

Rush University Medical Center HIMSS Davies Award Presentation

Chicago, IL

About Rush



Rush University Medical Center

- 669 bed academic medical center
- 35,000 admissions per year
- 65,000 ED visits per year

Clinical Staff

- 1,397 professional nursing staff
- 813 attending physicians
- 644 residents and fellows

Ambulatory Practices

- ~50 owned practices and ~100 private practices

Epic 2018 EHR

- Upgraded to 2018 7/22/2018

Clostridium *difficile* Infection Intervention Team

Case Study #1

Clostridium *difficile* Background

What is Clostridium *difficile* Colitis?

- Contagious Diarrhea
- Symptoms include: Watery Diarrhea, Abdominal pain, Fever, and Nausea/Loss of Appetite

How does it spread?

- A bacterium that spreads from one patient to another primarily through the hands of healthcare workers and contaminated environment.
- Very difficult to kill; Requires specific cleaning products
- Both modifiable and non-modifiable patient factors that increase the risk of *C. difficile* infection

C. difficile Background

Severity and Impact

- 500,000 *C. difficile* infections (CDI) in the US in 2011
- Toxic Megacolon can be a rare complication of (<3% of *C. difficile* cases), requires surgical removal of the bowel and may result in death (see picture)
- 29,000 patients died within 30 days of initial diagnosis
- *C. difficile* recurs in 25% of patients
- Intangible costs to the patient may include psychological stress, pain and suffering and change in social functioning / ADLs ¹

Financial Impact

- Total costs in the US attributable to CDI management was \$6.3 billion
- Cost of *C. difficile* in the U.S. varies based on onset of infection²
 - Average cost of Hospital onset: \$34,157
 - Average cost of Community onset: \$20,095

¹ https://www.cdc.gov/hai/organisms/cdifficile/cdifficile_clinicians.html

² Zhang, S., Palazuelos-Munoz, S., Balsells, E. M., Nair, H., Chit, A., & Kyaw, M. H. (2016). Cost of hospital management of *Clostridium difficile* infection in United States—a meta-analysis and modelling study. *BMC Infectious Diseases*, 16(1), 447. <http://doi.org/10.1186/s12879-016-1786-6>



NHSN Definitions

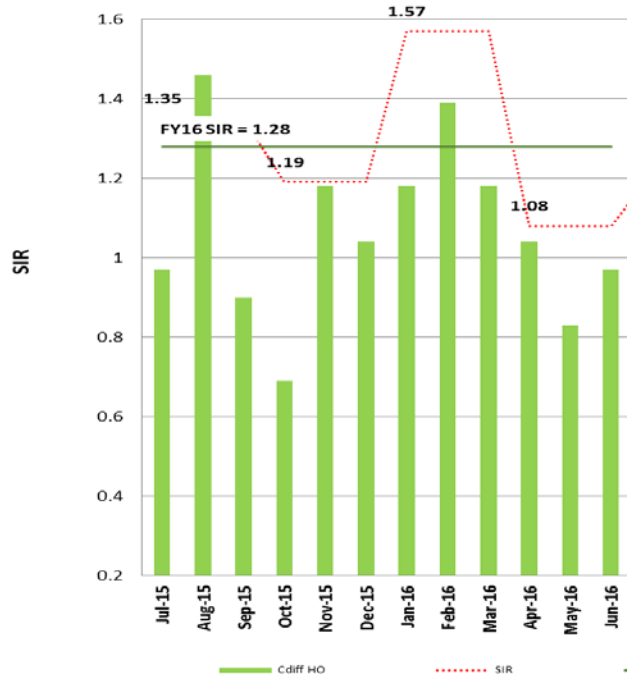
- Mandatory reporting to the National Healthcare Safety Network
- Lab ID events
 - Community Onset
 - Days 1 – 3 of inpatient admission
 - CO-HCFA
 - Hospital Onset
 - Day 4 of inpatient admission and after
- Accurate categorization
 - Helps to determine the burden of patients in the surrounding community
 - Identification of true Hospital onset cases helps to identify organizational opportunities

SIR, Percentile Ranking, and Organizational Rates

- Standardized Infection Ratio
 - Summary measure used to track HAIs over time (observed/expected)
 - Adjusts for facility/patient-level factors that contribute to HAI risk
 - Calculation is risk adjusted based on several variables
 - Facility type
 - Medical School affiliation
 - Number of ICU beds
- Percentile ranking
 - Compares our performance to all other acute care hospitals
- Organizational and Unit Based data
 - Organizational goals
 - SIR
 - Unit based goals
 - Rates

Rush *C. difficile* Baseline

Hospital Onset Clostridium Difficile
FY2016 - FY2018
(NHSN 2015 Baseline)



- All positive *C. difficile* tests identified by the lab are reviewed by Infection Prevention
 - Categorize onset as Community or Hospital Onset
 - Thoroughly review cases
 - Identify opportunities for improvement
- Monthly, Infection Prevention reports all of the *C. difficile* cases data to NHSN
- **Quarterly, NHSN calculates a SIR, which can be compared to national peers for benchmarking.**
 - FY16 SIR Benchmarked at 80% compared to peers (lower is better) ³

³ <https://www.cdc.gov/hai/surveillance/data-reports/2015-HAI-data-report.html>

Number of HO Cdiff

■ Cdiff HO
 ⋯ SIR
 — FY16 SIR = 1.28
 — FY17 SIR = 1.09
 — FY18 SIR Goal = 0.96
 — FY18 SIR = 0.89

