Sepsis Awareness and Education

Meets the updated New York State Department of Health (NYSDOH) requirements for Infection Control and Barrier Precautions coursework

Element VII: Sepsis Awareness and Education

FINAL 9-26-2018

Learning Objectives:

At the conclusion of course work or training on this element, the learner will be able to:

- Describe the scope of the sepsis problem and the NYS Sepsis Improvement Initiative;
- Recognize the signs and symptoms of sepsis to identify and treat at-risk patients, both adult and pediatric, as early as possible;
- Demonstrate knowledge of the need for rapid evaluation and management in adults and children if sepsis is suspected;
- Identify common sources of sepsis;
- Educate patients and families on methods for preventing infections and illnesses that can lead to sepsis and on identifying the signs and symptoms of severe infections and when to seek care.

Definitions

Sepsis Physiology:

- Sepsis is the body's extreme response to an infection.
- Sepsis happens when an infection – in skin, lungs, urinary tract, blood or somewhere else – triggers a massive physiologic response throughout the body.
- This response results in a cascade of changes that damage multiple organ systems, leading them to function abnormally, sometimes even resulting in death.
- Signs and symptoms include fever, difficulty or rapid breathing, low blood pressure, fast heart rate, and mental confusion
- This severe response to infection can lead to conditions known as **Sepsis**, **Severe Sepsis** and **Septic Shock.**

Adult: Sepsis, Severe Sepsis and Septic Shock*

Sepsis: SIRS (Systematic Inflammatory Response Syndrome) due to an infection (either suspected or confirmed) as manifested by two or more of the following:

- Fever (≥101 F ≥38.3 C) or hypothermia (≤96.8 F ≤36.0 C)
- WBC >12,000 or <4,000 or Bands >10%
- Tachycardia (pulse >90)
- Tachypnea (respiratory rate >20)

Severe Sepsis:

- Sepsis causing dysfunction of at least 1 organ system- such as acute kidney injury/acute renal failure, acute respiratory failure, or encephalopathy **OR Sepsis with**
- Sepsis-induced hypotension defined as "the presence of a systolic blood pressure of less than 90mm Hg, MAP<65, or a reduction of more than 40mm Hg from baseline in the absence of other causes of hypotension." **OR Sepsis with**
- Elevated lactate >2 mmol/L ; indicating high risk for septic shock

Septic Shock:

- Severe Sepsis with refractory hypotension (systolic blood pressure <90 mmHg or MAP<65 mmHg or reduction in systolic blood pressure >40 mmHg or more from baseline) despite adequate fluid resuscitation along with perfusion abnormalities (often requiring vasopressor therapy) **OR SEVERE SEPSIS with**
- Lactic acidosis (lactate level >4 mmol/L)

*https://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier3&cid=1228772869636

Pediatric Systemic **I**nflammatory **R**esponse **S**yndrome (***SIRS***) Criteria*

Core Temp:	< 36 C or > 38.5 C (core = rectal, bladder, oral. May use temp/axillary for hem-one pts)	
Tachycardia/bradycardia (rate/min)	<29 days	< 100 or >180
	29 days to < 1 yr:	< 90 or >180
	1-11 yr:	> 140
	≥ 12 yr:	>110
Tachypnea (rate/min):	< 29 days:	>50
	29 days to < 1 yr:	>40
	1-11 yr:	>30
	≥12 yr:	>20
WBC:	< 29 days:	WBC <5000 or > 19500
	29 days to < 2 yr	WBC <5000 or > 17500
	2 to 5 yr:	WBC <4500 or > 15000
	> 5 yr:	WBC <4500 or > 12000
	Any age	WBC ? 10% bands

*To satisfy Pediatric SIRS criteria, patient must have **two** of the four criteria **AND** at least one must be an abnormality in temperature or an abnormal white blood cell count (WBC).

UR Medicine Pediatric Sepsis Protocol Targeted Patients/Exclusio9ns and Definitions. Official copy at http://urmc-smh.poilicystat.com/policy3293726/.

