AETCM
Academy for Emergency, Trauma & Critical care Medicine

AETCM LEARNING SERIES

HUNDRED GOLDEN STEPS

of

SEPSIS MANAGEMENT

in Emergency and Critical Care



Aligned with Surviving Sepsis Campaign 2026 · Sepsis-3 · Landmark trials

By

Dr. Gireesh Kumar K P

ACADEMY FOR EMERGENCY, TRAUMA & CRITICAL CARE MEDICINE · KOCHI

Foreword

Every emergency physician carries the memory of a patient who came in "just a little unwell" — a fever, a fast breath, a quiet confusion — and was in the intensive care unit a few hours later. Sepsis rarely announces itself. It hides behind ordinary complaints, and it punishes delay more than any other condition we treat.



Dr. Gireesh Kumar K P

Sepsis is still one of the leading causes of death worldwide, and India carries a large share of that burden. Our patients arrive late, often from far away, with tropical infections, diabetes, kidney disease and drug-resistant organisms. Yet the care that saves them is not exotic: recognise early, take cultures, give the right antibiotic in the first hour, restore perfusion with the right fluid in the right amount, start norepinephrine without hesitation, find and control the source — and then do the quiet, daily work of the ICU well.

This book breaks that care into **100 golden steps**, from the triage desk to the follow-up clinic. Each step has two pages. The first tells you what to do, why it matters, what to watch out for and what the new **Surviving Sepsis Campaign 2026** guideline says. The second gives you the tables, graphs and algorithms to do it at the bedside — doses, scores, formulas and flowcharts. Every page links to the guideline, Medscape, Radiopaedia and the landmark trial behind the recommendation.

Doses and thresholds are typical adult values for orientation. They must always be checked against the patient's weight, renal and hepatic function, the local antibiogram and the institution's protocol. This book is a companion at the bedside, not a substitute for senior clinical judgement.

I thank my colleagues in Emergency Medicine and Critical Care at Amrita Institute of Medical Sciences, Kochi, and the faculty and students of the Academy for Emergency, Trauma & Critical Care Medicine, whose questions shaped every page. If one patient receives the right antibiotic an hour earlier because of this book, it will have done its job.

Dr. Gireesh Kumar K.P.
Principal — Amrita School of Medicine
Director — Academy for Emergency, Trauma & Critical Care Medicine (AETCM)
Amrita Institute of Medical Sciences, Kochi, Kerala
amrita.edu/faculty/gireeshkumarkp

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

How to use this book

Sepsis care is a chain: every link — recognition, cultures, antibiotics, fluids, vasopressors, source control, organ support and recovery — must hold. The 100 golden steps follow that chain in the order a patient meets it, from the triage desk to the follow-up clinic. Every step has exactly two pages.

PAGE 1 — THE STEP

- **The golden step** — one sentence to remember
- **Why it matters** — the physiology and the stakes
- **How to do it at the bedside** — practical actions
- **Watch out** — the common traps
- **SSC 2026 says** — the guideline statement with its strength and certainty
- **Evidence** — tap to open the guideline, landmark trial, Medscape and Radiopaedia

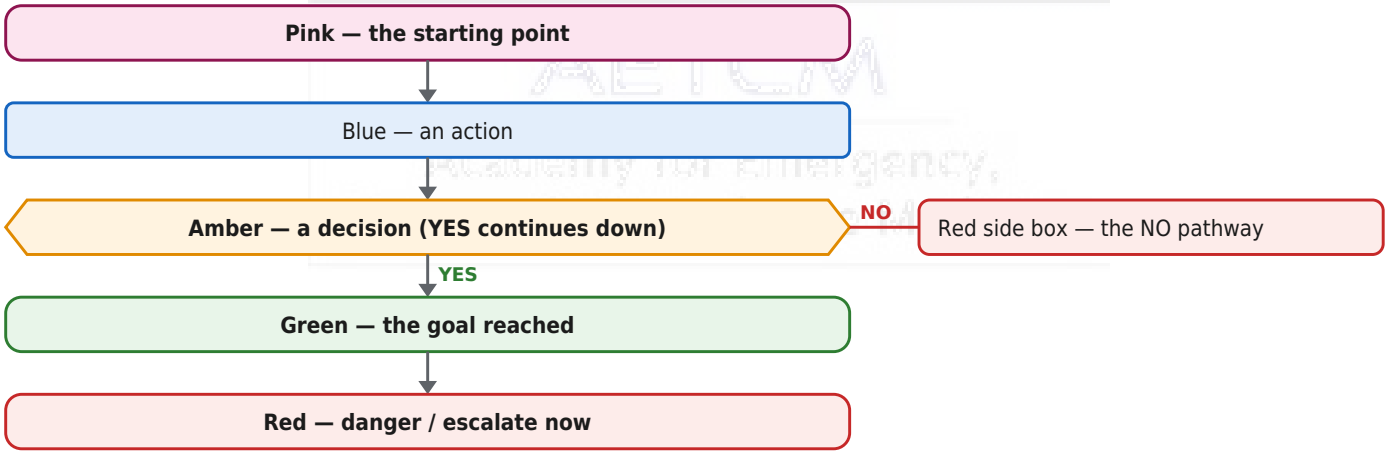
PAGE 2 — TABLES, GRAPHS & ALGORITHM

- **Tables** — scores, doses, formulas, thresholds
- **Graphs** — what the trials and the numbers show
- **Algorithms** — decision flowcharts for the bedside
- **Golden pearl** — the single message to carry away

Reading the guideline boxes

Wording	Meaning	What you should do
Strong — "we recommend"	Benefits clearly outweigh harms	Do it for almost every patient
Conditional — "we suggest"	Benefits probably outweigh harms; values and context matter	Do it for most patients; individualise
Good practice statement	Ungraded, but obviously right	Always do it
Insufficient evidence	No recommendation possible	Use clinical judgement and local protocol
Certainty: high · moderate · low · very low	Confidence in the evidence	Very low often means simply "not yet studied"

Flowchart colours



Navigation

Every entry in the front Contents and the back Index is a hyperlink. On each step, "Tables, graphs & algorithm ›" takes you to its second page and "‹ Back to Step" returns you; "Contents" in every footer brings you back to the list.

IMPORTANT

Doses are typical adult doses for orientation in an emergency. Always check the current formulary, the patient's weight, renal and hepatic function, allergies, pregnancy status, local antibiogram and institutional protocol before prescribing.


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Surviving Sepsis Campaign 2026 — what is new

The 2026 adult guideline (Prescott, Antonelli et al.; *Intensive Care Medicine* and *Critical Care Medicine*, published 23 March 2026) contains 129 statements, 46 of them new, developed by an international panel and endorsed by 24 societies. The changes that affect daily emergency and ICU practice are summarised below; each is discussed at the relevant step.

Topic	2026 statement	Strength · certainty	Step
Screening	Use NEWS/NEWS2, MEWS or SIRS — not qSOFA — as the single screening tool	Strong · Moderate	1, 4
Code sepsis	Sepsis huddle / code sepsis protocol suggested	Conditional · Low	6
MAP target	Initial target 65 mmHg (range ~5); 60–65 mmHg if age ≥ 65 years	Strong · Mod / Cond · Low	36, 56
Antibiotic timing	Shock or probable sepsis: within 1 h · possible sepsis without shock: rapid assessment, within 3 h if infection still suspected	Strong / Conditional · VL	25
Prehospital antibiotics	Suggested for likely septic shock when transport > 60 min, with a screening process	Conditional · VL	25
Anaerobic cover	Only when anaerobic risk factors exist (abdominal, gynaecological, necrotising, head & neck, CNS)	Conditional · VL	26
Fluids	≥ 30 mL/kg crystalloid in 3 h; balanced crystalloids over saline (saline in TBI)	Conditional · Low / Moderate	29, 30
Albumin	Crystalloids alone over crystalloid + albumin; albumin selectively (large volumes, cirrhosis), avoid in TBI	Conditional · Moderate	32
Dynamic measures	PLR, fluid challenge, SV/SVV, PPV over static measures alone	Conditional · Low	34
Blood pressure monitoring	Invasive or non-invasive acceptable; invasive if high or escalating vasopressors	Conditional · VL	57
β-lactam infusion	Prolonged infusion after a loading dose — upgraded	Strong · Moderate	49
De-escalation	De-escalate once microbiology and susceptibilities are known — upgraded	Strong · VL	52
Empiric antifungals	Generally suggest against; case-by-case for high-risk patients	Conditional · Low	46
Vasopressors	Norepinephrine first; add vasopressin when NE escalates; then epinephrine	Strong / Conditional	36, 59, 60
Corticosteroids	IV corticosteroids suggested in septic shock (downgraded to low certainty)	Conditional · Low	63
Fluid removal	Active fluid removal (diuretics, then ultrafiltration) after resuscitation — new	Conditional · VL	66, 67
Respiratory	HFNC over conventional O_2 and over NIV for hypoxaemic failure; awake proning trial	Conditional	22, 23
Digestive decontamination	SDD suggested for ventilated patients in low-resistance units — new	Conditional · Moderate	73
Goals of care	Discuss within 72 hours	Conditional · Low	94
Recovery	Post-ICU follow-up, rehabilitation after > 48 h ventilation, mental-health support	Conditional · Low	98, 99

SSC 2026 adult guideline (SCCM) · ESICM announcement · DOI: Intensive Care Med 2026 · SSC 2021 (Evans)


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Contents

Foreword 2
How to use this book 3
Surviving Sepsis Campaign 2026 — what is new 4

1. TRIAGE, RECOGNITION & DIAGNOSTICS

1. Screen early at triage with an early-warning score 8 · 9
2. Know the Sepsis-3 definition 10 · 11
3. Quantify organ dysfunction with SOFA 12 · 13
4. Use qSOFA only as a bedside prompt 14 · 15
5. Identify septic shock 16 · 17
6. Activate a code sepsis or sepsis huddle 20 · 21
7. Check a full set of vital signs immediately 22 · 23
8. Assess mental status 24 · 25
9. Inspect skin perfusion 26 · 27
10. Measure serum lactate immediately 28 · 29
11. Two sets of blood cultures before antibiotics 32 · 33
12. Culture every suspected site 34 · 35
13. Complete blood count with differential 36 · 37
14. Comprehensive metabolic panel 38 · 39
15. Coagulation studies and DIC screening 40 · 41
16. Arterial or venous blood gas 44 · 45
17. Early portable chest radiograph 46 · 47
18. Point-of-care ultrasound (POCUS) 48 · 49
19. Evaluate non-infectious mimics 50 · 51
20. Escalate to critical care early 52 · 53

2. IMMEDIATE STABILISATION & HOUR-1 RESUSCITATION

21. Open and protect the airway 56 · 57
22. Supplemental oxygen to the right target 58 · 59
23. Prepare for early intubation 60 · 61
24. Two large-bore peripheral IV lines 62 · 63
25. Antimicrobials within the first hour 64 · 65
26. Tailor the empiric regimen 68 · 69
27. Higher loading doses for hydrophilic drugs 70 · 71
28. Never delay antibiotics for tests 72 · 73
29. Rapid crystalloid resuscitation — 30 mL/kg 74 · 75
30. Prefer balanced crystalloids 76 · 77
31. Avoid synthetic colloids 80 · 81
32. Use albumin selectively 82 · 83
33. Reassess after every fluid bolus 84 · 85
34. Use dynamic measures of fluid responsiveness 86 · 87
35. Stop fluids early when overload appears 88 · 89
36. Norepinephrine is the first-line vasopressor 92 · 93
37. Start norepinephrine peripherally if needed 94 · 95


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

38. Repeat lactate within a few hours 96 · 97
39. Track perfusion, not just pressure 98 · 99
40. Transfer to ICU promptly 100 · 101

3. SOURCE CONTROL & ANTIMICROBIAL OPTIMISATION

41. Identify sources that need intervention 104 · 105
42. Emergent source control — within 6 hours 106 · 107
43. Remove or exchange infected catheters 108 · 109
44. Relieve urinary obstruction 110 · 111
45. Review prior microbiology and antibiotic exposure 112 · 113
46. Empiric antifungals only for high-risk patients 116 · 117
47. Antivirals when viral infection is likely 118 · 119
48. Adjust doses for organ dysfunction — after the first day 120 · 121
49. Prolonged infusion of β-lactams 122 · 123
50. Therapeutic drug monitoring 124 · 125
51. Re-evaluate the diagnosis daily 128 · 129
52. De-escalate once cultures return 130 · 131
53. Stop antimicrobials when infection is excluded 132 · 133
54. Plan a delimited stop date for antibiotics 134 · 135
55. Document the critical times 136 · 137

4. HAEMODYNAMIC & REFRACTORY SHOCK MANAGEMENT

56. Target MAP 65 mmHg — and 60–65 in older adults 140 · 141
57. Arterial line for accurate pressure 142 · 143
58. Central venous catheter when needed 144 · 145
59. Add vasopressin as the second agent 146 · 147
60. Epinephrine as the third agent 148 · 149
61. Avoid dopamine 152 · 153
62. Inotrope for myocardial dysfunction 154 · 155
63. Hydrocortisone for septic shock 156 · 157
64. Monitor bedside perfusion markers 158 · 159
65. Follow the lactate trend 160 · 161
66. Transition to de-resuscitation 164 · 165
67. Diuretics carefully during de-resuscitation 166 · 167
68. Serial echocardiography 168 · 169
69. Correct severe electrolyte derangements 170 · 171
70. Wean vasopressors daily 172 · 173

5. ORGAN SUPPORT & ICU BUNDLE CARE

71. Lung-protective ventilation 176 · 177
72. Titrate PEEP and FiO_2 178 · 179


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

73. Prevent ventilator-associated pneumonia 180 · 181
74. Daily awakening and breathing trials 182 · 183
75. Prone positioning for severe ARDS 184 · 185
76. Hourly urine output and AKI staging 188 · 189
77. Avoid nephrotoxins 190 · 191
78. Renal replacement therapy — for clear indications 192 · 193
79. Glucose control — insulin at ≥ 180 mg/dL 194 · 195
80. Frequent point-of-care glucose 196 · 197
81. Pharmacological VTE prophylaxis 200 · 201
82. Mechanical prophylaxis when anticoagulation is contraindicated 202 · 203
83. Stress ulcer prophylaxis for those at risk 204 · 205
84. Early low-dose enteral nutrition 206 · 207
85. No aggressive feeding in unresolved shock 208 · 209
86. Light sedation, analgesia first 212 · 213
87. Screen for delirium 214 · 215
88. Restrictive red-cell transfusion 216 · 217
89. Avoid routine plasma and platelet transfusion 218 · 219
90. Daily multidisciplinary rounds 220 · 221

6. RECOVERY, DISPOSITION & FOLLOW-UP

91. Track organ-support trends every shift 224 · 225
92. Remove unnecessary lines and catheters 226 · 227
93. Screen for secondary infections 228 · 229
94. Goals-of-care conversations early 230 · 231
95. Communicate honestly with families 232 · 233
96. Step down only when ready 236 · 237
97. Reconcile medications at every transition 238 · 239
98. Screen survivors for PICS 240 · 241
99. Rehabilitation and post-sepsis follow-up 242 · 243
100. Audit bundle timing and outcomes 244 · 245

Index 248

Landmark trials in sepsis 251

Suggested PG dissertation topics 252

Page numbers: **step page** · **tables, graphs & algorithm page**

AETCM Academy for Emergency, Trauma & Critical care Medicine



Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 1

Screen early at triage with an early-warning score

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Screen every acutely ill adult at triage with a structured tool such as NEWS / NEWS2, MEWS or SIRS.

WHY IT MATTERS

Sepsis kills through delay. Most patients who die of sepsis were in the hospital — often in the emergency department — hours before anyone used the word. A standard screening tool applied to every patient turns sepsis recognition from a matter of luck into a system.

HOW TO DO IT AT THE BEDSIDE

- Record a full set of observations at triage and calculate NEWS2 for every adult.
- NEWS2 ≥ 5 (or 3 in any single parameter) plus any suspicion of infection = sepsis alert; NEWS2 ≥ 7 = emergency response.
- Ask the one question that matters: “Could this be infection?” — fever is absent in up to one-third of elderly and immunocompromised patients.
- Re-score at every set of observations; a rising score in the waiting area is a red flag.
- Use the same tool in the ambulance, ED and ward so that the number means the same thing everywhere.

WATCH OUT

- A normal score does not exclude sepsis — beta-blockers, steroids and old age blunt the vital signs.
- Do not wait for a score to act when the patient looks unwell; clinician concern is itself a trigger.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

For acutely ill hospital patients, use NEWS, NEWS2, MEWS or SIRS rather than qSOFA as a single screening tool. A standard screening tool is also suggested in ambulances and flights.
Strong · Moderate certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Churpek 2017: qSOFA vs SIRS vs early-warning scores | Sepsis-3 (Singer, JAMA 2016) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 1 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ED – emergency department; **SSC** – Surviving Sepsis Campaign
NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. Calculator / source › table ›
NEWS (National Early Warning Score): Original National Early Warning Score (2012) — same idea as NEWS2; replaced by NEWS2 in the UK. Calculator / source › table ›
MEWS (Modified Early Warning Score): SBP, HR, RR, temperature and AVPU scored 0–3; ≥ 5 associated with ICU admission or death. Calculator / source › see Step 4 ›
qSOFA (quick SOFA): RR ≥ 22, SBP ≤ 100, altered mentation — 1 point each; ≥ 2 = high risk. A prompt, not a screening tool. Calculator / source › see Step 4 ›
SIRS (systemic inflammatory response syndrome): ≥ 2 of: temp > 38 or < 36 °C, HR > 90, RR > 20 or $PaCO_2$ < 32, WBC > 12 000 or < 4 000 or > 10% bands. Sensitive, not specific. Calculator / source › see Step 4 ›
Sepsis-3: 2016 definitions: sepsis = infection + acute SOFA rise ≥ 2; septic shock = vasopressor for MAP ≥ 65 + lactate > 2 despite fluids. Calculator / source › see Step 2 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 1

Screen early at triage with an early-warning score

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

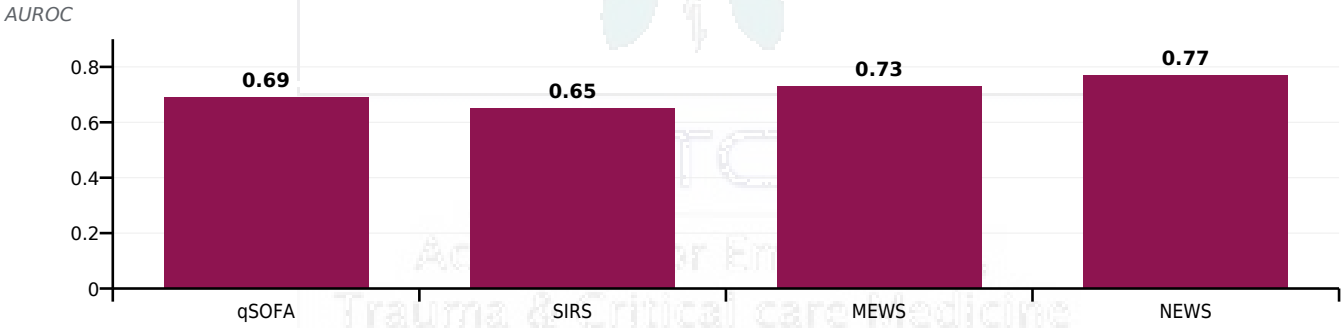
NEWS2 — the scoring chart (Royal College of Physicians, 2017)

Parameter	3	2	1	0	1	2	3
Respiration rate (/min)	≤ 8		9–11	12–20		21–24	≥ 25
SpO_2 scale 1 (%)	≤ 91	92–93	94–95	≥ 96			
Air or oxygen?		Oxygen		Air			
Systolic BP (mmHg)	≤ 90	91–100	101–110	111–219			≥ 220
Pulse (/min)	≤ 40		41–50	51–90	91–110	111–130	≥ 131
Consciousness				Alert			New confusion, V, P or U
Temperature (°C)	≤ 35.0		35.1–36.0	36.1–38.0	38.1–39.0	≥ 39.1	

What the NEWS2 total means

NEWS2	Risk	Response at the bedside
0–4	Low	Ward-level monitoring; reassess at least 4–6-hourly
3 in one parameter	Low–medium	Urgent review by a doctor
5–6	Medium	Urgent response — sepsis screen, senior review within 1 hour, monitoring at least hourly
≥ 7	High	Emergency response — resuscitation team / critical-care outreach, continuous monitoring

Discrimination for in-hospital death in infected ward/ED patients (approximate AUROC, Churpek 2017)



GOLDEN PEARL

Screen everyone, every time. The tool matters less than the habit — but qSOFA alone misses too many patients to be used as the screen.

‹ Back to Step 1 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AUROC – area under the receiver-operating curve; **BP** – blood pressure; **ED** – emergency department; **SpO_2** – peripheral oxygen saturation
NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. **Calculator / source › table ›**
NEWS (National Early Warning Score): Original National Early Warning Score (2012) — same idea as NEWS2; replaced by NEWS2 in the UK. **Calculator / source › table ›**
MEWS (Modified Early Warning Score): SBP, HR, RR, temperature and AVPU scored 0–3; ≥ 5 associated with ICU admission or death. **Calculator / source › see Step 4 ›**
qSOFA (quick SOFA): RR ≥ 22, SBP ≤ 100, altered mentation — 1 point each; ≥ 2 = high risk. A prompt, not a screening tool. **Calculator / source › see Step 4 ›**
SIRS (systemic inflammatory response syndrome): ≥ 2 of: temp > 38 or < 36 °C, HR > 90, RR > 20 or $PaCO_2$ < 32, WBC > 12 000 or < 4 000 or > 10% bands. Sensitive, not specific. **Calculator / source › see Step 4 ›**


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 2

Know the Sepsis-3 definition

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Recognise sepsis as life-threatening organ dysfunction caused by a dysregulated host response to infection (Sepsis-3).

WHY IT MATTERS

The definition shifts the focus from inflammation (SIRS) to organ dysfunction. A patient with fever and tachycardia who is otherwise well has an infection; a patient whose infection is making the kidneys, lungs, brain or circulation fail has sepsis — and needs the full sepsis pathway now.

HOW TO DO IT AT THE BEDSIDE

- Think in two questions: Is there an infection (suspected or proven)? Is there new organ dysfunction?
- Organ dysfunction = an acute rise in SOFA of ≥ 2 points from baseline (assume baseline 0 if unknown).
- Look for the commonest dysfunctions first: hypotension, hypoxaemia, confusion, oliguria, raised creatinine, low platelets, jaundice.
- Septic shock is the subset with profound circulatory and cellular/metabolic abnormality (see Step 5).
- Sepsis is a clinical diagnosis — no single test rules it in or out.

WATCH OUT

- "Severe sepsis" is an obsolete term — do not use it in notes or audits.
- Organ dysfunction may be due to the infection or to a non-infectious mimic (Step 19) — keep both in mind.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Sepsis is a clinical diagnosis that cannot be ruled in or out by a single biomarker or test. Treat sepsis and septic shock as medical emergencies.
Good practice statement

EVIDENCE & FURTHER READING — TAP TO OPEN

Sepsis-3 definitions (Singer, JAMA 2016) · Seymour 2016: clinical criteria for sepsis · Global burden of sepsis (Rudd, Lancet 2020) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 2 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. Calculator / source › see Step 3 ›
SIRS (systemic inflammatory response syndrome): ≥ 2 of: temp > 38 or < 36 °C, HR > 90, RR > 20 or $PaCO_2$ < 32, WBC > 12 000 or < 4 000 or > 10% bands. Sensitive, not specific. Calculator / source › see Step 4 ›
Sepsis-3: 2016 definitions: sepsis = infection + acute SOFA rise ≥ 2; septic shock = vasopressor for MAP ≥ 65 + lactate > 2 despite fluids. Calculator / source › table ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 2

Know the Sepsis-3 definition

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

From infection to septic shock — the Sepsis-3 pathway

Suspected or documented infection

↓

Acute change in SOFA score ≥ 2 points (new organ dysfunction)? — NO → Infection without sepsis — treat, observe, re-score

↓ YES

SEPSIS — hospital mortality > 10%

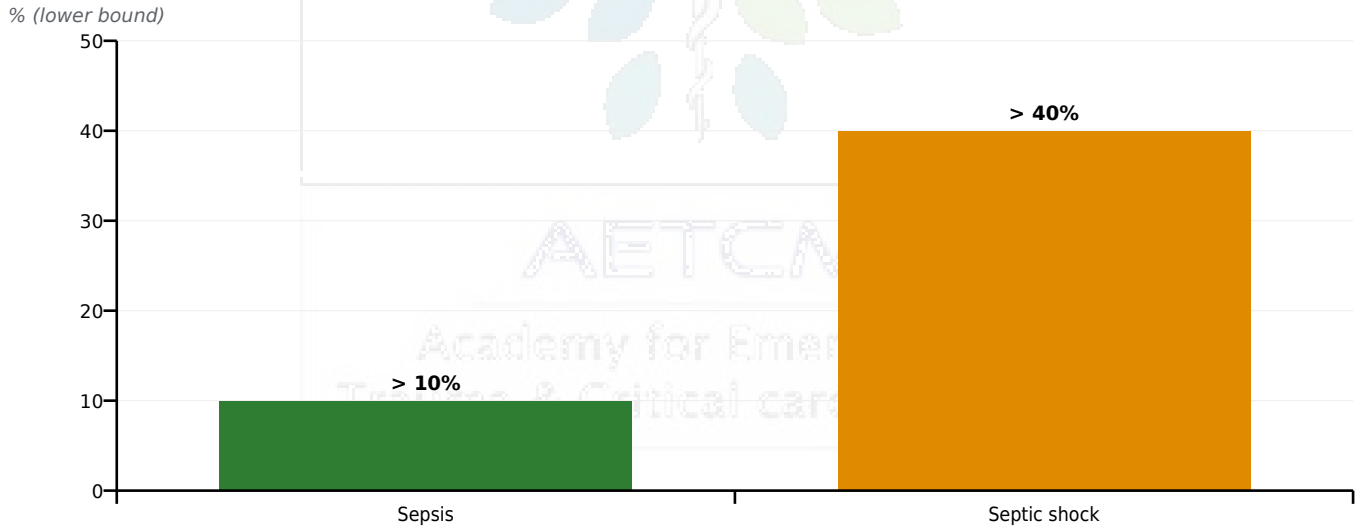
↓

Vasopressor needed for MAP ≥ 65 mmHg AND lactate > 2 mmol/L despite adequate fluids? — NO → Sepsis without shock — Hour-1 bundle, monitor closely

↓ YES

SEPTIC SHOCK — hospital mortality > 40%

Hospital mortality by Sepsis-3 category (Singer 2016: sepsis > 10%, septic shock > 40%)



GOLDEN PEARL

Infection + organ dysfunction = sepsis. Find the organ that is failing and you have found the patient who needs you most.

‹ Back to Step 2 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: MAP – mean arterial pressure
SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. Calculator / source › see Step 3 ›
Sepsis-3: 2016 definitions: sepsis = infection + acute SOFA rise ≥ 2; septic shock = vasopressor for MAP ≥ 65 + lactate > 2 despite fluids. Calculator / source › table ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 3

Quantify organ dysfunction with SOFA

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Calculate the SOFA score to quantify acute organ dysfunction and follow its trend.

WHY IT MATTERS

SOFA (Sequential Organ Failure Assessment) gives a common language for six organ systems. A rise of two or more points defines sepsis, and the trajectory over the first 48–72 hours tells you whether the patient is responding.

HOW TO DO IT AT THE BEDSIDE

- Score the worst value in each 24-hour period for respiration, coagulation, liver, cardiovascular, CNS and renal systems.
- Use PaO_2/FiO_2 when an ABG is available; SpO_2/FiO_2 is an acceptable surrogate in the ED.
- Record a baseline score at admission and repeat daily (Step 91).
- Use the score to prioritise ICU referral and to communicate severity to the team and family.

WATCH OUT

- Chronic organ disease raises the baseline — score the acute change, not the absolute number.
- GCS in sedated patients should be the estimated pre-sedation value.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Sepsis-3 uses an acute SOFA change of ≥ 2 to define organ dysfunction; the SSC 2026 panel uses SOFA in research and audit, not as a screening tool.

Definition (Sepsis-3)

EVIDENCE & FURTHER READING — TAP TO OPEN

Vincent 1996: the SOFA score | Sepsis-3 (Singer 2016) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 3 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ABG – arterial blood gas; **CNS** – central nervous system; **ED** – emergency department; **FiO_2** – fraction of inspired oxygen; **ICU** – intensive care unit; **PaO_2** – arterial partial pressure of oxygen; **SpO_2** – peripheral oxygen saturation; **SSC** – Surviving Sepsis Campaign
SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. Calculator / source › table ›
Sepsis-3: 2016 definitions: sepsis = infection + acute SOFA rise ≥ 2; septic shock = vasopressor for MAP ≥ 65 + lactate > 2 despite fluids. Calculator / source › see Step 2 ›
GCS (Glasgow Coma Scale): Eye 1–4 + Verbal 1–5 + Motor 1–6 = 3–15; ≤ 8 usually means the airway is at risk. Calculator / source › see Step 8 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 3

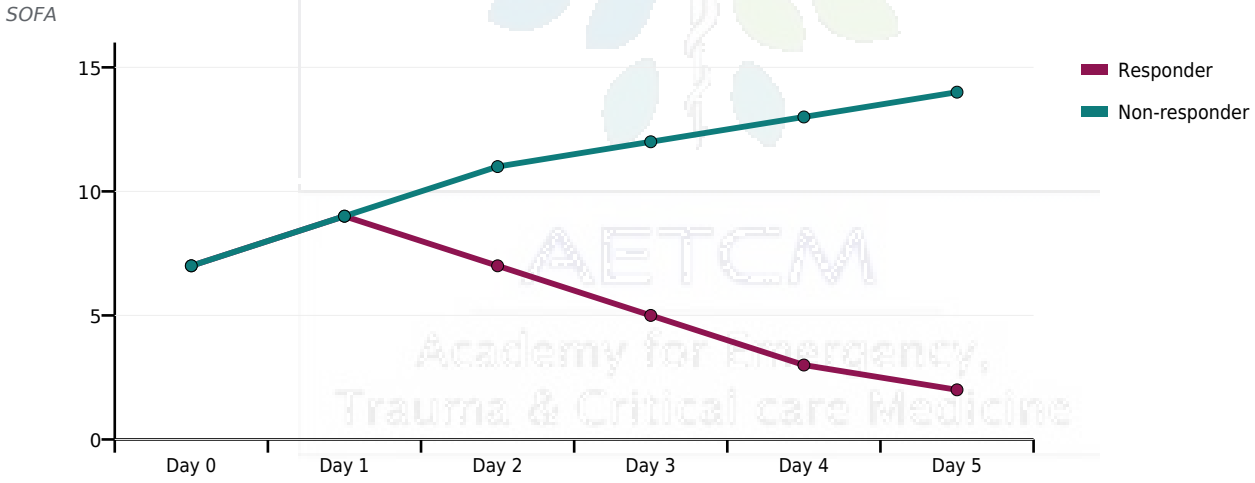
Quantify organ dysfunction with SOFA

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

SOFA score (Vincent 1996, as used in Sepsis-3)

System	0	1	2	3	4
Respiration PaO_2/FiO_2 (mmHg)	≥ 400	< 400	< 300	< 200 with resp. support	< 100 with resp. support
Coagulation platelets ($\times 10^3/\mu L$)	≥ 150	< 150	< 100	< 50	< 20
Liver bilirubin (mg/dL)	< 1.2	1.2–1.9	2.0–5.9	6.0–11.9	> 12.0
Cardiovascular	MAP ≥ 70	MAP < 70	Dopamine < 5 or dobutamine any	Dopa 5.1–15 or NE/epi ≤ 0.1 µg/kg/min	Dopa > 15 or NE/epi > 0.1 µg/kg/min
CNS Glasgow Coma Scale	15	13–14	10–12	6–9	< 6
Renal creatinine (mg/dL) or urine output	< 1.2	1.2–1.9	2.0–3.4	3.5–4.9 or UO < 500 mL/day	> 5.0 or UO < 200 mL/day

Worked example — a patient's SOFA trend (illustrative)



GOLDEN PEARL

SOFA is a moving picture, not a photograph. Falling SOFA by day 3 is the most reassuring number in the ICU.

‹ Back to Step 3 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CNS – central nervous system; **FiO_2** – fraction of inspired oxygen; **ICU** – intensive care unit; **MAP** – mean arterial pressure; **NE** – norepinephrine (noradrenaline); **PaO_2** – arterial partial pressure of oxygen; **UO** – urine output
SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. **Calculator / source › table ›**
Sepsis-3: 2016 definitions: sepsis = infection + acute SOFA rise ≥ 2; septic shock = vasopressor for MAP ≥ 65 + lactate > 2 despite fluids. **Calculator / source › see Step 2 ›**
Drug information (RxList — tap): Dopamine · Dobutamine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 4

Use qSOFA only as a bedside prompt

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Use qSOFA (RR ≥ 22, SBP ≤ 100 mmHg, altered mentation) as a bedside prompt for poor outcome — never as a standalone diagnostic or screening tool.

WHY IT MATTERS

qSOFA identifies infected patients at higher risk of death, but it is specific rather than sensitive. Using qSOFA to decide who gets screened or treated misses many patients who are already developing organ failure.

HOW TO DO IT AT THE BEDSIDE

- Score 1 point each for RR ≥ 22/min, systolic BP ≤ 100 mmHg and any altered mentation (GCS < 15).
- qSOFA ≥ 2 in a patient with suspected infection: think sepsis, measure lactate, look for organ dysfunction, escalate.
- qSOFA 0–1 does not exclude sepsis — complete NEWS2 and laboratory assessment anyway.
- Remember the components: they are the vital signs you should be measuring at triage in any case.

WATCH OUT

- Low sensitivity: up to half of patients who later die of sepsis are qSOFA-negative at presentation.
- Not validated for decisions on antibiotics or ICU admission.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend NEWS, NEWS2, MEWS or SIRS over qSOFA as a single screening tool for sepsis.
Strong · Moderate certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Seymour 2016: qSOFA derivation (JAMA) | Churpek 2017: qSOFA vs early-warning scores | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 4 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure; **ICU** – intensive care unit; **RR** – respiratory rate; **SBP** – systolic blood pressure
NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. Calculator / source › see Step 1 ›
NEWS (National Early Warning Score): Original National Early Warning Score (2012) — same idea as NEWS2; replaced by NEWS2 in the UK. Calculator / source › see Step 1 ›
MEWS (Modified Early Warning Score): SBP, HR, RR, temperature and AVPU scored 0–3; ≥ 5 associated with ICU admission or death. Calculator / source › table ›
qSOFA (quick SOFA): RR ≥ 22, SBP ≤ 100, altered mentation — 1 point each; ≥ 2 = high risk. A prompt, not a screening tool. Calculator / source › table ›
SIRS (systemic inflammatory response syndrome): ≥ 2 of: temp > 38 or < 36 °C, HR > 90, RR > 20 or $PaCO_2$ < 32, WBC > 12 000 or < 4 000 or > 10% bands. Sensitive, not specific. Calculator / source › table ›
GCS (Glasgow Coma Scale): Eye 1–4 + Verbal 1–5 + Motor 1–6 = 3–15; ≤ 8 usually means the airway is at risk. Calculator / source › see Step 8 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 4

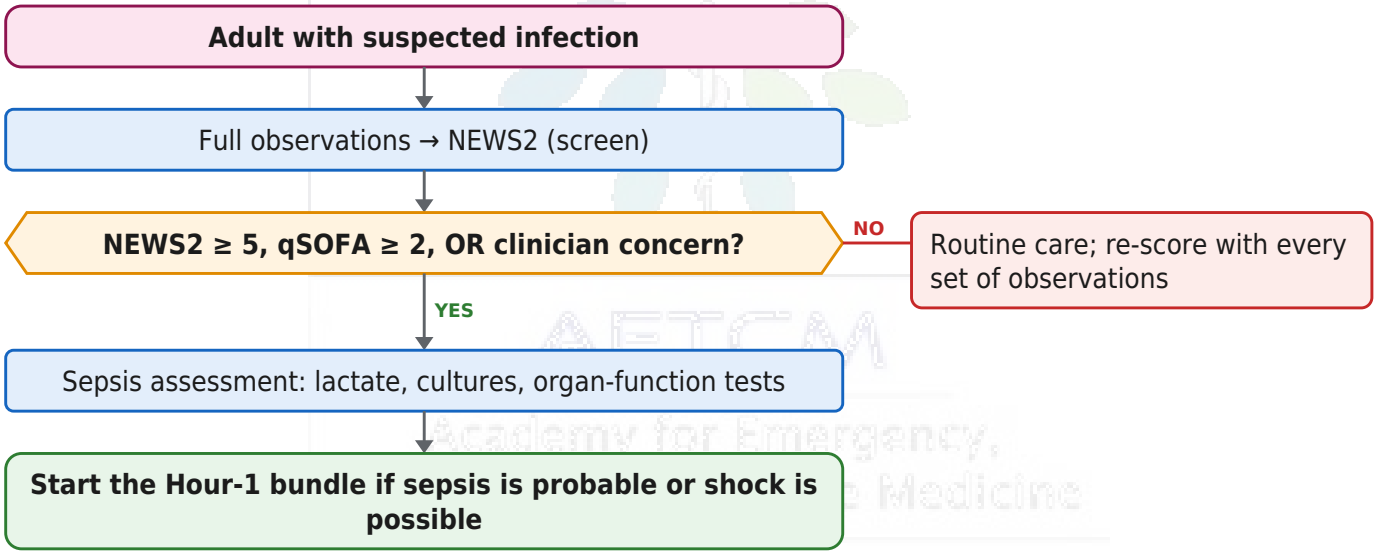
Use qSOFA only as a bedside prompt

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Three bedside tools compared

Tool	Components	Strength	Weakness	Role
qSOFA	RR ≥ 22, SBP ≤ 100, altered mentation (1 point each)	Quick, no labs, specific for poor outcome	Low sensitivity	Prompt only — never the sole screen
SIRS	Temp > 38 or < 36; HR > 90; RR > 20 or $PaCO_2$ < 32; WBC > 12k, < 4k or > 10% bands	Sensitive	Non-specific (exercise, pain, anxiety)	Acceptable screen
NEWS2	RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature	Sensitive, graded, triggers a response	Needs full observations	Preferred screen (SSC 2026)
MEWS	RR, HR, SBP, temperature, AVPU	Simple	Less studied for sepsis	Acceptable screen

Where qSOFA fits in the ED



GOLDEN PEARL

A positive qSOFA should frighten you; a negative qSOFA should not reassure you.

‹ Back to Step 4 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ED – emergency department; **HR** – heart rate; **OR** – odds ratio; **$PaCO_2$** – arterial partial pressure of CO_2; **RR** – respiratory rate; **SBP** – systolic blood pressure; **SpO_2** – peripheral oxygen saturation; **SSC** – Surviving Sepsis Campaign; **WBC** – white blood cell count
NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. Calculator / source › see Step 1 ›
MEWS (Modified Early Warning Score): SBP, HR, RR, temperature and AVPU scored 0–3; ≥ 5 associated with ICU admission or death. Calculator / source › table ›
qSOFA (quick SOFA): RR ≥ 22, SBP ≤ 100, altered mentation — 1 point each; ≥ 2 = high risk. A prompt, not a screening tool. Calculator / source › table ›
SIRS (systemic inflammatory response syndrome): ≥ 2 of: temp > 38 or < 36 °C, HR > 90, RR > 20 or $PaCO_2$ < 32, WBC > 12 000 or < 4 000 or > 10% bands. Sensitive, not specific. Calculator / source › table ›
AVPU (Alert, Voice, Pain, Unresponsive): Alert / responds to Voice / responds to Pain / Unresponsive. 'V' ≈ GCS 12–13, 'P' ≈ GCS ≤ 8. Calculator / source › see Step 8 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 5

Identify septic shock

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Identify septic shock: vasopressors needed to keep MAP ≥ 65 mmHg and serum lactate > 2 mmol/L despite adequate fluid resuscitation.

WHY IT MATTERS

Septic shock is where circulatory failure and cellular metabolic failure meet. It carries a hospital mortality above 40%, and every hour of untreated hypotension adds to it. Recognising shock early changes the tempo of everything: antibiotics, vasopressors, source control and ICU admission.

HOW TO DO IT AT THE BEDSIDE

- Measure MAP, not just systolic pressure: MAP ≈ DBP + (SBP − DBP)/3.
- Measure lactate in every hypotensive patient with suspected infection.
- Hypotension persisting after the first crystalloid boluses → start norepinephrine; do not wait for the full 30 mL/kg if the patient is crashing.
- Label it explicitly in the notes: “Septic shock, time zero = hh:mm”.
- Treat “cryptic shock” (normotensive but lactate ≥ 4 mmol/L) with the same urgency.

WATCH OUT

- A normal BP in a young patient with a high lactate, mottling and oliguria is still shock.
- Lactate can be raised by adrenaline, metformin, liver failure and seizures — interpret in context.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Antimicrobials immediately, ideally within 1 hour, for possible, probable or definite septic shock.
Strong · Very low certainty

LACTATE CLEARANCE — WHAT IS GOOD?

Lactate clearance (%) = (initial − repeat) ÷ initial × 100. A clearance of **≥ 10% within 2–6 h** (Jones 2010; Nguyen 2004) or **≥ 20% per 2 h** (Jansen 2010) indicates a good response; aim for normalisation (< 2 mmol/L) within 6–24 h. In Nguyen's cohort each 10% increase in clearance was associated with about an 11% fall in the odds of death; clearance < 10% at 6 h marks a high-risk patient who needs reassessment (perfusion, source, heart, abdomen). Example: 6.0 → 4.5 mmol/L at 2 h = 25% clearance.

EVIDENCE & FURTHER READING — TAP TO OPEN

Shankar-Hari 2016: septic shock definition (JAMA) · Sepsis-3 (Singer 2016) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 5 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure; **DBP** – diastolic blood pressure; **ICU** – intensive care unit; **MAP** – mean arterial pressure; **SBP** – systolic blood pressure
Sepsis-3: 2016 definitions: sepsis = infection + acute SOFA rise ≥ 2; septic shock = vasopressor for MAP ≥ 65 + lactate > 2 despite fluids. Calculator / source › see Step 2 ›
Drug information (RxList — tap): Norepinephrine · Metformin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 5

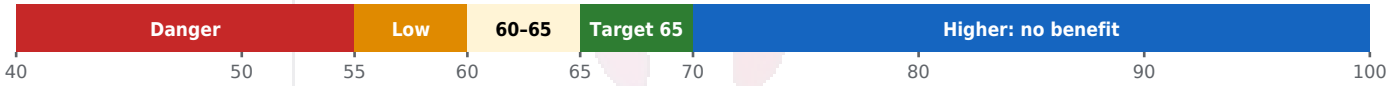
Identify septic shock

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

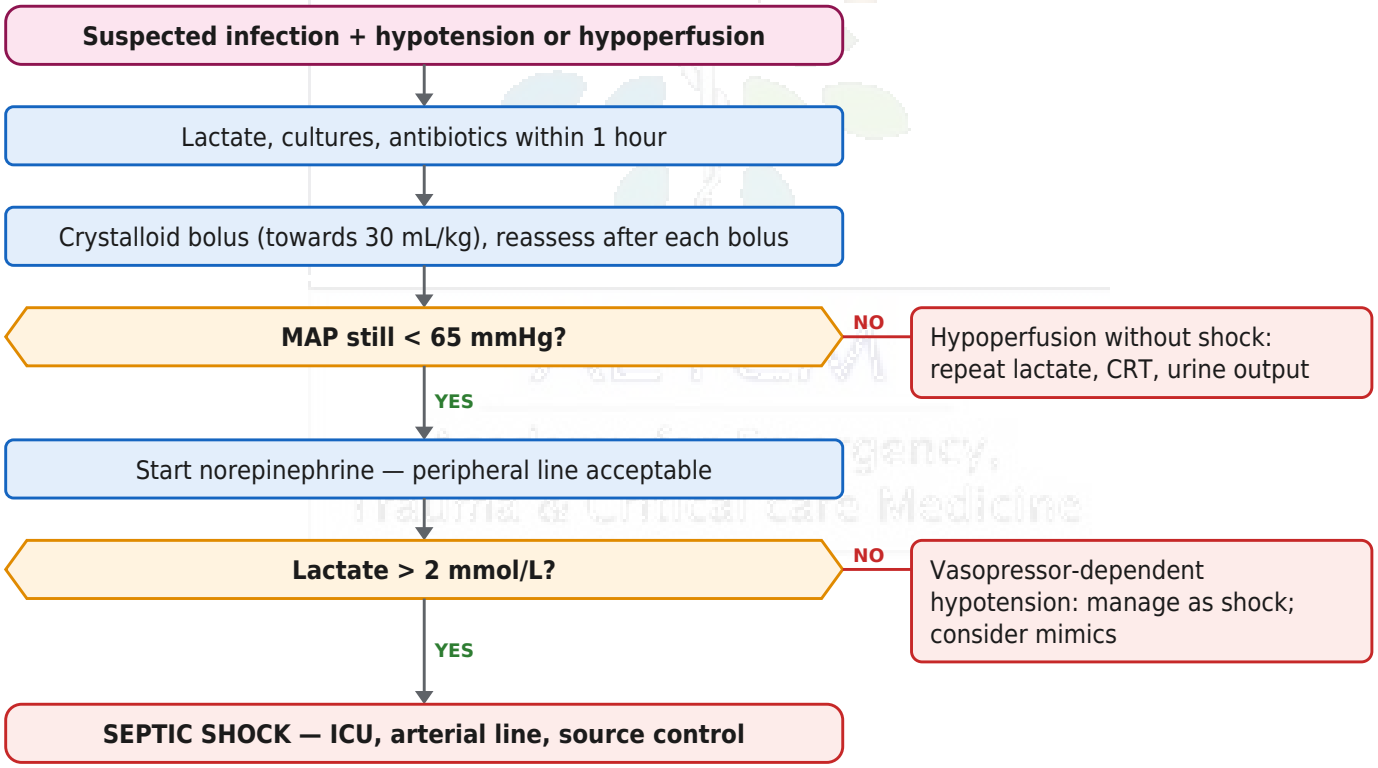
Shock states in sepsis — how to label the patient

Label	MAP	Lactate	Vasopressor	Action
Sepsis, no hypoperfusion	≥ 65	< 2	No	Antibiotics within 1 h, monitor
Sepsis-induced hypoperfusion	≥ 65 or < 65	≥ 2 (or ≥ 4 = cryptic shock)	No	Fluids 30 mL/kg, repeat lactate
Sepsis-induced hypotension	< 65	Any	Not yet	Crystalloid bolus, then vasopressor if persistent
SEPTIC SHOCK	< 65 after fluids	> 2	Yes	Norepinephrine, ICU, source control

Mean arterial pressure — where you want to be (mmHg)



Recognising septic shock at the bedside



GOLDEN PEARL

Shock is a state of cells, not a number on the monitor. Look at the skin, the urine and the lactate as well as the BP.

