Sepsis Definitions

"Sepsis" is defined as a documented or suspected infection with one or more of the following:

General variables:

- Fever (core temperature >38.3°C)
- Hypothermia (core temperature <36°C)
- Heart rate >90 min^{-1} or >2 SD above the normal value for age
- Tachypnea
- Altered mental status
- Significant edema or positive fluid balance (>20 mL/kg over 24 hrs)
- Hyperglycemia (plasma glucose >120 mg/dL) in the absence of diabetes

Inflammatory variables:

- Leukocytosis (WBC count >12,000 μL^{-1})
- Leukopenia (WBC count <4000 μL^{-1})
- Normal WBC count with >10% immature forms
- Plasma C-reactive protein >2 SD above the normal value
- Plasma procalcitonin >2 SD above the normal value

Other:

- SvO_2 >70%
- Cardiac index >3.5 $L \cdot min^{-1} \cdot M^{-2}$

"Severe sepsis" is defined as sepsis associated with organ dysfunction, hypoperfusion or hypotension.

Organ dysfunction variables:

- Arterial hypoxemia (PaO2/FIO2 <300)
- Acute oliguria (urine output <0.5 $mL \cdot kg^{-1} \cdot hr^{-1}$ or 45 mmol/L for at least 2 hrs)
- Creatinine > 2.0 mg/dL
- Coagulation abnormalities (INR >1.5 or aPTT >60 secs)
- Thrombocytopenia (platelet count <100,000 μL^{-1})
- Hyperbilirubinemia (plasma total bilirubin > 2.0 mg/dL or 35 mmol/L)

Tissue perfusion variables:

- Hyperlactatemia (>2 mmol/L)

Hemodynamic variables:

- Arterial hypotension (SBP <90 mm Hg, MAP <70, or SBP decrease >40 mm Hg)

"Septic shock" is defined as acute circulatory failure unexplained by other causes.

Acute circulatory failure is defined as persistent arterial hypotension (SBP <90 mmHg, MAP <60, or a reduction in SBP >40 mm Hg from baseline despite adequate volume resuscitation).

"Bundle" (as in "Sepsis Bundle") is defined as the following:
A group of interventions related to a disease that, when implemented together, result in better outcomes than when implemented individually. The science behind the elements of the bundle is so well-established that their implementation should be considered a generally accepted practice. Bundle components can be easily measured as completed or not completed. As such, the overall bundle — all of the elements taken together — can also be measured as completed or not completed.

Evaluation for Severe Sepsis Screening Tool

Instructions: Use this optional tool to screen patients for severe sepsis in the emergency department, on the wards, or in the ICU.

*****Important: select a date format: _____ (dd/mm/yy) _____ (mm/dd/yy)**

1. Is the patient's history suggestive of a new infection? ___ Yes ___No

a. Pneumonia/ empyema
b. UTI
c. Acute abdominal infection
d. Meningitis
e. Skin/soft tissue inflammation
f. Bone/joint infection
g. Wound infection
h. Catheter or device infection
i. Endocarditis

2. Are any two of following signs & symptoms of infection both present and new to the patient?

a. Hyperthermia > 38.3 °C (101.0 °F)
b. Hypothermia < 36 °C (96.8 °F)
c. Chills with rigors
d. Tachycardia > 90 bpm
e. Tachypnea > 20 bpm
f. SBP < 90 or MAP < 65
g. Headache with stiff neck

___ Yes ___No

If the answer is yes to either question 1 or 2, *suspicion of infection* is present:

1. Record the current time ___: ___ (24 hour clock) and date ___/___/___ (date format as above).
2. Obtain: **lactic acid**, **blood cultures**, CBC with differential, basic chemistry labs, bilirubin.
3. At the physician's discretion obtain: UA, chest x-ray, amylase, lipase, ABG, CRP, CT scan.

3. Are any of the following organ dysfunction criteria present at a site remote from the site of the infection that are not considered to be chronic conditions?

- ☐ Acutely altered mental status
- ☐ SBP < 90 or MAP < 65 mmHg
- ☐ SpO_2 < 90% on room air or on supplemental O_2
- ☐ Creatinine > 2.0 mg/dl (176.8 mmol/L) or Urine Output < 0.5 ml/kg/hour for > 2 hours
- ☐ Bilirubin > 2 mg/dl (34.2 mmol/L)
- ☐ Platelet count < 100,000
- ☐ Lactate > 2 mmol/L (18.0 mg/dl)

___ Yes ___No

If *suspicion of infection* is present AND *organ dysfunction* is present, the patient meets the criteria for SEVERE SEPSIS and should be entered into the severe sepsis bundle pathway.

Addressograph

Patient Identifier: _____

Date of Admission: ____/____/____
(date format as above).

