Surviving Sepsis: Early Management of Childhood Systemic Infection

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Norton Children's

UofL School of Medicine

Objectives

- Define sepsis and septic shock
- Recognize the signs in a child
- Manage the early hours of therapy
- Know when to transfer to tertiary care center

Definitions

Sepsis: life-threatening organ dysfunction caused by a dysregulated host response to infection*

Septic shock: severe infection leading to cardiovascular dysfunction

- Hypotension
- Need for vasoactive medication
- Impaired perfusion

Sepsis-associated organ dysfunction: severe infection leading to cardiovascular dysfunction and/or non-cardiovascular dysfunction

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- Pediatric patients from full-term birth to 18 years
- Guidelines for best practices and other recommendations
- *Pediatric Critical Care Medicine*, February, 2020;21(2):e52-e106

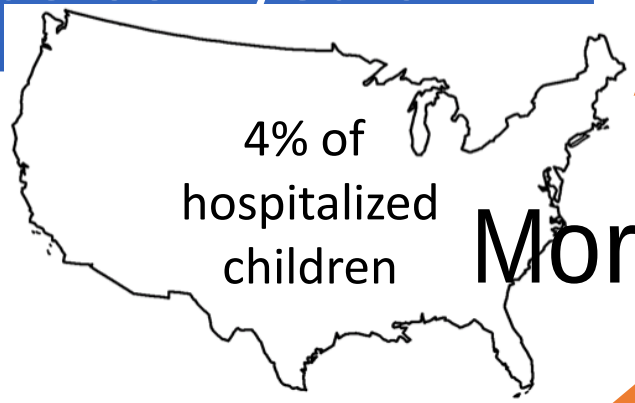
https://www.sccm.org/SurvivingSepsisCampaign/Guidelines/Pediatric-Patients

Sepsis

22 cases in child person years

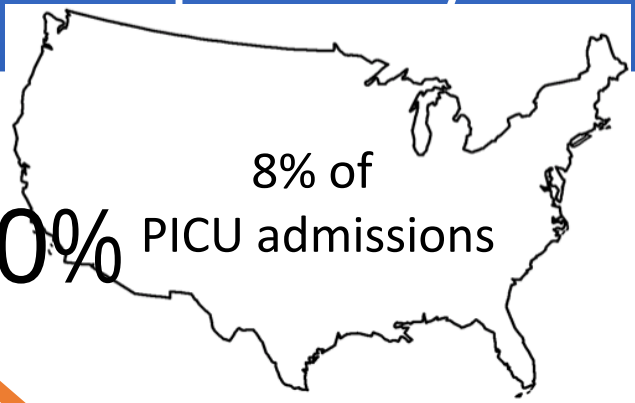
1.2 million children/year

2200 cases in ,000 person-years



4% of hospitalized children

Mortality 4-50%



8% of PICU admissions

Illness Severity

Risk Factors

Geographic Location

Most deaths occur within the initial 48-72 hours after presentation.

Screening

- Children who present as acutely unwell should have a timely & systematic screening for septic shock and related organ dysfunction
- All healthcare entities should have a sepsis quality improvement program
- Facilities with EHRs may institute electronic triggers to alert clinicians

