

# Actionable Patient Safety Solutions™ (APSS™): Early Detection and Treatment of Sepsis

## How to use this guide

This APSS provides evidence-based actions and resources for executives, leaders, clinicians, and performance improvement specialists. This document is intended to be used as a guide for healthcare organizations to examine their own workflows, identify practice gaps, and implement improvements. In it, you'll find:

**Best Practice Summary:** A high level summary of evidence-based, clinical best practices. (page 2)

**Executive Summary:** Executives should understand the breadth of the problem and its clinical and financial implications. (page 2)

**Leadership Checklist:** This section is for senior leaders to understand common patient safety problems and their implications related to early detection and treatment of sepsis. Most preventable medical harm occurs due to system defects rather than individual mistakes. Leaders can use this checklist to assess whether best practices are being followed and whether action is needed in their organization around early detection and treatment of sepsis. (page 3)

**Clinical Workflow:** This section includes more specific information about recognizing early detection and treatment of sepsis across the continuum of care. Leaders should include the people doing the work in improving the work. This section outlines what should be happening on the frontline. Clinicians can use this section to inform leaders whether there are gaps and variations in current processes. This is presented as an infographic that can be used for display in a clinical area. (page 4)

**Education for Patients and Family Members:** This section outlines what frontline healthcare professionals should be teaching patients and family members about early detection and treatment of sepsis. Clinicians can inform leaders whether there are gaps and variations in the current educational processes. (page 8)

**Performance Improvement Plan:** If it has been determined that there are gaps in current practice, this section can be used by organizational teams to guide them through an improvement project. (page 9)

**What We Know about Early Detection and Treatment of Sepsis:** This section provides additional detailed information about early detection and treatment of sepsis. (page 12)

**Resources:** This section includes helpful links to free resources from other groups working to improve sepsis safety. (page 14)

**Endnotes:** This section includes the conflict of interest statement, workgroup member list, and references. (page 15)

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# Best Practice Summary

## Awareness

- Prioritize awareness campaigns within the community about signs and symptoms of sepsis and what to do if signs and symptoms are present.
- Empower patients and community members to say “I suspect sepsis” when they arrive in a care facility with signs and symptoms of sepsis.
- Sepsis Recognition
- Perform initial sepsis screening for all patients using validated tools.
- Rule in sepsis before ruling it out.
- Communicate sepsis suspicion across team members, including patient-specific risk factors.
- Use appropriate assessment criteria, including, but not limited to, SIRS criteria and markers of organ dysfunction.

## Sepsis Intervention

- Administer fluids and antibiotics as early as possible.
- Re-evaluate patient condition to determine appropriate next steps, which may include IV antibiotics, obtaining serum lactate levels, and administration of oxygen or vasopressors.
- Initiate sepsis shock bundle when appropriate.
- Continuously assess the patient for improvement or need for increased intervention.
- Remain vigilant for alerts if patient vitals change to indicate possible sepsis.

## Discharge

- Explain to the patient and family members the long-term implications of sepsis beyond hospitalization, including information about post-sepsis syndrome.
- Ensure patient and family members understand their role in follow up care, appropriate use of medications, and when and how to seek help if needed.

# Executive Summary

## The Problem

Any infection can lead to sepsis and worldwide, one-third of people who develop sepsis die ([Sepsis Alliance, 2021](#)). Mortality from sepsis increases by as much as 8% for every hour that treatment is delayed. As many as 80% of sepsis deaths could be prevented with standardization and mobilization of tools and protocols already available in many institutions.

## The Cost

Sepsis was rated the most expensive condition to treat in hospitals, with an estimated \$55,616,438 spent on sepsis in the US each day ([CDC, 2015](#)) and \$62 billion spent annually worldwide ([Buchman et al., 2020](#)). Sepsis patients are not only 2-3 times more likely to be readmitted to the hospital than patients with heart failure or pneumonia, but the readmission for previously-septic patients is more expensive than readmission for either aforementioned condition ([NIH, 2020](#)).

## The Solution

Many healthcare organizations have successfully implemented and sustained improvements and reduced sepsis morbidity and mortality. This document provides a blueprint that outlines the actionable steps organizations should take to successfully reduce/improve sepsis rates and summarizes the available evidence-based practice protocols. This document is revised annually and is always available free of charge on our website.

## Leadership Checklist

(See [Appendix A](#) for Detailed Senior Leadership Checklist)

On a monthly basis, or more frequently if a problem exists, the executive team should review the outcomes of patients with infections and sepsis. Use this checklist as a guide to determine whether current evidence-based guidelines are being followed in your organization:

### Ensure policies and protocols are easy for the frontline to follow in their existing clinical workflows.

- Ensure that sepsis prevention and early recognition protocols are embedded into [clinical workflows](#), whether electronic or paper.
- Implement a process for continuous monitoring protocols that is readily accessible by those on the frontline.
- Eliminate barriers to making rapid changes to documentation templates and order sets.
- Establish a priority system, whether through the EHR alerts or clinical workflow decision making, to flag sepsis based on initial vital signs.
- Establish the expectation for sepsis screening upon admission and any change in condition.
- Establish a mechanism to call ahead into the emergency department if the patient has signs of sepsis.

