



**PEDIATRIC SEPSIS  
ADULT SEPSIS UPDATE  
PHYSICIAN AND LICENSED STAFF**

May 2018



# Why is Pediatric Sepsis Care Important?

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- Sepsis is a leading cause of death in children
  - ▣ In patients who survive, significant injury may occur to major organs such as the heart and lungs.
  - ▣ Over the last decade, the Surviving Sepsis Campaign and American Academy of Critical Care Medicine (AACCM) have reviewed evidence and have provided guidelines for care.
  - ▣ These include rapid recognition and treatment of severe sepsis and septic shock, including administration of empiric antibiotics within one hour of sepsis recognition when possible, rapid fluid resuscitation, and early inotropic support.
  - ▣ Rapid treatment is associated with lower morbidity and mortality in adults.
  - ▣ Data from children show trends in improved outcomes with rapid recognition and treatment.

# What is Sepsis?

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- Sepsis is a life-threatening condition that occurs when the body's systemic inflammatory response to a source of infection causes injury to tissues and organs.
- It is a dysregulated immune response to infection that results in organ dysfunction and is the leading cause of death from infection if not recognized early and treated quickly

# Recognizing Sepsis in Pediatric Patient

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- In the adult the following is used
  - ▣ Systemic Inflammatory Response Syndrome (SIRS) + Organ Dysfunction + Infection
    - SIRS is the presence of at least two of the following: Temperature  $>101.3$  or  $<96.8$ , Tachycardia, Tachypnea, Leukocytosis
- In the pediatric population
  - ▣ Tachycardia and/or hypotension, then fever, hypothermia and a source of infection
  - ▣ Combination of electronic alerts and clinical judgement identifies potential sepsis;
  - ▣ Huddles with the team reviews the data and makes a determination of sepsis or symptoms related to another cause

# Goals

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- Identify patients at risk for severe sepsis
- Vascular access within 10 minutes
  - ▣ If not able to establish an IV Line then an IO approach is established within the 10 minutes of presentation
- Rapid bolus x3 (20 ml/kg each bolus) until VS correction or escalation to vasopressors
- Blood culture obtained prior to antibiotics
- Completion of first antibiotic within first hour
- Assessment of response to treatment
- Consult with Pediatric Intensivist and Transfer to appropriate level of care

RWJBarnabas ED Pathway for Evaluation/Treatment of **Pediatric Severe Sepsis: < 18 years**

Identified in Triage or by Alert

Meets Alert Criteria/Huddle indicated  
Notify Charge Nurse and Physician  
**Huddle within 15 minutes**

Sepsis pathway not indicated:  
Care/reassessment continues as clinically indicated

**Monitor parameters after Sepsis Identified:**

- Vital signs (HR, RR, BP, O2 Sat) every 15 minutes
- Capillary Refill, Mental Status (MS), Skin Temp every 30 minutes
- Temperature every 60 minutes

**Initiate Pathway**

**WITHIN THE FIRST HOUR**

Initiate Pediatric Sepsis Order Set - labs, IV fluid, antibiotics  
Place on a Monitor, assess frequently  
Immediate IV access with IV fluid escalation plan  
Administer Oxygen  
Obtain weight in kilograms  
Check and correct hypoglycemia  
Assure antibiotics started in the first hour  
Consult when appropriate with Peds Critical Care (and admission/transfer to Children's Hospital)

IV Escalation Plan:  
If unable to establish IV peripherally within 5 minutes intraosseous access should be established within 10 minutes

**Numbers for Transfer:**

Bristol Meyers Squibb Children's Hospital:  
732-418-8011  
Unterberg Children's Hospital at MMC:  
732-267-6644  
Children's Hospital of NJ at NBI:  
973-926-7700  
SBMC:  
973-322-8400

Rapid fluid bolus 20 ml/kg

Repeat for a total of 3 boluses in the first hour

History & Physical to Identify Source

Re-assess, monitor MS, VS, ADCBE's, perfusion

Fluids are given to correct tachycardia or hypotension

Final decision on admission or transfer.  
Consider starting epinephrine for fluid resistant shock; consult pediatric intensivist.

