Sepsis Clinical Pathway:
Recognition and Initial Management

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What Is a Clinical Pathway?

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An evidence-based guideline that decreases unnecessary variation and helps promote safe, effective, and consistent patient care

Objectives of the Pathway

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- To standardize the approach in caring for patients with sepsis and septic shock
- To improve the early recognition of sepsis
- To create an understanding of the benefits of using a shared mental model framework for recognizing and managing sepsis (use of sepsis huddle)
- To treat sepsis early and rapidly with timely administration of antibiotics and fluid resuscitation
- To standardize the supportive care of patients with sepsis

Why Is a Pathway Necessary?

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- Sepsis is a life threatening condition that requires rapid recognition and treatment
- A clinical pathway can empower early recognition and treatment to reduce morbidity and mortality

2026 Updates

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- Fluid resuscitation: lactated ringers added as option, in addition to NS
- Vancomycin: dosing updated per new pharmacy protocol
- Hypocalcemia correction: calcium gluconate is preferred agent (rather than CaCl)
- Language for “fluid resistant” changed to “fluid refractory”
- Urinary catheter changed to be “considered” rather than always placed (reduces risk of infection)
- Consider placing central venous access, rather than always placed
- Bicarbonate therapy: removed tromethamine (THAM) as buffer agent
- Consult ID: added indications (positive blood culture, diagnostic therapeutic concerns)

Background

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Every year 40,000 children are hospitalized for sepsis in the U.S.

Almost 5,000 children die from sepsis yearly

25-40% survivors suffer from long term health issues

Background

- The window for diagnosis and effective intervention in children is 1-4 hours
- Every hour delay in treatment increases mortality by nearly 8%

If undetected…

Rapid escalation to severe sepsis + septic shock

Extensive + irreversible body system damage

Pediatric Sepsis: Mortality

Schlapback LJ et al. JAMA 2024

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- Overall sepsis mortality: 7.1%
  - 9.8% in 2005 (Watson et al)
  - LMIC - 28.5%
  - If effective QI, < 3% mortality
- Septic Shock mortality (defined as CV dysfunction)
  - 10.8% mortality (33.5% in LMIC)
- Adult sepsis mortality: 20-24%
  - ARISE, ProMISE, ProCESS (2014-2016)

Background

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Early recognition and treatment drastically improves patient outcomes

- Sepsis can be difficult to diagnose
- Effective and timely recognition require high levels of coordination
- Timeliness of recognition and treatment are of upmost importance

Background

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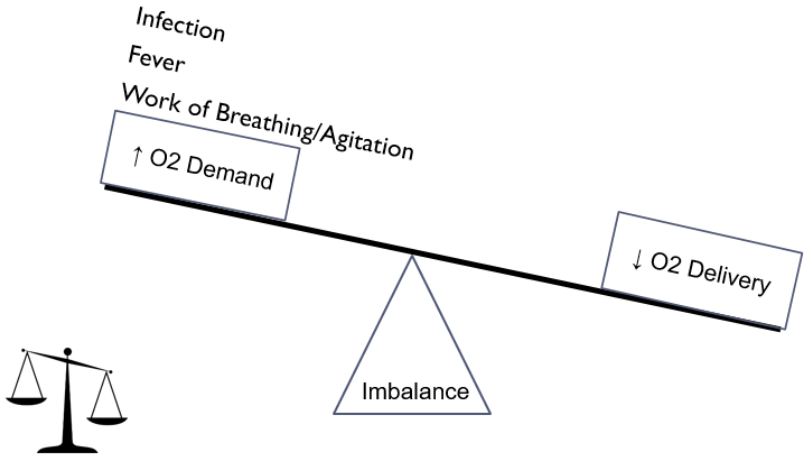
Pediatric sepsis research and guidelines are evolving, and preventing child deaths requires continual refining of evidence-based interventions