‹ Back to Step 5 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

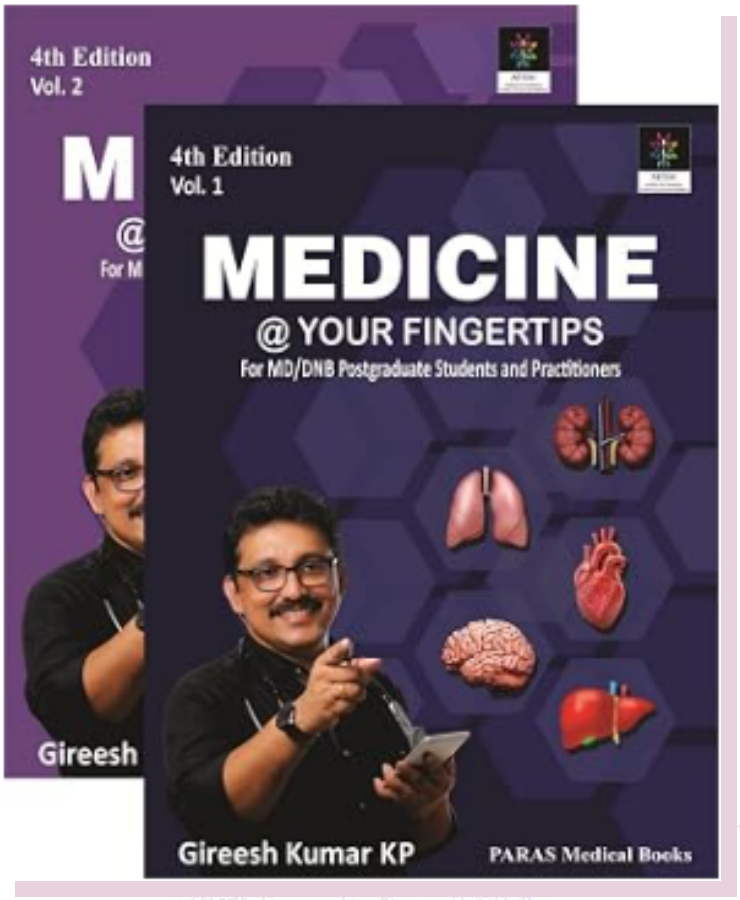
Abbreviations: BP – blood pressure; **CRT** – capillary refill time; **ICU** – intensive care unit; **MAP** – mean arterial pressure
Drug information (RxList — tap): Norepinephrine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Medicine @ Your Fingertips

Clinical medicine at a glance — a high-yield reference for MD/DNB postgraduates and practitioners.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 6

Activate a code sepsis or sepsis huddle

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Activate a hospital “code sepsis” or sepsis huddle wherever it exists.

WHY IT MATTERS

Sepsis care is a team sport performed against the clock. A code sepsis brings the doctor, nurse, pharmacist and laboratory together in parallel rather than in sequence, so cultures, antibiotics, fluids and lactate happen in the first hour rather than over the first shift.

HOW TO DO IT AT THE BEDSIDE

- Trigger: NEWS2 ≥ 5 (or single red score) with suspected infection, hypotension, or lactate ≥ 2.
- Announce “code sepsis”, record time zero and assign roles: leader, airway/vitals, IV access & samples, drugs.
- Use a printed sepsis checklist or electronic order set so nothing depends on memory.
- Huddle again at 60 minutes: what has been done, what is outstanding, what is the source, who is the ICU contact?

WATCH OUT

- A code that delivers antibiotics in 90 minutes is not a code — audit every activation (Step 100).
- Avoid alarm fatigue: keep trigger criteria simple and agreed by the whole hospital.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest a “code sepsis” or sepsis huddle protocol over no such protocol; recommend a hospital performance-improvement programme with screening and standard procedures.
Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Seymour 2017: time to treatment in New York (NEJM) | SSC 2026 adult guideline | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 6 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit; **IV** – intravenous; **SSC** – Surviving Sepsis Campaign
NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. Calculator / source › see Step 1 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 6

Activate a code sepsis or sepsis huddle

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Code sepsis — the first 60 minutes

T = 0 min: trigger met → call "CODE SEPSIS", note time zero

↓

0–10 min: ABC, O_2, monitor, 2 IV lines, NEWS2, POC lactate & glucose

↓

10–20 min: 2 sets of blood cultures + site cultures; send CBC, CMP, coagulation, ABG/VBG

↓

15–45 min: broad-spectrum antibiotics (loading doses); crystalloid bolus

↓

MAP < 65 after initial fluids?

NO → Continue fluids by response; repeat lactate

YES ↓

Start norepinephrine (peripheral line acceptable)

↓

T = 60 min: huddle — source, imaging, ICU referral, documentation

Who does what

Role	Tasks
Team leader	Declares code, time zero, decisions, escalation, family update
Nurse 1	Monitoring, NEWS2, O_2, vitals every 15 min
Nurse 2	IV access, cultures, blood tests, fluid bolus
Pharmacist / Nurse 3	Antibiotic preparation, loading doses, vasopressor syringe
Recorder	Time stamps: cultures, antibiotics, fluids, vasopressors

GOLDEN PEARL

If it is not timed, it did not happen. Time zero is the most important number on the sepsis sheet.

‹ Back to Step 6 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ABG – arterial blood gas; **CBC** – complete blood count; **CMP** – comprehensive metabolic panel; **ICU** – intensive care unit; **IV** – intravenous; **MAP** – mean arterial pressure; **VBG** – venous blood gas
NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. **Calculator / source › see Step 1 ›**
Drug information (RxList — tap): Norepinephrine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 7

Check a full set of vital signs immediately

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Check full vital signs at once: temperature, heart rate, BP with MAP, respiratory rate and SpO_2.

WHY IT MATTERS

The respiratory rate is the most sensitive and most neglected vital sign in sepsis. A full set of observations, repeated often, is the cheapest monitor of organ dysfunction you have and the basis of every screening tool.

HOW TO DO IT AT THE BEDSIDE

- Count the respiratory rate for a full 30 seconds — do not estimate.
- Calculate MAP; use an appropriately sized cuff.
- Record temperature centrally if peripheral readings are unreliable; hypothermia carries a worse prognosis than fever.
- Record SpO_2 with the FiO_2 / oxygen flow that produced it.
- Repeat every 15 minutes during resuscitation, then hourly.

WATCH OUT

- Tachycardia may be absent on beta-blockers or in the elderly; bradycardia in shock is a pre-arrest sign.
- Poor perfusion makes SpO_2 unreliable — check the waveform.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest assessing oxygenation by SpO_2 or arterial blood gas together with clinical examination.

Conditional · Very low certainty

SHOCK INDEX — DESCRIPTION

Shock index (SI) = heart rate ÷ systolic BP. Normal 0.5–0.7. SI ≥ 0.9–1.0 suggests occult shock even when the BP looks "normal", and is associated with hyperlactataemia, need for ICU and higher mortality in sepsis. **Modified SI** = HR ÷ MAP (normal 0.7–1.3). **Age SI** = age × SI (> 50 predicts mortality in older adults). Advantages: free, instant, repeatable; limitations: β-blockers, pacing, pain, fever. Example: HR 120 / SBP 100 → SI 1.2 = high risk.

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Churpek 2017: early-warning scores | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 7 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **BP** – blood pressure; **FiO_2** – fraction of inspired oxygen; **HR** – heart rate; **ICU** – intensive care unit; **MAP** – mean arterial pressure; **SBP** – systolic blood pressure; **SI** – shock index; **SpO_2** – peripheral oxygen saturation; **SSC** – Surviving Sepsis Campaign
Shock index: HR ÷ SBP; normal 0.5–0.7; ≥ 0.9–1.0 suggests occult shock and higher mortality. Calculator / source › table ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 7

Check a full set of vital signs immediately

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Vital signs — red flags for sepsis

Vital sign	Amber (worry)	Red (act now)	Pearl
Respiratory rate	21–24 /min	≥ 25 /min or ≤ 8	Earliest sign of metabolic acidosis
SpO_2	92–95%	< 92% or needs O_2	Record with FiO_2
Heart rate	91–130	> 130 or < 40	Rate > SBP (shock index > 1) = danger
Systolic BP	91–100	≤ 90 or fall > 40 from baseline	Calculate MAP
MAP	65–70	< 65	Target 65 (60–65 if ≥ 65 y)
Temperature	36.0 or 38.1–39	< 36 or ≥ 39.1	Hypothermia = higher mortality
Consciousness	—	New confusion / V, P, U	Septic encephalopathy

Shock index (HR ÷ SBP) — worked examples



GOLDEN PEARL

Count the respiratory rate. A rate above 22 in a patient with infection deserves a lactate.

‹ Back to Step 7 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure; **FiO_2** – fraction of inspired oxygen; **HR** – heart rate; **MAP** – mean arterial pressure; **SBP** – systolic blood pressure; **SpO_2** – peripheral oxygen saturation
Shock index: HR ÷ SBP; normal 0.5–0.7; ≥ 0.9–1.0 suggests occult shock and higher mortality. Calculator / source › table ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 8

Assess mental status

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Assess mental status for acute encephalopathy — confusion, agitation, drowsiness or lethargy.

WHY IT MATTERS

Sepsis-associated encephalopathy is the commonest organ dysfunction in sepsis and often the first. In older patients a new confusion may be the only sign of infection. It is also a predictor of long-term cognitive impairment.

HOW TO DO IT AT THE BEDSIDE

- Use AVPU or GCS at triage; any new confusion scores 3 points in NEWS2.
- Ask the family: “Is this how he/she normally is?” — compare with baseline.
- Check glucose immediately in every confused patient.
- Look for alternative or coexisting causes: hypoxia, hypercapnia, hyponatraemia, uraemia, drugs, stroke, meningitis.
- Use a validated delirium tool (4AT in ED, CAM-ICU in ICU).

WATCH OUT

- Do not attribute confusion to “age” or “dementia” without excluding sepsis.
- Meningism and focal signs demand LP/CT and meningitic-dose antibiotics.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Altered mentation is part of qSOFA and NEWS2; treat new confusion with infection as possible sepsis.
Screening principle

AVPU, GCS AND DELIRIUM TOOLS — TAP FOR CALCULATORS

AVPU: A = alert; V = responds to voice (≈ GCS 12–13); P = responds only to pain (≈ GCS ≤ 8 — protect the airway); U = unresponsive. **GCS** = E (1–4) + V (1–5) + M (1–6). **4AT** (ED/ward): alertness + AMT4 + months backwards + acute change; ≥ 4 = possible delirium. **CAM-ICU** (ICU, works in ventilated patients) — see Step 87.

GCS calculator (MDCalc) | 4AT delirium tool | CAM-ICU (icudelirium.org) | CAM-ICU flowchart → Step 87
GCS table → Step 8, page 2

EVIDENCE & FURTHER READING — TAP TO OPEN

Ely 2001: CAM-ICU validation (JAMA) | Iwashyna 2010: cognitive impairment after sepsis | SSC 2026 (ESICM)
Medscape | Radiopaedia

Tables, graphs & algorithm for Step 8 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CT – computed tomography; **ED** – emergency department; **ICU** – intensive care unit; **LP** – lumbar puncture
NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. Calculator / source › see Step 1 ›
qSOFA (quick SOFA): RR ≥ 22, SBP ≤ 100, altered mentation — 1 point each; ≥ 2 = high risk. A prompt, not a screening tool. Calculator / source › see Step 4 ›
GCS (Glasgow Coma Scale): Eye 1–4 + Verbal 1–5 + Motor 1–6 = 3–15; ≤ 8 usually means the airway is at risk. Calculator / source › table ›
AVPU (Alert, Voice, Pain, Unresponsive): Alert / responds to Voice / responds to Pain / Unresponsive. ‘V’ ≈ GCS 12–13, ‘P’ ≈ GCS ≤ 8. Calculator / source › table ›
4AT (4 'A's Test (delirium screen)): Alertness, AMT4, attention (months backwards), acute change — score ≥ 4 = possible delirium. Quick ED/ward screen. Calculator / source › table ›
CAM-ICU (Confusion Assessment Method for the ICU): Acute change/fluctuation + inattention + (altered consciousness or disorganised thinking) = delirium. Works in ventilated patients. Calculator / source › see Step 87 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 8

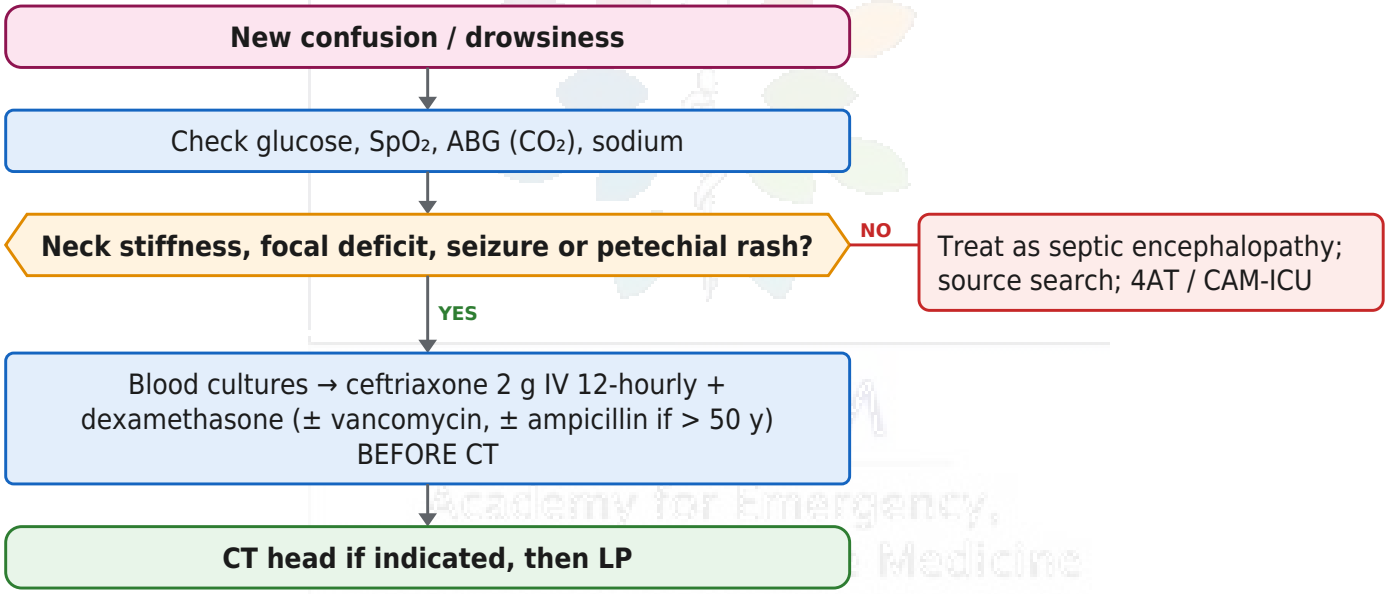
Assess mental status

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Glasgow Coma Scale

Component	Score 4-6	Score 3	Score 2	Score 1
Eye opening (E)	4 Spontaneous	To voice	To pain	None
Verbal (V)	5 Oriented · 4 Confused	Inappropriate words	Incomprehensible sounds	None
Motor (M)	6 Obeys · 5 Localises · 4 Withdraws	Abnormal flexion	Extension	None

Confused patient with suspected infection



GOLDEN PEARL

New confusion + infection = sepsis until proven otherwise. Check the sugar first.

‹ Back to Step 8 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ABG – arterial blood gas; **CT** – computed tomography; **ICU** – intensive care unit; **IV** – intravenous; **LP** – lumbar puncture; **SpO₂** – peripheral oxygen saturation
4AT (4 'A's Test (delirium screen)): Alertness, AMT4, attention (months backwards), acute change — score ≥ 4 = possible delirium. Quick ED/ward screen. **Calculator / source › table ›**
CAM-ICU (Confusion Assessment Method for the ICU): Acute change/fluctuation + inattention + (altered consciousness or disorganised thinking) = delirium. Works in ventilated patients. **Calculator / source › see Step 87 ›**
Drug information (RxList — tap): Dexamethasone · Ceftriaxone · Vancomycin · Ampicillin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 9

Inspect skin perfusion

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Inspect skin perfusion — mottling, cold extremities and capillary refill time (> 3 seconds is abnormal).

WHY IT MATTERS

The skin is the first organ the body sacrifices in shock and the first to recover. Capillary refill time and mottling are free, repeatable, and predict mortality; capillary refill is now a guideline-endorsed adjunct to lactate (ANDROMEDA-SHOCK).

HOW TO DO IT AT THE BEDSIDE

- CRT: press firmly on the distal phalanx of the index finger for 10 seconds with a glass slide; time the return of colour. Normal ≤ 3 s.
- Grade mottling around the knee using the mottling score (0–5).
- Feel the temperature gradient from knee to foot; cold to the knee = poor perfusion.
- Repeat every 30 minutes during resuscitation — normalisation is a target.
- Inspect the whole skin: purpura (meningococcus), necrotising infection, cellulitis, line sites.

WATCH OUT

- Ambient cold, dark skin and peripheral vascular disease make assessment harder — use the knee and the nail bed.
- Do not chase CRT with endless fluid — check fluid responsiveness first (Step 34).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest capillary refill time as an adjunct measure of perfusion.
Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

ANDROMEDA-SHOCK (Hernández, JAMA 2019) · Ait-Oufella 2011: mottling score · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 9 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRT – capillary refill time


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 9

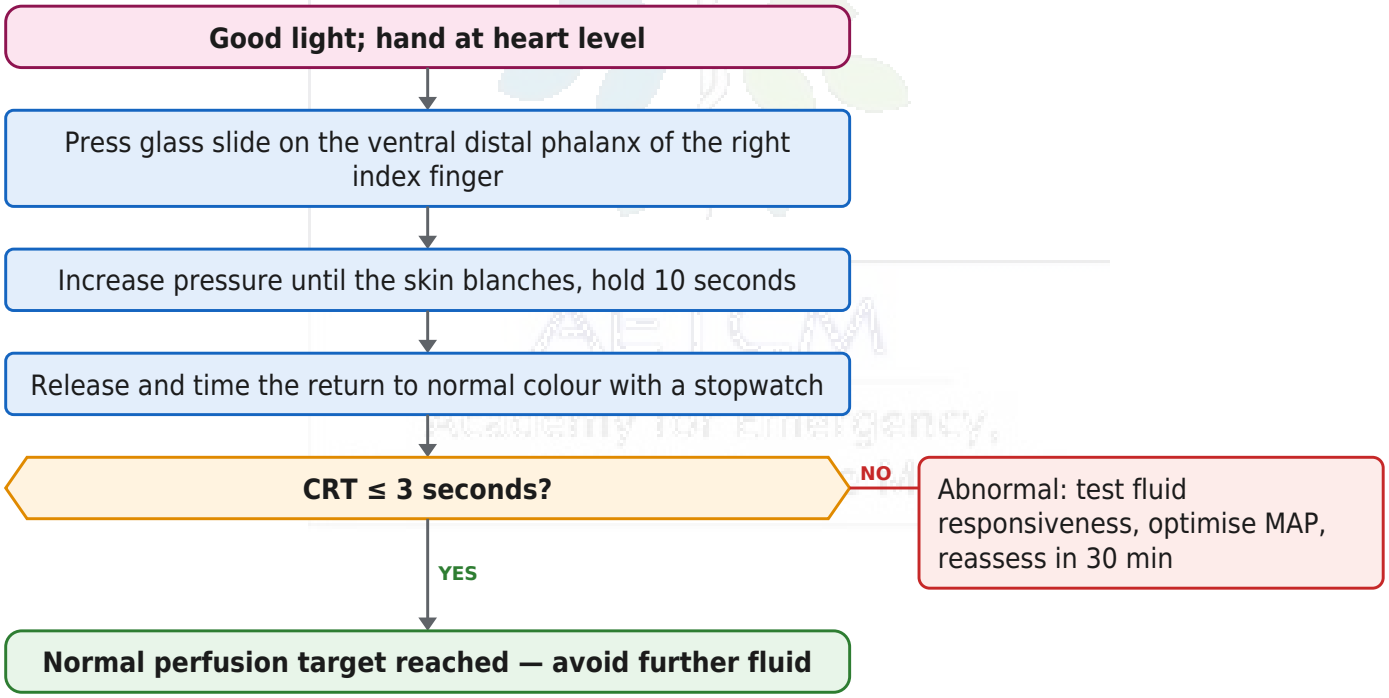
Inspect skin perfusion

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Mottling score (Ait-Oufella)

Score	Extent of mottling	Meaning
0	No mottling	Normal
1	Small, coin-sized area at the centre of the knee	Mild
2	Not beyond the superior edge of the kneecap	Moderate
3	Not beyond the middle of the thigh	Severe
4	Not beyond the fold of the groin	Very severe
5	Extending beyond the groin	Extreme — very high mortality

How to measure capillary refill time (ANDROMEDA protocol)



GOLDEN PEARL

A warm knee and a 2-second refill are worth more than a central line.

‹ Back to Step 9 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRT – capillary refill time; **MAP** – mean arterial pressure


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 10

Measure serum lactate immediately

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Measure a baseline serum lactate immediately.

WHY IT MATTERS

Lactate is a marker of stress and tissue hypoperfusion and a powerful predictor of death. It identifies cryptic shock in normotensive patients and is the basis of the shock definition. Point-of-care devices give the result in a minute.

HOW TO DO IT AT THE BEDSIDE

- Venous or capillary lactate is acceptable for screening; if > 2 mmol/L, confirm on blood gas.
- Lactate ≥ 4 mmol/L = high risk: full resuscitation pathway regardless of BP.
- Repeat within 2–4 hours if raised (Step 38).
- Record the time of the first lactate in the sepsis sheet.

WATCH OUT

- Type B causes: metformin, adrenaline infusions, salbutamol, liver failure, seizures, thiamine deficiency, malignancy.
- Ringer's lactate does not meaningfully raise serum lactate — do not avoid it for this reason.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest measuring blood lactate in adults with suspected sepsis.
Conditional · Low certainty

LACTATE CLEARANCE — WHAT IS GOOD?

Lactate clearance (%) = (initial − repeat) ÷ initial × 100. A clearance of **≥ 10% within 2-6 h** (Jones 2010; Nguyen 2004) or **≥ 20% per 2 h** (Jansen 2010) indicates a good response; aim for normalisation (< 2 mmol/L) within 6–24 h. In Nguyen's cohort each 10% increase in clearance was associated with about an 11% fall in the odds of death; clearance < 10% at 6 h marks a high-risk patient who needs reassessment (perfusion, source, heart, abdomen). Example: 6.0 → 4.5 mmol/L at 2 h = 25% clearance.

EVIDENCE & FURTHER READING — TAP TO OPEN

Jones 2010: lactate clearance vs $ScvO_2$ (JAMA) · Shankar-Hari 2016: septic shock definition · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 10 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure; **$ScvO_2$** – central venous oxygen saturation
Drug information (RxList — tap): Thiamine · Metformin · Salbutamol


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 10

Measure serum lactate immediately

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Interpreting the lactate

Lactate (mmol/L)	Interpretation	Action
< 2	Normal	Does not exclude sepsis; continue assessment
2–3.9	Hyperlactataemia — hypoperfusion possible	Fluids if responsive; repeat in 2 h
≥ 4	High risk / cryptic shock if normotensive	30 mL/kg crystalloid, ICU referral, repeat in 2 h
> 2 + vasopressor	Septic shock (Sepsis-3)	Full shock pathway

Causes of a high lactate

Type A — hypoperfusion / hypoxia	Type B — no tissue hypoxia
Septic, cardiogenic, haemorrhagic shock	β_2-agonists, adrenaline infusion (aerobic glycolysis)
Severe hypoxaemia, severe anaemia	Metformin, linezolid, propofol infusion syndrome, NRTIs
Mesenteric / limb ischaemia	Liver failure (reduced clearance)
Carbon monoxide or cyanide poisoning	Seizures, malignancy, thiamine deficiency, DKA

Academy for Emergency, Trauma & Critical care Medicine

GOLDEN PEARL

A lactate of 4 in a patient with a normal blood pressure is shock in disguise.

‹ Back to Step 10 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

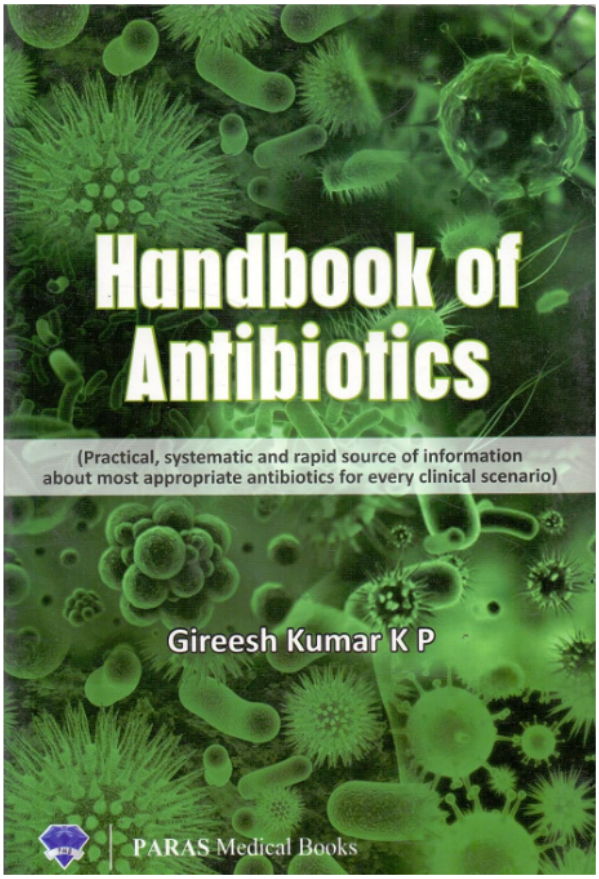
Abbreviations: DKA – diabetic ketoacidosis; **ICU** – intensive care unit; **NRTIs** – nucleoside reverse-transcriptase inhibitors
Sepsis-3: 2016 definitions: sepsis = infection + acute SOFA rise ≥ 2; septic shock = vasopressor for MAP ≥ 65 + lactate > 2 despite fluids. **Calculator / source ›** **see Step 2 ›**
Drug information (RxList — tap): Linezolid · Propofol · Thiamine · Metformin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Handbook of Antibiotics

A practical bedside guide to choosing, dosing and monitoring antibiotics — the natural companion to the antimicrobial steps of this book.

BUY NOW ›

Scan to buy

See all books by the author ›



Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes

BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 11

Two sets of blood cultures before antibiotics

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Draw at least two sets of blood cultures (aerobic and anaerobic) before starting antimicrobials — when this does not delay therapy.

WHY IT MATTERS

Blood cultures are the only test that identifies the organism and its susceptibility. Antibiotics sterilise blood cultures within hours, so cultures drawn after the first dose lose much of their yield — and with it the chance to de-escalate safely.

HOW TO DO IT AT THE BEDSIDE

- Two sets from two separate venepuncture sites (one may be from a newly inserted cannula).
- Fill each bottle with 8–10 mL (adults) — volume is the main determinant of yield.
- Skin antisepsis with 2% chlorhexidine in 70% alcohol; allow to dry 30 seconds; disinfect bottle tops.
- If a central line is in place, take one set through the line and one peripherally, labelled (differential time to positivity).
- Send immediately; do not refrigerate.

WATCH OUT

- Never delay antibiotics more than a few minutes to obtain cultures in septic shock.
- Contaminants (CoNS, diphtheroids, Bacillus) in one of two sets usually do not need treatment.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend obtaining blood cultures as soon as possible, ideally before starting antimicrobials.
Strong · Low certainty

HOW OFTEN ARE CULTURES POSITIVE IN SEPSIS?

Blood cultures are positive in only about **30–40% of patients with sepsis** (higher in septic shock), and overall **40–50% of sepsis is "culture-negative"** (Phua 2013: 41.5%; Gupta 2016: 47%). Antibiotics given before cultures roughly halve the yield — in Cheng 2019, blood culture positivity fell from 31.4% before to 19.4% after antimicrobials. Every adequately filled bottle drawn before the first dose counts.

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Blood-culture volume and yield | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 11 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CoNS – coagulase-negative staphylococci; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 11

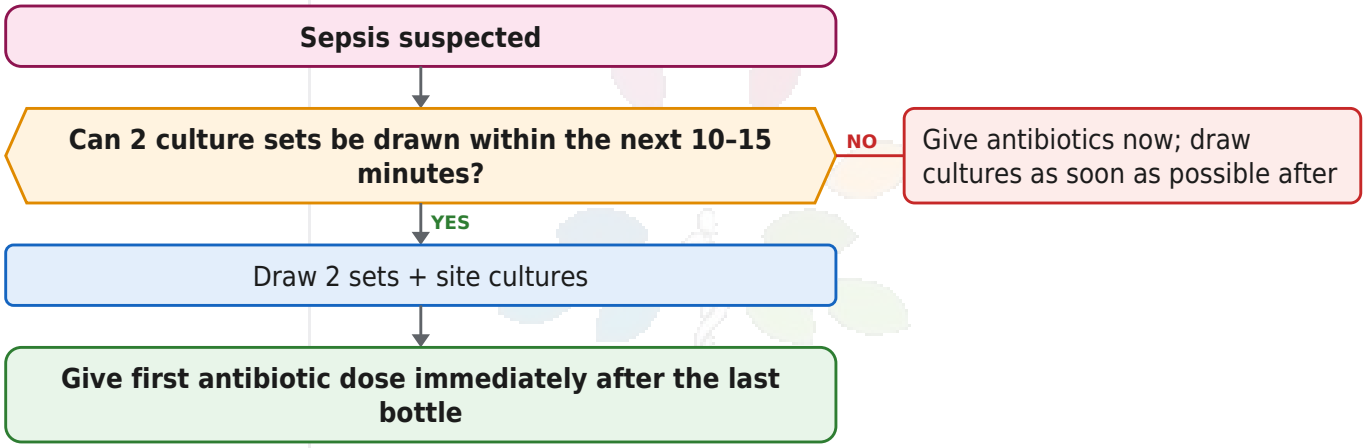
Two sets of blood cultures before antibiotics

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

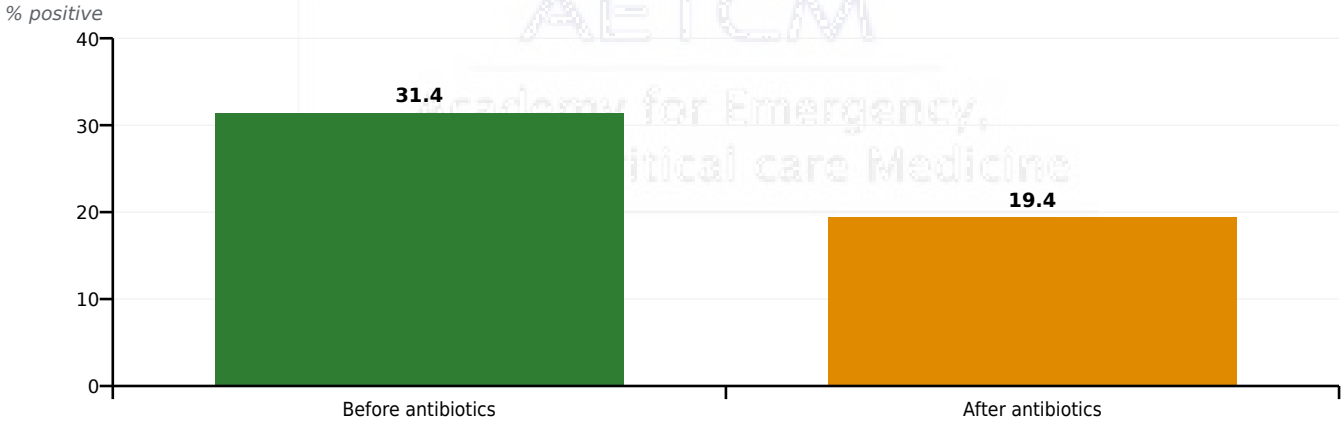
Blood culture technique — getting it right

Step	Standard	Common error
Number of sets	2 (aerobic + anaerobic bottle per set)	Single set — cannot judge contaminants
Volume	8–10 mL per bottle (16–20 mL per set)	Under-filling — yield falls ~3% per mL
Sites	Two separate venepunctures	Both from the same line
Antisepsis	2% CHG in 70% alcohol, dry 30 s	Touching the site after cleaning
Timing	Before antibiotics, within minutes	After antibiotics, hours later
Transport	To lab within 2 h, room temperature	Refrigeration

Cultures and antibiotics — never a trade-off



Blood culture positivity before vs after antibiotics (Cheng, Ann Intern Med 2019)



GOLDEN PEARL

Fill the bottle. A half-filled bottle is a half-done culture.

‹ Back to Step 11 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CHG – chlorhexidine gluconate


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 12

Culture every suspected site

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Collect cultures from other suspected sites — urine, sputum or tracheal aspirate, wounds, pus, CSF or catheters.

WHY IT MATTERS

Finding the source tells you which antibiotic, which duration and whether source control is needed. Site cultures often grow when blood cultures do not.

HOW TO DO IT AT THE BEDSIDE

- Urine: mid-stream or fresh catheter sample (never from the bag) for microscopy and culture.
- Respiratory: sputum or endotracheal aspirate; consider BAL when ventilated.
- Pus and tissue in a sterile container — swabs are inferior.
- CSF if meningitis is suspected (after CT if indicated), with cell count, glucose, protein, Gram stain.
- Add rapid tests where relevant: malaria RDT/smear, dengue NS1, scrub typhus IgM, leptospira, influenza/COVID PCR.

WATCH OUT

- Do not delay antibiotics for LP or imaging.
- Catheter-tip cultures only when CRBSI is suspected — routine tip culture is wasteful.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest pathogen-specific rapid tests on a case-by-case basis.

Conditional · Low certainty

CULTURE POSITIVITY BY SITE

Positive cultures identify the organism in only about half of sepsis cases. Site cultures add yield when blood cultures are negative: urine (urosepsis) is positive in most pyelonephritis; respiratory samples in about 40–60% of pneumonia; pus and tissue from abscesses or necrotising infection have the highest yield. A negative culture does not exclude infection — act on the clinical picture and de-escalate carefully.

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | IDSA microbiology guide (Miller 2018) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 12 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **BAL** – bronchoalveolar lavage; **CRBSI** – catheter-related bloodstream infection; **CSF** – cerebrospinal fluid; **CT** – computed tomography; **IDSA** – Infectious Diseases Society of America; **IgM** – immunoglobulin M; **LP** – lumbar puncture; **NS1** – non-structural protein 1 (dengue antigen); **PCR** – polymerase chain reaction; **RDT** – rapid diagnostic test; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 12

Culture every suspected site

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Site-specific samples in sepsis

Suspected source	Sample	Rapid / additional test
Pneumonia	Sputum or tracheal aspirate, BAL	Urinary pneumococcal & Legionella antigen; influenza/COVID PCR
Urinary	Mid-stream or fresh catheter urine	Urine microscopy; USG KUB for obstruction
Intra-abdominal / biliary	Pus, bile, ascitic fluid (in blood-culture bottles)	Ascitic PMN ≥ 250/µL = SBP
Skin & soft tissue	Pus aspirate or tissue biopsy	LRINEC, surgical exploration if necrotising
CNS	CSF	Gram stain, cell count, glucose, protein, multiplex PCR
Catheter / device	Paired central & peripheral blood cultures	Differential time to positivity ≥ 2 h
Tropical fever (India)	Peripheral smear	Malaria RDT, dengue NS1/IgM, scrub typhus IgM, leptospira IgM

GOLDEN PEARL

Find the source. Blood tells you there is a fire; the site tells you where it is burning.

‹ Back to Step 12 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BAL – bronchoalveolar lavage; **CNS** – central nervous system; **CSF** – cerebrospinal fluid; **IgM** – immunoglobulin M; **KUB** – kidneys, ureters, bladder; **NS1** – non-structural protein 1 (dengue antigen); **PCR** – polymerase chain reaction; **PMN** – polymorphonuclear neutrophils; **RDT** – rapid diagnostic test; **SBP** – systolic blood pressure; in ascites — spontaneous bacterial peritonitis; **USG** – ultrasonography
LRINEC (Laboratory Risk Indicator for Necrotising Fasciitis): Six blood tests (CRP, WBC, Hb, Na, creatinine, glucose); ≥ 6 suggests necrotising fasciitis — never use it to exclude. **Calculator / source** › **see Step 41** ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 13

Complete blood count with differential

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Obtain a complete blood count with differential and platelet count.

WHY IT MATTERS

The CBC contributes to SIRS, SOFA and DIC scoring and points to the cause: neutropenia changes empirical therapy, thrombocytopenia is part of organ dysfunction and of tropical infections, and a falling haemoglobin may mean bleeding.

HOW TO DO IT AT THE BEDSIDE

- Note WBC (> 12 000 or < 4 000 /µL, or > 10% bands), neutrophil count, platelets and haemoglobin.
- ANC < 500/µL (or expected to fall) = febrile neutropenia pathway; antipseudomonal β-lactam within 1 hour.
- Platelets < 100 000 = SOFA ≥ 2 for coagulation; look for DIC, dengue, malaria, leptospirosis, scrub typhus.
- Request a peripheral smear for malaria parasites, fragmented cells (TMA/DIC) and toxic granulation.

WATCH OUT

- Leucopenia in sepsis carries a worse prognosis than leucocytosis.
- A normal WBC does not exclude bacterial infection, particularly in the elderly.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Sepsis is a clinical diagnosis; laboratory values support the assessment of organ dysfunction.
Good practice statement

EVIDENCE & FURTHER READING — TAP TO OPEN

IDSA febrile neutropenia guideline (Freifeld 2011) · Sepsis-3 (Singer 2016) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 13 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ANC – absolute neutrophil count; **CBC** – complete blood count; **DIC** – disseminated intravascular coagulation; **IDSA** – Infectious Diseases Society of America; **TMA** – thrombotic microangiopathy; **WBC** – white blood cell count
SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. Calculator / source › see Step 3 ›
SIRS (systemic inflammatory response syndrome): ≥ 2 of: temp > 38 or < 36 °C, HR > 90, RR > 20 or $PaCO_2$ < 32, WBC > 12 000 or < 4 000 or > 10% bands. Sensitive, not specific. Calculator / source › see Step 4 ›
Sepsis-3: 2016 definitions: sepsis = infection + acute SOFA rise ≥ 2; septic shock = vasopressor for MAP ≥ 65 + lactate > 2 despite fluids. Calculator / source › see Step 2 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 13

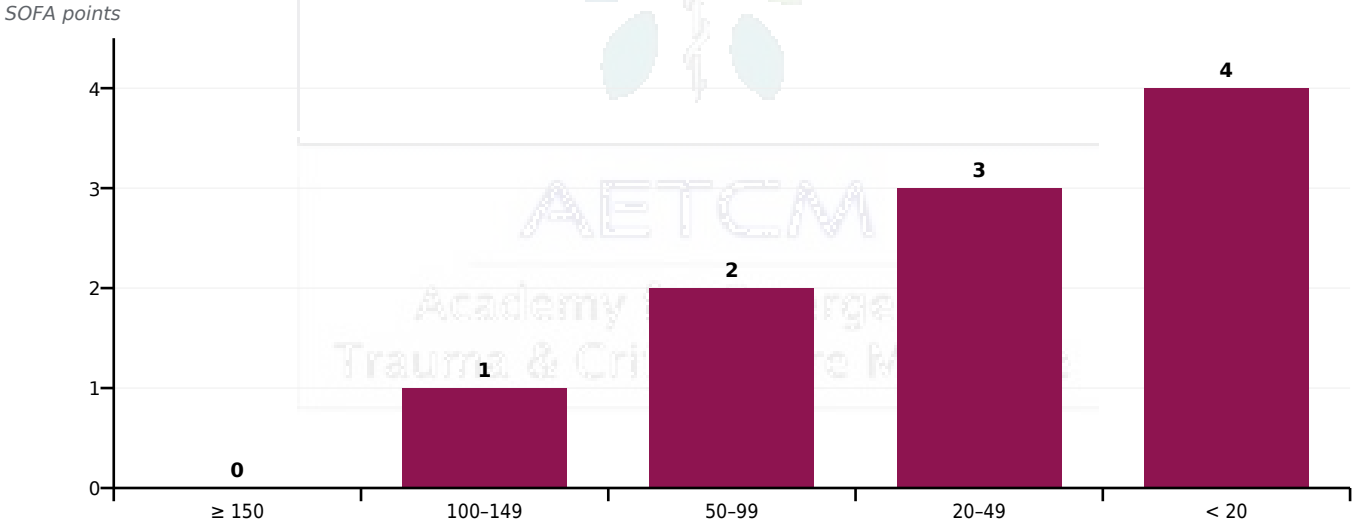
Complete blood count with differential

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Reading the CBC in sepsis

Finding	Threshold	Think of
Leucocytosis	WBC > 12 000 /µL	Bacterial infection, stress, steroids
Leucopenia	WBC < 4 000 /µL	Overwhelming sepsis, viral, typhoid, marrow failure
Neutropenia	ANC < 500 /µL	Chemotherapy — febrile neutropenia emergency
Bandaemia	> 10% bands	Bacterial sepsis
Thrombocytopenia	< 100 000 /µL	DIC, dengue, malaria, leptospirosis, scrub typhus, HIT
Anaemia	Hb < 7 g/dL	Bleeding, haemolysis (malaria, clostridia), marrow suppression
Lymphopenia	< 1 000 /µL	Immunoparalysis, poor prognosis

Platelet count and SOFA coagulation points



GOLDEN PEARL

Neutropenic fever is a one-hour emergency, even when the patient looks well.

‹ Back to Step 13 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **ANC** – absolute neutrophil count; **CBC** – complete blood count; **DIC** – disseminated intravascular coagulation; **Hb** – haemoglobin; **HIT** – heparin-induced thrombocytopenia; **WBC** – white blood cell count
SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. Calculator / source › see Step 3 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 14

Comprehensive metabolic panel

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Order a comprehensive metabolic panel — renal function, electrolytes, bilirubin and liver enzymes.

WHY IT MATTERS

Creatinine and bilirubin are two of the six SOFA organ systems. Electrolytes guide fluid choice and identify life-threatening hyperkalaemia, hypokalaemia and hyponatraemia, and the bicarbonate and anion gap tell you about acidosis.

HOW TO DO IT AT THE BEDSIDE

- Creatinine and urea (AKI staging — Step 76), sodium, potassium, chloride, bicarbonate.
- Bilirubin, ALT/AST, ALP, albumin (cholangitis, hepatitis, shock liver).
- Calcium, magnesium and phosphate (Step 69).
- Calculate anion gap: $Na^+ - (Cl^- + HCO_3^-)$; correct for albumin (+2.5 per 1 g/dL fall below 4).
- Add amylase/lipase, CK and troponin when clinically indicated.