# Initial Assessment

Use the following criteria to identify children with history, symptoms suggestive of infection and inadequate tissue perfusion

Temperature Abnormality	Fever > 38.5°C or < 36°C
Heart Rate Abnormality	<u>See PALS VS Table</u>

Age	Heart Rate
0 d - 1 m	> 205
≥ 1 m - 3 m	> 205
≥ 3 m - 1 r	> 190
≥ 1 y - 2 y	> 190
≥ 2 y - 4 y	> 140
≥ 4 y - 6 y	> 140
≥ 6 y - 10 y	> 140
≥ 10 y - 13 y	> 100
> 13 y	> 100

Plus one of the following:

Mental Status Abnormality	Anxiety, restlessness, agitation, irritability, inappropriate crying Drowsiness, confusion, lethargy, obtunded
Perfusion Abnormality	Cool extremities, capillary refill > 3 seconds, diminished pulses, mottling <b>OR</b> Flushed, warm extremities, bounding pulses, flash capillary refill
High Risk Conditions	<56 days of age Central line presence BMT or solid organ transplants Malignancy Immune compromised Asplenia, Sickle Cell Disease Immunosuppressive therapy Static encephalopathy Petechial, purpuric rash Erythroderma

# Pediatric Sepsis Alert

Patient Name \_\_\_\_\_

Arrival Time \_\_\_\_\_

Medical Record Number \_\_\_\_\_

Time Screen Completed \_\_\_\_\_

Check box if abnormal	Enter patient vital signs	Findings Compatible With Sepsis									
		Age <1m	Age ≥ 1m - 3m	Age ≥ 3m - 1 yr	Age ≥ 1 yr - 2yr	Age ≥ 2 yr- 4 yr	Age ≥ 4yr- 6 yr	Age ≥ 6yr- 10yr	Age ≥ 10yr-13 y	Age ≥ 13 yr	
<input type="radio"/> +1	Temp	<96.8- >100.8	<96.8- >100.8	<96.8- >101.3	<96.8- >101.3	<96.8- >101.3	<96.8- >101.3	<96.8- >101.3	<96.8- >101.3	<96.8- >101.3	<96.8- >101.3
<input type="radio"/> +1	*Systolic Blood Pressure*	<60	<70	<70	<70 + (agex2)	<70 + (agex2)	<70 + (agex2)	<70 + (agex2)	<70 + (agex2)	<90	<90
<input type="radio"/> +1	Heart Rate	>205	>205	>190	>190	>140	>140	>140	>140	>100	>100
<input type="radio"/> +1	Respiratory Rate	>60	>60	>60	>40	>40	>32	>30	>30	>30	>16
<input type="radio"/> +1	Cap Refill	Cold Shock ≥ 3 secs or Warm Shock <1 sec (flash)									
<input type="radio"/> +1	Mental Status	Decreased, irritability, confusion, inappropriate crying, or drowsiness, poor interactions with parents, lethargy, diminished arousability, obtunded									
<input type="radio"/> +1	Pulse Quality	Cold shock: decreased or weak Warm shock: Bounding									
<input type="radio"/> +1 <input type="radio"/> +2	Skin	Mottled and cool (cold shock), flushed, ruddy, erythema (other than on face) = +1 Petechiae below the nipple, any purpura= +2									
<input type="radio"/> +2	High Risk PMH	Any history of malignancy, asplenia (including SCD), bone marrow transplant, central or indwelling catheter, solid organ transplant, severe CP/MR, immunodeficiency									

**Total Score** \_\_\_\_\_

Score 0-2: Continue with standard care

Score 3 or greater

- Notify Charge Nurse and Attending immediately
- Attending must assess patient within 15 minutes

**If attending confirms sepsis:**

- IV/IO access within 5 minutes from + screen
- Fluid resuscitation within 30 minutes from + screen
- Antibiotic administration within 60 minutes from patient arrival

Negative for Sepsis Reason \_\_\_\_\_

Intervention	Time
Attending Assessment	
IV/IO Access	
First Fluid Bolus	
Blood Culture Drawn	
Antibiotic Administration	

