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NEONATOLOGY

NEONATAL SEPSIS & SEPTIC SHOCK

The first-hour rules

What to do, when to do it and the **vasoactive quick-reference table** to keep in your pocket.

Antibiotics | Fluids | Vasoactives

Calculated in seconds

Swipe →

Reference

Orlandin EAS, Oharomari LK Jr, Gonçalves-Ferri WA. The management of neonatal sepsis and septic shock. *Curr Treat Options Pediatr*. 2026;12:19. doi:10.1007/s40746-026-00379-3

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DEFINITIONS

What is sepsis now?

SEPSIS

A **dysregulated host response to infection** causing **life-threatening organ dysfunction**. The old SIRS-based criteria are out.

SEPTIC SHOCK

Sepsis with **cardiovascular dysfunction** not explained by another cardiac cause.

550,000+

neonatal deaths a year worldwide from sepsis.

2026 Surviving Sepsis Campaign Pediatric Guidelines, as summarized in Orlandin et al., 2026.

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TIMING

Early or late?
It changes everything.

EOS

< 7 days

Term infants. Many experts use **48–72 h**. Preterm and VLBW: **< 72 h**.

Usually **vertical transmission**.

LOS

7–28 days

Usually **horizontal or environmental** exposure (NICU).

Very late: beyond 28 days in preterm infants.

The window defines the **likely pathogens**, the diagnostic work-up, the **empiric antibiotic** and the outcome.

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RECOGNITION

Subtle signs.
Low threshold.

Nonspecific, overlapping with normal transition, and they **may be absent early**.

- **Temperature instability**
- **Respiratory distress**
- **Apnea**
- **Poor feeding**
- **Lethargy**
- **Hemodynamic instability**

- **Low threshold** to evaluate and start empiric antibiotics.
- Rapid progression to **multiorgan failure** is possible.
- **EOS risk calculators** combine maternal factors, clinical findings and labs.

Stewardship still matters: treat fast, then reassess.

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BIOMARKERS

No single marker decides

CRP	Most useful **serially**. Normal over 24–48 h has high NPV and **supports stopping** antibiotics.
PCT	Rises earlier than CRP, but **hard to read in the first 48 h** of life.
IL-6	Early marker, **short half-life**: timing is critical.
Presepsin	Fast kinetics and good performance. Limited availability.
nCD64	Useful as an **adjunct**, combined with other markers.

Best approach: serial, multimarker, always read with the clinical picture.

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RULE #1

ANTIBIOTICS IN SEPTIC SHOCK

≤1h

from the **decision to treat**. Always.

≤3h

Probable sepsis without shock: brief focused evaluation, start as soon as possible, ideally within 3 h.

Cultures first?

Yes, when feasible. **Never** delay antibiotics in an unstable neonate to get them.

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RULE #2

Right drug, right window

EOS

Ampicillin (or benzylpenicillin) + gentamicin

Cefotaxime only for suspected **Gram-negative meningitis** or when aminoglycosides are contraindicated: routine use raises **Candida** and resistance.

LOS

Vancomycin + 3rd-gen cephalosporin or aminoglycoside

Cover Gram-positives (MRSA where prevalent) and Gram-negatives.

ESBL producers: carbapenem, such as meropenem.

Adapt to your unit's local microbiology.

