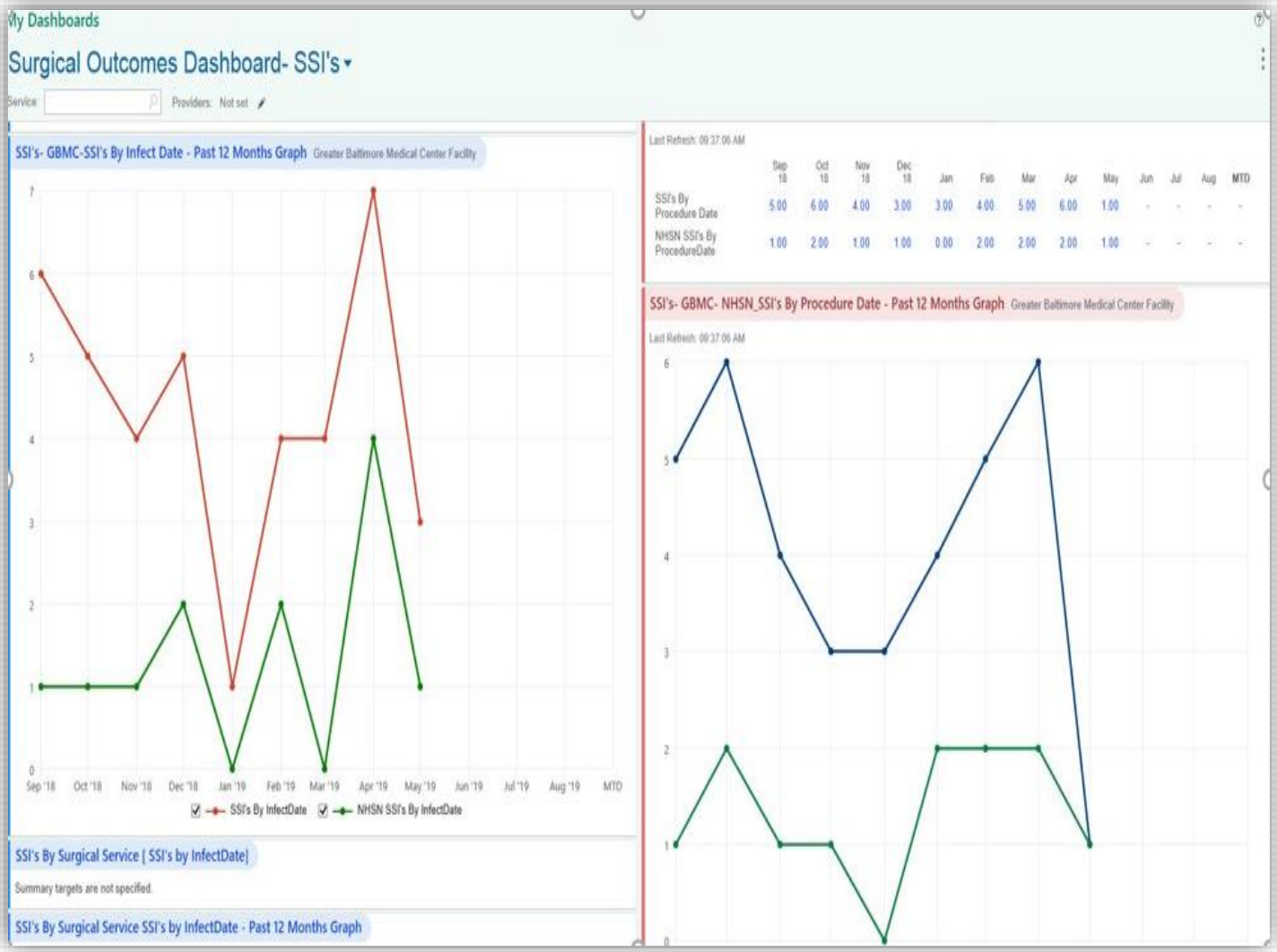
Surgical Site Infection Dashboard

- Improves data transparency and dissemination
- Moves performance improvement closer to “real time”
- Allows limited resources to concentrate on performance improvement, not data collection
- Tool for clinical engagement and culture change



