respectively; both P > 0.05); however, the frequency of NAAT+tox− tests decreased hospital wide (1.8 to 1.3; P = 0.0003) and in heme-onc units (3.8 to 2.4; P > 0.05).

Conclusion. A C. difficile testing algorithm was successful decreasing the number of C. difficile tests performed and had a hospital-wide reduction of NAAT+tox− tests. The rate of NAAT+tox+ cases in heme-onc units and hospital wide remained unchanged despite active screening and isolation in selected units.

Results. Of 51 surveyed laboratories, response rate was 86% (n = 44). 91% of respondents (n = 40) process bacterial cultures. 47.5% (n = 19) primarily perform urine culture when ordered, whereas the remainder primarily perform cultures in a reflex algorithm when ordered (n = 12; 30%) or a reflex algorithm automatically (n = 9; 22.5%) (Figure 1). The definition of an abnormal urinalysis varied widely (Figure 2). 15% (n = 6) of laboratories reported considering changes to their workflow; two cited a goal of reducing unnecessary testing. Of the 32 laboratories that perform in-house C. difficile testing, the assays and sequence in which they were implemented in testing algorithms varied substantially (Figure 3) and most commonly included NAAT testing. Seven (21.8%) laboratories reported recently changed practices; these changes did not favor any particular algorithm. 84.2% (n = 32) reported stool rejection criteria to limit unnecessary testing, but these criteria varied (Figure 4).

Conclusion. Wide variation exists in laboratory workflows for UTI and CDI diagnoses in Oregon, suggesting lack of consensus on optimal practices. Encouragingly, multiple labs described recently implemented or planned interventions to reduce unnecessary testing for both infections. This snapshot will inform statewide education and interventions to optimize testing and help prevent patient and population harm.

Figure 1: Which is the most common circumstance by which urine cultures are performed?

### Table: C. difficile testing utilization and plans for change

| Circumstance | Labs (n = 40) |
|--------------|--------------|
| When urine culture is ordered (as a stand-alone order) | 47.5% (19) |
| Abnormal urinalysis (+/– microscopy are reflexed to culture only if ordered) | 30% (12) |
| All abnormal labs (+/– microscopy are automatically reflexed to culture) | 22.5% (9) |

Figure 2: Current criteria for abnormal urinalyses and plans for change

- If reflex culturing is performed for abnormal UA and/or microscopy, what are the criteria used to define "abnormal" for general adult patients?

| Definition of Abnormal | Labs utilizing definition (n = 40) |
|------------------------|----------------------------------|
| Positive leukocyte esterase | 62.5% (25) |
| Nucleic acid | 80.0% (32) |
| WBC ≥ 5×106 | 22.5% (9) |
| WBC ≥ 10×106 | 32.5% (13) |
| Bacteria present | 42.5% (17) |
| Blood present | 5.0% (2) |

Is your laboratory considering changing your UTI testing practice within the next year?

| Considering changes | Labs (n = 40) |
|---------------------|--------------|
| Yes | 15% (6) |
| No | 85% (34) |

If considering changes, why?

- N=2 Criteria "most stringent enough"
- N>2 Criteria (numerator is incorrect)

N=2 Algorithm is out of date/needs updating per clinicians.

Figure 3: Hematology oncology units - C. difficile testing results

- A. Nucleic acid amplification test (NAAT) performed and their respective results per 1000 patient days. Phase 3 corresponded to different C. difficile screening and isolation interventions primarily in hematology oncology units.
- B. NAAT positive results based on the test's positivity and negativity per 1000 patient days.