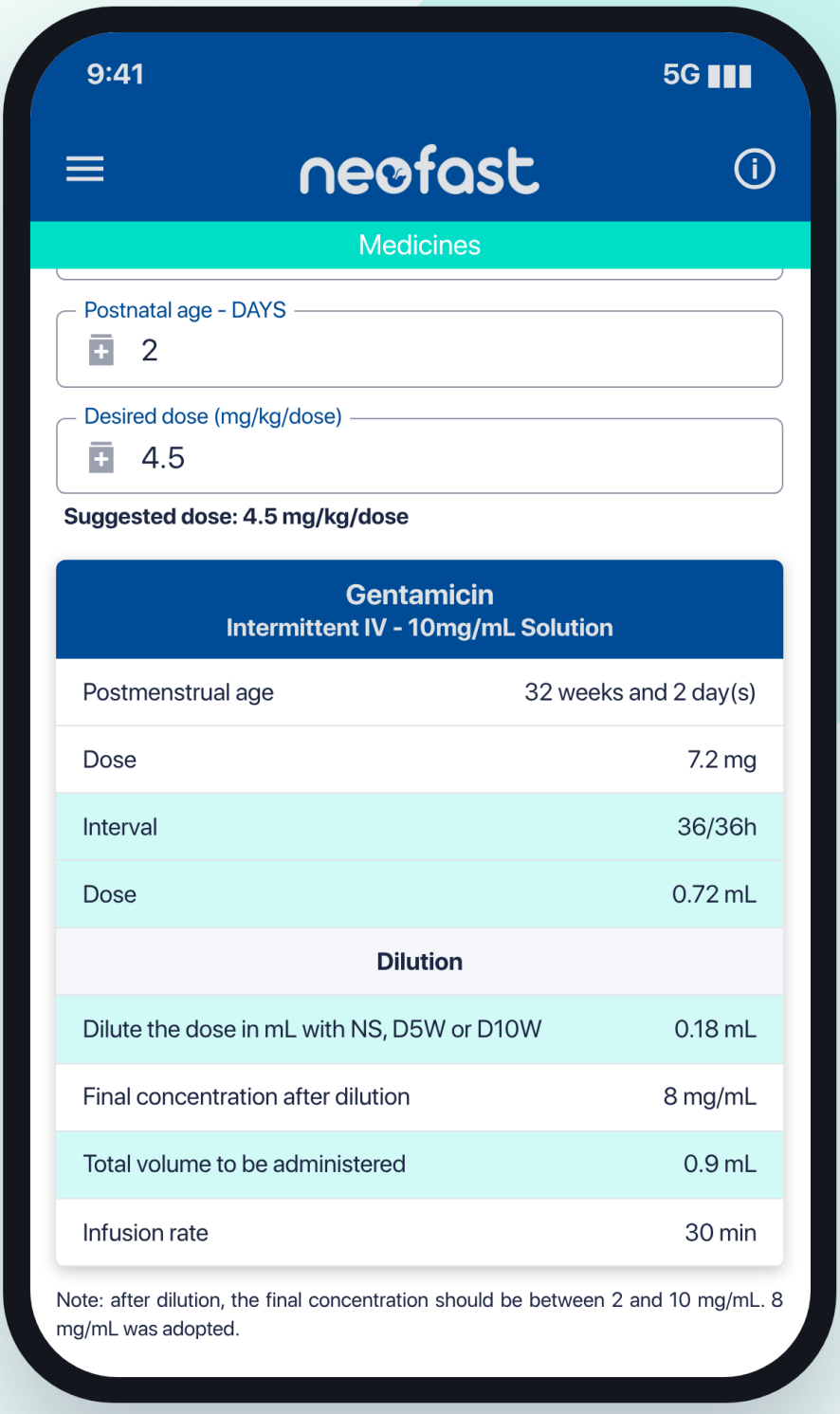
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NEOFAST

Gentamicin in seconds

1.6 kg · born at 32 weeks · day 2

1. **Postmenstrual age** worked out for you.
2. **Interval** set by age: 36/36h.
3. **mL of drug, diluent and total volume**, ready to draw up.



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RULE #3

Start broad.
Then step down.

36–48h

Suspected EOS: reassess. Stop if **cultures are negative** and the baby is **well or improving**.

- **Narrow** as soon as susceptibilities are available.
- No pathogen? Narrow or stop by clinical picture, site, host factors and response.
- Stewardship cut antibiotic use **without more** recurrence, NEC or mortality.
- Rapid PCR and mass spectrometry help, but are **not definitive**.

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RULE #4

FLUIDS: SMALL AND REASSESSED

10–20 mL/kg

over the **first hour**, titrated to **heart rate, capillary refill and urine output**.

STOP

at the first signs of **fluid overload**. Preterms reach it faster.

Isotonic

crystalloid is the default first fluid.

POCUS helps: in a 2024 RCT, lung-ultrasound-guided resuscitation used less fluid, with shorter stays and less AKI and early IVH.

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SHOCK PHENOTYPES

Neonatal shock is not adult shock

Warm shock

is **more common** in neonates than in older children.

Also frequent

Myocardial dysfunction, **pulmonary hypertension**, adrenal insufficiency.