Time of Admission: ____: ____ (24 hr. clock)

Severe Sepsis Bundles:

Sepsis Resuscitation Bundle

(To be accomplished as soon as possible and scored over first 6 hours):

1. Serum lactate measured.
2. Blood cultures obtained prior to antibiotic administration.
3. From the time of presentation, broad-spectrum antibiotics administered within 3 hours for ED admissions and 1 hour for non-ED ICU admissions.
4. In the event of hypotension and/or lactate > 4 mmol/L (36 mg/dl):
    a) Deliver an initial minimum of 20 ml/kg of crystalloid (or colloid equivalent*).
    b) Apply vasopressors for hypotension not responding to initial fluid resuscitation to maintain mean arterial pressure (MAP) $\geq$ 65 mm Hg.
5. In the event of persistent hypotension despite fluid resuscitation (septic shock) and/or lactate > 4 mmol/L (36 mg/dl):
    a) Achieve central venous pressure (CVP) of $\geq$ 8 mm Hg.
    b) Achieve central venous oxygen saturation ($ScvO_2$) of $\geq$ 70%.**

Sepsis Management Bundle

(To be accomplished as soon as possible and scored over first 24 hours):

1. Low-dose steroids* administered for septic shock in accordance with a standardized ICU policy.
2. Drotrecogin alfa (activated) administered in accordance with a standardized ICU policy.
3. Glucose control maintained $\geq$ lower limit of normal, but < 150 mg/dl (8.3 mmol/L).
4. Inspiratory plateau pressures maintained < 30 cm H_2O for mechanically ventilated patients.

**See the individual chart measurement tool for an equivalency chart.*

***Achieving a mixed venous oxygen saturation (SvO_2) of 65% is an acceptable alternative.*

Individual Chart Measurement Tool:

Instructions: Attach this tool to each chart of a patient with severe sepsis, septic shock at the time of data abstraction. This tool can be used for concurrent, prospective, or retrospective data collection. However, individual hospitals are strongly encouraged to choose a single approach and maintain that collection over time. Once all Individual Chart Measurement Tools are gathered for a single month, complete the Monthly Measurement Worksheet to report results.

***Important: mark the date format you will be following: ____ (dd/mm/yy) ____ (mm/dd/yy)**

1. **Document whether the patient met criteria for severe sepsis or septic shock. Check only one answer. Because strict definitions apply it may be helpful to consult the Sepsis Definitions Tool or the Evaluation for Severe Sepsis Screening Tool to ensure accuracy.**

   _____ No, does not meet criteria for either severe sepsis or septic shock. Stop data collection.
   _____ Yes, met criteria for severe sepsis. Continue data collection.
   _____ Yes, met criteria for septic shock. Continue data collection.

2. **Record the patient identifier number _____**

3. **Question 3 establishes a uniform "time of presentation" for each patient depending upon their individual admission characteristics. The time of presentation will be the basis for answering subsequent questions and making calculations. Only one statement below (3a, 3b, or 3c) will apply to a single patient.**

   Note: A protocol, protocol form and protocol order set are recommended to facilitate the treatment process and the accurate recording of timelines.

   3a. For patients admitted to the ICU from the ED meeting criteria for severe sepsis or septic shock, record the time of triage in the emergency department as the time of presentation.

   _____ Not applicable. Proceed to 3b.
   _____ Applicable, record time of presentation below and proceed to question 4.

   3b. For patients transferred to the ICU from units other than the ED:

   - ***Preferred:*** **if the resuscitation and management of severe sepsis was annotated as beginning on the transferring unit, record the time and date of that annotation as the time of presentation.**
   - ***Default:*** **if the resuscitation and management of severe sepsis *was not* in annotated as beginning on the transferring unit, record the ICU admission date and time as the time of presentation.**

   Note: it is critical to establish whether there was reasonable and straightforward annotation of the time of initiation of efforts to manage severe sepsis on the ward prior to ICU transfer. Otherwise, no credit can be assigned for key interventions performed prior to the default time of presentation, the time of ICU admission. Annotation may include a practitioner's note, a practitioner's timed and dated orders, a nurse's timed and dated records documenting discussion of severe sepsis with a practitioner, timed records initiating referral to the ICU for severe sepsis.

_____ Not applicable. Proceed to question 3c.

_____ Applicable; the annotated time and date for the resuscitation and management of sepsis on the transferring unit is recorded below as the time of presentation. Proceed to question 4.

_____ Applicable; the ICU admission date and time is recorded below as the time of presentation. Proceed to question 4.

3c. For patients admitted to the ICU with a diagnosis other than sepsis and who subsequently develop severe sepsis or septic shock on the same ICU stay, record the annotated time and date of the beginning of the resuscitation and management of severe sepsis as the time of presentation.

_____ Not applicable. Stop data collection, time of presentation cannot be accurately determined. If data is being collected concurrently or prospectively, the patient may remain on the sepsis protocol without further data collection.

_____ Applicable, record time of presentation below and proceed to question 4.

*****Time of Presentation: __ __ /__ __/ __ __ (date format as above) __ __ : __ __ (24 hour clock).*****

4. Document whether serum lactate was obtained:

_____ No. Proceed to question 5.

_____ Yes. Place a mark in Box 1 on line 16 of this document. Proceed to question 4a.

4a. Record the value serum lactate value if obtained: _____ mmol/L or ____ mg/dl

4b. Record date and time of serum lactate collection:

__ __ /__ __/ __ __ (date format as above) __ __:__ __ (24 hour clock).

5. Document whether the patient received a broad-spectrum antibiotic:

____ No. Proceed to question 7.

____ Yes. Proceed to question 5a.

5a. Name of Antibiotic(s): _____

5b. Date and time of first broad-spectrum antibiotic administration:

__ __ /__ __/ __ __ (date format as above) __ __ : __ __ (24 hour clock).

5c. Calculate the difference between line 3, time of presentation above, and line 5b in hours and minutes: Difference: __ __ hours __ __ minutes

5d. Multiply the HOURS ONLY on line 5c above x 60 ____

5e. Time in minutes to broad spectrum antibiotic administration for this patient: add the total of line 5d above to the number of MINUTES ONLY listed on line 5c above: _____

5f. If item 3a above is marked applicable, was the number of minutes on line 5e above ≤ 180 minutes:

____ No. Proceed to question 6.

____ Yes. Place a mark in Box 3 on line 16 of this document. Proceed to question 6.

5g. If item 3b or 3c is marked applicable, was the number of minutes on line 5e above ≤ 60 minutes:

____ No. Proceed to question 6.

____ Yes. Place a mark in Box 3 on line 16 of this document. Proceed to question 6.

6. Document date and time of blood culture collection.

____ If not collected, enter "No" on 6a and proceed to question 7.
__ __ /__ __/ __ __ (date format as above) __ __:__ __ (24 hour clock). Proceed to question 6a.

6a. Document whether the time and date listed on 6 above is earlier than the time and date listed on line 5b above:

_____ No. Proceed to question 7.
_____Yes. Place a mark in Box 2 on line 16 of this document. Proceed to question 7.

7. Answer the following questions regarding resuscitation of severe sepsis or septic shock:

7a. Document whether the patient was hypotensive and/or if serum lactate was > 4 mmol/L (36 mg/dl) on line 4a of this document:

____ No. Place a mark in Box 4, 5, 6, 7 on line 16 of this document. Place a mark in Box A on line 17 of this document. Proceed to question 11.
____ Yes. Proceed to question 7b.

7b. Document the basis for the diagnosis of hypotension, if present:

____ SBP < 90 mm Hg
____ MAP < 65 mm Hg **Note:** *MAP = (2 x diastolic pressure + systolic pressure) / 3*
____ SBP decrease of ≥ 40 mm Hg from known baseline

7c. Document whether initially the patient received ≥ 20 ml/kg of crystalloid or ≥ an equivalent amount of colloid in response to hypotension or lactate > 4 mmol/L (36 mg/dl):

Cyrstalloid/Colloid Equivalency Chart:[1]	
Normal Saline	20 ml/kg
Lactated Ringer's Solution	20 ml/kg
Albumin 4-5% Albumin 20-25% Albumin	0.24 grams/kg 5.2 ml/kg 1.1 ml/kg
Hetastarch 3% Hetastarch 6% Hetastarch 10% Hetastarch	0.29 grams/kg 9.7 ml/kg 4.8 ml/kg 2.9 ml/kg
Pentastarch 10% Pentastarch	0.30 grams/kg 3 ml/kg
10% Dextran-40	0.30 grams/kg (3ml/kg)
3% Dextran-60, 6% Dextran-70 3% Dextran-60 6% Dextran-70	0.19 grams/kg 6.3 ml/kg 3.1 ml/kg
Gelatins (succinylated & crosslinked 2.5, 3.0, 4.0%; urea-linked 3.5%)	0.23 grams/kg

[1] Adapted from: Evidence-based Colloid Use in the Critically Ill: American Thoracic Society Consensus Statement. Am J Respir Crit Care Med. 2004. Vol 170:1247-1259. For percentage solutions, listed ml/kg are calculated from the g/kg data.

____ No. Record "No" on lines 7f, 8b, 9b and 10 below. Proceed to question 11.

____ Yes. Place a mark in Box 4 on line 16 of this document. Proceed to question 7d.

7d. Document whether MAP remained ≥ 65 in response to the initial fluid resuscitation described in 7c:

i. ____ No. Proceed to question 7e.
ii. ____ Yes, if lactate was ≤ 4 mmol/L (36 mg/dl) on line 4a of this document place a mark in Box 5, Box 6 and Box 7 on line 16 of this document. Proceed to question 10.
iii. ____ Yes, if lactate was > 4 mmol/L (36 mg/dl) on line 4a of this document, proceed to question 8.

7e. Document whether the patient received vasopressors:

____ No. Record "No" on lines 7f, 8b, 9b and 10 below. Proceed to question 11.
____ Yes. Place a mark in Box 5 on line 16 of this document. Proceed to question 7f.

7f. Document whether the MAP remained ≥ 65 mm Hg without the use of vasopressors:

Note: If no evidence for removal of vasopressors can be found, mark item 7f "no" and proceed to question 8.

i. ____ No. Proceed to question 8.
ii. ____ Yes, if lactate was ≤ 4 mmol/L (36 mg/dl) on line 4a of this document place a mark in Box 6 and Box 7 on line 16 of this document. Proceed to question 10.
iii. ____ Yes, if lactate was > 4 mmol/L (36 mg/dl) on line 4a of this document, proceed to question 8.

8. Document date and time CVP first ≥ 8 mm Hg within 24 hours:

____ CVP not obtained or never ≥ 8 mm Hg within 24 hours. Record line 8b as "No" and proceed to question 9.

Date: __ __ /__ __/ __ __ (date format as above) **Time**: __ __ : __ __ (24 hour clock).
Proceed to question 8a.