Recognition

Altered mental status, temperature instability

Tachypnea, abnormal lung sounds, hypoxia

Tachycardia, peripheral pulse changes, perfusion abnormalities, hypotension

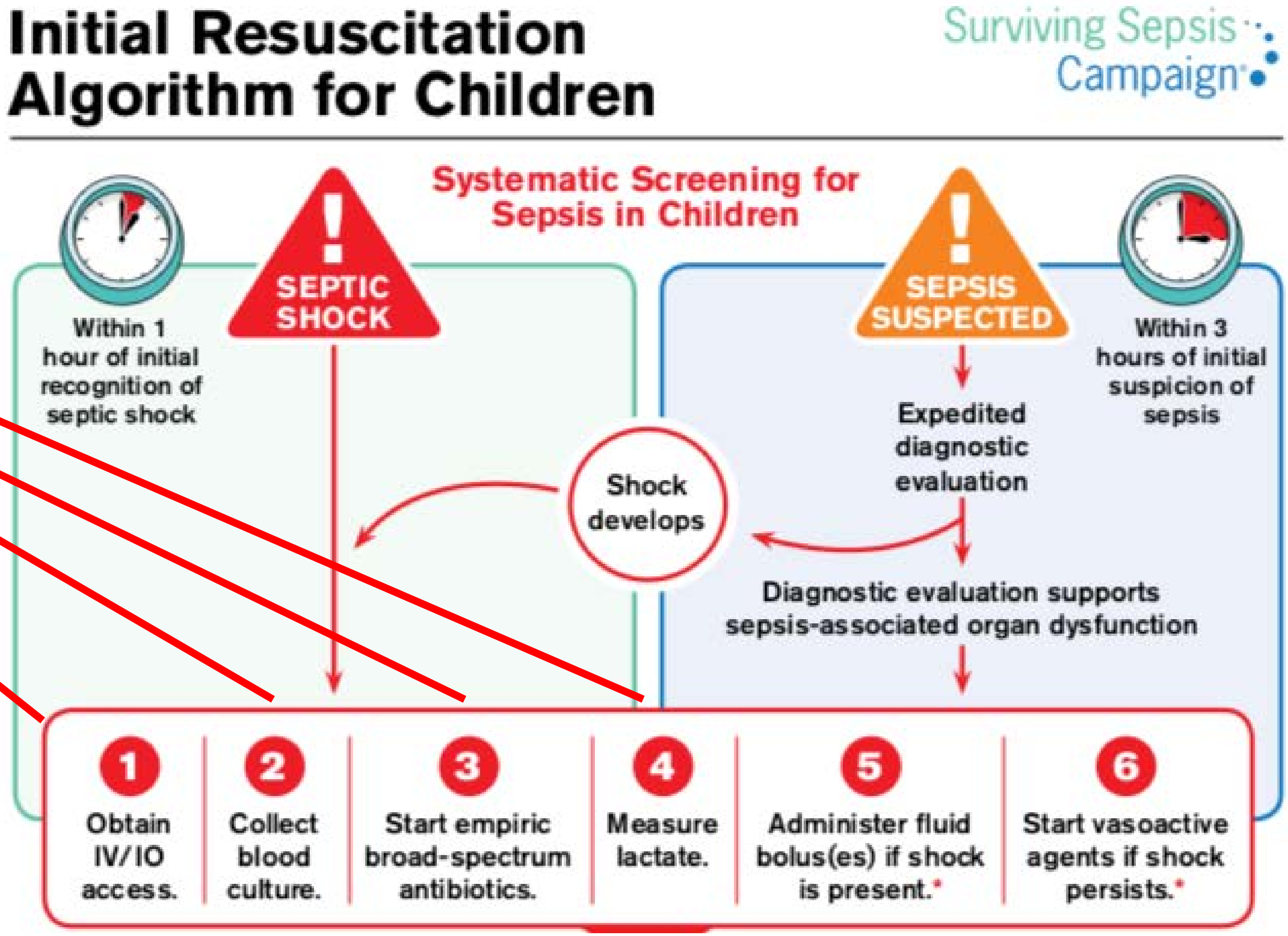
Abdominal pain, vomiting, decreased appetite

Poor urine output

Mottling, flushing, rash

Designed by macrovector / Freepik

- Broad-spectrum ... or ... likely pathogens
- Antibiotics ≤1 hour for septic shock
  - CSF
- Antibiotics ≤3 hours for sepsis-associated organ dysfunction
  - Tracheal aspirate
  - Wound



