Neonatal Sepsis- Emergency Department

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Signs & Symptoms of Critical Sepsis

- Hypotension (MAP <40 mm/Hg)
- Tachycardia
- Poor perfusion
- Reduced urine output/poor feeding
- Tachypnea/new oxygen requirement/ grunting/cyanosis/apnea
- Mental status changes/seizures
- Fever ≥ 38°C or hypothermia ≤ 35°C

Inclusion Criteria:
Any patient 0-29 days old with clinical concern for neonatal sepsis/septic shock **OR**
Sepsis RED **AND**
ED Attending/Fellow assessment with concern for neonatal sepsis/ septic shock
Exclusion Criteria:
Burn patients

Consider alternate diagnoses:

- Ductal dependent congenital heart disease
- Congenital adrenal hypoplasia
- Inborn errors in metabolism
- Arrhythmias
- CMS-P

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)

- Bolus in 20 minutes from time zero
- Antibiotics in 60 minutes from time zero

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

Does patient meet **Neonatal SEPSIS** criteria?

NO → **OFF PATHWAY** Resume routine care

YES

Activate Neonatal 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 PIV
- Consider PIV in patients with central line
- Consider umbilical line if cord stub still present
- **If 2 unsuccessful IV attempts: consider IO**

Diagnostic Evaluation

- Blood/urine cultures
- iSTAT VBG
- POCT Glucose
- CBC + diff
- UA
- BMP
- CRP
- Procalcitonin
- Consider Type & Screen
- Lactate-order STAT
- Magnesium
- Phosphorus

! **Correct glucose and calcium**

- Lumbar puncture
- Consider PT/PTT/d-dimer
- STAT lytes
- Ammonia level
- HSV serum/multisite swab
- EKG
- Acute Abdominal Series
- LFTs

Initial Fluid Resuscitation

- Administer 1st bolus of 10-20mL/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:
  - Previously healthy patients:
    -Ampicillin & cefotaxime
  - Medically complex patients:
    -Cefepime & vancomycin (if suspect MRSA)
- Acyclovir if clinical concern for HSV
- Consider NEC with abdominal symptoms
- Surgical consult for suspected infection requiring source control (e.g. skin/soft tissue, intra-abdominal)

! **Reassess patient after every bolus**

Ongoing Resuscitation

- Administer 2nd and 3rd 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
- If suspect CHD, start prostaglandin
- Consider hydrocortisone for fluid refractory shock
- Treat seizure activity

Initiate vasoactive/inotropic drips for Fluid Refractory Shock

- Dopamine – LIP reassess patient within 10 minutes of starting drip to adjust dose if needed
- Epinephrine for cold 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

- Intubate if hypoxic or apneic, fluid refractory shock, or if starting PGE using shock safe medications
  NO ETOMIDATE
- Consider NIPPV as an alternative

Inpatient Admit Criteria

(ACNW – use clinical judgement for transfer to ACLR)

- Normotensive after ≤ 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 ≥ 4mmol/L
- pH <7.3
- Base excess greater than -6mmol
- Ill appearing
- Cold shock
- Tachycardia not resolved after intervention
- CR ≥ 3 sec after ≥ 60mL/kg NS boluses
- Need for critical care management
- MAP <40 mm/Hg

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

E. Rader 4-1659
Approved by P&T committee 6/15/21

Neonatal Sepsis – General Care Inpatient Phase

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Signs & Symptoms of Critical Sepsis

- Hypotension (MAP <40 mm/Hg)
- Tachycardia
- Poor perfusion
- Reduced urine output
- Tachypnea/new oxygen requirement
- Mental status changes

Inclusion Criteria:
Any patient 0-29 days old with clinical deterioration **AND** concern for new or evolving neonatal 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)

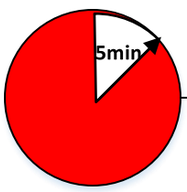
- Bolus in 20 minutes from time zero
- Antibiotics in 60 minutes from time zero

!
Rapid Response/MET

Does patient meet **NEONATAL SEPSIS** criteria?