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Figure 4: Does your lab have a policy to reject stool specimens for C. difficile testing? Check all that apply.

| Criteria | Lab (n = 30) |
|----------|-------------|
| Yes, when stools are formed | 84.2% (25) |
| if there is a stool specimen already positive within designated time period | 30.8% (14) |
| if there is a stool specimen that tested negative for C. difficile within designated time period | 21% (8) |
| No rejection policy | 15.8% (6) |

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2341. Effectiveness of Interventions Targeting Stewardship of Clostridium difficile Testing
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Session: 249. HAI: C. difficile - Diagnostic Stewardship
Saturday, October 5, 2019: 12:15 PM

Background. Clostridium difficile infection (CDI) is the most common health-care-associated infection. C. difficile PCR assays do not differentiate between colonization (seen in up to 2% of inpatients) and symptomatic disease, highlighting the importance of testing only symptomatic patients.

Methods. Interventions included system-wide implementation of C. difficile testing guidelines, face-to-face education of licensed providers, and Best Practice Alerts (BPAs) embedded in the electronic health record (EHR) C. difficile PCR order. The guidelines recommend testing only when ≥3 liquid bowel movements within a 24-hour period, without laxatives, oral contrast or new enteral feeds in the preceding 24 hours, and without recent C. difficile PCR test (negative ≤7 days or positive <30 days). We reviewed 100 consecutive C. difficile PCR orders across two hospitals pre- and post-intervention to assess compliance with guidelines; performed weekly review of all C. difficile PCRs, all BPA responses and all hospital-onset CDI. Cost savings were calculated based on published estimates of CDI attributable costs.

Results. Hospital-onset CDI rates fell from 0.75 to 0.48 cases per 1000 patient-days, with an estimated costs savings of $295,555 per quarter and $1.04 million per year. There were no deaths due to CDI and no morbidity due to delayed CDI diagnosis. C. difficile PCR guideline compliance increased from 39% to 53%; orders decreased by 50% post-intervention. Receipt of laxatives and <3 episodes of diarrhea were the most common reasons for guideline noncompliance. BPAs fired an average of 150 times/month. The most common trigger for BPA was laxative use. Providers canceled PCR orders in 40% of BPA events.

Conclusion. Interventions incorporating testing guidelines, face-to-face education, and EHR-embedded decision support resulted in fewer C. difficile PCRs orders, increased guideline compliance, lower rates of hospital-onset CDI and cost savings of $1 million per year without an increase in CDI-attributable death or morbidity.

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2342. Elimination of Reflexive C. difficile PCR Testing Among Inpatients Resulted in Cost Savings Without Adverse Events
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Saturday, October 5, 2019: 12:15 PM

Background. Diagnosis of C. difficile infection is imperfect and various algorithms have been proposed. While PCR is sensitive for detecting toxin-carrying C. difficile, it leads to overdiagnoses resulting in antibiotic overuse and potentially unnecessary healthcare costs.

Methods. We performed a study of C. difficile cases after changing the testing protocol from reflexive vs. physician-requested PCR in cases of indeterminate EIA testing (antigen +, toxin –). The study was conducted among inpatient adults at four large hospitals in the southern California area and evaluated two 6-month periods: pre-intervention (September 5, 2016–March 5, 2017) and post-intervention (March 6, 2017–September 5, 2017). Only the first C. difficile test during a period per patient was evaluated. Primary outcome was change in number of C. difficile diagnoses. Secondary outcomes included adverse events (missed cases of C. difficile and 30-day readmissions) and cost savings (accounting for PCR, isolation, and treatment costs). The difference in demographics, laboratory values (WBC, Cr), or hospital site between the study periods was not statistically significant differences in demographics, laboratory values (WBC, Cr), or hospital site between the study periods. A PCR was performed in 99.6% (280/281; one not performed due to an inhibitor) and 66% (144/219) in the pre- vs. post-intervention periods (P < 0.01); the PCR was positive in 65% (n = 182 and n = 94, respectively) in both periods. The change in testing strategy resulted in a 49% reduction in PCR testing and 48% fewer C. difficile cases. There were no differences between study periods in 30-day readmissions for all-cause (P = 0.96), GI-related illness (P = 0.93) or C. difficile (P = 0.47), nor in new or recurrent C. difficile cases (P > 0.99). No patient without a PCR and not treated was later diagnosed with C. difficile infection. Each reflexive PCR avoided led to a cost savings of $4,384/patient.