Laying the Groundwork

- **Interprofessional team** convened
 - Performance Improvement, Infection Prevention, Infectious Disease physicians, Nursing, EVS, Antibiotic Stewardship, Clinical Engineering, and Information Systems
- **Executive leadership** provided oversight
 - Consisted of physician, nurse, and operations VP
- **Literature review** to define major strategies
- **Prioritized a multipronged approach** for leveraging Epic decision support and advanced analytics/reporting to improve outcomes

Rush Way Standard Improvement Framework

R

Ready

- Establish team
- Prepare team
- Define process at High Level
- Implement immediate containment if necessary
- Executive Sponsor Approval

U

Understand

- Establish and Execute Data Collection Plan
- Establish Baseline Performance
- Define Current Process in Detail
- Identify Root Cause
- Executive Sponsor Approval

S

Solve

- Develop Solution (s)
- Test Solution(s) (Pilot)
- Benefit Analysis
- Define Improved Process
- Develop and Execute Implementation Plan
- Executive Sponsor Approval

H

Hold

- Benefits Validated
- Process Control Systems
- Standardize and Translate
- Executive Sponsor Approval
- Celebrate!

Problem Solving Success

- Empower cross functional teams
- Focused project management methodology
- Strong team leadership

Strategies Selected to Control *C. difficile*

- Strategies selected based on **opportunities identified during case reviews**
- **Evidence based interventions** recognized by national authorities
 - Early recognition of *C. difficile*
 - Implement Transmission-based precautions
 - Begin treatment
 - Optimizing environmental cleaning
 - Ensuring appropriate testing for *C. difficile*



APIC Implementation Guide

**Guide to Preventing
Clostridium difficile
Infections**



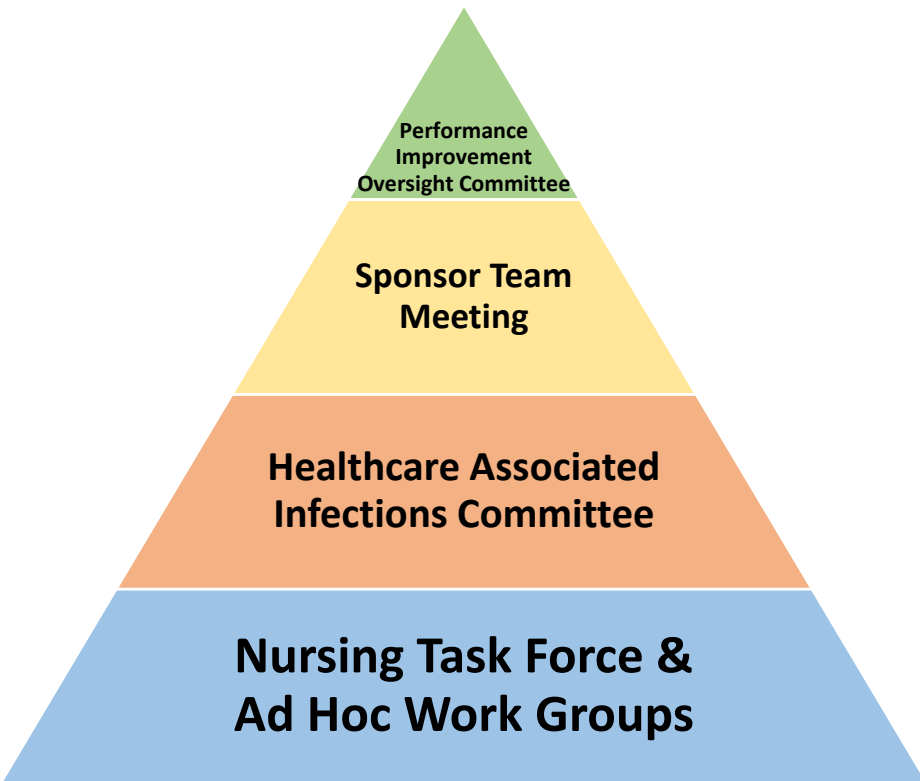
"Clinical Practice Guidelines for Clostridium difficile Infection in Adults and Children: 2017 Update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA)

2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings

Jane D. Siegel, MD; Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello, RN MS; the Healthcare Infection Control Practices Advisory Committee

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Reporting and Meeting Structure



Performance Improvement Oversight Committee

- Executive Buy-In
- Barrier Busting
- Organizational Alignment
- Monthly / Quarterly Report Outs

Sponsor Team Meeting

- Executive Buy-In
- Accountability and barrier busting
- Monthly meetings

Healthcare Associated Infections Committee

- Experts on Infection Control
- Approval body for interventions
- Weekly meetings

Nursing Task Force & Ad Hoc Workgroups

- Identified barriers
- Brainstormed solutions
- Deployed education
- Local level champions
- Nursing Taskforce Monthly meetings; Ad Hoc Groups as needed

