The Intersection of COVID-19 and Sepsis and the Role of Anti-Microbial Stewardship in Addressing Anti-Microbial Resistance

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Background

The sudden emergence of Coronavirus Disease 2019 (COVID-19) caused by the Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) in Wuhan, China which led to a global pandemic causing a strain on medical and public health facilities as well as financial hardships[1].

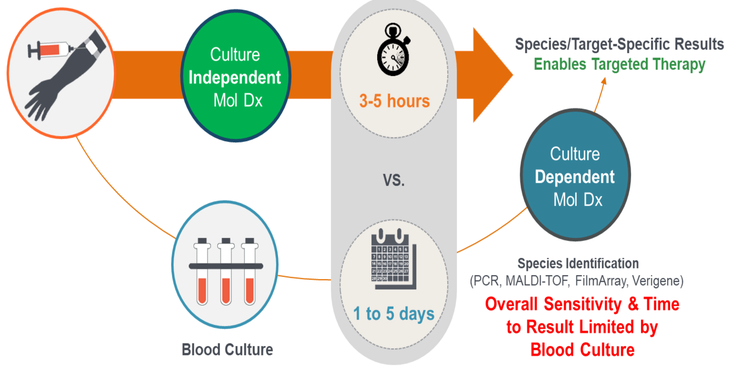
Patients with COVID-19 infection are documented to experience a wide range of clinical manifestations from asymptomatic cases to mild, moderate and severe illnesses. Patients, who are critically ill and those with co-morbidities are likely to develop severe COVID-19 and may also develop acute respiratory distress syndrome and septic shock [2].

Sepsis is 'defined as a clinical condition with life-threatening organ dysfunction which is caused by an abnormal response to infection'. it is a clinical syndrome that is caused by different infectious agents such as bacteria, fungal and viruses[3]. While septic shock is a subset of sepsis which causes a severe decrease in blood pressure and other metabolic abnormalities, presenting even a greater risk of death[4].

Severely ill hospitalized COVID-19 patients are more likely to develop secondary infections that could lead to sepsis and are often initiated on antimicrobial agents[5].

Therefore, there is an urgent need for rapid laboratory diagnostics such as the Culture Independent Diagnostics Test (CIDT) that can detect and identify pathogens direct from whole blood, thereby shortening the time to diagnosis which may ultimately reduce the unnecessary use of antimicrobial and help initiate targeted therapy in patients with co-infection.

Figure 1. Culture-Independent Molecular Diagnostic vs Blood Culture Workflow



Method

A descriptive study that involves literature review of sepsis in critically ill hospitalized COVID-19 patients and the use of antimicrobial therapy. A Systematic search of database was conducted to identify relevant articles.

The objective was to determine co-infection in severely ill COVID-19 patients and the frequency of antibiotics usage.

Results

Bloodstream infections (BSIs) in critically ill hospitalized COVID-19 patients is an increasing cause of significant morbidity and mortality[3].

The rates of viral, bacterial, and/or fungal coinfections in these patients were proven to be significantly higher when compared to patients who were not as severely affected with COVID-19[6].

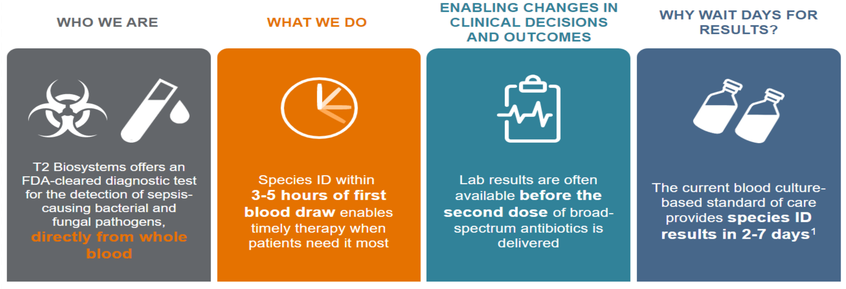
Some studies have shown that over 70% of hospitalized patients with COVID-19 received antibiotic therapy, resulting in antibiotic overuse and multidrug resistance could arise as a consequence[3].

Figure 2. T2Biosystems FDA Cleared Assays

T2Candida® Panel	T2Bacteria® Panel
Sensitivity: 91%[8] Specificity: 99%[8]	Sensitivity: 90%[2] Specificity: 98%[2]
C. albicans *C. tropicalis* *C. parapsilosis* *C. krusei* *C. glabrata*	*E. faecium* *S. aureus* *K. pneumoniae* *P. aeruginosa* *E. coli*
FDA-cleared 1-3 CFU/mL LoD	FDA-cleared 2-11 CFU/mL LoD

Conclusion

COVID-19 and sepsis is an unfortunate occurrence in hospitalized critically ill patients. Culture Independent Diagnostic Tests (CIDT) such as the magnetic resonance (T2MR), metagenomic shotgun sequencing methods, and nucleic acid amplification platforms, could potentially impact on patient management such as shorten time to pathogen detection, lead to faster initiation of targeted therapy, reduce the time of unnecessary antimicrobial drug usage, lessen time of exposure to ineffective drugs which may ultimately decrease the chances of developing Anti-Microbial Resistance (AMR), improve clinical outcomes, and lower the cost of patient management.



Disclosures

TF and AA are employees of T2 Biosystems, Inc,

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