

IV Fluid Therapy in the ICU

Section Editor: seat open

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Overview

IV fluid is one of the most common ICU interventions and, given uncritically, one of the most harmful — cumulative positive fluid balance is independently associated with worse outcomes. Fluid therapy is best thought of as four overlapping phases (Resuscitation, Optimization, Stabilization, Evacuation — "ROSE"), each with a different goal and a different default answer to "should I give more fluid?" A large multicenter cohort (SUFFIR) found that non-resuscitation fluids — drug diluents, maintenance fluid, carrier volumes — usually exceed resuscitation fluid in total volume and are the more overlooked driver of fluid accumulation.

Steps

01 Identify the Current Phase of Fluid Therapy

Table 1. The four phases of fluid therapy

PHASE	GOAL	DEFAULT FLUID POSTURE
Resuscitation	Restore perfusion rapidly	Give fluid
Optimization	Weigh added benefit vs. harm of more fluid	Give only if a signal of benefit
Stabilization	Maintain organ perfusion	Fluid only with a fluid-responsiveness signal
Evacuation (de-escalation)	Remove accumulated fluid once stable	Actively consider removal

State the phase explicitly on rounds — it determines whether the default answer to "another bolus?" is yes or no.

02 Resuscitation Phase — Type and Volume

- **Balanced crystalloid is first-line**, preferred over both 0.9% saline and albumin for volume expansion in critically ill adults generally, in sepsis, and in acute respiratory failure (conditional recommendations, moderate-certainty evidence).
- Large-volume 0.9% saline (sodium and chloride both 154 mmol/L, both higher than plasma) risks hyperchloremic metabolic acidosis.
- For sepsis-induced hypoperfusion/septic shock: **up to 30 mL/kg IV crystalloid** in the initial phase, with continuous clinical reassessment — this remains a conditional recommendation, not a fixed target to hit and stop reassessing.
- Calculate on actual body weight; consider adjusted/ideal body weight for BMI > 30 kg/m².

03 Optimization Phase — Reassess Before Every Additional Bolus

- Use dynamic measures of fluid responsiveness (passive leg raise, pulse pressure/stroke volume variation) where feasible, rather than static measures (CVP) or reflex re-dosing.
- Fluid responsiveness has a physiological ceiling (Frank-Starling): once the patient is on the flat part of the curve, further boluses add volume without added stroke volume — recognize this and stop.
- An individualized strategy is recommended for this phase specifically because the evidence is low-certainty — protocolize the *process of reassessment*, not a fixed volume target.

04 Track the "Hidden" Fluid Volume, Not Just Boluses

- Non-resuscitation fluid — drug diluents, carrier volumes, maintenance fluid — has consistently been shown to exceed resuscitation fluid as a share of total intake, and is the more overlooked contributor to positive balance.
- Chart and display **cumulative total intake**, not just documented boluses, so this is visible on rounds.

05 Stabilization Phase

- Give fluid only when there's a positive fluid-responsiveness signal; otherwise hold.
- Actively minimize maintenance and carrier fluid volume during this phase (concentrated drug formulations where feasible — see EMR/Pharmacy notes below).

06 Evacuation (De-escalation) Phase

- Once the acute phase of resuscitation has passed and the patient is hemodynamically stable, **actively consider fluid removal** (diuresis, or ultrafiltration/RRT if renal function or diuretic response doesn't allow diuresis) rather than waiting for spontaneous negative balance.
- This is a conditional recommendation (low-certainty evidence) but reflects a real shift from a passive to an active de-escalation posture once the shock phase has resolved.