### Recognize that the key to sepsis prevention is education of patients, family members, and the general public.

- Work with the emergency department to raise patient awareness of their symptoms of sepsis and the language to use to call attention to it (e.g., share signs and symptoms of sepsis and what to do on walls or TVs in the emergency room).
- Establish a general public awareness campaign to inform patients of signs and symptoms of sepsis and to inform them of the time-sensitive need to raise concern and say 'I suspect sepsis' to mobilize the clinical team immediately. Include patients and family members in community education efforts. See [Appendix D](#) for a general public awareness campaign toolkit, adaptable by region and culture.

### Involve all in the improvement work and recognize well-executed efforts.

- Ensure frontline involvement in sepsis prevention improvement activities. Maintain their engagement and remove barriers to progress.
- Standardize continued sepsis education for all medical providers and for nonmedical professionals in a clinical position who interact with patients within the healthcare continuum.
- Ensure collaboration between critical access hospitals and EMS and standardize the decision making in the EMS setting around which facilities should receive the patient

based on their signs and symptoms.

- Incorporate atypical disciplines into sepsis education, simulations, and activities (e.g., registration staff, IT, etc). Emphasize the staff perceptions of hierarchy as a barrier to sepsis improvement and ensure all are aware of their responsibility to raise concern about sepsis.
- Hold staff accountable for providing the standard of care and reward success.

### **Create an automated surveillance system to monitor process and assess gaps.**

- Use an effective electronic surveillance system to improve early recognition of septic patients based on monitoring of the data found in the [clinical workflow](#).
- Use automated electronic screening and documentation of the process of care, based on existing data.
- Create a process for case reviews for outliers.
- Use your EHR as a data collection tool and source for predicting risk of sepsis for patients.
- Create a process for continuous monitoring of electronic systems and protocols, including compliance, efficacy, and outcome measures.

### **Measure effectively and share data to inform practice.**

- Measure and report sepsis prevention compliance monthly (number of inpatient mortalities for patients with severe sepsis and/or septic shock/total number of patients with severe sepsis and/or septic shock diagnosis codes that are admitted to the ICU from the emergency department or from an acute floor setting). Note trends in areas with low screening compliance and high incidence rate of poor outcomes due to sepsis. Routinely reassess outcomes.
- Debrief on a regular basis to solicit team feedback about barriers to sustained compliance. Adjust the plan quickly and nimbly as needed.
- Ensure that leaders have a simple process to oversee sepsis improvement work while also considering how it aligns with other initiatives across the organization.

## **Clinical Workflow**

### **1. GENERAL PUBLIC AWARENESS**

- Within general public awareness campaigns:
- Encourage all patients entering into the hospital to obtain [appropriate vaccinations and immunizations](#).
  - o Ensure individuals understand that if they ever suspect sepsis, they should not call a primary care physician or go to urgent care. They should go to the emergency room immediately.
  - o Give examples of the language patients should use if they suspect sepsis to convey the sense of emergency to the care team when they arrive at the hospital (e.g., Make the recommendation to clearly state "I'm concerned about sepsis and I need care now").
- See [Appendix D](#) for general public awareness information.



