Early Identification of Sepsis on the Hospital Floors:

Insights for Implementation of the Hour-1 Bundle
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THE SURVIVING SEPSIS CAMPAIGN (SSC, also referred to as the “Campaign”) is a joint program of the Society of Critical Medicine (SCCM) and the European Society of Intensive Care Medicine (ESICM) begun in 2002 to reduce mortality from sepsis through multiple initiatives (1). The cornerstone of the Campaign has been the publication and subsequent implementation of regularly updated evidence-based guidelines (2). To encourage use of the guidelines in clinical practice, SSC collaborated with the Institute for Healthcare Improvement in launching a program that allowed for collection of data primarily from patients identified in the emergency department (ED) with subsequent care in the ICU. Results of that program demonstrated that measuring performance can drive change in clinical behavior and improve quality of care (3).

Recognizing that patients who arrived in the ICU from hospital floors were sicker and had worse outcomes, the next phase of the Campaign’s improvement efforts focused on patients on hospital medical, surgical, and telemetry units. Through the generous support of the Gordon and Betty Moore Foundation, the SSC Sepsis on the Wards Collaborative was developed and implemented with participation from leaders of the Society of Hospital Medicine. Faculty included nurses, hospitalists, intensivists, and improvement advisors. The aim was to study, test, and disseminate messages and tools related to the early identification and treatment of sepsis on hospital floors through regular screening and application of the sepsis bundles, the guideline elements that had been identified as decision points and courses of action that when combined with clinical judgment can make a difference in patient outcomes. The bundles have been central to the improvement efforts and have evolved as new evidence has become available (4). Examples of the efforts of the participating hospitals were documented in Spotlight on Success: Collaborative Stories from the Surviving Sepsis Campaign, which can be a resource for hospitals embarking on implementation (5).

To further the efforts of the Campaign’s work on hospital floors, a conference was held at the Centers for Disease Control and Prevention that brought together representatives from the multidisciplinary, interprofessional organizations and agencies involved in care of sepsis patients. This guide summarizes the discussion and aggregates their experience for hospital floor-based providers as well as
first responders and residential- and home-based caregivers to maximize early recognition and treatment.

SCCM and ESICM continue to ensure that their SSC guidelines reflect the current science surrounding management of the patient with sepsis and septic shock. Additional publications related to improvement data and implementation of the guidelines will be forthcoming as research is reported. The SSC will continue to provide tools and educational materials to support the guidelines and their implementation in the ongoing effort to reduce incidence and mortality from this too-frequent condition. We urge providers to use this tool and the SSC website to improve sepsis care in all settings.

Mitchell M Levy, MD, MCCM
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Co-chairs, SSC Sepsis on the Wards Collaborative

References
The Surviving Sepsis Campaign wishes to thank the attendees at the CDC Conference for their presentations and involvement in the discussion during the meeting as well as for their contributions to this guide. In addition to participants listed below, representatives from the CDC Division of Healthcare Quality Promotion were in attendance.

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Evidence indicates that patients diagnosed with sepsis and septic shock on general hospital floors are at particularly high risk of death. Delays in sepsis recognition and slow initiation of treatment in multiple settings have been associated with worse outcomes, while early evidence-based treatment has been shown to improve survival (1,2,3). The higher risk of death for patients on the medical surgical floors has been largely attributed to delayed recognition of their deteriorating condition.

The Society of Critical Care Medicine and the Society of Hospital Medicine, with a grant from the Gordon and Betty Moore Foundation, convened a meeting of multidisciplinary experts with experience in developing initiatives to facilitate early identification of sepsis on the hospital floors. This guide, based on the proceedings of the conference held in conjunction with the Centers for Disease Control in 2016, serves as an implementation resource for caregivers who are integrating routine screening for sepsis into clinical routines on hospital floors.

Sepsis-related evidence continues to be generated at an increasing pace. Examples can be found in various places that sepsis touches:

- Public awareness campaigns have highlighted a formerly unknown condition so that individuals and family members are increasingly aware of signs and symptoms (4).

