

# Critical Sepsis- Emergency Department

### Signs & Symptoms of Critical Sepsis

- Hypotension (MAP  $\leq$  5<sup>th</sup> percentile for age)
- Tachycardia
- Poor perfusion
- Reduced urine output
- Tachypnea/new oxygen requirement
- Mental status changes

### Inclusion Criteria:

Any patient > 30 days old with clinical concern for critical sepsis/septic shock OR

Sepsis RED AND ED Attending/Fellow assessment with concern for critical sepsis/septic shock

### Exclusion Criteria:

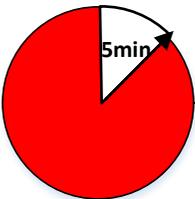
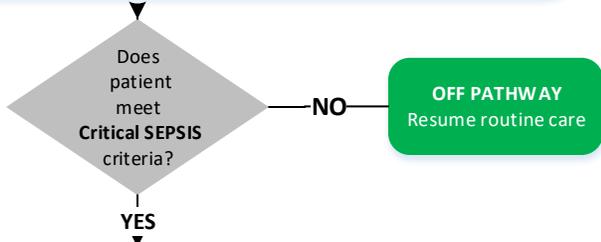
Burn patients

**! RN calls SEPSIS Triage Alert for "SEPSIS REDs"**

- Primary team huddle to evaluate for sepsis (RN/Team Leader, LIP, Surgeon when appropriate)
  - Notify Attending
- Deviation from pathway requires detailed documentation

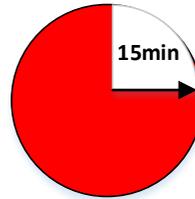
### SHOCK TIME GOALS

Time Zero = Patient flags sepsis red



### Activate Critical Sepsis Pathway/Order Set

- Provide supplemental oxygen as needed (oral/nasal ETCO2 for perfusion deficits)
- Reassess vital signs every 5 minutes
- Order appropriate antibiotics



### Access

- Place 2 large bore PIVs if no central line
- Consider PIV in patients with central line
- If 2 unsuccessful IV attempts: consider IO

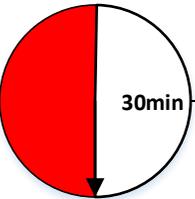
### Labs

- Blood/urine cultures
- iSTAT VBG
- POCT Glucose
- CBC + diff
- UA
- BMP
- CRP
- Procalcitonin
- Consider Type & Screen
- Lactate-order STAT
- Magnesium
- Phosphorus
- Consider PT/PTT/d-dimer
- Consider lumbar puncture <1 year old

**! Correct glucose and calcium**

### Initial Fluid Resuscitation

- Administer 1<sup>st</sup> bolus of 20mL/kg normal saline **RAPIDLY** via push-pull or pressure bag within 5-15 minutes. Consider 5-10mL/kg boluses if concern for fluid intolerance (cardiac/ renal dysfunction)
- Consider hydrocortisone stress dosing in pt. with adrenal insufficiency or petechia/purpura

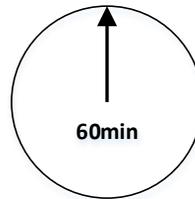


### Administer Antimicrobials

- Appropriate antibiotics for specific populations:
  - HemOnc Suspected Infection
  - Central Line Infections
  - Previously healthy patients with/without intra-abdominal source
  - Medically complex patients with/without intra-abdominal source
- Consider history of resistant organisms
- Surgical consult for suspected infection requiring source control (e.g. skin/soft tissue, intra-abdominal)

### Ongoing Resuscitation

- Administer 2<sup>nd</sup> and 3<sup>rd</sup> bolus of 20mL/kg normal saline **RAPIDLY** via push-pull or pressure bag, until perfusion improves or rales or hepatomegaly develop
- Order vasoactive/inotropic drips
- Consider blood products



### Initiate vasoactive/inotropic drips for Fluid Refractory Shock

- Epinephrine for cold shock
- Norepinephrine for warm shock
- Obtain additional access if needed
- Consider broadening antibiotic coverage