WATCH OUT

- A “normal” creatinine in an elderly, wasted patient may hide a large fall in GFR.
- Hyperchloraemia after large saline volumes worsens acidosis (Step 30).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Laboratory organ-function tests underpin SOFA scoring and therapeutic drug monitoring decisions.
Supporting practice

Inflammatory markers and albumin in sepsis

Marker	Kinetics / values	Use in sepsis	Pitfalls
Procalcitonin (PCT)	Rises 2–4 h, peaks 12–24 h; < 0.25 bacterial unlikely; > 0.5 possible; > 2 likely bacterial sepsis	Supports STOPPING antibiotics (< 0.5 or ≥ 80% fall) — not for starting (SSC 2026)	↑ trauma, surgery, burns, pancreatitis, cardiogenic shock, CKD
CRP	Rises 6–8 h, peaks ~48 h; often > 100 mg/L in bacterial sepsis	Trend response; falling CRP is reassuring	Non-specific; ↑ in any inflammation; slow
Ferritin	Acute-phase; > 3 000–10 000 ng/mL is extreme	Consider HLH / MAS (hyperferritinaemic sepsis), dengue, Still's	↑ liver disease, transfusion, iron overload
Albumin (low)	Falls with capillary leak and reduced synthesis; < 2.5 g/dL is common in shock	Marker of severity and poor prognosis; correct anion gap & calcium	↑ free fraction of protein-bound drugs (ceftriaxone, ertapenem); do not ‘treat the number’

EVIDENCE & FURTHER READING — TAP TO OPEN

Sepsis-3 (Singer 2016) · SMART trial (Semler 2018) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 14 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **ALP** – alkaline phosphatase; **ALT** – alanine aminotransferase; **AST** – aspartate aminotransferase; **CK** – creatine kinase; **CKD** – chronic kidney disease; **CRP** – C-reactive protein; **GFR** – glomerular filtration rate; **HLH** – haemophagocytic lymphohistiocytosis; **MAS** – macrophage activation syndrome; **PCT** – procalcitonin; **SSC** – Surviving Sepsis Campaign
SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. **Calculator / source › see Step 3 ›**
Sepsis-3: 2016 definitions: sepsis = infection + acute SOFA rise ≥ 2; septic shock = vasopressor for MAP ≥ 65 + lactate > 2 despite fluids. **Calculator / source › see Step 2 ›**
Drug information (RxList — tap): Ceftriaxone · Ertapenem · Albumin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 14

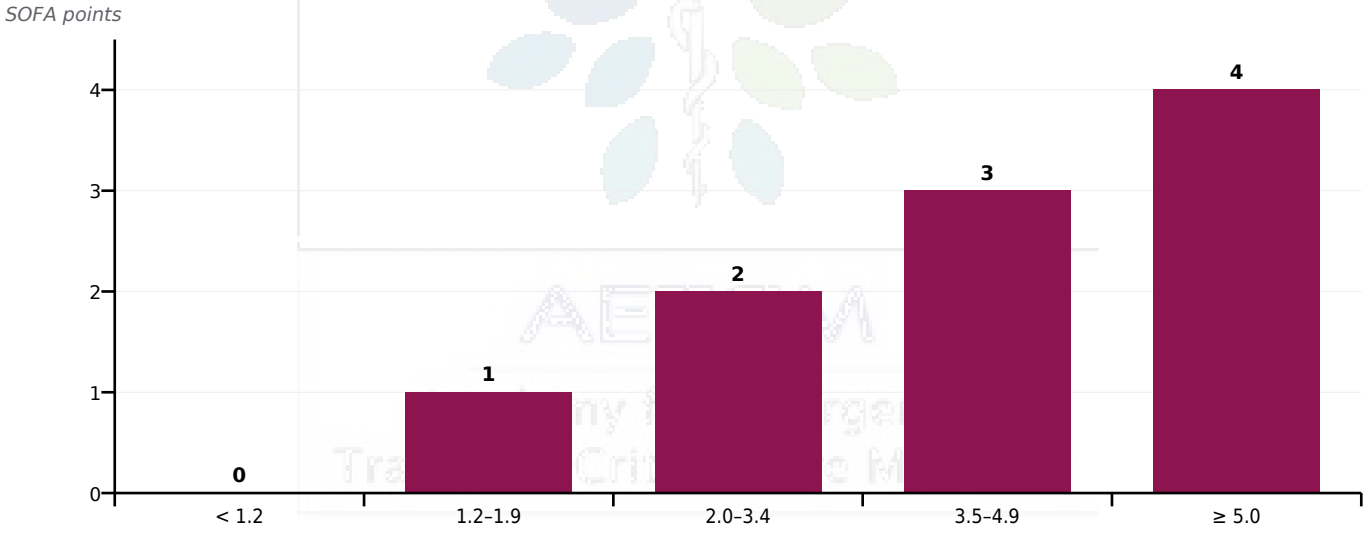
Comprehensive metabolic panel

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Metabolic panel — the formulas you need

Measure	Formula	Normal / target
Anion gap	$Na^+ - (Cl^- + HCO_3^-)$	8–12 mmol/L
Albumin-corrected AG	AG + 2.5 × (4 − albumin g/dL)	8–12 mmol/L
Delta ratio	$(AG - 12) \div (24 - HCO_3^-)$	1–2 = pure HAGMA
Corrected calcium	Ca + 0.8 × (4 − albumin g/dL)	8.5–10.5 mg/dL
Creatinine clearance (Cockcroft-Gault)	[(140 − age) × wt kg] ÷ (72 × S.Cr) × 0.85 if female	> 90 mL/min
Serum osmolality	2 Na + glucose/18 + urea/6 (mg/dL)	275–295 mOsm/kg

Creatinine (mg/dL) and SOFA renal points



GOLDEN PEARL

Calculate the anion gap every time. It costs nothing and tells you whether acidosis is lactate, ketones, kidneys or chloride.

‹ Back to Step 14 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AG – anion gap; **HAGMA** – high anion gap metabolic acidosis
SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis.
Calculator / source › see Step 3 ›
Drug information (RxList — tap): Albumin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 15

Coagulation studies and DIC screening

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Check coagulation — PT/INR, aPTT and fibrinogen (with D-dimer) when coagulopathy or DIC is suspected.

WHY IT MATTERS

Sepsis-induced coagulopathy precedes overt DIC and carries a higher mortality. Identifying it guides procedures, blood-product use, anticoagulant prophylaxis and the search for purpura fulminans.

HOW TO DO IT AT THE BEDSIDE

- Send PT/INR, aPTT, fibrinogen, D-dimer and platelets in all patients with shock or bleeding.
- Calculate the SIC score (Iba) early and the ISTH overt DIC score when indicated.
- Repeat 12–24-hourly — the trend matters more than a single value.
- Treat the infection; give products only for bleeding or before procedures (Step 89).

WATCH OUT

- Fibrinogen is an acute-phase reactant — a “normal” value may be falling.
- Purpura fulminans (meningococcus, pneumococcus, splenectomy) needs immediate antibiotics and ICU.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Products are not given to correct laboratory values in the absence of bleeding; restrictive transfusion is recommended.
Strong · Moderate certainty (transfusion)

EVIDENCE & FURTHER READING — TAP TO OPEN

ISTH overt DIC score (Taylor 2001) · Sepsis-induced coagulopathy (Iba) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 15 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **aPTT** – activated partial thromboplastin time; **DIC** – disseminated intravascular coagulation; **ICU** – intensive care unit; **INR** – international normalised ratio; **ISTH** – International Society on Thrombosis and Haemostasis; **PT** – prothrombin time; **SIC** – sepsis-induced coagulopathy


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 15

Coagulation studies and DIC screening

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

ISTH overt DIC score (Taylor 2001)

Item	0	1	2	3
Platelets (×10⁹/L)	> 100	50–100	< 50	—
Fibrin marker (D-dimer)	No increase	—	Moderate increase	Strong increase
PT prolongation (s)	< 3	3–6	> 6	—
Fibrinogen (g/L)	> 1.0	< 1.0	—	—

Sepsis-induced coagulopathy (SIC) score — total ≥ 4 = SIC

Item	1 point	2 points
Platelets (×10⁹/L)	100–150	< 100
PT-INR	1.2–1.4	> 1.4
SOFA (resp + CVS + liver + renal)	1	≥ 2

ISTH score ≥ 5 = overt DIC: repeat daily. < 5: suggestive of non-overt DIC — repeat in 24–48 h.

Coagulation tests in sepsis — including aPTT

Test	Normal	In sepsis / DIC	Other causes of abnormality
PT / INR	11–13.5 s / 0.9–1.2	Prolonged (factor consumption, vitamin K deficiency)	Warfarin, liver disease
aPTT	25–35 s	Prolonged in DIC, heparin infusion, severe liver failure	Heparin, factor VIII/IX/XI deficiency, lupus anticoagulant (no bleeding)
Fibrinogen	2–4 g/L	Falls in overt DIC (may be 'normal' but falling)	Liver failure, massive transfusion
D-dimer	< 0.5 mg/L FEU	Markedly raised	VTE, surgery, age, pregnancy
Platelets	150–400 ×10⁹/L	Falling	HIT, TTP, dengue, malaria, drugs

GOLDEN PEARL

Falling platelets plus a rising INR in a septic patient is SIC — look harder for the source and treat it faster.

‹ Back to Step 15 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

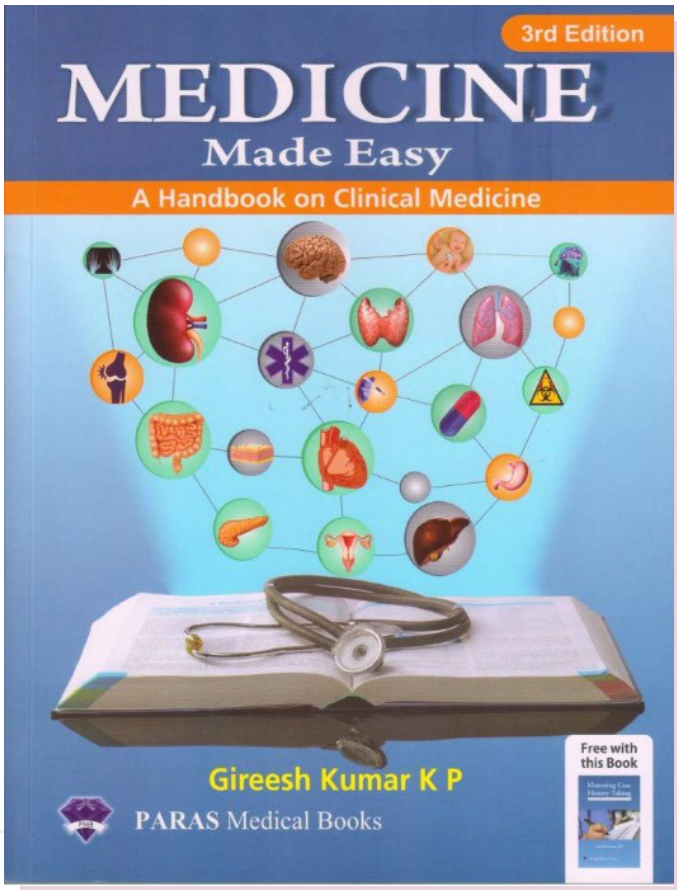
Abbreviations: **aPTT** – activated partial thromboplastin time; **DIC** – disseminated intravascular coagulation; **HIT** – heparin-induced thrombocytopenia; **INR** – international normalised ratio; **ISTH** – International Society on Thrombosis and Haemostasis; **PT** – prothrombin time; **SIC** – sepsis-induced coagulopathy; **TTP** – thrombotic thrombocytopenic purpura; **VTE** – venous thromboembolism
SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. **Calculator / source** › **see Step 3** ›
Drug information (RxList — tap): Heparin · Vitamin k


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Medicine Made Easy

A concise, easy-to-read handbook of clinical medicine.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 16

Arterial or venous blood gas

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Obtain an arterial or venous blood gas for acid–base status, lactate and oxygenation.

WHY IT MATTERS

The blood gas is the fastest laboratory test in the department: pH, $PaCO_2$, bicarbonate, lactate, potassium, sodium, glucose and haemoglobin in two minutes. An ABG adds the PaO_2/FiO_2 ratio that grades lung injury.

HOW TO DO IT AT THE BEDSIDE

- VBG is adequate for pH, bicarbonate, lactate and electrolytes; venous pH ≈ arterial − 0.03.
- ABG when oxygenation or $PaCO_2$ matters (respiratory failure, ventilation, ARDS grading).
- Use a systematic approach: pH → primary process → compensation (Winter's) → anion gap → delta ratio.
- Calculate P/F ratio: $PaO_2 \div FiO_2$ (e.g., 80 ÷ 0.4 = 200).

WATCH OUT

- A normal pH can hide a mixed disorder — always calculate compensation.
- Rising $PaCO_2$ in a tiring septic patient = imminent respiratory arrest (Step 23).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest oxygenation be assessed by SpO_2 or arterial blood gas with clinical examination; bicarbonate only for pH ≤ 7.2 with AKI stage 2–3.

Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

BICAR-ICU (Jaber, Lancet 2018) | Berlin definition of ARDS (2012) | Radiopaedia: ARDS chest X-ray | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 16 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **ABG** – arterial blood gas; **AKI** – acute kidney injury; **ARDS** – acute respiratory distress syndrome; **FiO_2** – fraction of inspired oxygen; **ICU** – intensive care unit; **$PaCO_2$** – arterial partial pressure of CO_2; **PaO_2** – arterial partial pressure of oxygen; **SpO_2** – peripheral oxygen saturation; **VBG** – venous blood gas


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 16

Arterial or venous blood gas

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Five-step blood gas interpretation

1. pH: < 7.35 acidaemia · > 7.45 alkalaemia

↓

2. Primary process: HCO_3^- ↓ = metabolic acidosis · $PaCO_2$ ↑ = respiratory acidosis

↓

3. Compensation — Winter's: expected $PaCO_2$ = 1.5 × HCO_3^- + 8 (± 2)

↓

Measured $PaCO_2$ within expected range?

NO → Higher = added respiratory acidosis (tiring!); lower = added respiratory alkalosis

YES ↓

4. Anion gap (corrected for albumin) — HAGMA vs NAGMA

↓

5. Delta ratio: < 1 additional NAGMA (saline) · > 2 additional metabolic alkalosis

P/F ratio and Berlin ARDS severity (PEEP ≥ 5 cm H_2O)

Severity	PaO_2/FiO_2	Approximate mortality
Mild	201–300	~27%
Moderate	101–200	~32%
Severe	≤ 100	~45%

SEE THE X-RAY — ARDS ON RADIOPAEDIA (TAP TO OPEN)

Radiopaedia: acute respiratory distress syndrome — chest X-ray cases

GOLDEN PEARL

Winter's formula in a septic patient tells you whether the lungs are still coping. When they are not, intubate before the arrest.

‹ Back to Step 16 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ARDS – acute respiratory distress syndrome; **FiO_2** – fraction of inspired oxygen; **HAGMA** – high anion gap metabolic acidosis; **NAGMA** – normal anion gap metabolic acidosis; **$PaCO_2$** – arterial partial pressure of CO_2; **PaO_2** – arterial partial pressure of oxygen; **PEEP** – positive end-expiratory pressure
Drug information (RxList — tap): Albumin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 17

Early portable chest radiograph

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Order a portable chest radiograph early to look for pneumonia, effusion or pulmonary oedema.

WHY IT MATTERS

Pneumonia is the commonest source of sepsis. The chest film locates the source, shows complications (empyema, abscess, ARDS) and gives a baseline before large fluid volumes and central lines.

HOW TO DO IT AT THE BEDSIDE

- Portable AP film in resuscitation — do not move an unstable patient to the department.
- Look for consolidation, air bronchograms, cavitation, effusion, bilateral infiltrates, pneumothorax.
- Check the position of lines and tubes on every film after insertion.
- Use lung ultrasound when the film is equivocal or unavailable (Step 18).

WATCH OUT

- The early film may be normal in dehydrated patients — infiltrates appear after fluids.
- Bilateral infiltrates with hypoxaemia: think ARDS, fluid overload, PJP, leptospirosis or tuberculosis.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Rapidly evaluate for the anatomical source of infection.
Good practice statement

EVIDENCE & FURTHER READING — TAP TO OPEN

Radiopaedia: pneumonia | IDSA/ATS CAP guideline 2019 | Radiopaedia: ARDS chest X-ray | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 17 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ARDS – acute respiratory distress syndrome; **ATS** – American Thoracic Society; **CAP** – community-acquired pneumonia; **IDSA** – Infectious Diseases Society of America; **PJP** – Pneumocystis jirovecii pneumonia


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 17

Early portable chest radiograph

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Chest radiograph in sepsis — what to look for

Finding	Suggests	Next step
Lobar consolidation	Bacterial pneumonia	CAP regimen, urinary antigens
Cavitation	S. aureus, Klebsiella, TB, anaerobes, melioidosis	Sputum AFB, CT, cover MRSA if severe
Effusion	Parapneumonic / empyema	Ultrasound-guided tap; pH < 7.2 → drain
Bilateral infiltrates + hypoxaemia	ARDS, oedema, PJP, leptospirosis	P/F ratio, echo, lung-protective ventilation
Air under diaphragm	Perforated viscus	Urgent surgical source control
Normal film, hypoxic	Early pneumonia, PE, sepsis-related V/Q mismatch	Lung ultrasound, CT

SEE THE X-RAY — ARDS ON RADIOPAEDIA (TAP TO OPEN)

Radiopaedia: acute respiratory distress syndrome — chest X-ray cases

GOLDEN PEARL

Every new line and tube deserves a film — and every film deserves a second look for the source.

‹ Back to Step 17 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AFB – acid-fast bacilli; **ARDS** – acute respiratory distress syndrome; **CAP** – community-acquired pneumonia; **CT** – computed tomography; **MRSA** – methicillin-resistant Staphylococcus aureus; **PE** – pulmonary embolism; **PJP** – Pneumocystis jirovecii pneumonia; **TB** – tuberculosis


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 18

Point-of-care ultrasound (POCUS)

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Perform point-of-care ultrasound of the heart, lungs and IVC / volume status.

WHY IT MATTERS

POCUS at the bedside answers three questions in minutes: Is the heart pumping? Is the patient filled? Where is the source? It identifies tamponade, severe LV or RV failure, pneumonia, effusions, hydronephrosis and abscesses, and warns when fluid is no longer helping.

HOW TO DO IT AT THE BEDSIDE

- Use a RUSH-style protocol: Pump (heart), Tank (IVC, lungs, abdomen), Pipes (aorta, DVT).
- Heart: LV function (eyeball), RV size, pericardial effusion.
- Lungs: B-lines (oedema/ARDS), consolidation, effusion.
- Source search: gallbladder, kidneys (hydronephrosis), soft-tissue abscess, free fluid.
- Repeat after each fluid bolus to detect emerging B-lines or venous congestion.

WATCH OUT

- IVC size alone poorly predicts fluid responsiveness — combine with dynamic tests.
- The adult SSC 2026 guideline did not evaluate POCUS; it was suggested for children. Use it as an adjunct, not a gate.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

POCUS was not formally evaluated in the adult guideline; the 2026 paediatric guideline gives a conditional recommendation for POCUS to guide resuscitation.

Not graded for adults

EVIDENCE & FURTHER READING — TAP TO OPEN

Perera 2010: RUSH exam · ESICM consensus on circulatory shock (Cecconi 2014) · ▶ POCUS video 1 · ▶ POCUS video 2 · ▶ POCUS video 3 · ▶ IVC POCUS video 1 · ▶ IVC POCUS video 2 · Radiopaedia: ARDS chest X-ray · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 18 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ARDS – acute respiratory distress syndrome; **DVT** – deep vein thrombosis; **ESICM** – European Society of Intensive Care Medicine; **IVC** – inferior vena cava; **LV** – left ventricle; **POCUS** – point-of-care ultrasound; **RUSH** – Rapid Ultrasound in Shock; **RV** – right ventricle; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 18

Point-of-care ultrasound (POCUS)

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

RUSH protocol — Pump, Tank, Pipes

Component	Look for	Septic picture	Alternative diagnosis
Pump — heart	LV contractility, RV size, effusion	Hyperdynamic LV (or septic cardiomyopathy)	Tamponade, massive PE (RV > LV), cardiogenic shock
Tank — IVC	Size and collapse	Small, collapsing early	Plethoric IVC: obstructive / cardiogenic / overload
Tank — lungs	A-lines, B-lines, consolidation, effusion	Consolidation (source)	Diffuse B-lines: pulmonary oedema; absent sliding: pneumothorax
Tank — abdomen	Free fluid, gallbladder, kidneys	Hydronephrosis, cholecystitis, abscess	Haemoperitoneum
Pipes	Aorta, leg veins	—	AAA, DVT

WATCH — POCUS VIDEOS (TAP TO OPEN ON YOUTUBE)

▶ POCUS video 1 ▶ POCUS video 2 ▶ POCUS video 3 ▶ IVC POCUS video 1 ▶ IVC POCUS video 2

GOLDEN PEARL

Look before you pour. Thirty seconds of ultrasound can stop the third unnecessary litre.

‹ Back to Step 18 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AAA – abdominal aortic aneurysm; **DVT** – deep vein thrombosis; **IVC** – inferior vena cava; **LV** – left ventricle; **PE** – pulmonary embolism; **RUSH** – Rapid Ultrasound in Shock; **RV** – right ventricle


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 19

Evaluate non-infectious mimics

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Consider non-infectious mimics — pancreatitis, acute MI, pulmonary embolism, adrenal crisis and others.

WHY IT MATTERS

Up to one in five patients treated for sepsis in the ED turn out to have another diagnosis. Anchoring on sepsis delays specific treatment for a condition that may be equally lethal — and exposes the patient to unnecessary antibiotics.

HOW TO DO IT AT THE BEDSIDE

- Ask: does the story, examination and source fit infection?
- ECG and troponin in every shocked patient; echo for RV strain or regional wall-motion abnormality.
- Lipase, glucose and ketones, cortisol (if adrenal crisis suspected), TSH when clinically suggested.
- Review drugs: toxidromes, anaphylaxis, serotonin syndrome, NMS, drug fever.
- Treat sepsis while you exclude mimics — but stop antibiotics when an alternative is confirmed (Step 53).

WATCH OUT

- Mimics and sepsis can coexist (e.g., infected pancreatic necrosis, pneumonia triggering MI).
- Hypotension unresponsive to fluids and vasopressors in a steroid user: give hydrocortisone 100 mg IV.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

For possible sepsis without shock, rapidly assess for infectious versus non-infectious causes of acute illness.
Good practice statement

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Sepsis mimics in the ED | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 19 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ECG – electrocardiogram; **ED** – emergency department; **IV** – intravenous; **MI** – myocardial infarction; **NMS** – neuroleptic malignant syndrome; **RV** – right ventricle; **SSC** – Surviving Sepsis Campaign; **TSH** – thyroid-stimulating hormone
Drug information (RxList — tap): Hydrocortisone


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 19

Evaluate non-infectious mimics

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

Mimics of sepsis — the clues

Mimic	Clue	Confirm with
Acute pancreatitis	Epigastric pain to back, alcohol/gallstones	Lipase > 3× ULN, CT
Acute MI / cardiogenic shock	Chest pain, cold & wet, ECG changes	ECG, troponin, echo
Pulmonary embolism	Hypoxia, clear chest, RV dilatation	CTPA, echo, leg Doppler
Adrenal crisis	Steroid use, hyponatraemia, hyperkalaemia	Random cortisol; treat empirically
Anaphylaxis	Exposure, urticaria, wheeze	Clinical; tryptase
DKA / HHS	Glucose, ketones, Kussmaul breathing	Blood ketones, VBG
Thyroid storm	Hyperpyrexia, AF, agitation	TSH, free T4
Toxidromes / heat stroke / NMS	Drug history, rigidity, environment	CK, drug screen
GI bleed / haemorrhage	Melaena, falling Hb	Hb trend, endoscopy

ECG library: anterior myocardial infarction (LITFL)

AETCM

GOLDEN PEARL

When the patient is not getting better, ask the bravest question in medicine: "Is this really sepsis?"

‹ Back to Step 19 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AF – atrial fibrillation; **CK** – creatine kinase; **CT** – computed tomography; **CTPA** – CT pulmonary angiography; **DKA** – diabetic ketoacidosis; **ECG** – electrocardiogram; **GI** – gastrointestinal; **Hb** – haemoglobin; **HHS** – hyperosmolar hyperglycaemic state; **MI** – myocardial infarction; **NMS** – neuroleptic malignant syndrome; **RV** – right ventricle; **TSH** – thyroid-stimulating hormone; **ULN** – upper limit of normal; **VBG** – venous blood gas


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 20

Escalate to critical care early

1. Triage, Recognition & Diagnostics · Page 1 of 2 — the step

THE GOLDEN STEP

Escalate immediately to critical care / ICU for shock or evolving organ failure.

WHY IT MATTERS

Delay in ICU admission is associated with higher mortality. Early involvement of the critical-care team brings expertise in vasopressors, ventilation and invasive monitoring before the patient deteriorates — and is now a guideline target.

HOW TO DO IT AT THE BEDSIDE

- Refer at the first sign of septic shock, lactate ≥ 4, respiratory failure, GCS ≤ 12 or rising NEWS2.
- Use SBAR when referring: Situation, Background, Assessment, Recommendation.
- Continue resuscitation in the ED while awaiting a bed — the ICU is a level of care, not a room.
- Aim for ICU arrival within 6 hours of the decision to admit.

WATCH OUT

- Elderly or frail patients deserve the same timely discussion — base limitations on goals of care, not age alone (Step 94).
- Document the escalation plan and ceiling of care if ICU is not appropriate.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

For adults with sepsis or septic shock who require ICU admission, suggest admitting them within 6 hours.

Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | ED boarding and sepsis outcomes | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 20 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ED – emergency department; **ICU** – intensive care unit; **SBAR** – Situation, Background, Assessment, Recommendation; **SSC** – Surviving Sepsis Campaign

NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. Calculator / source › see Step 1 ›

GCS (Glasgow Coma Scale): Eye 1–4 + Verbal 1–5 + Motor 1–6 = 3–15; ≤ 8 usually means the airway is at risk. Calculator / source › see Step 8 ›

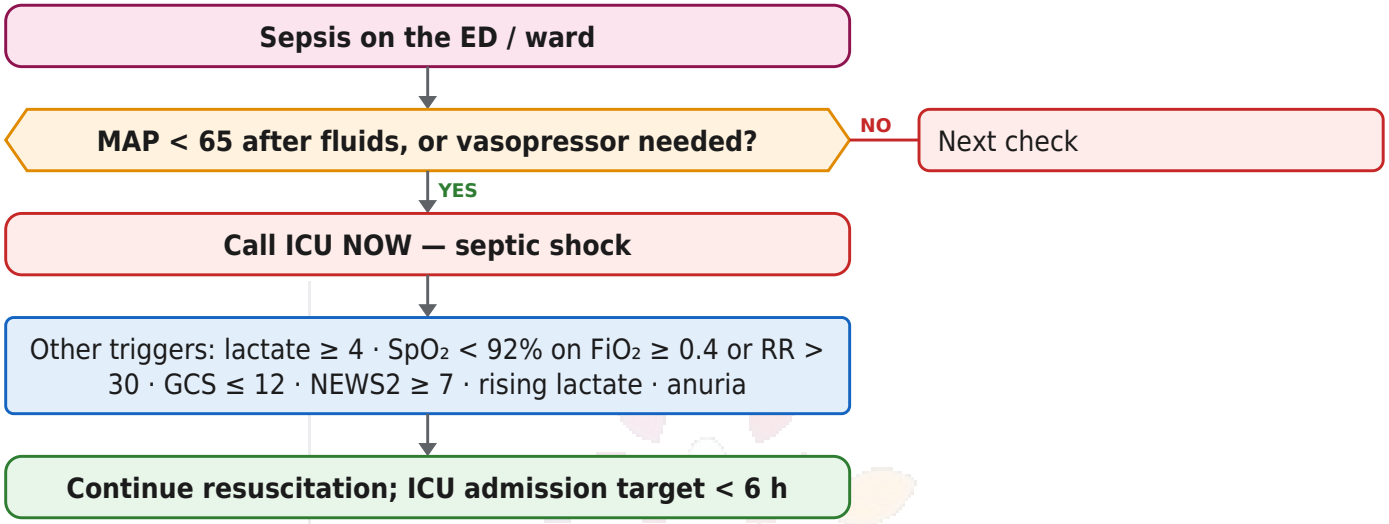

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 20

Escalate to critical care early

1. Triage, Recognition & Diagnostics · Page 2 of 2 — tables, graphs & algorithm

When to call the ICU



SBAR referral template

	What to say
S — Situation	"Mr X, 62 y, septic shock from pneumonia, on norepinephrine 0.2 µg/kg/min."
B — Background	Comorbidities, functional baseline, time zero, cultures/antibiotics given
A — Assessment	Vitals, lactate trend, SOFA, fluids given, urine output, airway concerns
R — Recommendation	"I would like ICU admission now; airway plan agreed; family informed."

GOLDEN PEARL

Call early and keep resuscitating. The best ICU admissions are the ones that arrive before the arrest.

‹ Back to Step 20 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

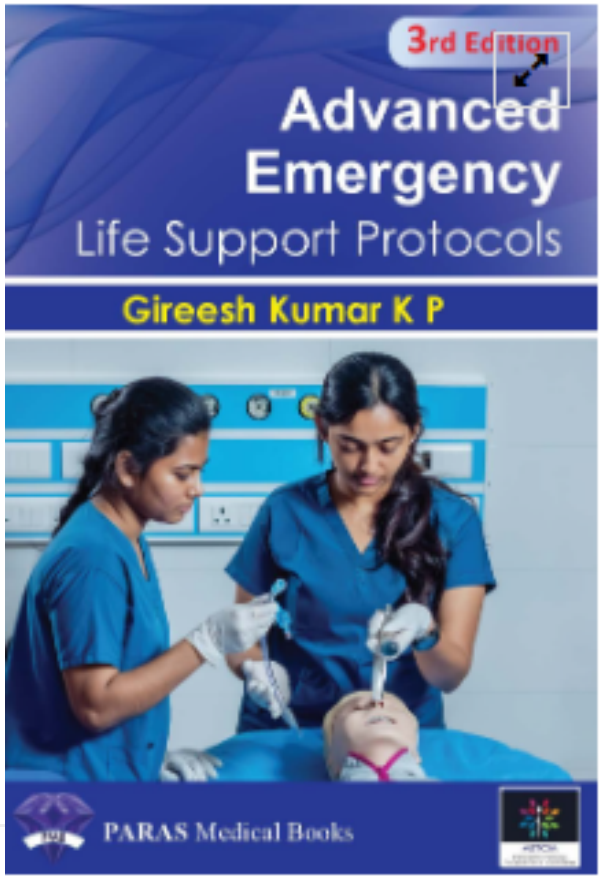
Abbreviations: ED – emergency department; **FiO_2** – fraction of inspired oxygen; **ICU** – intensive care unit; **MAP** – mean arterial pressure; **RR** – respiratory rate; **SBAR** – Situation, Background, Assessment, Recommendation; **SpO_2** – peripheral oxygen saturation
NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. Calculator / source › see Step 1 ›
SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. Calculator / source › see Step 3 ›
GCS (Glasgow Coma Scale): Eye 1–4 + Verbal 1–5 + Motor 1–6 = 3–15; ≤ 8 usually means the airway is at risk. Calculator / source › see Step 8 ›
Drug information (RxList — tap): Norepinephrine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Advanced Emergency Life Support Protocols

Step-by-step emergency and resuscitation protocols for the emergency department and wards.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 21

Open and protect the airway

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Open and protect the airway when consciousness or airway reflexes are compromised.

WHY IT MATTERS

A septic patient with a falling GCS can obstruct, vomit and aspirate. Airway management in sepsis is also high-risk for cardiovascular collapse: induction drugs and positive-pressure ventilation unmask hypovolaemia and vasoplegia. Plan both the airway and the circulation before you push any drug.

HOW TO DO IT AT THE BEDSIDE

- Basic manoeuvres first: head tilt–chin lift/jaw thrust, suction, recovery position, oro-/nasopharyngeal airway.
- Indications to intubate: GCS ≤ 8 or unable to protect airway, refractory hypoxaemia, exhaustion, severe shock with rising lactate.
- Resuscitate before induction: fluid bolus if responsive, norepinephrine running (or push-dose ready).
- Choose haemodynamically stable induction (ketamine 1–1.5 mg/kg or etomidate 0.2–0.3 mg/kg) at reduced dose; rocuronium 1.2 mg/kg.
- Pre-oxygenate with HFNC or NIV; use video laryngoscopy and a checklist.

WATCH OUT

- Post-intubation hypotension is common — have norepinephrine connected before induction.
- Avoid hyperventilation after intubation in patients who were compensating a metabolic acidosis — match their pre-intubation minute ventilation.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Treat sepsis and septic shock as medical emergencies with immediate resuscitation; HFNC is preferred over NIV for hypoxaemic respiratory failure.
Good practice · Conditional

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline · Ketamine vs etomidate RSI (Jabre, Lancet 2009) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 21 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: HFNC – high-flow nasal cannula; **NIV** – non-invasive ventilation; **SSC** – Surviving Sepsis Campaign
GCS (Glasgow Coma Scale): Eye 1–4 + Verbal 1–5 + Motor 1–6 = 3–15; ≤ 8 usually means the airway is at risk. Calculator / source › see Step 8 ›
Drug information (RxList — tap): Norepinephrine · Ketamine · Etomidate · Rocuronium


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 21

Open and protect the airway

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Peri-intubation algorithm for the septic patient

Decision to intubate

↓

Checklist, team roles, video laryngoscope, suction, bougie, front-of-neck kit

↓

SBP ≥ 100 and shock index < 0.9?

NO → Resuscitate first: bolus if responsive, start norepinephrine, push-dose ready

YES ↓

Pre-oxygenate 3–5 min (HFNC / NIV / BVM + PEEP); keep HFNC on for apnoeic oxygenation

↓

Induce: ketamine 1 mg/kg or etomidate 0.2 mg/kg + rocuronium 1.2 mg/kg

↓

Confirm with waveform capnography; lung-protective settings; sedation-analgesia plan

Induction and paralytic drugs in sepsis

Drug	Dose (adult)	Advantage	Caution
Ketamine	1–1.5 mg/kg IV (0.5–1 if shocked)	Preserves BP and airway reflexes	Catecholamine-depleted patients may still drop BP
Etomidate	0.2–0.3 mg/kg IV	Cardiovascular stability	Transient adrenal suppression
Propofol	Avoid or 0.5 mg/kg	—	Marked hypotension in shock
Rocuronium	1.2 mg/kg IV	Long safe apnoea window	Have sugammadex available
Succinylcholine	1.5 mg/kg IV	Short acting	Hyperkalaemia, rhabdomyolysis, prolonged immobility
Push-dose epinephrine	10–20 µg IV (10 µg/mL)	Rescue for peri-intubation hypotension	Bridge only — start an infusion

GOLDEN PEARL

In sepsis, resuscitate before you intubate. The airway is rarely the thing that kills — the induction drop is.

‹ Back to Step 21 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure; **HFNC** – high-flow nasal cannula; **IV** – intravenous; **NIV** – non-invasive ventilation; **PEEP** – positive end-expiratory pressure; **SBP** – systolic blood pressure
Shock index: HR ÷ SBP; normal 0.5–0.7; ≥ 0.9–1.0 suggests occult shock and higher mortality. **Calculator / source** › **see Step 7** ›
Drug information (RxList — tap): Norepinephrine · Epinephrine · Ketamine · Etomidate · Propofol · Rocuronium · Succinylcholine · Sugammadex


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 22

Supplemental oxygen to the right target

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Give supplemental oxygen to keep SpO_2 generally between 90% and 96% (88–92% in CO_2 retainers).

WHY IT MATTERS

Hypoxaemia worsens organ dysfunction, but hyperoxia has no benefit and may harm. The SSC 2026 panel did not pick between liberal and conservative strategies, but most experts aim for an SpO_2 of about 90–96%.

HOW TO DO IT AT THE BEDSIDE

- Start with nasal cannula or mask; escalate early to HFNC if SpO_2 < 92% on FiO_2 ≥ 0.4 or the work of breathing is high.
- Use 88–92% in COPD, obesity hypoventilation or neuromuscular disease with hypercapnia.
- Titrate down as well as up — avoid SpO_2 100% for hours.
- Record the device and flow rate with every SpO_2 reading; calculate SpO_2/FiO_2 (S/F).

WATCH OUT

- Peripheral vasoconstriction makes the probe unreliable — use an ear probe or ABG.
- Pulse oximeters may over-read in patients with darker skin — confirm borderline values with an ABG.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Liberal or conservative oxygen targets based on patient factors and resources (panelists typically target SpO_2 ~90–96%). For P/F < 200 (or S/F < 235), suggest HFNC over conventional oxygen. **Conditional · Low / Very low certainty**

EVIDENCE & FURTHER READING — TAP TO OPEN

HOT-ICU (Schjørring, NEJM 2021) · ICU-ROX (2020) · FLORALI (Frat, NEJM 2015) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 22 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ABG – arterial blood gas; **COPD** – chronic obstructive pulmonary disease; **FiO_2** – fraction of inspired oxygen; **HFNC** – high-flow nasal cannula; **ICU** – intensive care unit; **ROX** – ROX index — (SpO_2/FiO_2) ÷ respiratory rate; **SpO_2** – peripheral oxygen saturation; **SSC** – Surviving Sepsis Campaign

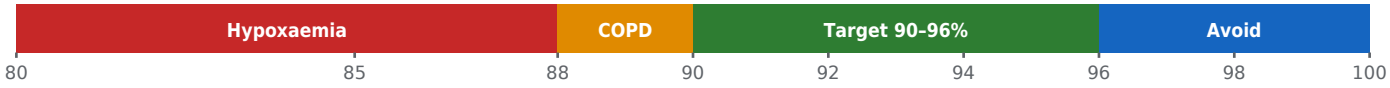

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 22

Supplemental oxygen to the right target

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

SpO_2 target (%) — most septic adults



Oxygen delivery devices

Device	Flow	Approx. FiO_2	Use in sepsis
Nasal cannula	1–6 L/min	0.24–0.44	Mild hypoxaemia
Simple face mask	5–10 L/min	0.35–0.55	Short-term
Venturi mask	Per valve (2–15 L/min)	0.24–0.60 fixed	CO_2 retainers
Non-rebreather mask	10–15 L/min	0.60–0.90	Bridge to HFNC / intubation
High-flow nasal cannula	30–60 L/min	0.21–1.0	First-line for hypoxaemic failure (SSC 2026)
NIV (CPAP / BiPAP)	—	0.21–1.0	Hypercapnia, cardiogenic oedema

S/F and P/F — quick conversion

SpO_2 / FiO_2 (S/F)	Approximate P/F	Meaning
315	300	Mild lung injury threshold
235	200	HFNC recommended (SSC 2026)
~150	~100	Severe hypoxaemia — prepare to intubate

GOLDEN PEARL

Aim for 90–96%, not 100%. Oxygen is a drug — prescribe it, titrate it, record it.

‹ Back to Step 22 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **BiPAP** – bilevel positive airway pressure; **COPD** – chronic obstructive pulmonary disease; **CPAP** – continuous positive airway pressure; **FiO_2** – fraction of inspired oxygen; **HFNC** – high-flow nasal cannula; **NIV** – non-invasive ventilation; **SpO_2** – peripheral oxygen saturation; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 23

Prepare for early intubation

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Prepare for early endotracheal intubation for severe hypoxaemia, exhaustion or worsening shock.

WHY IT MATTERS

Late intubation of a septic patient who has been tiring for hours is one of the most dangerous procedures in medicine. Recognising failure of HFNC or NIV early — and intubating in a controlled way — prevents peri-intubation arrest.

HOW TO DO IT AT THE BEDSIDE

- Start HFNC (40–60 L/min, FiO_2 titrated) as first-line for acute hypoxaemic respiratory failure.
- Calculate the ROX index (SpO_2/FiO_2 ÷ RR) at 2, 6 and 12 h: < 3.85 predicts HFNC failure.
- Consider an awake-prone trial if the patient tolerates it without sedation.
- Intubate for: rising $PaCO_2$, RR > 35, falling GCS, worsening shock or ROX failure.
- Do not let NIV hide failure — reassess within 1 hour.

WATCH OUT

- Delayed intubation after HFNC failure was associated with higher mortality in observational data.
- Large tidal volumes on NIV in hypoxaemic patients may worsen lung injury.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

HFNC as initial therapy over NIPPV, and over HFNC alternating with NIPPV; trial of awake proning in non-intubated patients without sedation.

Conditional · Low / Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

FLORALI (Frat, NEJM 2015) · ROX index (Roca 2019) · Kang 2015: delayed intubation after HFNC · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 23 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **FiO_2** – fraction of inspired oxygen; **HFNC** – high-flow nasal cannula; **NIPPV** – non-invasive positive-pressure ventilation; **NIV** – non-invasive ventilation; **$PaCO_2$** – arterial partial pressure of CO_2; **ROX** – ROX index — (SpO_2/FiO_2) ÷ respiratory rate; **RR** – respiratory rate; **SpO_2** – peripheral oxygen saturation **GCS** (Glasgow Coma Scale): Eye 1–4 + Verbal 1–5 + Motor 1–6 = 3–15; ≤ 8 usually means the airway is at risk. Calculator / source › see Step 8 ›

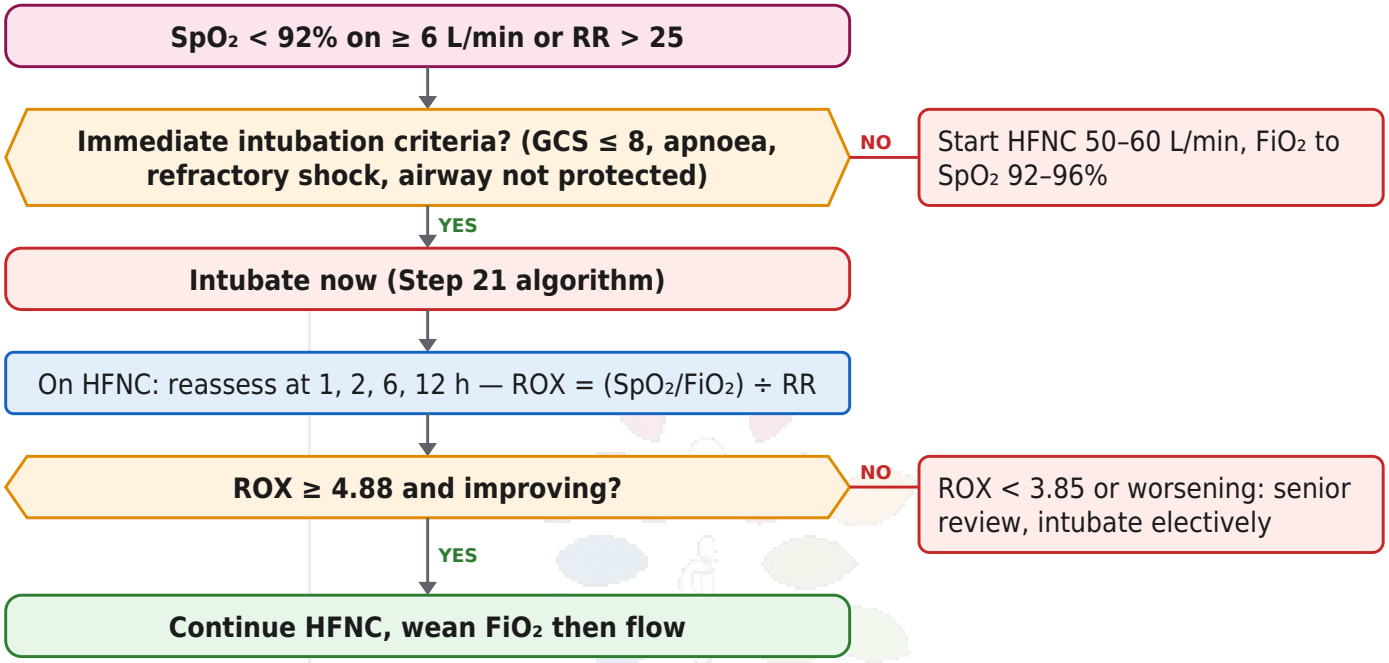

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 23

Prepare for early intubation

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Hypoxaemic septic patient — HFNC, NIV or intubate?



ROX index — worked examples

SpO₂	FiO₂	RR	ROX	Interpretation
94%	0.40	24	9.8	Success likely
92%	0.60	30	5.1	Watch
90%	0.80	34	3.3	Failure likely — intubate

GOLDEN PEARL

Intubate a septic patient when you choose to, not when the patient chooses for you.

‹ Back to Step 23 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **FiO₂** – fraction of inspired oxygen; **HFNC** – high-flow nasal cannula; **NIV** – non-invasive ventilation; **ROX** – ROX index — (SpO₂/FiO₂) ÷ respiratory rate; **RR** – respiratory rate; **SpO₂** – peripheral oxygen saturation
GCS (Glasgow Coma Scale): Eye 1–4 + Verbal 1–5 + Motor 1–6 = 3–15; ≤ 8 usually means the airway is at risk. **Calculator / source** › **see Step 8** ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 24

Two large-bore peripheral IV lines

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Establish at least two large-bore peripheral IV cannulae immediately.

WHY IT MATTERS

Resuscitation, antibiotics, blood samples and vasopressors all compete for access. Flow is proportional to the fourth power of the radius (Poiseuille) — a short wide cannula delivers fluid far faster than a long thin central line.

