

C. difficile Reduction:

Experiences with Quality Improvement at Mass General Hospital

Erica S. Shenoy, MD, PhD; David Hooper, MD; Michael Phillips, MPH; Brian Cummings, MD, PhD; Lauren West, MPH; Dee Dee Suslak, MSN; Paula Wright, RN; Scott Parsons; Ellen Fitzgerald, RN; Barbara Cashavelly, RN; Sara Geary, RN; Susan Finn, RN; Judith Tarselli, RN; Joshua Stripling, MD; Karen Coffey, MD, MPH; George Eng, MD, PhD; Kerry Reynolds, MD; Gabriella Hobbs, MD; Sean McWalters, MS, CPHQ; Syrene Reilly, MBA and Elizabeth Mort, MD, MPH

Background

- *Clostridium difficile* (*C. diff*) is one of the most common hospital-acquired infections in US hospitals. Toxin-producing strains can cause severe gastrointestinal symptoms that may result in long term complications and increased costs of care.
- The *C. diff* organism produces spores that cannot be eliminated using alcohol-based hand rub (ABHR) and can be easily transmitted in the healthcare environment unless correct contact and hygiene precautions are taken.
- *C. diff* poses a significant risk to patient safety, particularly on acute care units where individuals are most sick. To address this, an interdisciplinary team was formed consisting of subject-matter experts and quality improvement professionals.
- Now entering its second year, the team has worked together to identify drivers of *C. diff* infections at Mass General and to design, support and pilot several tests of change to limit transmission and lower the incidence of *C. diff*.

AIM

- Reduce the number of Hospital Onset, Lab-Identified *C. diff* (HO LabID CD) by 10% on two medical oncology units by the end of 2017, relative to a 2016 baseline, supported by interventions beginning at the end of Q1 2017.

Approach and Methods

Defining the problem

- The incidence of HO LabID *C. diff* was evaluated to understand the hospital-wide burden of the disease and to highlight any opportunity to target small tests of change to specific units.
- 2016 HO LabID *C. diff* data showed a disproportionate number of infections originated on two medical oncology units, cumulatively accounting for approximately 20% of the total burden of *C. diff* at Mass General (Figure 1).
- The team identified collaboration points with nursing, clinical and environmental service leadership to seek improvement in these locations.

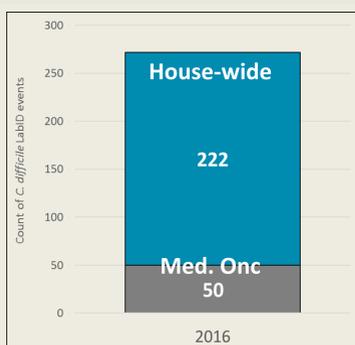


Figure 1: 2016 Incidence of LabID HO *C. diff*

Identifying Drivers

- The in-hospital pathway of *C. diff* infections was analyzed to identify drivers and potential change ideas that could reduce the incidence of infection on these units.
- Drivers fell into 3 principal categories, each spawning related change ideas that could minimize transmission and advance appropriate identification of *C. diff* (Figure 2).

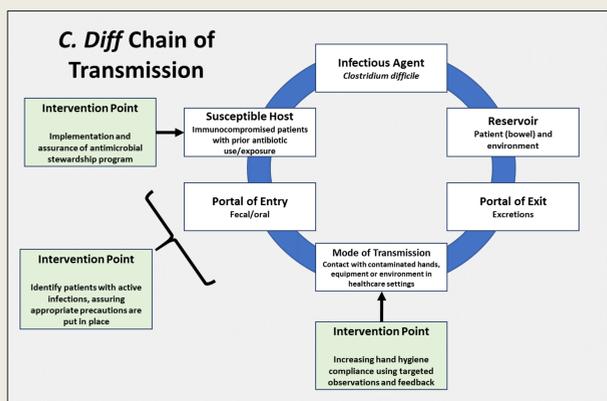


Figure 2: *C. diff* Chain of Transmission with intervention points

- Note that, although antimicrobial stewardship is an essential step to prevent *C. diff*, it was considered outside the scope of this group due to other competing efforts and availability of resources.

Preventing Transmission by Enhancing Healthcare Worker Hand Hygiene Compliance

- The group monitored hand hygiene compliance exit from *C. diff* rooms on targeted medical oncology units and provided enhanced feedback to increase compliance to prevent transmission of *C. diff* from workers to patients.
- Hand hygiene compliance was the process measure essential to project success. The primary outcome measure was the reduction of *C. diff* on targeted units (Table 1).
- This activity was carried out from May 2017 to December 2017 with observations being performed by an independent observer.
- Compliance was analyzed using R Studio. This was paired with insights and tips from observations and reported to unit leadership to be shared among HCWs working on the units.