Conclusion. Diagnostic stewardship is an emerging area that can potentially reduce overdiagnosis and overtreatment of a variety of infectious diseases. Our study showed that changing C. difficile PCR testing among EIA-indeterminate cases from reflexive to requiring a physician order resulted in valuable cost savings without associated adverse events.

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2343. How Smart Is the Chart? Accuracy of the Medical Record in Documenting Diarrhea in Patients Tested for Clostridium difficile Infection
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Background. Inappropriate testing for Clostridium difficile infection (CDI) may result in diagnosis of CDI in asymptomatic carriers with diarrhea due to other causes such as laxatives. Current guidelines suggest that periodic chart review may be useful to assess the appropriateness of CDI testing, but it is not known how accurate the medical record is in documenting diarrhea.

Methods. We conducted a prospective cohort study of 80 patients tested for CDI to determine the accuracy of diarrhea documentation in the medical record in comparison to patient interviews and to assess the appropriate CDI testing. We reviewed these charts and calculated based on published estimates of CDI attributable costs.

Results. Thirty-five of 80 (44%) CDI tests were deemed inappropriate because patients either did not have clinically significant diarrhea (i.e., ≥3 or more unformed stools per day) or had an alternative explanation for diarrhea. Seventy-four of 80 (93%) patients stated they had diarrhea, but only 53 (66%) had clinically significant diarrhea based on symptom review. Physician and/or nursing notes documented diarrhea of 67 in 84 (88%) patients, but the number of bowel movements and the consistency of stool were documented for only 36 (45%) and 41 (51%) patients.

Conclusion. In our facility, inappropriate CDI testing was common and the accuracy of the medical record in documenting diarrhea was suboptimal. Education of patients and providers may be beneficial in improving the accuracy of diarrhea documentation and the appropriateness of testing.

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2344. Evaluation of a Best Practice Alert (BPA) to Reduce Inappropriate Testing for Clostridium difficile Infection (CDI) Within a Multi-Hospital System
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Background. Hospital-acquired CDI contribute to significant morbidity, mortality, and cost burden in hospitalized patients. Clinical practice guidelines recommend strict testing criteria when employing nucleic acid amplification testing alone as to not test asymptomatic carriers. A BPA within the electronic medical record (EMR) may assist with this screening.

Methods. At our 9-hospital system, we created a BPA to help identify patients who may not meet criteria for CDI testing. Initial BPA (January 2018) asked if patient had or more stools (yes/no) and if laxatives were administered in the last 48 hours (yes/no). An expanded BPA was updated to pull medication administration records for use of laxatives in the prior 48 hours (August 2018) and notified providers of recent C. difficile testing in the past 7 days (January 2019). C. difficile orders from March 2017 (historical), March 2018 (intervention 1), and March 2019 (intervention 2) were evaluated to assess impact of these interventions.

Results. C. difficile testing in 31,307 (historical), 31,299 (intervention 1), and 31,960 (intervention 2) patient-days were evaluated. Rates of C. difficile orders and infections are reported in the table. Ratio of positive C. difficile specimens to tested specimens were similar between the historical arm (51 of 402; 12.7%) and only intervention 2 (45 of 316; 14.2%) arms (P = 0.3 and P = 0.5, respectively). Intervention 1 and intervention 2 arms were similar in all metrics. Statistical analysis was performed using Stats. v14.2.

Conclusion. Implementation of a decision support tool to assist with C. difficile testing significantly decreased order rates in both the initial and expanded BPA intervention arms. Compared with historical rates, incidence of CDI decreased in both intervention arms though these were not statistically significant. Similarly, ratio of positive specimens to specimens tested increased in both intervention arms, though not significant, indicating a trend toward improved patient selection. To improve appropriate CDI testing, further oversight and/or education is needed to accompany implementation of an EMR decision support tool, such as BPAs.