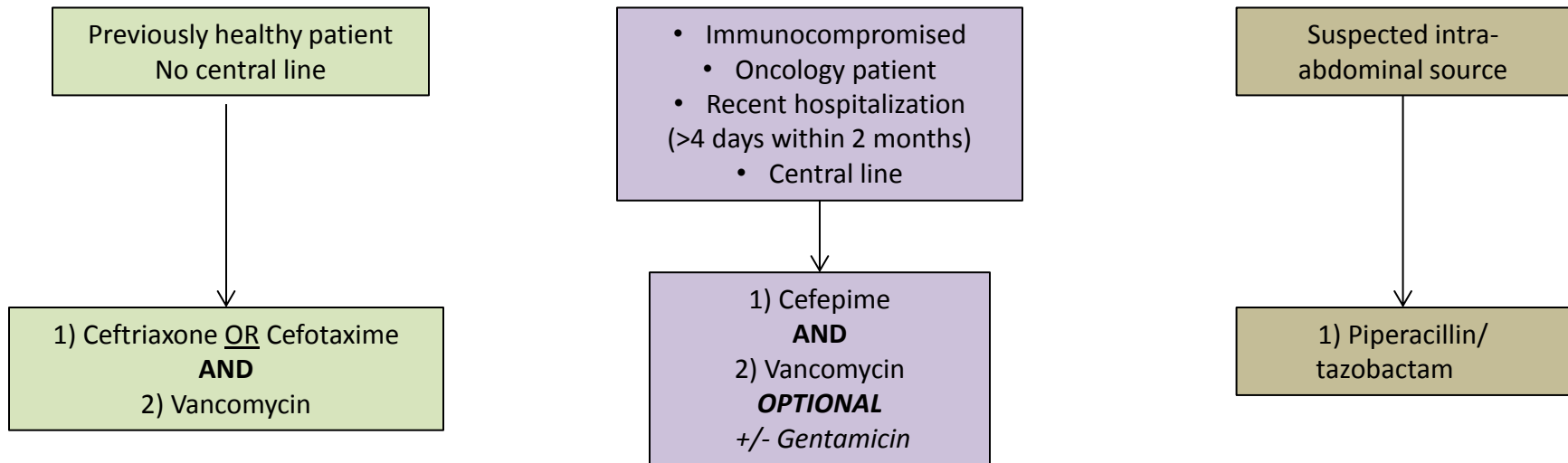
\*For patients under 2 years of age, complete a blood pressure for scores of 2\*



# Rapid Fluid Resuscitation

<p>Fluid Resuscitation</p>	<p><b>First Hour</b> Rapid NS 20 mL/kg boluses fast as possible (goal is 20ml/kg within first 20 minutes) Reassess, repeat boluses to improve perfusion for total of 3 boluses</p>
<p>Rapid Fluid Infusion Techniques</p>	<p><b>Push-Pull Technique</b> 30 mL syringe Macro drip set up with 3 way stopcock T-connector</p> <p><b>Pressure Bag</b> <b>Rapid infuser</b></p>