Pediatric Definitions

- **Sepsis:** *SIRS* in association with suspected or proven infection
- **Severe Sepsis**: Sepsis with:
  - Cardiovascular dysfunction (abnormal cap refill/pulses/color), and/or
  - Respiratory dysfunction (50% FiO2 needed to keep O2 sat > 92%), and/or
  - Two or more of the following four system dysfunctions:
    - Neurologic (altered mental status based on clinical exam, Glascow Coma Scale (GCS) $\leq$ 11 or change from baseline $\geq$3);
    - Hematologic (defined by specific abnormal laboratory values)
    - Hepatic (defined by specific abnormal laboratory values)
    - Renal (defined by specific abnormal laboratory values)
- **Septic Shock**: Sepsis with cardiovascular dysfunction that persists **despite $\geq$ 40 ml/kg in 1 hour**

Goldstein 2005

Pediatric Definitions

- **Refractory Shock**
  - *Fluid-Refractory*: Cardiovascular dysfunction persists **despite ≥ 60 ml/kg fluids in 1 hr**
  - *Catecholamine-Refractory*: Cardiovascular dysfunction persists **despite ≥ 10 mcg/kg/min dopamine** ***and/or*** **epinephrine/norepinephrine**
- **Multiple Organ System Failure (MODS)**:
  - Specific definitions

Content Outline:

I. Sepsis – scope of the problem

a) Sepsis is a life-threatening medical emergency that requires early recognition and intervention.

b) Sepsis Prevalence and Mortality:

- Sepsis affects millions of people around the world each year, killing one in four.

- United States:

  According to the Centers for Disease Control and Prevention:

  - More than 1.5 million people get sepsis each year in the U.S.
  - At least 250,000 Americans die from sepsis each year.
  - About 1 in 3 patients who die in a hospital have sepsis.

  https://www.cdc.gov/sepsis/education/hcp-resources.html

- New York State:

  - According to the NYS Department of Health 2016 Statewide Report:
  - Severe sepsis and septic shock impact approximately 50,000 patients in NY each year.
  - On average, almost 30% of patients died from sepsis (prior to the implementation of the 2014 NYS Sepsis Care Improvement Initiative).
  - https://www.health.ny.gov/press/reports/docs/2016_sepsis_care_improvement_initiative.pdf

II. New York State Sepsis Improvement Initiative

a) Purpose

i. Early recognition of sepsis is the responsibility of all healthcare providers.

a) Most patients have **community-acquired** sepsis.

b) 7 in 10 patients with sepsis have recently used healthcare services or have chronic conditions requiring frequent medical care.

c) New York State's health care provider requirements for sepsis education:

1. New York State Public Health Law Section 239 https://www.health.ny.gov/regulations/public_health_law/section/239/
2. New York State Education Department – Education Law http://www.op.nysed.gov/title8/subart1.htm

b) Hospital regulations

i. *Rory's Regulations*: 10NYCRR 405.2 and 405.4 were implemented in 2013, and they require hospitals in New York State to adopt evidence-based protocols to ensure early diagnosis and treatment of sepsis.

a) Link to the actual law (439 pages): https://www.health.ny.gov/facilities/public_health_and_health_planning_council/meetings/2013-02-07/docs/13-01.pdf

b) Link to a summary of the law on the Rory Staunton Foundation website: https://rorystauntonfoundationforsepsis.org/rorys-regulations-full-legal-document/

III. Causes of Sepsis

Development of sepsis following infection:

i. Any infection can trigger a physiologic response resulting in sepsis.

ii. There are populations at increased risk for developing sepsis.*

   1. Extremes of age (65 yr and older; children less than 1 yr).
   2. Chronic conditions such as diabetes, lung disease, cancer, and kidney disease.
   3. People with weakened immune systems.