Project Reporting Structure

Executive Sponsors	Vision, Oversight, Alignment	VP Operations, ACMO, AVP Professional Nursing Practice (PNP)					
Quality Improvement	Drive QI process. Convene, facilitate and project manage all cdiff sub-teams and related cdiff work. Report directly to Executive Sponsor(s). Provide ongoing communication within teams and to leaders.	Performance Improvement Consultant (Internal)					
Information Systems	IS / EPIC Expert	IS Analyst, Chief Analytics Officer					
Infection Prevention	Infection control expert	Infection Preventionist					
Stakeholder Groups	Partner for understanding, solution identification and implementation	Nursing	Providers	EVS & CE	ABX Stewardship Program	Infection Prevention	OTHER Stakeholder Partners
Champion	Workgroup level decision making; barrier busting within area, escalation across areas.	AVP PNP	ACMO	VP Operations	Chief Analytics Officer / ID Physician	ID Physicians x2	Varied
Process Owner	Oversee implementation in operational area; responsible for long term sustainability.	Unit Director	Medical Director, Director of APPs	EVS Director	Director, ABX Stewardship	Director, Infection Prevention	Varied
Frontline Expert Contributors	Subject matter and process expert, implement in practice, provide PDSA feedback.	Frontline		Frontline	Frontline	Infection Preventionist	Varied
Example Projects and Associated Interprofessional Teams							
	Cdiff Bundle	x	x	x	x	x	OT, PT, linen, food service etc
	Equipment Cleaning	x	x	x		x	Transport
	BPAs	x	x			x	IS
	Medication Stewardship		x		x	x	
	Hand Hygiene PPE Use	x	x	x		x	x

Intended Goals

- **Outcome Goals**

- Reduce HO *C. difficile* SIR to align with NHSN median (SIR 0.93)
 - FY 2016 Baseline: SIR 1.28⁴

- **Process Goals**

- Ensure **early identification** of true infections to appropriately isolate and reduce the spread of infection
- Ensure **appropriate testing** to avoid unnecessary isolation
- Improve **quality of environmental cleaning**
- Improve **timely and accurate data communication** to clinical and EVS teams to enable appropriate interventions

⁴ <https://www.cdc.gov/hai/surveillance/data-reports/2015-HAI-data-report.html>

Colonization vs Active Infection

- **More efficient testing methods** have led to an increased identification of patient's colonized with *C. difficile* vs those with an active infection
 - PCR testing identifies the presence of the organism
 - **Over identification** of colonized patients
- **Patients colonized with *C. difficile* spores do not have signs/symptoms**
- **Patient with active *C. difficile* infection have large volumes of liquid/loose stool which contributes to the transmission of infectious organisms**
- The 2017 IDSA *C. difficile* guidelines recommend **use of nucleic acid amplification testing alone if patients are properly screened** for symptoms of active infection

Importance of Accurate Testing

- **Accurate Testing**
 - Early Identification to reduce spread
 - Reducing inappropriate diagnosis (and reducing unnecessary testing, isolation, antibiotics)
- **Accurate classification** of Community Onset vs Hospital Onset infections allows us to:
 - Better understand our opportunities to decrease preventable transmission/infection
 - Clear outcome metrics for evaluation of interventions
 - Accurately benchmark against other organizations

Problem Summary and Decision Support

- **Inconsistent ordering practice**
 - Patients not identified at onset of symptoms
 - Inappropriate orders for patients without clear symptoms or other known reasons for symptoms
- Nursing and EVS **inconsistent processes** for **communicating** cases; standardizing response
- Reached out to IS to determine the options for
 - Providing ordering guidance
 - Hard stopping inappropriate orders
 - Order authorization process
 - Push notifications
- **BPA**s have shown to be the **best method** to hardwire ordering practice

Nursing: Order Guidance PDSA

May 2015

First nursing BPA initiated

- Nurses unable to order testing

Fine Tuned Solutions

1. Limiting BPA overrides
2. Order validation that doesn't allow protocol orders after day 3
3. Nursing education

Nurse C. difficile protocol approved by MEC

- Allow nurses to order in Epic
- Confusion about when it is appropriate for nurses to order
- Many orders placed by nursing outside of the approved protocol

March 2017

Encourage Earlier Identification of Symptoms

- **Prior to admission**
 - ED admission assessment form identifies diarrhea and tests on the spot
- **Once admitted**
 - Nursing Patient Admission Assessment identifies diarrhea
 - Nursing BPA to remind to test based on
 - Admission Assessment
 - Day 1: Diarrhea
 - Day 2: 3 or more stools documented
 - Medical Executive Committee approved Nursing Protocol allowing nurses Epic access to order in first 3 calendar days of inpatient stay
- **Accountability**
 - In Basket message to ACMO when order not placed per BPA

Nursing: Decision Support

Admission

ADULT ADMISSION
 Interpreter
 Allergies
 Vitals
 Dosing Weight
 Med Hx & Pharm...
 Controlled Med Hx

PROTOCOLS
 Pregnancy Tests
 OB/Gyn Status
 Pregnancy Protocol
 Immunization Rep...
 Last Vaccine
 Historical Vaccines
 Imm/Injections
 Protocol Orders
 Orders

NURSING ASSESSMENTS
 LDA Removal
 General Assess
 Fall Risk Assess
 Safety Assessment
 Braden Scale
 Adult Assessment

Needs Assessment - Needs and Orientation

Time taken: 1650 8/7/2018

Values By

Sleep

Difficulty Sleeping Yes (Comment) No
 Sleep Needs Assessment: 9/11/17 0744 - 8/7/18 1650

Use of Sleeping Aids Yes (Comment) No
 Sleep Needs Assessment: 9/11/17 0744 - 8/7/18 1650

Bowel

Last Stool Prior to Admission
 Bowel Needs Assessment: 9/11/17 0744 - 8/7/18 1650

Patient was experiencing watery / loose or diarrhea stools now or within the past 24 hours Yes No
 Bowel Needs Assessment: 9/11/17 0744 - 8/7/18 1650

Psychosocial/Spiritual

Resources for Emotional Support Spouse Family None
 Psychosocial/Spiritual Needs Assessment: 9/11/17 0744 - 8/7/18 1650

Nurses document diarrhea prior to admission for all patients

During the first three hospital days, BPA suggest *C. difficile* order

April 2017- Nursing Protocol allowed Nursing orders

In Basket message to ACMO if order not placed within 6 hours

BestPractice Advisory - Diarrhea

ⓘ Your patient may have diarrhea. If yes, place the patient in contact precautions and place a *C. difficile* test order via Conditional/Protocol Order mode.