Clinical practice guidelines and bundles improve patient outcomes

Goal is to prevent septic shock, and if there is shock, treat it ASAP

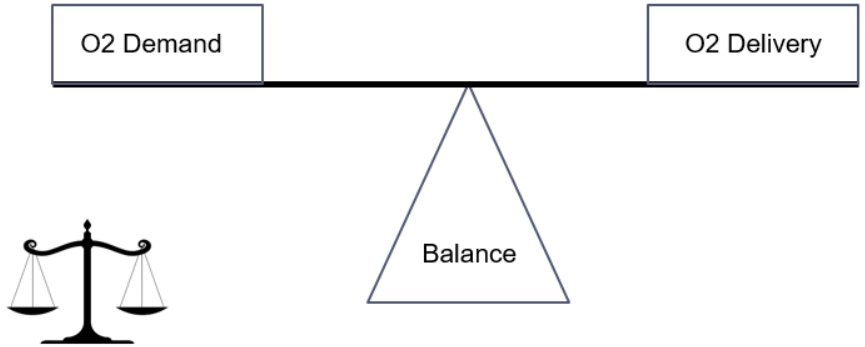
Septic Shock Physiology

- Increased oxygen demand



Shock Management Goal

- Restore the balance by increasing O2 delivery and reducing O2 demand



- Prompt fluid bolus and pressors
- Control infection (early antibiotics and source control)
- Control fever (antipyretics)
- Reduce agitation and work of breathing (CPAP/BiPAP, early intubation with muscle relaxation)

SEPSIS PATHWAY: RECOGNITION

Early recognition and treatment of Sepsis and Septic Shock are ***essential***

Positive screen → timely clinical assessment

Initial Evaluation

Recognize Sepsis

Temperature		Heart Rate			
	A	<1 y/o	1-2 y/o	2- 10 y/o	≥ 11 y/o
>38°C	N				
OR	D	≥180	≥160	≥140	≥110
<36°C					

Accompanied by one or more signs of shock / poor organ perfusion as defined by ACCM guidelines:

Vascular: capillary refill > 2 sec, decreased pulses, cool/mottled extremities (cold shock) OR flash capillary refill, bounding pulses (warm shock)

Hypotension for age (LATE finding; may be preceded by narrowed or widened pulse pressure or diastolic hypotension):

- SBP <60 mm Hg in term neonates (0 to 28 days)
- SBP <70 mm Hg in infants (1 month to 12 months)
- SBP <70 mm Hg + (2 × age in years) in children 1 to 10 years
- SBP <90 mm Hg in children ≥10 years of age

Renal: Urine output < 1mL/kg/hr

Neuro: altered mental status, lethargy

Patients with septic shock may have:

ID: Abnormal WBC count (>12,000/µL or < 4,000/µL or >10% immature [band] forms)

Metabolic acidosis (base deficit > -4 or lactate > 2)

GI: nausea, vomiting, ileus, ↑LFTs

Renal: Acute kidney injury (↑Cr)

Heme: disseminated intravascular coagulation, purpura

Hypotension Definition

- Normal systolic BP defined as:
  - 90 + (2x age in years up to 10 yrs)
- Hypotension
  - < 70 + (2x age in years to 10 yrs)
- Patient is 4 years old → minimal SBP 78

Initial Evaluation

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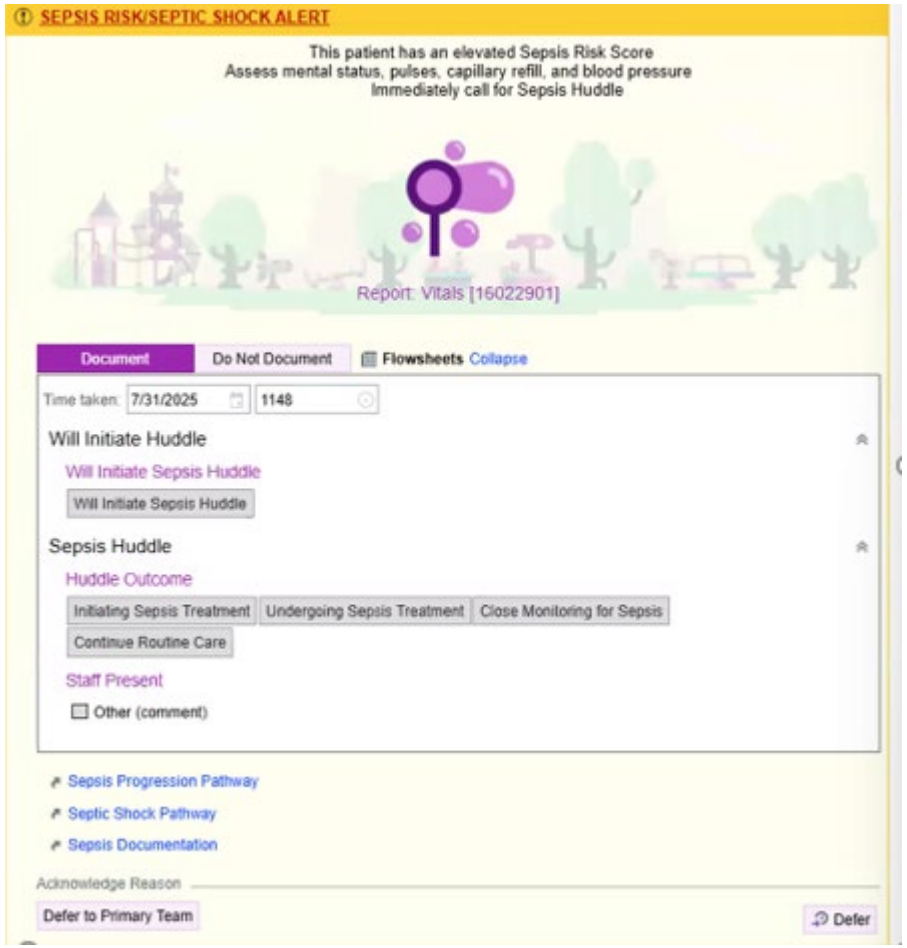
OPA + Huddle



