

Improving Morbidity and Mortality in Patients with Sepsis



King Abdulaziz Medical City | Jeddah, Saudi Arabia



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Sepsis is a life-threatening condition with a high mortality rate that can develop in hospitalized patients, often ICU patients, but can also begin in patients in the community setting following deterioration of more common infections. It is characterized by multiple organ dysfunction caused by a dysregulated host response to infection. Successful management requires early identification and initiation of appropriate treatment combined with monitoring of treatment response. The inability to recognize sepsis early in its course and initiate proper medical management can lead to septic shock, organ failure and death.

Although preventative measures are important, the early detection and identification of patients at risk for or in the early stages of sepsis is essential. The initiation of antibiotic treatment, when appropriate, together with fluid resuscitation and pharmacologic intervention to manage hypotension are most successful when initiated early on.

The increasing number of cases and the high mortality rate associated with sepsis, led to the need biomarkers to both identify sepsis early on and to monitor the response to treatment.

Procalcitonin is a protein that the body produces with measurable increases in the bloodstream in response to bacterial infection with subsequent diminishment of levels when bacterial infections have been effectively treated with antibiotics. Detection of procalcitonin levels has proven useful in assisting clinicians in differentiating sepsis linked to bacterial from non-bacterial infections, improving the management of patients with sepsis and in assessing the response to antibiotic therapy which increases the potentiality for antibiotic stewardship.

Improving the management and outcomes of patients with sepsis was an important part of the Kingdom of Saudi Arabia Vision 2030 initiative, a government led program with the goal of modernizing healthcare systems and achieving population wellness. To help solve care gaps that were identified with sepsis, including the reduction of potential morbidity and mortality, the NGHHA Hospital in the Western Region of Saudi Arabia, pioneered the use of procalcitonin (PCT) in sepsis management. NGHHA built the PCT initiative upon its foundational infrastructure of total lab automation, artificial intelligence tools and optimization of healthcare resources.

At the time that NGHHA first implemented PCT testing in management of patients in the Intensive Care Unit (ICU), less than 50 PCT tests were performed each month. With the use of PCT-guided protocols in the ICU, the mortality rate of ICU patients with sepsis declined by 20%. There was a decrease in the average length of stay of 1.5 days for urgent care patients after implementation of this clinical care initiative. This strong success led the team to expand the use of PCT-guided protocols to patients in the Emergency Department (ED) where PCT testing had further utilization and testing increased to 2,800 tests per month. Additionally, when managing sepsis patients associated with hospital acquired infections, the readmission rate decreased by 11%. PCT-guided clinical protocols enabled clinicians to make decisions to discontinue antibiotics safely and appropriately.

“By using the PCT test in concordance with other biomarkers, it was easier for us to differentiate between sepsis and non-sepsis patients, while giving the right treatment accordingly.”



— Dr. Asim Al Soedi, associate executive director, Infection Prevention and Control

The improved patient care also served to mitigate costs with annualized savings translated to be \$250,000 each year. This included \$168,000 savings from reduced length of stay, \$35,000 savings from successful antibiotic stewardship and \$47,000 from reduced readmission rate. Overall, physicians were satisfied with the PCT-guided protocol and high rate of result availability within one hour, with 84% (31/37) of respondents indicating satisfaction.

After NGHHA successfully implemented this PCT-guided sepsis protocol, the first hospital in the Western Region of Saudi Arabia to do so, other hospitals followed suit. This clinical care protocol was successfully replicated in three additional hospitals, some private and some governmental.

“Our laboratory is processing more than 2,800 samples per day, serving not only the hospital inpatients and outpatient, but also another seven primary health care centers and one dialysis center in the area covering Makkah, Taif and Jeddah cities. The addition of PCT testing and full lab automation enabling auto-verification of test results has allowed the laboratory to utilize more of its excess capacity. In this way, I can say that adding PCT helped us in reaching our destination of resource optimization.”



— Dr. Mohammed Al Mohammadi, pathology chairman and laboratory director

The introduction of PCT-guided clinical care protocols improved patient management and outcomes in both the ICU and for patients presenting to the ED, permitted successful antibiotic stewardship, reduced costs while improving care and was successfully replicated at other hospitals in Saudi Arabia.

Significantly, it was observed that biomarkers such as PCT can play a pivotal role in the diagnosis and monitoring of efficacy of treatment for sepsis in both the ICU and the ED. It was demonstrated that PCT-guided clinical protocols decreased mortality, reduced average length of stay, decreased readmission rate, had significant cost mitigation and increased clinician satisfaction. The clinical protocols utilizing PCT permitted the safe discontinuation of antibiotics. Importantly, the PCT-guided clinical protocols were replicated at other hospitals.

The multi-disciplinary working team at NGHHA Hospital that collaborated to pioneer the introduction of PCT into its clinical protocols was recently recognized by the UNIVANTS of Healthcare Excellence for achievement in improving patient care.

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