HOW TO DO IT AT THE BEDSIDE

- Two cannulae, 18G or larger, in the antecubital fossae or forearms.
- Use ultrasound guidance early for difficult access; consider an external jugular vein.
- Intraosseous access (humerus/tibia) if two attempts fail in a shocked patient — all drugs and fluids can be given.
- Draw cultures and blood tests at insertion if this does not delay therapy.
- Dedicate one line to vasopressors once started.

WATCH OUT

- A triple-lumen central line infuses slower than a 16G peripheral cannula.
- Check cannula sites hourly when infusing vasopressors peripherally.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Vasopressors may be started peripherally rather than delaying until central access is obtained.

Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Ultrasound-guided peripheral access | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 24 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: IV – intravenous; **SSC** – Surviving Sepsis Campaign

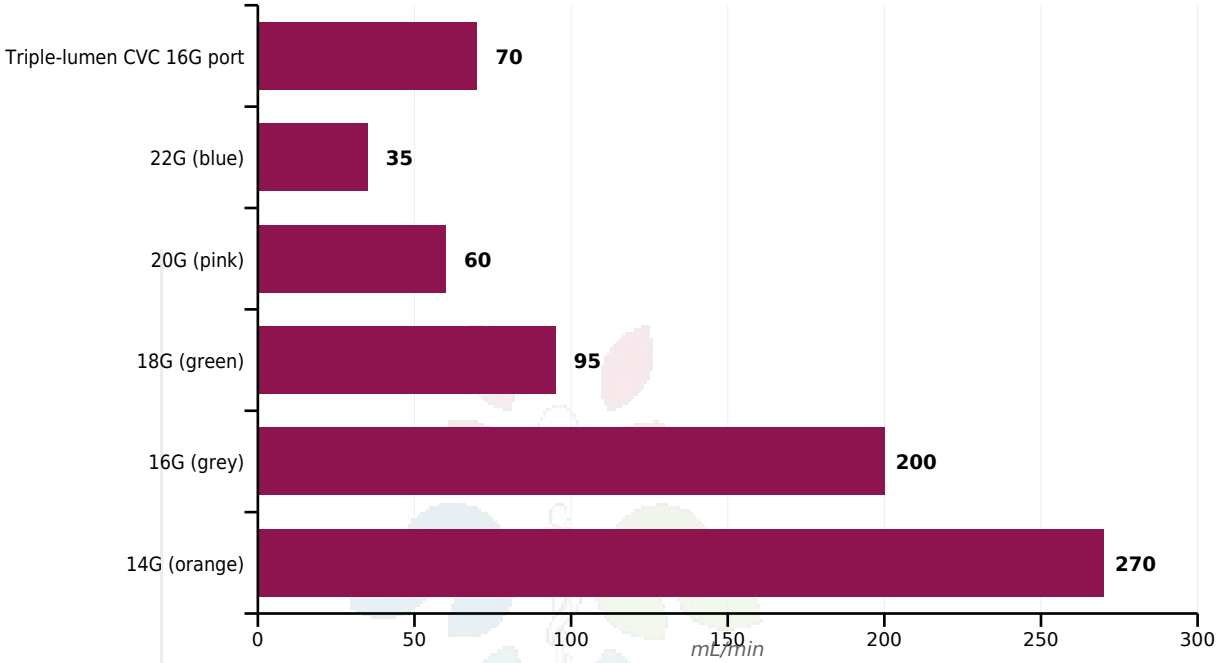

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 24

Two large-bore peripheral IV lines

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Approximate gravity flow by cannula size (mL/min, manufacturer data)



Access options in septic shock

Route	Time to insert	Flow	Notes
Peripheral 16–18G	1–3 min	High	First choice; two lines
Ultrasound-guided peripheral	3–5 min	High	Difficult access, obesity, oedema
Intraosseous	< 1 min	Moderate (pressure bag)	Rescue; painful in awake patient — lidocaine 40 mg IO
Central venous catheter	10–20 min	Lower per lumen	Vasopressors, CVP/$ScvO_2$; do not delay drugs for it

GOLDEN PEARL

Short and wide beats long and thin. Two good peripheral lines in the first ten minutes are worth more than a central line in the first hour.

‹ Back to Step 24 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CVC – central venous catheter; **CVP** – central venous pressure; **$ScvO_2$** – central venous oxygen saturation
Drug information (RxList — tap): Lidocaine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 25

Antimicrobials within the first hour

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Give broad-spectrum IV antimicrobials as soon as possible — ideally within 1 hour of recognition for shock or probable sepsis.

WHY IT MATTERS

For septic shock, each hour of delay in effective antibiotics is associated with a measurable rise in mortality. The 2026 guideline keeps the 1-hour target for shock and probable sepsis, and introduces a time-limited assessment (up to 3 hours) for possible sepsis without shock to avoid unnecessary antibiotics.

HOW TO DO IT AT THE BEDSIDE

- Decide the probability: possible, probable or delimited sepsis — with or without shock.
- Shock (possible or delimited) or probable sepsis: antibiotics immediately, ideally < 1 h from recognition.
- Possible sepsis without shock: rapid investigation; give antibiotics within 3 h if infection is still suspected.
- Prescribe, prepare and administer in the ED — do not wait for ward transfer.
- Prehospital antibiotics are suggested if transport > 60 min with a structured screening process.

WATCH OUT

- Antibiotics charted but not given are not given — record the administration time.
- Use loading doses (Step 27); the first dose is never renally adjusted.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Possible/probable/definite septic shock or probable sepsis: antimicrobials immediately, ideally within 1 h. Possible sepsis without shock: within 3 h of suspicion after time-limited investigation. Procalcitonin is not needed to start antimicrobials.

Strong / Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Kumar 2006: hypotension to antibiotics (CCM) · Seymour 2017: time to treatment (NEJM) · SSC Antibiotic Timing Framework 2026 · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 25 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ED – emergency department; **IV** – intravenous; **SSC** – Surviving Sepsis Campaign

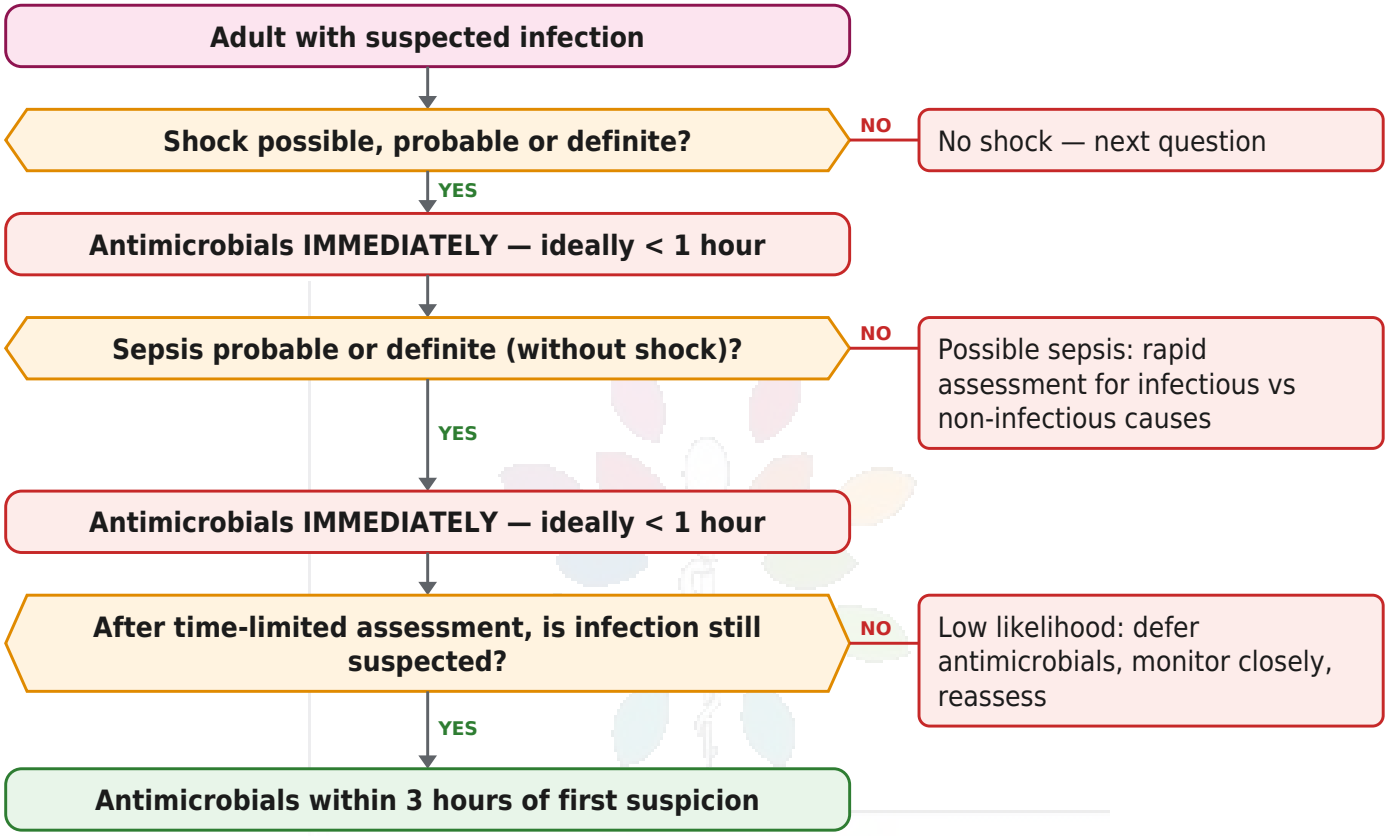

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 25

Antimicrobials within the first hour

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

SSC 2026 antibiotic timing framework (adults)



Seymour 2017 (New York, 49 331 patients) — each hour of delay

Bundle element	Odds of in-hospital death per hour of delay
Completion of 3-hour bundle	OR 1.04 per hour
Administration of antibiotics	OR 1.04 per hour
Completion of fluid bolus	No significant association

GOLDEN PEARL

In shock the clock is in minutes. In possible sepsis without shock, use the three hours to think — but do not let thinking become forgetting.

‹ Back to Step 25 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

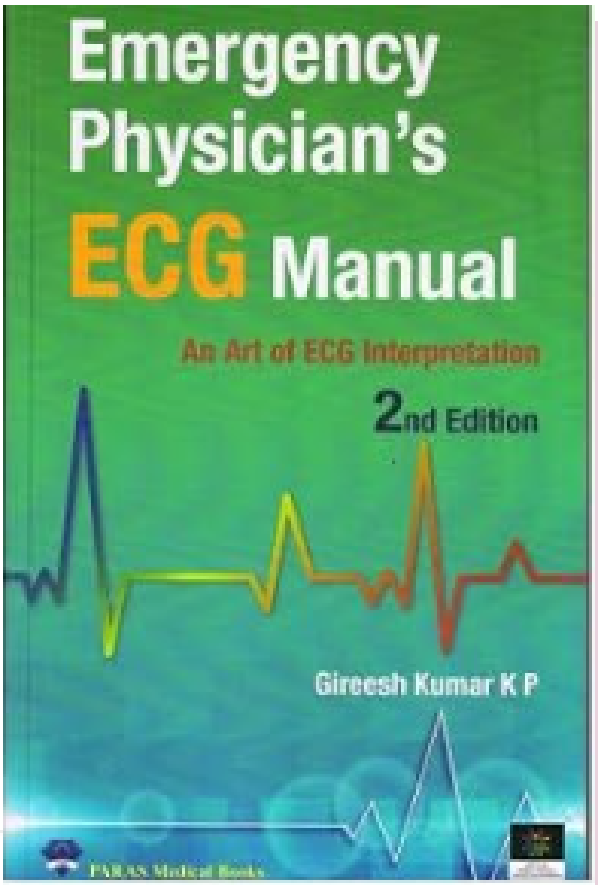
Abbreviations: OR – odds ratio; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Emergency Physician's ECG Manual

Practical ECG interpretation for the emergency physician — recognise, decide and act.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 26

Tailor the empiric regimen

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Tailor empiric antibiotics to the likely source, the local antibiogram and the risk of multidrug-resistant organisms.

WHY IT MATTERS

Inadequate initial therapy is one of the strongest predictors of death in sepsis, but unnecessary carbapenems and MRSA cover drive resistance and harm. The right empiric regimen covers the likely organisms for the source in your hospital — not every organism in the world.

HOW TO DO IT AT THE BEDSIDE

- Name the probable source before you prescribe.
- Check your hospital antibiogram (ESBL and carbapenem-resistance rates in India are high in ICU-acquired infection).
- Add MRSA cover (vancomycin or linezolid) only with MRSA risk factors or severe necrotising/line infection.
- Add anaerobic cover only for abdominal, gynaecological, necrotising soft-tissue, head-and-neck or CNS abscess sources.
- Remember tropical sepsis in India: doxycycline/azithromycin for scrub typhus & leptospirosis; artesunate for severe malaria.

WATCH OUT

- Double β-lactam or double anaerobic cover (pip-tazo + metronidazole) adds toxicity without benefit.
- Penicillin “allergy” labels are often wrong — clarify before choosing inferior second-line agents.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Cover a specific MDR pathogen empirically only if risk is high; suggest against empiric MDR cover when risk is low; anaerobic cover only with anaerobic risk factors.

Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | ICMR Treatment Guidelines for Antimicrobial Use | IDSA HAP/VAP guideline (Kalil 2016) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 26 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **CNS** – central nervous system; **ESBL** – extended-spectrum β-lactamase; **HAP** – hospital-acquired pneumonia; **ICMR** – Indian Council of Medical Research; **ICU** – intensive care unit; **IDSA** – Infectious Diseases Society of America; **MDR** – multidrug-resistant; **MRSA** – methicillin-resistant Staphylococcus aureus; **SSC** – Surviving Sepsis Campaign; **VAP** – ventilator-associated pneumonia
Drug information (RxList — tap): Vancomycin · Linezolid · Metronidazole · Azithromycin · Doxycycline · Artesunate


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 26

Tailor the empiric regimen

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Empiric regimens by source — adult, normal renal function (adapt to local antibiogram)

Source	Community-acquired, no MDR risk	Healthcare-associated / MDR risk
Pneumonia	Ceftriaxone 2 g OD + azithromycin 500 mg OD (± doxycycline in monsoon)	Pip-tazo 4.5 g q6h or meropenem 1 g q8h ± vancomycin / linezolid
Urinary (pyelonephritis)	Ceftriaxone 2 g OD (or amikacin 15 mg/kg OD)	Meropenem 1 g q8h (ESBL) ± amikacin
Intra-abdominal / biliary	Ceftriaxone 2 g + metronidazole 500 mg q8h	Pip-tazo or meropenem (no metronidazole needed)
Skin / necrotising fasciitis	Pip-tazo + clindamycin 600–900 mg q8h	Meropenem + vancomycin/linezolid + clindamycin
Meningitis	Ceftriaxone 2 g q12h + vancomycin (+ ampicillin 2 g q4h if > 50 y)	Meropenem 2 g q8h + vancomycin
Febrile neutropenia	Pip-tazo 4.5 g q6h or cefepime 2 g q8h	Meropenem ± vancomycin ± amikacin
Unknown source, shock	Pip-tazo 4.5 g q6h ± doxycycline	Meropenem ± vancomycin; colistin/ceftazidime-avibactam only if CRE known/likely
Tropical acute febrile illness	Doxycycline 100 mg q12h (scrub/lepto) ± ceftriaxone; artesunate 2.4 mg/kg if malaria	Add per culture

Doses are typical adult doses for orientation; adjust after the first dose for renal/hepatic function (Step 48). Always follow your hospital antibiogram and antimicrobial stewardship policy.

GOLDEN PEARL

Ask "where is it coming from and where has the patient been?" before you ask "which antibiotic?".

‹ Back to Step 26 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRE – carbapenem-resistant Enterobacterales; **ESBL** – extended-spectrum β-lactamase; **MDR** – multidrug-resistant; **OD** – once daily
Drug information (RxList — tap): Ceftriaxone · Meropenem · Cefepime · Ceftazidime · Amikacin · Vancomycin · Linezolid · Colistin · Metronidazole · Clindamycin · Azithromycin · Doxycycline · Ampicillin · Artesunate


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 27

Higher loading doses for hydrophilic drugs

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Use full (and higher) loading doses for hydrophilic antimicrobials because sepsis expands the volume of distribution.

WHY IT MATTERS

Capillary leak and fluid resuscitation increase the volume of distribution of hydrophilic drugs (β-lactams, aminoglycosides, glycopeptides, colistin). A standard first dose may give sub-therapeutic levels exactly when killing matters most — and early AKI is no reason to reduce it.

HOW TO DO IT AT THE BEDSIDE

- Give the first dose at full strength regardless of renal function.
- Vancomycin loading 25–30 mg/kg (actual body weight, max ~3 g); amikacin 25–30 mg/kg once daily in shock.
- Colistin (CMS) loading 9 million IU, then maintenance per renal function.
- β-lactam: give the loading dose over 30 minutes, then start the prolonged infusion (Step 49).
- Adjust maintenance doses only after the first 24 hours (Step 48).

WATCH OUT

- Augmented renal clearance (young, trauma, high cardiac output) causes under-dosing — consider TDM.
- Lipophilic drugs (fluoroquinolones, macrolides, linezolid) are less affected by fluid shifts.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Prolonged β-lactam infusion for maintenance after an initial loading dose; therapeutic drug monitoring case-by-case.
Strong · Moderate (prolonged infusion)

EVIDENCE & FURTHER READING — TAP TO OPEN

Roberts 2014: PK/PD of antibiotics in critical illness (Lancet ID) | Vancomycin consensus (Rybak 2020) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 27 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **PD** – pharmacodynamic; **PK** – pharmacokinetic; **TDM** – therapeutic drug monitoring
Drug information (RxList — tap): Amikacin · Vancomycin · Linezolid · Colistin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 27

Higher loading doses for hydrophilic drugs

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Hydrophilic vs lipophilic antimicrobials

Property	Hydrophilic	Lipophilic
Examples	β-lactams, aminoglycosides, vancomycin, colistin, fluconazole	Fluoroquinolones, macrolides, linezolid, doxycycline, tigecycline
Volume of distribution in sepsis	↑↑ (capillary leak, fluids)	Little change
Clearance	Renal — ↑ in ARC, ↓ in AKI	Mostly hepatic
Dosing implication	Higher loading dose; adjust maintenance to renal function	Standard dosing

Loading doses in septic shock (adult)

Drug	Loading dose	Then
Piperacillin–tazobactam	4.5 g IV over 30 min	4.5 g q6–8h as 3–4 h infusion
Meropenem	1–2 g IV over 30 min	1–2 g q8h as 3 h infusion
Cefepime	2 g IV over 30 min	2 g q8h as 3–4 h infusion
Vancomycin	25–30 mg/kg (max ~3 g) over ≥ 2 h	15–20 mg/kg q8–12h; AUC 400–600
Amikacin	25–30 mg/kg once daily	Interval by level / renal function
Colistin (CMS)	9 million IU	4.5 MIU q12h (adjust to CrCl)
Fluconazole	800 mg (12 mg/kg)	400 mg daily

GOLDEN PEARL

The first dose is never renally adjusted. Load fully, then think about the kidneys.

‹ Back to Step 27 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **ARC** – augmented renal clearance; **AUC** – area under the concentration–time curve; **CrCl** – creatinine clearance; **IV** – intravenous
Drug information (RxList — tap): Piperacillin · Meropenem · Cefepime · Amikacin · Vancomycin · Linezolid · Colistin · Doxycycline · Fluconazole


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 28

Never delay antibiotics for tests

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Do not delay antibiotics for imaging or non-essential cultures.

WHY IT MATTERS

CT scans, lumbar punctures, transfers and waiting for the senior can each swallow an hour. In septic shock that hour costs lives. Get the essential cultures, give the antibiotics, then go to the scanner.

HOW TO DO IT AT THE BEDSIDE

- Essential before antibiotics: two blood culture sets (only if achievable within minutes).
- Everything else — CT, LP, urine, sputum, wound swabs — can follow the first dose.
- Suspected meningitis needing CT: blood cultures → dexamethasone + antibiotics → CT → LP.
- Make antibiotics available in the ED stock (pre-packed sepsis kits).
- Escort the patient to imaging only after the first dose is running.

WATCH OUT

- "Waiting for the CT report" is the most common avoidable cause of antibiotic delay.
- Do not let a transfer to another hospital delay the first dose — give it before the ambulance leaves.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Antimicrobials immediately, ideally within 1 hour, in shock and probable sepsis; obtain blood cultures before antimicrobials only when it does not delay them.

Strong · Very low / Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Kumar 2006 (CCM) | Proulx 2005: delays in meningitis treatment | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 28 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CT – computed tomography; **ED** – emergency department; **LP** – lumbar puncture
Drug information (RxList — tap): Dexamethasone


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 28

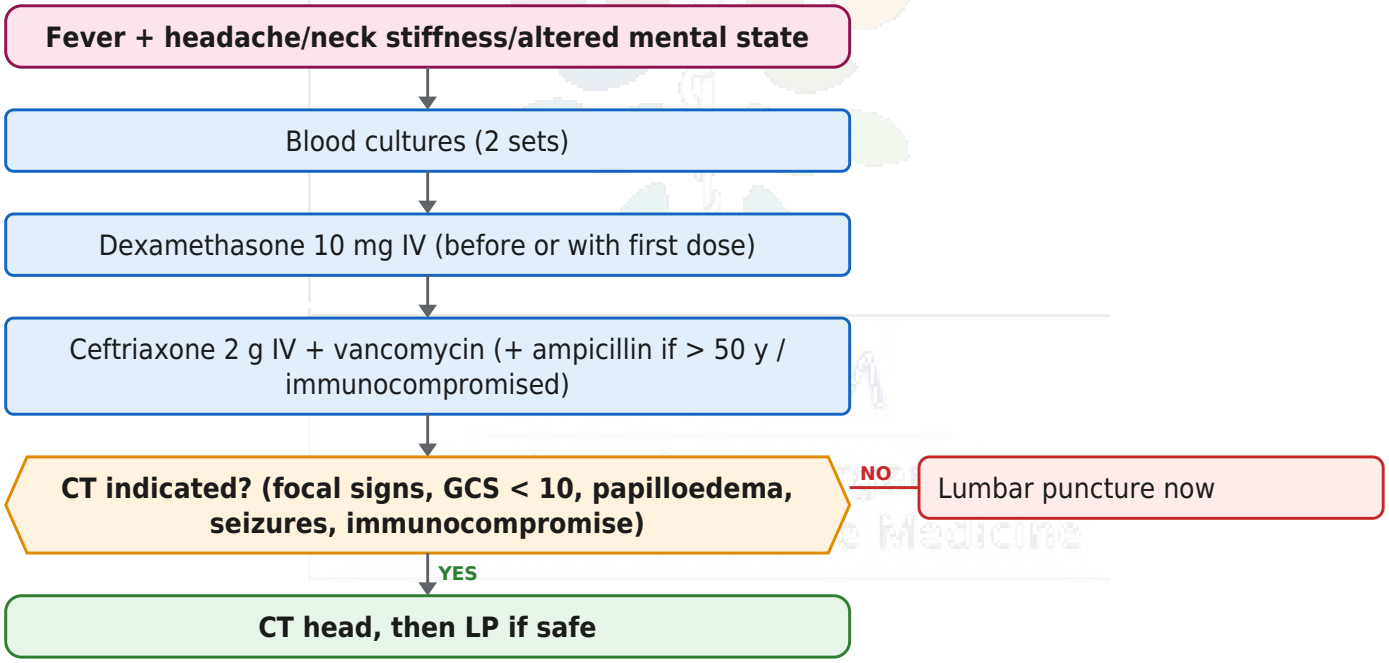
Never delay antibiotics for tests

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

What can wait — and what cannot

Do BEFORE the first antibiotic dose (if possible)	Do AFTER the first dose
Two blood culture sets (if within ~10–15 min)	CT head, chest, abdomen
Point-of-care lactate & glucose	Lumbar puncture (if CT needed first)
	Urine, sputum, wound and pus cultures (preferably soon)
	Ultrasound, echo, formal radiology
	Transfer to ward / ICU / another hospital

Suspected bacterial meningitis — order of events



GOLDEN PEARL

Cultures in minutes, antibiotics in the hour, scans after. Never the other way round.

‹ Back to Step 28 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CT – computed tomography; **ICU** – intensive care unit; **IV** – intravenous; **LP** – lumbar puncture
GCS (Glasgow Coma Scale): Eye 1–4 + Verbal 1–5 + Motor 1–6 = 3–15; ≤ 8 usually means the airway is at risk. **Calculator / source › see Step 8 ›**
Drug information (RxList — tap): Dexamethasone · Ceftriaxone · Vancomycin · Ampicillin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 29

Rapid crystalloid resuscitation — 30 mL/kg

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Begin rapid IV crystalloid resuscitation — at least 30 mL/kg within the first 3 hours — for sepsis-induced hypoperfusion or septic shock.

WHY IT MATTERS

Septic shock is a state of absolute and relative hypovolaemia: capillary leak, venodilation and poor intake. Early fluid restores preload and cardiac output. The 30 mL/kg figure is a starting estimate, not a fixed prescription — individualise using response and dynamic tests.

HOW TO DO IT AT THE BEDSIDE

- Give 500 mL (or 250 mL in frail/cardiac patients) boluses over 10–15 minutes.
- Reassess after every bolus: HR, MAP, CRT, mentation, urine output, lung ultrasound.
- Use ideal or adjusted body weight in obesity (BMI > 30).
- If hypotension persists after initial boluses, start norepinephrine — concurrent fluids and vasopressor are acceptable in unstable shock.
- Record the volume and time of every bolus.

WATCH OUT

- Severe LV dysfunction, ESRD on dialysis, severe AS: smaller boluses with ultrasound guidance.
- In resource-limited settings without ICU (FEAST, Zambia trials), aggressive fluids increased harm — titrate carefully.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest at least 30 mL/kg IV crystalloid in the first 3 hours for hypoperfusion or septic shock, individualising the volume; crystalloid first, then vasopressors if hypotension persists.

Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

ProCESS (2014) · ARISE (2014) · ProMISe (2015) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 29 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BMI – body mass index; **CRT** – capillary refill time; **ESRD** – end-stage renal disease; **HR** – heart rate; **ICU** – intensive care unit; **IV** – intravenous; **LV** – left ventricle; **MAP** – mean arterial pressure
Drug information (RxList — tap): Norepinephrine

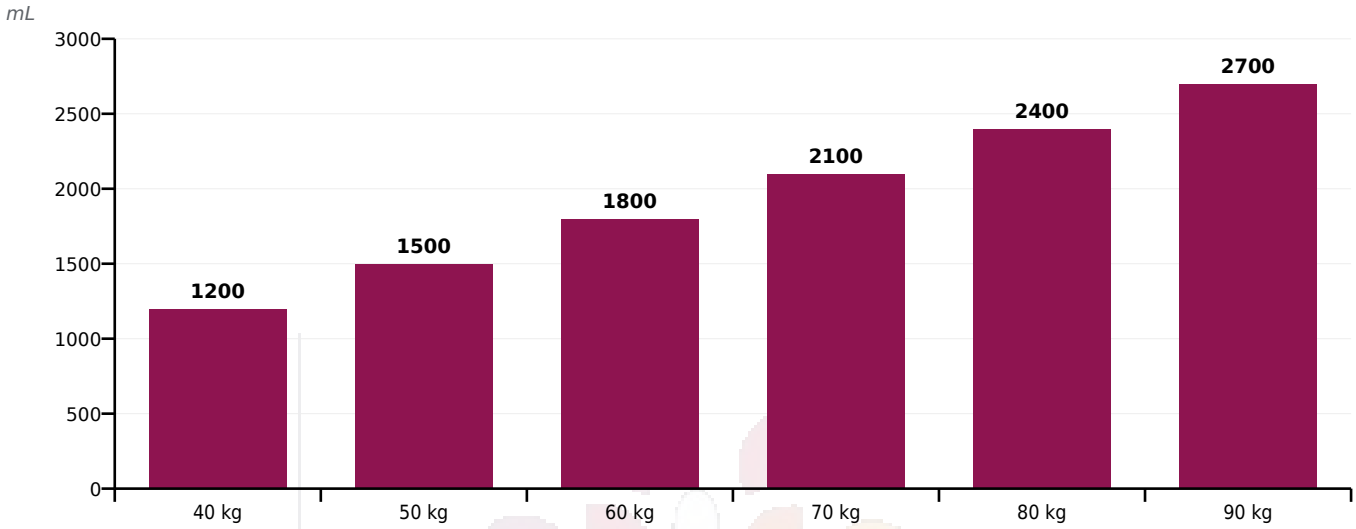

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 29

Rapid crystalloid resuscitation — 30 mL/kg

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

30 mL/kg — total crystalloid volume by body weight (mL)



Fluid bolus cycle

Hypoperfusion or hypotension

↓

Bolus 500 mL balanced crystalloid over 10–15 min

↓

Reassess: MAP, HR, CRT, lactate trend, mentation, urine, lung ultrasound

↓

Still hypoperfused AND fluid-responsive AND no congestion?

NO → Stop fluids — vasopressor / inotrope / look for other cause

YES ↓

Repeat bolus (up to ~30 mL/kg in 3 h, then individualise)

↓

Perfusion restored → maintenance only, avoid positive balance

GOLDEN PEARL

Thirty millilitres per kilogram is where you start thinking, not where you stop thinking.

‹ Back to Step 29 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRT – capillary refill time; **HR** – heart rate; **MAP** – mean arterial pressure


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 30

Prefer balanced crystalloids

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Prefer balanced crystalloids (Ringer's lactate, Plasma-Lyte) over 0.9% saline to reduce hyperchloraemic acidosis and AKI.

WHY IT MATTERS

0.9% saline contains 154 mmol/L of chloride — 50% more than plasma. Large volumes cause hyperchloraemic acidosis and renal vasoconstriction. Balanced solutions are closer to plasma; in SMART, they reduced major adverse kidney events, and meta-analyses favour them in sepsis.

HOW TO DO IT AT THE BEDSIDE

- Use Ringer's lactate or Plasma-Lyte as default resuscitation fluids.
- Use 0.9% saline in traumatic brain injury (hypotonic RL may worsen cerebral oedema).
- Ringer's lactate is safe in liver disease and hyperkalaemia — its potassium (4 mmol/L) is lower than the plasma rise caused by saline acidosis.
- Monitor chloride and bicarbonate after large volumes.

WATCH OUT

- Do not mix Ringer's lactate with blood products in the same line (calcium → clotting) or with ceftriaxone in neonates.
- Plasma-Lyte contains acetate and gluconate — mild vasodilatory effect in large rapid volumes.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend crystalloids as first-line fluid; suggest balanced crystalloids over 0.9% saline (0.9% saline in traumatic brain injury).
Strong · Moderate / Conditional · Moderate

EVIDENCE & FURTHER READING — TAP TO OPEN

SMART (Semler, NEJM 2018) · PLUS (Finfer, NEJM 2022) · BaSICS (Zampieri, JAMA 2021) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 30 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **RL** – Ringer's lactate
Drug information (RxList — tap): Ceftriaxone


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 30

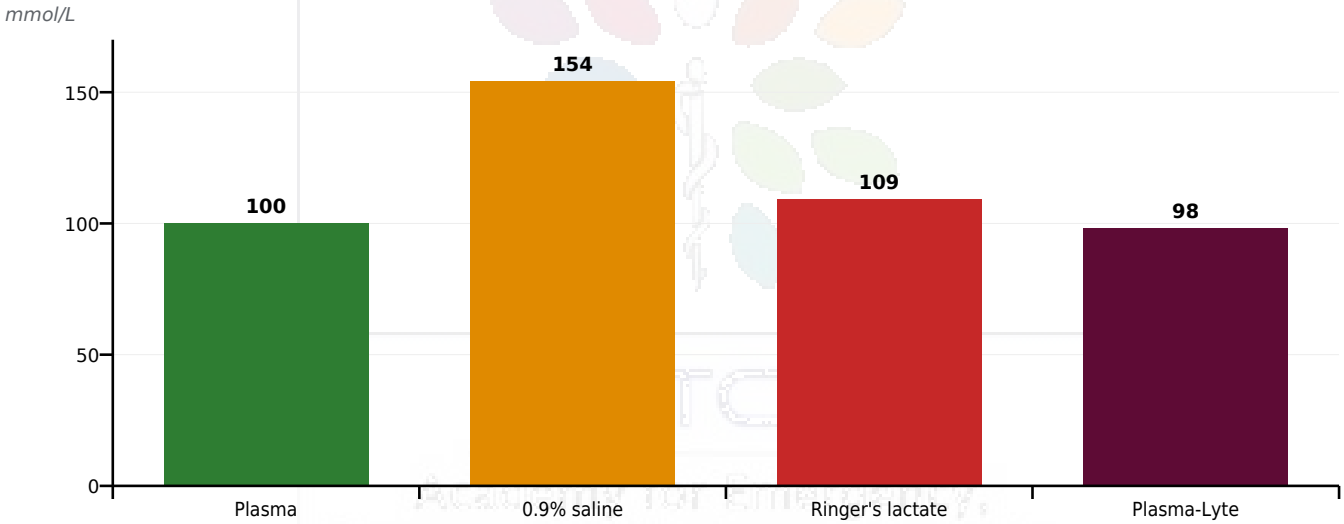
Prefer balanced crystalloids

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Composition of crystalloids (mmol/L)

Solution	Na^+	K^+	Cl^-	Ca^{2+}	Buffer	Osm (mOsm/L)	pH
Plasma	140	4–5	100	2.2–2.6	HCO_3^- 24	285–295	7.4
0.9% saline	154	0	154	0	None	308	~5.5
Ringer's lactate	130	4	109	1.4	Lactate 28	273	~6.5
Plasma-Lyte 148	140	5	98	0	Acetate 27, gluconate 23	294	7.4
5% dextrose	0	0	0	0	—	278 (free water)	~4.5

Chloride content (mmol/L)



SMART trial (15 802 ICU adults) — MAKE30

Outcome	Balanced	Saline
Major adverse kidney events at 30 days	14.3%	15.4%
In the sepsis subgroup — 30-day mortality	25.2%	29.4%

GOLDEN PEARL

Give the patient what they lost — something that looks like plasma, not like seawater.

‹ Back to Step 30 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

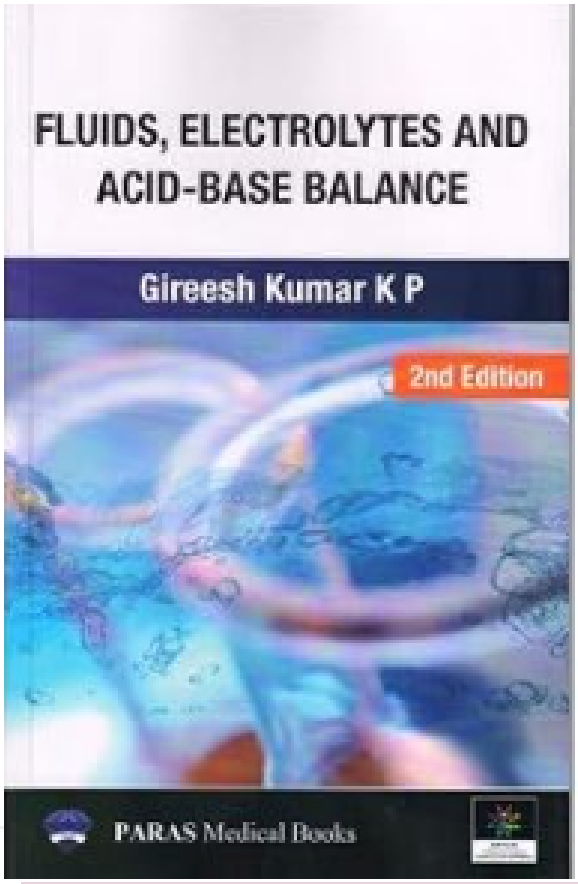
Abbreviations: ICU – intensive care unit; **MAKE30** – major adverse kidney events within 30 days


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Fluids, Electrolytes and Acid-Base Balance

Fluid, electrolyte and acid-base management made practical — the perfect companion to the resuscitation and de-resuscitation steps.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 31

Avoid synthetic colloids

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Do not use synthetic colloids such as hydroxyethyl starch (HES) or gelatin.

WHY IT MATTERS

Starches increase acute kidney injury, the need for renal replacement therapy, bleeding and death in sepsis (6S, CHEST, VISEP). They were withdrawn or restricted by regulators worldwide. Gelatins have no proven benefit and carry anaphylaxis and renal risk.

HOW TO DO IT AT THE BEDSIDE

- Use crystalloids as first-line; albumin selectively (Step 32).
- Remove HES and gelatin from emergency trolleys where possible.
- Use blood products for bleeding, not for volume expansion.

WATCH OUT

- "Colloid for faster expansion" is a myth in capillary leak — the volume-sparing effect is only about 1:1.2–1.4.
- Dextrans interfere with cross-matching and platelet function.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend against starches for resuscitation; suggest against gelatin. **Strong · High certainty / Conditional · Moderate**

EVIDENCE & FURTHER READING — TAP TO OPEN

6S trial (Perner, NEJM 2012) | CHEST (Myburgh, NEJM 2012) | VISEP (Brunkhorst, NEJM 2008) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 31 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: HES – hydroxyethyl starch
Drug information (RxList — tap): Albumin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 31

Avoid synthetic colloids

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Resuscitation fluids — the SSC 2026 verdict

Fluid	Verdict	Strength	Why
Balanced crystalloid	USE first-line	Strong (crystalloid) / conditional (balanced)	Effective, cheap, less hyperchloraemia
0.9% saline	Acceptable; preferred in TBI	Conditional	Hyperchloraemic acidosis with large volumes
Albumin 4–5% / 20%	Selective use	Conditional against routine	No mortality benefit overall (ALBIOS)
Hydroxyethyl starch	DO NOT USE	Strong against · High	AKI, RRT, bleeding, death
Gelatin	Do not use	Conditional against	No benefit; anaphylaxis, AKI
Dextran	Do not use	—	Bleeding, anaphylaxis, cross-match problems

6S trial — HES 130/0.42 vs Ringer's acetate (798 patients)

Outcome at 90 days	HES	Ringer's acetate
Death	51%	43%
Renal replacement therapy	22%	16%

GOLDEN PEARL

Starch belongs in the kitchen, not in the drip stand.

‹ Back to Step 31 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **HES** – hydroxyethyl starch; **RRT** – renal replacement therapy; **SSC** – Surviving Sepsis Campaign; **TBI** – traumatic brain injury
Drug information (RxList — tap): Albumin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 32

Use albumin selectively

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Reserve albumin for selected patients — those who have already received large volumes of crystalloid, or with cirrhosis — and avoid it in traumatic brain injury.

WHY IT MATTERS

Albumin is a safe colloid (SAFE) but has not reduced mortality in sepsis overall (ALBIOS). The 2026 guideline changed from suggesting albumin for large-volume resuscitation to suggesting crystalloids alone, with albumin kept for selected patients.

HOW TO DO IT AT THE BEDSIDE

- Consider albumin after large crystalloid volumes (e.g., > 4–5 L) with persistent need for volume.
- In cirrhosis with sepsis, albumin may help (also used for SBP: 1.5 g/kg day 1, 1 g/kg day 3).
- Use 20% albumin (100 mL = 20 g) when volume restriction matters; 4–5% for volume replacement.
- Avoid in traumatic brain injury (SAFE-TBI: increased mortality).

WATCH OUT

- Albumin is costly and scarce — it should not replace crystalloid as first-line.
- Targeting serum albumin ≥ 3 g/dL (ALBIOS) did not improve 28- or 90-day survival.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest crystalloids alone over crystalloids plus albumin; albumin may be appropriate after large crystalloid volumes or in cirrhosis; avoid in TBI.
Conditional · Moderate certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SAFE (Finfer, NEJM 2004) · ALBIOS (Caironi, NEJM 2014) · SAFE-TBI (2007) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 32 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: SBP – systolic blood pressure; **TBI** – traumatic brain injury
Drug information (RxList — tap): Albumin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 32

Use albumin selectively

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

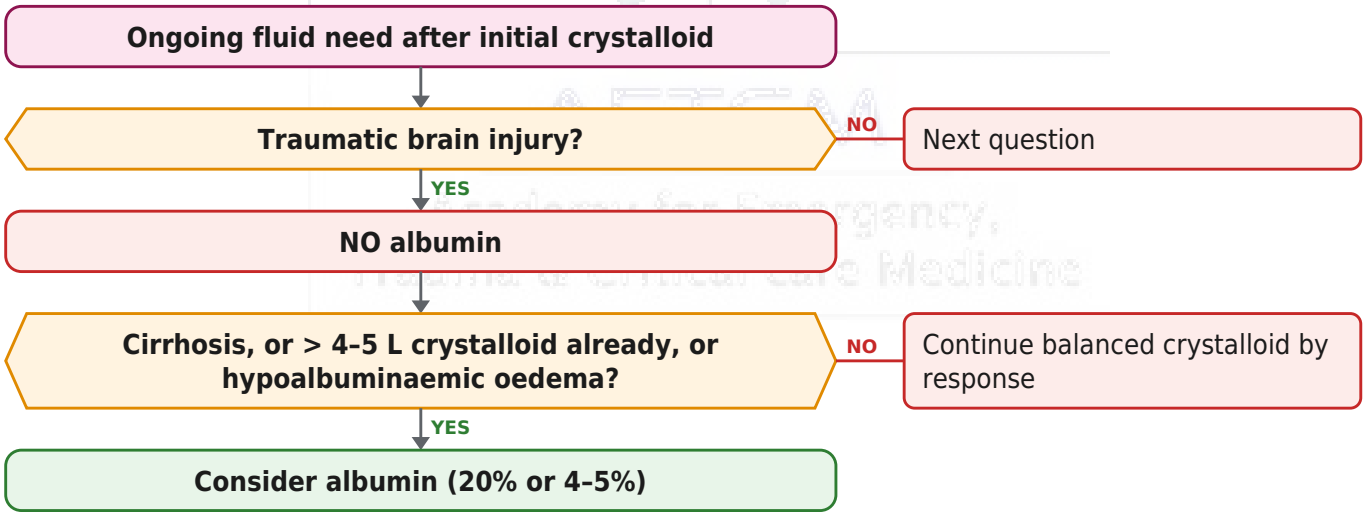
Albumin preparations

Preparation	Content	Oncotic effect	Typical use
4–5% albumin	4–5 g/100 mL	Iso-oncotic	Volume replacement
20% albumin	20 g/100 mL	Hyper-oncotic (draws ~4× its volume)	Cirrhosis, SBP, hypoalbuminaemic oedema with diuretics
25% albumin	25 g/100 mL	Hyper-oncotic	Large-volume paracentesis (6–8 g per L removed)

Albumin trials in sepsis

Trial	Population	Result
SAFE (2004)	6 997 ICU patients, 4% albumin vs saline	No difference in 28-day mortality; harm in TBI
ALBIOS (2014)	1 818 severe sepsis, albumin to ≥ 3 g/dL	90-day mortality 41.1% vs 43.6% (NS)
ALBIOS shock subgroup	Post-hoc	Possible benefit — hypothesis only

Should this patient get albumin?



GOLDEN PEARL

Albumin is a scalpel, not a shovel — use it for the patient who needs it, not for every patient who is hypotensive.

‹ Back to Step 32 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit; **NS** – normal (0.9%) saline; **SBP** – systolic blood pressure; **TBI** – traumatic brain injury
Drug information (RxList — tap): Albumin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 33

Reassess after every fluid bolus

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Reassess the haemodynamic response after each fluid bolus rather than giving fluid blindly.

WHY IT MATTERS

Only about half of haemodynamically unstable patients respond to fluid with an increase in cardiac output. Fluid that does not raise cardiac output only raises venous pressure, oedema and organ congestion. Each bolus is a test — read the result before the next one.

HOW TO DO IT AT THE BEDSIDE

- Before each bolus ask: Is the patient hypoperfused? Is the patient likely to respond? Is it safe?
- After each bolus check: MAP, HR, CRT, mottling, mentation, urine output, lung ultrasound/SpO_2.
- Record the response ("500 mL → MAP 58→64, CRT 5→3 s").
- Stop when perfusion is restored, when the patient no longer responds, or when congestion appears.

WATCH OUT

- A rise in BP without improved perfusion is not a response.
- CVP targets (8–12 mmHg) are no longer recommended.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest dynamic measures over physical examination or static parameters alone to guide fluid; serial lactate and CRT to guide resuscitation.

Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

ANDROMEDA-SHOCK (2019) | Monnet 2016: passive leg raising meta-analysis | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 33 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure; **CRT** – capillary refill time; **CVP** – central venous pressure; **HR** – heart rate; **MAP** – mean arterial pressure; **SpO_2** – peripheral oxygen saturation


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 33

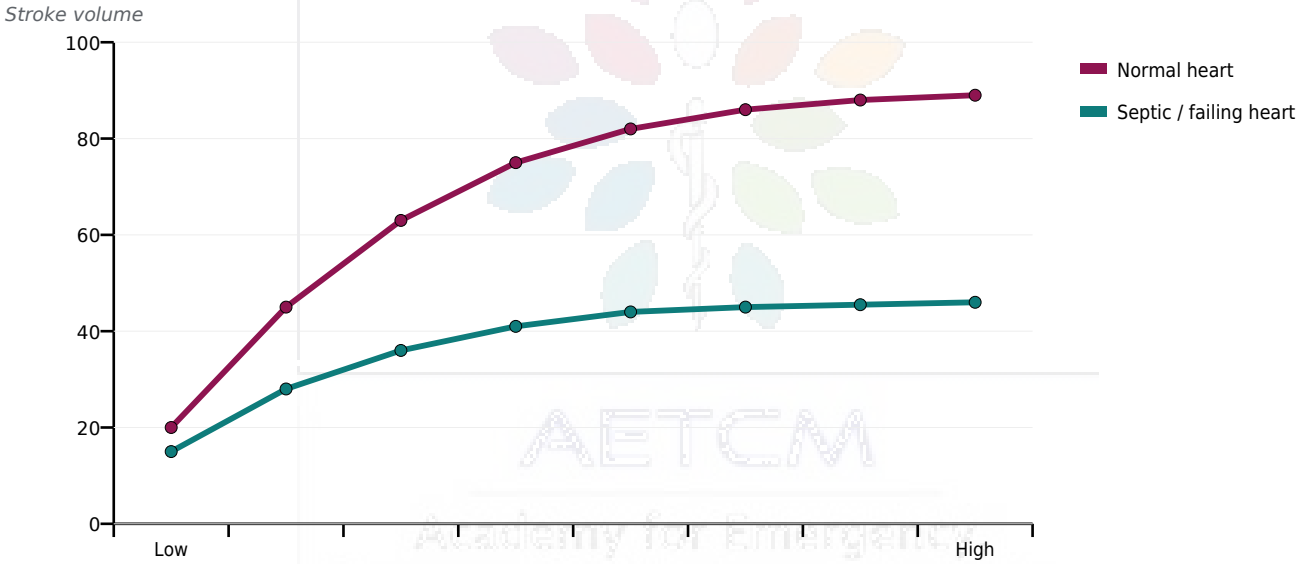
Reassess after every fluid bolus

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Bolus response sheet — record after every bolus

Time	Bolus	MAP	HR	CRT	Lactate	UO (mL/h)	Lung US	Decision
10:05	500 mL RL	58	122	5 s	4.2	10	A-lines	Repeat
10:25	500 mL RL	63	114	4 s	—	20	A-lines	Repeat
10:45	500 mL RL	64	112	4 s	3.6	25	Few B-lines	Stop fluid, start NE
11:15	NE 0.1	68	104	3 s	2.9	45	—	Continue

Frank-Starling curve — why fluid stops working (schematic)



On the steep part of the curve a bolus raises stroke volume (responder); on the flat part it only raises filling pressure and oedema (non-responder).

GOLDEN PEARL

Every bolus is an experiment. Write down the result before you repeat it.

‹ Back to Step 33 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRT – capillary refill time; **HR** – heart rate; **MAP** – mean arterial pressure; **NE** – norepinephrine (noradrenaline); **RL** – Ringer's lactate; **UO** – urine output


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 34

Use dynamic measures of fluid responsiveness

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Use dynamic measures — passive leg raising, fluid challenge with stroke volume, pulse pressure variation — when available.

WHY IT MATTERS

Static numbers (CVP, IVC diameter alone, PAOP) poorly predict whether fluid will raise cardiac output. Dynamic tests create a reversible preload change and measure the response; they reduce unnecessary fluid and are now favoured by the guideline.

HOW TO DO IT AT THE BEDSIDE

- Passive leg raise (PLR): from semi-recumbent 45° to legs-up 45°; a ≥ 10% rise in stroke volume/cardiac output (or VTI on echo) = responsive.
- Mini fluid challenge: 100–250 mL over 1–2 min with VTI or SV measurement.
- Pulse pressure variation ≥ 12–13% predicts response only in ventilated, sedated patients, Vt ≥ 8 mL/kg, in sinus rhythm.
- End-tidal CO_2 rise ≥ 5% during PLR is a useful surrogate in ventilated patients.
- Use pulse pressure or BP alone with caution — less reliable than flow.

WATCH OUT

- Raised intra-abdominal pressure gives false-negative PLR.
- PPV is invalid with spontaneous breaths, arrhythmia, low tidal volume, open chest or right heart failure.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest dynamic measures (PLR, fluid challenge with SV, SVV, PPV) over physical examination or static parameters alone.
Conditional · Low certainty (upgraded)

EVIDENCE & FURTHER READING — TAP TO OPEN

Monnet 2016: PLR meta-analysis | CLOVERS (2023) | Douglas 2020: SV-guided resuscitation | ▶ POCUS video 1 | ▶ POCUS video 2 | ▶ POCUS video 3 | ▶ IVC POCUS video 1 | ▶ IVC POCUS video 2 | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 34 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure; **CVP** – central venous pressure; **IVC** – inferior vena cava; **PLR** – passive leg raise; **PPV** – pulse pressure variation; **SV** – stroke volume; **SVV** – stroke volume variation; **Vt** – tidal volume; **VTI** – velocity-time integral


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 34

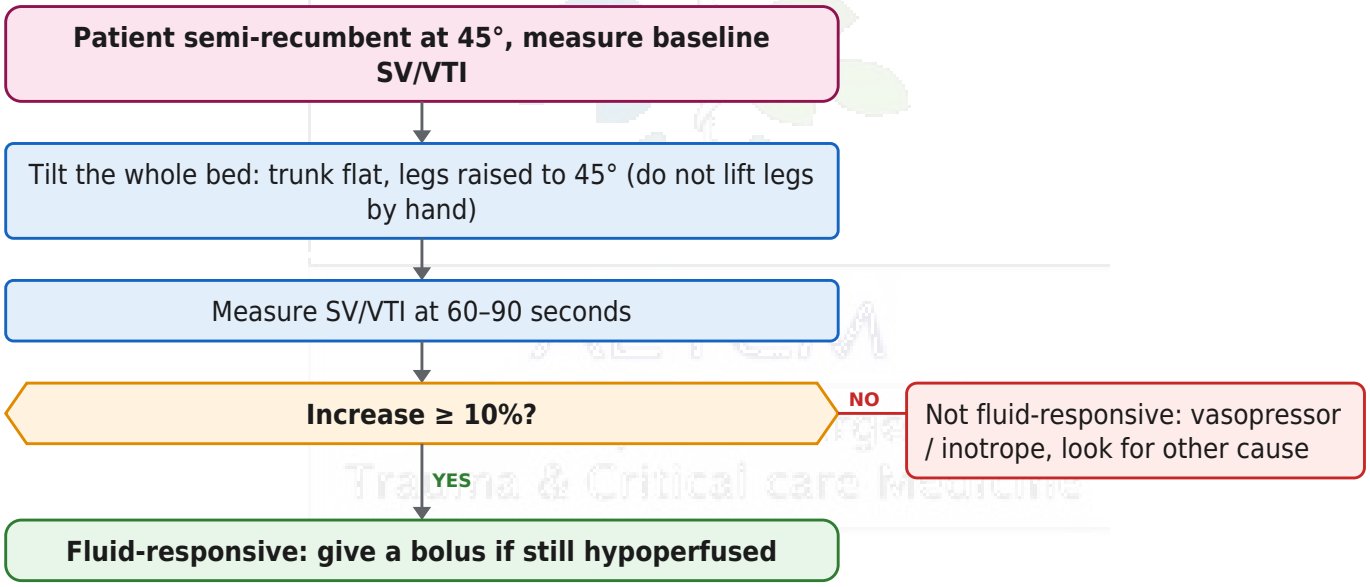
Use dynamic measures of fluid responsiveness

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Dynamic tests of fluid responsiveness

Test	How	Positive	Limitations
Passive leg raise	Semi-recumbent 45° → supine with legs at 45° for 60–90 s	SV / CO / VTI ↑ ≥ 10%	Needs real-time flow measure; IAH
Mini-fluid challenge	100 mL over 1 min	VTI ↑ ≥ 10%	Echo skill; small changes
Fluid challenge	250–500 mL over 10–15 min	SV ↑ ≥ 10–15%	Gives fluid to non-responders
Pulse pressure variation	Arterial line, controlled ventilation	PPV ≥ 12–13%	Sinus rhythm, Vt ≥ 8 mL/kg, no spontaneous breaths
End-expiratory occlusion	15-s hold in ventilated patient	CO ↑ ≥ 5%	Patient must tolerate hold
IVC distensibility (ventilated)	M-mode subcostal	> 18%	Many confounders

How to do a passive leg raise



WATCH — POCUS VIDEOS (TAP TO OPEN ON YOUTUBE)

▶ POCUS video 1 · ▶ POCUS video 2 · ▶ POCUS video 3 · ▶ IVC POCUS video 1 · ▶ IVC POCUS video 2

GOLDEN PEARL

The legs hold a free, reversible 300 mL bolus. Borrow it before you give the real one.

‹ Back to Step 34 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CO – cardiac output; **IAH** – intra-abdominal hypertension; **IVC** – inferior vena cava; **PPV** – pulse pressure variation; **SV** – stroke volume; **Vt** – tidal volume; **VTI** – velocity-time integral


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 35

Stop fluids early when overload appears

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Stop fluid boluses early when signs of volume overload appear on lung ultrasound or clinical examination.

WHY IT MATTERS

Positive fluid balance is independently associated with mortality, prolonged ventilation and AKI. Lung ultrasound detects interstitial oedema before it is visible on the chest film or clinical examination, and venous Doppler (VExUS) detects organ congestion.

HOW TO DO IT AT THE BEDSIDE

- Scan anterior and lateral chest zones before and after boluses: ≥ 3 B-lines in ≥ 2 zones per side = interstitial syndrome.
- Watch for rising SpO_2 requirement, crackles, rising JVP, peripheral oedema.
- Check the IVC (plethoric > 2 cm, non-collapsing) and VExUS hepatic/portal/renal venous Doppler.
- When overload appears with persistent hypotension: vasopressor ± inotrope, not more fluid.

WATCH OUT

- Bilateral B-lines can also be ARDS or pneumonia — interpret with the clinical picture.
- Do not withhold fluid in true hypovolaemia simply because the patient is old.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

After 30 mL/kg, individualise liberal vs restrictive fluid strategy; after the acute phase, suggest active fluid removal.
Conditional · Low / Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

CLASSIC (Meyhoff, NEJM 2022) | Lichtenstein FALLS protocol | VExUS (Beaubien-Souligny 2020)
▶ POCUS video 1 | ▶ POCUS video 2 | ▶ POCUS video 3 | ▶ IVC POCUS video 1 | ▶ IVC POCUS video 2
Radiopaedia: ARDS chest X-ray | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 35 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **ARDS** – acute respiratory distress syndrome; **IVC** – inferior vena cava; **SpO_2** – peripheral oxygen saturation; **VExUS** – Venous Excess Ultrasound score


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 35

Stop fluids early when overload appears

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Signs that fluid has gone far enough

Domain	Warning sign
Lung ultrasound	New B-lines (≥ 3 per zone, bilateral), pleural effusions
Oxygenation	Rising FiO_2 requirement, falling S/F or P/F
Venous system	Plethoric IVC, VExUS grade ≥ 2 (pulsatile portal / interrupted renal flow)
Clinical	Crackles, raised JVP, oedema, weight gain, intra-abdominal hypertension
Cumulative balance	> +5 L or > 10% body weight

VExUS grading (venous excess ultrasound)

Grade	IVC	Doppler (hepatic, portal, intra-renal)	Meaning
0	< 2 cm	Any	No congestion
1	≥ 2 cm	Normal or mild abnormalities	Mild
2	≥ 2 cm	One severely abnormal pattern	Moderate congestion
3	≥ 2 cm	≥ 2 severely abnormal patterns	Severe congestion — stop fluid, consider removal

WATCH — POCUS VIDEOS (TAP TO OPEN ON YOUTUBE)

▶ POCUS video 1 ▶ POCUS video 2 ▶ POCUS video 3 ▶ IVC POCUS video 1 ▶ IVC POCUS video 2

AETCM Academy for Emergency, Trauma & Critical care Medicine

GOLDEN PEARL

Fluids save lives in the first hours and take lives after that. Look at the lungs before every bolus.

‹ Back to Step 35 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

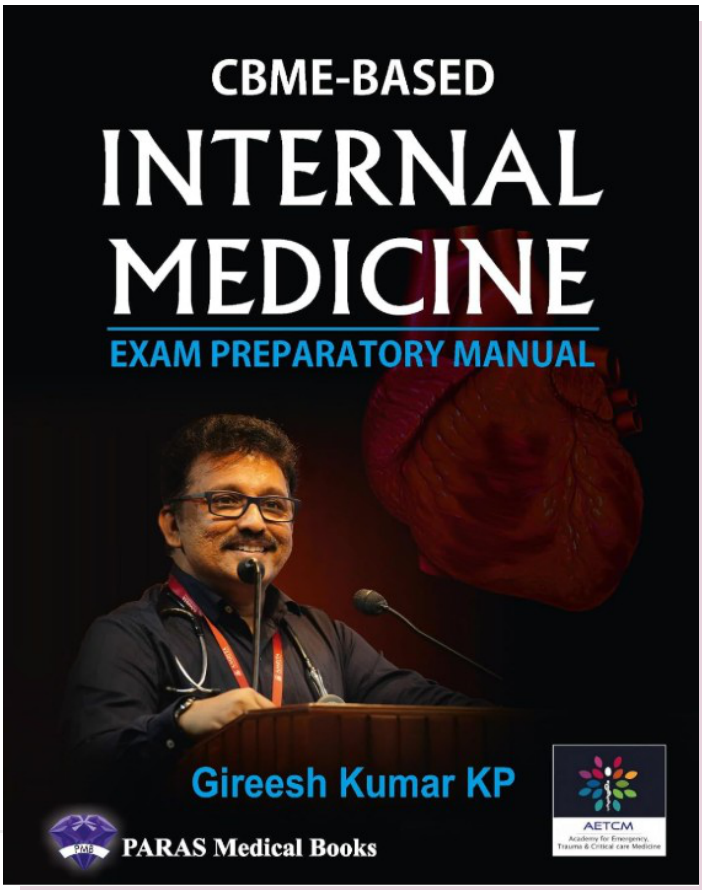
Abbreviations: **FiO_2** – fraction of inspired oxygen; **IVC** – inferior vena cava; **VExUS** – Venous Excess Ultrasound score


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



CBME-Based Internal Medicine

Internal medicine for the CBME MBBS final examination — exam-focused and curriculum-mapped.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 36

Norepinephrine is the first-line vasopressor

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Start norepinephrine as the first-line vasopressor for persistent hypotension, targeting an initial MAP of 65 mmHg (60–65 mmHg in patients ≥ 65 years).

WHY IT MATTERS

Norepinephrine restores vascular tone with modest inotropy and fewer arrhythmias than dopamine or epinephrine. Early norepinephrine (CENSER) improved shock control. The 2026 guideline strongly recommends a MAP target of 65 rather than higher, and 60–65 mmHg for older adults.

HOW TO DO IT AT THE BEDSIDE

- Standard dilution: 4 mg in 50 mL (80 µg/mL) or 8 mg in 50 mL (160 µg/mL) in 5% dextrose or saline.
- Start 0.05–0.1 µg/kg/min and titrate every 5–10 minutes to MAP 65 (±5).
- Use a dedicated lumen and a syringe pump; never flush the line.
- Concurrent fluid and vasopressor are acceptable in unstable shock.
- Escalate: add vasopressin when NE ≥ 0.25–0.5 µg/kg/min (Step 59).

WATCH OUT

- Higher MAP targets (80–85) add arrhythmias without improving survival, except possibly in chronic hypertension for kidney protection.
- Prolonged hypotension below 65 mmHg is harmful — do not delay the vasopressor while fluids run.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend norepinephrine first-line over dopamine, epinephrine or selepressin; initial MAP target 65 mmHg; for age ≥ 65, MAP 60–65 mmHg.
Strong · High–Low / Conditional · Low

EVIDENCE & FURTHER READING — TAP TO OPEN

SOAP II (De Backer, NEJM 2010) · CENSER (Permpikul 2019) · 65 trial (Lamontagne, JAMA 2020) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 36 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: MAP – mean arterial pressure; **NE** – norepinephrine (noradrenaline)
Drug information (RxList — tap): Norepinephrine · Vasopressin · Epinephrine · Dopamine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 36

Norepinephrine is the first-line vasopressor

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Norepinephrine infusion rates (mL/h) — 4 mg in 50 mL = 80 µg/mL

Weight	0.05 µg/kg/min	0.1	0.2	0.3	0.5
40 kg	1.5	3.0	6.0	9.0	15.0
50 kg	1.9	3.8	7.5	11.2	18.8
60 kg	2.2	4.5	9.0	13.5	22.5
70 kg	2.6	5.2	10.5	15.8	26.2
80 kg	3.0	6.0	12.0	18.0	30.0
90 kg	3.4	6.8	13.5	20.2	33.8
100 kg	3.8	7.5	15.0	22.5	37.5

Formula: Rate (mL/h) = dose (µg/kg/min) × weight (kg) × 60 ÷ concentration (µg/mL). With 8 mg in 50 mL (160 µg/mL), halve the rates shown.

Norepinephrine dose bands

Dose (µg/kg/min)	Interpretation	Action
< 0.1	Low	Titrate; consider weaning when stable
0.1–0.25	Moderate	Arterial line; reassess volume and cardiac function
0.25–0.5	High	Add vasopressin; consider hydrocortisone; echo
> 0.5	Very high / refractory	Add epinephrine; search source, mimics, tamponade, adrenal failure

GOLDEN PEARL

Fluids fill the tank; norepinephrine tightens the pipes. Start it early — do not wait for the last litre.

‹ Back to Step 36 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Drug information (RxList — tap): Norepinephrine · Vasopressin · Epinephrine · Hydrocortisone


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 37

Start norepinephrine peripherally if needed

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Do not delay norepinephrine for central access — start through a reliable peripheral IV while central access is arranged.

WHY IT MATTERS

Placing a central line takes time, and every minute of hypotension below 65 mmHg harms organs. Large series show peripheral norepinephrine at low–moderate concentrations is safe for short periods, with extravasation rates below 5% and very few serious injuries.

HOW TO DO IT AT THE BEDSIDE

- Use a 20G or larger cannula in the forearm or antecubital fossa — not the hand or wrist; ultrasound-guided upper-arm veins are ideal.
- Confirm good blood return and flush before starting.
- Inspect the site every hour (nurse checklist); keep it visible.
- Plan central access if needed beyond 24–48 h or at high doses.
- Extravasation: stop the infusion, aspirate, elevate; infiltrate phentolamine 5–10 mg in 10 mL saline subcutaneously.

WATCH OUT

- Do not use peripheral lines that are positional, in the hand, or in an oedematous limb.
- Do not run other drugs through the vasopressor cannula.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest starting vasopressors peripherally rather than delaying until central venous access is secured.
Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Loubani 2015: peripheral vasopressor complications (systematic review) · Tian 2020: peripheral norepinephrine safety · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 37 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: IV – intravenous
Drug information (RxList — tap): Norepinephrine · Phentolamine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 37

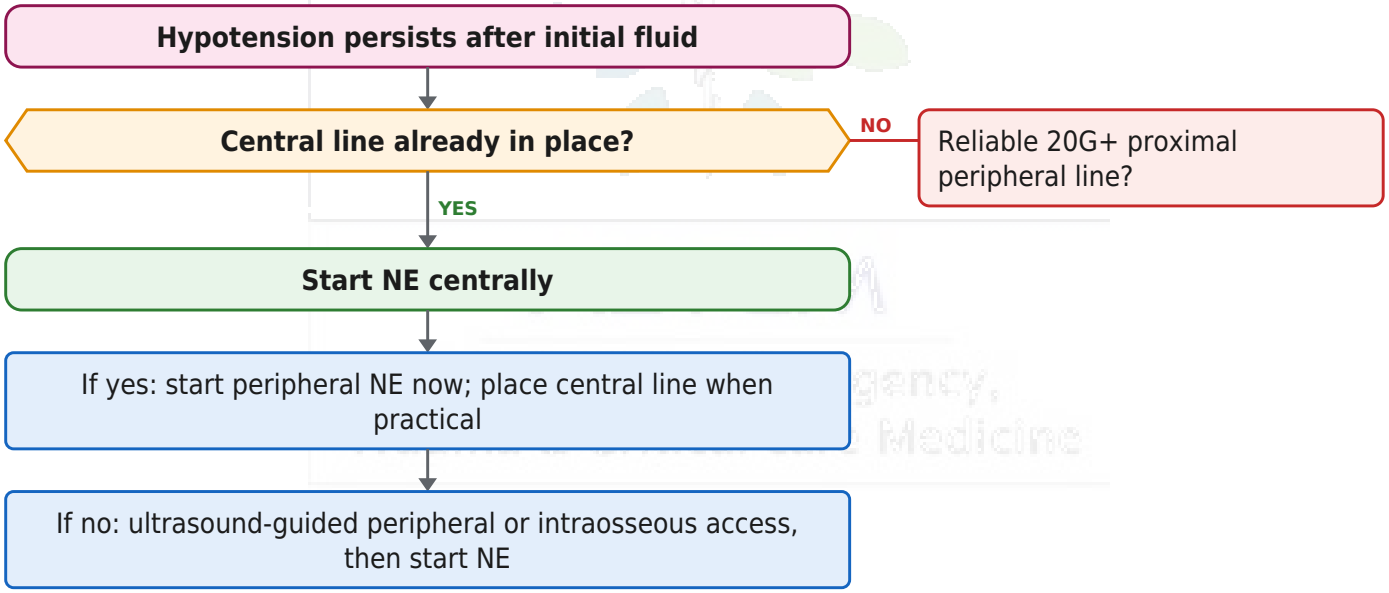
Start norepinephrine peripherally if needed

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Peripheral vasopressor safety protocol

Item	Standard
Cannula	20G or larger, < 24 h old, good blood return
Site	Antecubital fossa or upper arm (ideally ultrasound-guided); avoid hand, wrist, foot
Concentration	Norepinephrine ≤ 16 µg/mL (e.g., 4 mg in 250 mL) or as per protocol
Monitoring	Site check hourly: swelling, blanching, pain, coolness
Duration	Bridge — plan central access if > 24–48 h or escalating doses
Extravasation	Stop, aspirate, elevate; phentolamine 5–10 mg in 10 mL NS subcut. around site; plastic surgery if necrosis

Vasopressor access decision



GOLDEN PEARL

A vasopressor in the arm now beats a vasopressor in the neck in an hour.

‹ Back to Step 37 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: NE – norepinephrine (noradrenaline); **NS** – normal (0.9%) saline
Drug information (RxList — tap): Norepinephrine · Phentolamine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 38

Repeat lactate within a few hours

THE GOLDEN STEP

Repeat serum lactate within 2–4 hours if the initial value was > 2 mmol/L.

WHY IT MATTERS

Lactate trends are more informative than single values. A fall indicates response; a rise or plateau should prompt re-examination of volume status, cardiac function, source control and the diagnosis.

HOW TO DO IT AT THE BEDSIDE

- Repeat at 2 h (and 4–6 h) after resuscitation starts if initial lactate > 2.
- Lactate clearance (%) = (initial − repeat) ÷ initial × 100; ≥ 10–20% per 2 h is reassuring.
- Interpret alongside CRT, mottling, urine output and mentation.
- Rising lactate: reassess — inadequate resuscitation, uncontrolled source, ischaemic bowel, drug effect, liver failure.

WATCH OUT

- Do not chase a normal lactate with endless fluid — lactate falls slowly and has non-hypoxic causes.
- Epinephrine raises lactate through β_2 stimulation — interpret with care.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest using serial lactate to guide resuscitation, with individualised fluid rather than targeting normalisation.
Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Jones 2010 (JAMA) · Jansen 2010: lactate-guided therapy (AJRCCM) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 38 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRT – capillary refill time
Drug information (RxList — tap): Epinephrine

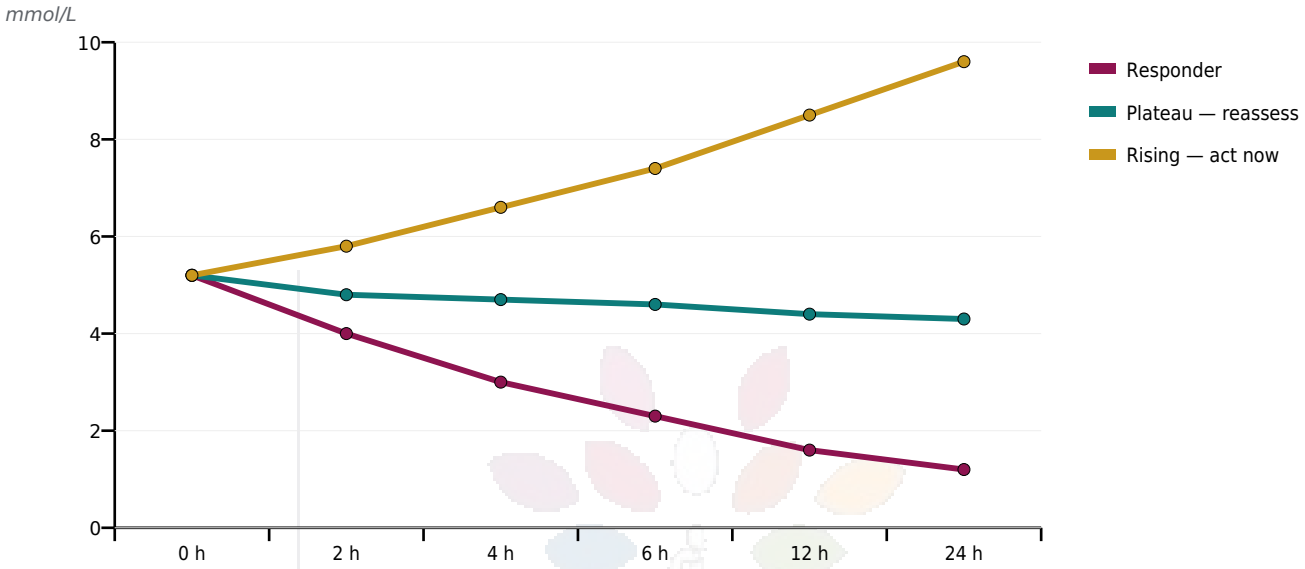

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 38

Repeat lactate within a few hours

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Lactate trajectories (illustrative)



Lactate clearance — worked example

Initial	Repeat (2 h)	Clearance	Interpretation
4.8	3.6	(4.8 − 3.6) ÷ 4.8 = 25%	Good response
4.8	4.6	4%	Inadequate — reassess
4.8	5.9	−23%	Deteriorating — escalate, source?

Vasopressor drug table (NE, vasopressin, adrenaline, dopamine, dobutamine) → Step 61

GOLDEN PEARL

A rising lactate is a question, not an answer: what have I missed?

‹ Back to Step 38 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: NE – norepinephrine (noradrenaline)
Drug information (RxList — tap): Vasopressin · Dopamine · Dobutamine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 39

Track perfusion, not just pressure

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Track serial lactate clearance alongside skin perfusion and urine output.

WHY IT MATTERS

No single number reflects tissue perfusion. Combining a macro-haemodynamic target (MAP) with micro- and organ-level markers — CRT, mottling, lactate, urine output and mentation — gives a fuller picture and prevents both under- and over-resuscitation.

HOW TO DO IT AT THE BEDSIDE

- Insert a urinary catheter in shock and measure hourly urine output (target ≥ 0.5 mL/kg/h).
- Re-check CRT every 30 minutes during active resuscitation (target ≤ 3 s).
- Re-check lactate every 2 hours until falling.
- Use a perfusion dashboard at the bedside (MAP, CRT, lactate, UO, mentation) and review it at each huddle.

WATCH OUT

- Urine output may lag in AKI despite restored perfusion.
- Diuretics invalidate urine output as a perfusion marker.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Capillary refill time as an adjunct; serial lactate to guide resuscitation.
Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

ANDROMEDA-SHOCK (2019) | Hernández 2019 Bayesian re-analysis | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 39 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **CRT** – capillary refill time; **MAP** – mean arterial pressure; **UO** – urine output


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 39

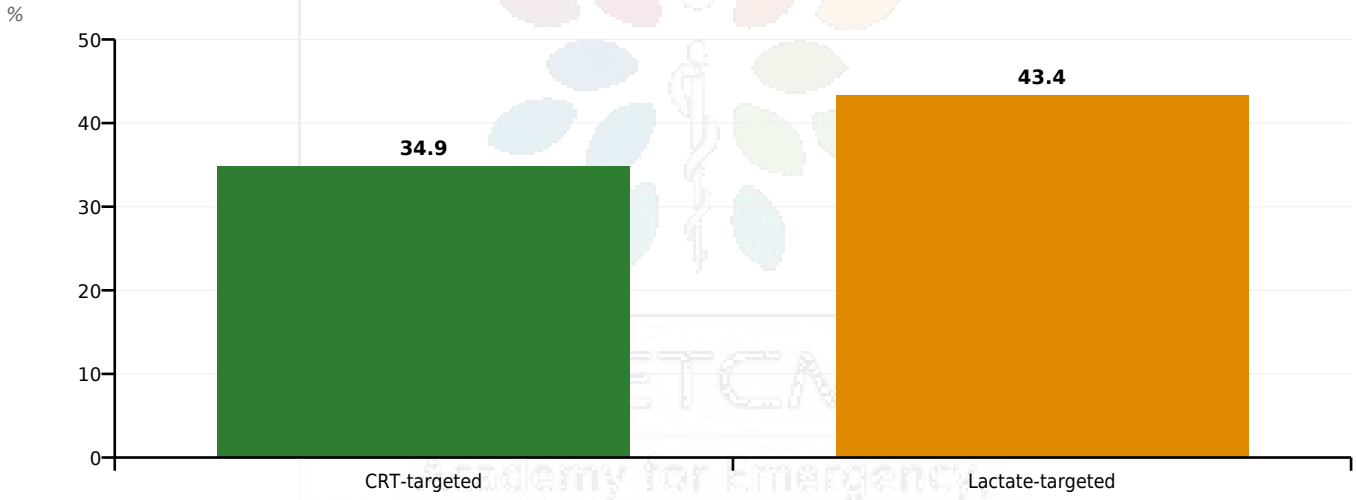
Track perfusion, not just pressure

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

Perfusion dashboard — targets during resuscitation

Marker	Target	Check every	If not met
MAP	65 mmHg (60–65 if ≥ 65 y)	Continuous / 5–15 min	Titrate NE
Capillary refill	≤ 3 seconds	30 min	PLR → fluid if responsive; else MAP/inotrope
Mottling score	0–1	1 h	As above
Lactate	Falling ≥ 10–20% / 2 h	2 h	Reassess source, heart, abdomen
Urine output	≥ 0.5 mL/kg/h	1 h	Volume status, MAP, obstruction
Mentation	Improving GCS / 4AT	1 h	Exclude hypoglycaemia, hypoxia, drugs

ANDROMEDA-SHOCK: 28-day mortality (%)



ANDROMEDA-SHOCK (424 patients): CRT-targeted resuscitation had lower 28-day mortality (p = 0.06), less organ dysfunction at 72 h and less fluid — supporting CRT as a simple bedside target.

GOLDEN PEARL

Pressure is what you measure; perfusion is what you want. Track both on one sheet.

‹ Back to Step 39 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRT – capillary refill time; **MAP** – mean arterial pressure; **NE** – norepinephrine (noradrenaline); **PLR** – passive leg raise
GCS (Glasgow Coma Scale): Eye 1–4 + Verbal 1–5 + Motor 1–6 = 3–15; ≤ 8 usually means the airway is at risk. **Calculator / source › see Step 8 ›**
4AT (4 'A's Test (delirium screen)): Alertness, AMT4, attention (months backwards), acute change — score ≥ 4 = possible delirium. Quick ED/ward screen. **Calculator / source › see Step 8 ›**


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 40

Transfer to ICU promptly

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 1 of 2 — the step

THE GOLDEN STEP

Transfer the patient to the ICU promptly once initial stabilisation is under way — for continuous monitoring and organ support.

WHY IT MATTERS

Prolonged boarding of critically ill septic patients in the ED is associated with higher mortality. The 2026 guideline suggests ICU admission within 6 hours for those who need it. A structured handover prevents loss of critical information at the transition.

HOW TO DO IT AT THE BEDSIDE

- Complete the Hour-1 bundle before transfer; do not let transfer interrupt infusions.
- Use a structured handover (SBAR / I-PASS): time zero, cultures, antibiotics with times, fluids, vasopressor dose, source plan.
- Transfer with monitoring, oxygen, infusion pumps, airway kit and a competent escort.
- Communicate the ceiling-of-care discussion if one has occurred.

WATCH OUT

- Transport is a high-risk period — check lines, tubes and pump batteries before leaving.
- Second antibiotic doses are frequently missed after transfer — write the next due time on the handover.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest ICU admission within 6 hours; structured handoff of critical information at transitions of care.

Conditional · Low / Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Chalfin 2007: ED boarding and outcome | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 40 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **ED** – emergency department; **ICU** – intensive care unit; **SBAR** – Situation, Background, Assessment, Recommendation; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 40

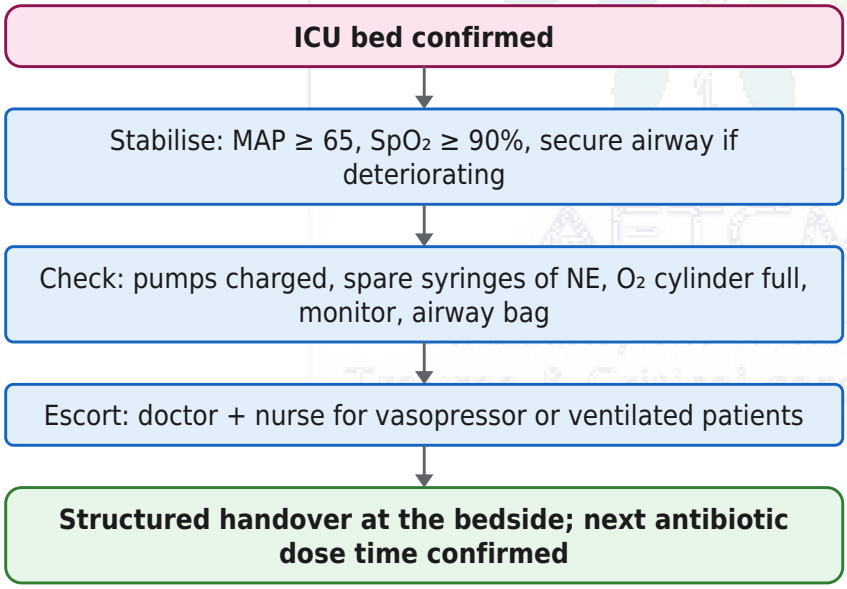
Transfer to ICU promptly

2. Immediate Stabilisation & Hour-1 Resuscitation · Page 2 of 2 — tables, graphs & algorithm

ED → ICU handover checklist

Item	Record
Time zero	Time sepsis recognised
Cultures	Blood ×2 + sites, time
Antibiotics	Drug, dose, time given; NEXT DOSE DUE
Fluids	Type, total volume, response
Vasopressors	Drug, dose (µg/kg/min), line
Source	Suspected source, imaging, source-control plan
Airway / breathing	Device, FiO_2, ventilator settings
Lactate trend	Values and times
Goals of care	Discussion held? Ceiling of care?

Safe intra-hospital transfer



GOLDEN PEARL

The ICU is a destination, but resuscitation is a journey that must not stop in the corridor.

‹ Back to Step 40 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

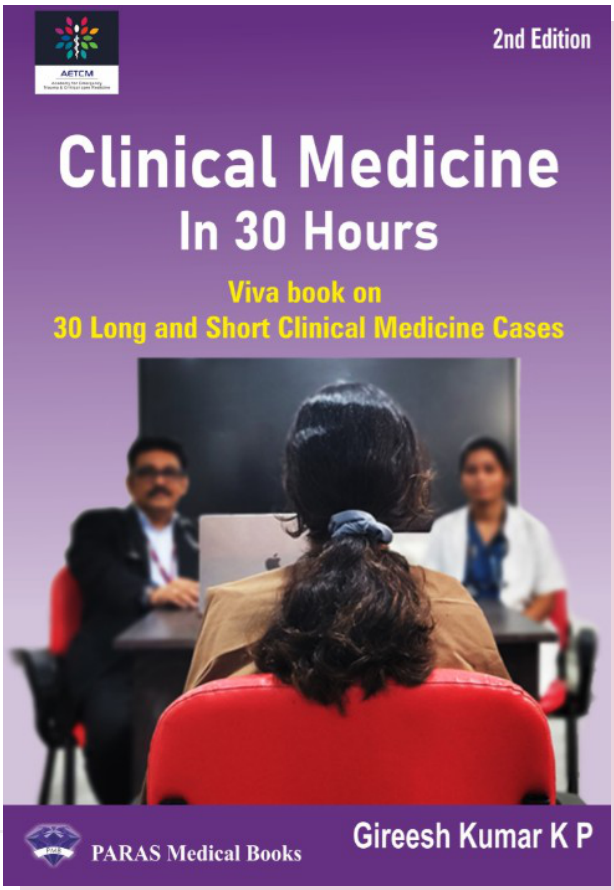
Abbreviations: **ED** – emergency department; **FiO_2** – fraction of inspired oxygen; **ICU** – intensive care unit; **MAP** – mean arterial pressure; **NE** – norepinephrine (noradrenaline); **SpO_2** – peripheral oxygen saturation


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Clinical Medicine in 30 Hours

Thirty long and short cases presented the way they are asked at the bedside and in the viva.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 41

Identify sources that need intervention

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Identify anatomical sources that need urgent intervention — abscess, necrotising soft-tissue infection, cholangitis, empyema, obstructed urinary tract, perforation or infected device.

WHY IT MATTERS

Antibiotics cannot sterilise pus, dead tissue or an obstructed duct. In these infections the patient will not recover until the source is drained, debrided, decompressed or removed — and the sooner, the better.

HOW TO DO IT AT THE BEDSIDE

- Examine the whole body: skin, wounds, pressure areas, perineum, line sites, joints.
- Image to find the source: ultrasound at the bedside, then CT (with contrast if renal function allows the risk–benefit).
- Ask the classic questions: jaundice + fever (cholangitis), loin pain + obstruction (pyonephrosis), pain out of proportion (necrotising infection or ischaemic bowel).
- Use LRINEC as support but never to exclude necrotising fasciitis — clinical suspicion = surgical exploration.

WATCH OUT

- Elderly and immunosuppressed patients may have minimal abdominal signs with perforation.
- Gas in soft tissue is a late sign of necrotising infection.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Rapidly evaluate adults with sepsis for a source of infection that requires emergent source control.
Good practice statement

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | LRINEC score (Wong 2004) | Tokyo Guidelines 2018 (cholangitis) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 41 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CT – computed tomography; **SSC** – Surviving Sepsis Campaign
LRINEC (Laboratory Risk Indicator for Necrotising Fasciitis): Six blood tests (CRP, WBC, Hb, Na, creatinine, glucose); ≥ 6 suggests necrotising fasciitis — never use it to exclude. Calculator / source › table ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 41

Identify sources that need intervention

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Sources that need intervention

Source	Clue	Imaging	Intervention
Cholangitis	Fever, jaundice, RUQ pain	USG / MRCP	ERCP drainage (PTBD if ERCP fails)
Pyonephrosis / obstructed UTI	Loin pain, stone history, anuria	USG KUB / CT KUB	PCN or DJ stent
Necrotising soft-tissue infection	Pain out of proportion, bullae, crepitus, rapid spread	Do not delay for imaging	Emergency surgical debridement
Perforated viscus / peritonitis	Guarding, air under diaphragm	Erect CXR, CT	Laparotomy / laparoscopy
Abscess (liver, psoas, other)	Persistent fever, focal pain	USG / CT	Percutaneous or surgical drainage
Empyema	Effusion with pH < 7.2, pus	USG thorax	Intercostal drain ± fibrinolytics/VATS
Infected device	Line site pus, persistent bacteraemia	—	Remove the device

LRINEC score (≥ 6 suggests necrotising fasciitis; < 6 does NOT exclude it)

Variable	Points
CRP ≥ 150 mg/L	4
WBC 15–25 / > 25 ×10³/µL	1 / 2
Hb 11–13.5 / < 11 g/dL	1 / 2
Sodium < 135 mmol/L	2
Creatinine > 1.6 mg/dL	2
Glucose > 180 mg/dL	1

GOLDEN PEARL

Pus must go. If you can find it, drain it — no antibiotic can do the surgeon's job.

‹ Back to Step 41 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRP – C-reactive protein; **CT** – computed tomography; **DJ** – double-J (ureteric stent); **ERCP** – endoscopic retrograde cholangiopancreatography; **Hb** – haemoglobin; **KUB** – kidneys, ureters, bladder; **PCN** – percutaneous nephrostomy; **PTBD** – percutaneous transhepatic biliary drainage; **USG** – ultrasonography; **VATS** – video-assisted thoracoscopic surgery; **WBC** – white blood cell count
LRINEC (Laboratory Risk Indicator for Necrotising Fasciitis): Six blood tests (CRP, WBC, Hb, Na, creatinine, glucose); ≥ 6 suggests necrotising fasciitis — never use it to exclude. Calculator / source › table ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 42

Emergent source control — within 6 hours

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Perform or obtain surgical / interventional radiology source control as early as possible — ideally within 6 hours of diagnosis.

WHY IT MATTERS

Delayed source control is associated with higher mortality in septic shock. The 2026 guideline suggests early source control, ideally within 6 hours of diagnosis. Choose the least invasive effective intervention, but do not let "stabilising for theatre" delay a life-saving procedure.

HOW TO DO IT AT THE BEDSIDE

- Call surgery / IR as soon as a drainable or removable source is suspected.
- Resuscitate in parallel — the procedure is part of resuscitation, not an alternative to it.
- Prefer percutaneous drainage when equivalent to surgery (abscess, gallbladder, kidney).
- Send pus/tissue for culture during the procedure.
- Document time of diagnosis and time of source control.

WATCH OUT

- Infected pancreatic necrosis is the exception — delayed, step-up drainage is better than early necrosectomy.
- Re-image if the patient does not improve — a second collection or incomplete drainage is common.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest early source control, ideally within 6 hours of diagnosis, over late source control.

Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Martínez 2017: timing of source control (Crit Care) | PANTER step-up approach (van Santvoort 2010) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 42 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: IR – interventional radiology; **SSC** – Surviving Sepsis Campaign

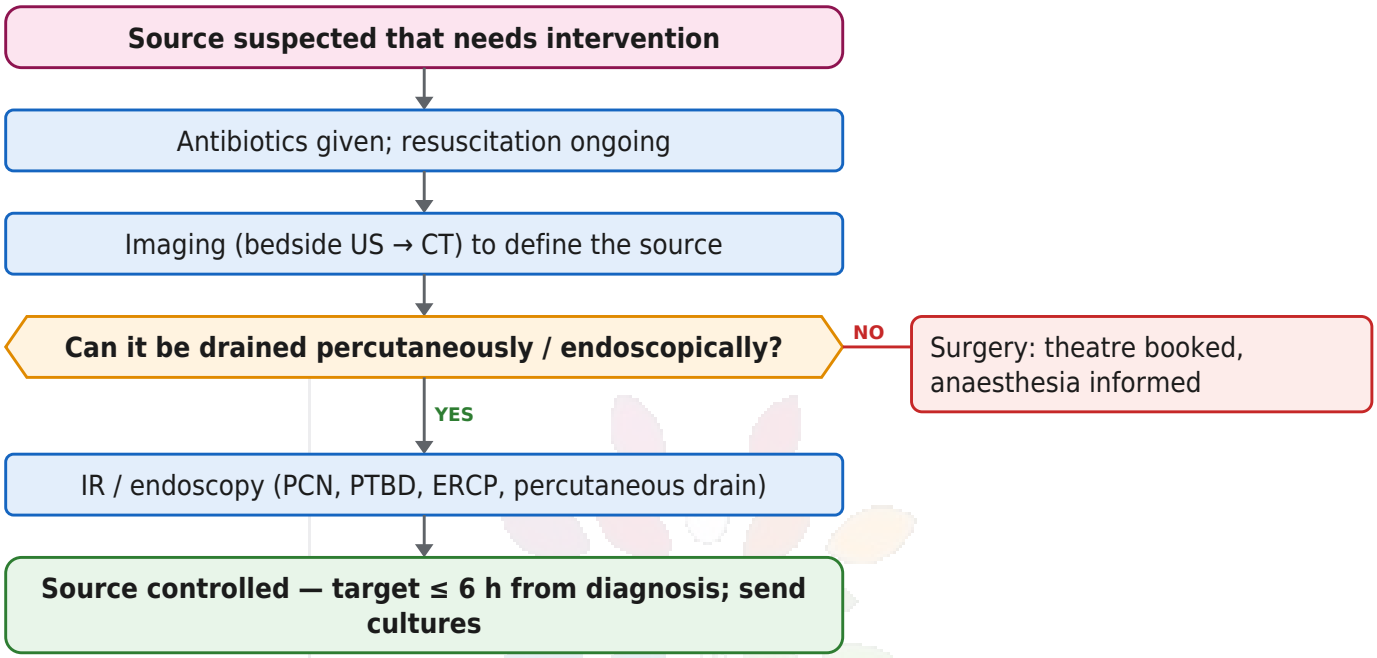

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 42

Emergent source control — within 6 hours

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Source control pathway



Least invasive effective option

Source	First option	If it fails
Obstructed infected kidney	Percutaneous nephrostomy or DJ stent	Nephrectomy (rare)
Cholangitis	ERCP + stent	PTBD / surgical drainage
Acalculous cholecystitis (ICU)	Percutaneous cholecystostomy	Cholecystectomy
Liver abscess > 5 cm	Percutaneous aspiration / catheter	Surgery
Infected pancreatic necrosis	Delay ≥ 4 weeks if possible; percutaneous / endoscopic step-up	Minimally invasive necrosectomy
Necrotising fasciitis	Radical surgical debridement (no alternative)	Re-look in 24 h

GOLDEN PEARL

The six-hour clock for source control starts when you think of the source — so think of it early.