## 2. SEPSIS VIGILANCE AND SCREENING

- **Perform initial sepsis screening for all patients and rule in sepsis before ruling it out.** (See [The UK Sepsis Trust](#) for an Inpatient Sepsis Screening and Action Tool worksheet; See "[Sepsis Screening Tool and Algorithm for Critical Access Hospitals](#)" for a screening checklist).
  - Remain vigilant for sepsis in the prehospital setting. See "[Sepsis: First Response, EMS Training Module](#)" for more information.
- Use validated screening tools.
  - [qSOFA](#) Score: altered mental status (Glasgow coma scale < 15), respiratory rate  $\geq$  22/min, or systolic blood pressure  $\leq$  100 mmHg.
    - ◇ If two of the above, increase monitoring and assess for ICU admission.
  - [TIME from the Sepsis Alliance](#): Assess for Temperature, signs of Infection, altered Mental status, and patient indication of feeling Extremely ill such as being short of breath (See [Appendix C](#)).
- **Evaluate risk factors.** Very old or very young patients, those with an impaired immune system, those with chronic conditions, and pregnant females are among the high risk populations.
- **Check for infection.** Pneumonia (50%), followed by urinary tract (20%) and abdominal infections (15%), are the top three most common infections predicting sepsis ([United Kingdom Sepsis Trust, 2017](#)).
- **If initial broad screening indicates a possibility for sepsis, continue with assessment.**
  - *SIRS criteria*:
    - ◇ Temperature  $> 38.3^{\circ}$  C or  $< 36^{\circ}$  C.
    - ◇ HR  $> 90$ /min or greater than 2 SD above normal for age.
    - ◇ RR  $> 20$  breaths/min.
    - ◇ WBC ( $< 4,000$ /cu mm or  $> 12,000$ /cu mm or  $> 10\%$  bands).
    - ◇ Glucose  $> 140$  mg/dL or 7.7 mmol/L in the absence of diabetes.
  - *Markers of organ dysfunction*:
    - ◇ Tissue perfusion: lactate  $> 2$  mmol/L.
    - ◇ Cardiovascular: SBP  $< 90$  mmHg or MAP  $< 70$  mmHg or decrease in SBP  $> 40$  mmHg.
    - ◇ Hepatic: Tbili  $> 2$  mg/dL, INR  $> 1.5$ .
    - ◇ Renal: Cr increase  $> 0.5$  mg/dL or 44.2  $\mu$ mol/dL from baseline or urine output  $< 0.5$  mL/kg/hr for at least 2 hours despite adequate fluid resuscitation.
    - ◇ Pulmonary: PaO<sub>2</sub>  $< 60$  mmHg or SpO<sub>2</sub>  $< 90\%$  or PF ratio  $< 200$ .
    - ◇ Coagulation: Platelets  $< 100,000$  uL<sup>-1</sup> or aPTT  $> 60$  sec.
      - See [Appendix B](#) for SOFA score as a measure to identify organ dysfunction.
  - Other:
    - ◇ Plasma C reactive protein  $> 2$  SD above normal.

- ◇ Plasma procalcitonin > 2 SD above normal.
- ◇ Decrease in urine output and skin changes (mottling) or prolonged capillary-refill time.
- If organ dysfunction is present or if patient exhibits two or more SIRS criteria and is suspected of having an infection, document appropriately and initiate sepsis bundle.



### 3. INITIAL CARE AND ROUTINE TREATMENT, IF SEPTIC

#### **Administer fluids and antibiotics as early as possible.**

- Obtain blood cultures. Do not delay antibiotic administration if cultures cannot be obtained.
- Administer antibiotics to target the suspected bacteria/bacterium causing infection. Administer broad spectrum antibiotics based on suspicion of origin of sepsis.
- Administer 30 mL/kg crystalloid for hypotension or lactate  $\geq 4$  mmol/L within the first hour and complete within three hours of presentation.

#### **Evaluate the condition of the patient to determine appropriate prioritization of next steps.**

- Conduct the following sepsis protocols within one hour of diagnosis (See '[1-Hour Bundle](#)'):
  - Administer oxygen.
    - ◇ If patient is critically ill, oxygen should be delivered via reservoir mask at 15 L/min.
    - ◇ Once stabilized, aim for oxygen flow to achieve 94-98%.
  - Obtain and evaluate serum lactate levels.
  - Obtain blood cultures to guide antimicrobial therapy.
  - Give antibiotics via IV.
    - ◇ If unsure of source of infection, administer broad spectrum antibiotics.
    - ◇ Reduce antibiotics as soon as possible to avoid resistance.
  - Measure urine output.
    - ◇ Start a fluid balance chart once the catheter is placed.
  - Administer vasopressors for hypotension that does not respond to initial fluid resuscitation to maintain a mean arterial pressure (MAP)  $\geq 65$  mmHg.
- For septic shock, initiate septic shock bundle:
  - In the event of persistent hypotension despite volume resuscitation (septic shock) or initial lactate  $\geq 4$  mmol/L (36 mg/dL), re-assess volume status and tissue perfusion and document findings.
  - Either:

- ◇ Repeat focused exam (after initial fluid resuscitation) by licensed independent practitioner including vital signs, cardiopulmonary, capillary refill, pulse and skin findings.
- ◇ Or one of the following:
  - Measure CVP.
  - Measure ScvO<sub>2</sub>.
  - Conduct bedside cardiovascular ultrasound.
  - Conduct dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge.



## 4. DISCHARGE

- Explain to the patient and family how to recognize infection and sepsis and when to seek medical care.
  - Make sure patients and family members have a thorough and comprehensive understanding that sepsis is the body's reaction to an infection and as such, the full care team will be vigilant about possible infections.
- Ensure understanding of physical and cognitive self-care.
  - Tailor care efforts to patient preferences and resources available.
  - Explain medications and how to use appropriately.
- Make an attempt to understand the patient's daily life to mitigate barriers to medication non-adherence.
  - Help the patient take notes on their pill card, portal, etc. to keep track of their medications.
- Explain follow up appointments needed and how to schedule.
  - Make sure patients and families understand the need for each appointment and what questions may be appropriate to ask. See [Care Coordination](#) APSS.
- Communicate with the patient about what they might experience physically and psychologically upon returning home.
  - Convey that discharge can be emotionally rigorous and that it is okay to seek help, if and when needed, and at any point.
- Explain any long term effects of sepsis and how to best mitigate.
  - Be realistic yet encouraging when describing the typical obstacles and milestones in sepsis recovery.
- Explain post-sepsis syndrome and ensure that patient and family members understand how to monitor for post-sepsis syndrome (See [Post-sepsis Syndrome](#)).