07 Adjust the Approach by Shock Type

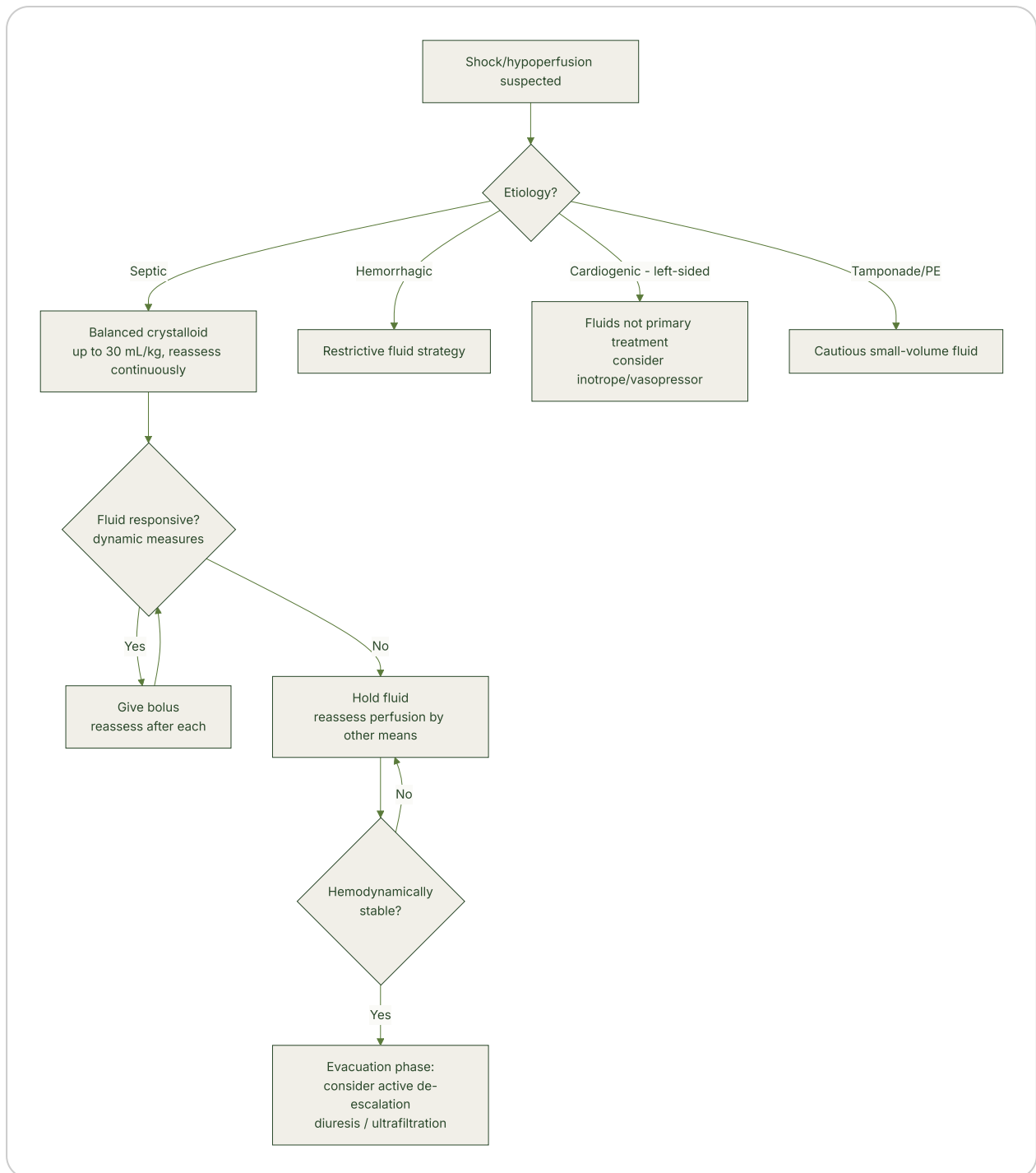
Table 2. Fluid posture by shock etiology

ETIOLOGY	POSTURE
Septic shock	Resuscitation as above; reassess continuously; avoid running 30 mL/kg on autopilot
Hemorrhagic shock (trauma, blunt or penetrating)	Restrictive strategy — this is a deliberately different posture from sepsis, not an oversight
Cardiogenic shock, left-sided	Fluid resuscitation is not recommended as primary treatment
Cardiac tamponade / pulmonary embolism	Cautious, small-volume fluid administration
ARDS-associated circulatory failure	No formal recommendation (insufficient evidence) — use clinical judgment and the general ROSE framework

08 Make Cumulative Balance a Structured Rounding Field

- Display cumulative fluid balance (24h and since-admission) as a standing rounding field, not something calculated only when a problem is suspected — this is what turns Steps 4–6 into a habit rather than an occasional audit.

Algorithm



EMR Order Set

PHYSICIAN ORDERS

- Fluid order tagged with phase-of-care (Resuscitation / Optimization / Stabilization / Evacuation) — not a free-text rate order.
- Default fluid type = balanced crystalloid; override requires a reason code (e.g., hyperkalemia contraindication, TBI).
- De-escalation order (scheduled diuretic, or ultrafiltration/RRT referral) once Evacuation phase is reached.