# Antibiotic Recommendations for Pediatric Patients (> 28 days of life) with Suspected Septic Shock

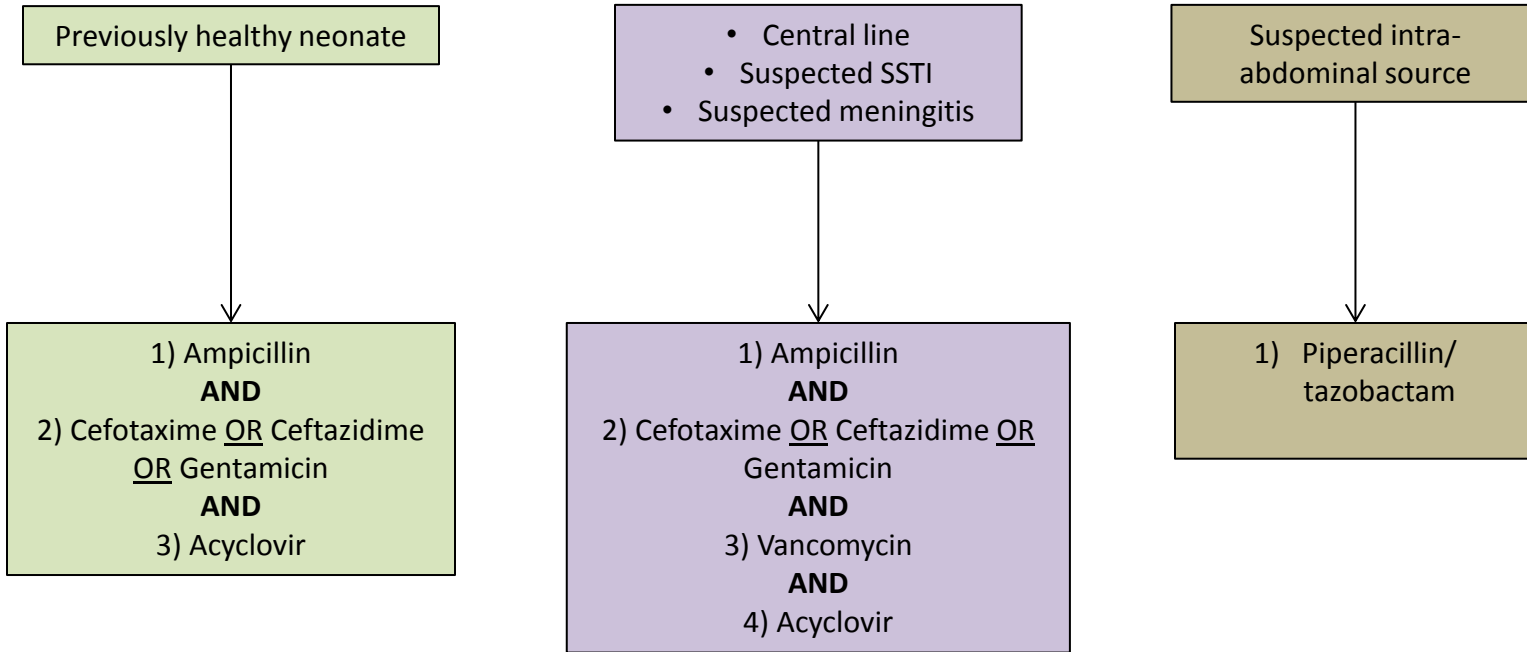


**Cephalosporin/type I mediated penicillin allergy:**  
Levofloxacin replaces cephalosporin agent

*For intra-abdominal pathway:*  
Levofloxacin + Metronidazole replaces piperacillin/ tazobactam

Drug	Pediatric Dose	Maximum Dose	Comments
Cefepime	50 mg/kg/dose q8h	2 g q8h	
Ceftriaxone	50 mg/kg/dose q12h	2 g q12h	Contraindicated in < 1 month of age
Cefotaxime	50 mg/kg/dose q8h	2 g q6h	
Levofloxacin	< 5 years: 10 mg/mg/dose q12h >5 years: 10 mg/kg/dose q24h	375 mg q12h 750 mg q24h	
Metronidazole	10 mg/kg/dose q8h	500 mg q8h	
Gentamicin	2.5 mg/kg/dose q8h	120 mg q8h	Order P/T around 4th dose
Piperacillin/Tazobactam	75 mg/kg/dose q6h	4.5 g q6h	
Vancomycin	20 mg/kg/dose q6h	2 grams loading dose 1 g q6-8h	Order T prior to 4th dose

# Antibiotic Recommendations for Neonatal Patients ( $\leq 28$ days of life) with Suspected Septic Shock



**Neonatal Medication Dosing**

Drug	Postnatal Age	Dose
Acyclovir	0 to 28 days	20 mg/kg/dose q8h
Ampicillin	$\leq 7$ days	100 mg/kg/dose q12h
	8 to 28 days	50 mg/kg/dose q6h
Cefotaxime	$\leq 7$ days	50 mg/kg/dose q12h
	8 to 28 days	50 mg/kg/dose q8h
Ceftazidime	$\leq 7$ days	50 mg/kg/dose q12h
	8 to 28 days	50 mg/kg/dose q8h
Gentamicin	$\leq 7$ days	4 mg/kg/dose q24h
	8 to 28 days	5 mg/kg/dose q24h
Piperacillin/tazobactam	0 to 28 days	80 mg piperacillin/kg/ dose q6h
Vancomycin	$< 7$ days	15 mg/kg/dose q12h
	$\geq 7$ days	15 mg/kg/dose q8h