# Education for Patients and Family Members

The outline below illustrates all of the information about sepsis prevention, recognition, and treatment that should be conveyed to the patient and family members by someone on the care team in a consistent and understandable manner.

- Elaborate on the signs and symptoms indicating possible sepsis.
- Provide a basic overview of the methods of sepsis recognition.
- Explain the cause of sepsis and its impact.
- Explain how patients and family members can serve as an extra pair of eyes for detection and explain what they should look for that may indicate deterioration (e.g., abnormal vital signs, etc).
- Ensure patients and family members understand exactly where to go for help, who to call, and what to say.
- Give patients and family members a “job” while they are in the hospital, which could include:
  - Monitoring for and alerting staff of changes in the patient’s mental status.
  - Alerting staff to apparent changes, such as fever or chills.
  - Alerting staff if patient is feeling lightheaded or dizzy.
  - Alerting staff to changes in breathing patterns.
  - Alerting staff if patient is experiencing feelings of ‘impending doom’ or restlessness.
  - Alerting staff of unusual bleeding.
  - Alerting staff to changes in urine output.
- Describe what can be anticipated upon a sepsis diagnosis.
- Thoroughly explain the treatment that can be expected if sepsis is detected.
- Explain what can be anticipated in the patient after discharge regarding both physical and cognitive functioning.
- Ensure that time has been allocated to the discussion of post sepsis syndrome. Explain how patients and family members can mitigate the onset of post-sepsis syndrome and what to do if they suspect deterioration after discharge.
- Ensure thorough explanation of necessary post-discharge appointments, therapies, medications, and potential complications. Assess for patient preference in time and location of follow-up appointments, if possible.
- Provide patients and family members resources, including direct contact phone numbers, to the hospital for post-discharge questions. Make sure the resources are in their own language.
- Explain how life after discharge may be different after a sepsis experience.
  - [CDC: Life After Sepsis Factsheet](#)
  - Sepsis Alliance: [Sepsis Survivor Information](#)

See [Healthcare Literacy](#) APSS for strategies to effectively communicate with patients and family members.

# Performance Improvement Plan

Follow this checklist if the leadership team has determined that a performance improvement project is necessary:

- Gather the right project team.** Be sure to involve the right people on the team. You'll want two teams: an oversight team that is broad in scope, has 10-15 members, and includes the executive sponsor to validate outcomes, remove barriers, and facilitate spread. The actual project team consists of 5-7 representatives who are most impacted by the process. Whether a discipline should be on the advisory team or the project team depends upon the needs of the organization. Patients and family members should be involved in all improvement projects, as there are many ways they can contribute to safer care.

## Complete this Lean Improvement Activity:



Conduct a [SIPOC](#) analysis to understand the current state and scope of the problem. A SIPOC is a lean improvement tool that helps leaders to carefully consider everyone who may be touched by a process, and therefore, should have input on future process design.

### RECOMMENDED SEPSIS IMPROVEMENT TEAM

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• Nurses</li><li>• Intensivist (e.g., pulmonologist, infection prevention, etc)</li><li>• Emergency physician</li><li>• Hospitalist</li><li>• Pharmacists</li><li>• Respiratory therapists</li><li>• Infection preventionist</li><li>• Laboratory</li><li>• Patient advocates</li><li>• Admitting and registration staff</li><li>• Case management</li></ul> | <ul style="list-style-type: none"><li>• Clinical educators</li><li>• Quality management</li><li>• Clinical nurse specialistNurse practitioners</li><li>• Patient safety officer</li><li>• EMS service</li><li>• Quality improvement officer</li><li>• EMS state director</li><li>• Long term care clinician</li><li>• Patients and family member representation</li><li>• Public health specialists (e.g., HAI coordinator)</li><li>• Health promotion specialists</li></ul> |
|--|--|

Table 1: Understanding the necessary disciplines for a sepsis improvement team

- Understand what is currently happening and why.** Reviewing objective data and trends is a good place to start to understand the current state, and teams should spend a good amount of time analyzing data (and validating the sources), but the most important action here is to go to the point of care and observe. Even if team members work in the area daily, examining existing processes from every angle is generally an eye-opening experience. The team should ask questions of the frontline during the observations that allow them to understand each step in the process and identify the people, supplies, or other resources needed to improve patient outcomes.

Create a [process map](#) once the workflows are well understood that illustrates each step and the best practice gaps the team has identified ([IHI, 2015](#)). Brainstorm with the advisory team to understand why the gaps exist, using whichever [root cause analysis tool](#) your organization is accustomed to ([IHI, 2019](#)). Review the map with the advisory team and invite the frontline to validate accuracy.