Preterm clue: high LV output with preserved ejection fraction suggests **vasoregulatory failure**.

TNE / POCUS shows the physiology

NIRS: read trends, not single values

Interpret imaging with clinical findings and biomarkers. Treat PH differently from typical septic shock.

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RULE #5

Fluids not enough? Start a vasoactive.

FIRST LINE

Epinephrine or norepinephrine

Guidelines do not pick between them by warm or cold phenotype.

- **Do not wait** for a central line: a carefully monitored peripheral infusion is recommended in pediatrics.
- In neonates, a **PICC** is preferred over other central lines. **Intraosseous** access carries significant risk.
- **Dopamine** is no longer first line.
- Norepinephrine **> 0.3 mcg/kg/min**: consider adding vasopressin.

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SAVE THIS

Vasoactives at a glance

DRUG	DOSE	MAIN EFFECT	USE IN SHOCK
Epinephrine	**0.05–0.3** mcg/kg/min · up to 1	↑ inotropy, ↑ HR, ↑ SVR at higher doses	First line · **cold shock** (low CO, high SVR)
Norepinephrine	**0.05–0.3** mcg/kg/min · up to 1–2	↑ SVR, ↑ BP, modest ↑ inotropy	First line · **warm shock** (high CO, low SVR)
Vasopressin	**0.0003–0.002** units/kg/min (0.018–0.12 units/kg/h)	↑ SVR, ↑ BP, no direct inotropy	**Catecholamine-refractory** shock; adjunct
Milrinone	**0.25–0.75** mcg/kg/min · load 25–50 mcg/kg over 30–60 min	↑ inotropy, ↓ SVR, ↓ PVR	Cold shock with **myocardial dysfunction**; adjunct
Dopamine	**5–20** mcg/kg/min	Variable, dose-dependent	**No longer** first line

Either **epinephrine or norepinephrine** is an acceptable first choice. Titrate to perfusion and reassess often.

Orlandin et al., 2026, Table 2. CO cardiac output · SVR/PVR systemic/pulmonary vascular resistance.
Educational content: check your unit's protocol.

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FIRST LINE

The first-line pair: what to watch

Epinephrine

Low doses: mostly β1 and β2. Higher doses: α1 vasoconstriction.

- May raise lactate (β2)
- Arrhythmia
- Monitor glucose

Norepinephrine

Potent α1 with β1, minimal β2: raises BP with less effect on heart rate.

- Excess vasoconstriction
- > 0.3 mcg/kg/min: think vasopressin

A 2024 neonatal cohort linked doses **above 0.3 mcg/kg/min** to higher mortality.

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SECOND LINE

Adjuncts and the preterm twist

Vasopressin

Restores tone in vasodilatory shock. Watch **hyponatremia** and **ischemia**.

Milrinone

May **worsen hypotension** in warm shock. Needs adequate preload. Long half-life.

Dopamine

More arrhythmia, less predictable. Versus norepinephrine: more tachycardia, lower cerebral oxygenation, lower pH at 24 h.

Preterm: immature adrenergic receptors make dose-response unpredictable. **Reassess often** instead of matching drugs to phenotypes.