iii. Sites and sources of infections commonly associated with sepsis include:*

   1. Lung
   2. Urinary tract
   3. Skin
   4. GI tract
   5. Implanted lines, drains or devices

*https://www.cdc.gov/sepsis/pdfs/hcp/HCP_infographic_protect-your-patients-from-sepsis-P.pdf

IV. Early Recognition of Sepsis

a. Manifestations of sepsis may be subtle and vary by types of infections and populations.

b. Early signs and symptoms of sepsis in persons with confirmed or suspected infection can include vital sign and laboratory abnormalities indicative of a Systemic Inflammatory Response Syndrome ("SIRS" criteria), as well as other symptoms. These include:

- Altered mental status
- Clammy or sweaty skin
- Fever or hypothermia (more than 38.3°C or less than 36°C)
  - Pediatric – Temp > 38.5°C or less than 36° C
- Tachycardia (rapid heart rate) of more than 90 beats/min
  - Pediatric - age dependent
- Tachypnea (rapid breathing) of more than 20 breaths/min
  - Pediatric – age dependent
- WBC (white blood cell) count of more than 12,000 or less than 4,000 cells/mm3 or more than 10% immature neutrophils (bands)
  - Pediatric – age dependent

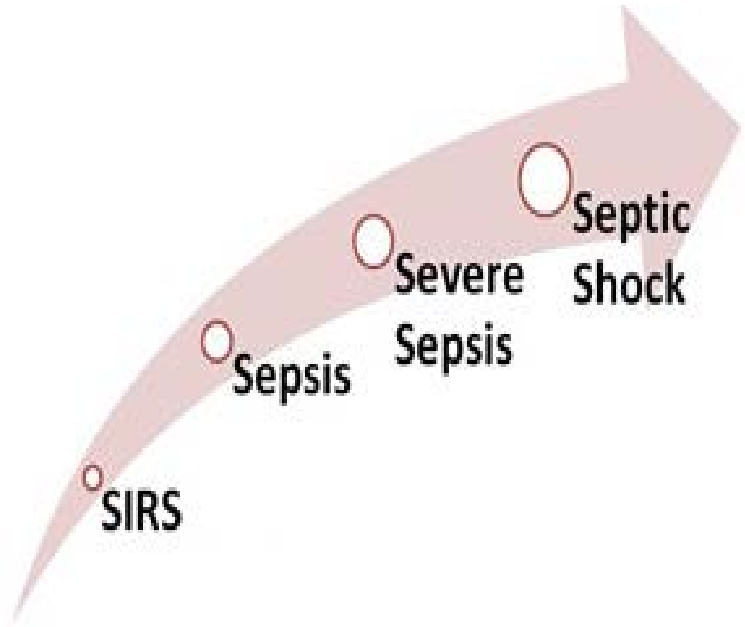
IV. Early Recognition of Sepsis (cont.)

c. Special considerations about Signs and Symptoms for children and the elderly:
   - Children: subtle clinical signs but may rapidly decompensate; hypotension a late sign; lactate levels not reliable
   - Elderly: more likely to present with altered mental status, hypothermia, and rapid decompensation.

d. Severe forms of sepsis may progress to septic shock:

Sepsis is a multi-stage syndrome, often beginning with SIRS criteria and then progressing to sepsis, which when severe can lead to septic shock. The goal is to treat sepsis as early as possible using a set of validated interventions ("bundle") that can reduce morbidity and mortality, especially when applied early.

A septic patient's vital signs, mental status, perfusion (pulses, capillary refill, distal extremity temperature) and urine output should be monitored as treatment progresses.



V. Principles of Adult Sepsis Treatment

Sepsis is treated in two stages, or "bundles." The key is identifying early symptoms so treatment can be started as soon as possible:

TO BE COMPLETED WITHIN 3 HOURS (PREFERABLY 1 HOUR):

1. Measure lactate level.
2. Obtain blood cultures prior to administration of antibiotics.
3. Administer broad spectrum antibiotics.
4. Administer 30 ml/kg crystalloid intravenous fluids (IVF) for hypotension* or lactate ≥ 4mmol/L. Ideal Body Weight (IBW) may be used but only for patients with a BMI of 31 or above. Ordering provider must clearly document if IBW was used for calculation of IVF.

