Clinical Performance of T2Bacteria® Panel on Whole Blood for Early Identification of Bloodstream Infections in a Tertiary Care Teaching Hospital

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Background

- At our institution, a nursing screening tool was developed to identify patients presenting to the Emergency Department with possible sepsis.
- The electronic tool utilizes a patient's vital signs, mental status, and physical findings in triage to identify patients requiring provider notification and ordering of Sepsis Triage labs including blood culture (BC).
- Many early warning sepsis screening tools demonstrate high sensitivity however low specificity.
- Positive blood cultures are beneficial for antibiotic streamlining however most bottles are negative.
- A 6-month internal retrospective blood culture report determined an overall positive blood culture rate of 0.09% (798/8,541 bottles incubated).
- Previously published literature report positive blood culture rates of approximately 30% in critically ill patients with septic shock.
- Inappropriate selection of empiric antimicrobial treatment is a significant contributor to increased mortality. Therefore, accurate timely identification of patients with blood stream pathogens may be helpful.
- T2Biosystems® currently offers the T2B® Panel, which provides sensitive detection of specific sepsis-causing bacterial pathogens directly from a whole blood specimen in approximately 3-5 hours.
- The panel's high sensitivity allows for organism identification as low as 1 CFU/mL compared to 100 to 1,000 CFU/mL.
- The Panel identifies five common bacteria known to cause sepsis: *Enterococcus faecium, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa,* and *Staphylococcus aureus.*
- Taking into consideration diagnostic stewardship, there is little information available on which patients would benefit the most from this test.

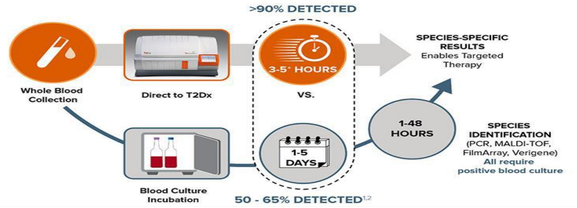
Purpose

The purpose of this study is to determine the clinical and financial impact of the T2Bacteria® Panel in early pathogen identification and antimicrobial optimization in select septic patients presenting to the Emergency Department.

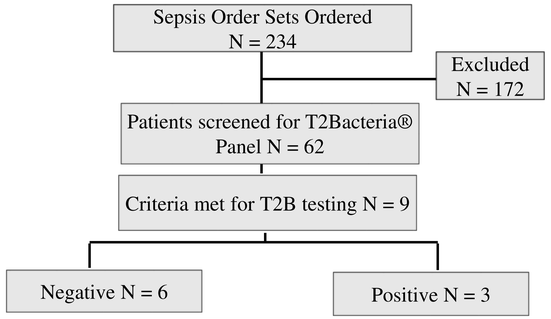
Methodology

Study design: February 11 – March 31, 2019 (Interim analysis 9/48 tests provided by company. Study is ongoing)
Prospective interventional study of ED patients 0700 – 1530 M-F
Study Sample:

- Adult patients presenting to ED with possible sepsis
- ED Pharmacist eligibility screening criteria:
  1. Age ≥ 18 years of age
  2. Sepsis order set ordered by provider and Severe Sepsis Risk defined as ≥ 2 SIRS Criteria *PLUS* Suspected Source of Infection *PLUS* SBP <90 or MAP <65 or AMS
  3. Written informed consent
- ID Pharmacist Testing/Intervention Timetable
  0700 – 1300: SAME DAY antimicrobial intervention
  > 1300 < 1530: NEXT DAY antimicrobial intervention
- Exclusion Criteria:
  No pharmacy/microbiology trained staff available
- Outcomes:
  - Primary: To determine if the results from the T2Bacteria® panel facilitated timely modification of empiric therapy



Study Enrollment



Results

Pt #	Admission Diagnosis	T2B result	Infectious Disease Pharmacist Interventions	Blood Culture results	Outcomes
1	HCAP vs. Aspiration Pneumonia Started on Ceftazidime, Vanc, CD	*K. pneumoniae*	▪ Changed ceftazidime to meropenem based on internal antibiogram (88% versus 99%) ▪ Discontinued clindamycin ▪ Ordered expectorated sputum to rule out need to continue vancomycin	Negative	▪ WBC declined from 25 to 10 next am ▪ Meropenem DOT 7 days ▪ Transferred back to nursing home ▪ Vancomycin DOT 3 days
2	Sepsis in a dialysis patient with decreased responsiveness and AMS started on zosyn and vancomycin	*Staphylococcus aureus* and *Pseudomonas aeruginosa*	▪ Set vancomycin high trough goal of (15-20) ▪ Initiated MRSA contact precautions ▪ Obtained ID consult for *Staph aureus* bacteremic bundle	Positive for MRSA	▪ Vancomycin continued ▪ Source control achieved ▪ Bacteremia cleared and patient discharged to complete 6 weeks ▪ Zosyn DOT 3 days
3	Sepsis in a dialysis patient who became unresponsive started on zosyn and vancomycin	*Staphylococcus aureus*	▪ Set vancomycin high trough goal of (15-20) ▪ Initiated MRSA contact precautions ▪ Obtained ID consult for *Staph aureus* bacteremic bundle	Positive for MRSA	▪ Vancomycin continued ▪ Source control achieved ▪ Bacteremia cleared and patient discharged to complete 6 weeks

- The percent positivity of the T2B for patients meeting criteria was 33% (3/9).
- The T2Bacteria® Panel resulted in Improved time to: Appropriate antibiotics and vancomycin trough goals, timely Infectious disease consultations for *Staphylococcus aureus* bacteremia and timely initiation of contact precautions.
- The T2B was able to identify one patient with negative blood cultures
- The T2B was able to rule out relapsing E. coli bacteremia in an oncology patient completing treatment for bacteremia from a previous visit. This allowed the provider to explore other reasons for fever present during readmission.
- At our institution, providers use the sepsis order set to rule out sepsis in patients presenting to the ED. Therefore the rate of patients meeting criteria were low.
- Sepsis order set use was not a good marker for patients who might benefit from the T2B assay.
- Additionally, in our community teaching hospital, molecular assays are limited to first shift which reduces the opportunity to enroll patients.
- A previous internal 16-month review of positive blood cultures with organisms included in the T2B assay revealed a lactic acid level of 2 or more in 51% (43/83) of cases. Therefore, future initiatives will include: POC LA levels and modification of the protocol to include patients with LA values of ≥ 2.

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Disclosures

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