- Epic has a “Sepsis Risk/Septic Shock” OPA
- Helps drive Sepsis Huddle

SEPSIS PATHWAY: RECOGNITION & DOCUMENTATION

MD evaluates patient within **15 minutes**, confirms diagnosis of septic shock and need to proceed with Septic Shock Clinical Pathway

If MD not readily available, contact Medical Emergency Team (except in ED or PICU)

Initial Evaluation

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Ongoing Evaluation

MD evaluates patient within 15 minutes, confirms diagnosis of septic shock and need to proceed with pathway. If MD not readily available, contact Medical Emergency Team (except in ED or PICU)

Continue resuscitation until therapeutic endpoints achieved:

- capillary refill ≤2 secs
- normal pulses with no differential between the quality of peripheral and central pulses
- warm extremities
- urine output ≥1 mL/kg/h
- normal mental status
- normal blood pressure for age
- normal glucose concentration
- normal ionized calcium concentration
- normal lactate

SEPSIS PATHWAY: RESUSCITATION

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Place on Oxygen for O2 Sats ≤97%

IV Access

- Ideally 2 points of access
- Move to IO if unable to obtain IV within 5min

Fluid Resuscitation

- 20mL/kg
- Up to 60mL/kg *unless patient has a known cardiac history*

Labs

- iStat Blood Gas and Lactate*
- iStat Chem 8*
- Blood culture*
- CBC with differential
- Cortisol
- DIC panel

Priorities if limited blood sample available

Administer 1st dose of antibiotics

See next 2 slides

FLUID RESUSCITATION

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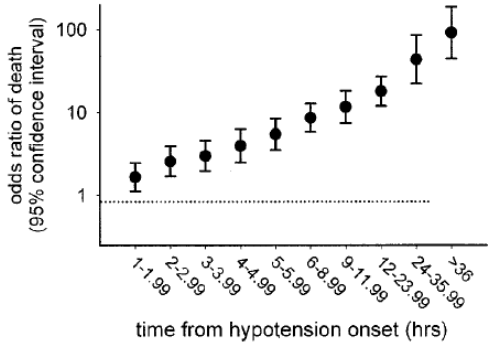
Clinical Pathway: Pediatric Septic Shock: **Initial Management**

Pathway	Initial Evaluation	Ongoing Evaluation
Treatments Airway, Breathing	Assess need for intubation, mechanical ventilation 1. Etomidate should be used with caution due to reports of adrenal suppression and increased risk of mortality 2. Consider atropine and ketamine for RSI 3. Strongly consider volume loading and vasoactive initiation prior to RSI	Assess need for intubation, mechanical ventilation 1. Etomidate should be used with caution due to reports of adrenal suppression and increased risk of mortality 2. Consider atropine and ketamine for RSI 3. Strongly consider volume loading and vasoactive initiation prior to RSI
Fluids	0.9% normal saline (NS) or lactated ringers (LR) 20 ml/kg over 5 minutes by "pull- push" method or rapid infuser	0.9% normal saline (NS) or lactated ringers (LR) 20 ml/kg every 5 minutes or less until ≥ 60 ml/kg, signs of volume overload (pulmonary crackle, hepatomegaly) or perfusion normal