## SEPSIS PROCESSES TO CONSIDER ASSESSING

### Awareness:

- How current and prospective community partners are engaged
- [Awareness campaigns](#) (e.g., presentations, social media, [public service announcements](#), etc)

### Screening and actions taken thereafter: Pre-hospital

- Treatment within ambulance
- Timing of antibiotic administration prehospital versus in facility
- Coordination of pre-hospital versus hospital environment (E.g., implementing sepsis bundle)
- EMS screening and decision making (fluid resuscitation versus critical care path)
- EMS decision making around the care facility to go to based on patient severity

### Screening and actions taken thereafter: ED and in-patient

- Screening of patients at high risk for deterioration using the [Modified Early Warning Score](#), [Early Warning Scoring System](#), or [National Early Warning Score](#)
- Consider who is completing the screening, where the screening is done, who responds to the positive screen, and how the sepsis bundle is activated.
- Use of trigger tool ([Sepsis Algorithm for Critical Access Hospitals](#))
- Mental status assessment
- Vitals assessment
- Urinary output monitoring
- Competency of different staff members in recognizing sepsis and mobilizing staff appropriately
- Continuous in-patient monitoring
- Detection during surgery
- Patient elevation of concern within care team dialogue
- Patient/family initiation of rapid response
- Actions after a sepsis alert is identified (e.g., transfer to higher level of care, use of sepsis checklists, etc)

### Bundle:

- Execution of the [hour-1 bundle](#)
- Identification of infection source
- Labs
- Drawing of blood cultures prior to administration of broad spectrum antibiotics
- Administration of fluids and antibiotics after sepsis identification

### Rapid Response:

- Use of sepsis pack or sepsis trolley
- Time to gather materials
- Code Sepsis use (e.g., awareness of frontline staff in calling a code sepsis, role clarity of sepsis care team upon arrival)

### Hand-Off (See [Hand-Off Communication APSS](#)):

- Opportunities for repeat back during hand-off
- Receiver interpretation and decision making after hand-off
- Index of suspicion conveyed by sender in a hand-off

### Documentation:

- Earliest chart documentation of sepsis
- Time of alert of infectious disease physicians
- Classification of deaths as directly attributable to sepsis, instead of underlying conditions

*Table 2: Consider assessing these processes to understand where the barriers contributing to sepsis outcomes may be in your organization. See [Appendix A](#) for further questions to ask for a current state assessment.*

- **Prioritize the gaps to be addressed and develop an action plan.** Consider the cost effectiveness, time, potential outcomes, and realistic possibilities of each gap identified. Determine which are a priority for the organization to focus on. Be sure that the advisory team supports moving forward with the project plan so they can continue to remove barriers. Design an experiment to be trialed in one small area for a short period of time and create an action plan for implementation.

**The action plan should include the following:**



- Assess the ability of the culture to change and adopt appropriate strategies
- Revise policies and procedures
- Redesign forms and electronic record pages
- Clarify patient and family education sources and content
- Create a plan for changing documentation forms and systems
- Develop the communication plan
- Design the education plan
- Clarify how and when people will be held accountable

**TYPICAL GAPS IDENTIFIED IN SEPSIS PREVENTION, RECOGNITION, AND TREATMENT**

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Those in the general public are not aware of the signs and symptoms of sepsis and where to go if they suspect sepsis.</li> <li>• Patients do not vocalize their concern of sepsis to those in the emergency room.</li> <li>• The screening tool execution is not standardized.</li> <li>• Sepsis may be misclassified as another issue.</li> </ul> | <ul style="list-style-type: none"> <li>• Urgent treatments are not delivered quickly.</li> <li>• Staff members do not pay attention to alerts.</li> <li>• There is too much time between recognition of sepsis and initiation of treatment.</li> <li>• EMS decision making is not standardized.</li> <li>• Blood cultures may be contaminated after administration of broad spectrum antibiotics.</li> </ul> |
|---|--|

Table 3: By identifying the gaps in sepsis prevention and treatment compliance, organizations can tailor their project improvement efforts more effectively

- **Evaluate outcomes, celebrate wins, and adjust the plan when necessary.** Measure both process and outcome metrics. Outcome metrics include the rates outlined in the leadership checklist. Process metrics will depend upon the workflow you are trying to improve and are generally expressed in terms of compliance with workflow changes. Compare your outcomes against other related metrics your organization is tracking.

Routinely review all metrics and trends with both the advisory and project teams and discuss what is going well and what is not. Identify barriers to completion of action plans, and adjust the plan if necessary. Once you have the desired outcomes in the trial area, consider spreading to other areas ([IHI, 2006](#)).

It is important to be nimble and move quickly to keep team momentum going, and so that people can see the results of their labor. At the same time, don't move so quickly that you don't consider the larger, organizational ramifications of a change in your plan. Be sure to have a good understanding of the other, similar improvement projects that are taking place so that your efforts are not duplicated or inefficient.