‹ Back to Step 42 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CT – computed tomography; **DJ** – double-J (ureteric stent); **ERCP** – endoscopic retrograde cholangiopancreatography; **ICU** – intensive care unit; **IR** – interventional radiology; **PCN** – percutaneous nephrostomy; **PTBD** – percutaneous transhepatic biliary drainage


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 43

Remove or exchange infected catheters

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Remove or exchange potentially infected intravascular catheters promptly, after securing alternative access.

WHY IT MATTERS

Central lines, dialysis catheters and ports are among the commonest hospital sources of bacteraemia. Leaving an infected line in place leads to persistent bacteraemia, metastatic infection and relapse.

HOW TO DO IT AT THE BEDSIDE

- Suspect CRBSI with fever and no other source, exit-site pus, or rigors on flushing.
- Paired cultures: from the line and peripherally; differential time to positivity ≥ 2 h suggests CRBSI.
- Remove short-term CVCs in septic shock, tunnel infection, or with S. aureus, Pseudomonas, Candida or mycobacteria.
- Secure new access at a different site before removal in vasopressor-dependent patients.
- Send the tip for culture only when CRBSI is suspected.

WATCH OUT

- Guidewire exchange is not appropriate for a proven infected line.
- S. aureus bacteraemia needs echocardiography and at least 14 days of therapy.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Rapidly evaluate for a source requiring emergent control; prompt removal of intravascular access devices that are a possible source after other access is established (SSC 2021, unchanged principle).

Good practice / Ungraded

EVIDENCE & FURTHER READING — TAP TO OPEN

IDSA CRBSI guideline (Mermel 2009) · SSC 2021 (Evans) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 43 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRBSI – catheter-related bloodstream infection; **IDSA** – Infectious Diseases Society of America; **SSC** – Surviving Sepsis Campaign

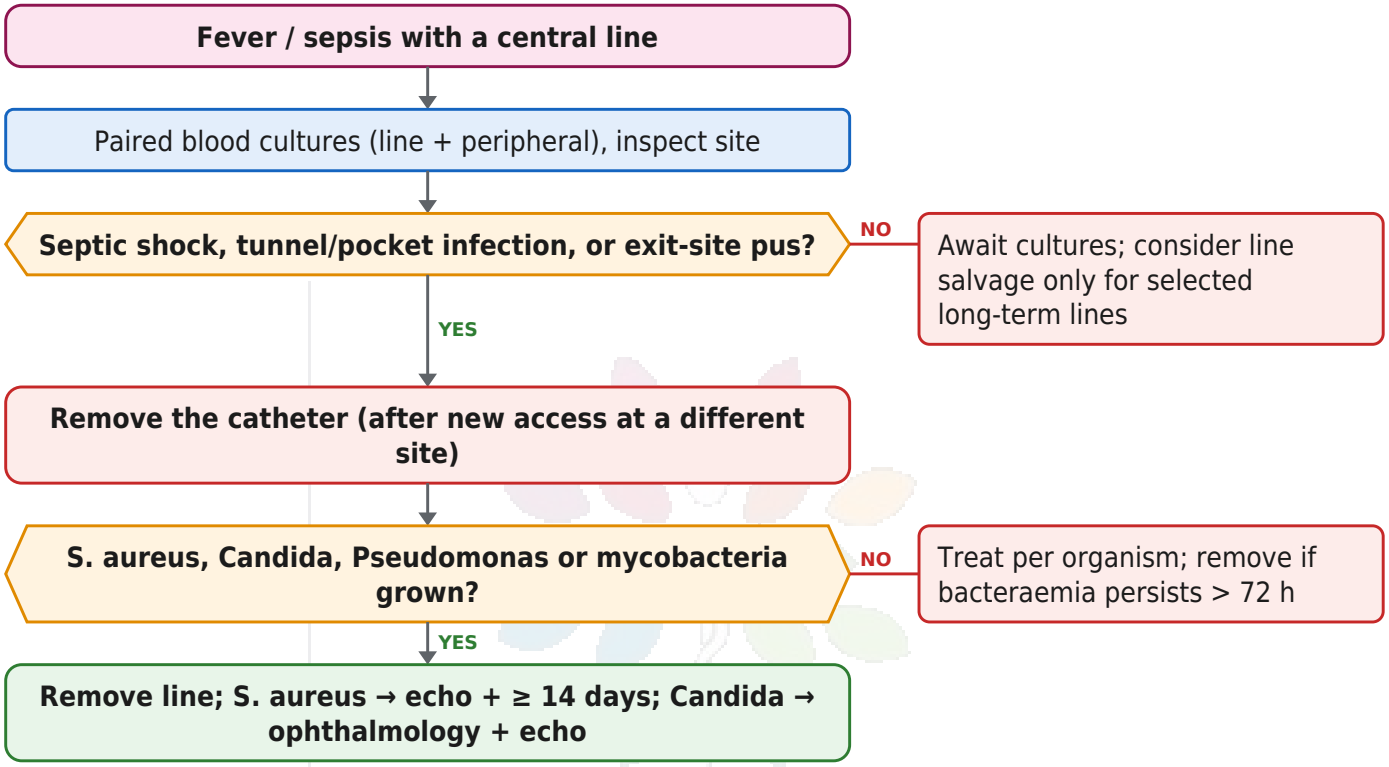

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 43

Remove or exchange infected catheters

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Suspected catheter-related bloodstream infection



Interpreting paired cultures

Result	Meaning
Line positive ≥ 2 h before peripheral (same organism)	CRBSI likely
Only line culture positive	Colonisation or contamination
Only peripheral positive	Source elsewhere (or CRBSI with low burden)
CoNS in 1 of 2 sets	Usually contaminant

GOLDEN PEARL

When in doubt in a shocked patient, take it out — after you have another way in.

‹ Back to Step 43 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CoNS – coagulase-negative staphylococci; **CRBSI** – catheter-related bloodstream infection


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 44

Relieve urinary obstruction

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Relieve urinary tract obstruction and replace long-term urinary catheters when a urinary source is suspected.

WHY IT MATTERS

An obstructed, infected kidney is a closed abscess under pressure; antibiotics alone fail and mortality is high. Long-term catheters carry biofilm and should be replaced before collecting the urine culture.

HOW TO DO IT AT THE BEDSIDE

- Bedside ultrasound in every urosepsis patient: look for hydronephrosis, stones, bladder distension.
- Obstruction + infection = urological emergency: percutaneous nephrostomy or ureteric stent.
- Retention: catheterise and record residual volume.
- Long-term catheter: remove and replace, then send urine from the new catheter.

WATCH OUT

- Do not do definitive stone surgery (ureteroscopy) in active sepsis — decompress first.
- Emphysematous pyelonephritis in diabetics: CT and urgent urology review.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Early source control, ideally within 6 hours of diagnosis.

Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

EAU urological infections guideline | Pearle 1998: PCN vs stent in obstructed infected kidney | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 44 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CT – computed tomography; **PCN** – percutaneous nephrostomy


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 44

Relieve urinary obstruction

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Urosepsis — decompress the obstruction

Sepsis with urinary source

↓

Cultures, antibiotics, resuscitation; bedside USG KUB

↓

Hydronephrosis / obstructing stone / retention?

NO → Medical treatment; replace long-term catheter; reassess at 48–72 h

YES ↓

Retention → urinary catheter; upper-tract obstruction → urology / IR now

↓

PCN or DJ stent; definitive stone treatment after recovery

PCN or ureteric stent?

Feature	Percutaneous nephrostomy	Retrograde DJ stent
Anaesthesia	Local	Often general / spinal
Coagulopathy	Relative contraindication	Preferred
Large stone / pyonephrosis	Preferred (larger drainage)	May block
Patient comfort	External bag	Internal; stent symptoms

GOLDEN PEARL

An infected obstructed kidney is an abscess — and abscesses need drainage.

‹ Back to Step 44 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **DJ** – double-J (ureteric stent); **IR** – interventional radiology; **KUB** – kidneys, ureters, bladder; **PCN** – percutaneous nephrostomy; **USG** – ultrasonography


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 45

Review prior microbiology and antibiotic exposure

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Review prior microbiology results and recent antibiotic exposure to refine empiric coverage.

WHY IT MATTERS

The best predictor of a resistant organism is the patient's own history: previous cultures, recent antibiotics, recent hospitalisation and colonisation. Five minutes with the records can turn a guess into a targeted choice.

HOW TO DO IT AT THE BEDSIDE

- Check cultures from the past 3–12 months (including surveillance swabs).
- Ask about antibiotics in the last 90 days, hospital or ICU stays, dialysis, nursing home residence, travel.
- Match the empiric regimen to the organism most likely for this source in this patient.
- Call the microbiologist for complex cases.

WATCH OUT

- A prior ESBL or CRE isolate from the same site is a strong reason to cover it empirically.
- Colonisation is not always infection — weigh it against the clinical source.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Cover a specific MDR pathogen empirically when the risk is high; suggest against MDR coverage when risk is low.
Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | ICMR AMRSN annual report | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 45 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRE – carbapenem-resistant Enterobacterales; **ESBL** – extended-spectrum β-lactamase; **ICMR** – Indian Council of Medical Research; **ICU** – intensive care unit; **MDR** – multidrug-resistant; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 45

Review prior microbiology and antibiotic exposure

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Risk factors for multidrug-resistant organisms

Risk factor	Organisms to consider
Previous colonisation/infection with MDRO (12 months)	Same organism — cover empirically
IV antibiotics in last 90 days	ESBL Enterobacterales, Pseudomonas, MRSA
Hospitalisation ≥ 5 days / ICU-acquired infection	ESBL, CRE, Acinetobacter, Pseudomonas
Haemodialysis, nursing home, chronic wounds	MRSA, ESBL
Recent travel/hospital care in high-prevalence region (incl. much of India)	ESBL, CRE (NDM, OXA-48)
Structural lung disease (bronchiectasis)	Pseudomonas
Septic shock + high local MDR prevalence	Broader empiric therapy, then de-escalate

Common resistance phenotypes and empiric choices

Phenotype	Reliable options	Notes
ESBL Enterobacterales	Meropenem / ertapenem	Pip-tazo inferior in bacteraemia (MERINO)
CRE — KPC / OXA-48	Ceftazidime–avibactam	Need molecular result
CRE — NDM (MBL)	Ceftazidime–avibactam + aztreonam; colistin	Common in India
CRAB (Acinetobacter)	Colistin / sulbactam-based combinations	ID consultation
MRSA	Vancomycin or linezolid	Daptomycin for bacteraemia (not pneumonia)

GOLDEN PEARL

The patient's old culture report is the best antibiogram you will ever have.

‹ Back to Step 45 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

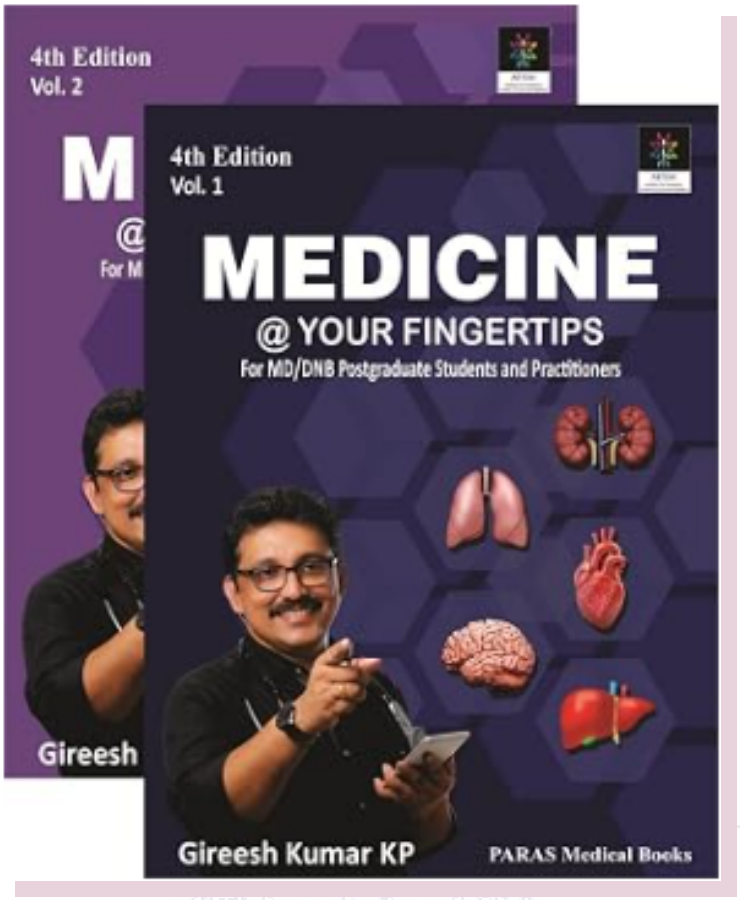
Abbreviations: CRAB – carbapenem-resistant Acinetobacter baumannii; **CRE** – carbapenem-resistant Enterobacterales; **ESBL** – extended-spectrum β-lactamase; **ICU** – intensive care unit; **IV** – intravenous; **KPC** – Klebsiella pneumoniae carbapenemase; **MBL** – metallo-β-lactamase; **MDR** – multidrug-resistant; **MDRO** – multidrug-resistant organism; **MRSA** – methicillin-resistant Staphylococcus aureus; **NDM** – New Delhi metallo-β-lactamase
Drug information (RxList — tap): Meropenem · Ertapenem · Ceftazidime · Vancomycin · Linezolid · Daptomycin · Colistin · Aztreonam


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Medicine @ Your Fingertips

Clinical medicine at a glance — a high-yield reference for MD/DNB postgraduates and practitioners.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 46

Empiric antifungals only for high-risk patients

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Add empiric antifungal cover only when specific risk factors exist — neutropenia, prolonged broad-spectrum antibiotics, TPN, recent abdominal surgery, or Candida colonisation at multiple sites.

WHY IT MATTERS

Invasive candidiasis is serious but uncommon at presentation. Routine empiric antifungals add cost, toxicity and resistance. The 2026 guideline suggests against empiric antifungals in general, while allowing case-by-case use for high-risk patients.

HOW TO DO IT AT THE BEDSIDE

- Consider empiric echinocandin in septic shock with multiple risk factors (Candida score ≥ 3).
- Neutropenic patients with persistent fever after 4–7 days of antibiotics: mould-active cover.
- Send blood cultures (and β-D-glucan where available); remove central lines in candidaemia.
- Stop empiric antifungals if cultures are negative and the patient has improved.

WATCH OUT

- Candida in sputum or urine of a catheterised patient is usually colonisation.
- Candida biomarkers should not be used alone to start or stop therapy (case-by-case exceptions).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Generally suggest against empiric antifungal therapy, with case-by-case use for those with risk factors; against using Candida biomarkers to start or stop antifungals.

Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

IDSA candidiasis guideline (Pappas 2016) | EMPIRICUS trial (Timsit 2016) | Candida score (León 2006) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 46 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: IDSA – Infectious Diseases Society of America; **TPN** – total parenteral nutrition


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 46

Empiric antifungals only for high-risk patients

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Candida score (León) — ≥ 3 identifies high risk

Factor	Points
Total parenteral nutrition	1
Surgery on ICU admission	1
Multifocal Candida colonisation	1
Severe sepsis / septic shock	2

Antifungal dosing (adult)

Drug	Loading	Maintenance	Use
Caspofungin	70 mg IV	50 mg IV daily	Empiric / candidaemia in shock
Micafungin	—	100 mg IV daily	Candidaemia
Anidulafungin	200 mg IV	100 mg IV daily	Candidaemia
Fluconazole	800 mg (12 mg/kg)	400 mg (6 mg/kg) daily	Stable, susceptible Candida (step-down)
Liposomal amphotericin B	—	3–5 mg/kg/day (5–10 for mucor)	Moulds, mucormycosis, resistant Candida
Voriconazole	6 mg/kg q12h × 2	4 mg/kg q12h (TDM 1–5.5 mg/L)	Aspergillus

Candidaemia: remove central venous catheters, repeat blood cultures until negative, ophthalmology examination, treat for 14 days after the first negative culture.

GOLDEN PEARL

Fungi are opportunists. Look for the open door (TPN, lines, surgery, neutropenia) before you reach for an antifungal.

‹ Back to Step 46 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit; **IV** – intravenous; **TDM** – therapeutic drug monitoring; **TPN** – total parenteral nutrition
Drug information (RxList — tap): Fluconazole · Caspofungin · Micafungin · Anidulafungin · Voriconazole · Amphotericin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 47

Antivirals when viral infection is likely

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Add antiviral therapy (e.g., oseltamivir) during seasonal outbreaks when viral pneumonia is suspected, and specific antivirals for other likely viruses.

WHY IT MATTERS

Influenza and other respiratory viruses can cause sepsis directly or set up secondary bacterial pneumonia. Early oseltamivir reduces complications in hospitalised influenza, and its benefit is greatest when started early — but it should be started even after 48 hours in severe disease.

HOW TO DO IT AT THE BEDSIDE

- Send influenza/COVID-19/RSV PCR in severe respiratory illness during outbreak seasons.
- Start oseltamivir 75 mg orally/NG twice daily empirically in severe influenza-like illness; adjust for renal function.
- Suspected HSV encephalitis: acyclovir 10 mg/kg IV q8h immediately.
- Stop antivirals if PCR is negative and an alternative diagnosis is made.

WATCH OUT

- Viral and bacterial co-infection is common — do not stop antibiotics solely because a virus is found in a shocked patient.
- Acyclovir causes crystal nephropathy — hydrate and dose by renal function.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Pathogen-specific rapid tests case-by-case; empiric therapy covering likely pathogens, including viral where indicated.

Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

IDSA influenza guideline (Uyeki 2019) · Muthuri 2014: oseltamivir in hospitalised H1N1 (Lancet Resp Med) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 47 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: HSV – herpes simplex virus; **IDSA** – Infectious Diseases Society of America; **IV** – intravenous; **NG** – nasogastric; **PCR** – polymerase chain reaction; **RSV** – respiratory syncytial virus
Drug information (RxList — tap): Oseltamivir · Acyclovir


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 47

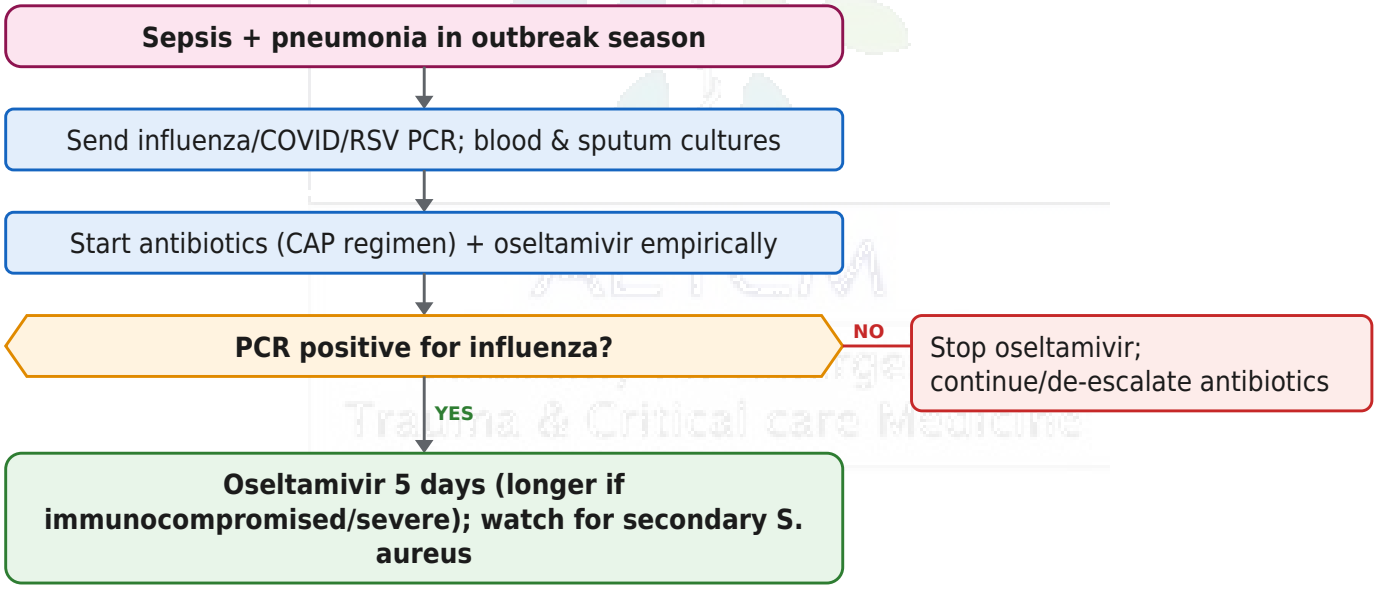
Antivirals when viral infection is likely

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Antivirals in sepsis (adult doses)

Virus	Drug	Dose	Renal adjustment
Influenza A/B	Oseltamivir	75 mg PO/NG q12h × 5 days (longer if severe)	CrCl 30–60: 30 mg q12h; 10–30: 30 mg daily
HSV encephalitis	Acyclovir	10 mg/kg IV q8h × 14–21 days	CrCl 25–50: q12h; 10–25: q24h
VZV (disseminated)	Acyclovir	10 mg/kg IV q8h	As above
CMV (immunocompromised)	Ganciclovir	5 mg/kg IV q12h	Adjust by CrCl
COVID-19 (hypoxic, early)	Remdesivir	200 mg day 1, then 100 mg daily × 4	Per current label

Severe respiratory infection in flu season



GOLDEN PEARL

In the influenza season, every severe pneumonia is influenza until the PCR says otherwise.

‹ Back to Step 47 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CAP – community-acquired pneumonia; **CMV** – cytomegalovirus; **CrCl** – creatinine clearance; **HSV** – herpes simplex virus; **IV** – intravenous; **NG** – nasogastric; **PCR** – polymerase chain reaction; **PO** – by mouth; **RSV** – respiratory syncytial virus; **VZV** – varicella-zoster virus
Drug information (RxList — tap): Oseltamivir · Acyclovir · Ganciclovir · Remdesivir


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 48

Adjust doses for organ dysfunction — after the first day

THE GOLDEN STEP

Adjust subsequent antimicrobial doses for renal or hepatic dysfunction using pharmacokinetic/pharmacodynamic principles.

WHY IT MATTERS

AKI in sepsis is often transient; premature dose reduction leads to under-treatment in the most dangerous first 48 hours. Conversely, persistent renal failure leads to accumulation and toxicity (seizures with β-lactams, nephro- and ototoxicity with aminoglycosides).

HOW TO DO IT AT THE BEDSIDE

- Give full doses for the first 24 hours regardless of creatinine.
- Estimate creatinine clearance (Cockcroft–Gault) or measure (8–24 h urine) once stable.
- Adjust maintenance dose or interval for drugs cleared renally; consult the pharmacist.
- Patients on CRRT often need near-normal doses of β-lactams.
- Use TDM where available (Step 50).

WATCH OUT

- Creatinine lags behind GFR changes — creatinine-based estimates are unreliable in unstable AKI.
- Cefepime neurotoxicity and carbapenem seizures occur when doses are not reduced in persistent renal failure.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest therapeutic drug monitoring on a case-by-case basis; prolonged β-lactam infusion after loading.
Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Cockcroft-Gault formula (1976) | Roberts 2014: PK/PD in critical illness | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 48 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **AKI** – acute kidney injury; **CRRT** – continuous renal replacement therapy; **GFR** – glomerular filtration rate; **PD** – pharmacodynamic; **PK** – pharmacokinetic; **TDM** – therapeutic drug monitoring
Drug information (RxList — tap): Cefepime


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 48

Adjust doses for organ dysfunction — after the first day

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Renal dose adjustment — common antimicrobials (maintenance, adults; check local formulary)

Drug	CrCl > 50	CrCl 25-50	CrCl 10-25	CrCl < 10 / HD
Meropenem	1 g q8h	1 g q12h	500 mg q12h	500 mg q24h
Piperacillin-tazobactam	4.5 g q6–8h	4.5 g q8h (3.375 g q6h)	2.25 g q6h	2.25 g q8h
Cefepime	2 g q8h	2 g q12h	2 g q24h	1 g q24h
Ceftriaxone	2 g q24h	No change	No change	No change (max 2 g/day)
Levofloxacin	750 mg q24h	750 mg q48h	750 mg then 500 mg q48h	As 10–25
Amikacin	15–20 mg/kg q24h	q36h	q48h	By level
Vancomycin	15–20 mg/kg q8–12h	q24h	By level	By level
Fluconazole	400 mg q24h	200 mg q24h	200 mg q24h	400 mg after each HD

Cockcroft–Gault: CrCl (mL/min) = [(140 − age) × weight (kg)] ÷ [72 × serum creatinine (mg/dL)], × 0.85 for women. Example: 70-year-old man, 60 kg, creatinine 2.0 → (70 × 60) ÷ 144 = 29 mL/min.

GOLDEN PEARL

Load fully, then dose to the kidney you have tomorrow, not the creatinine you had yesterday.

‹ Back to Step 48 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CrCl – creatinine clearance; **HD** – haemodialysis
Drug information (RxList — tap): Ceftriaxone · Piperacillin · Meropenem · Cefepime · Amikacin · Vancomycin · Levofloxacin · Fluconazole


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 49

Prolonged infusion of β-lactams

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Give β-lactams as extended (3–4 h) or continuous infusions after a loading dose.

WHY IT MATTERS

β-lactams kill by time above the MIC (fT>MIC). Intermittent boluses produce high peaks and long troughs below the MIC in septic patients with augmented clearance. Prolonged infusion keeps concentrations above the MIC; the 2026 guideline upgraded this to a strong recommendation after BLING III and its meta-analysis.

HOW TO DO IT AT THE BEDSIDE

- Give a 30-minute loading dose first.
- Then piperacillin–tazobactam 4.5 g over 4 h q8h (or 16 g/2 g per 24 h continuous).
- Meropenem 1–2 g over 3 h q8h; cefepime 2 g over 3–4 h q8h.
- Check drug stability at room temperature (meropenem: prepare fresh, ≤ 8 h).
- Use a dedicated line or check compatibility.

WATCH OUT

- Missing the loading dose defeats the purpose — levels take hours to rise.
- Line competition with vasopressors and sedation is the commonest practical barrier — plan lumens.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend prolonged infusion of β-lactams for maintenance (after an initial bolus) over conventional bolus infusion.

Strong · Moderate certainty (upgraded)

EVIDENCE & FURTHER READING — TAP TO OPEN

BLING III (Dulhunty, JAMA 2024) · Abdul-Aziz 2024 meta-analysis (JAMA) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 49 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: MIC – minimum inhibitory concentration
Drug information (RxList — tap): Piperacillin · Meropenem · Cefepime

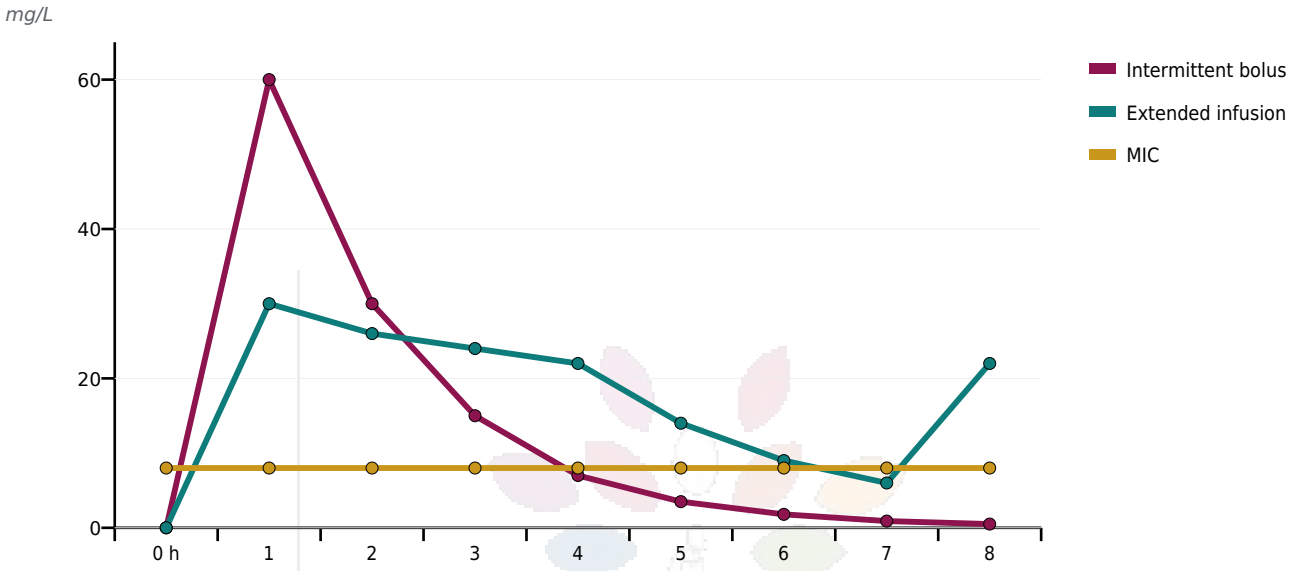

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 49

Prolonged infusion of β-lactams

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

β-lactam concentration vs MIC (schematic)



With bolus dosing, levels fall below the MIC for most of the dosing interval; with extended infusion they stay above it — what matters for β-lactam killing.

Extended-infusion regimens (adult, normal renal function)

Drug	Loading	Maintenance
Piperacillin–tazobactam	4.5 g over 30 min	4.5 g over 4 h every 8 h
Meropenem	1–2 g over 30 min	1–2 g over 3 h every 8 h
Cefepime	2 g over 30 min	2 g over 3–4 h every 8 h
Ceftazidime	2 g over 30 min	6 g/24 h continuous infusion

GOLDEN PEARL

For β-lactams, time is the dose. Keep the drug above the MIC and let it work.

‹ Back to Step 49 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: MIC – minimum inhibitory concentration
Drug information (RxList — tap): Piperacillin · Meropenem · Cefepime · Ceftazidime


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 50

Therapeutic drug monitoring

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Monitor drug levels (vancomycin, aminoglycosides and, where available, β-lactams) when applicable.

WHY IT MATTERS

Septic patients have unpredictable pharmacokinetics — expanded volumes, augmented clearance, AKI, CRRT. TDM is the only way to know whether the dose is effective and safe, particularly for narrow-therapeutic-index drugs.

HOW TO DO IT AT THE BEDSIDE

- Vancomycin: AUC-guided dosing (target AUC_{24} 400–600 mg·h/L); trough-only (15–20 mg/L) is acceptable where AUC tools are unavailable.
- Amikacin once daily: peak (1 h after start) 8–10 × MIC (≈ 50–64 mg/L); trough < 2.5–5 mg/L.
- Gentamicin once daily: peak 15–20 mg/L for serious Gram-negative infection; trough < 1 mg/L.
- Voriconazole trough 1–5.5 mg/L; posaconazole > 0.7–1 mg/L.
- β-lactam TDM (where available): 100% fT>MIC (often 4× MIC) in critically ill.

WATCH OUT

- Timing errors make levels meaningless — record the exact dose and sample times.
- Concurrent nephrotoxins (vancomycin + pip-tazo, aminoglycoside + contrast) add up.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest therapeutic drug monitoring on a case-by-case basis.
Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Vancomycin consensus (Rybak 2020) · Abdul-Aziz 2020: antimicrobial TDM position paper · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 50 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **AUC** – area under the concentration–time curve; **CRRT** – continuous renal replacement therapy; **MIC** – minimum inhibitory concentration; **TDM** – therapeutic drug monitoring
Drug information (RxList — tap): Amikacin · Gentamicin · Vancomycin · Voriconazole


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 50

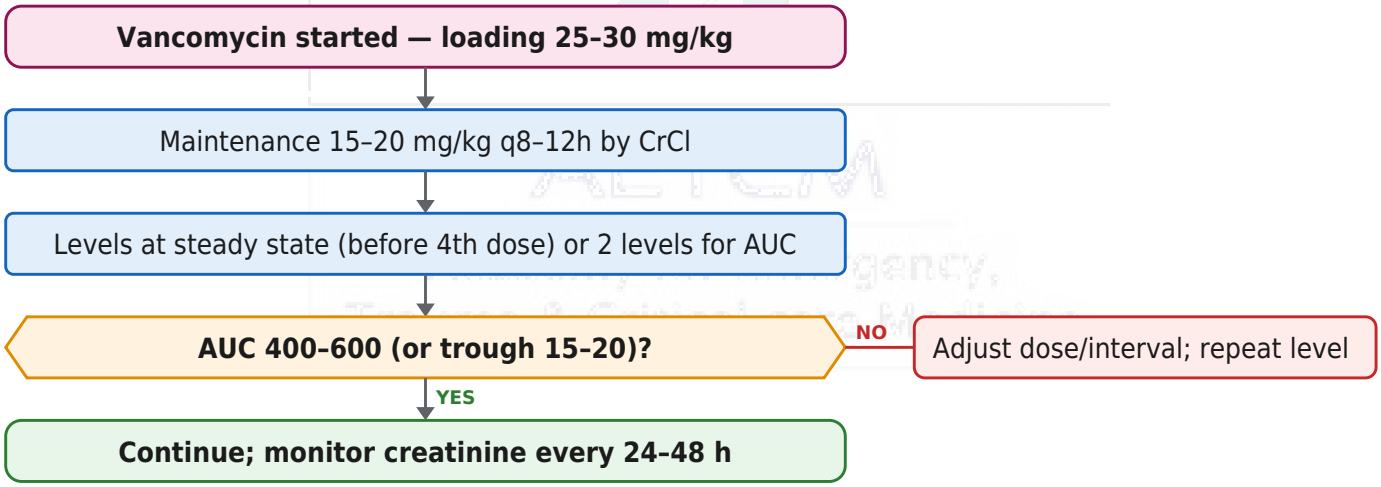
Therapeutic drug monitoring

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

TDM targets (adults)

Drug	Sample	Target	If high
Vancomycin	AUC (2 levels) or trough	AUC_{24} 400–600; trough 15–20 mg/L	Hold/extend interval; AKI risk
Amikacin (OD)	Peak 1 h, trough	Peak 50–64; trough < 2.5–5 mg/L	Extend interval
Gentamicin (OD)	Peak, 6–14 h level	Peak 15–20; trough < 1 mg/L	Hartford nomogram interval
Voriconazole	Trough day 5	1–5.5 mg/L	Neuro/hepatotoxicity
β-lactams	Steady-state	fT>MIC 100% (≈ 4× MIC)	Neurotoxicity (cefepime)
Colistin	Steady-state (where available)	Css ~2 mg/L	Nephrotoxicity

Vancomycin dosing pathway



GOLDEN PEARL

Measure, do not guess. In sepsis the right dose is the one the patient's blood level confirms.

‹ Back to Step 50 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

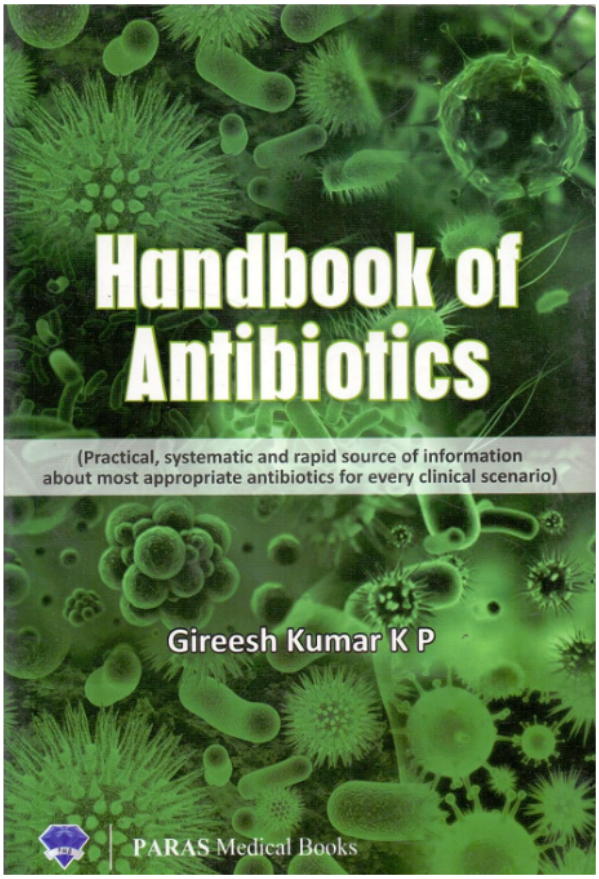
Abbreviations: AKI – acute kidney injury; **AUC** – area under the concentration–time curve; **CrCl** – creatinine clearance; **MIC** – minimum inhibitory concentration; **OD** – once daily; **TDM** – therapeutic drug monitoring
Drug information (RxList — tap): Cefepime · Amikacin · Gentamicin · Vancomycin · Colistin · Voriconazole


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Handbook of Antibiotics

A practical bedside guide to choosing, dosing and monitoring antibiotics — the natural companion to the antimicrobial steps of this book.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 51

Re-evaluate the diagnosis daily

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Re-evaluate the diagnosis every day to exclude non-infectious causes and missed sources.

WHY IT MATTERS

The working diagnosis at hour one is wrong more often than we admit. A daily structured "antibiotic time-out" asks whether this is still infection, whether the source is controlled and whether the regimen is still right.

HOW TO DO IT AT THE BEDSIDE

- Daily: review history, examination, imaging and microbiology as if seeing the patient for the first time.
- Ask: Is this infection? Where is the source? Is it controlled? Are the drugs right (spectrum, dose, route)? Can we stop?
- Consider mimics (Step 19), drug fever, VTE, pancreatitis, adrenal insufficiency, malignancy.
- Document the antibiotic plan and planned duration in the daily note.

WATCH OUT

- A persistently febrile patient on day 5 needs a new search, not a new antibiotic.
- Avoid "diagnostic momentum" — labels pass from note to note without being checked.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Continually reassess and stop empiric antimicrobials if an alternative diagnosis emerges.

Good practice statement

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | CDC Core Elements: antibiotic time-out | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 51 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: SSC – Surviving Sepsis Campaign; **VTE** – venous thromboembolism


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 51

Re-evaluate the diagnosis daily

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Daily antibiotic time-out (five questions)

Question	Options
1. Is this still infection?	Yes / No → stop (Step 53) / Unsure → investigate
2. What is the source — is it controlled?	Controlled / needs drainage / unknown → image
3. What do the cultures show?	Organism & susceptibility → de-escalate (Step 52)
4. Is the dose and route right?	Renal adjustment, TDM, IV-to-oral switch
5. What is the stop date?	Planned duration documented (Step 54)

Persistent fever on antibiotics — think beyond resistance

Category	Examples
Undrained source	Abscess, empyema, cholangitis, infected necrosis
New infection	CLABSI, CAUTI, VAP, C. difficile, sinusitis
Non-bacterial infection	Fungal, viral (CMV, HSV), TB, tropical (scrub typhus, malaria)
Non-infectious	Drug fever, VTE, pancreatitis, transfusion reaction, malignancy, HLH
Wrong dose	Under-dosing, augmented clearance — check TDM

GOLDEN PEARL

Every morning, re-diagnose the patient. Yesterday's diagnosis is today's hypothesis.

‹ Back to Step 51 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **CAUTI** – catheter-associated urinary tract infection; **CLABSI** – central line-associated bloodstream infection; **CMV** – cytomegalovirus; **HLH** – haemophagocytic lymphohistiocytosis; **HSV** – herpes simplex virus; **IV** – intravenous; **TB** – tuberculosis; **TDM** – therapeutic drug monitoring; **VAP** – ventilator-associated pneumonia; **VTE** – venous thromboembolism


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 52

De-escalate once cultures return

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

De-escalate the antibiotic spectrum once culture and susceptibility results are available.

WHY IT MATTERS

Empiric therapy is deliberately broad; continuing it once the organism is known gives no benefit and increases C. difficile, resistance, toxicity and cost. The 2026 guideline upgraded de-escalation to a strong recommendation.

HOW TO DO IT AT THE BEDSIDE

- Review cultures at 48–72 h.
- Switch to the narrowest effective agent (e.g., meropenem → ceftriaxone for a susceptible E. coli).
- Stop MRSA cover if MRSA is not grown from adequate cultures (nasal MRSA PCR has a high negative predictive value for pneumonia).
- Stop double Gram-negative cover once susceptibility is known.
- If no pathogen is found and the patient is improving, de-escalate or stop based on the clinical picture.

WATCH OUT

- Do not de-escalate onto an agent that does not reach the site (e.g., daptomycin for pneumonia).
- In ESBL bacteraemia, carbapenem is preferred over pip-tazo (MERINO).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend de-escalation once microbiology and susceptibilities are known; suggest de-escalation when no pathogen is identified.
Strong · Very low / Conditional · Very low

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | MERINO (Harris, JAMA 2018) | Tabah 2020: de-escalation in ICU (DIANA) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 52 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ESBL – extended-spectrum β-lactamase; **ICU** – intensive care unit; **MRSA** – methicillin-resistant Staphylococcus aureus; **PCR** – polymerase chain reaction; **SSC** – Surviving Sepsis Campaign
Drug information (RxList — tap): Ceftriaxone · Meropenem · Daptomycin

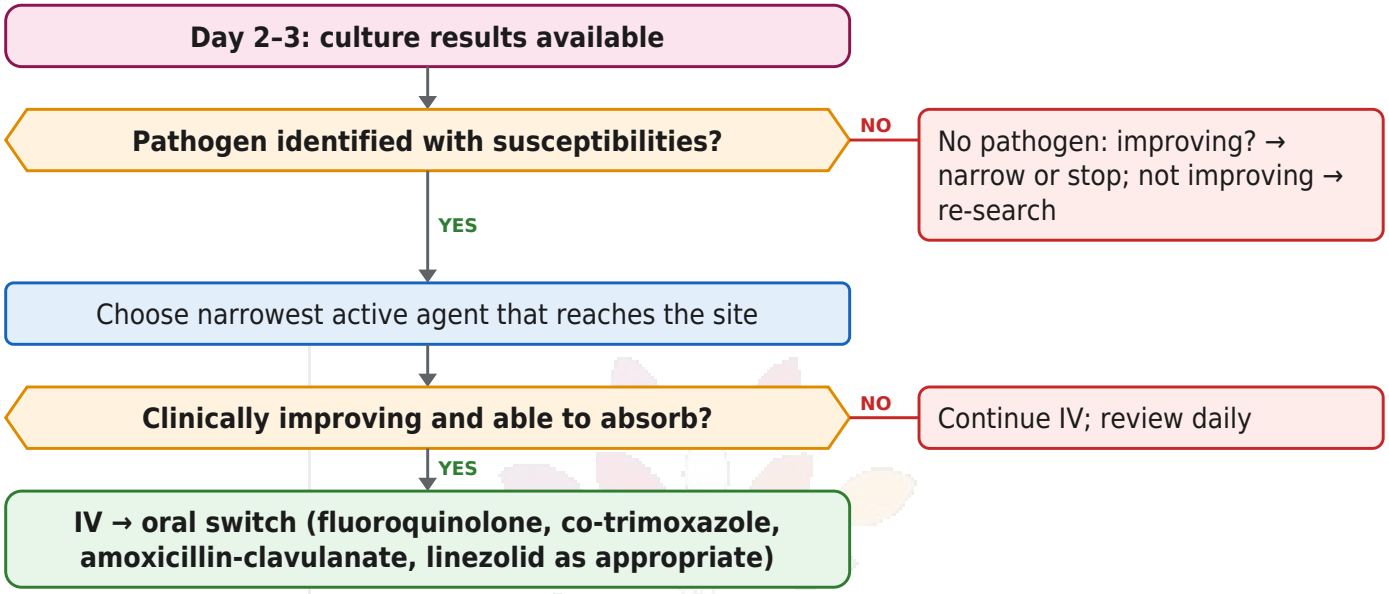

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 52

De-escalate once cultures return

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

De-escalation at 48–72 hours



Common de-escalation moves

Empiric	Culture result	De-escalate to
Meropenem	E. coli susceptible to ceftriaxone	Ceftriaxone
Pip-tazo + vancomycin	MSSA	Cloxacillin or cefazolin
Pip-tazo	Streptococcus pneumoniae	Penicillin / ceftriaxone
Meropenem + amikacin	ESBL Klebsiella	Meropenem alone (or ertapenem)
Vancomycin	Nasal MRSA PCR negative, cultures negative	Stop vancomycin

GOLDEN PEARL

Broad on day one, narrow on day three. De-escalation is not a risk — it is the second half of good empiric therapy.