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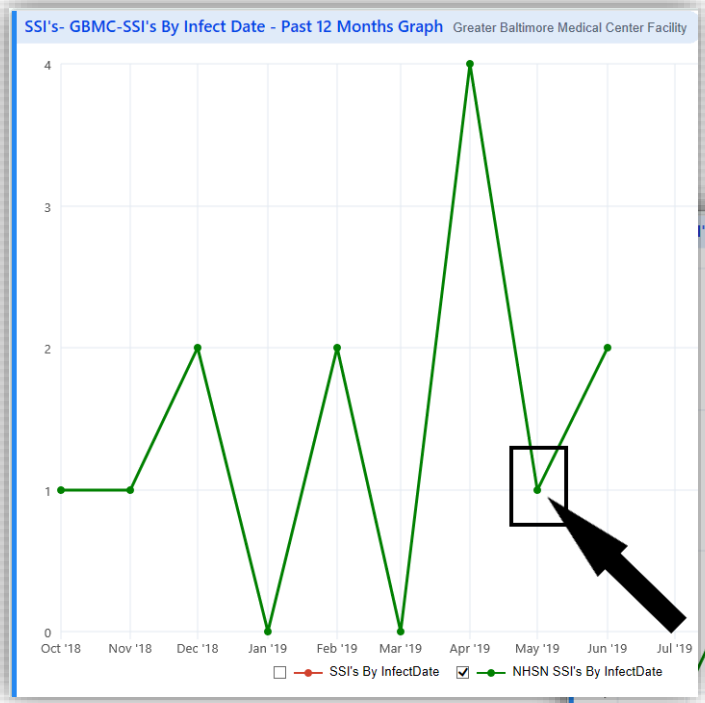
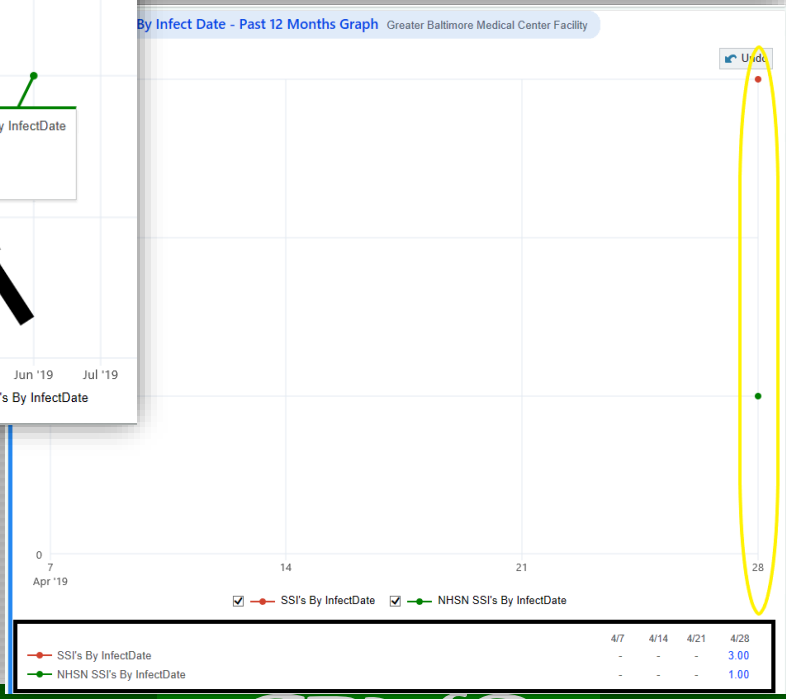
Dashboard Drill Down and Display

- Can drill down to different lengths of time
- Can display in table view or graph view





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Average Length of Stay and 30 Day Readmission Rate Dashboard

Surgical Outcomes Dashboard- ALOS+ 30 Day Readmission Rate

Surgical Outcomes Dashboard- Message Board

Dashboard Announcements

None at this time.

Fri 6/28 10:35 AM - Carla Barresi

External Websites

Last Refresh: 03:20:06 PM

- CMS
- ACS National Surgical Quality Improvement Program
- American Society for Enchanced Recovery

ERAS Anesthesia

RW-ERAS Pre-Op Checklist- General/Colorectal Reports

- GC ERAS Pre-Op Checklist Daily Report- General/Colorectal
- GC ERAS Pre-Op Checklist - Monthly Report- General/Colorectal
- GC ERAS Pre-Op Checklist Yearly Report-General/Colorectal

Crystal Reports- ERAS Data Elements- General/Colorectal

- ERAS Report- Colorectal (Monthly)
- ERAS Report- Colorectal (Yearly)