2026 update:
Lactated ringers (LR)

- Fluid type: 0.9% normal saline (NS) or lactated ringers (LR) 20 ml/kg
- Fluids should be given over 5 minutes by "pull-push" method or rapid infuser
- Repeat every 5 minutes or less until ≥60 ml/kg (unless patient has cardiac history)

ANTIBIOTICS – give within ONE HOUR



Kumar et al, Crit Care Med 2006

Antibiotics	**Select both Gram positive and Gram negative Coverage**
	Start gram negative coverage first unless neonate ≤28 days
	
	Gram Positive – You Must Pick One
	• Standard
	  ○ Vancomycin IV: ≤44 weeks PMA‡/about ≤1 month old: 15 mg/kg x1; >44 weeks PMA‡/about >1 month old: 20 mg/kg x1 (max dose 2 g/dose); subsequent dosing per hospital pharmacy vancomycin protocol to avoid AKI
	  ‡PMA (Post-Menstrual Age) = gestational age + postnatal age
	• Vancomycin allergy*/Renal insufficiency
	  ○ Linezolid IV: <12 years: 30 mg/kg/day div q8hr (max 600 mg/dose); ≥12 years: 600 mg q12hr; if ≥12 yrs old but <45 kg: 20 mg/kg/day q12hr (max 600 mg/dose)
	• Neonate ≤28 days:
	  ○ Ampicillin 300 mg/kg/day (q8hr for ≤7 day olds; q6hr for >7 day olds)
	  ○ Consult ID if concern for MRSA or MSSA (e.g., SSTI, hx of CVL)
		Adjunctive Antibiotics
		• Intra-abdominal infection/anaerobic coverage:
		  ○ Metronidazole 30 mg/kg/day div q8hr (max 500 mg/dose)
		  ○ Note: if patient is already receiving meropenem or piperacillin/tazobactam, no additional anaerobic coverage is needed with metronidazole.
		• Double Coverage of Gram Negatives is no longer routine practice.
		
		Notes:
		• For Vancomycin Flushing Syndrome (VFS), which can present with flushing, pruritis, chest pain, hypotension: give Vancomycin but slow infusion rate to 2 hours and consider diphenhydramine
		• *Vancomycin allergy is rare; hallmarks are angioedema, wheezing, respiratory distress.

	Gram Negative – You Must Pick One
	If there is a history of resistant organisms in the past 6 months, suspicion of salmonella or other less common pathogens, 3rd or higher generation cephalosporin allergy: consult ID for appropriate antibiotics.
	• Standard
	  ○ Ceftriaxone IV 100 mg/kg/day div q12hr (max 2000 mg/dose)
	• (continued on next page)
	• Neonate ≤28 days:
	  ○ ≤21 day old: Gentamicin 4 mg/kg q24hr (for ≥35 weeks gestation only)
	  ○ 22-28 days: Ceftriaxone 100 mg/kg/day div q12hr (max 2000 mg/dose)
	• Fever and Neutropenia / Immunocompromised / Chronically Hospitalized:
	  ○ Ceftazidime IV 150 mg/kg/day div q8hr (max 2000 mg/dose)
	• If concern for toxic shock: Add clindamycin IV 40 mg/kg/day div q8hr (max 900 mg/dose)	

ANTIBIOTICS – Nursing Sepsis Card

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SEPTIC SHOCK MEDICATION GUIDE

ANTIBIOTICS – GIVE ASAP WITHIN ONE HOUR; give gram negative first (except for neonate)
IN OMNI (ER Main, PICU B, MS6C, MS7C, MS8C)