### Bedside Huddle with ED, ICU, +/- Inpatient Admitting LIP

LIP-Document outcome of huddle

RN-Sepsis reassessment

### Respiratory Support

- Consider ET intubation for hypoxemic respiratory failure or persistent shock despite adequate resuscitation and inotropic support (obtain CXR for ETT verification) using shock safe medications NO ETOMIDATE
- Consider BiPAP as an alternative

### Inpatient Admit Criteria (ACNW – use clinical judgement for transfer to ACLR)

- Normotensive after  $\leq$  40mL/kg NS boluses
- Well appearing with reassuring labs
- First dose of antibiotics administered
- Improving tachycardia

### ICU Admit/Transfer to AC Little Rock Criteria:

Any of the following and/or other concerning clinical findings:

- Ventilatory support
- Vasoactive/inotropic support
- Hypotension despite fluid resuscitation volume
- Lactate  $\geq$  4mmol/L
- pH <7.3
- Base excess greater than -6mmol
- Ill appearing
- Cold shock
- Tachycardia not resolved after intervention
- CR  $\geq$  3 sec after  $\geq$  60mL/kg NS boluses
- $\downarrow$  MAP according to the following: < 1.5(age in years) + 40; 14 years old and greater MAP < 60mmHg
- Need for critical care management

### IMU Admit Criteria (ACNW – use clinical judgement for transfer to ACLR)

- Need for monitored bed
- Normotensive after 40-60mL/kg NS boluses
- Increased assessment needs
- Increased vital sign needs
- Increasing HFNC support

# New Onset Critical Sepsis – General Care Inpatient Phase

## Signs & Symptoms of Critical Sepsis

- Hypotension (MAP  $\leq$  5<sup>th</sup> percentile for age)
- Tachycardia
- Poor perfusion
- Reduced urine output
- Tachypnea/new oxygen requirement
- Mental status changes

**Inclusion Criteria:**  
Any patient > 30 days old with clinical deterioration AND concern for new or evolving critical sepsis/septic shock AND/OR that flags Sepsis Red

**Exclusion Criteria:**  
Burn and ICU patients

**! Call code blue for imminent cardiac or pulmonary failure or neurologic emergency**

- Primary team huddle to evaluate for sepsis (RN/Team Leader, LIP, Surgeon when appropriate)
  - Notify Attending
  - Call MET
  - Consider transfer to IMU/ICU

## SHOCK TIME GOALS

Time Zero = Patient flags sepsis red

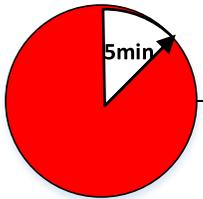
**! Rapid Response/MET**

Does patient meet CRITICAL SEPSIS criteria?

**OFF PATHWAY**  
Resume routine care

## Activate Critical Sepsis Pathway

- Provide supplemental oxygen as needed (oral/nasal ETCO<sub>2</sub> for perfusion deficits)
- Reassess vital signs every 5 minutes
- Order appropriate antibiotics



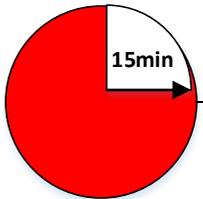
## Labs

- POCT: Electrolytes, VBG, lactate, iCa, Glucose
- Procalcitonin
- Blood/urine/CSF cultures
- CBC + diff
- CMP
- CRP
- Magnesium
- Phosphorus
- Consider Type & Screen
- Consider lumbar puncture

**! Correct glucose and calcium**

## Access/Initial Fluid Resuscitation

- Consider PIV in patients with central line if additional access is needed
- Administer 1<sup>st</sup> bolus of 20ml/kg normal saline rapidly over 20 minutes OR LESS
- Consider 5-10ml/kg boluses if concern for fluid intolerance (cardiac/renal dysfunction)

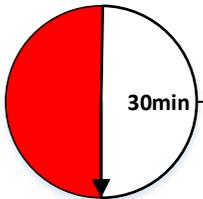


## Administer Antimicrobials

- Appropriate antibiotics for specific populations:
  - HemOnc Suspected Infection
  - Central Line Infections
  - Previously healthy patients with/without intra-abdominal source
  - Medically complex patients with/without intra-abdominal source
- Consider history of resistant organisms
- Consider broadening antibiotic coverage
- Surgery consult for suspected infection requiring source control (e.g. skin/soft tissue, intra-abdominal)