RW- ERAS Pre-Op Checklist- Orthopedics

- GC ERAS Pre-Op Checklist Daily Report- Orthopedics
- GC ERAS Pre-Op Checklist Monthly Report- Orthopedics
- GC ERAS Pre-Op Checklist Yearly Report-Orthopedics

GC Surgical Outcomes Dashboard Links

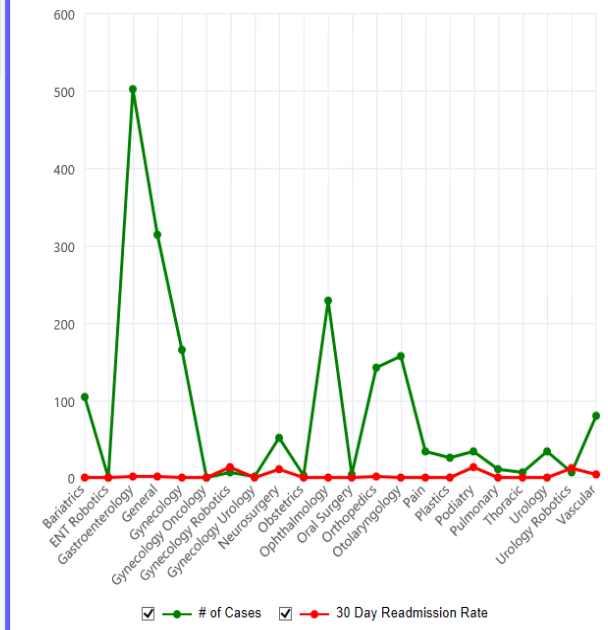
Last Refresh: 03:20:06 PM

- Surgical Outcomes Dashboard: ALOS+ 30 Day Hospital Readmission
- Surgical Outcomes Dashboard: Case Volume+Mortality
- Surgical Outcomes Dashboard: SSI's
- Surgical Outcomes Dashboard: Complications

Average LOS By Service- Monthly

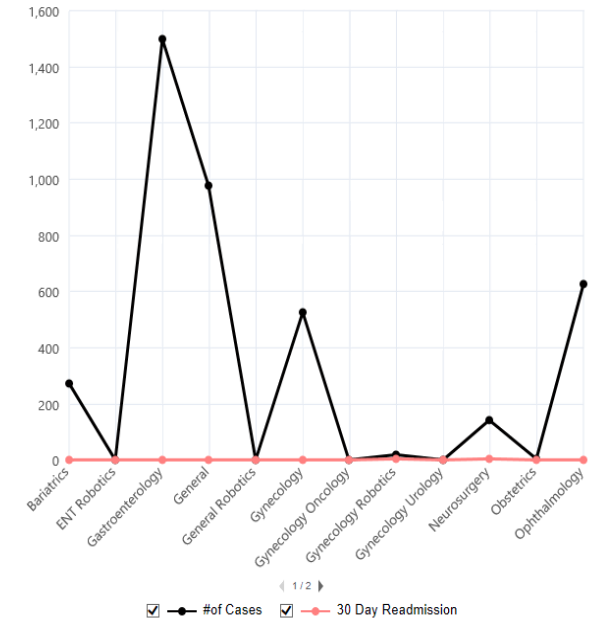
30 Day Readmission Rate by Service(Monthly)

Report completed: Fri 8/9 03:21 PM



30 Day Readmission Rate by Service(Quarterly)

Report completed: Fri 8/9 03:27 PM



30 Day Readmission Rate By Provider (Monthly)

Report completed: Fri 8/9 03:21 PM

Service	# of Cases	30 Day Readmission Rate
Bariatrics	105	0.95 %
Elizabeth A Dovec, Md [1149]	50	0.00 %
Gustavo E Bello, Md [1152]	40	2.50 %
Mingwei Ni, Md [13855]	6	0.00 %

30 Day Readmission Rate By Provider (Quarterly)

Report completed: Fri 8/9 03:27 PM

Service	#of Cases	30 Day Readmission
Bariatrics	273	1.47 %
Elizabeth A Dovec, Md [1149]	103	0.00 %
Gustavo E Bello, Md [1152]	114	1.75 %
Mingwei Ni, Md [13855]	17	5.88 %

