Sepsis (Sepsis and Septic Shock)

Opportunity: Sepsis has the highest mortality rate and cost of any condition treated in U.S. hospitals, and causes significant morbidity. It ranks high on Health Catalyst's key process analysis of opportunity based on financial and volume metrics from a large normalized data set.

About this map: This high-level Care Process Improvement Map illustrates key evidence-based best practices for each phase of care, along with associated improvement opportunities that drive metrics and data visualizations in the Sepsis application. It is not intended as an inclusive care process model or a precise representation of application metrics, but rather to catalyze iterative outcomes improvement work.

> ED early recogn (screening and

alert processes)

KEY OUTCOME METRICS

Ventilator days

Clinical

- Hospital mortality rate
- Length of stay • Time on vasopressors
- (ICU, overall) · Discharges to home Readmissions (vs. long-term care)

ABBREVIATIONS

Financial

per case

to 6-hour

bundle

Variable cost

• Sepsis: Life-threatening organ dysfunction caused by a dysregulated host response to infection; includes severe sepsis (Sepsis-3)

Recommended initial

knowledge assets

improvement focus areas

Recommended standardized

• Septic shock: A subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality in excess of 40% (Sepsis-3)

KEY DATA SOURCES

· Electronic Medical Record (EMR)

Areas to prevent or avoid OR

areas to consider only after

careful review of indicators

Time-measured processes

- Billing: Professional and Hospital
- Financial

Provide antibiotics and other discharge

Instruct patient/family on wound treatment,

• % of patients with patient/family

• % of patients discharged to home versus

education documented

appointment scheduled

• % of patients with follow-up

Establish pain management plan

monitoring signs and symptoms

• Make follow-up appointments

care facility

Prehospital/Transport

 Use an early detection and treatment protocol (EMS personnel)

Early Recognition: ED

- · As part of triage, routinely screen for sepsis; components may include:
- Altered mental status Fever Hypothermia – Hypotension
- Tachycardia Hypoxia
- Tachypnea - WBC
- Immunocompromised
- Notify MD of potential sepsis
- Initiate standard sepsis order set (bundles)



- Routine ED sepsis screening tool
- Electronic automated sepsis identification and alerts



- % compliance to routine sepsis screening protocol
- Time from triage to sepsis recognition or alert
- Time from sepsis recognition to MD notification
- Time from sepsis recognition to initiation of 3-hour bundle/standard sepsis order set
- % of ED patients eventually coded for sepsis who screened positive in the ED

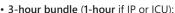
Early Recognition: Inpatient (IP) or ICU

- Standardize nursing practice and training in **inpatient units** to recognize and respond to emerging symptoms
- Routinely screen in the ICU to recognize and respond to emerging symptoms
- Notify MD of potential sepsis
- Initiate bundle/standard sepsis order set



- % compliance to sepsis screening protocol
- Time from sepsis recognition to MD notification
- Time from sepsis recognition to initiation of 1-hour bundle/standard sepsis order set

Early Intervention (3-hour Bundle) ED, IP, ICU



- Measure lactate level within first hour
- Obtain **2 blood cultures** prior to antibiotic administration (if antibiotics not delayed >1 hour); consider cultures from other potential infection sites (e.g., urine, CSF, sputum)

to 3-hour

- Give broad-spectrum antibiotics (1B) within 1 hour of recognition (1B-septic shock; 1C-sepsis without septic shock)
- If hypotensive or lactate ≥ 4 mmol/L, provide fluid resuscitation with 30 mL/kg crystalloid (1B); consider albumin if large volume of crystalloids needed
- Obtain labs for organ dysfunction or inflammation (e.g., creatinine, bilirubin, INR, platelets, CRP, procalcitonin)
- Target resuscitation to achieve normal
- Do timely transfer to ICU as indicated



Potential

Sensis

- Sepsis order set (includes 3- and 6-hour bundles)
- Standardized sepsis protocol w/reminders
- Antimicrobial guide/algorithms



