

Sepsis

Measure 6: Documentation of Heart Rate during Fluid Resuscitation in Children with Severe Sepsis or Septic Shock

Description

The proportion of hospitalized children with severe sepsis or septic shock who had documentation of heart rate at least every 15 minutes for the first hour of intravenous or intraosseous fluid resuscitation, and then hourly. A higher proportion indicates better performance.

Definitions

Intake period	January 1 through December 31 of the measurement year
Hospitalized children	All children admitted to the hospital, including the Emergency Department
Severe sepsis	Sepsis plus one of the following: cardiovascular organ dysfunction OR acute respiratory distress syndrome OR two or more other organ dysfunctions. ICD-9 code 995.92 (See Table 6-B).
Septic shock	Sepsis and cardiovascular organ dysfunction. ICD-9 code 785.52 (See Table 6-B).
Onset of fluid resuscitation	The time at which the first intravenous or intraosseous fluid bolus administration begins
Resolution of severe sepsis or septic shock	See Table 6-C.

Table 6-A: Definition of Severe Sepsis and Septic Shock

Term	Definition
Severe sepsis	Sepsis plus one of the following: cardiovascular organ dysfunction OR acute respiratory distress syndrome OR two or more other organ dysfunctions
Sepsis	Systemic Inflammatory Response Syndrome (SIRS) in the presence of, or as a result of, suspected or proven infection
SIRS	<p>The presence of at least two of the following four criteria, <u>one of which must be abnormal temperature or leukocyte count</u>:</p> <ul style="list-style-type: none"> • Core temperature of > 38.5°C or < 36°C. • Tachycardia, defined as a mean heart rate > 2 SD above normal for age in the absence of external stimulus, chronic drugs, or painful stimuli; or otherwise unexplained persistent elevation over a 0.5-to 4-hr time period OR for children <1 yr old: bradycardia, defined as a mean heart rate <10th percentile for age in the absence of external vagal stimulus, β-blocker drugs, or congenital heart disease; or otherwise unexplained persistent depression over a 0.5-hr time period. • Mean respiratory rate > 2 SD above normal for age or mechanical ventilation for an acute process not related to underlying neuromuscular disease or the receipt of general anesthesia. • Leukocyte count elevated or depressed for age (not secondary to chemotherapy-induced leukopenia) or > 10% immature neutrophils
Infection	A suspected or proven (by positive culture, tissue stain, or polymerase chain reaction test) infection caused by any pathogen OR a clinical syndrome associated with a high probability of infection. Evidence of infection includes positive findings on clinical exam, imaging, or laboratory tests (e.g., white blood cells in a normally sterile body fluid, perforated viscus, chest radiograph consistent with pneumonia, petechial or purpuric rash, or purpura fulminans)
Suspected infection	<p>Infection is suspected when one of the following is documented:</p> <ul style="list-style-type: none"> • Orders for antibiotics OR • Antibiotics administered OR • Orders for urine, blood or spinal culture OR • Urine, blood or spinal culture drawn OR • Chart notation of: <ul style="list-style-type: none"> ○ “Rule out infection” OR ○ “Suspected infection” OR ○ “Rule out sepsis” OR ○ “Suspected sepsis”

Term	Definition
Organ dysfunctions	<p>Cardiovascular Despite administration of isotonic intravenous fluid bolus ≥ 40 mL/kg in 1 hour,</p> <ul style="list-style-type: none"> • Decrease in BP (hypotension) < 5th percentile for age or systolic BP < 2 SD below normal for age <p>OR</p> <ul style="list-style-type: none"> • Need for vasoactive drug to maintain BP in normal range (dopamine > 5 μg/kg/min or dobutamine, epinephrine, or norepinephrine at any dose) <p>OR</p> <ul style="list-style-type: none"> • Two of the following: <ul style="list-style-type: none"> – Unexplained metabolic acidosis: base deficit > 5.0 mEq/L – Increased arterial lactate > 2 times upper limit of normal – Oliguria: urine output < 0.5 mL/kg/hr – Prolonged capillary refill: > 5 seconds – Core to peripheral temperature gap $> 3^{\circ}\text{C}$ <p>Respiratory</p> <ul style="list-style-type: none"> • PaO₂/FIO₂ < 300 in absence of cyanotic heart disease or preexisting lung disease <p>OR</p> <ul style="list-style-type: none"> • PaCO₂ > 65 torr or 20 mm Hg over baseline PaCO₂ <p>OR</p> <ul style="list-style-type: none"> • Proven need or $> 50\%$ FIO₂ to maintain saturation $\geq 92\%$ <p>OR</p> <ul style="list-style-type: none"> • Need for non-elective invasive or noninvasive mechanical ventilation <p>Neurologic</p> <ul style="list-style-type: none"> • Glasgow Coma Score ≤ 11 <p>OR</p> <ul style="list-style-type: none"> • Acute change in mental status with a decrease in Glasgow Coma Score ≥ 3 points from abnormal baseline <p>Hematologic</p> <ul style="list-style-type: none"> • Platelet count $< 80,000/\text{mm}^3$ or a decline of 50% in platelet count from highest value recorded over the past 3 days (for chronic hematology/oncology patients) <p>OR</p> <ul style="list-style-type: none"> • International normalized ratio >2 <p>Renal</p> <ul style="list-style-type: none"> • Serum creatinine ≥ 2 times upper limit of normal for age or 2-fold increase in baseline creatinine <p>Hepatic</p> <ul style="list-style-type: none"> • Total bilirubin ≥ 4 mg/dL (not applicable for newborn) <p>OR</p> <ul style="list-style-type: none"> • ALT 2 times upper limit of normal for age
Septic shock	Sepsis and cardiovascular organ dysfunction.