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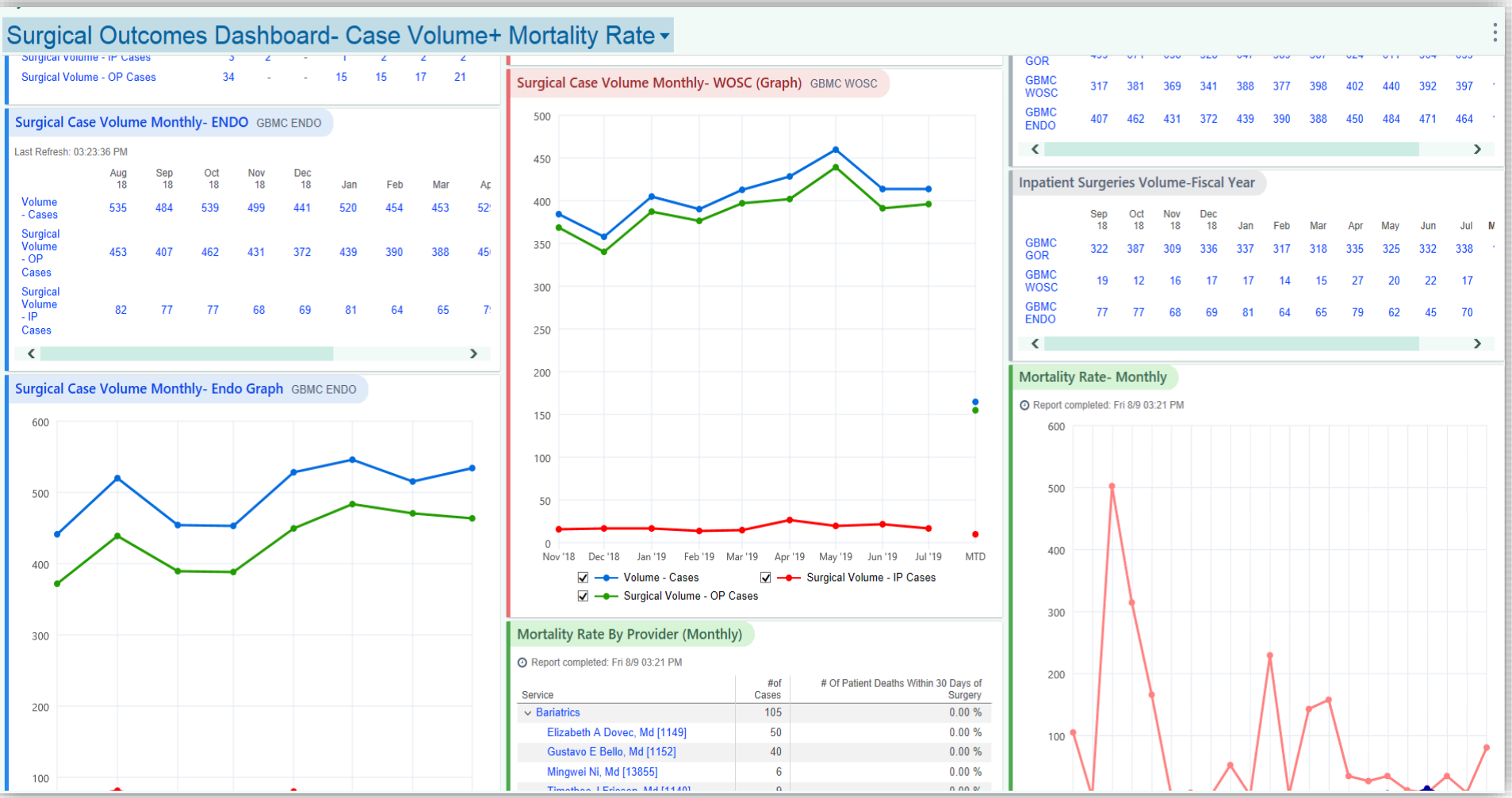
Case Volume and Mortality Rate Dashboard



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ERAS Dashboard

My Dashboards

Enhanced Recovery After Surgery (ERAS)

ERAS Message Board

Last Refresh: 02:13:51 PM

There are no posts to show.