‹ Back to Step 52 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **ESBL** – extended-spectrum β-lactamase; **IV** – intravenous; **MRSA** – methicillin-resistant Staphylococcus aureus; **MSSA** – methicillin-sensitive Staphylococcus aureus; **PCR** – polymerase chain reaction
Drug information (RxList — tap): Ceftriaxone · Meropenem · Ertapenem · Amikacin · Vancomycin · Linezolid · Cefazolin · Cloxacillin · Co-trimoxazole


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 53

Stop antimicrobials when infection is excluded

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Stop antimicrobials promptly if an alternative, non-infectious diagnosis is confirmed.

WHY IT MATTERS

A large proportion of patients started on antibiotics for suspected sepsis turn out not to have bacterial infection. Continuing "to be safe" exposes them to harm without benefit.

HOW TO DO IT AT THE BEDSIDE

- Document the alternative diagnosis and the reason for stopping.
- Check cultures are negative at 48 h and the patient is stable.
- Communicate the plan to the team and the family.
- Monitor after stopping — restart if new evidence of infection appears.

WATCH OUT

- Procalcitonin can support stopping but should not be used alone.
- Some conditions coexist with infection (e.g., pancreatitis with infected necrosis) — stop only when infection is truly excluded.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Continually reassess and stop empiric therapy if an alternative diagnosis emerges; suggest deferring antimicrobials when infection is unlikely and there is no shock.

Good practice / Conditional

NOTE ON PROCALCITONIN (PCT)

PCT is a precursor of calcitonin released by many tissues in response to bacterial toxins and IL-1β/TNF; interferon (viral infection) suppresses it. **Normal < 0.05 ng/mL; < 0.25 bacterial infection unlikely; 0.25–0.5 possible; > 0.5 likely; > 2 high probability of bacterial sepsis; > 10 often septic shock.** It rises within 2–4 h and peaks at 12–24 h with a half-life of ~24 h. **Best use: deciding when to STOP** — stop if PCT < 0.5 ng/mL or fallen ≥ 80% from the peak and the patient is improving (SAPS, PRORATA). SSC 2026 advises against using PCT to decide whether to START antimicrobials. False highs: trauma, surgery, burns, pancreatitis, cardiogenic shock, heat stroke, CKD, medullary thyroid cancer, ATG/OKT3; false lows: very early sampling, localised infection (abscess), atypical organisms.

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | PRORATA (Bouadma, Lancet 2010) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 53 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ATG – antithymocyte globulin; **CKD** – chronic kidney disease; **PCT** – procalcitonin; **SSC** – Surviving Sepsis Campaign

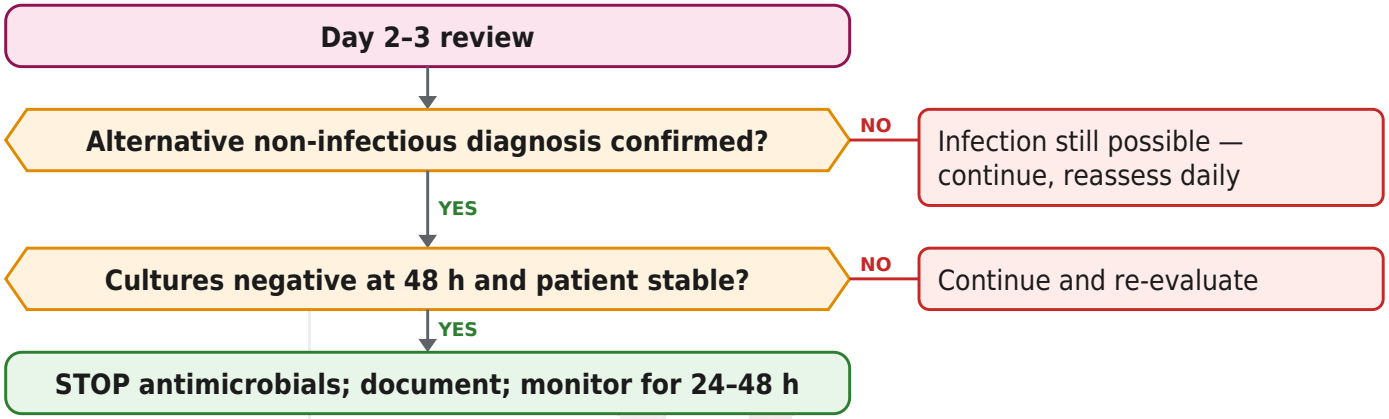

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 53

Stop antimicrobials when infection is excluded

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Can we stop the antibiotic?



Common diagnoses that mimic sepsis and allow stopping

Diagnosis	Evidence to confirm
Acute pancreatitis (sterile)	Lipase, CT, no infected necrosis
Pulmonary embolism	CTPA
Acute heart failure	Echo, BNP, response to diuretics
Drug reaction / DRESS	Rash, eosinophilia, drug history
Vasculitis / Still's / HLH	Serology, ferritin, biopsy
Adrenal crisis	Cortisol, response to hydrocortisone

Academy for Emergency, Trauma & Critical care Medicine

GOLDEN PEARL

Stopping an unnecessary antibiotic is as much a clinical decision as starting a necessary one.

‹ Back to Step 53 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BNP – B-type natriuretic peptide; **CT** – computed tomography; **CTPA** – CT pulmonary angiography; **DRESS** – drug reaction with eosinophilia and systemic symptoms; **HLH** – haemophagocytic lymphohistiocytosis
Drug information (RxList — tap): Hydrocortisone


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 54

Plan a delimited stop date for antibiotics

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Plan how long antibiotics are needed — set a delimited stop date — based on the infection site, source control and clinical response.

WHY IT MATTERS

Short courses are as effective as long courses for most infections with adequate source control, and cause less resistance and toxicity. The 2026 guideline suggests shorter durations with source control, and procalcitonin plus clinical evaluation to decide when to stop when the duration is unclear.

HOW TO DO IT AT THE BEDSIDE

- Write the planned duration on day 1 and review it daily.
- Count from the first day of effective therapy (or from source control).
- Use procalcitonin < 0.5 ng/mL or a fall ≥ 80% from peak to support stopping.
- Extend for undrained foci, S. aureus bacteraemia, endocarditis, osteomyelitis, immunosuppression.

WATCH OUT

- Fever alone is not a reason to extend antibiotics.
- S. aureus bacteraemia is never a 7-day infection.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

With adequate source control, suggest shorter over longer duration; when duration is unclear, suggest procalcitonin plus clinical evaluation to decide when to stop.

Conditional · Very low / Low

EVIDENCE & FURTHER READING — TAP TO OPEN

STOP-IT (Sawyer, NEJM 2015) | BALANCE (7 vs 14 days bacteraemia, NEJM 2025) | SAPS procalcitonin (de Jong 2016) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 54 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 54

Plan a delimited stop date for antibiotics

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Typical durations with adequate source control and clinical response

Infection	Duration	Evidence / note
Community-acquired pneumonia	5–7 days	Stop when stable ≥ 48 h
HAP / VAP	7 days	Longer for non-fermenters if slow response
Pyelonephritis / complicated UTI	7 days (FQ) / 7–14 days	Male UTI 7–14 days
Intra-abdominal, source controlled	4 days	STOP-IT
Uncomplicated Gram-negative bacteraemia	7 days	BALANCE, Yahav 2019
Uncomplicated S. aureus bacteraemia	≥ 14 days IV	Echo; 4–6 weeks if complicated
Candidaemia	14 days after first negative culture	Remove lines
Cellulitis	5–6 days	Extend if slow
Meningitis	Meningococcal 7; pneumococcal 10–14; Listeria 21 days	
Scrub typhus	Doxycycline 7 days	

STOP-IT: recurrent infection or death (%)



Procalcitonin-guided stopping: discontinue when PCT < 0.5 ng/mL or ≥ 80% below peak, if clinically improving (SAPS: shorter courses with lower mortality).

GOLDEN PEARL

Every antibiotic course needs an end date on day one. Shorter is usually better when the source is controlled.

‹ Back to Step 54 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: FQ – fluoroquinolone; **HAP** – hospital-acquired pneumonia; **IV** – intravenous; **PCT** – procalcitonin; **VAP** – ventilator-associated pneumonia
Drug information (RxList — tap): Doxycycline


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 55

Document the critical times

3. Source Control & Antimicrobial Optimisation · Page 1 of 2 — the step

THE GOLDEN STEP

Document the exact times of sepsis recognition, cultures, antibiotics, fluids and vasopressor initiation.

WHY IT MATTERS

You cannot improve what you do not measure. Time stamps allow audit of bundle compliance, feedback to the team, and medico-legal protection — and they make handovers safe.

HOW TO DO IT AT THE BEDSIDE

- Record time zero: the time sepsis/septic shock was first recognised (triage or deterioration).
- Record times of: lactate, blood cultures, first antibiotic dose (administration, not prescription), fluid bolus start, vasopressor start, ICU referral, source control.
- Use a single sepsis sheet or electronic flowsheet, not scattered notes.
- Review the times at the 60-minute huddle and at handover.

WATCH OUT

- "Antibiotics prescribed 10:05" is not "given 10:05" — record administration.
- Retrospective documentation is unreliable — record in real time.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend a performance-improvement programme including screening, standard procedures and quality-improvement measurement.
Strong · Moderate certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Seymour 2017 (NEJM) | SSC hour-1 bundle (Levy 2018) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 55 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 55

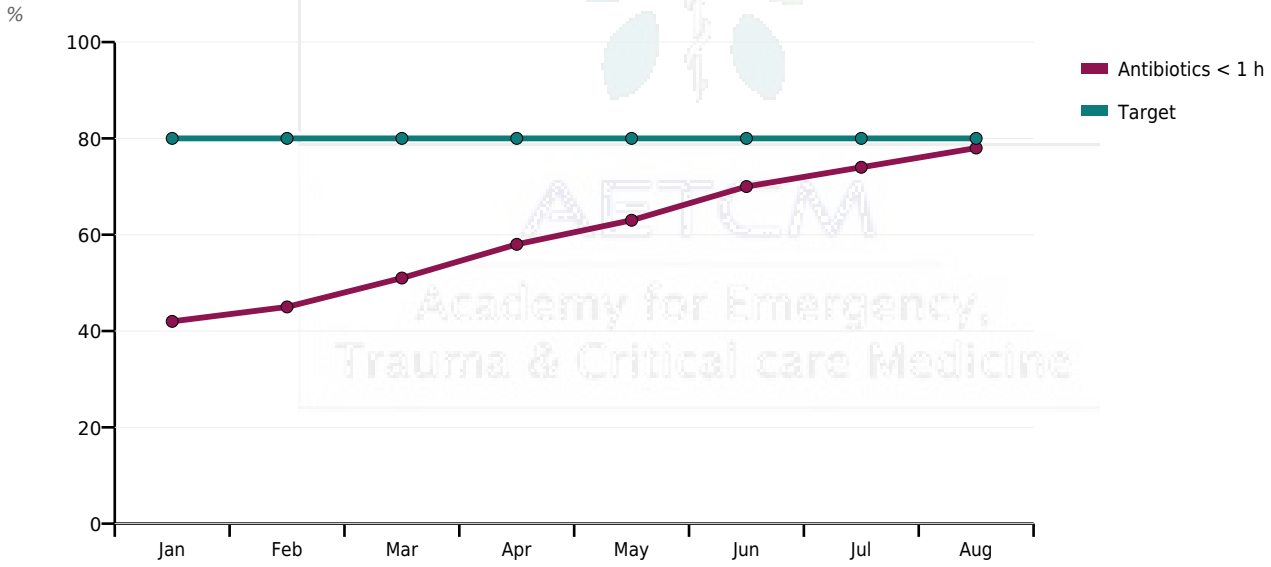
Document the critical times

3. Source Control & Antimicrobial Optimisation · Page 2 of 2 — tables, graphs & algorithm

Sepsis time-stamp sheet

Event	Time	Target from time zero
Time zero (recognition)	__:__	—
Lactate measured	__:__	≤ 1 h
Blood cultures × 2	__:__	Before antibiotics
First antibiotic ADMINISTERED	__:__	≤ 1 h (shock/probable); ≤ 3 h (possible)
Fluid bolus started (if hypoperfused)	__:__	≤ 1 h; 30 mL/kg by 3 h
Vasopressor started (if MAP < 65)	__:__	≤ 1 h
Repeat lactate (if > 2)	__:__	2–4 h
ICU referral / admission	__:__	≤ 6 h
Source control	__:__	≤ 6 h

Example audit — % of patients receiving antibiotics within 1 h (illustrative run chart)



GOLDEN PEARL

Time zero is a fact, not an opinion. Write it down the moment you think "sepsis".

‹ Back to Step 55 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

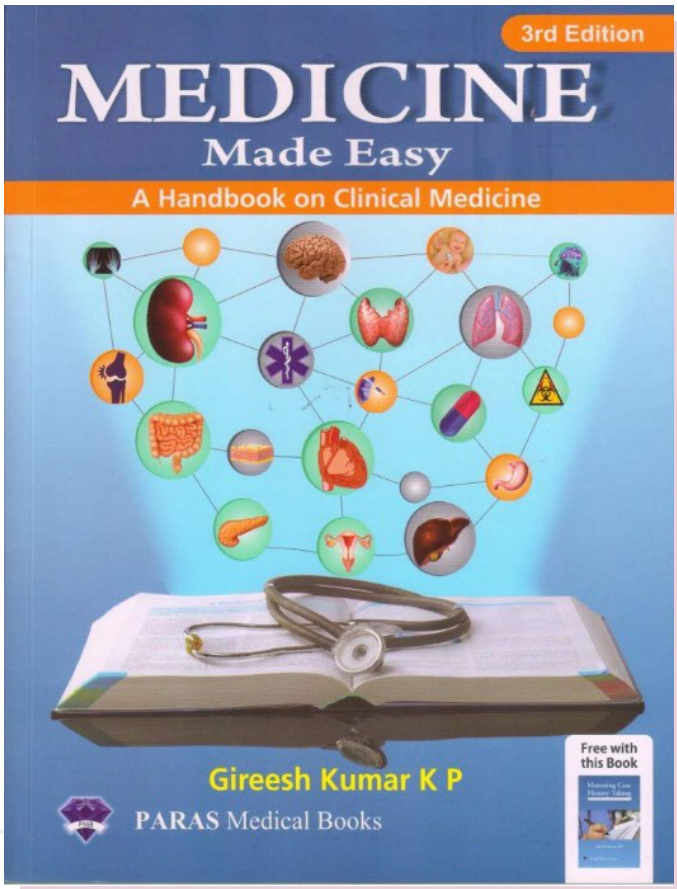
Abbreviations: ICU – intensive care unit; **MAP** – mean arterial pressure


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Medicine Made Easy

A concise, easy-to-read handbook of clinical medicine.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 56

Target MAP 65 mmHg — and 60–65 in older adults

4. Haemodynamic & Refractory Shock Management · Page 1 of 2 — the step

THE GOLDEN STEP

Maintain MAP at 65 mmHg as the initial target (titrated within about ±5 mmHg); use 60–65 mmHg in patients aged ≥ 65 years; individualise higher targets only for specific reasons.

WHY IT MATTERS

Higher MAP targets mean more vasopressor, more arrhythmias and no survival benefit. In the 65 trial, permissive hypotension (60–65) in older patients reduced vasopressor exposure with a trend toward lower mortality. The 2026 guideline makes 65 a strong recommendation and 60–65 a conditional one for those ≥ 65 years.

HOW TO DO IT AT THE BEDSIDE

- Titrate norepinephrine to MAP 65 (range ~60–70); avoid drifting to 80–90 with unnecessary vasopressor.
- In patients ≥ 65 years, accept 60–65 mmHg if perfusion markers are satisfactory.
- Consider a higher target (70–75) only for chronic uncontrolled hypertension with falling urine output despite MAP 65 — and reassess.
- Measure MAP accurately: arterial line when vasopressor doses are high (Step 57).

WATCH OUT

- MAP < 65 for long periods is associated with AKI and death — permissive does not mean neglected.
- Raised intra-abdominal or intracranial pressure need perfusion-pressure targets, not MAP alone.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend an initial MAP target of 65 mmHg over higher targets (titrated within ~5 mmHg); for age ≥ 65 with septic shock, suggest an initial MAP range of 60–65 mmHg.

Strong · Moderate / Conditional · Low

EVIDENCE & FURTHER READING — TAP TO OPEN

65 trial (Lamontagne, JAMA 2020) · SEPSISPAM (Asfar, NEJM 2014) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 56 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **MAP** – mean arterial pressure
Drug information (RxList — tap): Norepinephrine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 56

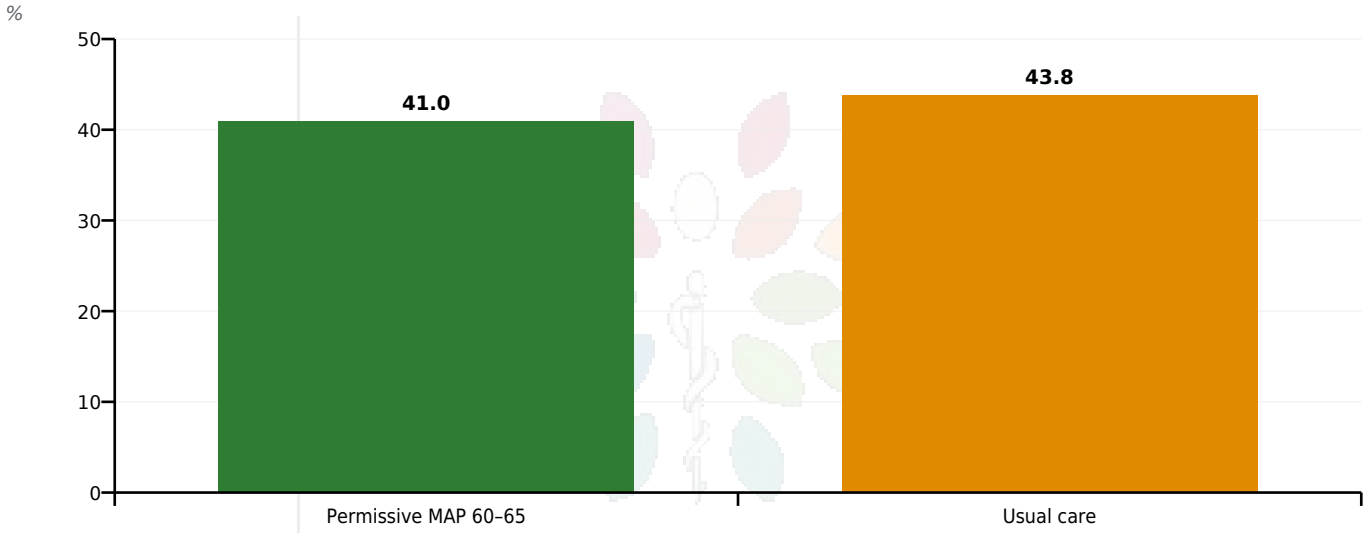
Target MAP 65 mmHg — and 60–65 in older adults

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

MAP targets in septic shock (mmHg)



65 trial (2 600 patients ≥ 65 y): 90-day mortality (%)



SEPSISPAM (776 patients): high vs low MAP target

Outcome	MAP 80–85	MAP 65–70
28-day mortality	36.6%	34.0%
New atrial fibrillation	6.7%	2.8%
RRT in chronic hypertension subgroup	Lower	Higher

GOLDEN PEARL

Sixty-five is the target, not the minimum to be exceeded. In the elderly, sixty is often enough.

‹ Back to Step 56 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: MAP – mean arterial pressure; **RRT** – renal replacement therapy


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 57

Arterial line for accurate pressure

4. Haemodynamic & Refractory Shock Management · Page 1 of 2 — the step

THE GOLDEN STEP

Place an arterial line for continuous, accurate blood pressure monitoring in shock on high or escalating vasopressor doses.

WHY IT MATTERS

Non-invasive cuffs are inaccurate in shock and arrhythmia, and intermittent readings miss rapid changes during titration. An arterial line also allows frequent blood gases and pulse-pressure-variation analysis. The 2026 guideline accepts non-invasive monitoring in lower-risk shock but favours invasive monitoring with escalating doses.

HOW TO DO IT AT THE BEDSIDE

- Radial artery first (ultrasound-guided); femoral if radial fails.
- Check the waveform: square-wave (fast flush) test for damping.
- Zero at the phlebostatic axis (4th intercostal space, mid-axillary line).
- Use the MAP — it is least affected by damping.

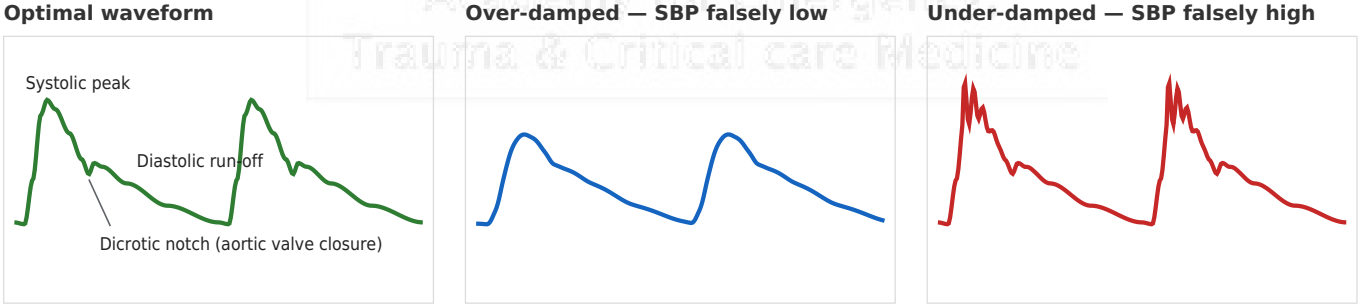
WATCH OUT

- Over-damped trace under-reads systolic and over-reads diastolic; under-damped does the opposite.
- Do not delay vasopressors to place the arterial line.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest either invasive or non-invasive BP monitoring in septic shock; invasive when high-dose or escalating vasopressors, frequent arterial sampling, or inconsistent cuff readings. **Conditional · Very low certainty**

Arterial pressure waveform (schematic)



MAP is least affected by damping — titrate vasopressors to the MAP. Look for: air bubbles, clots, kinks, long tubing.

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Lakhal 2009: non-invasive vs invasive BP in shock | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 57 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure; **MAP** – mean arterial pressure; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 57

Arterial line for accurate pressure

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

Invasive vs non-invasive BP — when to use which

Situation	Preferred monitoring
Sepsis with MAP ≥ 65, low-dose NE, stable	Non-invasive cuff every 5–15 min acceptable
Escalating or high-dose vasopressor (≥ 0.1–0.2 µg/kg/min)	Arterial line
Multiple vasopressors / inotropes	Arterial line
Frequent ABGs (ventilated, acidotic)	Arterial line
Arrhythmia, obesity, oedema — cuff unreliable	Arterial line

Fast-flush (square-wave) test

Oscillations after flush	Damping	Effect on readings
1.5–2 oscillations	Optimal	Accurate
< 1.5 (sluggish return)	Over-damped (air, clot, kink)	SBP falsely low, DBP high
> 2 (ringing)	Under-damped (long/stiff tubing)	SBP falsely high

GOLDEN PEARL

Titrate vasopressors to a number you can trust. Square-wave test every shift.

‹ Back to Step 57 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **BP** – blood pressure; **DBP** – diastolic blood pressure; **MAP** – mean arterial pressure; **NE** – norepinephrine (noradrenaline); **SBP** – systolic blood pressure


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 58

Central venous catheter when needed

THE GOLDEN STEP

Place a central venous catheter for reliable vasopressor infusion and, if indicated, CVP or $ScvO_2$ assessment.

WHY IT MATTERS

A CVC is needed for prolonged or high-dose vasopressors, irritant drugs, poor peripheral access and some monitoring. Protocolised $ScvO_2$ targets (EGDT) did not improve outcomes, but $ScvO_2$ and the venous–arterial CO_2 gap can still help interpret an unclear shock state.

HOW TO DO IT AT THE BEDSIDE

- Ultrasound-guided insertion; internal jugular or subclavian preferred over femoral for infection risk.
- Full sterile barrier precautions and chlorhexidine skin preparation (CLABSI bundle).
- Confirm position (ultrasound bubble test or chest film).
- $ScvO_2$ < 70% suggests low oxygen delivery; CO_2 gap ($PcvCO_2 - PaCO_2$) > 6 mmHg suggests low flow.

WATCH OUT

- Do not target CVP 8–12 mmHg — CVP does not predict fluid responsiveness.
- High $ScvO_2$ (> 80%) with high lactate suggests impaired extraction — not adequacy.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Vasopressors may start peripherally; protocolised EGDT is not recommended (ProCESS, ARISE, ProMISe).
Conditional

EVIDENCE & FURTHER READING — TAP TO OPEN

PRISM meta-analysis of EGDT (NEJM 2017) | Rivers EGDT (NEJM 2001) | CLABSI prevention (Pronovost, NEJM 2006) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 58 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CLABSI – central line-associated bloodstream infection; **CVC** – central venous catheter; **CVP** – central venous pressure; **EGDT** – early goal-directed therapy; **$PaCO_2$** – arterial partial pressure of CO_2; **$ScvO_2$** – central venous oxygen saturation


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 58

Central venous catheter when needed

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

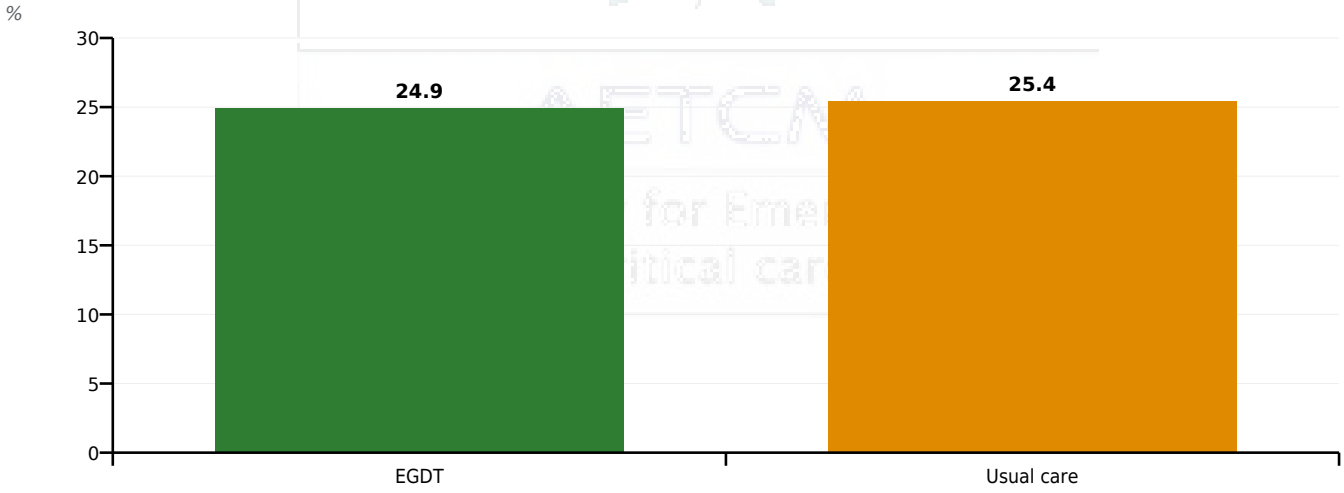
Central venous access sites

Site	Advantages	Disadvantages
Internal jugular (US-guided)	Compressible, high success with US	Neck movement, carotid puncture
Subclavian	Lowest infection, comfortable	Pneumothorax, non-compressible
Femoral	Fast in arrest/coagulopathy	Higher infection and DVT risk

Interpreting central venous oxygen and CO_2

Finding	Suggests	Consider
$ScvO_2$ < 70%	Low O_2 delivery (low CO, Hb, SaO_2) or high demand	Fluid if responsive, inotrope, transfuse if Hb < 7, sedation/antipyretics
$ScvO_2$ > 80% + high lactate	Impaired extraction (microcirculation)	Source control, time
CO_2 gap > 6 mmHg	Low cardiac output	Inotrope / fluid
CO_2 gap ≤ 6 mmHg	Flow adequate	Search other causes of hyperlactataemia

Protocolised EGDT vs usual care — 90-day mortality (PRISM, %)



GOLDEN PEARL

The CVC is a delivery route, not a target. Stop chasing the CVP.

‹ Back to Step 58 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **CO** – cardiac output; **CVC** – central venous catheter; **CVP** – central venous pressure; **DVT** – deep vein thrombosis; **EGDT** – early goal-directed therapy; **Hb** – haemoglobin; **$ScvO_2$** – central venous oxygen saturation


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 59

Add vasopressin as the second agent

4. Haemodynamic & Refractory Shock Management · Page 1 of 2 — the step

THE GOLDEN STEP

Add vasopressin as the second vasopressor when norepinephrine requirements are escalating.

WHY IT MATTERS

Septic shock produces relative vasopressin deficiency. Adding vasopressin (fixed 0.03 U/min) spares norepinephrine, reduces arrhythmias and may protect the kidneys; meta-analyses suggest a modest survival benefit. The 2026 guideline suggests adding vasopressin to escalating norepinephrine rather than escalating norepinephrine alone.

HOW TO DO IT AT THE BEDSIDE

- Add when norepinephrine reaches about 0.25–0.5 µg/kg/min.
- Dose: 0.03 U/min (up to 0.04 U/min); do not titrate above this for BP.
- Dilution: 20 U in 50 mL (0.4 U/mL) → 0.03 U/min = 4.5 mL/h.
- When weaning, taper norepinephrine first, then vasopressin (lower risk of rebound hypotension).

WATCH OUT

- Digital, mesenteric and myocardial ischaemia at higher doses; avoid in low cardiac output states without inotropy.
- Terlipressin is not recommended in septic shock.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest adding vasopressin for escalating norepinephrine; norepinephrine first-line over vasopressin; suggest against terlipressin.
Conditional · Moderate / Low

EVIDENCE & FURTHER READING — TAP TO OPEN

VASST (Russell, NEJM 2008) · VANISH (Gordon, JAMA 2016) · McIntyre 2018 meta-analysis (JAMA) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 59 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure
Drug information (RxList — tap): Norepinephrine · Vasopressin · Terlipressin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 59

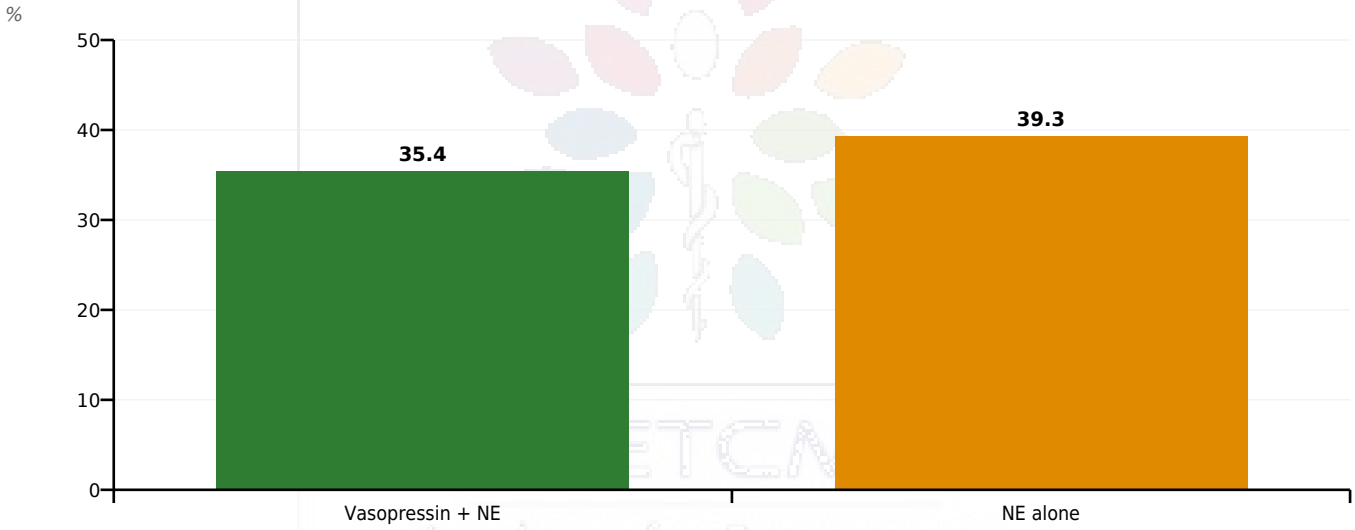
Add vasopressin as the second agent

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

Vasopressin — practical prescription

Item	Detail
Start when	NE ≥ 0.25–0.5 µg/kg/min and rising
Dose	0.03 U/min fixed (max 0.04 U/min)
Dilution	20 U in 50 mL NS = 0.4 U/mL → 0.03 U/min = 4.5 mL/h
Expected effect	NE dose ↓, MAP ↑ within 1 h
Wean	Taper NE to ≤ 0.1, then stop vasopressin (or per unit protocol)
Side effects	Digital ischaemia, hyponatraemia, mesenteric ischaemia

VASST: 28-day mortality (%)



VASST (778 patients) showed no overall difference (p = 0.26) but a possible benefit in less severe shock (NE 5–14 µg/min). Meta-analyses (McIntyre 2018) found reduced atrial fibrillation and modest mortality benefit with vasopressin added.

GOLDEN PEARL

When norepinephrine climbs, add vasopressin rather than doubling the norepinephrine.

‹ Back to Step 59 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: MAP – mean arterial pressure; **NE** – norepinephrine (noradrenaline); **NS** – normal (0.9%) saline
Drug information (RxList — tap): Norepinephrine · Vasopressin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 60

Epinephrine as the third agent

THE GOLDEN STEP

Add epinephrine as an additional vasopressor/inotrope when norepinephrine plus vasopressin fail to reach the target MAP.

WHY IT MATTERS

Epinephrine adds both vasoconstriction (α_1) and inotropy (β_1). It is effective in refractory shock and in septic cardiomyopathy, though it raises lactate and heart rate. The 2026 guideline suggests adding epinephrine when MAP is inadequate on norepinephrine and vasopressin.

HOW TO DO IT AT THE BEDSIDE

- Dilution: 4 mg in 50 mL (80 µg/mL); start 0.02–0.05 µg/kg/min, titrate to MAP and perfusion.
- Consider epinephrine earlier when cardiac dysfunction or bradycardia is present.
- Interpret lactate cautiously — epinephrine causes type B (β_2) hyperlactataemia.
- In refractory shock, re-examine: source, adrenal insufficiency, tamponade, pneumothorax, abdominal compartment, haemorrhage.

WATCH OUT

- Tachyarrhythmia and myocardial ischaemia; hyperglycaemia.
- Splanchnic vasoconstriction at high doses.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest adding epinephrine when MAP is inadequate despite norepinephrine plus vasopressin; without vasopressin, add epinephrine to norepinephrine.
Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

CAT study (Myburgh 2008) · Annane 2007: NE+dobutamine vs epinephrine (Lancet) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 60 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: MAP – mean arterial pressure; **NE** – norepinephrine (noradrenaline)
Drug information (RxList — tap): Norepinephrine · Vasopressin · Epinephrine · Dobutamine

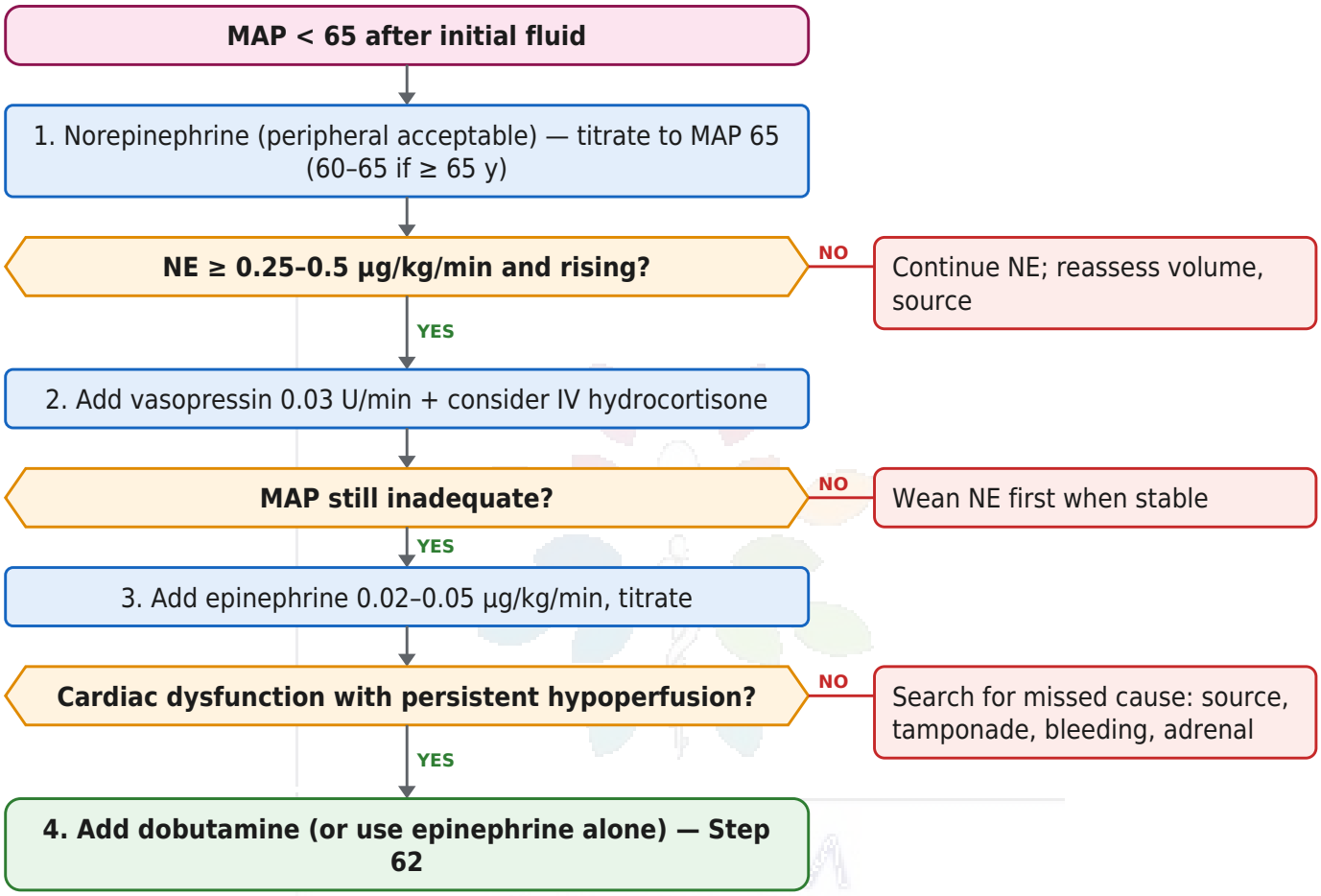

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 60

Epinephrine as the third agent

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

Vasopressor ladder in septic shock (SSC 2026)



Epinephrine — dose guide

Dose (µg/kg/min)	Main effect
0.01–0.05	β_1 inotropy, β_2 vasodilation
0.05–0.2	Mixed α and β
> 0.2	Predominant α vasoconstriction

GOLDEN PEARL

Refractory shock is often a missed diagnosis. Climb the ladder, but look around at every rung.

‹ Back to Step 60 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

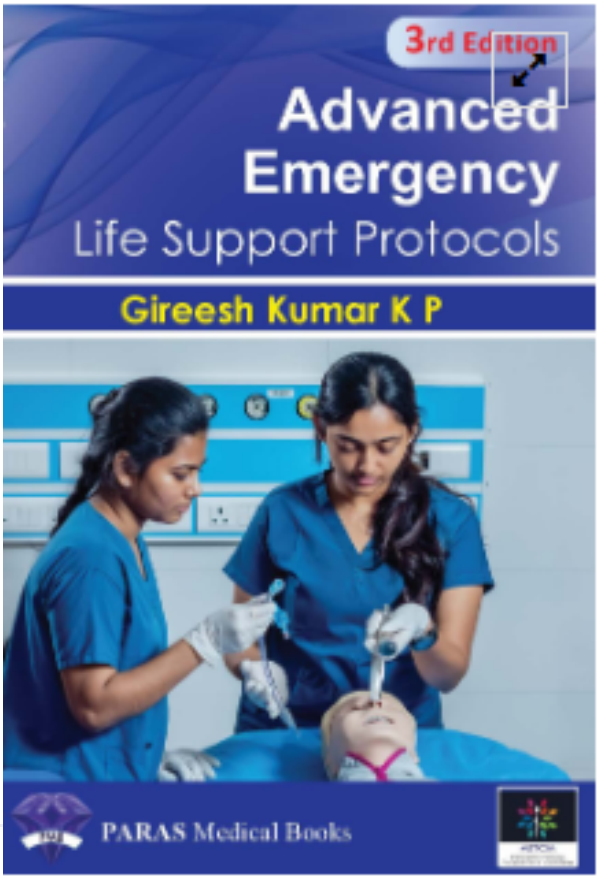
Abbreviations: IV – intravenous; **MAP** – mean arterial pressure; **NE** – norepinephrine (noradrenaline); **SSC** – Surviving Sepsis Campaign
Drug information (RxList — tap): Norepinephrine · Vasopressin · Epinephrine · Dobutamine · Hydrocortisone


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Advanced Emergency Life Support Protocols

Step-by-step emergency and resuscitation protocols for the emergency department and wards.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 61

Avoid dopamine

4. Haemodynamic & Refractory Shock Management · Page 1 of 2 — the step

THE GOLDEN STEP

Do not use dopamine for “renal protection”; reserve it only for selected bradycardic patients when other agents are unavailable.

WHY IT MATTERS

Dopamine causes more arrhythmias than norepinephrine and increased mortality in cardiogenic shock (SOAP II). Low-dose “renal” dopamine does not prevent AKI. The guideline keeps a strong recommendation for norepinephrine over dopamine.

HOW TO DO IT AT THE BEDSIDE

- Use norepinephrine as first-line in all septic shock.
- Bradycardia with shock: consider epinephrine (or pacing) rather than dopamine.
- Remove dopamine from sepsis order sets.

WATCH OUT

- “Renal-dose” dopamine (1–3 µg/kg/min) has no benefit — ANZICS trial.
- Dopamine suppresses pituitary hormones (prolactin, GH, TSH).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend norepinephrine over dopamine as first-line.
Strong · High certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SOAP II (De Backer, NEJM 2010) · ANZICS low-dose dopamine (Bellomo, Lancet 2000) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 61 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **TSH** – thyroid-stimulating hormone
Drug information (RxList — tap): Norepinephrine · Epinephrine · Dopamine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 61

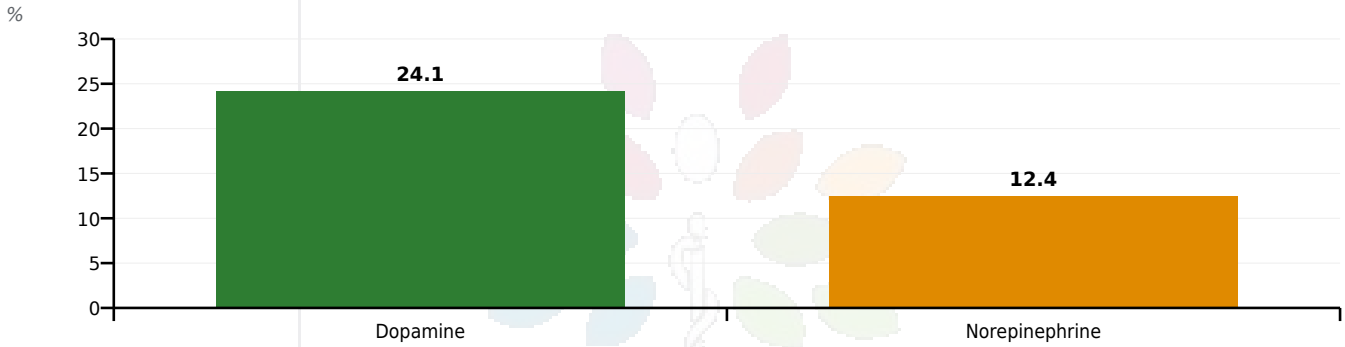
Avoid dopamine

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

Receptor profile of vasoactive drugs

Drug	α_1	β_1	β_2	V_1	D	Main use
Norepinephrine	+++	++	0	0	0	First-line septic shock
Epinephrine	+++	+++	++	0	0	Third-line / cardiac dysfunction
Vasopressin	0	0	0	+++	0	Second-line
Dopamine	++ (high)	++	+	0	+++	Avoid
Phenylephrine	+++	0	0	0	0	Tachyarrhythmia, short-term
Dobutamine	+	+++	++	0	0	Inotrope

SOAP II: arrhythmias (%)



SOAP II (1 679 patients in shock): no overall difference in 28-day mortality, but twice the arrhythmias with dopamine and higher mortality in the cardiogenic-shock subgroup.