NURSING ORDERS

- Strict intake/output charting that separately tags resuscitation boluses vs. maintenance/carrier/diluent volume, rolled into one cumulative-balance flowsheet trend.
- Fluid-responsiveness assessment documentation required before a repeat bolus can be charted as given (mirrors the sepsis protocol's fluid reassessment gate).

PHARMACY ORDERS

- Default to concentrated drug formulations/minimum-volume diluents when clinically appropriate, to reduce non-resuscitation fluid volume.
- Flag cumulative non-resuscitation fluid volume on daily review.

Build notes — cumulative fluid balance (all sources) should be a live, visible flowsheet trend on the ICU dashboard, not a value clinicians have to calculate by hand.

Adoption Notes

- The main behavior change isn't the resuscitation-phase dosing (already familiar via sepsis protocols) — it's making **phase-of-care** and **cumulative total intake** explicit, structured, and visible, so Optimization/Stabilization/Evacuation don't default to "keep giving fluid" out of habit.
- Champion: ICU pharmacist + intensivist reviewing daily fluid balance on rounds; pharmacy's role in minimizing diluent volume (Step 4) is a genuinely new workflow piece, not just documentation.
- This protocol interlocks with [Sepsis and Septic Shock](sepsis-septic-shock.md) (Resuscitation-phase dosing) and [IV Pressors](iv-pressors-peripheral.md) (Optimization-phase escalation) — roll out together rather than in isolation.

Success Metrics & Monitoring

Cumulative fluid balance at 72 hours and 7 days, proportion of total intake that is non-resuscitation fluid, AKI/RRT rate, ventilator-free days, and ICU length of stay. Track via nursing flowsheet trend and critical care database; review monthly during rollout.

Suggested Reading

- 1 Arabi YM, Belley-Cote E, Carsetti A, et al. European Society of Intensive Care Medicine clinical practice guideline on fluid therapy in adult critically ill patients. Part 1: the choice of resuscitation fluids. **Intensive Care Med**. 2024;50(6):813–831. doi:10.1007/s00134-024-07369-9. Primary current guideline for Step 2 — balanced crystalloid over saline and over albumin, across general ICU, sepsis, and respiratory failure populations.

- 2 Mekontso Dessap A, AlShamsi F, Belletti A, et al. European Society of Intensive Care Medicine (ESICM) 2025 clinical practice guideline on fluid therapy in adult critically ill patients: part 2 — the volume of resuscitation fluids. **Intensive Care Med**. 2025;51(3):461–477. doi:10.1007/s00134-025-07840-1. Source for the shock-etiology-specific posture in Step 7 (sepsis vs. hemorrhagic vs. cardiogenic) and the individualized-strategy recommendation for the optimization phase.
- 3 Ostermann M, Alshamsi F, Artigas Raventós A, et al. European Society of Intensive Care Medicine Clinical Practice Guideline on fluid therapy in adult critically ill patients: Part 3 — fluid removal at de-escalation phase. **Intensive Care Med**. 2025;51(10):1749–1763. doi:10.1007/s00134-025-08058-x. Source for Step 6 — suggests active de-escalation over passive/no de-escalation once stable.
- 4 Zampieri FG, Bagshaw SM, Semler MW. Fluid Therapy for Critically Ill Adults With Sepsis: A Review. **JAMA**. 2023;329(22):1967–1980. doi:10.1001/jama.2023.7560. Source of the four-phase (ROSE) framework this protocol is organized around.
- 5 Schortgen F, et al (SUFFIR Study Group). Fluid Intake in Critically Ill Patients: The "Save Useless Fluids For Intensive Resuscitation" Multicenter Prospective Cohort Study. **Crit Care Med**. 2023. doi:10.1097/CCM.0000000000006091. Source for Step 4 — non-resuscitation fluid is the larger, more overlooked share of total intake.
- 6 Kaufman DA, Lopes M, Maviya N, Magder SA. The Ins and Outs of IV Fluids in Hemodynamic Resuscitation. **Crit Care Med**. 2023;51(10):1397–1403. doi:10.1097/CCM.0000000000006001. Physiology background (osmolality, tonicity, glycocalyx) underlying why fluid type and volume both matter.

Revision History

VERSION	DATE	EDITOR	SUMMARY
0.1	2026-07-19	FunctionalHealth editorial team	Initial version grounded in the local IV-fluid source folder plus the current 3-part ESICM fluid therapy guideline series

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