Implementing Sepsis Quality Initiatives in a Multiprofessional Care Model

Emanuel P. Rivers, MD, MPH, IOM; Ilan S. Rubinfeld, MD; Jacob Manteuffel, MD; Gilbert Abou Dagher, MD; Kristine McGregor, RN, CFN; and Mark Mlynarek, RPh, BCPS

Abstract: Studies of acute myocardial infarction, trauma, and stroke have resulted in improved outcomes through earlier diagnosis and application of therapy at the most proximal stage of hospital presentation. Most critical therapies for these diseases are frequently instituted prior to admission to an ICU. This systems-based approach to the sepsis patient has been lacking. To change this paradigm, a trial comparing early goal-directed therapy (EGDT) versus standard care was performed using specific criteria for the early identification of high-risk sepsis patients and a consensus-derived protocol to reverse the hemodynamic perturbations of hypovolemia, vasoregulation, myocardial suppression, and increased metabolic demands. One decade later, EGDT has been shown to modulate inflammation, decrease the progression of organ failure, improve microcirculatory function, and decrease health resource consumption and mortality. A standard operating procedure beginning with EGDT for severe sepsis and septic shock is a hospital-wide initiative.

Keywords: severe sepsis, septic shock, lactate, early goal-directed therapy, sepsis bundle, sepsis outcomes, implementation, biomarkers, critical care quality improvement, sepsis, multiprofessional care

The Scope of the Problem

Severe sepsis and septic shock are one of the top 10 causes of death in the United States with a mortality of up to 50%. Sepsis is the most expensive cause of hospital admission and consumes more than $50 billion per year in health care cost nationally. The long term morbidity is equally as costly. It has become apparent that sepsis is a hospital-wide disease and emphasis on this comprehensive approach has led to a significant mortality reduction in the past decade. The transition from sepsis to severe life-threatening disease frequently develops well before admission to an ICU, often in the prehospital setting, emergency department (ED), general practice unit (GPU), operating room, or the outpatient clinic setting. The GPU harbors patients with primary and nosocomial infections who can deteriorate through the spectrum of sepsis from multiple etiologies. Secondary infections related to surgical complications is associated with a 3- to 10-fold increase in hospital mortality. As a result, patients who develop severe sepsis and septic shock in GPUs have a consistently higher mortality rate than patients presenting to the ED or de novo in the ICU.

After sepsis is recognized, early interventions should begin. However, optimal care may be delayed for many reasons, including delayed presentation, lack of recognition in the ED, GPU or ICU, ED overcrowding and long wait times for ICU beds. For years it has been recognized that delay in care negatively affects outcome for trauma, myocardial infarction, and stroke. There is now robust evidence that treatment delay can also negatively affect outcome in sepsis. This article will review the evidence for early intervention, review models of care, and potential obstacles.

DOI: 10.1177/1944451611421488. From Department of Emergency Medicine, Department of Surgery, Quality Initiatives, and Department of Pharmacy Services, Henry Ford Hospital, Detroit, Michigan. Conflict of Interest: The authors declared no potential conflicts of interest with respect to the authorship and/or publication of this article. Address correspondence to: Emanuel P. Rivers, MD, MPH, IOM, Department of Emergency Medicine, Henry Ford Hospital, 2799 West Grand Boulevard, Detroit, MI 48202; e-mail: erivers1@hfhs.org.

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The Essentials of a Sepsis Quality Initiative

Sepsis has traditionally been viewed as an “ICU disease” rather than a hospital disease. The successful implementation of a standard operating procedure requires that diagnosis and treatment be integrated across all geographic locations and specialties for optimal compliance and quality improvement. Sepsis requires a similar approach to acute myocardial infarction, trauma, and stroke, which have seen improvements in outcome by the application of early diagnosis and time-sensitive therapies at the most proximal stage of hospital presentation (Figure 1). This approach is a comprehensive strategy that includes (a) an institutional assessment of the sepsis prevalence and mortality, (b) identification of high-risk patients or a sepsis alert (Figures 3 and 4), (c) mobilization of resources, (d) timely intervention of the 6- and 24-hour sepsis bundle (Figure 2) or sepsis order sets (Figures 5, 6, and 7), (e) use quality indicators to assess compliance, (f) quantification of health care resource consumption, (g) assessment of outcomes, and (h) a continuous quality improvement program that includes feedback and continuing education.