8a. Calculate the difference between line 3, time of presentation, and line 8 above in hours and minutes: Difference: __ __ : __ __ (hours:minutes).

8b. Document whether line 8a is ≤ 6 hours.

____ No. Proceed to question 9.
____ Yes. Place a mark in Box 6 on line 16 of this document. Proceed to question 9.

9. Document date and time $ScvO_2$ first ≥ 70% (or SvO_2 ≥ 65%) within 24 hours:

____$ScvO_2$ not obtained or never ≥ 70% (or SvO_2 ≥ 65%) within 24 hours. Record line 9b as "No" and proceed to question 10.

Date: __ __ /__ __/ __ __ (date format as above) **Time**: __ __ : __ __ (24 hour clock).
Proceed to question 9a.

9a. Calculate the difference between line 3, time of presentation, and line 9 above in hours and minutes: Difference: __ __ : __ __ (hours:minutes).

9b. Document whether line 9a is ≤ 6 hours.

____ No. Proceed to question 10.

____ Yes. Place a mark in Box 7 on line 16 of this document. Proceed to question 10.

10. Answer the following questions regarding low-dose steroids administration:

10a. Document whether line 7d or line 7f above has been answered affirmatively:

____ Yes. The bundle element is not applicable because the patient's MAP was ≥ 65 and did not have persistent arterial hypotension. Place a mark in Box A on line 17 and proceed to question 11.

____ No. Proceed to question 10b.

10b. Document whether there is a standardized ICU policy regarding low-dose steroid administration for septic shock:

____ No. Proceed to question 11.

____ Yes. Proceed to question 10c.

10c. Indicate whether there is documentation that the patient did not merit low-dose steroids based upon the standardized protocol:

____ No documentation is present. Proceed to question 10d.

____ Yes there is documentation present. Place a mark in Box A on line 17 below. Proceed to question 11.

10d. Document whether low-dose steroids were administered:

Note: low-dose steroids refer to a daily dose of 200–300 mg of hydrocortisone or equivalent.

Steroid Equivalency Chart:[2]	
Steroid:	**Equivalent TOTAL DAILY dose:**
Hydrocortisone	200 – 300 mg
Dexamethasone	8 – 12 mg
Prednisone	50 – 75 mg
Prednisolone	50 – 75 mg
Methylprednisolone	40 – 60 mg
Cortisone	250 – 375 mg
Triamcinolone	40 – 60 mg
Betamethasone	6 – 10 mg

[2]Adapted from: Knoben JE, Anderson PO. *Handbook of Clinical Drug Data*, 6th ed. Drug Intelligence Pub, Inc. 1988.

____ No. Proceed to question 11.

____ Yes. Record date and time below. Proceed to question 10e.

__ __ /__ __/ __ __(date format as above) __ __ : __ __ (24 hour clock)

10e. Time of presentation: from line 3 above:

__ __ /__ __/ __ __(date format as above) __ __ : __ __ (24 hour clock)

10f. Document whether the time and date on 10d is ≤ 24 hours from the time of presentation listed on item 10e.

____ No. Proceed to question 11.

____ Yes. Place a mark in Box A on line 17 and proceed to question 11.

11. Answer the following questions regarding Drotrecogin alfa (activated) administration:

11a. Document whether there is a standardized ICU policy regarding Drotrecogin alfa (activated) administration:

____ No. Proceed to question 12.

____ Yes. Proceed to question 11b.

11b. Indicate whether there is documentation that the patient did not merit Drotrecogin alfa (activated) administration based upon the standardized protocol:

____ No documentation is present. Proceed to question 11c.

____ Yes there is documentation present. Place a mark in Box B on line 17 below. Proceed to question 12.

11c. Document whether Drotrecogin alfa (activated) was administered:

____ No. Proceed to question 12.

____ Yes. Record date and time below. Proceed to question 11d.

__ __ /__ __/ __ __(date format as above) __ __ : __ __ (24 hour clock)

11d. Time of presentation: from line 3 above:

__ __ /__ __/ __ __(date format as above) __ __ : __ __ (24 hour clock)

11e. Document whether the time and date on 11c is ≤ 24 hours from the time of presentation listed on item 11d.

____ No. Proceed to question 12.

____ Yes. Place a mark in Box B on line 17 and proceed to question 12.

12. Document the median glucose* value within 24 hours of the time of presentation:

Median glucose: _____ mg/dl or ____ mmol/L

If and only if median glucose is < 150 mg/dl (8.3 mmol/L) place a mark in Box C on line 17 of this document. Proceed to question 12a.

12a. Document the lower limit of normal for serum glucose at your institution: ____

12b. Document the total number of measurements that fell below the lower limit of normal within 24 hours from the time of presentation for this patient: ____

* Refer to the optional *Median Glucose Tool,* if necessary.

13. Document the median inspiratory plateau pressure (IPP)* achieved within 24 hours of time of presentation:

____ Not applicable because the patient was not mechanically ventilated. Place a mark in Box D on line 17 of this document. Proceed to question 14.

Median IPP: _____ If and only if < 30 cm H_20, place a mark in Box D on line 17 of this document.