- Quality improvement efforts around the world have resulted in creative and effective process changes to ensure that multidisciplinary, multiprofessional teams watch for and respond to the indications that their patients may be vulnerable to sepsis (1,5).

- Published clinical and basic science research has added to the evidence practitioners can utilize as they treat patients with sepsis and septic shock, and technologic advances have been applied to improve identification, data collection, and treatment via tools embedded in electronic medical records and show promise in diagnostic aids.

- And, arguably most importantly, in the US, federal and state regulatory agencies require reporting of sepsis care (3,6).
The SSC Sepsis on the Wards Collaborative was instrumental in identifying factors that contribute to improving care of sepsis patients on the hospital floors and providing resources for implementation. The lessons learned from the introduction of the Surviving Sepsis Campaign and its emphasis on application of bundles of care based on the guidelines were the basis for the efforts on hospital floors. The following chapters describe the factors and provide insight into how to best address them in improving care of sepsis patients on hospital floors. The bundles have been revised as new evidence became available and the Hour-1 Bundle, which acknowledges the need to treat sepsis as a medical emergency by initiating immediate care, is explained in this guide (7).

References


Sepsis is a medical emergency requiring immediate attention. Recognition of risk factors and knowledge of signs and symptoms of sepsis/septic shock are essential for all caregivers — residential facility staff, first responders, emergency department workers, and nursing and medical staff on the hospital floors. Initiation of the sepsis bundle has been central to quality improvement efforts that have been proven to reduce mortality from sepsis and septic shock (1). As the Surviving Sepsis Campaign’s messages have evolved, the Hour-1 bundle has been introduced as a valuable tool for caregivers’ application upon recognition of sepsis/septic shock. The composite elements of the bundle are shown in the graphic SurvivingSepsis.org/Bundle. Following is a description of each of the individual bundle elements; evidence for the individual elements is discussed in detail in the Surviving Sepsis Campaign Guidelines (2,3).

1. Measure lactate level. Remeasure lactate if the initial lactate level is elevated (> 2mmol/L).

2. Obtain blood cultures before administering antibiotics.

3. Administer broad-spectrum antibiotics.

4. Begin rapid administration of 30 ml/kg crystalloid for hypotension or lactate ≥4 mmol/L.

5. Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mm Hg.
Hour-1 Bundle
Initial Resuscitation for Sepsis and Septic Shock

1. Measure lactate level.
   Remeasure lactate if initial lactate elevated (> 2 mmol/L).

2. Obtain blood cultures before administering antibiotics.

3. Administer broad-spectrum antibiotics.

4. Begin rapid administration of 30 mL/kg crystalloid for hypotension or lactate ≥ 4 mmol/L.

5. Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mm Hg.

MEDICAL EMERGENCY
Initiate bundle upon recognition of sepsis/septic shock.
May not complete all bundle elements within one hour of recognition.

Bundle: SurvivingSepsis.org/Bundle
Complete Guidelines: SurvivingSepsis.org/Guidelines
1. **Measure Lactate Level**

Serum lactate can be a surrogate for tissue perfusion (4,5). Studies have shown a significant reduction in mortality via lactate-guided resuscitation (6-10).

If initial lactate is >2mmol/L, the guidelines recommend remeasurement within 2 to 4 hours to guide resuscitation to normalize lactate (6).

*The SSC Guideline for lactate measurement is a weak recommendation, low quality of evidence.*
2. Obtain Blood Cultures Before Administering Antibiotics

Optimizing the identification of pathogens to improve outcomes is crucial. Because cultures can be sterilized within minutes of delivery of the appropriate antimicrobial (11,12), cultures should be drawn before antimicrobials are introduced. Appropriate blood cultures include at least two sets (aerobic and anaerobic). Administration of appropriate antimicrobials should not be delayed.

*The SSC Guidelines consider this a best practice statement.*
3. Administer Broad-Spectrum Antibiotics

One or more intravenous antimicrobials should be started immediately (13). Once pathogen identification and sensitivities are established, empiric antimicrobial therapy should be narrowed or discontinued if the patient does not have an infection. The consideration of early administration of antibiotics for suspected infection and antibiotic stewardship are essential to high-quality sepsis management.