Figure 1. Standard operating procedure. Abbreviations: ED, emergency department; ICU, intensive care unit; CME, continuing medical education.
Figure 2. The 6- and 24-hour sepsis algorithm. Abbreviations: CVP, central venous pressure; MAP, mean arterial pressure; ScvO₂, central venous oxygen saturation.
A collaborative team approach for planning and intervention is required, with integration of medical, nursing, and support staff from both the ED and ICU. Effective teams are based on reliable mobilization of resources—both personnel and equipment—to perform the required tasks. In addition, an appropriately sized pool of health care providers (both
Physicians and nurses who can effectively deliver early goal-directed therapy (EGDT) is key to successful implementation. Most important, a local “champion” or Sepsis Coordinator (Table 1) is needed to be responsible for implementation and to communicate effectively with both the ED and ICU personnel. Reliance on the presence of the systemic inflammatory response syndrome as well as the advanced analytics methods using neural networks and computerized sepsis alert systems have been trialed as triggers. Once identified, these patients are initially managed and then typically transferred to an intensive care setting to pursue formal sepsis resuscitation.

**Models of Care**

Although all successful EGDT programs share strong collaboration between the ED, GPU, and ICU, there are essentially 4 models of implementation: an ED-based model, a mobile ICU or medical emergency team (MET)-based model, pharmacy-based, and completely ICU-based model. In the ED-based model, the ED should diagnose and perform all the necessary steps to deliver EGDT, prior to transfer to the ICU. EGDT would be continued from the ED to the ICU, and transfer to the ICU would occur as soon as possible. Hospitals that have already successfully implemented a MET may be able to expand its role to the provision of EGDT. This model requires significant cooperation between the ED and ICU, along with 24-hour availability of health care providers capable of central venous access. It would likely work best in hospitals with a significant ICU bed wait-time in the face of the pressures for a rapid ED turnaround.

An ICU-based model would entail ED notification of ICU staff followed by transfer as rapidly as possible to the ICU, where EGDT would be instituted (only after arrival in the ICU). In effect, this model is the method that most hospitals follow for critically ill patients. The primary limitation of this model is that ICU beds may not be readily available, leading to delays in initiating potentially life-saving therapy and defeating the goals of the treatment regimen. For those patients who need attention during the night, intensivists, hospitalists, mid-level providers, and emergency physicians may provide the higher level of expertise such as invasive monitoring.

Provision of appropriate and prompt care while in the ED, GPU, or the ICU, have common, and at the same time unique, barriers to implementation of EGDT for each location. While components of EGDT may be regarded as resource and labor intensive; a coordinated patient care model that combines appropriate expertise and resource allocation may rectify such a situation. To achieve a consistent level of quality at various locations within the hospital, multiple models of care may be required.

**Barriers to Implementation of EGDT**

As with any new therapy or process, implementation of a sepsis quality initiative would face the familiar barriers of inertia and lack of resources. However, a sepsis quality initiative also faces several unique challenges. Successful delivery of sepsis quality initiative begins with the recognition that it is a hospital-wide problem. This requires open communication between the ED, GPU, operating room, and the ICU. This involves physician, nurses, and allied health care professionals. A sepsis quality initiative also requires the routine implementation of technologies that may be seen as “ICU based” by many health care providers, such as measurements of central venous pressure, blood pressure (noninvasive and invasive), as well as central venous oxygen saturation (SvO₂). Up to 50% of patients would be mechanically ventilated as well. The successful use of these technologies outside the ICU may require new levels of expertise among health care providers, outside their usual domain.