* Refer to the optional *Median IPP Calculation Tool,* if necessary.

14. Date and time of hospital discharge:

__ __ /__ __/ __ __(date format as above) __ __ : __ __ (24 hour clock)

15. Status at hospital discharge: ____ Alive ___ Deceased

16. Boxes 1 through 7:

Box 1	Box 2	Box 3	Box 4	Box 5	Box 6	Box 7

17. Boxes A through D:

Box A	Box B	Box C	Box D

Monthly Measurement Worksheet:

<u>Instructions:</u> Gather the individual chart measurement tools that have been collected in a particular month and complete the following form.

****<u>Note</u>: Where blanks are found on the Individual Chart Measurement Tool as you tally results, this is by design. Blank items should not factor into your calculations.**

1) **Total number of patients selected for monthly reporting.** Each patient should have an individual chart measurement tool completed: ____

2) **Reliability of compliance with the sepsis resuscitation bundle element 1:** *lactate measured*:

   a) Tally the number of affirmative answers to question 4 on the individual chart measurement tool: ____
   b) **Reliability of compliance with the sepsis resuscitation bundle element 1:** divide line 2a from this worksheet by line 1 from this worksheet: ____

3) **Quality Indicator #1**, *blood cultures collected before broad-spectrum antibiotic administration*:

   a) Tally the number of affirmative answers to question 6a on the individual chart measurement tool: ____.
   b) **Reliability of compliance with sepsis resuscitation bundle element 2,** *blood cultures before antibiotics administered*: divide line 3a from this worksheet by line 1 from this worksheet: _____*

   Numerator for Improvement Tracker (from line 3a on this worksheet): ____
   Denominator for Improvement Tracker (from line 1 on this worksheet): ____

   * The reliability of compliance with the second bundle element is the same as the final value for quality indicator #1 in this instance.

4) **Quality Indicator #2,** *median time in minutes to broad-spectrum antibiotic(s) administration from time of presentation:*

   a) Tally the number of affirmative answers to question 5f on the individual chart measurement tool: ____
   b) Tally the number of affirmative answers to question 5g on the individual chart measurement tool: ____
   c) **Reliability of compliance with sepsis resuscitation bundle element 3,** *from the time of presentation, broad-spectrum antibiotics administered within 3 hours for ED admissions and 1 hour for non-ED ICU admissions*: add lines 4a and 4b on this worksheet and divide the total by line 1 on this worksheet: _____
   d) Tally the median number of minutes to antibiotic administration as follows:

      Arrange each value listed on line 5e of the individual chart measurement tools for each patient in numerical sequence from the smallest to the largest:

Smallest																	

																Largest

      The median is the middle value of the set if the number of measurements is odd and the average of the central pair if the number is even.

      Median number of minutes to broad spectrum antibiotic administration. Report in Improvement Tracker: ____

5) **Reliability of compliance with sepsis resuscitation bundle element 4a**: *for hypotension and/or lactate > 4 mmol/L (36 mg/dl), deliver an initial minimum of 20 ml/kg of crystalloid (or colloid equivalent):*

   a) Tally the number of charts with an affirmative answer to question 7a on the individual chart measurement tool: ____
   b) Tally the number of charts with affirmative answers to question 7c on the individual chart measurement tool. _____
   c) Reliability of compliance with sepsis resuscitation bundle element 4a: divide line 5b on this worksheet by line 5a on this worksheet _____

6) **Reliability of compliance with sepsis resuscitation bundle element 4b:** *apply vasopressors for hypotension not responding to initial fluid resuscitation to maintain mean arterial pressure (MAP) ≥ 65 mmHg:*

   a) Tally the number of charts with negative answers to question 7d on the individual chart measurement tool: _____
   b) Tally the number of charts with affirmative answers to question 7e on the individual chart measurement tool: _____
   c) Reliability of compliance with sepsis resuscitation bundle element 4b: divide line 6b on this worksheet by line 6a on this worksheet: _____

7) **Quality Indicator #3,** *following septic shock or lactate > 4 mmol/L (36 mg/dl) identification, central venous pressure (CVP) of ≥ 8 mm Hg achieved within 6 hours of presentation time:*

   a) Number of patients in septic shock: tally the number of charts marked with a negative response to question 7f on the individual chart measurement tool. _____
   b) Number of patients not in septic shock but with serum lactate > 4 mmol/L (36 mg/dl): tally the number of charts marked at 7d (iii) AND 7f (iii) on the individual chart measurement tool: ____
   c) Total number of patients who are in septic shock and/or who have lactate > 4 mmol/L (36 mg/dl): add lines 7a and 7b from this worksheet. ____
   d) The number patients in septic shock or with lactate greater than 4 mmol/L (36 mg/dl) for whom CVP is ≥ 8 within 6 hours from time of presentation: tally the number of charts with an affirmative answer to question 8b on the individual chart measurement tool. _____
   e) **Reliability of compliance with sepsis resuscitation bundle element 5a,** *in the event of persistent hypotension despite fluid resuscitation (septic shock) and/or lactate > 4 mmol/L (36 mg/dl), achieve central venous pressure (CVP) ≥ 8 mm Hg:* Divide line 7d on this worksheet by line 7c on this worksheet: _____*

   Numerator for Improvement Tracker (from line 7d on this worksheet): ____
   Denominator for Improvement Tracker (from line 7c on this worksheet): ____

   * The reliability of compliance with sepsis resuscitation bundle element 5a is the same as the final value for quality indicator #3 in this instance.