# Pre-checked

## Labs/Studies for Peds Sepsis Orders

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- CBC with differential
- Blood culture
- Urinalysis
- Urine culture
- Complete Metabolic Panel
- CRP
- Procalcitonin
- PT/PTT/INR
- Lactic Acid
- Blood gas for pH
  - ▣ Venous or Arterial
  - ▣ iStat
- CXR (1 or 2 view)

# Outcome Metrics

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- Time of ED presentation to recognition (huddle)
- Time to IV/IO access (< 10 minutes)
- Time to fluid start
- Percent of patients who received fluid management in the first hour:  
20ml/kg in 20 minutes and 60 ml/kg in 60 minutes from time of recognition
- Time to first antibiotics
- Appropriate first antibiotics
- ED length of stay
- Percent of patients with blood cultures sent prior to antibiotics
- Time of Decision to Transfer time (to Inpatient Unit or Left Hospital)
- Outcome - Mortality

## REFERENCES

Davis, A, et al. 2017 American College of Critical Care Medicine clinical practice parameters for hemodynamic support of pediatric and neonatal septic shock. Crit Care Med. 2017 Nov 28.

Cruz, AT, et al. Implementation of goal-directed therapy for children with suspected sepsis in the emergency department. Pediatrics. 2011 Mar;127(3):e758-66.

Larsen, GY, Mecham N, Greenberg R. An emergency department septic shock protocol and care guideline for children initiated at triage. Pediatrics. 2011 Jun;127(6):e1585-92  
Goldstein, B, Giroir B, Randolph A.

International pediatric sepsis consensus conference: definitions for sepsis and organ dysfunction in pediatrics. Pediatr Crit Care Med. 2005 Jan;6(1):2-8

Surviving Sepsis Guidelines: Pediatric Consideration

<http://www.survivingsepsis.org/Guidelines/Documents/Pediatric%20table.pdf>

Kawasaki, T Update on Pediatric Sepsis – Review. Journal of Intensive Care (2017) 5:47 DOI 10.1186/s40560-017-0240-1

# Adult Sepsis Update

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- Early identification is supported by the St. Johns sepsis alert process operating in Cerner.
- An alert is announced with RRT responding with exceptions to ED and ICU.
- Newly updated guidelines from Surviving Sepsis Campaign once sepsis is identified aggressive and timely treatment is needed within 1 hour (CMS is still measuring compliance within 3 hours)
  - ▣ Labs- Lactate and Blood Culture
  - ▣ Antibiotics – Broad Spectrum, changed with culture results/source of infection is realized
  - ▣ IV Fluids – 30 ml/kg of NS or LR for hypotension or Lactate >4
  - ▣ For CMS: Reassessment of patient response should be done after IVF started



## Initial Resuscitation for Sepsis and Septic Shock (begin Immediately):

### Time Zero/Time Presentation

Time of Presentation used by CMS is when criteria is met or documented by a physician/APN/PA. Surviving Sepsis Campaign uses Triage Time or if another venue when meet Criteria.