ERAS Website Links

External Website URLS

American Society for Enchanced Recovery

Hyperspace Activities

Last Refresh: 02:13:52 PM

Open Case
Open Chart
Open Snapboard
Open Staff Schedule

ERAS Anesthesia Type By Provider- Daily

Last Refresh: 02:14:05 PM

Report completed: Mon 7/15 02:13 PM

3 Total # of ERAS Cases

Anesthesia Type	Total # of ERAS Cases
general ETT	1
KING, VICTOR F	1
general ETT;regional block	1
AMIN, FARID B	1
spinal	1
KESSLER, DAN D	1
Count unique values	3

ERAS Anesthesia- Number Carb Drinks- Daily

Last Refresh: 02:13:55 PM

Report completed: Mon 7/15 02:13 PM

ERAS Inpatient Clinical Indicators

Reporting Workbench Reports

GC IP ERAS Nursing Flowsheets_Discharged Patients
GC IP ERAS Nursing Flowsheets_CurrentPatients

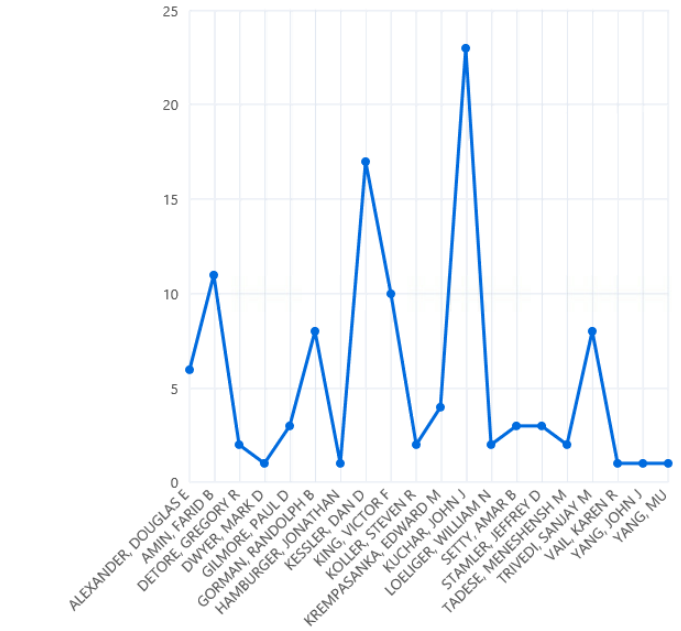
Clarity Reports

GC IP ERAS Foley Cath Measure

ERAS Anesthesia- Case Per Anesthesiologist -Monthly

Last Refresh: 02:14:12 PM

Report completed: Mon 7/15 02:14 PM



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Crystal Reports- ERAS Data Elements- General/Colorectal

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ERAS Report- Colorectal (Yearly)

RW- ERAS Pre-Op Checklist- Orthopedics

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GC ERAS Pre-Op Checklist Monthly Report- Orthopedics
GC ERAS Pre-Op Checklist Yearly Report-Orthopedics

ERAS- Cases Per Anesthesiologist- Yearly

Running – 44 %

Report: GC ERAS DATA (YEARLY)

ERAS Anesthesia- Number of Carb Drinks- Yearly

Running – 44 %

Report: GC ERAS DATA (YEARLY)