[Read this paper](#) from the Institute for Healthcare Improvement to understand how small local steps



## SEPSIS METRICS TO CONSIDER ASSESSING

- EMR alerts
- Hand hygiene
- Time from recognition to administration of antibiotics
- Order of blood cultures
- Administration of broad spectrum antibiotics
- Readmission rates
- Length of stay
- Time spent in emergency room

Table 4: Consider evaluating related metrics to better understand sepsis presence and contributing factors

## What We Know About Sepsis

### Sepsis

Sepsis is defined as life-threatening organ dysfunction caused by the body's abnormal and dysregulated response to an infection. Any infection can lead to sepsis. Septic shock is defined as a "subset of sepsis in which particularly profound circulatory, cellular, and metabolic abnormalities are associated with a greater risk of mortality than with sepsis alone" ([Singer et al., 2016](#)).

- See the [Sepsis Alliance's Risk Factors Fact Sheet](#).
- See the [Sepsis Alliance's Sepsis Information Guides](#) for information tailored for specific populations or circumstances, such as sepsis and amputations, sepsis and C. diff, sepsis and invasive devices, etc.

### Clinical Implications

Sepsis affects an estimated 49 million people worldwide each year, including more than 20 million children under age 5, and nearly 5 million older children and adolescents (ages 5-19) ([Rudd et al., 2020](#)). Around the world each year, sepsis takes 11 million lives, contributing to 20% of all deaths globally and taking more lives than cancer ([Rudd et al., 2020](#)). This is more than 20 deaths every minute ([Kempker & Martin, 2020](#)).

Those in low- and middle-income countries are estimated to have a higher rate of sepsis due to a higher rate of infectious diseases and higher rates of morbidity and mortality due to limitations in structural, organizational, and human resources.

In the US alone, more than 1.7 million people are diagnosed with sepsis each year - one every 20 seconds - and the incidence is rising ([Rhee et al., 2017](#); [Hall et al., 2011](#); [Buchman et al., 2020](#)). 270,000 people die from sepsis every year in the US - one every 2 minutes; more than from prostate cancer, breast cancer and opioid overdose combined ([NIH, 2020](#); [NIH, 2020](#); [Rhee et al., 2017](#)).

- Scotland and Wales have reported national mortality rates of 20% and 24% respectively.
- Researchers in the UK estimate that around 5% of emergency admissions are due to sepsis. With 5,482,700 emergency admissions in 2015, this extrapolates to approximately 274,000 sepsis cases in the UK in one year ([United Kingdom Sepsis Trust, 2017](#)). Additionally, England's 2015 NCEPOD report, titled 'Just Say Sepsis', announced an overall sepsis mortality rate of 28.9% ([United Kingdom Sepsis Trust, 2017](#)).
- In Australia, approximately 5,000 die of sepsis each year, causing more deaths than

breast, prostate, or colorectal cancer ([Australian Sepsis Network, 2020](#)).

- In Germany, sepsis claims 60,000 lives annually ([WHO, 2020](#)).
- Worldwide, one-third of people who develop sepsis die ([Sepsis Alliance, 2019](#)).

As many as 87% of sepsis cases originate in the community and not in the hospital ([Rhee et al., 2017](#)). Studies show hospital-acquired severe sepsis is associated with higher resource utilization and cost along with higher mortality than community-acquired severe sepsis ([Page et al., 2015](#)).

Mortality from sepsis increases by as much as 8% for every hour that treatment is delayed. As many as 80% of sepsis deaths could be prevented with rapid diagnosis and treatment ([Kumar et al., 2006](#)).

## Financial Implications

Because septic patients often require extensive time in the ICU and expensive treatments, the Agency for Healthcare Research and Quality (AHRQ) listed sepsis as the most expensive condition treated in US hospitals ([NIH, 2020](#)). Costs for acute sepsis hospitalization and skilled nursing are estimated to be \$62 billion annually ([Buchman et al., 2020](#)). The average cost per hospital stay for sepsis is double the average cost per stay across all other conditions ([Pfundtner et al., 2013](#)). Sepsis is the number one cause of readmission to the hospital, costing more than \$3.5 billion each year ([Gadre et al., 2018](#); [Torio & Moore, 2016](#)).

- Sepsis treatment in Canada cost an average of \$325 million annually ([Canadian Sepsis Foundation, 2019](#)).
- York Health Economics Consortium (YHEC) estimated that given the 250,000 sepsis cases annually, the NHS spends between £1.5 and £2 billion each year on treatment efforts ([United Kingdom Sepsis Trust, 2017](#)).

## Post-Sepsis Syndrome

Many who survive sepsis are left with life-changing effects, such as [post-traumatic stress disorder \(PTSD\)](#), chronic pain and fatigue, organ dysfunction, or [amputations](#). These complications that arise after a sepsis diagnosis and recovery are known holistically as “post-sepsis syndrome” (PSS) ([Sepsis Alliance, 2021](#)).