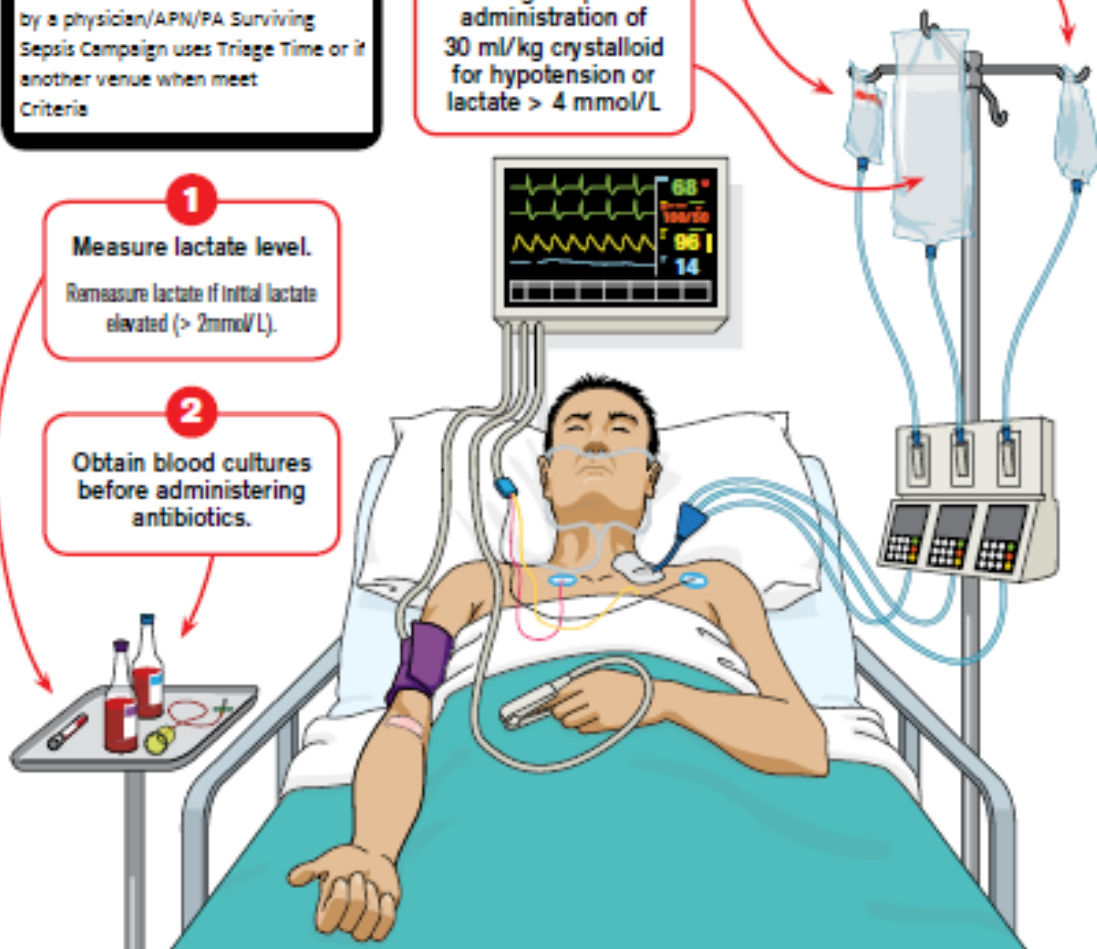
**1**  
Measure lactate level.  
Remeasure lactate if initial lactate elevated ( $> 2\text{mmol/L}$ ).

**2**  
Obtain blood cultures before administering antibiotics.

**3**  
Administer broad-spectrum antibiotics.

**4**  
Begin rapid administration of 30 ml/kg crystalloid for hypotension or lactate  $> 4\text{mmol/L}$ .

**5**  
Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure  $\geq 65\text{mm Hg}$ .





# Special Considerations

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- Sepsis continues to have a high mortality rate
- The OB patient should follow the Adult Sepsis Pathway and Order Sets
- Older adults may present atypically for infection with mental status changes
- Post Sepsis Syndrome – Occurs in up to 50% of patients who survive; Can be physical or psychological and vary in severity
  - Sleep Disturbances, Panic Attacks, Muscle and Joint Pain, Extreme Fatigue, Poor Concentration, Decreased Cognitive Functioning, Loss of Self Esteem or Self Belief.

# Don't forget Handwashing .....

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- Handwashing is the number 1 way to prevent sepsis from occurring in our hospitalized patients.
- Remember to wash your hands as per hospital policy to help save lives.

# Physician Attestation

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I have read and reviewed the slides on Pediatric Sepsis and Adult Sepsis Update

Name:

Signature:

Date:

Return this form to the Medical Staff Office via fax 732-557-8935 or scan [angela.clute@rwjbh.org](mailto:angela.clute@rwjbh.org) or drop off to the office.