- Lactate: % of patients with lactate measured within 1 hour of triage/recognition
- Blood culture: % of patients with blood cultures drawn before antibiotics; % of patients with cultures drawn from other sites
- Antibiotics: % of patients who received broad spectrum within 1 hour of recognition (IP, ICU) or within 3 hours of
- Fluid resuscitation: % of patients who received appropriate fluid resuscitation (30 mL/kg crystalloid); % of patients with fluid resuscitation within 1 hour of recognition (IP, ICU) or 3 hours of triage (ED)
- 3-hour bundle: % of eligible patients for whom all components of 3-hour bundle were met; time from triage or recognition to completion of 3-hour bundle

Early Therapy for Septic 3 Shock (6-hour Bundle)



- Give vasopressors for hypotension that does not respond to initial fluid resuscitation, maintain MAP ≥ 65 mm Hg; use norepinephrine before other vasopressors (1B)
- If persistent arterial hypotension after initial fluid administration (MAP < 65 mm Hg) or initial lactate ≥ 4 mmol/L, reassess volume status and tissue perfusion and document findings with:
- Repeat focused exam (after initial fluid resuscitation) by licensed independent practitioner (vital signs, cardiopulmonary, capillary refill, pulse, skin findings)

OR two of the following:

- Measure CVP
- Measure ScvO₂
- Bedside cardiovascular ultrasound
- Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge

Note: Central line placement is no longer required

 If initial lactate was elevated, repeat lactate measure



Persistent

sepsis-

induced

hypotension/

septic shock

Responsive to early resuscitation

or test negative for sepsis

(i.e., no organ dysfunction,

normal lactate, etc.)

- Sepsis order set (includes 3- and 6-hour bundles)
- Early goal-directed therapy checklist



- Vasopressors: % of patients who received vasopressors within 6 hours; % of patients who receive norepinephrine before other vasopressors
- Volume status/tissue perfusion: % of eligible patients with documented volume status and tissue perfusion findings within 6 hours
- Repeat lactate: % of eligible patients who had repeat lactate within 6 hours
- 6-hour bundle: % of eligible patients for whom all components of 6-hour bundle were met; average time to completion of 6-hour bundle

Supportive Therapy of Sepsis: ICU

LEGEND

Outcome Metrics

Process Metrics

- Continue goal-directed therapy from 6-hour bundle (1C)
- For sepsis-induced ARDS, target tidal volume of 6 mL/kg predicted body weight (1A); measure plateau pressures (1B); apply PEEP (1B)
- For mechanically ventilated patients, minimize continuous or intermittent sedation (1B); target specific titration endpoints; elevate head of bed 30-45 degrees (1B); follow weaning protocol (1A)
- For hemoglobin < 7 g/dL, after tissue hypoperfusion has resolved, transfuse RBC to target a concentration of 7–9 g/dL in adults (1B)
- For persistent hypotension, consider low-dose steroids with standardized ICU policy within 24 hours



• % compliance with ventilator weaning protocol (if data available)



- Ventilator days
- Time on vasopressors

D/C criteria met

BEST PRACTICE SOURCES

Care Facility

Discharge

medications

• Unless otherwise indicated, key best practices are from:

Length of stay at care facility

- Dellinger RP, et al. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock: 2012. Crit Care Med. 2013:41(2):580-637.
- Society of Critical Care Medicine. Updated bundles in response to new evidence. Surviving Sepsis Campaign. http://www.survivingsepsis. org/SiteCollectionDocuments/ SSC_Bundle.pdf. Published 2015. Accessed September 14, 2016.
- Practices with the strongest recommendation level (Grade 1) and high to moderate quality of evidence (Class A or B), based on the grading system used in the above guidelines, are noted as such.
- See the Sepsis Outcomes Improvement Packet for aims, interventions, and resources related to each of these areas of focus.

Monitoring/Maintenance

- Identify and control infection sources within 12 hours if feasible • Reassess antibiotic regimen daily for potential
- deescalation (1B) Manage **blood glucose** per protocol; target upper blood glucose ≤180 rather than
- ≤110 mg/dL (1A) Provide daily VTE pharmacoprophylaxis (1B)
- Provide stress ulcer prophylaxis with H2 blocker, or proton pump inhibitor if bleeding risk (1B)
- Discuss goals and prognosis with patients and families (1B); incorporate goals into treatment and end-of-life care (1B)



- % of patients for whom infection source is discovered and control implemented
- % of patients for whom glucose control, VTE prophylaxis, etc., protocols were
- Days on broad-spectrum antibiotics