The SSC Guideline is a strong recommendation, moderate quality of evidence.
4. Administer IV Fluid

Initial fluid resuscitation should begin immediately upon recognizing a patient with sepsis and/or hypotension and elevated lactate. The guidelines recommend a minimum of 30 mL/kg of intravenous crystalloid fluid to be completed within 3 hours of recognition. Observational evidence supports this volume (1,14). Fluid administration beyond initial resuscitation should be carefully monitored to ensure that the patient remains fluid responsive.

The SSC Guideline is a strong recommendation, low quality of evidence.
5. **Apply Vasopressors**

Restoration of adequate perfusion pressure to the vital organs is essential. Vasopressors should be started within the first hour to achieve MAP of \( \geq 65 \text{ mm Hg} \) if initial fluid resuscitation is not adequate.

*The SSC Guideline is a strong recommendation, moderate quality of evidence.*
References


The Surviving Sepsis Campaign recognized early that dissemination and implementation of the guidelines were essential to changing clinical behavior throughout the world if its goals were to be met. SSC leaders identified the Institute for Healthcare Improvement as an expert partner to apply their innovative approaches in improvement science to move the Campaign toward its goals (1). Successful implementation of an early identification program as part of sepsis quality improvement on the hospital floors requires evidence that is compelling and that will move clinicians to act, similarly to what was proven in the Campaign's initial efforts in emergency departments and intensive care units.

What was proven in the Campaign’s initial efforts in other locations can be found on the SSC website at www.survivingsepsis.org and applied and adapted for in-patient units. Examples of protocols and checklists that emerged from improvement efforts are available on the site along with detailed background and descriptions of improvement science techniques to guide teams in establishing their efforts. Additionally, educational resources such as videos and handouts; news items; announcements of educational events; and relevant literature can be found on the site (2). An electronic mailing list is available to share questions and tips among clinician peers at sepsisgroup@lists.sepsisgroups.org.

PILOTING THE PROGRAM

Introducing the program on a pilot unit allows for tests of change on a small scale, promotes feedback from frontline staff, and generates modifications to adaptive process change prior to spreading the initiative to other units. Piloting routine nurse sepsis screening on a unit with a known positive environment, high job satisfaction, and supportive leadership is key to success and eventual spread of the initiative. Ideally this will be a unit with a significant sepsis patient population because the staff will observe and be inspired by the results of their efforts quickly. Timely and actionable data on performance are essential in designing the strategy. In most circumstances, an initiative for routine screening for sepsis—increasingly based on the electronic medical record (EMR)—will be managed by the nursing staff on the hospital floors. Therefore, the success of any team’s initiative will be directly dependent on recruitment of motivated nurse leaders. Feedback is crucial
and may be done one-on-one, in small groups, or in staff meetings. Information discussed should include the screening compliance rate, whether cases were appropriately identified, review of missed cases, celebration of successes, and barriers to communication and documentation.

References
2. Surviving Sepsis Campaign website. www.survivingsepsis.org
Early identification of patients with sepsis on the hospital floors is dependent on acceptance of the work by bedside nurses. The aim of routine screening done by nurses is to facilitate early sepsis identification to avoid preventable clinical deterioration. The Campaign’s bywords are “Screen every patient; every shift; every day.” As the chief bedside caregivers in a hospital setting, nurses are in the best position to recognize worsening of a patient’s clinical condition. Identification of at-risk patients can result in provider consultation, early intervention, and improved outcomes. As partners with hospitalists or admitting physicians, nurses play a key role in improving sepsis care. Gains are typically achieved by respecting a nurse’s autonomous judgment within the scope of their work, and by ensuring multidisciplinary collaboration.

The concept of “looking for sepsis” with standardized screening tools and protocols can be a significant culture change for floor nurses. As such, a team-oriented approach that provides feedback on clinical performance for both the screening and management of each patient is critical. Initially, nursing staff may experience anxiety having to accomplish yet another task and respond to additional alerts; however, creating the motivation to incorporate screening as standard work and keeping the importance of the initiative at the forefront can alleviate this concern. Generating enthusiasm is most effectively done by reviewing data collected on actual patients the team knows and providing feedback about caregiver performance.