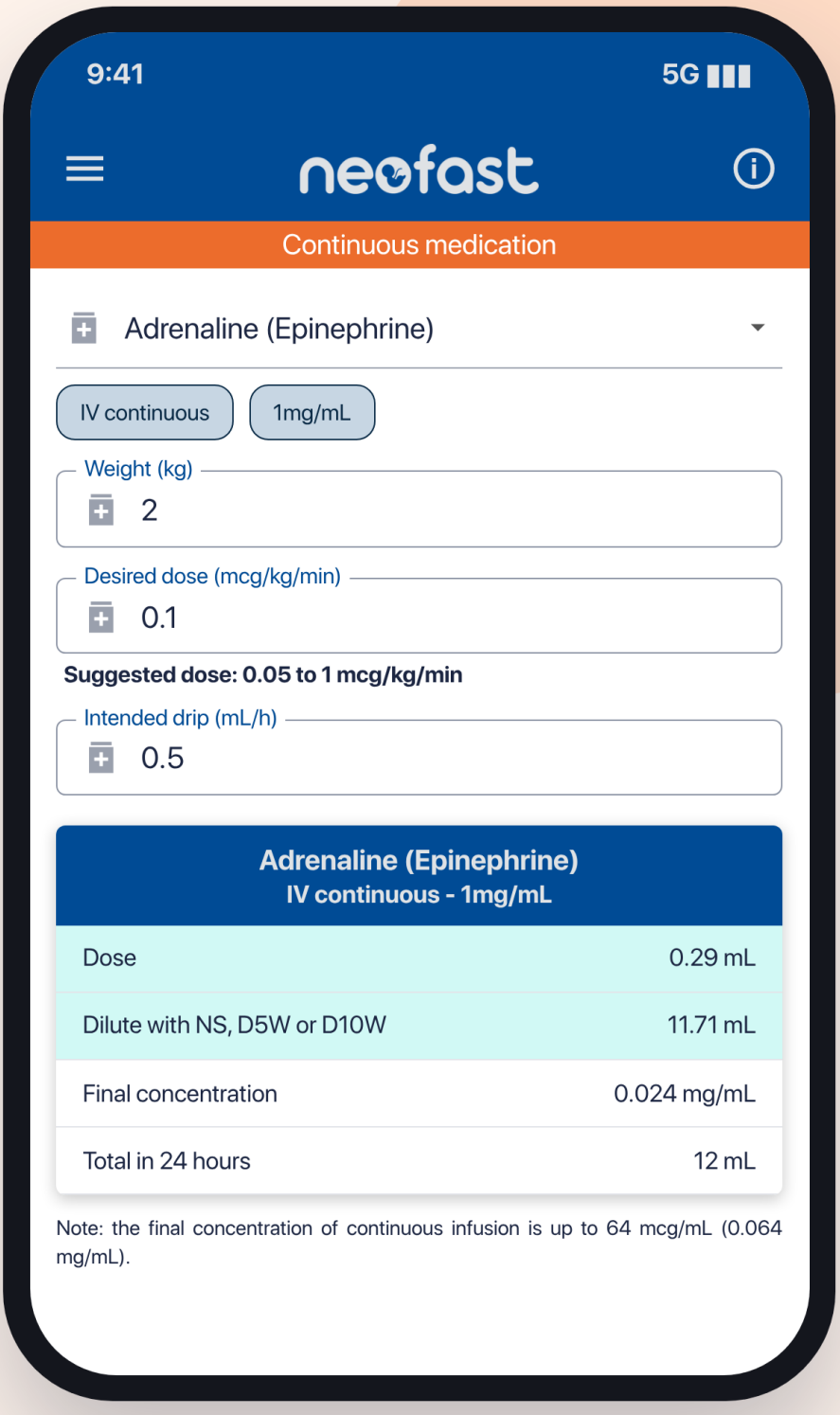
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NEOFAST

Epinephrine drip, ready

2 kg · 0.1 mcg/kg/min · pump at 0.5 mL/h

1. Type **weight, dose and drip**.
2. Get **mL of drug and diluent** for 24 h.
3. **Final concentration** shown, with the maximum noted.