The following actions have been applied:

✓ Scheduled: If the order is not placed in 6 hours, this patient will be added to an InBasket message for review by the CMO's office.

Acknowledge Reason

No diarrhea in the past 48 hours Select Other Option

BestPractice Advisory - Testflag,Diarr

ⓘ This patient has documented diarrhea in the past 48 hours. Place the patient in contact precautions and place a *C. difficile* test order via Conditional/Protocol Order mode.

The following actions have been applied:

✓ Scheduled: If the order is not placed in 6 hours, this patient will be added to an InBasket message for review by the CMO's office.

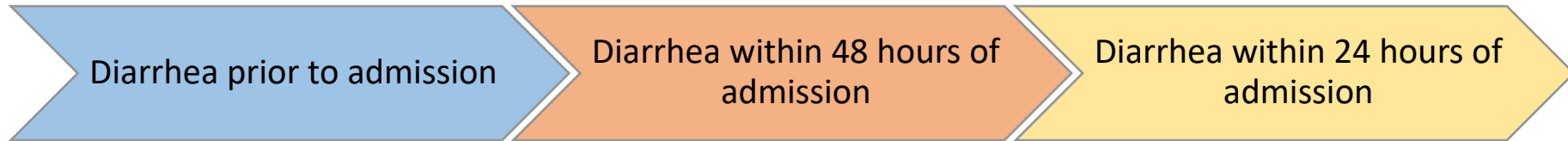
Acknowledge Reason

GI Bleed Bowel Prep

Best Practice Alert: Promise, Progress and Pitfalls

- **Nursing BPA evolution**

- Initially fired based on documentation of stool description / criteria
 - Yielded 100-200 alerts per month
- Expanded to fire based on admission question – added an additional 500-600 alerts per month

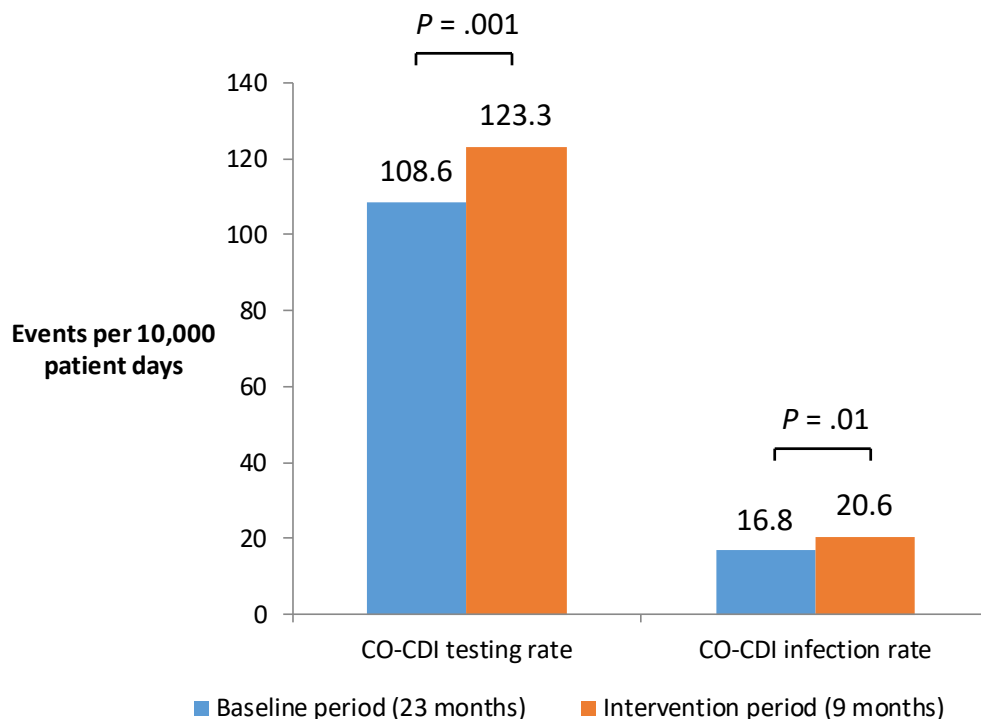


- There was an unanticipated dramatic increase of 50% in the number of BPAs that fired as a result of changes that were made to optimize the intent of the admission BPA
- The BPA was updated – requiring nursing to make a decision to either order testing or document one of the predetermined acceptable reasons for BPA dismissal.
 - The number of admission BPAs returned to expected

This process set BPA standards for the organization

- Changed internal workflow
- BPA changes are now initially run silently in the background