8) **Quality Indicator #4,** *following septic shock or lactate > 4 mmol/L (36 mg/dl) identification, $ScvO_2$ ≥ 70% (or SvO_2 ≥ 65%) achieved within 6 hours of presentation time*:

   a) Total from line 7c on this worksheet: ____
   b) Number of patients who are in septic shock or who have lactate greater than 4 mmol/L (36 mg/dl) for whom $ScvO_2$ is ≥ 70% (or SvO_2 is ≥ 65%) within 6 hours of presentation: tally the number of charts with an affirmative answer to question 9b on the individual chart measurement tool: ____
   c) **Reliability of compliance with sepsis resuscitation bundle element 5b,** *in the event of persistent hypotension despite fluid resuscitation (septic shock) and/or lactate > 4 mmol/L (36 mg/dl), achieve central venous oxygen saturation ($ScvO_2$) of 70% (or mixed venous oxygen saturation (SvO_2) of 65%)*: divide line 8b on this worksheet by line 8a on this worksheet: _____*

Numerator for Improvement Tracker (from line 8b on this worksheet): ____
Denominator for Improvement Tracker (from line 8a on this worksheet): ____

* The reliability of compliance with sepsis resuscitation bundle element 5b is the same as the final value for quality indicator #4 in this instance.

9) **Quality Indicator #5,** *low-dose steroids administered in accordance with a standardized ICU policy for septic shock over the first 24 hours following the time of presentation:*

   a) Total number of patients with septic shock: line 7a on this worksheet: ____
   b) Tally the number of affirmative answers to question 10c on the individual chart measurement tool: ____
   c) Tally the number of affirmative answers to question 10f on the individual chart measurement tool: ____
   d) Number of patients for whom steroids were administered in accordance with a standardized ICU policy within 24 hours of presentation: Add lines 9b on this worksheet and 9c on this worksheet: ____
   e) **Reliability of compliance with sepsis management bundle element 1,** *low-dose steroids administered for septic shock in accordance with a standardized ICU policy:* Divide line 9d on this worksheet by line 9a on this worksheet: ____*

Numerator for Improvement Tracker (from line 9d on this worksheet): ____
Denominator for Improvement Tracker (from line 9a on this worksheet): ____

* The reliability of compliance with sepsis management bundle element 1 is the same as the final value for quality indicator #5 in this instance.

10) **Quality Indicator #6,** *Drotrecogin alfa (activated) administered in accordance with a standardized ICU policy for septic shock over the first 24 hours following time of presentation:*

   a) Tally the number of affirmative answers to question 11b on the individual chart measurement tool: ____
   b) Tally the number of affirmative answers to question 11e on the individual chart measurement tool: ____
   c) Number of patients for whom Drotrecogin alfa (activated) was administered in accordance with a standardized ICU policy within 24 hours of presentation: Add lines 10a on this worksheet and 10b on this worksheet: ____
   d) **Reliability of compliance with sepsis management bundle element 2,** *Drotrecogin alfa (activated) administered in accordance with a standardized ICU policy:* divide line 10c on this worksheet by line 1 on this worksheet: ____*

Numerator for Improvement Tracker (from line 10c on this worksheet): ____
Denominator for Improvement Tracker (from line 1 on this worksheet): ____

* The reliability of compliance with sepsis management bundle element 2 is the same as the final value for quality indicator #6 in this instance.

11) **Quality Indicator #7,** *glucose control maintained ≥ the lower limit of normal and with median value < 150 mg/dl (8.3 mmol/L) over the first 24 hours following presentation with severe sepsis, septic shock*:

   a) Tally the number of patients for whom median glucose was recorded to be < 150 on line 12 of the individual chart measurement tool AND for whom no episodes of hypoglycemia were recorded on line 12b: ____
   b) **Reliability of compliance with sepsis management bundle element 3,** *glucose control maintained ≥ lower limit of normal, but < 150 mg/dl (8.3 mmol/L):* divide line 11a on this worksheet by line 1 on this worksheet: ____

Numerator for Improvement Tracker (from line 11a on this worksheet): ____
Denominator for Improvement Tracker (from line 1 on this worksheet): ____

* The reliability of compliance with sepsis management bundle element 3 is the same as the final value for quality indicator #7 in this instance.

12) **Quality Indicator #8,** *median inspiratory plateau pressure (IPP) less than 30 cm H_2O over the first 24 hours in patients presenting with severe sepsis, septic shock who require mechanical ventilation:*

a) Total from line 1 on this worksheet: ____
b) Tally the number of cases marked on line 13 of the individual chart measurement tool as not applicable because the patient was not mechanically ventilated: ____
c) Number of mechanically ventilated patients: subtract line 12b on this worksheet from line 12a on this worksheet: _____
d) Tally the number of patients for whom median IPP was maintained less than 30 cm H_20 on line 13 of the individual chart measurement tool: ____
e) **Reliability of compliance with sepsis management bundle element 4,** *for mechanically ventilated patients, plateau pressures maintained < 30 cm H_2O*, divide line 12d by line 12c: ____*

Numerator for Improvement Tracker (from line 12d on this worksheet): ____
Denominator for Improvement Tracker (from line 12c on this worksheet): ____

* The reliability of compliance with sepsis management bundle element 4 is the same as the final value for quality indicator #8 in this instance.