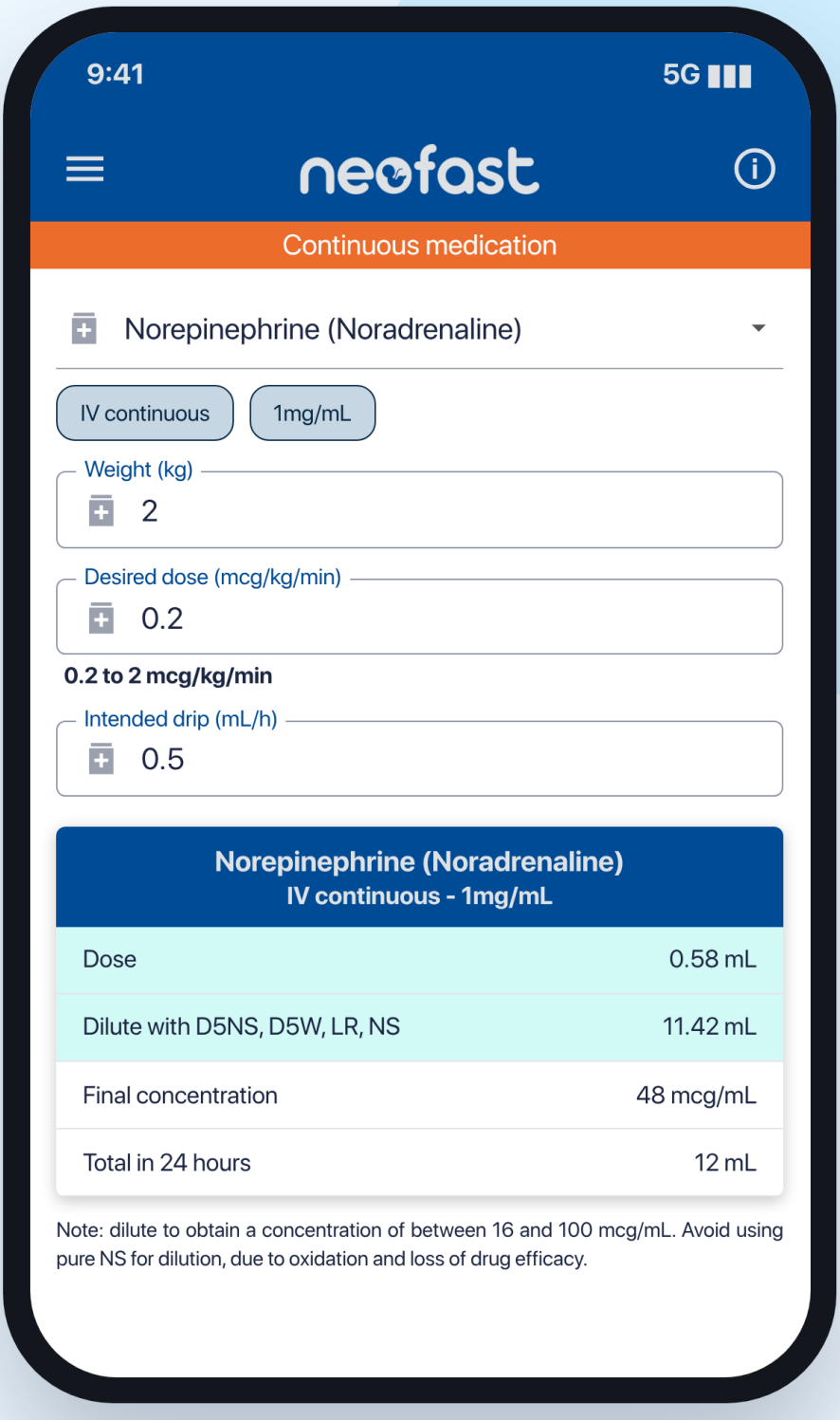
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NEOFAST

Norepinephrine, no mental math

2 kg · 0.2 mcg/kg/min · pump at 0.5 mL/h

1. Calculated as **norepinephrine base** (1 mg/mL), not hemitartrate.
2. Diluent options and the **oxidation warning** on screen.
3. Change the dose, results update **instantly**.



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BEYOND THE BASICS

Supportive care that counts

Feed when perfused

Start enteral nutrition once perfusion is restored, never into a hypoperfused gut. In infants of 23–28 weeks, each week of delay to full feeds meant **16% higher LOS risk**.

NOT ROUTINE

- Hydrocortisone
- IVIG
- Vitamins C, B1, D*
- Granulocytes / G-CSF
- Pentoxifylline (investigational)

*Unless deficiency is documented. ECMO and blood purification: selected cases only.

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CHECKLIST

The pathway in one look

Recognize	Low threshold, nonspecific signs
Cultures	If feasible, without delaying treatment
Antibiotics ≤ 1 h	EOS and LOS cover different bugs
10–20 mL/kg	Titrate, reassess, stop if overload
Epi or norepi	If perfusion is not restored
TNE / POCUS	Find the phenotype, monitor response
De-escalate	Reassess EOS at 36–48 h

Prevention still wins: GBS prophylaxis, hand hygiene, central line bundles, early enteral feeding, breast milk and skin-to-skin, stewardship.

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Made for neonatology. Built with you.

NeoFast is a calculator app **built exclusively for neonatal care**. Every dose in this post, calculated in seconds.

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neofastapp.com
iOS and Android

Educational content. Doses from Orlandin et al., 2026; always check your unit's protocol.