PREPARING THE TEAM

Prior to implementing a sepsis program, involving nursing leadership and frontline staff is imperative. Nursing leadership and bedside nurses should be engaged in all aspects of team preparation, in planning an education process, and in the overall implementation plan. Great care should be undertaken to provide nurses the training and support required to help them understand the value of the new task.

Sharing patient cases and current literature that highlight both positive and negative outcomes can inspire nurses to complete routine sepsis screening, and can elucidate opportunities to engage in critical thinking. Teaching the natural history of sepsis and the effect that early identification and common interventions such as fluids and antibiotics can have on outcomes motivates nurses to act.
Ideally, the setting for a successful sepsis screening program fosters nurse empowerment and multi-professional collaboration. The implementation team should consider the effect of new screening processes on existing clinical workflows (e.g., nurse-to-patient ratio, usage of nursing assistants) and nursing unit characteristics (e.g., experience, self-confidence, communication skills). Once the environment is well understood, the implementation team can work to develop skills in critical thinking, sepsis clinical assessment, and interprofessional collaboration essential to routine sepsis screening.

**PROVIDING EDUCATION**

Concurrent education is essential while nurses become accustomed to new screening processes. Education should focus on understanding the pathophysiology and early identification of sepsis, effective communication with the provider, and preparing for and giving timely treatments. Refreshers on assessment skills related to potential new infection sites as well as response to treatment for existing infection may be part of an education plan. Education about early signs of organ failure is also useful. Training related to specific checklists, screening tools, and communication protocols enhances the program.

**COMMUNICATION SKILLS**

Effective communication of findings to licensed independent practitioners is essential to the provision of timely treatment, especially because the physician or an advanced practice provider may not always be available on the unit. Establishing communication policies and scripted responses to positive screens can support requests for help and overcome resistance from providers or superiors.
Appreciating the truth of “sepsis without walls” is paramount in the role of physicians across all disciplines in optimizing care for patients with sepsis. As members of the collaborative team, physicians’ engagement and active participation in sepsis quality improvement demonstrate commitment to the rest of the team’s screening and communication efforts.

Knowledge of the evidence-based clinical guidelines and how to implement them as well as acknowledging that sepsis is a medical emergency that requires immediate initiation of the Hour-1 Bundle are essential to a successful improvement effort. All physicians’ participation in education, communication, and data collection show their commitment and enhance interaction with the other team members in clinical situations.

Because patients with sepsis or septic shock will be admitted to inpatient wards or directly to the ICU, good communication and handoffs are crucial between the ED and transferring care unit staff. Patients who are resuscitated in the ED may need further monitoring every shift, every day for their hospital stay. In-hospital staff, consultants, intensivists, emergency physicians, and primary care physicians are just some of those whose actions impact outcomes. Discharge orders from all points of care should include information so receiving physicians are aware of the patients’ history of sepsis to arrange appropriate follow-up care.

Without question, any institution striving to provide exemplary care of patients with sepsis will establish a clear process among all team members for communicating effortlessly at all points.
To change culture and ensure success of any initiative involving behavior change, identifying caregiver-specific barriers is essential, as is providing potential solutions. Although institutional variance may occur, many systems have common barriers. By anticipating these barriers and proactively generating potential solutions, resistance from caregivers can be ameliorated and clinicians can be recruited to the change process. Common barriers and their possible solutions for the process of integrating routine screening for sepsis on the hospital floors are identified in Tables 1 and 2.