Early initiation of antibiotics presents challenges. To expedite the selection of appropriate antibiotics, an order form (Figure 5) can be helpful. Once the antibiotics are selected, the order could be called to a dedicated phone line in the Critical Care Pharmacy (The Sepsis Phone). Antibiotics would then be
delivered to any patient on the GPU or ICU to meet the time requirements of the sepsis bundle. Sepsis order sets have been associated with improvements in process of care. Computerized protocols and the use of telemedicine are being increasingly used to expedite the early institution of sepsis care. This enhances communication and provides source documentation for quality assurance. Weekly feedback on compliance to health care providers and SRT activation to respond to patients with septic shock in a timely manner improve sepsis care and mortality.
The Outcome Evidence

One decade later, the outcome benefit of a sepsis initiative has been replicated in adults and pediatric patients. The mean age, baseline APACHE II scores, and mortality of these adult patients are similar to the original EGDT study. Whether EGDT was performed in the ED or the ICU, these studies have shown that the outcome benefit equals or exceeds the original EGDT study. This shows that EGDT can be performed in the community hospital setting. From a...
quality perspective, awards provided by the Joint Commission for Hospital Accreditation Organization (The Codman Award) have gone to programs implementing EGDT in the past 2 years.45,48

The Socioeconomic Benefit of a Sepsis Quality Initiative

A sepsis quality initiative has been shown to decrease hospital-related costs consistently by 20%.54-56 The mean hospital

Figure 7. Sepsis order set (page 3).
length of stay was 5.02 days shorter and hospital charges were $47,923 less between groups (both statistically significant, \( P < .0001 \)). Even when factoring in additional overhead costs; a sepsis quality initiative is cost-effective.

**Better Late Than Never**

The effectiveness of a delayed resuscitation is a frequent question. Coba et al\(^5^7\) examined the impact of the resuscitation bundle (RB) on patient outcomes when completed beyond the 6-hour period. Overall, 498 patients with severe sepsis and/or septic shock were evaluated to determine the upper limit of time that compliance with the RB would still improve outcomes. The patients who received the RB within 18 hours had a significant lower hospital mortality rate compared with those who did not (10.2\% vs 37.1\% or a 22\% relative risk reduction) compared with the noncompliers at 18 hours hospital mortality of 47.3\% (\( P < .03 \)). When the 2 groups were adjusted for differences in baseline illness severity, the compliers at 18 hours had a greater reduction in predicted mortality of 26.8\% versus 9.4\%, \( P < 0.01 \). This study uniquely showed that when bundle completion is extended to 18 hours, the mortality reduction remains significant.\(^5^7\)

**References**


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**Table 1. The Sepsis Coordinator Responsibilities**

| 1. | Available by pager and phone to evaluate patients on any adult unit and the emergency department (ED) for severe sepsis using the severe sepsis screening tool |
| 2. | Identifies the physician responsible for the patient’s care and communicates the results of the screening process immediately if the patients screens positive for severe sepsis with septic shock or if the results of the screening process affect the patients level of care requirements |
| 3. | Makes recommendations for next steps in care to the physician based on patient assessment |
| 4. | Has in-depth knowledge of Severe Sepsis Order set, qualifying criteria for the order set, sepsis resuscitation bundle time dependent goals, and use of monitoring |
| 5. | Acts as a resource and educator to bedside staff through all stages of sepsis screening and care including process, monitoring, and equipment issues |
| 6. | Available as an escalation tool for bedside staff around issues of patient care for a sepsis patient |
| 7. | Sees all patients meeting criteria for severe sepsis and septic shock with initial visit, 6-hour, 24-hour, and 72-hour follow-up visits |
| 8. | Establishes system for assessing compliance with sepsis resuscitation and maintenance bundle elements |
| 9. | During initial and follow-up visits assesses and documents patient’s current status, compliance with sepsis bundle elements and care goals for the next time period on standardized forms |
| 10. | Collects bundle compliance data on the data collection tool at each visit and reports this information to the sepsis quality initiative coordinator |
| 11. | Makes rounds at least once per 12 hours shift with the charge nurse of each adult critical care unit to focus on identifying additional septic patients by reviewing patients in each unit on the severe sepsis order set, who have been started on pressors within the last hour or are of a concern for sepsis per the charge nurses evaluation |

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**Conclusion**

Since 2001, EGDT or early initiatives have been repeatedly shown to significantly reduce mortality in patients presenting to the ED with sepsis or septic shock. However, widespread implementation requires a collaborative effort between multiple disciplines.