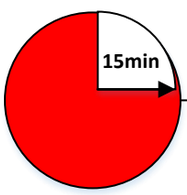
NO → **OFF PATHWAY** Resume routine care

YES ↓



Activate Critical Sepsis Pathway

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



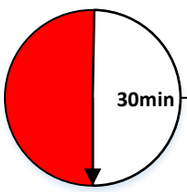
Diagnostic Evaluation

- POCT: Electrolytes, VBG, lactate, iCa, Glucose
- Procalcitonin
- Blood/urine/CSF cultures
- CBC + diff
- CMP
- LFTs
- CRP
- Magnesium
- Phosphorus
- Consider Type & Screen
- Consider PT/PTT/d-dimer
- UA/urine microscopy
- Lumbar puncture
- HSV serum/multisite swab
- EKG
- Acute Abdominal Series
- Chest x-ray 1 view

!
Correct glucose and calcium

Access/Initial Fluid Resuscitation

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

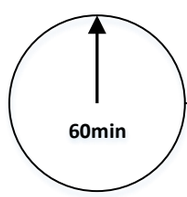


Administer Antimicrobials

- Appropriate antibiotics for specific populations:
  - Central Line Infections
  - Previously healthy patients with/without intra-abdominal source
  - Medically complex patients with/without intra-abdominal source
- Consider NEC with abdominal symptoms
- Acyclovir if clinical concern for HSV
- Consider broadening antibiotic coverage
- Surgery consult for suspected infection requiring source control (e.g. skin/soft tissue, intra-abdominal)

Ongoing Resuscitation

- Consider administration of 2nd and 3rd 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 2nd NS bolus
- Consider cardiogenic shock
- 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

NO ← **MET Debrief** Does patient meet IMU/ICU transfer criteria? → YES

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 (≤5th percentile for age)
  -MAP <40 mm/Hg
- Need for continuous cardiorespiratory monitoring
- Need for 3rd 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
  -MAP <40 mm/Hg
- Clinical situation not appropriate for ongoing fluid resuscitation
  -Defined as underlying cardiac disease, lung disease, existing fluid overload, impaired renal function
- Lactate ≥ 4 or base excess < -4 mmol
- Sustained change in mentation from baseline or perfusion (central CR >2 seconds) for at least 15 minutes
- Patient requires continuous ICU monitoring or ICU level respiratory support

Medication Dosing for Neonatal Sepsis

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Dosing is for normal renal function

Antipyretics – Choose one	
□Acetaminophen	15 mg/kg, PO, q6 PRN fever
□Acetaminophen	20 mg/kg, Rectal, q6 PRN fever
□Acetaminophen	15 mg/kg, IV, q6 PRN fever
Antibiotics: Previously healthy patients	
□ Ampicillin	100 mg/kg q8h ≤ 7 days old
□ Ampicillin	75 mg/kg q6h > 7 days old
□ Cefepime	50 mg/kg, IV, q12h
+/-	
□ Acyclovir – only if suspect HSV	20 mg/kg q8h
Antibiotics: Medically Complex Patients	
□ Cefepime	50 mg/kg, IV, q12h
+/-	
□ Vancomycin - only if suspect MRSA	15 mg/kg, IV, q12h ≤ 7 days old
□ Vancomycin - only if suspect MRSA	15 mg/kg IV, q8h > 7 days old
Hypocalcemia	
□ Calcium gluconate in dextrose 5%-PIV	50 mg/kg, IV, once
Adrenal Insufficiency	
□ Hydrocortisone	2 mg/kg, IV, once
Hypoglycemia – serum glucose < 60 mg/dL	
□ D10 Bolus	5 mL/kg, IV, once
□ D25 Bolus	2 mL/kg, IV, once
□ D50 Bolus	1 mL/kg, IV, once
Intubation	
□ Atropine	0.02 mg/kg (max 0.5 mg)
□ Ketamine	2 mg/kg (max 100 mg)
□ Rocuronium	1.2 mg/kg (max 100 mg)
□ Sugammadex (for NMB reversal)	16 mg/kg
Vasoactive	
Dopamine – titrate by 2.5 mcg/kg/min based on MAP	2.5 mcg/kg/min – 20 mcg/kg/min
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
Anticonvulsants	
Keppra (loading dose)	20 - 40 mg/kg
Ativan	0.1 mg/kg

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. Neonatal sepsis order set usage in ED and Inpatient areas
6. Number of neonatal sepsis/septic shock diagnoses added to problem list

Contributing Members

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