### Table 1. Top Five Barriers and Education/Solutions for Nurses

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<tr>
<th>Barriers/Contributing Factors</th>
<th>Targeted Education/Solutions</th>
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</thead>
<tbody>
<tr>
<td><strong>Delay in Recognition of Sepsis</strong></td>
<td>■ Develop enhanced education to improve knowledge of risks and sepsis recognition&lt;br&gt;■ Develop and implement standardized sepsis screening tools and treatment protocol</td>
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<tr>
<td>Nursing staff does not recognize when the patient has met sepsis criteria</td>
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<tr>
<td><strong>Poor Communication Regarding Change in Patient Status</strong></td>
<td>■ Implement sepsis tool/positive sepsis screen form to communicate with charge nurse that there is a sepsis patient to expedite treatment of that patient</td>
</tr>
<tr>
<td>Hesitation to call physician regarding possible sepsis patients and/or hesitation to question or recommend treatment</td>
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<tr>
<td><strong>Delay In or Failure To Measure Lactate Level</strong></td>
<td>■ Develop and implement a defined protocol for lactate rescreening specifically for patients moving from the ED to the floor</td>
</tr>
<tr>
<td>Patient movement between floors during time of draw</td>
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<tr>
<td><strong>Delayed or No Antibiotic Administration</strong></td>
<td>■ Develop a team-based approach so nursing leadership members assist with patient monitoring and care during busier hours&lt;br&gt;■ Consult with the pharmacy team to ensure timely drug administration</td>
</tr>
<tr>
<td>Lack of staff availability to administer medications</td>
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<tr>
<td><strong>Inadequate Fluid Resuscitation</strong></td>
<td>■ Develop a method for communicating with staff when fluids need to be suspended and a process to check infusion when patients return from procedure/test</td>
</tr>
<tr>
<td>Fluids disconnected when patients away for test or during administration of medications</td>
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Table 2. Top Five Barriers and Education/Solutions for Physicians

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<tr>
<th>Barriers/Contributing Factors</th>
<th>Targeted Education/Solutions</th>
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| **Delay in Recognition of Sepsis**                    | - Develop education to improve sepsis recognition  
- Develop nurse-driven screening protocols for sepsis recognition  
- Conduct simulated patient exercises related to sepsis  
- Develop automated sepsis alerts through an electronic medical record (EMR)                                                                                                                                 |
| **Sepsis Treatment Not Prioritized/Lack of Urgency**   | - Implement a “Code Sepsis” designation to emphasize the urgency of managing sepsis  
- Standardize and mandate response to positive screens for sepsis that include multiple provider confirmation of findings and collaborative determination of appropriate management (eg, bedside nurse and shift supervisor, responsible physician, and rapid response team personnel) |
| **Delay In or Failure To Measure Lactate Level**       | - Provide education about timing and utility of measurement of lactate levels in sepsis  
- Integrate time-sensitive lactate measurement into standardized responses to positive sepsis screens and other sepsis recognition  
- Consider automation of repeat lactate measurement when elevated initial value is discovered at laboratory  
- Develop decision support into sepsis-based order sets in electronic provider order entry systems prompting the timely assessment of lactate, as well as other appropriate laboratory assessments and therapeutics (eg, blood cultures, antibiotics). |
| **Delayed or No Antibiotic Administration**            | - Develop recommended sepsis treatment order sets that include appropriate empiric broad-spectrum antibiotic therapy  
- Integrate decision support to prompt obtaining blood cultures prior to antibiotic administration when sepsis is suspected  
- Develop empiric antibiotic regimens for the penicillin-allergic patient with sepsis  
- Optimize access and delivery of antibiotics to ensure timely therapy through the involvement of pharmacy, nursing, and other relevant staff locally |
| **Inadequate Fluid Resuscitation**                    | - Provide staff education regarding the recommended choice of fluid, volume, rates of administration, and measures of adequate volume resuscitation in sepsis fluid volumes and appropriate fluid resuscitation  
- Share local case-based feedback with staff about successful and appropriate fluid administration in sepsis patients as well as in cases in which inadequate volume resuscitation resulted in less than ideal outcomes. Share successful fluid resuscitation stories with staff so they become more comfortable giving fluids. |
IDENTIFYING ROOT CAUSE

Without identifying the root causes for a failure, an organization expends time, money, and resources toward solutions that may not work, thus creating a mandate to determine the reason for problems prior to implementing solutions. Root causes of failure can be identified in several ways:

■ mapping the entire process from start to finish can identify where waste and variation in the process occur;

■ collecting data on turnaround or production time, staffing, and volume can identify where there is waste and variation with time or resources; and

■ staff interviews, surveys, and questionnaires can help delineate where waste or delay occurs.