13) **Quality Indicator #9,** *reliability of compliance with ALL elements of the severe sepsis resuscitation bundle*:

a) Tally the number of charts with ALL boxes (1 through 7) in question 16 on the individual chart measurement tool marked: _____
b) **Aggregate reliability for the sepsis resuscitation bundle:** divide line 13(a) by line 1. _____

Numerator for Improvement Tracker (from line 13a on this worksheet): ____
Denominator for Improvement Tracker (from line 1 on this worksheet): ____

14) **Quality Indicator #10,** *reliability of compliance with ALL elements of the severe sepsis management bundle:*

a) Tally the number of charts with ALL boxes (A through D) in question 17 on the individual chart measurement tool marked: _____
b) **Aggregate reliability of sepsis management bundle**: divide line 14(a) by line 1. _____

Numerator for Improvement Tracker (from line 14a on this worksheet): ____
Denominator for Improvement Tracker (from line 1 on this worksheet): ____

15) **Quality Indicator #11,** *overall mortality due to severe sepsis, septic shock*:

a) Tally the number of patients marked as deceased from line 15 of the individual chart measurement tool: ____
b) **Overall mortality due to severe sepsis, septic shock:** divide line 15(a) by line 1. _____

Numerator for Improvement Tracker (from line 15a on this worksheet): ____
Denominator for Improvement Tracker (from line 1 on this worksheet): ____

Median Glucose Calculation Tool:

Use this optional tool to assist in determining the median glucose level within the first 24 hours from time of presentation.

Record the patient identifier number _____

Worksheet:

List all glucose values obtained in 24 hours:

Time (24° clock)								
Glucose								

Time (24° clock)								
Glucose								

To obtain the median glucose, first arrange the values in numerical sequence from the smallest to the largest:

Smallest															Largest

The median is the middle value of the set if the number of measurements is odd and the average of the central pair if the number is even.

Median glucose: _____mg/dl or ____ mmol/L

Record results on the Severe Sepsis Quality Measurement Tool under Median Glucose.

Median Plateau Pressure Tool:

Use this optional tool to assist in determining the median inspiratory plateau pressure for mechanically ventilated patients with severe sepsis within the first 24 hours from time of presentation.

Record the patient identifier number _____

Worksheet:

List all IPP values obtained in 24 hours.

Time (24° clock)								
IPP								

Time (24° clock)								
IPP								

To obtain the median IPP, first arrange the values in numerical sequence from the smallest to the largest:

Smallest														Largest

The median is the middle value of the set if the number of measurements is odd and the average of the central pair if the number is even.

Median IPP: _____ cm H_20

Record results on the Severe Sepsis Quality Measurement Tool under Median IPP.

Severe Sepsis Quality Indicators

Quality Indicator #1	Definition of Indicator	Specifications
Blood cultures collected before broad-spectrum antibiotic administration	The percent of patients presenting with severe sepsis, septic shock who had blood cultures collected prior to broad-spectrum antibiotic administration	*Numerator:* number of patients who had blood cultures collected before broad-spectrum antibiotic administration following presentation with severe sepsis, septic shock *Denominator:* number of patients presenting with severe sepsis, septic shock

Quality Indicator #2	Definition of Indicator	Specifications
Median time in minutes to broad-spectrum antibiotic(s) administration from time of presentation.	Median time to administration of broad-spectrum antibiotic(s).	For patients presenting with severe sepsis, septic shock, median time in minutes to broad-spectrum antibiotic(s) administration from time of presentation. For this indicator, time of presentation is determined as follows:

(i) If the patient presented to the ED with severe sepsis, septic shock, the time of presentation is ED triage time.
(ii) If the management of severe sepsis, septic shock was annotated as beginning on a unit transferring the patient to the ICU, the annotated time and date of the initiation of the resuscitation is the time of presentation.
(iii) If the management of severe sepsis, septic shock was NOT annotated as beginning on a unit transferring the patient to the ICU, the recorded ICU admission time is the default value for time of presentation.
(iv) If the patient is newly treated for severe sepsis, septic shock while in the ICU greater than 24 hours after admission to the ICU, the annotated time and date of the initiation of resuscitation for the management of severe sepsis, septic shock is the time of presentation.

Quality Indicator #3	Definition of Indicator	Specifications
Following septic shock or lactate > 4 mmol/L (36 mg/dl) identification, central venous pressure (CVP) of $\geq$ 8 mm Hg achieved within 6 hours of presentation time.	The percent of patients for whom a CVP goal of $\geq$ 8 mm Hg was achieved within 6 hours following septic shock or lactate > 4 mmol/L (36 mg/dl) identification.	*Numerator:* the number of patients with severe sepsis with lactate > 4 mmol/L (36 mg/dl) or septic shock for whom a CVP goal $\geq$ 8 mm Hg was achieved within 6 hours of presentation time. *Denominator:* the number of patients with severe sepsis with lactate > 4 mmol/L (36 mg/dl) or septic shock. *Exclusion:* patients with non-severe sepsis or severe sepsis with lactate $\leq$ 4 mmol/L (36 mg/dl).

