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Brief Report

# *Clostridioides difficile* nurse driven protocol: A cautionary tale

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In a 12-month study, a nurse driven protocol was implemented at a tertiary academic medical center. The purpose of the nurse driven protocol was to identify community-onset *Clostridioides difficile* infections, expeditiously isolate patients with presumed *C difficile* diarrheal illness, and prevent transmission while simultaneously decreasing the incidence of hospital-onset *C difficile*. The overall adherence to fidelity of the protocol was poor and failed to have a significant impact on infection rates.



*Clostridioides difficile* is a gram-positive, spore-forming bacteria that is resistant to many antibiotics.[1] *C difficile* infections (CDI) are the most common hospital-acquired infections, and are associated with significant morbidity with symptoms ranging from severe diarrhea, colitis, and even death.[2] Hospital-onset (HO) laboratory-identified *C difficile* is defined by the National Healthcare Safety Network as a positive test performed on or after the fourth day of hospitalization.[3]

Many patients with *C difficile* are asymptomatic carriers. Testing asymptomatic patients contributes to unnecessary antibiotic treatment because polymerase chain reaction (PCR) tests do not differentiate between harmless colonization and CDI.[4-6] Antibiotic overuse alters intestinal microbiota, creating a favorable environment for future CDI.[1] Lack of fidelity with *C difficile* testing protocols results in inappropriate testing and an increase in HO CDIs.[7]

A nurse driven protocol (NDP) was implemented in January of 2017, at an academic tertiary medical center to reduce HO CDI. This protocol aimed to improve the detection of community-onset (CO) infections and implement early isolation to prevent transmission. The fidelity of this protocol was examined over the course of 12 months.

## METHODS

An NDP (Fig 1) was implemented from January to December 2017, hospital-wide in a single academic tertiary medical center. The protocol consisted of 4 criteria for *C difficile* testing: (1) 3 or more watery stools within the past 24 hours[8]; (2) no administration of laxative/enema or bowel preparation medications within the past 24 hours; (3) no alternative explanation for diarrhea (such as tube feeding, liver failure, inflammatory bowel disease, etc); and (4) zero positive *C difficile* results within the past 7 days. Infection preventionists (IP) provided multiple education sessions on the NDP to the unit-based champions of infection prevention (CHIP) nurses and unit leadership prior to implementation and throughout the 12-month study period. CHIPs and unit leadership provided education to front-line staff.

All stool specimens were tested in the laboratory using PCR. Positive and negative *C difficile* tests ordered via the NDP were analyzed. Test fidelity was determined by retrospective electronic medical record (Cerner Software System, Kansas City, MO) manual review by the IPs. Test fidelity was confirmed if there was documentation of at least 3 watery stools and no laxative administration within 48 hours of testing (later changed to 24 hours in the fifth month of protocol implementation). Additional analysis included the number of tests ordered by provider level, *C difficile* tests performed within the first 3 days of hospitalization, and the number of HO cases versus CO cases.