In the estimated 50% of patients who recover from sepsis, PSS affects up between 16-50% of sepsis survivors, leaving them with physical and/or cognitive long term effects after a sepsis hospitalization ([Prescott & Angus, 2018](#); [Mostel et al., 2019](#)). These cognitive effects include insomnia, nightmares, anxiety, vivid hallucinations, panic attacks, PTSD, poor concentration, decreased cognitive functioning, and loss of self-esteem ([Mostel et al., 2019](#); [NHS Trust, n.d.](#)). In children, the impact of PSS can also include lower than average cognitive functioning and special education needs ([Sangan, 2019](#)). Older sepsis patients experience on average 1 to 2 new limitations on activities of daily living, such as bathing, dressing, or managing money after hospitalization.

About 40% of sepsis patients are rehospitalized within 90 days post-discharge, often for conditions that are typically preventable, such as infection ([Prescott & Angus, 2018](#)).

Sepsis survivors are also at increased risk for rehospitalization. The higher risk of infection following sepsis results from suppression of the immune system in the first few weeks and months following the initial bout of sepsis. In addition to infection, other common causes of rehospitalization after sepsis are heart failure, kidney failure, tissue death, and pulmonary aspiration.



## Resources

### For Sepsis Improvement

- [Sepsis Infographic](#)
- [Surviving Sepsis Campaign: Protocols, Screening Tools, and Checklists](#)
- [Surviving Sepsis Campaign: Hour-1 Bundle infographic](#)
- [Surviving Sepsis Campaign: Sepsis Recognition and Treatment Protocols](#)
- [CDC: Hospital Toolkit for Adult Sepsis Surveillance](#)
- [Sepsis: First Response](#)
- [Sepsis Alliance Clinical Community](#)
- [Sepsis Coordinator Network](#)
- [Sepsis: Across the Continuum of Care](#)
- [Posters and Infographics](#)
- [Sepsis Alliance Institute](#)
- [Sepsis Alliance](#)
- [Sepsis Community Education Toolkit](#)
- [Sepsis Information Guides](#)
- [Share your story on Faces of Sepsis](#)
- [Empowered Patient Signs of Sepsis Fact Sheet](#)
- [CDC: Sepsis resources](#)
- [National Institutes of Health \(NIH\) Sepsis Fact Sheet](#)
- [Sepsis Screening Tool and Algorithm for Critical Access Hospitals](#)

### Patient Stories and Resources

- [Gabriella Galbo](#)
- [Kate Hallisy](#)
- [Rory Staunton](#)
- [Joshua Nahum](#)
- [Nile Moss](#)
- [CDC: Get Ahead of Sepsis Infographic for Patients](#)
- [Sepsis Discharge Information for Patients](#)
- [CDC: Life After Sepsis Factsheet](#)
- [Life After Sepsis video Society of Critical Care Medicine and Sepsis Alliance](#)
- [Katy Grainger: Septic Shock with Multiple Amputations: A Survivor Story](#)

### For General Improvement

- [CMS: Hospital Improvement Innovation Networks](#)
- [IHI: A Framework for the Spread of Innovation](#)
- [The Joint Commission: Leaders Facilitating Change Workshop](#)
- [IHI: Quality Improvement Essentials Toolkit](#)
- [SIPOC Example and Template for Download](#)
- [SIPOC Description and Example](#)

# Endnotes

## Conflicts of Interest Disclosure

The Patient Safety Movement Foundation partners with as many stakeholders as possible to focus on how to address patient safety challenges. The recommendations in the APSS are developed by workgroups that may include patient safety experts, healthcare technology professionals, hospital leaders, patient advocates, and medical technology industry volunteers. Workgroup members are required to disclose any potential conflicts of interest.

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## Appendices

### Appendix A: Senior Leadership Checklists: Are all of the appropriate systems in place to ensure early recognition and proper treatment of sepsis?

#### Organizational assessment

1. Are there dedicated resources for a sepsis program?
  1. Does your hospital have a defined sepsis program?
  2. Is there dedicated staff to lead the sepsis program?
  3. What department is the program housed within? Quality, nursing, central hospital administration, others?
2. Is there ongoing, formal sepsis education offered for all of the following?

#### Sepsis screening and surveillance

1. Do all hospital departments have a standardized surveillance or routine screening process for early detection of sepsis, severe sepsis, and/or septic shock?
2. Is there automated continuous surveillance of data in electronic health records?
  1. Who receives alerts?
  2. What action does the alert prompt?
3. Is there intermittent routine screening by clinicians/nurses using a standardized process (ex. sepsis checklist, section of assessment flow-sheet, etc.)?
  1. What is the frequency of intermittent screening?
  2. What action does the intermittent screening result prompt?
4. Do your emergency department and urgent care department have an active surveillance or routine screening process for early detection of sepsis, severe sepsis, septic shock?
  1. If yes, is it electronic-based?

#### Sepsis management

1. Does your hospital have a standardized sepsis care bundle as part of a protocol or policy?
  1. Which of the following are included in your sepsis care bundle?

