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Project #18: Improving Early Detection of Clostridioides difficile Infections Through Electronic Reports

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Improving Early Detection of *Clostridioides difficile* Infections Through Electronic Reports

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WINNER

AIM

Clostridioides difficile (C. difficile) is a serious infection, causing life-threatening diarrhea. Patients with *C. difficile* will have liquid, loose, mucous-like, or non-formed stools. The financial burden of *C. difficile* infection (CDI) is substantial, increasing costs up to an additional $32,000 during hospitalization.[1] These patients can have complications leading to surgical intervention, longer length of stay, and are at risk for recurrent infection, which further adds to healthcare cost.[2] Each year nearly 500,000 people in the United States develop CDI.[3] Although *C. difficile* is historically classified as a hospital acquired condition, the incidence of community acquired CDI (CA-CDI) has increased.[4]

Classification of CDI is dependent upon hospital day. Positive stool samples collected within the first 3 calendar days of admission are classified as CA-CDI. Positive samples collected on calendar day 4 or after are hospital acquired CDI (HA-CDI). The institution had an existing nurse-driven *C. difficile* testing (CDT) protocol in place. According to the protocol, patients with mushy, loose, liquid/watery stool or clinical suspicion of *C. difficile* within 3 calendar days of admission are to be tested. Nurses can order CDT and isolation in the electronic medical record (EMR) without a provider co-signature. After calendar day 3, an automated *C. difficile* test-order hard-stop appears if patients received recent promotility agents, were tested in the last week, or previously tested positive during the admission.[5]

Problem Statement: The surgical intensive care unit (SICU) at Henry Ford Hospital experienced low incidence of CDT during the first 3 calendar days of admission and high rates of HA-CDI in 2019 and 2020.

Improvement Statement: The goal was to use an electronic medical record (EMR) report to conduct early screening for patients on the SICU to improve capture of CA-CDI by at least 50% by the end of 2022.

PLAN

- A planning group formed to analyze SICU CDI data and assess for missed opportunities for CDT during the first 3 calendar days of hospital admission.
- The team collaborated to develop a stool report in the EMR to assist in early screening for patients with potential CA-CDI.

Table 1: Example of SICU Stool Report

Bed	Actual Calendar Day	Stool Consistency
P411	1	Liquid/Watery Liquid/Watery
P438	3	Mushy
P456	3	
P458	4	Formed

DO

1St Quarter 2021: The clinical nurse specialist collaborated with Information Technology to build the stool report (Table 1). The report included patient identifiers, actual calendar day, and stool consistency and frequency.

Stool Report Implementation: Starting February 2021, the stool report was populated and reviewed daily by the clinical nurse specialists or infection prevention specialist. If documentation of mushy, loose, liquid/watery stool was identified within the first 3 calendar days of admission and CDT was not ordered, the clinical nurse specialists followed up with the assigned nurse.

Real Time Follow-up with Nursing: When CDT was not ordered when indicated, the protocol was reviewed with nursing staff, real-time education was provided, and testing and isolation were initiated.

Education: Infection prevention in-services were provided to nurses, reviewing unit data & the nurse-driven CDT protocol. Provider education was completed during SICU Collaborative meetings. Information was also reviewed at huddles and during SICU Progression Rounds.

CHECK

3rd Quarter 2021: The team reevaluated the frequency the report was reviewed and agreed it was necessary to continue with daily assessment.

4th Quarter 2021: Henry Ford Health implemented a loose stool best practice alert (BPA) within the EMR. This alerts the nurse of potential CDI during the community-acquired window. Gaps in early testing persisted on the SICU after implementation of the BPA. Daily population of the screening report, in conjunction with follow up, remained essential to facilitate early CDT after implementing the BPA.

Ongoing Education: Provider and nurse education were provided throughout the implementation period which included follow-up after missed CDT and during SICU orientation.

MEASURES

Data from the pre-intervention period (2019-2020) was compared to the intervention period (2021-2022).

- Twenty CA-CDIs were discovered with the use of the screening tool during the intervention period, compared to 8 prior to project implementation, resulting in a 150% improvement. HA-CDI rate decreased by 64%, from 7.3 in the pre-intervention period to 2.6 in the intervention period. When comparing CDT order trends, differences were noted after implementation of the stool report. A total of 606 CDT orders were placed in the SICU from 2019-2022, with 303 orders in both the pre-intervention and intervention periods. The percentage of CDT orders placed during the first 3 calendar days of hospital admission were 129% higher in the intervention group (56.8%) compared to the pre-intervention group (24.8%) ($p < 0.001$) (Table 2).
- Estimated healthcare cost was reduced by $384,000 during the intervention period.
- Patient demographics were similar between groups. In the pre-intervention period, 61% of patients were male compared to 50% in the intervention period. Average age of patients who developed HA-CDI in the SICU was 63 in the pre-intervention period compared to 69 in the intervention period.

ACT

- Successes and lessons learned were shared at monthly collaborative meetings and during shift huddles. Consistent messaging and education were critical to ensure compliance with the nurse-driven CDT protocol.
- **1st Quarter 2022:** Due to the success on the SICU, the screening report was implemented on other inpatient practice areas at Henry Ford Hospital.
- **2nd Quarter 2022:** Building on the success, the Infection Prevention and Control Department utilized the stool report to screen all inpatient areas for potential CDI, with similarly positive results. The stool report was easily implemented in various clinical settings.
- **3rd Quarter 2023:** A workgroup formed to improve the report to include additional columns, such as order and sample collection status. An updated screening report was shared at the System *C. diff* Collaboration Call. The report was shared across the organization to improve screening and capture of CA-CDI.

Table 2: Pre-Intervention and Intervention Data

Variable	Pre-Intervention	Intervention	Difference	P-value
Instance of CA-CDI	8	20	150% Increase	
HA-CDI Rate	7.3	2.6	64% Reduction	0.31
Percentage CDT Orders Placed in the First 3 Calendar Days	24.8%	56.8%	129% Increase	<0.001

KEYS TO SUCCESS

- Frequent and consistent messaging from the team was beneficial.
- Staff communicated concerns for testing cost. Education was provided explaining that the cost of the test, which is noninvasive and does not cause any harm to the patient, is inexpensive when compared to the cost of delayed discovery of a CDI.
- When CA-CDI was identified, staff recognition was provided in huddles and through email.

REFERENCES

1. Agency for Healthcare Research and Quality. Estimating the additional hospital inpatient cost and mortality associated with selected hospital-acquired conditions. 2017. https://www.ahrq.gov/hai/pfp/haccost2017-results.html. Accessed November 27, 2023.
2. Zhang S, Palazuelos-Munoz S, Balsells EM, Nair H, Chit A, Kyaw MH. Cost of hospital management of Clostridium difficile infection in United States-a meta-analysis and modelling study. BMC Infect Dis. 2016;16:447.
3. Centers for Disease Control and Prevention. Clostridioides difficile Infection. 2019. https://www.cdc.gov/hai/organisms/cdiff/cdiff_infect.html. Accessed November 27, 2023.
4. Fu Y, Luo Y, Grinspan AM. Epidemiology of community-acquired and recurrent Clostridioides difficile infection. Therap Adv Gastroenterol. 2021;14:17562848211016248.
5. Shallal A, Cherabuddi M, Podsiad L, et al. Role of diagnostic stewardship in reducing healthcare facility-onset Clostridioides difficile infections [abstract]. Antimicrob Steward Healthc Epidemiol. 2022;2(Suppl 1):s28-s29.