Community-Onset CDI Testing and Infection Rates



Provider: Ensuring Appropriate Testing

Mar. 2017

BPAs to alert providers

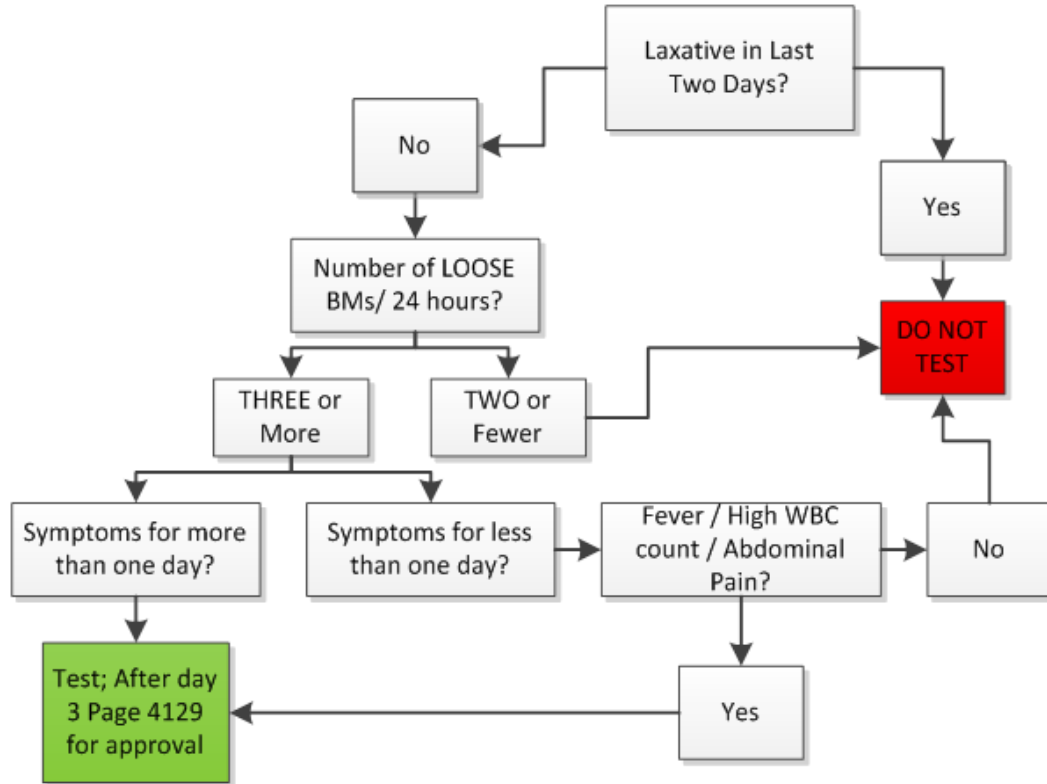
- Patient is on a laxative
- Patient has documented formed stool
- Patient has had <3 stools in 24 hours
- Patient has had a previous negative in 7 days

BPA to consult with ID

- To confirm that the patient does not have diarrhea associated with expected course of therapy
- Screen for the presence of signs/symptoms of active C. difficile infection

Dec. 2017

C. difficile BPA Inpatient Algorithm Workflow



Provider Interventions

BPAs to warn providers that they shouldn't test when: On a laxative; Formed/hard stool; Fewer than 3 stools in a 24 hour period; negative test in the past 7 days

Changed to a hard stop BPA that requires an Infectious Disease provider's name to proceed with order

ⓘ

Your patient's last stool consistency was charted as 'formed' or 'hard', making *C. difficile* colitis unlikely. *C. difficile* testing is not indicated at this time.

Remove the following orders? _____

C. Difficile Toxin by PCR
Print Label On Demand, ROUTINE First occurrence Today at 1724, Stool

Acknowledge Reason _____

ⓘ

BestPractice Advisory - Test, Caitlin

ⓘ *C. difficile* testing after 72 hours of hospitalization requires approval. Testing will not be performed at night. If you suspect *C. difficile* infection, place your patient on enhanced contact precautions and page 4129 between the hours of 8am and 5pm. If your suspicion for *C. difficile* associated diarrhea is high you may also consider starting empiric therapy.

Remove the following orders? _____

C. Difficile Toxin by PCR
Print Label On Demand, ROUTINE First occurrence Today at 1739, Stool

[More info about Ordering Process](#)

Acknowledge Reason _____

Daily report sent to Infectious Disease team to ensure that someone approved all *C. difficile* orders placed the previous day