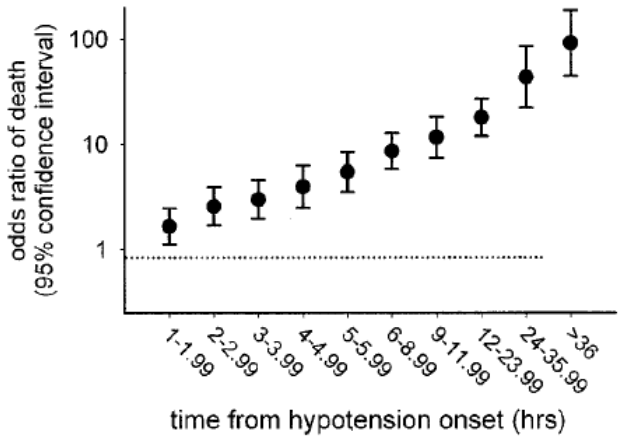
Bedside RN to mix initial doses. Give "push" meds first

DRUG	INDICATION	DOSE	RECONSTITUTE	DILUTE in NS or D_5W	RATE
CEFTRIAXONE 1 gram vial	**GRAM NEGATIVE**	100 mg/kg/day divided q12hr (max 2000 mg/dose)	9.6ml SW= 100 mg/mL solution	<= 8 Kg add dose to 10 mL in a syringe 8-15 Kg - add dose to 20 mL in a syringe >=15 Kg - add dose to 50 mL bag	Over 10 min
CEFTAZIDIME 1 gram vial	**GRAM NEGATIVE** FEVER + NEUTROPENIA / IMMUNOCOMPROMISE/CHRONIC HOSPITALIZATION	150 mg/kg/day divided q8hr (max 2000 mg/dose)	10ml SW= 100 mg/mL solution	N/A	Pushover 3-5 min
GENTAMICIN 2 mg/mL	**GRAM NEGATIVE** *Only for neonate ≤21 days old ≥35 weeks gestation*	4 mg/kg q24hr	Pharmacy to prepare STAT		Over 30 min
VANCOMYCIN 500 mg vial	**GRAM POSITIVE**	≤44 weeks PMA‡/about ≤1 month old: 15 mg/kg x1; >44 weeks PMA‡/about >1 month old: 20 mg/kg x1 (max dose 2 g/dose); subsequent dosing per hospital pharmacy vancomycin protocol to avoid AKI	10 mL SW= 50 mg/mL solution	0-7 Kg see below*** 8-29 Kg - add dose to 100 mL bag >30Kg - add dose to 250 mL bag	Over 90 min
LINEZOLID 2 mg/mL	**GRAM POSITIVE** VANCO ALLERGIC/ RENAL INSUFFICIENT	<12 years: 30 mg/kg/day divided q8hr (max 600 mg/dose); ≥12 yrs: 600 mg q12hr; if ≥12 yrs old but <45 kg: 20 mg/kg/day divided q12hr (max 600 mg/dose)	Pharmacy to prepare STAT		Over 30 min
AMPICILLIN 500 mg vial	**GRAM POSITIVE** NEONATE ≤28 DAYS	300 mg/kg/day divided q8hr ≤7 day olds, divided q6hr for >7 day olds	1.8 mL SW = 250 mg/mL	0-7 kg see below***	Over 15 min
CLINDAMYCIN 12 mg/mL	**TOXIC SHOCK**	40 mg/kg/day divided q8hr (max 900 mg/dose)	Pharmacy to prepare STAT		Over 30 min
METRONIDAZOLE 12 mg/mL	**INTRA·ABDOMINAL / ANAEROBIC**	30 mg/kg/day divided q8hr (max 500 mg/dose)	Pharmacy to prepare STAT		Over 30 min

***For patients weighing 1-3 Kg, add medication to 10 mL in a syringe
***For patients weighing 4-7 Kg, add medication to 20 mL in a syringe

Select both gram positive AND gram negative coverage

- Administer gram negative coverage first unless neonate ≤28 days
- Add metronidazole for intra-abdominal infection/anaerobic coverage when clinically necessary



Kumar et al, Crit Care Med 2006

ANTIBIOTICS – Where Can I Find Them?