Measure	Intervention
Outcome	Reduction of <i>C. diff</i>
Process	Hand hygiene compliance
Balance	Time spent observing

Table 1: Process, balance and outcome measures

Results

Process Measure: Hand Hygiene Compliance

Table 2: Process measure results

Floor	Baseline	Performance	Hours spent
Unit 1	31%	60%*	~81 hours
Unit 2	63%	69%	
Cumulative	57%	65%	

*Significant improvement ($p < .01$)

- During the intervention period both target units exhibited an increase of at-exit hand hygiene compliance relative to baseline. The increase in unit 1 was statistically significant at $p < .01$ (Table 2).

- Cumulative improvement was not significant; however there was an observed 8% absolute increase in hand hygiene compliance across both units. Compliant behaviors remained variable at the end of the intervention period, likely due to variation in weekly sample sizes, but a decrease of defects was noted (Figure 3).

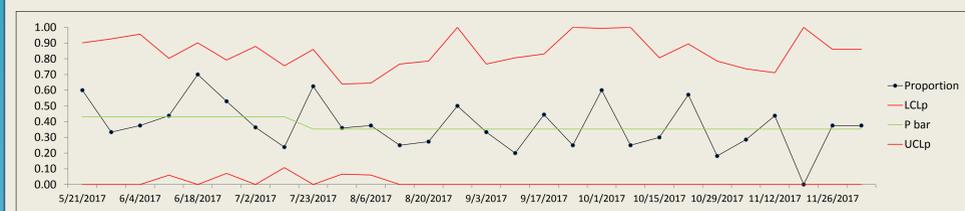


Figure 3: Cumulative Hand Hygiene Compliance through intervention

Outcome

- The primary outcome measure for phase 1 of this project was to reduce the incidence of HO LabID *C. diff* on the two targeted medical oncology units.



Figure 4: Incidence of LabID HO *C. diff* on targeted units between Q1 16 - Q4 17

- From the formation of the workgroup at the end of Q1 2017 we observed a reduction of incident HO LabID *C. diff* events on the two target units. This corresponded with increased surveillance and feedback of hand hygiene practices.
- From the formation of the workgroup at the end of Q1 2017 we observed a drop of incident HO LabID *C. diff* events on the two target units. This corresponded with increased surveillance and feedback of hand hygiene practices.
- The pre-intervention mean was 14. The post-intervention mean was 6 events. There was an overall reduction of 24% between 2016 & 2017. Resulting in our phase 1 AIM being met (Figure 4).

Phase 2

- The group is continuing its work to reduce *C. diff* at Mass General. Now in Phase 2, the group has revisited the drivers of *C. diff* infections.
- Through this process, the team established a new AIM seeking 10% reduction of hospital-wide events by the end of 2018, relative to a 2017 baseline, supported by interventions beginning Q1 2018.
- This will be achieved through a combination of targeted and hospital-wide initiatives designed to prevent transmission and through the promotion of appropriate testing for the disease (Table 3).

Driver	Intervention
Preventing environment to patient transmission	Installation of disposable toilet brushes
Appropriate identification of infected patients	Education, analytics and communication for <i>C. difficile</i> testing protocol
Preventing HCW to patient transmission	Nurse directed hand hygiene observations and feedback

Table 3: Phase 2 interventions

Conclusions

- *C. diff* reduction requires a cross-disciplinary approach to be successful given its involvement with multiple aspects of care.
- Planning requires careful analysis of all contributing factors so they can be thoughtfully addressed in the context of available resources.
- Differing start points between intervention targets will affect statistical significance; but improvement can still be documented.

References

1. Lessa FC, Mu Y, Bamberg WM, et al. Burden of *Clostridium difficile* infection in the United States. *N Engl J Med* 2015;372:825-34.
2. Alonso CD, Marr KA. *Clostridium difficile* infection among hematopoietic stem cell transplant recipients: beyond colitis. *Curr Opin Infect Dis* 2013;26:326-31.
3. Kelly SG, Yarrington M, Zembower TR, et al. Inappropriate *Clostridium difficile* Testing and Consequent Overtreatment and Inaccurate Publicly Reported Metrics. *Infect Control Hosp Epidemiol* 2016;37:1395-400