Provider Approval Validation Processes

C Diff Orders Placed Yesterday [4208654] as of Tue 8/7/2018 5:41 PM

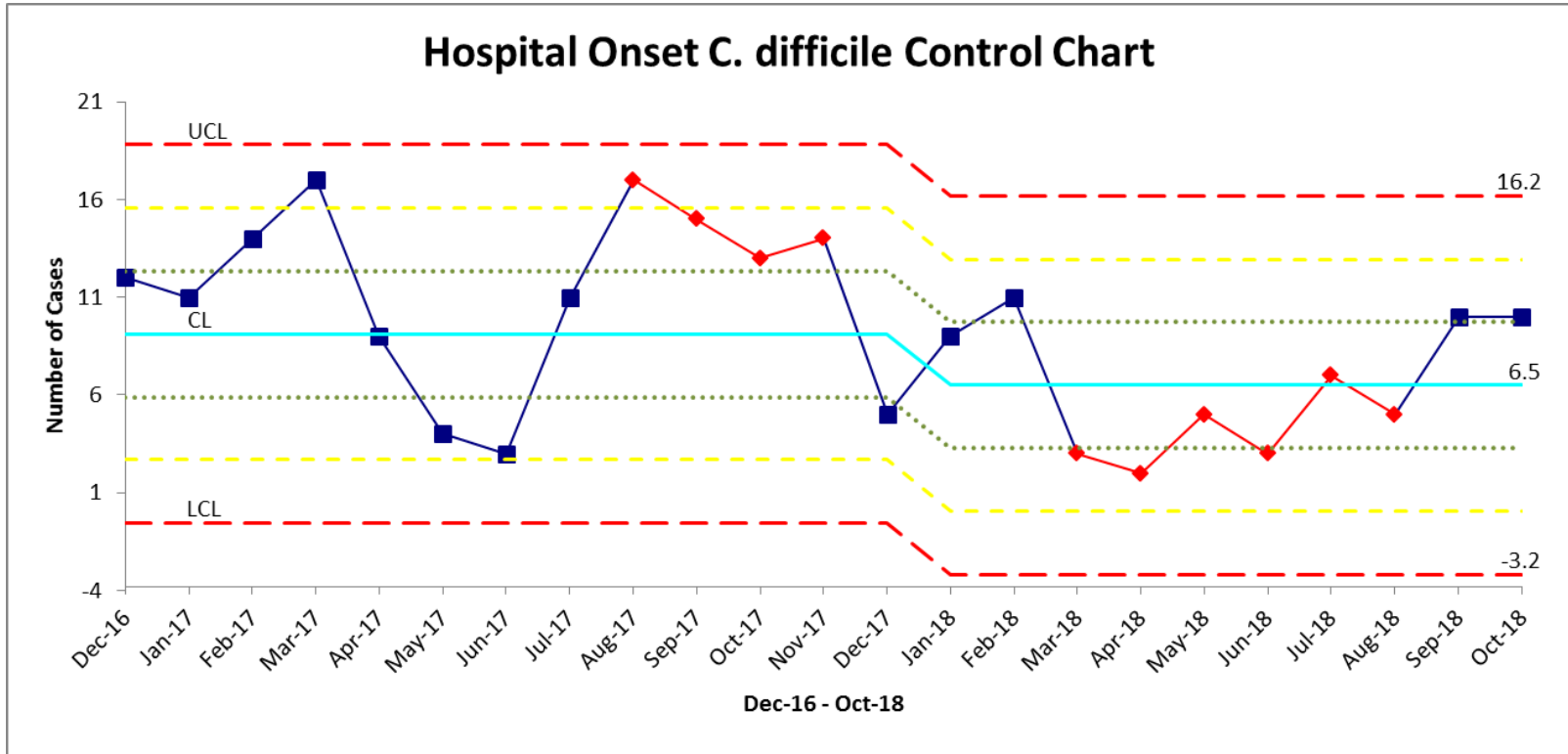
 Filters
  Options
  Management Console

Patient Name	MRN	Department	Alert Date	Alert Time	User	Provider Type	Alert Comments
		T14E - BMTU / HEMAT / ONC	08/06/18	1036	REIMER, ASHLEY	Physician Assistant	Dr. Segreti
		K09 - MEDICAL OBSERVATION	08/06/18	0101	ATISHA, PATRICK N	Attending	atisha
		T11E - SICU	08/06/18	0907	HETREA, STEPHANIE	Nurse Practitioner	Dr Proia, L

Reasons for *C. difficile* Test Non-Approval

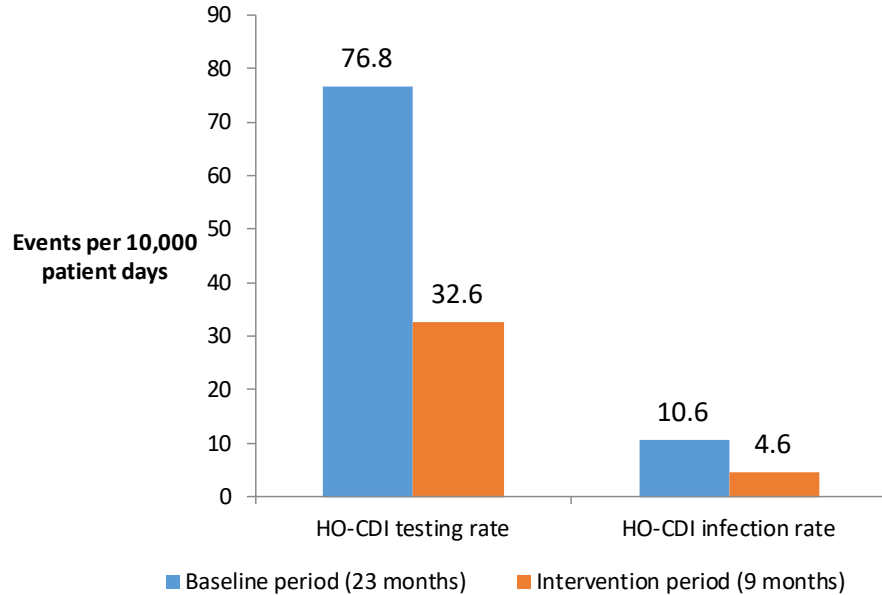
Reason	N	(%)
Laxative use in prior 48 hours	32	(46)
Did not meet diarrhea criteria	28	(40)
<3 BM/day	12	
<1 day of diarrhea	10	
No diarrhea	6	
Clinical syndrome not suggestive of <i>C. difficile</i> infection	8	(11)
Negative <i>C. difficile</i> test in prior 7 days	1	(1)
Recent positive <i>C. difficile</i> test	1	(1)

Hospital Onset Control Chart



Outcome Value

Impact of Mandatory ID Specialist Testing Approval on HO-CDI Testing and Infection Rates



Note. ID = Infectious Diseases. HO-CDI = Hospital onset *Clostridium difficile* infection using CDC's Laboratory-Identified (LabID) Event definition. Rate differences between baseline and intervention period were tested using Poisson models.