Consider the example of adequate fluid resuscitation for sepsis patients. Lack of staff knowledge on fluid volumes, staff fear of fluid overload, and fluids’ being disconnected when the patient leaves the unit are all examples of root causes for why a patient may receive inadequate fluid resuscitation. However, each of those root causes requires a different solution to solve the problem effectively. Without identifying the specific root cause, an organization runs the risk of putting solutions in place that do not address the actual problem. In many cases, piloting identified solutions in targeted areas before rolling out system-wide can provide valuable feedback and other opportunities for optimization.

SUSTAINABILITY

Once barriers are identified and solutions put in place, maintaining the achieved success presents new challenges. While units, hospitals, and hospital systems will have unique problems and solutions, the need to maintain successes is common. While organizations can implement alerts and protocols to improve processes and achieve success, if there is no continued plan for monitoring improvements/outcomes moving forward, it will be difficult to identify when and if the alerts or processes have stopped working or lost their effectiveness. This is why it is imperative to create a control plan for sustainability.

To create an effective control plan, you must first determine the critical inputs and outputs you will continue to monitor on a daily, weekly, or monthly basis. Next, minimize the greatest risks for failure to the process by ensuring that controls are in place to detect the failure when it occurs. If training or education is involved, determine the adequacy, frequency, maintenance, operating, and response plans for the training including involvement of new staff. Verify compliance with standard work or develop standard processes if none are in place. And, finally, be sure to assign roles and responsibilities for each measure or solution to ensure accountability.
Protocol fatigue is a serious problem affecting sustainability. Often, fatigue occurs when a system overloads providers with alerts (1). Several studies have shown that as many as 98% of automated alerts are ignored or dismissed by providers (2). To avoid alert and protocol fatigue, order sets should be carefully designed such that alerts do not interrupt the providers’ workflow. Ensure that front line staff are involved in designing any alert process to increase likelihood of integration into existing workflows. If alerts are triggered, they should be consolidated to a single “pop-up” and not be presented in a barrage of pop-ups as each one is encountered (3). To assist with this, utilize the Information Technology (IT) team early in the process to understand the capabilities and limitations of your existing EMR application. Another effective strategy for reducing alert fatigue is to show the providers that the alerts are relevant to their patients, and that they will be held accountable for their performance on related measures (4,5). Any algorithm that attempts to identify patients at risk for developing sepsis or with sepsis must take these design considerations and operational realities into consideration or risk being dismissed by the providers with no further consideration.

REMAIN VIGILANT

To promote continued monitoring and feedback, ensure that a team member is responsible for watching performance levels and can provide reminders and education to the team as needed. Include quality and process improvement staff to the team to assist in monitoring compliance with new standards.

References

Successful treatment of sepsis on the hospital floors depends on accurate, timely, and feasible identification of patients who have both physiologic instability and clinical suspicion of infection.

**PHYSIOLOGIC SCREENING**

Several approaches to identifying physiologic derangements are associated with sepsis (1). Traditionally, these have been SIRS-based, owing largely to the feasibility of a simple bedside tool that can be used without need for a computer or calculator. SIRS is highly sensitive, identifying the vast majority of patients who do have sepsis and identifying them early. However, it lacks specificity not only in the ED population (2), but also in general medical-surgical unit patients, approximately half of whom will meet SIRS criteria at some point during their stay (3). This lack of specificity profoundly increases false alarms and so limits the utility of SIRS-based screening on the floors. Although developed for predicting deterioration in patients with infection, qSOFA was not intended as a screening tool for sepsis (4). With only 3 criteria, it is even easier to complete at the bedside than SIRS; it also has significantly higher specificity than SIRS (5) for deterioration, not screening. The Center for Medicare and Medicaid Services requires SIRS for mandated reporting of SEP-1.