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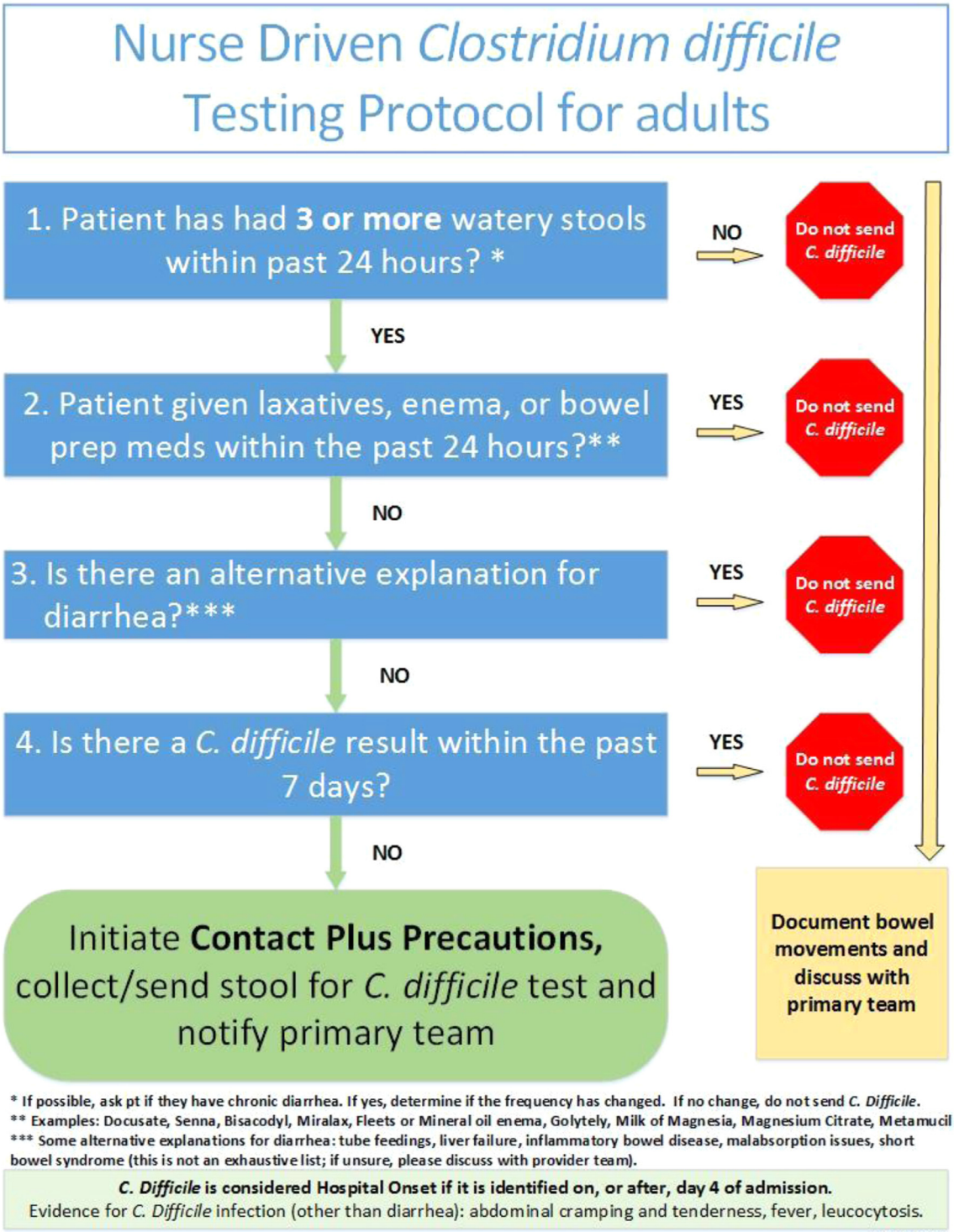


**Fig 1.** *Clostridioides difficile* testing nurse driven protocol.

## RESULTS

During the 12-month study period, a total of 3,474 *C difficile* tests were completed, 14% were positive; 321 tests were ordered via the NDP, 10% (32/321) were positive (Table 1). Analyzing positive and negative NDP test results yielded a 37% compliance with test fidelity. NDP testing fidelity for positive *C difficile* was at 28% (9/32). Testing fidelity failures included administration of laxatives (24%) and lack of clinically significant diarrhea (41%) during the testing period. NDP testing identified 23 HO cases and 9 CO cases. Of the 32 positive *C difficile* cases obtained by the NDP, 72% met the National Healthcare Safety Network laboratory identified definition for HO; 70% of the HO cases did not meet testing criteria.