Initial Resuscitation Algorithm for Children

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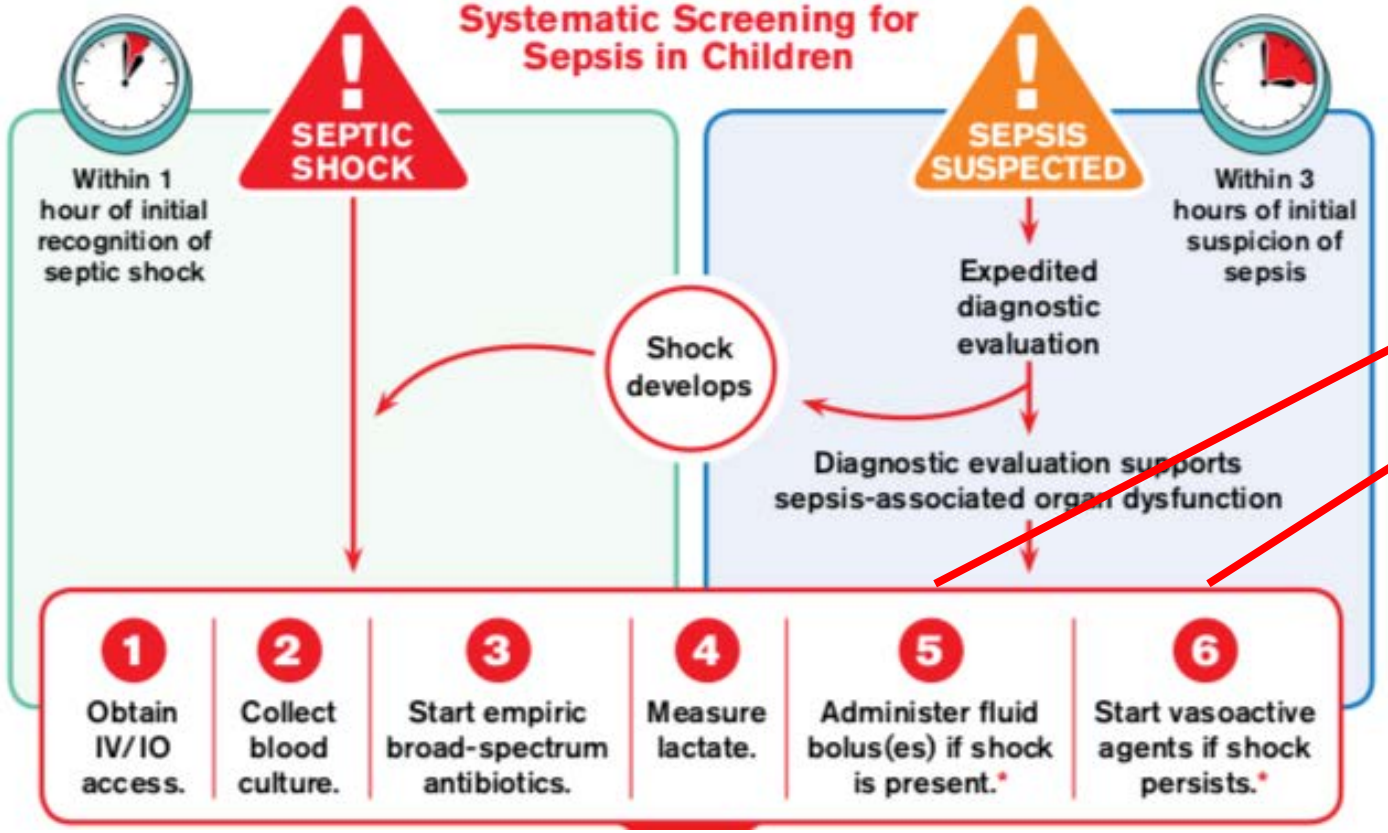

6 Start vasoactive agents if shock persists.*

- 20 ml/kg of isotonic crystalloid **at IBW**
  - Rapid bolus
  - Push-pull method
  - Pressure bag ≥ 50 kg
  - Reassess after each bolus
  - Up to 40-60 ml/kg total
- Can be given peripherally
- Epinephrine or norepinephrine infusions
- Preferred over dopamine
- Titrate to MAP and improving end points of resuscitation

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When is fluid resuscitation a good thing?

- Clinical markers of improving shock
  - Heart rate
  - Blood pressure
  - Capillary refill time
  - Level of consciousness
  - Urine output
  - Resolving lactic acidosis

MAP in Children in a Hospital Setting		
Age	5th percentile (mmHg)	50th percentile (mmHg)
Neonate	39	56
1-6 mo	41-44	59-62
6-12 mo	48	67
1-6 yr	52-53	69-72
6-13 yr	54-56	71-73
13-18 yr	56-57	74-76

Roberts, *et al. PCCM*. 2020;21(9):e759-768

When is fluid resuscitation a bad thing?

- Signs of fluid overload from heart failure
  - Pulmonary edema: crackles, worsening respiratory status, x-ray findings
  - Hepatomegaly: liver palpable below costal margin
  - Ultrasound: full IVC with little respiratory variation

- Downstream effects
  - Increased mortality
  - Prolonged mechanical ventilation
  - Acute kidney injury

Respiratory support

- Supplemental O2 for all children with septic shock
- No recommendation on the timing of intubation in children without respiratory failure
- Noninvasive ventilation (CPAP, BiPAP) is an option for patients with respiratory distress and who are responding to resuscitation

Antibiotics

- Empiric broad-spectrum antibiotics are indicated to cover most likely pathogens
- Sepsis in children is most commonly due to Gram (-) and Gram (+) bacteria
- Special populations
  - Immunosuppressed
  - Indwelling devices
  - Recent hospital admissions
  - Seasonal pathogens
  - Neonates
  - Recent immigration

Other management

- Hydrocortisone: consider for fluid- and pressor-refractory shock
- Fever control: unclear if fever is helpful or harmful
  - Comfort
  - Hyperpyrexia > 40^{o}C
  - Refractory shock
- Blood glucose management: prevent low and high
- Transfusions
  - Hgb ≥ 7 gm/dL
  - Platelets and plasma for clinical bleeding or specific populations

COVID pandemic effect

- Moderate-severe MIS-C presents similarly to septic shock
  - Fever
  - Cardiovascular compromise
  - Rash
  - GI symptoms
  - Mucocutaneous signs
  - Elevated inflammatory markers
- Acute COVID tests ±
- Heart failure more prominent that hypovolemia
- Treatment: vasoactive drips, steroids, IVIG, biologics, antithrombic