58% reduction in HO-CDI testing
57% reduction in HO-CDI rate

- Hospital onset CDI rate decreased from 10.6 cases/ 10,000 patient days → 4.6 cases / 10,000 patient days

C. difficile Pushed Reports



RUSH UNIVERSITY MEDICAL CENTER CDIFF PATIENTS - DAILY REPORT

Last Refreshed on 2018 Aug 13 at 06:30 AM

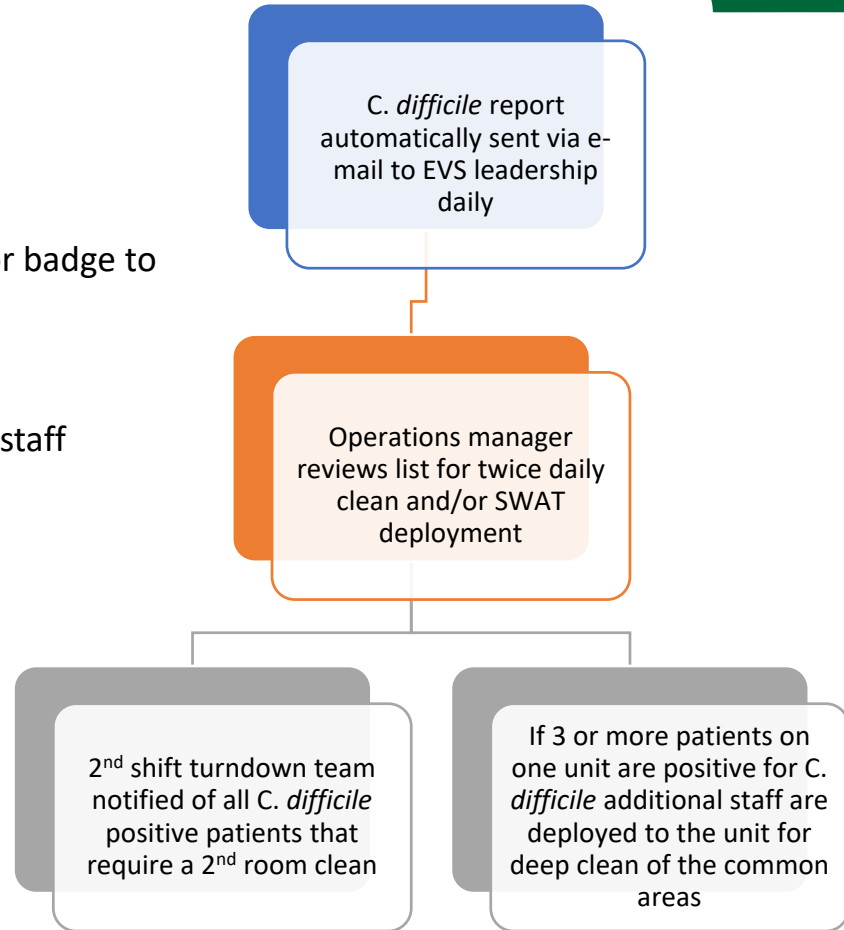
DEPARTMENT	MRN	PATIENT NAME	SEX	AGE	ROOM	ATTENDING	ADMIT TIME	ORDER DATE	ORDERING PROV
A7N Medical			F	64	AN745	Wagenaar Brian L	8/11/2018 08:41 AM	8/11/2018	Tenuto Frank A
T11W Nsicu			F	71	T1116	Lopez George A	7/27/2018 12:13 AM	7/30/2018	Akinduro Kolawole
T12E Imcu / Surgical			F	51	T1255	Gupta Samir K	8/ 3/2018 06:11 AM	8/8/2018	Kalra Salil
T12W Neurosciences			M	46	T1218	Dafer Rima M	7/19/2018 07:53 PM	7/21/2018	Garg Rajeev Kumar
T14E Bmtu / Hemat / Onc			F	63	T1473	Nathan Sunita	7/30/2018 06:06 AM	8/5/2018	Baptista Jacqueline A
T14E Bmtu / Hemat / Onc			F	55	T1455	Nathan Sunita	8/ 6/2018 03:46 PM	8/7/2018	Reimer Ashley

- **EVS** utilizes *C. difficile* pushed report to identify rooms for
 - Twice daily cleaning
 - “SWAT” Clean Team
- **Nursing** utilizes pushed report to confirm standard work:
 - Appropriate isolation signage
 - PPE stocked
 - Bleach wipes available