Table 6-B: Codes to Identify Severe Sepsis and Septic Shock

Condition Name	ICD-9 Code(s)
Septicemia	038.xx
Streptococcal septicemia	038.0
Staphylococcal septicemia	038.1
Staphylococcal septicemia, unspecified	038.10
Methicillin susceptible Staphylococcus aureus septicemia	038.11
Methicillin resistant Staphylococcus aureus septicemia	038.12
Other staphylococcal septicemia	038.19
Pneumococcal septicemia [Streptococcus pneumoniae septicemia]	038.2
Septicemia due to anaerobes	038.3
Septicemia due to other gram-negative organisms	038.4
Septicemia due to gram-negative organism, unspecified	038.40
Septicemia due to Haemophilus influenzae [H. influenzae]	038.41
Septicemia due to escherichia coli [E. coli]	038.42
Septicemia due to pseudomonas	038.43
Septicemia due to serratia	038.44
Other septicemia due to gram-negative organisms	038.49
Other specified septicemias	038.8
Unspecified septicemia	038.9
Severe sepsis	995.92
Sepsis	995.91
Septicemia [sepsis] of newborn	771.81
Systemic inflammatory response syndrome due to non-infectious process with acute organ dysfunction	995.94
Bacteremia	790.7
Septic shock	785.52

Table 6-C: Definition of Resolution of Severe Sepsis or Septic Shock

Term	Definition
Resolution of Severe Sepsis or Septic Shock	<ul style="list-style-type: none"> • For children who are not hypotensive: resolution of tachycardia (see Table 6-D) AND resolution of any 2 signs of decreased perfusion including: <ul style="list-style-type: none"> ○ Altered alertness. ○ Delayed capillary refill (>2 seconds). ○ Mottled or cool extremities. ○ Decreased urine output of < 0.5 mL/kg/hour. • For children who are hypotensive: resolution of hypotension (see Table 6-D) PLUS resolution of any 1 of the signs of decreased perfusion including: <ul style="list-style-type: none"> ○ Altered alertness. ○ Delayed capillary refill (>2 seconds). ○ Mottled or cool extremities. ○ Decreased urine output of < 0.5 mL/kg/hour. ○ Tachycardia (see Table 6-D)

Table 6-D: Age-specific vital signs and laboratory variables

(Lower values for heart rate, leukocyte count, and systolic blood pressure are for the 5th percentile; upper values for heart rate, respiration rate, or leukocyte count are for the 95th percentile)

Age Group	Tachycardia (Heart rate: Beats/min)	Bradycardia (Heart rate: Beats/min)	Tachypnea (Respiratory rate: Breaths/min)	Abnormal Count (Leukocytes x 10 ³ /mm ³)	Hypotension (Systolic BP: mm/Hg)
0 days to 1 week	>180	<100	>50	>34	<65
1 week to 1 month	>180	<100	>40	>19.5 or <5	<75
1 month to 1 year	>180	<90	>34	>17.5 or <5	<100
2–5 years	>140	NA	>22	>15.5 or <6	<94
6–12 years	>130	NA	>18	>13.5 or <4.5	<105
13 to <18 years	>110	NA	>14	>11 or <4.5	<117

Eligible Population

The determination of eligible population for this measure requires medical record data.

Ages 0 to less than 19 years of age during measurement year.

Event/Diagnosis Diagnosed with the severe sepsis or septic shock as documented in the medical record

Specification

Denominator All hospitalized children with severe sepsis or septic shock who received intravenous or intraosseous fluid resuscitation

Numerator Number of hospitalized children with severe sepsis or septic shock who had documentation of heart rate at least every 15 minutes for the first hour of resuscitation, beginning at the onset of intravenous or intraosseous fluid administration, and then hourly until severe sepsis or septic shock has resolved

Exclusions

- Patients with advanced directives for comfort care.
- Patient or surrogate decision maker declined or is unwilling to consent to therapies.