**Table 1**
*Clostridioides difficile* NDP data positive and negative results

| | *Clostridioides difficile* positive and negative NDP testing data | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Overall *C difficile* PCR testing | | | *C difficile* by NDP | | | *C difficile* testing by NDP with patient receipt of laxatives within 48 hours prior to testing* | | | *C difficile* testing by NDP in which patient did not have 3 diarrhea stools documented at time of testing | | | *C difficile* testing by NDP sent on days 1-3 of patient hospital admission | | | NDP per protocol fidelity | | | HO, CO identified by NDP | |
| Month | Total | Positive | % | Total | Positive | % | N | D | % | N | D | % | N | D | % | N | D | % | HO | CO |
| January | 424 | 48 | 11% | 26 | 2 | 8% | 17 | 26 | 65% | 10 | 26 | 38% | 6 | 26 | 23% | 3 | 26 | 12% | 2 | 0 |
| February | 325 | 25 | 8% | 18 | 1 | 6% | 7 | 18 | 39% | 6 | 18 | 33% | 7 | 18 | 39% | 6 | 18 | 33% | 0 | 1 |
| March | 295 | 44 | 15% | 23 | 4 | 17% | 5 | 23 | 22% | 4 | 23 | 17% | 8 | 23 | 35% | 12 | 23 | 52% | 1 | 3 |
| April | 282 | 36 | 13% | 31 | 2 | 7% | 14 | 31 | 45% | 9 | 31 | 29% | 11 | 31 | 35% | 8 | 31 | 26% | 1 | 1 |
| May | 286 | 48 | 17% | 28 | 2 | 7% | 4* | 28 | 14% | 8 | 28 | 29% | 12 | 28 | 43% | 17 | 28 | 61% | 2 | 0 |
| June | 275 | 48 | 17% | 32 | 4 | 13% | 5 | 32 | 16% | 20 | 32 | 63% | 5 | 32 | 16% | 9 | 32 | 28% | 3 | 1 |
| July | 256 | 41 | 16% | 37 | 4 | 11% | 6 | 37 | 16% | 15 | 37 | 41% | 7 | 37 | 19% | 17 | 37 | 46% | 4 | 0 |
| August | 252 | 41 | 16% | 28 | 4 | 14% | 5 | 28 | 18% | 14 | 28 | 50% | 5 | 28 | 18% | 13 | 28 | 46% | 3 | 1 |
| September | 248 | 41 | 16% | 26 | 0 | 0% | 7 | 26 | 27% | 12 | 26 | 46% | 3 | 26 | 12% | 6 | 26 | 23% | 0 | 0 |
| October | 268 | 38 | 14% | 24 | 3 | 13% | 6 | 24 | 25% | 11 | 24 | 46% | 6 | 24 | 25% | 7 | 24 | 29% | 2 | 1 |
| November | 276 | 45 | 16% | 24 | 2 | 8% | 2 | 24 | 8% | 11 | 24 | 46% | 1 | 24 | 4% | 12 | 24 | 50% | 2 | 0 |
| December | 287 | 43 | 15% | 24 | 4 | 17% | 3 | 24 | 13% | 13 | 24 | 54% | 8 | 24 | 33% | 10 | 24 | 42% | 3 | 1 |
| Total | 3474 | 498 | 14% | 321 | 32 | 10% | 77 | 321 | 24% | 133 | 321 | 41% | 79 | 321 | 25% | 120 | 321 | 37% | 23 | 9 |

*CO*, community-onset; *D*, denominator; *HO*, hospital-onset; *N*, numerator; *NDP*, nurse driven protocol; *PCR*, polymerase chain reaction.
*Changed to 24 hours.

## DISCUSSION

Implementation of the NDP failed to increase early identification of CO *C difficile*. Despite the implementation of the NDP, the incidence of HO *C difficile* cases exceeded national benchmark. Due to low testing fidelity, the NDP was discontinued after 1 year. NDP low testing fidelity prompted a review of test fidelity by all providers, which revealed similar poor test stewardship.[9]

Study strengths included test fidelity assessment for both positive and negative *C difficile* test results. IPs and CHIPs provided ongoing education and NDP compliance data to nursing staff and unit leaders throughout the 12-month study period. IPs audited NDP orders monthly and provided feedback to unit leadership for dissemination to bedside nurses to improve unit-specific adherence to the protocol.

There were several limitations to this study. Use of PCR testing does not distinguish between colonization of *C difficile* and true CDI.[4] The sensitivity of the PCR test benefits facilities with high-fidelity test stewardship, however, may cause patients to be overdiagnosed and unnecessarily treated when adherence to test stewardship is poor.[4] Despite ongoing education and compliance feedback to CHIPs and leadership, it is undetermined if bedside nurses received testing fidelity feedback. This may have been a factor in the poor adherence to the protocol, which may have led to patients being overtested and excessive antibiotic use. Additionally, we cannot predict if a provider would have ordered a *C difficile* test absent the NDP. Finally, this study was conducted at a single medical center, making the results difficult to generalize.

Implementation of a successful NDP should consider the following modifications to improve test fidelity: (1) embed decision support within the order entry process, which includes a hard-stop for tests not meeting criteria. This would eliminate the ability for nurses to test outside approved parameters; (2) ensure front-line nurses receive education regarding appropriate testing. Include a nursing communication process when tests are ordered outside of protocol; and (3) eliminate the ability for nurses to order *C difficile* test after hospital day 3.

We introduced a *C difficile* NDP with the goal of identifying CO *C difficile* cases. We found that the protocol's fidelity was low and of minimal impact on the identification of CO cases. As a result, and to avoid ongoing overtesting by a pool of both nurse and physician providers, the NDP was discontinued at our institution.

## CONCLUSIONS

In addition to antimicrobial stewardship, diagnostic stewardship plays an integral role in diminishing the incidence of CDI.[3] To our knowledge, this study is the first to report the impact of a nurse driven testing protocol on *C difficile* diagnosis and test stewardship. More stringent testing procedures may minimize the amount of false-positive results. Further studies are needed to best define *C difficile* testing by nurse providers. Testing for *C difficile* by PCR should be guided by electronic medical record-based decision support to assist all providers with improved test fidelity.

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