## Ongoing Resuscitation

- Consider administration of 2<sup>nd</sup> and 3<sup>rd</sup> boluses of 20ml/kg normal saline rapidly over 20 minutes OR LESS as clinically indicated
- Order vasoactive/inotropic drips as indicated
- Consider blood products as indicated
- BMT patients: consider vasoactive/inotropic drips after 2<sup>nd</sup> NS bolus
- Consider PICU consult or calling a code



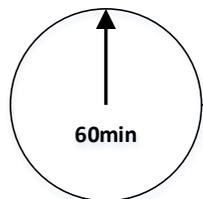
## Re-Evaluation

- Well-appearing patients who do not meet IMU/ICU transfer criteria, may stay on Inpatient unit and are placed on WATCHER list for reassessment

**MET Debrief**  
Does patient meet IMU/ICU transfer criteria?

## Transfer to ICU

- (ACNW – Use clinical judgement for transfer to ACLR)
- Initiate vasoactive/inotropic drips for Fluid Refractory Shock
  - Epinephrine for cold shock
  - Norepinephrine for warm shock
  - Titrate drips to resuscitation goals



## Intermediate Care (IMU) Transfer Criteria

(ACNW – use clinical judgement for transfer to ACLR)

- Resolved hypotension requiring intervention ( $\leq$  5<sup>th</sup> percentile for age)
  - How to calculate MAP-  $<1.5$  (age in years) +40 or if age >13 years MAP <60
- Need for continuous cardiorespiratory monitoring
- Need for 3<sup>rd</sup> normal saline fluid bolus
- IMU Admission, Transfer, and Discharge Criteria

## ICU Transfer Criteria

(ACNW – use clinical judgement for transfer to ACLR)

- Recurrent hypotension despite > 40ml/kg fluid resuscitation in the last 12 hours
  - Fluid resuscitation includes either crystalloid or colloid
  - Hypotension ( $\leq$  5<sup>th</sup> percentile for age)
  - How to calculate MAP-  $<1.5$  (age in years) +40 or if age >13 years MAP <60
- Clinical situation not appropriate for ongoing fluid resuscitation
  - Defined as underlying cardiac disease, lung disease, existing fluid overload, impaired renal function
- Lactate  $\geq$  4 or base excess  $<$  -4 mmol
- Sustained change in mentation from baseline or perfusion (CR >2 seconds) for at least 15 minutes
- Patient requires continuous ICU monitoring or ICU level respiratory support

## MAPs by Age

Age (year)	MAP 5 <sup>th</sup> %tile	MAP 50 <sup>th</sup> %tile
0	40	55
1	42	57
2	43	58
3	45	60
4	46	61
5	48	63
6	49	64
7	51	66
8	52	67
9	54	69
10	55	70
11	57	72
12	58	73
13	60	75
14	61	76
15	63	78
16	64	79
17	66	81
18	67	82