"Time of presentation" is defined as the earliest chart annotation which meets all elements of severe sepsis or septic shock or provider documentation of severe sepsis or septic shock.

TO BE COMPLETED WITHIN 6 HOURS:

5. Apply vasopressors (for hypotension* that does not respond to initial fluid resuscitation) to **achieve and maintain** a mean arterial pressure (MAP) ≥ 65 mm Hg or systolic blood pressure (SBP) > 90 mm Hg.
6. In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg or SBP < 90 mm Hg) or if initial lactate was ≥ 4 mmol/L, reassess volume status and tissue perfusion and document findings within 6 hours of severe sepsis presentation and IVF administration.
7. Remeasure lactate within 4 hours if initial lactate is elevated to 2.0 or above.

The 2018 Surviving Sepsis Campaign Guidelines recommends a 1-hour bundle to replace the current 3-hour bundle.
http://www.survivingsepsis.org/Guidelines/Pages/default.aspx

*Hypotension can be defined as systolic blood pressure ≤ 90 mm Hg or Mean Arterial Pressure (MAP) ≤ 65 mm Hg.

V. Adult Sepsis Treatment (cont.)

- **Adult: 3-Hour Bundle***
  - Timely lactate
  - Blood cultures prior to antibiotics
  - Timely administration of broad spectrum antibiotics
  - Timely crystalloid administration (if hypotensive or lactate ≥ 4

  *PREFERABLY 1-HOUR

- **Adult: 6-Hour Bundle**
  - Timely vasopressor administration (if hypotensive or elevated lactate unresponsive to fluid)
  - Timely remeasurement of lactate (if elevated lactate)
  - In the event of persistent hypotension or if initial lactate was ≥ 4, reassess volume status and perfusion AND document

- Prompt diagnosis and treatment are critical for optimal outcomes; there is increased morbidity/mortality with delayed recognition and response.
- Recommended diagnostic modalities include blood cultures and other testing to identify source and site of infection and organ dysfunction.
- Recommended treatment of sepsis includes administration of appropriate intravenous (IV) antimicrobial therapy, with source identification and de-escalation of antibiotics as soon as feasible.

The 2018 Surviving Sepsis Campaign Guidelines recommends a 1-hour bundle to replace the current 3-hour bundle. http://www.survivingsepsis.org/Guidelines/Pages/default.aspx

V. Pediatric Sepsis Treatment

Pediatric: 1-Hour Bundle

- Start interventions within 30 minutes of recognition of severe sepsis/septic shock
- Give bolus of 20ml/kg Normal Saline or Lactated Ringers up to 1000 ml, IV Push, over 5-10 min,
- If inadequate response to fluid bolus (still evidence of hemodynamic dysfunction and no evidence of fluid overload), repeat every 10 minutes, and re-evaluate after each bolus.
- If inadequate response after three fluid boluses (1 hour after recognition), start epinephrine drip peripherally or centrally (if central line available).
- Obtain blood cultures and other relevant cultures before antibiotics
- Initiate Broad-spectrum antibiotics within one hour of recognition of severe sepsis/septic shock

Davis, J. et.al. ACCM clinical practice parameters for hemodynamic support of pediatric and neonatal septic shock. Crit Care Med 2017; 45(6): 1061-1093

VI. Patient Education and Prevention

a. Preventing infection:
   i. Hand hygiene
   ii. Wound care
   iii. Line/Tube care
   iv. Immunization

b. Identifying risk factors (High-risk patients):
   i. Immunosuppressed patients
   ii. Elderly
   iii. Children including neonates

c. Warning signs and symptoms of sepsis.

d. Seeking immediate care for signs and symptoms of sepsis.

e. Providing relevant history and information to health care providers.