1. Obtain lactate level
2. Obtain blood cultures/other cultures (urine, CSF, wound, etc.)
3. Administer broad-spectrum antimicrobial agents within 1 hour of time of presentation (for inpatients) or within 3 hours of time of presentation (for ED patients)
4. Administer IV fluid challenge for hypotension or lactate  $\geq 4$  mmol/L
5. Administer vasopressor medications to maintain MAP  $\geq 65$  mmHg after IV fluid challenge and within 6 hours of time of presentation
6. Obtain a follow up lactate level if initial lactate was elevated ( $>2$ ), to evaluate resuscitation interventions (Target is normalization of lactate level)
7. If persistent hypotension, after 1-hour from completion of the 30 mL/kg IV fluid challenge resuscitation or lactate  $\geq 4$  mmol/L, measure CVP and/or ScvO<sub>2</sub> levels (Target is CVP 8-12 mmHg, ScvO<sub>2</sub> of  $\geq 70\%$  -these targets are being debated based on recent trial results –ARISE, PROCESS, PROMISE)

### Measurement

1. What are the metrics used?
2. What are the measurement procedures (manual, automated reports, etc.)?
3. Where is measurement data reported?
4. What are the screening compliance rates in your organization?

### Person and family engagement

1. Are materials or resources available for patients and families regarding:
  1. How the patient and family members can participate in prevention and early detection?
  2. The hospital's sepsis program (ex. screening, code sepsis, etc.)?
2. Do you have a rapid response team or a Condition H program?
  1. Is your rapid response or Condition H also patient-activated?
  2. How are patients and families alerted and oriented to the rapid response system?
3. Which provider or department is the contact point if the patient or family suspects infection or sepsis after discharge?

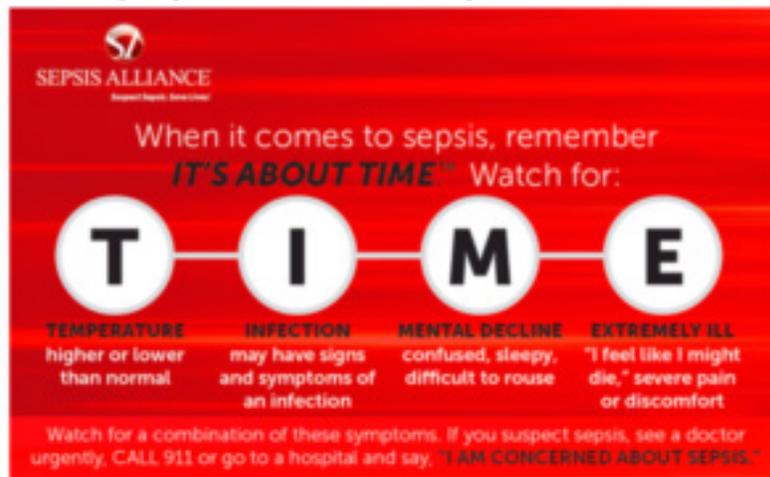
## Appendix B: SOFA Score

Box 5: The SOFA score

	Measurement	Score		Measurement	Score
<b>Respiratory</b>			<b>Liver</b>		
PaO <sub>2</sub> /FIO <sub>2</sub> (mmHg)	<400	1	Bilirubin(μmol/l)	20-32	1
	<300	2		33-101	2
	<200 + ventilated	3		102-204	3
	<100 + ventilated	4		>204	4
<b>Nervous system</b>			<b>Coagulation</b>		
GCS	13-14	1	Platelets x10 <sup>3</sup> /μl	<150	1
	10-12	2		<100	2
	6-9	3		<50	3
	<6	4		<20	4
<b>Cardiovascular system</b>					
	Mean arterial pressure <70 mmHg				1
	Receiving dopamine $\leq 5$ μg/kg/min or dobutamine (any dose)				2
	Dopamine >5 μg/kg/min OR epinephrine OR norepinephrine $\leq 0.1$ μg/kg/min				3
	Dopamine >15 μg/kg/min OR epinephrine OR norepinephrine >0.1 μg/kg/min				4
<b>Renal system</b>					
	Creatinine (μmol/l) (or urine output)			110-170	1
				171-229	2
			(or <500 ml UO per day)	300-440	3
			(or <200 ml UO per day)	>440	4

Image courtesy of the [UK Sepsis Trust](#)

## Appendix C: TIME Infographic from the Sepsis Alliance



## Appendix D: General Public Awareness Campaign Toolkit

- Sepsis Alliance offers a variety of 'Public Awareness Campaign' educational materials
  - [Sepsis 911](#)
  - [Public Service Announcements](#)
  - [Sepsis Symptoms](#)
  - [Sepsis Risk factors](#)
  - [Infection & Sepsis Prevention](#)
  - [Sepsis FACTS Sheets](#)
  - [Sepsis Information Guides \(SIGs\)](#)
  - [Sepsis & COVID-19](#)