EHR tools

- Pediatric sepsis screening tool
- Best practice advisory alerts
  - Scoring systems based on vital signs ± labs
  - Pop-up window when opening chart
- Pediatric sepsis order set
- Data accumulation for QI activities
- Unit-based or hospital-wide

NCH ED BPA (6 or higher)	Score
Temperature	2
High Risk Condition	2
HR	2
RR	2
Low SBP	3
Pulse Exam	1
Cap Refill	2
Skin Exam Abnormality	1

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Tertiary care transfer

- Septic shock and sepsis-associated organ dysfunction
- Intubation/chronic respiratory failure
- Complex medical issues
- Possible need for extracorporeal support
  - ARDS and refractory hypoxia
  - Renal replacement therapy
  - Plasma exchange

Just for Kids Transport

- Mobile ICU for ages 0-21 years
- Respiratory devices
  - Heated high-flow nasal cannula
  - BiPAP/CPAP
  - Mechanical ventilation
- Cardiovascular support/IV access
- On-line medical direction

1-(888) 729-9111

Recommendations

- Pediatric sepsis screening tool and management protocol
- Focus on good IV skills
- Frequent reassessment of patient status
- Prevent treatment delays
- Early, appropriate use of pediatric transport services

Review Surviving Sepsis Guidelines in the context of your practice

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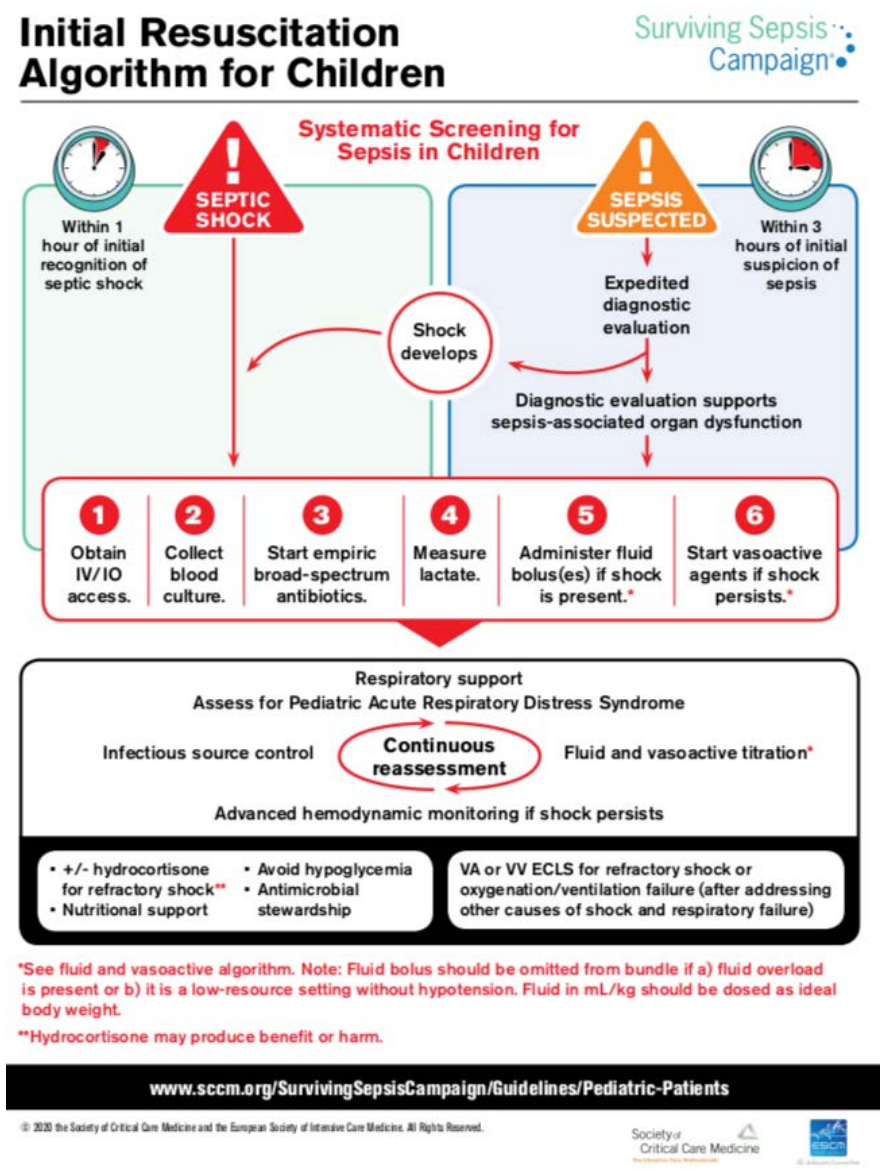

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