Quality Indicator #4	Definition of Indicator	Specifications
Following septic shock or lactate > 4 mmol/L (36 mg/dl) identification, central venous oxygen saturation ($ScvO_2$)* $\geq$ 70% achieved within 6 hours of presentation time. *mixed venous oxygen saturation (SvO_2) $\geq$ 65% may be substituted.	The percent of patients following septic shock or lactate > 4 mmol/L (36 mg/dl) identification for whom the $ScvO_2$ is $\geq$ 70% (or SvO_2 is $\geq$ 65%) within 6 hours of presentation time.	*Numerator:* the number of patients with severe sepsis with lactate > 4 mmol/L (36 mg/dl) or septic shock for whom a $ScVO_2$ goal $\geq$ 70% (or SvO_2 goal $\geq$ 65%) is achieved within 6 hours of presentation time. *Denominator:* the number of patients with severe sepsis with lactate > 4 mmol/L (36 mg/dl) or septic shock. *Exclusion:* patients with non-severe sepsis or severe sepsis with lactate $\leq$ 4 mmol/L (36 mg/dl).

Quality Indicator #5	Definition of Indicator	Specifications
Low-dose* steroids administered in accordance with a standardized ICU policy for septic shock over the first 24 hours following time of presentation.	The percent of patients with septic shock for whom low-dose steroids were administered in accordance with a standardized ICU policy within 24 hours following the time of presentation.	*Numerator*: number of patients with septic shock for whom low-dose steroids were administered in accordance with a standardized ICU policy within 24 hours following time of presentation. *Denominator*: total number of patients with septic shock. *Low-dose steroids refer to a daily dose of 200–300 mg of hydrocortisone or equivalent.

Quality Indicator #6	Definition of Indicator	Specifications
Drotrecogin alfa (activated) administered for septic shock in accordance with a standardized ICU policy over the first 24 hours following time of presentation.	The percent of patients with severe sepsis or septic shock for whom Drotrecogin alpha (activated) was administered in accordance with a standardized ICU policy within 24 hours following the time of presentation.	*Numerator:* number of patients with severe sepsis or septic shock for whom Drotrecogin alpha (activated) was administered in accordance with a standardized ICU policy within 24 hours following the time of presentation. *Denominator:* total number of patients presenting with severe sepsis, septic shock *Exclusion:* non-severe sepsis

Quality Indicator #7	Definition of Indicator	Specifications

Glucose control maintained greater than the lower limit of normal and with median value < 150 mg/dl (8.3 mmol/L) over the first 24 hours following presentation with severe sepsis, septic shock.	The percent of patients with severe sepsis, septic shock for whom serum glucose is maintained greater than the lower limit of normal and with a median value < 150 mg/dl (8.3 mmol/L) over the first 24 hours.	*Numerator:* number of patients with serum glucose maintained greater than the lower limit of normal and with a median value < 150 mg/dl (8.3 mmol/L) over the first 24 hours following presentation with severe sepsis, septic shock *Denominator:* number of patients presenting with severe sepsis, septic shock

Quality Indicator #8	**Definition of Indicator**	**Specifications**
Median inspiratory plateau pressure (IPP) less than 30 cm H_2O over the first the first 24 hours in patients presenting with severe sepsis, septic shock that require mechanical ventilation.	The percent of patients requiring mechanical ventilation who have a median IPP < 30 cm H_2O over the first 24 hours following presentation with severe sepsis, septic shock	*Numerator:* number of mechanically ventilated patients with severe sepsis, septic shock who had a median IPP < 30 cm H_2O over the first 24 hours following presentation with severe sepsis, septic shock. *Denominator:* number of mechanically ventilated patients presenting with severe sepsis, septic shock *Exclusion*: Patients not mechanically ventilated.

Quality Indicator #9	**Definition of Measure**	**Specifications**
Reliability of compliance with all elements of the severe sepsis resuscitation bundle.	The percent of cases of severe sepsis, septic shock that completed all applicable severe sepsis resuscitation bundle elements	*Numerator:* the number of cases of severe sepsis, septic shock that completed all applicable severe sepsis resuscitation bundle elements. *Denominator:* total number of patients with severe sepsis, septic shock *Exclusion:* non-severe sepsis

Quality Indicator #10	**Definition of Measure**	**Specifications**
Reliability of compliance with all elements of the severe sepsis management bundle.	The percent of cases of severe sepsis, septic shock that completed all applicable severe sepsis management bundle elements	*Numerator:* the number of cases of severe sepsis, septic shock that completed all applicable severe sepsis management bundle elements. *Denominator:* total number of patients with severe sepsis, septic shock *Exclusion:* non-severe sepsis

Quality Indicator #11	Definition of Measure	Specifications
Mortality due to severe sepsis, septic shock	The percent of cases of death due to severe sepsis, septic shock	*Numerator:* the number of cases of death due to severe sepsis, septic shock *Denominator:* total number of patients with severe sepsis, septic shock *Exclusion:* non-severe sepsis