A second approach includes using more general early warning scores, such as the MEWS (Modified Early Warning Score) which may be in place as part of many hospitals’ rapid response systems (6). While not designed specifically for sepsis, they tend to have good sensitivity since sepsis is a major cause of clinical deterioration. They have the added benefit of having an ordinal scale, with a wider range of output (eg, 0 to 14), which enables adjustment of the threshold to match a required specificity or timing need. In the UK, the UK’s NEWS (National Early Warning Score) may perform a similar function (7-9).

A third approach focuses on more complex, computer-generated risk-prediction tools that utilize EMR data (10-12). These have the promise of improved accuracy and timeliness, as they can utilize more data and run in real-time. Of note, the quality of all these screens is dependent on the quality and timing of the data input. Both respiratory rate and mental status are important predictors as evidenced...
by their inclusion in most candidate screening tools, yet both are known to be frequently poorly recorded (13,14). Further, if vital signs are monitored infrequently, screening will be delayed. Ultimately, optimal screening is likely to be a product of the tool, the quality of the data, and the frequency of the screen. Table 3 summarizes the tradeoffs among the available tools.

Table 3. Tradeoffs among Tools for Screening for Abnormal Physiology

<table>
<thead>
<tr>
<th></th>
<th>Accuracy</th>
<th>Timeliness</th>
<th>Feasibility</th>
<th>Comments</th>
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<tbody>
<tr>
<td>SIRS</td>
<td>★</td>
<td>★★</td>
<td>★★★★☆☆★☆</td>
<td>With high sensitivity but very low specificity, SIRS can be expected to generate many false positives. It is incorporated into CMS’s Sep-1 approach and is familiar to many providers.</td>
</tr>
<tr>
<td>qSOFA</td>
<td>★★</td>
<td>★</td>
<td>★★★★☆☆★☆</td>
<td>qSOFA is incorporated into Sepsis 3 as a prompt for clinicians to consider sepsis. It has better specificity than SIRS, but sacrifices some sensitivity.</td>
</tr>
<tr>
<td>Early Warning</td>
<td>★</td>
<td>★★</td>
<td>★★☆☆☆☆☆☆☆♀♀</td>
<td>Early warning scores such as MEWS, NEWS, and PEWS have been incorporated by many hospitals as part of rapid response system deployments. They require the computation of a score at bedside, which may limit feasibility.</td>
</tr>
<tr>
<td>Scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computerized</td>
<td>★★★☆</td>
<td>★★</td>
<td>★☆☆☆☆☆☆☆♀♀☆♀</td>
<td>Computerized algorithms use many parameters to enhance sensitivity and specificity of detecting patients at risk of poor outcomes, but their complexity may require specialized informatics support for practical implementation. They have not been widely disseminated or adopted; therefore, their wide application has yet to be confirmed.</td>
</tr>
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SCREENING FOR CLINICAL SUSPICION OF INFECTION AND SEPSIS

Infection is a core part of the definition of sepsis, but whether infection is suspected is subjective and has high inter-observer variability (15-18). This may be particularly true at the time sepsis screening is done, as evidenced by the lack of agreement between nurses and ordering providers in one ward study (19). While nurses in that study appeared to identify sepsis earlier and more often than the ordering providers, the predictive accuracy went up significantly when both provider types agreed, suggesting that screening should include components for both nursing and physician or other licensed provider suspicion.

Additionally, the timing of the screen is more complicated than in the ED although both the ED and wards use time of recognition as the trigger for sepsis intervention. Patients may stay on the wards for days with infinite longitudinal screening opportunities. As such, it may make more sense to have changes in physiology drive the query for clinical suspicion. A practical alternative is to define a set schedule for screening (eg, once per shift) which may be more aligned with workflow but can introduce delay in identification. Further, it is important to define patients for whom screening of sepsis is not indicated, such as those receiving comfort care.

Recommendations:

- Hospitals should select the most accurate and timely approach to sepsis screening that they can feasibly implement.

- Abnormal physiology should prompt a query for clinical suspicion of infection by both the bedside nurse and physician, nurse practitioner, or physician assistant.

- Hospitals should accurately document physiologic predictors of sepsis on the wards, including respiratory rate and mental status.

References