## Medication Dosing for Critical Sepsis

Dosing is for normal renal function

<b>Antipyretics – Choose one</b>	
<input type="checkbox"/> Acetaminophen	15 mg/kg, PO, q6 PRN fever
<input type="checkbox"/> Acetaminophen	20 mg/kg, Rectal, q6 PRN fever
<input type="checkbox"/> Acetaminophen	15 mg/kg, IV, q6 PRN fever
<input type="checkbox"/> Ibuprofen	10mg/kg, PO, q6 PRN fever
<b>Antibiotics: Previously healthy patients</b>	
<input type="checkbox"/> Ceftriaxone (bacteremia)	50 mg/kg, IV, q24h
<input type="checkbox"/> Ceftriaxone (meningitis)	50 mg/kg, IV q12h
<input type="checkbox"/> Ceftriaxone (pneumonia)	75 mg/kg, IV, q24h
+/-	
<input type="checkbox"/> Vancomycin – only if suspect MRSA (what dose has patient been on that gave therapeutic levels?)	15 mg/kg, IV, q6h
+/-	
<input type="checkbox"/> Metronidazole – only if suspect intra-abdominal infection	10 mg/kg, IV, q8h
<b>Antibiotics: Medically Complex Patients</b>	
<input type="checkbox"/> Cefepime	50 mg/kg, IV, q8h
+/-	
<input type="checkbox"/> Vancomycin - only if suspect MRSA (what dose has patient been on that gave therapeutic levels?)	15 mg/kg, IV, q6h
+/-	
<input type="checkbox"/> Metronidazole – only if suspect intra-abdominal infection	10 mg/kg, IV, q8h
<b>OR</b>	
<input type="checkbox"/> Meropenem - alternative if cefepime allergy or previous cefepime resistant infection (ID/ASP approval required) Must re-evaluate treatment plan at 72 hrs	40 mg/kg, IV, q8h
+/-	
<input type="checkbox"/> Vancomycin - only if suspect MRSA (what dose has patient been on that gave therapeutic levels?)	15 mg/kg, IV, q6h
<b>Hypocalcemia</b>	
<input type="checkbox"/> Calcium gluconate in dextrose 5%-PIV	50 mg/kg, IV, once
<b>Adrenal Insufficiency</b>	
<input type="checkbox"/> Hydrocortisone	2 mg/kg, IV, once
<b>Hypoglycemia</b>	
<input type="checkbox"/> D10 Bolus	5 mL/kg, IV, once
<input type="checkbox"/> D25 Bolus	2 mL/kg, IV, once
<input type="checkbox"/> D50 Bolus	1 mL/kg, IV, once
<b>Intubation</b>	
<input type="checkbox"/> Atropine	0.02 mg/kg (max 0.5 mg)
<input type="checkbox"/> Ketamine	2 mg/kg (max 100 mg)
<input type="checkbox"/> Rocuronium	1.2 mg/kg (max 100 mg)
<input type="checkbox"/> Sugammadex (for NMB reversal)	16 mg/kg
<b>Vasoactive</b>	
Epinephrine- titrate in small increments based on perfusion (drug of choice for inotropy in pediatric shock)	0.05-2 mcg/kg/min
Norepinephrine- titrate in small increments to achieve normal MAP	0.05-2 mcg/kg/min
Milrinone- no bolus; no titration	0.3-0.5 mcg/kg/min

## Metrics

1. Time to first normal saline bolus from positive sepsis red screen
2. Time to first antibiotics from positive sepsis red screen
3. Blood culture collection time and result
4. Huddle completed for patients that screen sepsis red
5. Critical sepsis order set usage in ED and Inpatient areas
6. Number of critical sepsis/septic shock diagnoses added to problem list

## Contributing Members

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Holly Maples, PharmD - Antimicrobial Stewardship Director  
Emily Rader, RN – Clinical Pathways Specialist

## References

1. Ikram U. Haque, MD, FAAP; Arno L. Zaritsky, MD, FAAP, FCCM (2007). Analysis of the evidence for the lower limit of systolic and mean arterial pressure in children. *Pediatr Crit Care Med* 2007 Vol. 8, No. 2. <https://doi.org/10.1097/01.PCC.0000257039.32593.DC>
2. B. Ku, MD; F. Balamuth, MD; M.K. Funari, RN; J. Lavelle, MD; C. Jacobstein, MD; D. Davis, MD; J. Fitzgerald, MD J. Gerber, MD; T. Metjian, Pharm D; S. Fesnak, MD; L. Hutchins, CRNP; D. Potts, RN 2018 July. ED Pathway for Evaluation/Treatment of Infants > 28 Days of Age and Children with Suspected Severe Sepsis. Available from: <https://www.chop.edu/clinical-pathway/sepsis-emergent-care-clinical-pathway>
3. Seattle Children's Hospital, Rutman, L., Robert, J., Beardsley, E., Farris, R., Fenstermacher, S., Leu, M., Marshall, H., Migita, D., O'hare, P., Ringer, C., 2016 December. Septic Shock Pathway. Available from: <http://www.seattlechildrens.org/pdf/septic-shock-pathway.pdf>