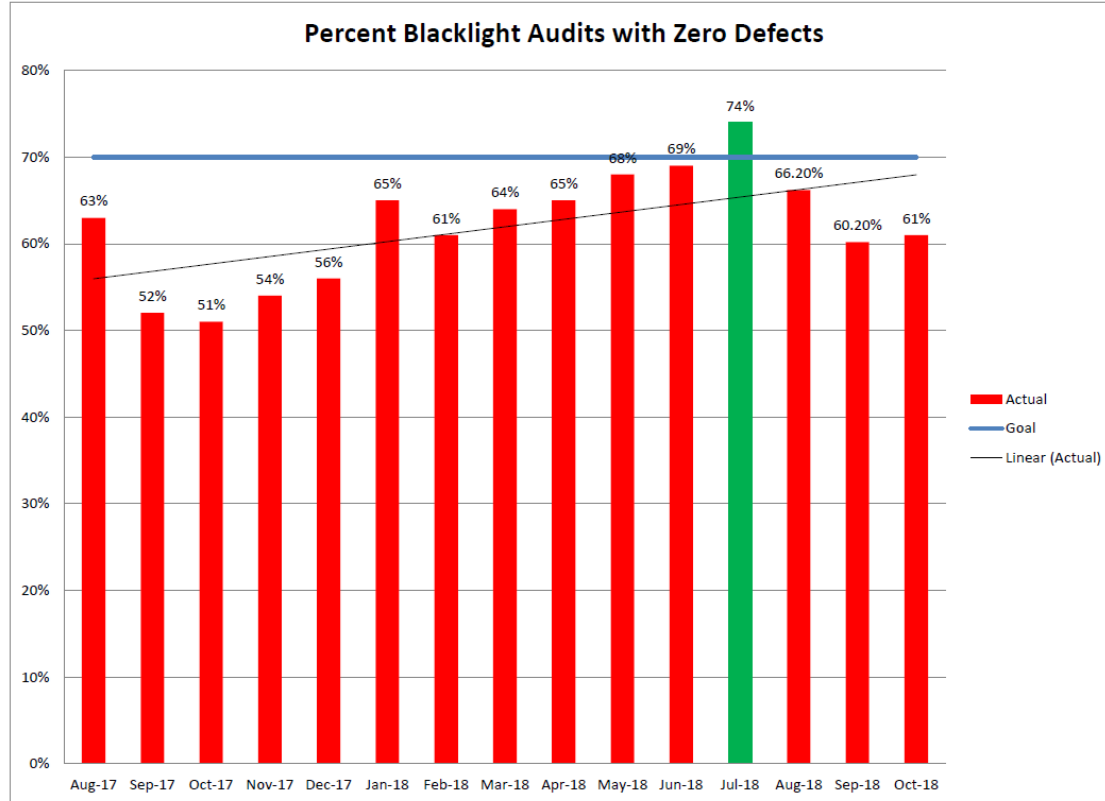
EVS Workflow

Currently investigating the potential use of a locator badge to verify room cleaning

- Provides real time location
- Already in use by nursing and other unit based staff



Environmental Cleaning Audits in Epic



- **EVS** transitioned their paper audit process into Epic
 - Allowed for ease in data collection and transparency in reporting

Additional Outcome Values

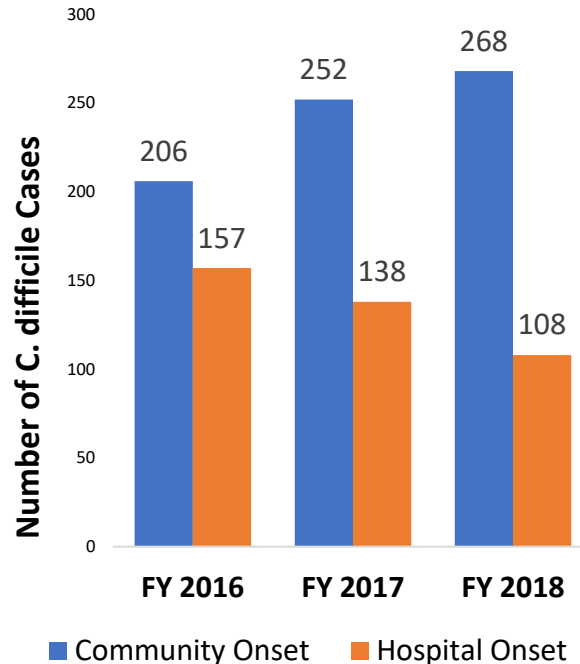
- **Estimated \$1.2 million*** in monetary savings over the last 2 years

Year	Total Cases HO+CO	Projected Cost based on FY16 Rate of 43% HO	Actual Rate of HO	Actual Cost HO + CO	Estimated Savings from FY16 Baseline
FY16	363	\$9,502,219	43%	\$9,502,219	0
FY17	390	\$10,199,466	35%	\$9,777,606	\$421,860
FY18	376	\$9,833,764	29%	\$9,074,416	\$759,348
Total	1129	\$29,535,449		\$28,354,241	\$1,181,208

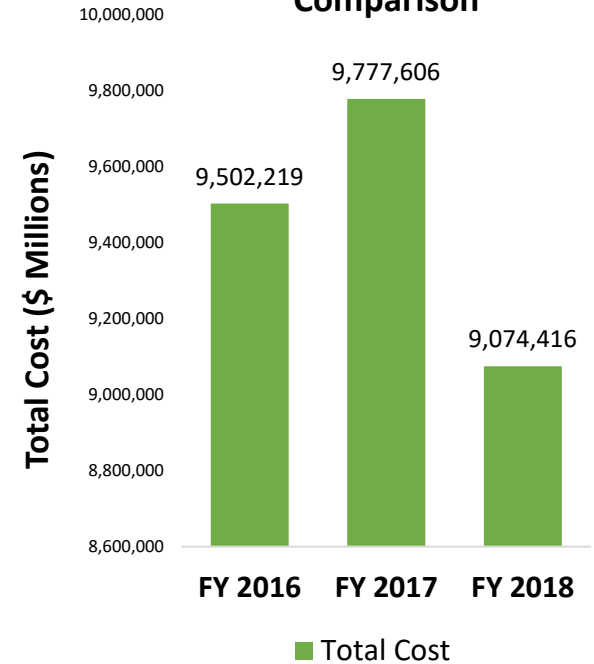
- **Intangible values**
 - Decrease PPE
 - Decrease carbon footprint
 - Increase patient satisfaction
 - Decrease use of antibiotic for patient that does not need

Return on Investment

C. difficile Case Onset Comparison



C. difficile Financial Comparison



- **Increased number of CO cases**
 - Increases the burden of *C. difficile* in the hospital
 - Increases the risk for transmission

Continuous Improvement of Care

Hospital Onset Clostridium Difficile
FY2017 - FY2019
(NHSN 2015 Baseline)

