**Background**

- Enzyme immunoassays (EIAs) for *Clostridium difficile* (formerly *Clostridium difficile*) toxins have low sensitivity and lead to missed cases of *C. difficile* infection (CDI).
- With the introduction of nucleic acid amplification tests (NAATs), which cannot differentiate between colonized individuals and CDI patients, the CDI incidence at many institutions has increased.
- CDI has become the most common cause of healthcare-associated infections in the U.S. and the yearly excess healthcare costs related to CDI are estimated to be as much as $4.8 billion.\(^1\)
- The Singulex Clarity assay, based on Simple Molecule Counting technology, was designed to provide a highly sensitive and specific rapid assay for CDI toxins A and B in stool.

**Aims**

The aim of this study was to understand the cost savings, in a U.S. context, of the Singulex Clarity C. diff toxins A/B assay compared to the following four current CDI laboratory testing methods:
- 1) NAAT alone
- 2) Glutamate dehydrogenase (GDH) EIA and toxin EIA
- 3) Multiplex algorithm: GDH and toxin EIA followed by NAAT
- 4) Multiplex algorithm: NAAT followed by toxin EIA if NAAT positive

**Methods**

**Singulex Clarity C. diff toxins A/B assay**

The Singulex Clarity C. diff toxins A/B assay measures C. difficile toxins A and B in stool on the Singulex Clarity system, an automated, in vitro diagnostic platform. The system is based on a paramagnetic microparticle-based immunoassay powered by Singulex Clarity software that uses single-photon fluorescence detection for analyte quantification. The quantitative limits of detection for toxin A and B have been shown to be 0.8 and 3 pg/mL, in buffer, and 2.0 and 0.7 pg/mL, in stool, respectively. The instrument automatically performs the immunoassay with a 1:5 mixture of paramagnetic microparticles pre-coated with either toxin A or B monovalent antibodies (capture reagent) and toxin-specific antibodies labeled with the fluorophore, Alexa Fluor 647 (detection reagent). The Singulex Clarity software interprets the data, using the fluorescent signal, into a combined toxin A/B concentration reported in units of pg/mL stool. The total turnaround time is 32 min and the system can process 1–8 samples in an assay run.

**Diagnostic Performance**

Specificity and sensitivity data for this study was based on fresh samples from 817 subjects with suspected CDI who were tested at two sites with the Singulex Clarity assay, PCR (Xpert®[\(^\text{TM}\)], Cepheid), the GDH EIA and toxin EIA (Quik Chek Complete)[\(^2\)] for detection of GDH and toxins A and B. The performance of the assay and multiplex algorithms were evaluated against cell cytotoxicity neutralization assay (Microbiology Specialists, Inc.).

**Health Economic Cost-Savings Model**

A U.S.-based economic model to describe the annual hospital cost savings utilized:
- 2018 American Hospital Association data (April 1, 2017-March 31, 2018) including hospital gross revenue and expenses;
- 2017 U.S. Census population estimates;
- 2015 Cost to Treat Model (CTM) average costs by hospital bed type; and

The biggest drivers across the key cost-saving measures were:
- 1) Decreased additional LOS due to improved specificity and true CDI diagnosis.
- 2) Reduction in vancomycin prescribed for CDI-negative cases.

**Conclusions**

- Singulex Clarity C. diff toxins A/B assay may offer hospital an opportunity to:
  - 1) decrease additional LOS due to improve specificity and diagnosis of true CDI, which may offer hospitals with bed capacity an opportunity to improve patient access; and
  - 2) save pharmacy cost by reducing vancomycin prescribed for CDI-negative cases.

**References**


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