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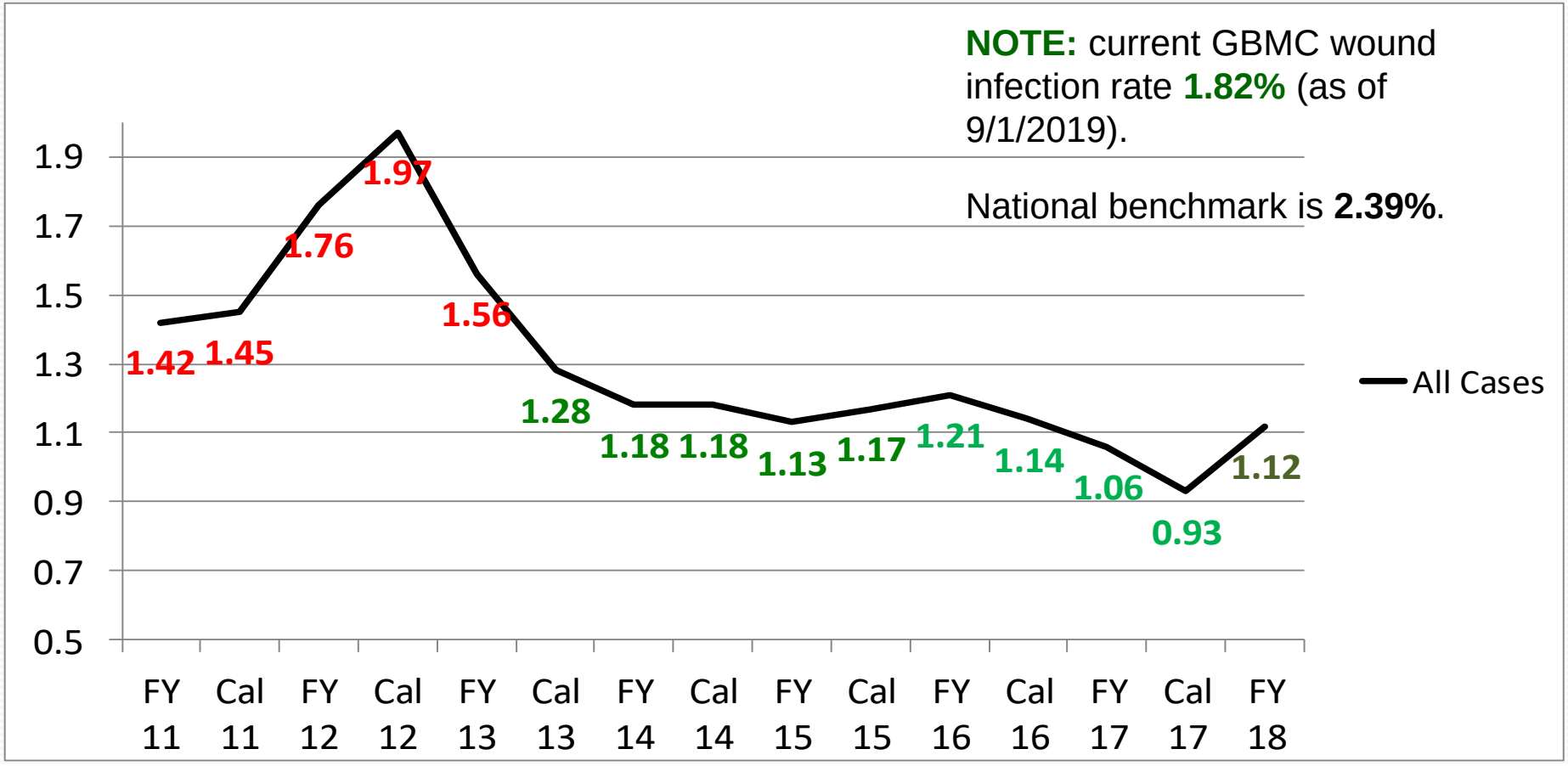
Value Derived

Surgical Site Infection Totals and Rate by Year

Calendar Year	Total # Infections	SSI Rate (%)
2007	61	3.8%
2008	72	4.3%
2009	53	3.5%
2010	68	4.6%
2011	70	4.2%
2012	86	3.0%
2013	62	2.1%
2014	31	1.9%
2015	55	2.1%
2016	44	1.85%
2017	34	1.47%
2018	47	2.12%

GBMC Surgical Site Infection Rates

July 2010- June 2018



Data based on July 2019 NSQIP SAR

Return On Investment- Cost Avoidance

- Increased costs from SSI's are driven by:
  - Increased Length of Stay
  - Emergency Department visits
  - Readmissions
- On average, an SSI extends hospital Length of Stay by:
  - 9.7 days[2]
- Increases the cost of hospitalization by:
  - More than $20,000 per admission[2]
- GBMC's highest number of surgical site infections in one year was 86 (2012), and most recently have decreased to 34, which equals a cost avoidance of:
  - **More than $1.04M per year.**

2. American College of Surgeons and Surgical Infection Society: Surgical Site Infection Guidelines, 2016 Update

Soft Return On Investment- Clinical

- Increased clinical costs from SSI's are driven by:
  - Increased Length of Stay
  - Emergency Department visits
  - Readmissions
  - Polypharmacy- antibiotics, anti-inflammatories, pain medicine
  - Iatrogenic injuries
  - Nosocomial infections

- Significant increase in morbidity and mortality for patients
- Per CDC in January 2019, SSI's were:
  - Leading cause of readmission for post-op patients
  - 3% mortality, 75% all deaths in SSI patients attributed to the SSI; 2.2 x RR of death with SSI
  - SSI is most costly Hospital Acquired Infection ($3.3 billion annual cost)
  - SSI accounts for >1 million additional annual inpatient days

Keys to Success

- Data alone will not cause change. Organizational infrastructure, culture, and information technology are all necessary.
- Empower staff to engage in performance improvement
- Leverage technology
  - Use of Epic for real time data
  - ACS-NSQIP for National benchmarking
- ACS-NSQIP is a long-term commitment by our organization and our process improvement strategy
  - Must realize the secondary benefits of a rigorous program on our culture of safety, ownership, and using data to drive outcomes
  - Incremental improvement over time continues with persistent IT work