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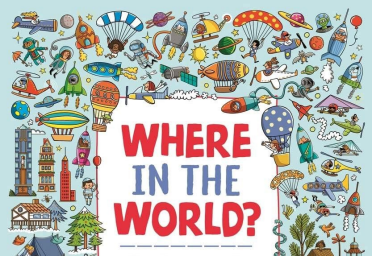
Pull from unit Omnicell and Mix:

- Ceftriaxone
- Ceftazidime
- Vancomycin
- Ampicillin

Pharmacy will send STAT:

- Gentamicin
- Linezolid
- Clindamycin
- Metronidazole *(Pharmacy will send to ED, all other antibiotics will be mixed by ED RN's)*



ED – Main Omni
MS6/7/8 – Pod C Omni
PICU – Pod B Omni

ELECTROLYTE & LAB CORRECTION

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Hypoglycemia <60

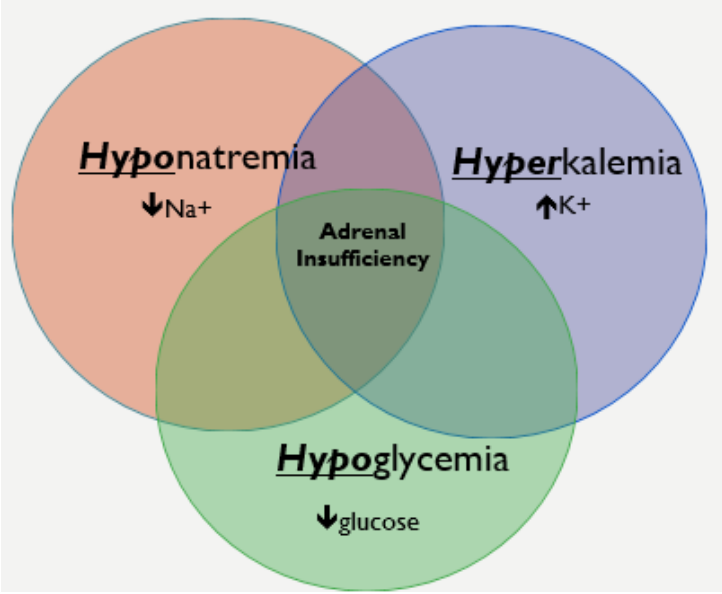
Give: D10W 5mL/kg or D25W 2mL/kg

Hypocalcemia <1.1mg/dl

Give: Calcium gluconate 50-100 mg/kg IV (max 2000 mg)

2026 update: Calcium gluconate preferred over CaCl

Adrenal Insufficiency



Consider: Hydrocortisone (2 mg/kg, standard adult dose 100 mg)

Fluid Refractory Shock

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If signs of hypoperfusion after fluid resuscitation:

- Reassess ventilation status, mentation, work of breathing
- Start vasoactive agent*

Which agent should you use?**

- **Epinephrine**: if hypotensive and vasoconstricted (cold shock)
- **Norepinephrine**: if hypotensive and vasodilated (warm shock)

*For rapidly deteriorating patients, consider starting fluids AND vasopressors concurrently
** Always reassess patient and alter therapy if not effective

Resources

- QR Code will be on Code Carts
- Sepsis Card in Code Cart Notebook (1st section)
- Children's Hospital Association – *Challenge Sepsis, Save Lives*
- Nursing Septic Shock Card also available on Sepsis Clinical Pathway internet site

Clinical Pathway INTERnet Site

https://www.connecticutchildrens.org/medical-professionals/clinical-pathways/septic-shock

Quality Metrics

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- Sepsis recognition compliance
  - Screening with BPA
  - Huddles and METs
  - Sepsis order set usage
- Clinically derived time zero to antibiotic administration
- Clinically derived time zero to antibiotic order
- Time from antibiotic order to administration
- Clinically derived time zero to bolus administration
- Mortality

Pathway Contacts

Connecticut Children's

- Elliot Melendez, MD
  - Critical Care
- Matt Laurich, MD
  - Emergency Medicine

References

- Kumar A, Roberts D, Wood KE, Light B, Parrillo JE, Sharma S, Suppes R, Feinstein D, Zanotti S, Taiberg L, Gurka D, Kumar A, Cheang M. Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. Crit Care Med. 2006 Jun;34(6):1589-96. doi: 10.1097/01.CCM.0000217961.75225.E9. PMID: 16625125.
- Schlapbach LJ, Watson RS, Sorce LR, et al; Society of Critical Care Medicine Pediatric Sepsis Definition Task Force. International Consensus Criteria for Pediatric Sepsis and Septic Shock. JAMA. 2024 Feb 27;331(8):665-674. doi: 10.1001/jama.2024.0179. PMID: 38245889; PMCID: PMC10900966.