Vasoactive drugs in sepsis — at a glance

Drug	Indication	Initial dose	Maximum (usual)	Caution
Noradrenaline (norepinephrine)	First-line septic shock	0.05–0.1 µg/kg/min	~1 µg/kg/min (add 2nd agent ≥ 0.25–0.5)	Peripheral extravasation, ischaemia
Vasopressin	2nd agent when NE escalates	0.03 U/min (fixed)	0.04 U/min	Digital/mesenteric ischaemia, hyponatraemia
Adrenaline (epinephrine)	3rd agent; cardiac dysfunction	0.02–0.05 µg/kg/min	~0.5–1 µg/kg/min	Tachyarrhythmia, ↑ lactate, hyperglycaemia
Dopamine	Avoid — only selected bradycardia if nothing else	2–5 µg/kg/min	20 µg/kg/min	Arrhythmias; no renal protection
Dobutamine	Myocardial dysfunction with hypoperfusion	2.5 µg/kg/min	20 µg/kg/min	Hypotension (vasodilation), tachycardia

GOLDEN PEARL

There is no such thing as a renal dose of dopamine — only a dose of arrhythmia.

‹ Back to Step 61 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: NE – norepinephrine (noradrenaline)
Drug information (RxList — tap): Norepinephrine · Vasopressin · Epinephrine · Dopamine · Dobutamine · Phenylephrine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 62

Inotrope for myocardial dysfunction

THE GOLDEN STEP

Consider dobutamine (added to norepinephrine) — or epinephrine alone — for myocardial dysfunction with persistent hypoperfusion despite adequate volume and MAP.

WHY IT MATTERS

Sepsis-induced cardiomyopathy occurs in up to 40–50% of patients. When the heart cannot generate enough flow despite adequate filling and pressure, an inotrope can restore delivery — but only after confirming low output on echo.

HOW TO DO IT AT THE BEDSIDE

- Confirm with echo: reduced LVEF/VTI, low cardiac output, adequate filling and MAP.
- Dobutamine 2.5 µg/kg/min, titrate to 10–20 µg/kg/min to perfusion targets.
- Alternatively, epinephrine alone (particularly with bradycardia).
- Reassess perfusion (CRT, lactate, $ScvO_2$) within 1 hour; stop if no improvement or tachyarrhythmia.

WATCH OUT

- Dobutamine causes vasodilation — be ready to increase norepinephrine.
- Levosimendan is not recommended (LeoPARDS); milrinone accumulates in AKI.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest adding an inotrope for persistent hypoperfusion with cardiac dysfunction despite adequate volume and BP: dobutamine with norepinephrine, or epinephrine alone; suggest against levosimendan.

Conditional · Very low / Low

EVIDENCE & FURTHER READING — TAP TO OPEN

LeoPARDS (Gordon, NEJM 2016) · Annane 2007 (Lancet) · Radiopaedia: ARDS chest X-ray · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 62 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **BP** – blood pressure; **CRT** – capillary refill time; **LVEF** – left ventricular ejection fraction; **MAP** – mean arterial pressure; **$ScvO_2$** – central venous oxygen saturation; **VTI** – velocity-time integral

Drug information (RxList — tap): Norepinephrine · Epinephrine · Dobutamine · Milrinone · Levosimendan

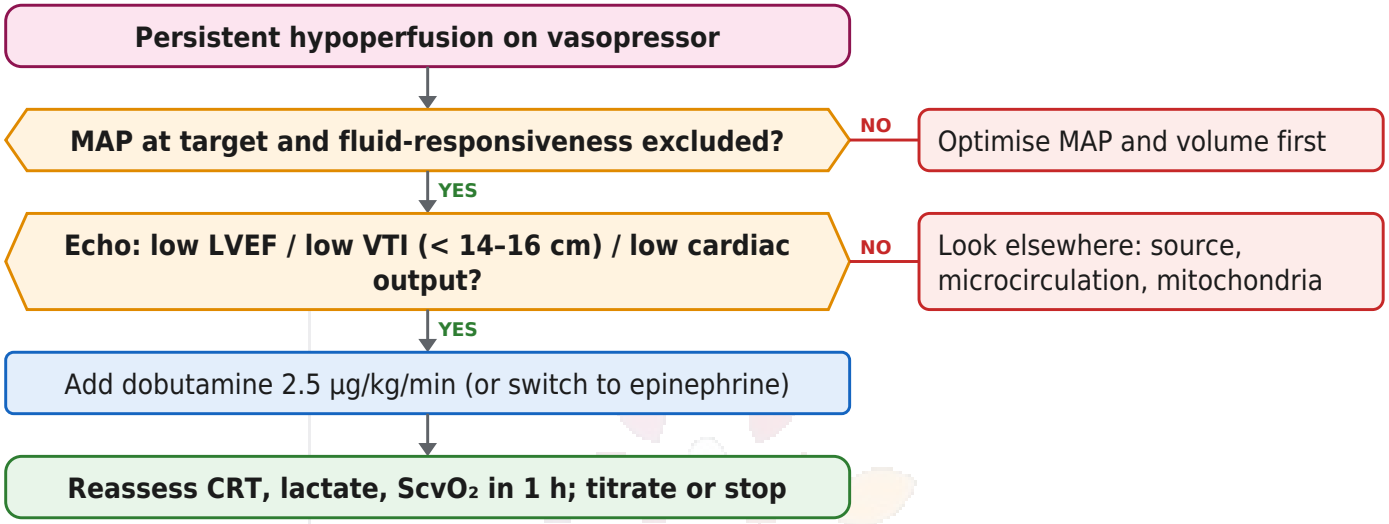

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 62

Inotrope for myocardial dysfunction

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

Is an inotrope indicated?



Inotropes

Drug	Dose	Effects	Cautions
Dobutamine	2.5–20 µg/kg/min	β_1 inotropy, β_2 vasodilation	Tachycardia, hypotension
Epinephrine	0.02–0.2 µg/kg/min	Inotropy + vasoconstriction	Lactate, arrhythmia
Milrinone	0.125–0.5 µg/kg/min	PDE-3, inodilator	Hypotension; accumulates in AKI
Levosimendan	—	Calcium sensitiser	Not recommended in septic shock

GOLDEN PEARL

Do not give an inotrope to a number — give it to a heart that echo shows is failing.

‹ Back to Step 62 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **CRT** – capillary refill time; **LVEF** – left ventricular ejection fraction; **MAP** – mean arterial pressure; **ScvO₂** – central venous oxygen saturation; **VTI** – velocity–time integral
Drug information (RxList — tap): Epinephrine · Dobutamine · Milrinone · Levosimendan


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 63

Hydrocortisone for septic shock

THE GOLDEN STEP

Give IV hydrocortisone (typically 200 mg/day) for septic shock requiring ongoing or escalating vasopressor therapy.

WHY IT MATTERS

Critical illness–related corticosteroid insufficiency and vasopressor hyporesponsiveness are common in septic shock. Hydrocortisone speeds shock reversal and shortens ventilation (ADRENAL); with fludrocortisone it reduced 90-day mortality in APROCCHSS. The 2026 guideline suggests corticosteroids, with low certainty.

HOW TO DO IT AT THE BEDSIDE

- Typical trigger: norepinephrine/epinephrine ≥ 0.25 µg/kg/min for ≥ 4 hours (SSC 2021 practice).
- Hydrocortisone 50 mg IV q6h or 200 mg/day continuous infusion.
- Optional fludrocortisone 50 µg orally daily (APROCCHSS regimen).
- Continue for 5–7 days or until vasopressors are stopped, then stop or taper.
- No ACTH stimulation test needed.

WATCH OUT

- Hyperglycaemia and hypernatraemia — monitor and treat.
- Do not use high-dose methylprednisolone or dexamethasone for septic shock.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest IV corticosteroids in adults with septic shock. **Conditional · Low certainty (downgraded from moderate)**

Hydrocortisone vs dexamethasone in sepsis

Feature	Hydrocortisone	Dexamethasone
Glucocorticoid equivalence	20 mg (200 mg/day ≈ 7.5 mg dexamethasone)	0.75 mg
Mineralocorticoid activity	Yes — helps vascular tone and sodium	None
Half-life (biological)	8–12 h	36–72 h
Evidence in septic shock	ADRENAL, APROCCHSS, CORTICUS — preferred	No septic-shock RCT evidence
Where dexamethasone is preferred	—	Bacterial meningitis (10 mg q6h × 4 days); COVID-19 hypoxaemia (6 mg/day × 10 days, RECOVERY)
Severe CAP	Hydrocortisone 200 mg/day reduced mortality (CAPE COD)	—
Bottom line	Use for septic shock (± fludrocortisone)	Do not substitute for hydrocortisone in septic shock

EVIDENCE & FURTHER READING — TAP TO OPEN

ADRENAL (Venkatesh, NEJM 2018) · APROCCHSS (Annane, NEJM 2018) · CORTICUS (Sprung, NEJM 2008) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 63 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CAP – community-acquired pneumonia; **IV** – intravenous; **RCT** – randomised controlled trial; **SSC** – Surviving Sepsis Campaign
Drug information (RxList — tap): Norepinephrine · Epinephrine · Hydrocortisone · Fludrocortisone · Dexamethasone · Methylprednisolone


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 63

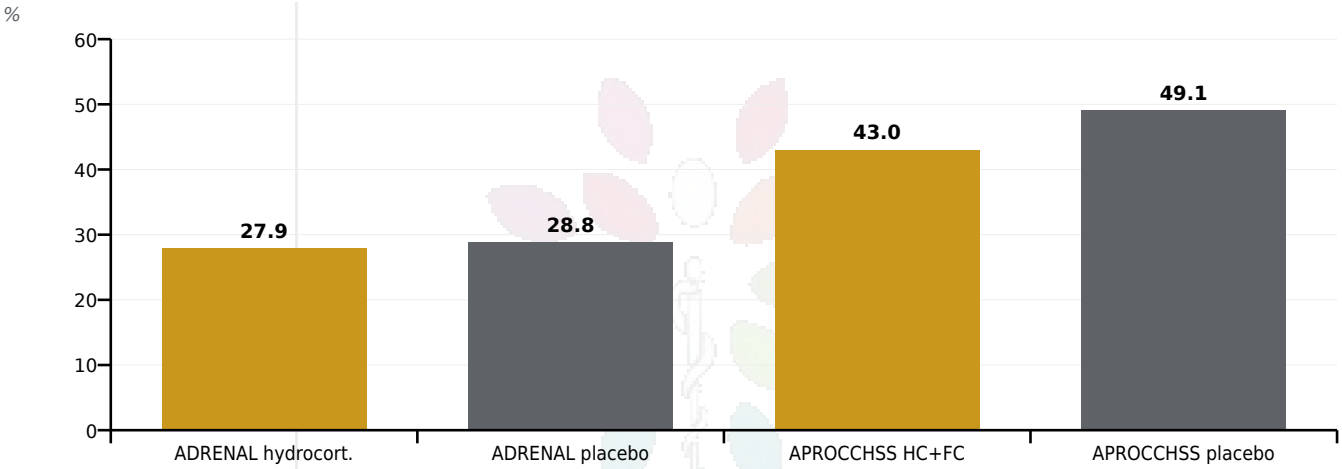
Hydrocortisone for septic shock

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

Corticosteroid regimens in septic shock

Regimen	Dose	Duration	Evidence
Hydrocortisone bolus	50 mg IV q6h	5–7 days / until off vasopressors	APROCCHSS, CORTICUS
Hydrocortisone infusion	200 mg/24 h continuous	≤ 7 days	ADRENAL
+ Fludrocortisone	50 µg PO/NG daily	7 days	APROCCHSS

Major steroid trials — 90-day mortality (%)



Adjunct therapies without proven benefit in septic shock (SSC guidance and key trials)

Therapy	Key trial	Current position
IV vitamin C (± thiamine, hydrocortisone)	LOVIT, VITAMINS	Suggest against
IV immunoglobulin	—	Suggest against
Polymyxin B haemoperfusion / blood purification	EUPHRATES	Suggest against
Levosimendan	LeoPARDS	Suggest against
Esmolol / landiolol (rate control)	STRESS-L	No benefit — not routine
Antipyretics to improve outcome	HEAT	No mortality benefit

GOLDEN PEARL

Steroids reverse shock faster; they are a vasopressor-sparing strategy, not a cure.

‹ Back to Step 63 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: FC – fludrocortisone; **HC** – hydrocortisone; **IV** – intravenous; **NG** – nasogastric; **PO** – by mouth; **SSC** – Surviving Sepsis Campaign
Drug information (RxList — tap): Levosimendan · Hydrocortisone · Fludrocortisone · Thiamine · Esmolol · Landiolol


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 64

Monitor bedside perfusion markers

THE GOLDEN STEP

Monitor capillary refill time, skin temperature and mottling frequently as bedside perfusion markers.

WHY IT MATTERS

Peripheral perfusion responds to resuscitation within minutes, long before lactate falls. In ANDROMEDA-SHOCK, targeting CRT normalisation was at least as good as lactate-guided resuscitation, with less fluid and less organ dysfunction.

HOW TO DO IT AT THE BEDSIDE

- Measure CRT every 30 minutes during active resuscitation, then hourly.
- If CRT > 3 s: check fluid responsiveness → bolus if responsive; if not, test a higher MAP (75–80) briefly in chronic hypertensives; consider inotrope.
- Score mottling hourly; record the knee-to-toe temperature gradient.
- Stop escalating resuscitation once CRT normalises.

WATCH OUT

- Peripheral vascular disease and hypothermia confound CRT.
- CRT may stay abnormal despite adequate flow in some patients — integrate with other markers.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest capillary refill time as an adjunct measure of perfusion.
Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

ANDROMEDA-SHOCK (JAMA 2019) | ANDROMEDA-SHOCK-2 | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 64 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRT – capillary refill time; **MAP** – mean arterial pressure


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 64

Monitor bedside perfusion markers

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

ANDROMEDA protocol — CRT-targeted resuscitation

Septic shock, CRT > 3 s

↓

Fluid-responsive (PLR or pulse pressure variation)? — NO → Go to MAP test

↓ YES

Fluid bolus 500 mL over 30 min; re-check CRT

↓

CRT still > 3 s? (and chronic hypertension) — NO → Target reached — stop escalation

↓ YES

Vasopressor test: raise MAP to 80–85 mmHg for 30 min

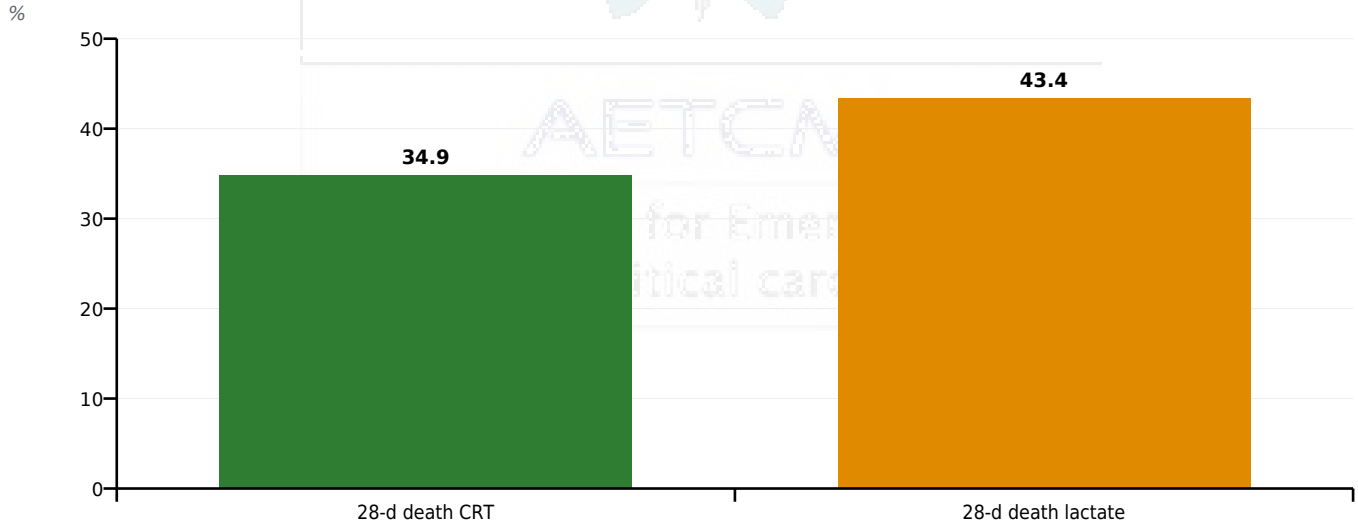
↓

CRT normalised? — NO → Inotrope test: dobutamine 5 µg/kg/min (or milrinone)

↓ YES

Keep the setting that normalised CRT; reassess hourly

ANDROMEDA-SHOCK: outcomes (%)



GOLDEN PEARL

Press, count, act. The fingertip is the cheapest perfusion monitor in the ICU.

‹ Back to Step 64 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRT – capillary refill time; **ICU** – intensive care unit; **MAP** – mean arterial pressure; **PLR** – passive leg raise
Drug information (RxList — tap): Dobutamine · Milrinone


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 65

Follow the lactate trend

THE GOLDEN STEP

Target a falling trend in lactate rather than an arbitrary single value.

WHY IT MATTERS

Lactate falls slowly even when resuscitation is complete, and non-hypoxic causes keep it raised. Chasing normal lactate with fluids leads to overload. The 2026 guideline suggests serial lactate to guide resuscitation while individualising fluid rather than targeting normalisation.

HOW TO DO IT AT THE BEDSIDE

- Repeat lactate every 2–4 hours while > 2 mmol/L.
- Aim for a consistent fall (≥ 10–20% per 2 h); expect normalisation over 24 h.
- If lactate does not fall: reassess perfusion (CRT), cardiac output (echo), source control, abdomen (ischaemia), drugs (epinephrine, metformin, linezolid).
- Do not give fluid for a high lactate unless the patient is fluid-responsive and hypoperfused.

WATCH OUT

- Liver dysfunction reduces lactate clearance — slow falls are expected.
- A late secondary rise after improvement suggests a new problem (ischaemic gut, new infection).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest serial lactate to guide resuscitation, with individualised fluids rather than targeting normalisation.
Conditional · Low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Jansen 2010 (AJRCCM) · Vincent 2016: lactate kinetics review · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 65 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRT – capillary refill time
Drug information (RxList — tap): Epinephrine · Linezolid · Metformin

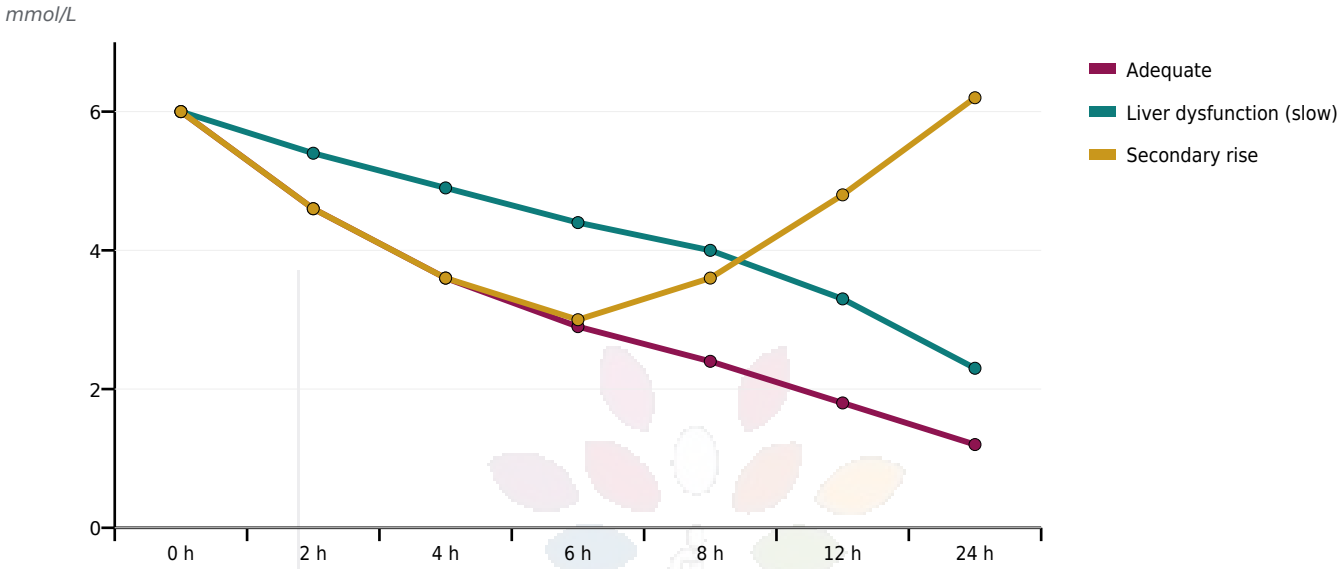

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 65

Follow the lactate trend

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

Lactate after resuscitation — expected fall vs warning patterns (illustrative)



Lactate not falling — checklist

Ask	Action
Is perfusion still poor (CRT, mottling)?	Fluid if responsive, MAP, inotrope
Is the source controlled?	Image, drain, debride
Is the gut ischaemic?	Abdominal exam, CT angiography, surgical review
Is it a drug?	Epinephrine, metformin, linezolid, propofol
Is the liver failing?	LFTs, INR — slower clearance expected

GOLDEN PEARL

Follow the direction of the lactate, not its value. Down is good; flat is a question; up is an alarm.

‹ Back to Step 65 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

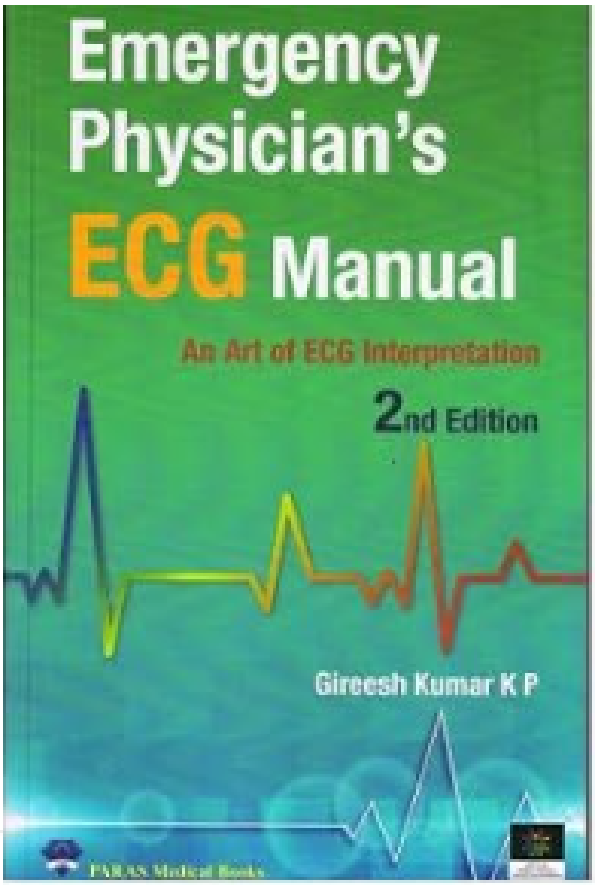
Abbreviations: CRT – capillary refill time; **CT** – computed tomography; **INR** – international normalised ratio; **MAP** – mean arterial pressure
Drug information (RxList — tap): Epinephrine · Linezolid · Propofol · Metformin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Emergency Physician's ECG Manual

Practical ECG interpretation for the emergency physician — recognise, decide and act.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 66

Transition to de-resuscitation

THE GOLDEN STEP

Transition from resuscitation to conservative fluid management — and active fluid removal — once shock resolves.

WHY IT MATTERS

Sepsis care has phases: rescue, optimisation, stabilisation and evacuation (ROSE). Fluid that saved the patient on day 1 harms the lungs, kidneys and gut by day 3. The 2026 guideline adds a new suggestion for active fluid removal after the acute resuscitation phase.

HOW TO DO IT AT THE BEDSIDE

- Once off or on stable low-dose vasopressors and perfusion is normal, stop maintenance fluids and concentrate drug infusions.
- Count all inputs, including drug diluents and flushes ("fluid creep").
- Aim for neutral, then negative daily balance (e.g., −0.5 to −1 L/day) as tolerated.
- Use diuretics first; ultrafiltration if diuretic-resistant or on RRT (Step 67).

WATCH OUT

- Too-early removal in unstable shock causes hypotension and AKI — re-check perfusion daily.
- Restrictive vs usual fluid (CLASSIC, CLOVERS) did not change mortality — the benefit lies in avoiding the unnecessary.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

After acute resuscitation, suggest active fluid removal (diuretics, then ultrafiltration if needed) in septic shock.
Conditional · Very low certainty (new)

EVIDENCE & FURTHER READING — TAP TO OPEN

CLASSIC (NEJM 2022) · CLOVERS (NEJM 2023) · Malbrain 2018: ROSE concept · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 66 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **ROSE** – Rescue, Optimisation, Stabilisation, Evacuation; **RRT** – renal replacement therapy

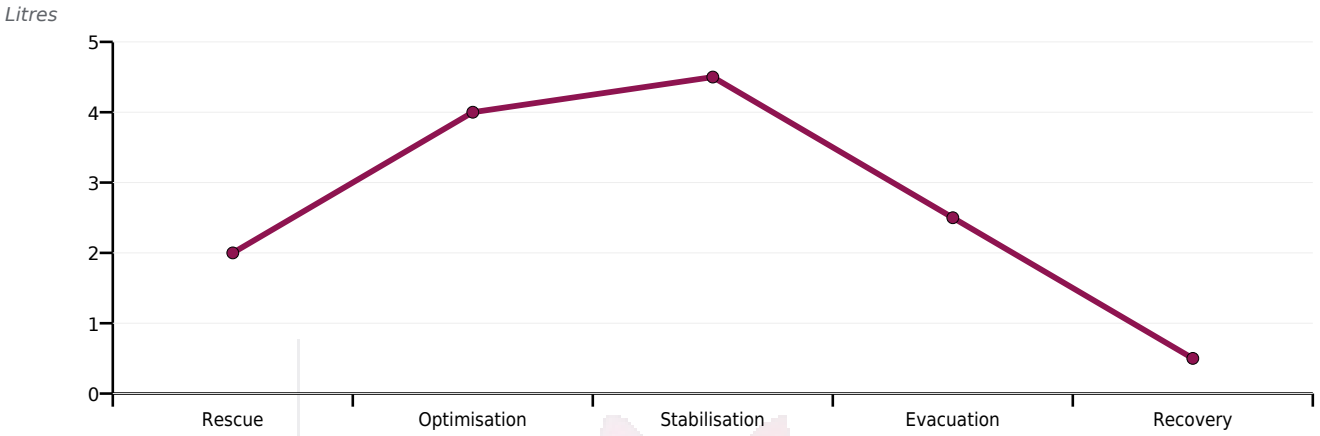

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 66

Transition to de-resuscitation

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

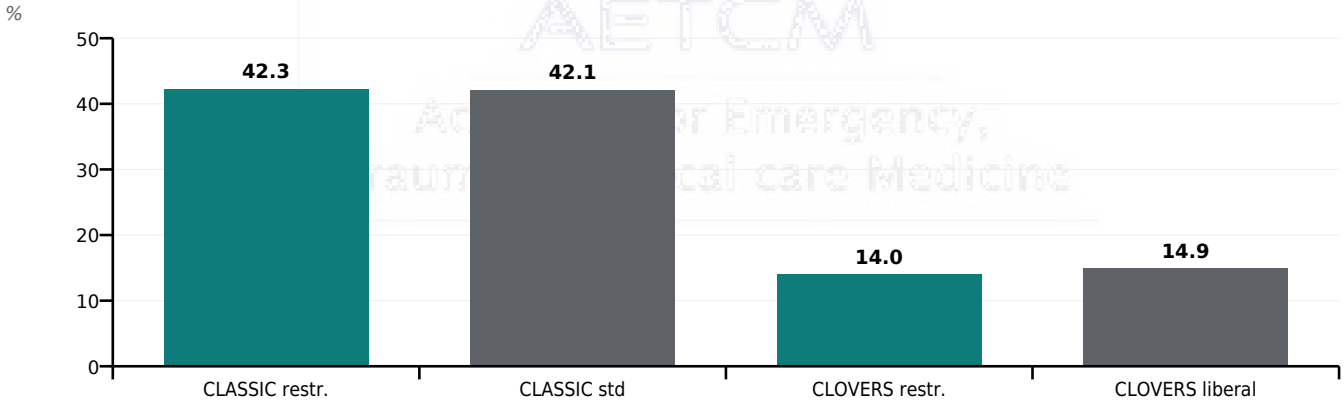
The four phases of fluid therapy — cumulative fluid balance (schematic)



ROSE model

Phase	Timing	Goal	Fluid
Rescue	Minutes	Restore BP and perfusion	Boluses, vasopressor
Optimisation	Hours	Optimise perfusion, avoid overload	Only if responsive
Stabilisation	Days	Neutral balance	Maintenance only; concentrate drugs
Evacuation	Days–weeks	Remove excess fluid	Diuretics / ultrafiltration

Restrictive vs liberal fluid — mortality (%)



GOLDEN PEARL

The fluid you needed on day one becomes the oedema you must remove on day three.

‹ Back to Step 66 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure; **ROSE** – Rescue, Optimisation, Stabilisation, Evacuation

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 67

Diuretics carefully during de-resuscitation

THE GOLDEN STEP

Use diuretics carefully during de-resuscitation in volume-overloaded, haemodynamically stable patients.

WHY IT MATTERS

Active removal of excess fluid shortens ventilation and may protect the kidneys from congestion. Diuretics are the first tool, but must be dosed to response and stopped if perfusion falls.

HOW TO DO IT AT THE BEDSIDE

- Pre-conditions: off vasopressors or stable low dose, normal lactate and CRT, positive balance or clinical overload.
- Furosemide 20–40 mg IV (higher in CKD); assess urine output at 2 and 6 h.
- If response poor: double the dose, or infusion 5–20 mg/h; add a thiazide (metolazone) or acetazolamide for metabolic alkalosis.
- Target net negative 0.5–1 L/day; monitor potassium, magnesium, sodium, creatinine daily.
- Ultrafiltration via CRRT if diuretic-resistant.

WATCH OUT

- Watch for hypokalaemia, hypomagnesaemia and contraction alkalosis.
- A rising creatinine with improving oxygenation may be acceptable — judge by perfusion.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest active fluid removal with diuretics, then ultrafiltration if needed, after the acute resuscitation phase.
Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

FACTT (NEJM 2006) · Furosemide stress test (Chawla 2013) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 67 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CKD – chronic kidney disease; **CRRT** – continuous renal replacement therapy; **CRT** – capillary refill time; **IV** – intravenous
Drug information (RxList — tap): Furosemide · Metolazone · Acetazolamide

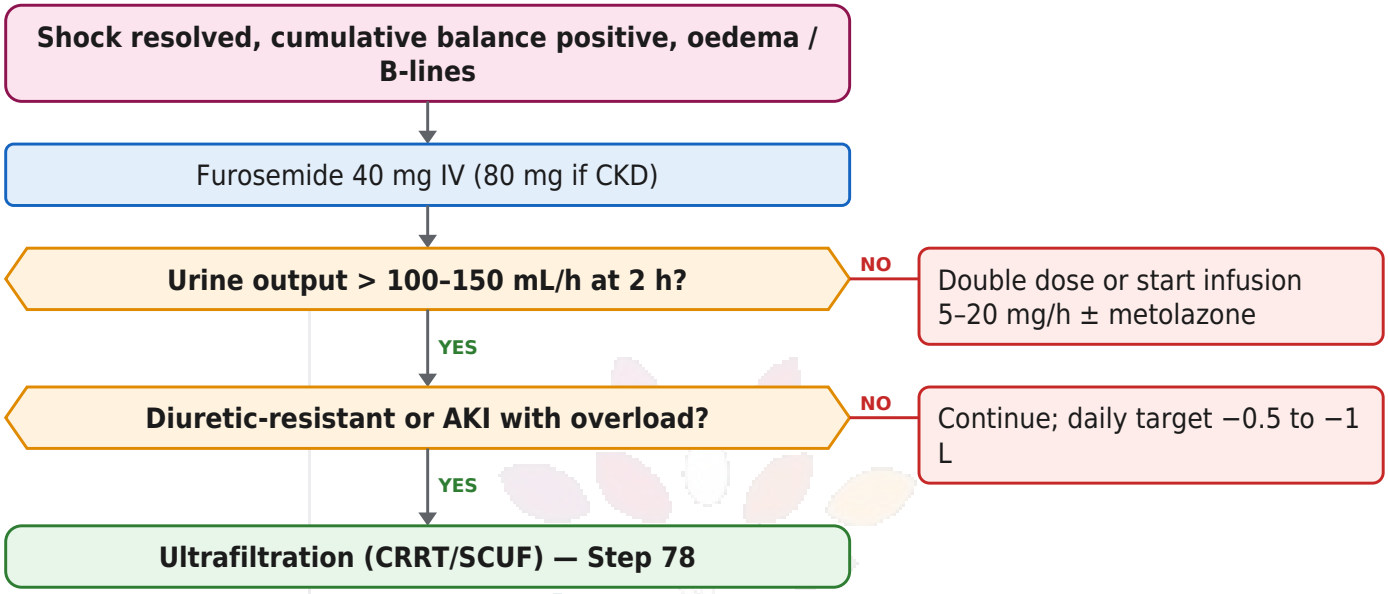

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 67

Diuretics carefully during de-resuscitation

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

De-resuscitation with diuretics



Diuretic toolbox

Drug	Dose	Use	Watch
Furosemide bolus	20–80 mg IV	First-line	Ototoxicity at high rates
Furosemide infusion	5–20 mg/h	Steady diuresis	Electrolytes
Metolazone	2.5–5 mg PO	Sequential nephron blockade	Severe hypokalaemia, hyponatraemia
Acetazolamide	250–500 mg IV	Metabolic alkalosis	Acidosis
Furosemide stress test	1–1.5 mg/kg IV	UO < 200 mL in 2 h predicts AKI progression	—

GOLDEN PEARL

Diurese to perfusion, not to a number. If the CRT lengthens, slow down.

‹ Back to Step 67 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **CKD** – chronic kidney disease; **CRRT** – continuous renal replacement therapy; **CRT** – capillary refill time; **IV** – intravenous; **PO** – by mouth; **UO** – urine output
Drug information (RxList — tap): Furosemide · Metolazone · Acetazolamide


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 68

Serial echocardiography

4. Haemodynamic & Refractory Shock Management · Page 1 of 2 — the step

THE GOLDEN STEP

Perform serial echocardiography/POCUS to detect sepsis-induced cardiomyopathy, pericardial effusion and right-heart failure.

WHY IT MATTERS

The heart in sepsis changes over hours: hyperdynamic early, depressed later, with RV dysfunction from ventilation and ARDS. Serial echo guides fluids, vasopressors, inotropes and de-resuscitation, and finds missed tamponade or regional ischaemia.

HOW TO DO IT AT THE BEDSIDE

- Baseline focused echo within the first hours of shock.
- Repeat after major changes: escalating vasopressor, new hypoxaemia, before de-resuscitation.
- Assess LV function (EF, VTI), RV size/function (TAPSE, RV:LV ratio), effusion, IVC, valves.
- LVOT VTI × LVOT area × HR = cardiac output; VTI < 14–16 cm suggests low output.

WATCH OUT

- Hyperdynamic LV ("kissing walls") suggests hypovolaemia or vasoplegia — not a reason for an inotrope.
- Septic cardiomyopathy is usually reversible in 7–10 days.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Cardiac dysfunction: norepinephrine or epinephrine first-line, adding inotropes for persistent hypoperfusion.
Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

Vieillard-Baron 2019: septic cardiomyopathy | ESICM haemodynamic monitoring consensus (Cecconi 2014) | ▶ POCUS video 1 | ▶ POCUS video 2 | ▶ POCUS video 3 | Radiopaedia: ARDS chest X-ray | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 68 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ARDS – acute respiratory distress syndrome; **ESICM** – European Society of Intensive Care Medicine; **HR** – heart rate; **IVC** – inferior vena cava; **LV** – left ventricle; **LVOT** – left ventricular outflow tract; **POCUS** – point-of-care ultrasound; **RV** – right ventricle; **TAPSE** – tricuspid annular plane systolic excursion; **VTI** – velocity–time integral
Drug information (RxList — tap): Norepinephrine · Epinephrine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 68

Serial echocardiography

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

Echo phenotypes in septic shock

Phenotype	Echo findings	Management
Hypovolaemic	Small hyperdynamic LV, collapsing IVC, VTI ↑ with PLR	Fluid
Vasoplegic	Normal/hyperdynamic LV, normal VTI	Norepinephrine ± vasopressin
LV systolic dysfunction	LVEF < 40%, low VTI	NE + dobutamine or epinephrine
RV dysfunction	RV:LV > 1, TAPSE < 16 mm, septal flattening	Optimise ventilation, avoid fluid, NE; consider PE
Tamponade	Effusion with RA/RV collapse, plethoric IVC	Pericardiocentesis

Cardiac output from echo — worked example

Measure	Value
LVOT diameter	2.0 cm → area = π × 1.0^2 = 3.14 cm^2
LVOT VTI	18 cm
Stroke volume	3.14 × 18 = 57 mL
Heart rate	110 /min
Cardiac output	57 × 110 = 6.2 L/min

WATCH — POCUS VIDEOS (TAP TO OPEN ON YOUTUBE)

▶ POCUS video 1 ▶ POCUS video 2 ▶ POCUS video 3

GOLDEN PEARL

Echo again when the patient changes. The heart you saw at hour one may not be the heart you have on day two.

‹ Back to Step 68 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: IVC – inferior vena cava; **LV** – left ventricle; **LVEF** – left ventricular ejection fraction; **LVOT** – left ventricular outflow tract; **NE** – norepinephrine (noradrenaline); **PE** – pulmonary embolism; **PLR** – passive leg raise; **RV** – right ventricle; **TAPSE** – tricuspid annular plane systolic excursion; **VTI** – velocity-time integral

Drug information (RxList — tap): Norepinephrine · Vasopressin · Epinephrine · Dobutamine



Medicine @ Your Fingertips

Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes

BUY NOW ›

STEP 69

Correct severe electrolyte derangements

THE GOLDEN STEP

Correct severe electrolyte derangements — potassium, magnesium, calcium and phosphate — promptly.

WHY IT MATTERS

Electrolyte disorders are common in sepsis due to AKI, fluids, diuretics, refeeding and RRT. They cause arrhythmias, weakness, ventilator dependence and vasopressor hyporesponsiveness.

HOW TO DO IT AT THE BEDSIDE

- Check electrolytes at least daily (more often during RRT, diuresis or refeeding).
- Keep K^+ 4.0–5.0 and Mg^{2+} ≥ 2 mg/dL in patients with arrhythmias.
- Replace phosphate when < 2.0 mg/dL (refeeding risk when feeding starts).
- Treat symptomatic or ionised hypocalcaemia (iCa < 1.0 mmol/L) — especially with massive transfusion.
- Bicarbonate only for pH ≤ 7.2 with AKI stage 2–3 (Step 78).

WATCH OUT

- Correct magnesium before potassium in refractory hypokalaemia.
- Rapid correction of chronic hyponatraemia (> 8–10 mmol/L/24 h) risks osmotic demyelination.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest bicarbonate for septic shock with pH ≤ 7.2 and AKI (AKIN 2–3); suggest against bicarbonate to improve haemodynamics in lactic acidaemia.
Conditional · Very low / Low

EVIDENCE & FURTHER READING — TAP TO OPEN

BICAR-ICU (Lancet 2018) | European hyponatraemia guideline (Spasovski 2014) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 69 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **AKI** – acute kidney injury; **AKIN** – Acute Kidney Injury Network; **ICU** – intensive care unit; **RRT** – renal replacement therapy


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 69

Correct severe electrolyte derangements

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

Electrolyte replacement (adult, normal renal function — halve in AKI)

Electrolyte	Threshold	Replacement	Max rate / caution
Potassium	< 3.5 mmol/L	20–40 mmol KCl IV in 100–250 mL	≤ 10 mmol/h peripheral; ≤ 20 mmol/h central with ECG
Magnesium	< 1.8 mg/dL	2 g $MgSO_4$ IV over 1 h (up to 4–6 g)	Faster (over 10 min) for arrhythmia
Phosphate	< 2.0 mg/dL	0.16–0.32 mmol/kg IV over 4–6 h	Hypocalcaemia; avoid if hyperkalaemic (K-phos)
Calcium (ionised)	< 1.0 mmol/L	10 mL 10% Ca gluconate IV over 10 min	Not with bicarbonate/phosphate in same line
Sodium (severe, symptomatic)	< 125 + seizures	150 mL 3% NaCl over 20 min, repeat ×2	Rise ≤ 8–10 mmol/L in 24 h
Bicarbonate	pH ≤ 7.2 + AKI 2–3	4.2–8.4% $NaHCO_3$ 125–250 mL	Hypernatraemia, ↓ iCa, CO_2 load

GOLDEN PEARL

Magnesium first, then potassium. The potassium will not stay up without it.

‹ Back to Step 69 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **ECG** – electrocardiogram; **IV** – intravenous


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 70

Wean vasopressors daily

4. Haemodynamic & Refractory Shock Management · Page 1 of 2 — the step

THE GOLDEN STEP

Reassess and wean vasopressors daily — and more often — as perfusion stabilises.

WHY IT MATTERS

Vasopressors are life-saving but cause arrhythmias, ischaemia and immunomodulation. Unnecessary exposure prolongs ICU stay. A structured weaning plan, reviewed every shift, shortens duration without compromising safety.

HOW TO DO IT AT THE BEDSIDE

- Wean when MAP is consistently at target, lactate falling and CRT normal.
- Reduce norepinephrine by 0.02–0.05 µg/kg/min every 30–60 min as tolerated.
- If on norepinephrine + vasopressin: wean norepinephrine first to ≤ 0.1, then stop vasopressin.
- Stop hydrocortisone when vasopressors are off (or taper over 3 days).
- Avoid restarting fluids to “help wean” unless fluid-responsive and hypoperfused.

WATCH OUT

- Sedative boluses and dialysis sessions cause transient dips — anticipate, do not escalate reflexively.
- Recurrent need for vasopressors after weaning suggests a new problem (infection, bleeding, adrenal insufficiency).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

MAP target 65 (60–65 if ≥ 65 y) applies during weaning; corticosteroids continued while vasopressors are needed.
Strong / Conditional

EVIDENCE & FURTHER READING — TAP TO OPEN

Jeon 2018: vasopressin vs NE discontinuation order · 65 trial (JAMA 2020) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 70 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CRT – capillary refill time; **ICU** – intensive care unit; **MAP** – mean arterial pressure; **NE** – norepinephrine (noradrenaline)
Drug information (RxList — tap): Norepinephrine · Vasopressin · Hydrocortisone


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 70

Wean vasopressors daily

4. Haemodynamic & Refractory Shock Management · Page 2 of 2 — tables, graphs & algorithm

Vasopressor weaning protocol

Every 4–6 h: is the patient ready to wean?

MAP at target ≥ 4 h, lactate falling, CRT ≤ 3 s, no new source?

NO → Not ready — reassess cause, continue

YES

Reduce NE by 0.02–0.05 µg/kg/min every 30–60 min

On vasopressin too?

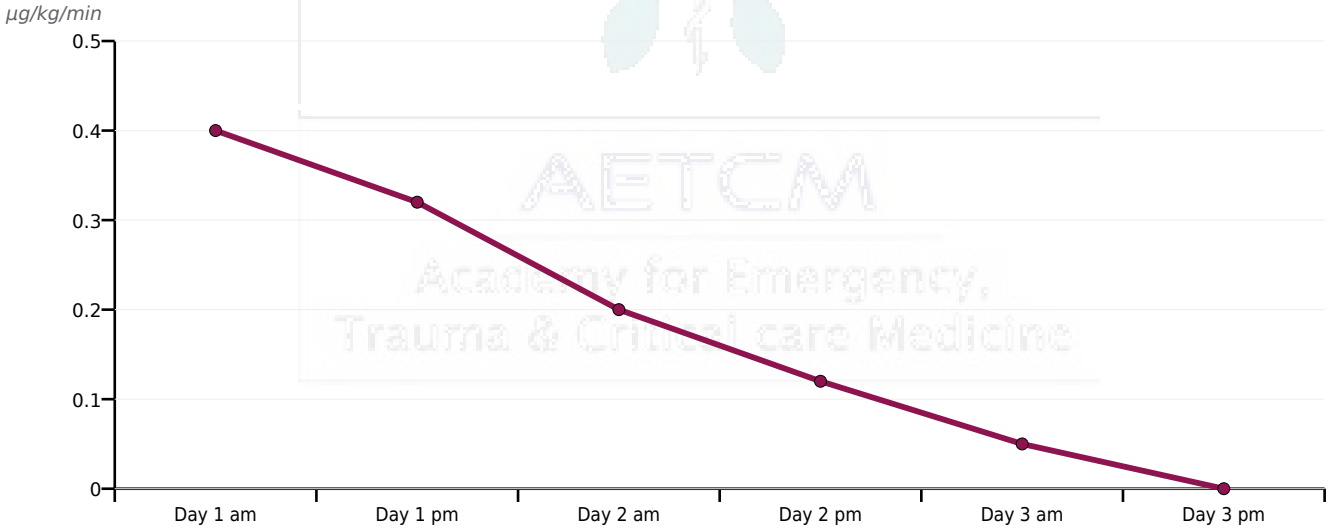
NO → Continue NE taper to off

YES

Taper NE to ≤ 0.1 µg/kg/min, then stop vasopressin

Off vasopressors: stop/taper hydrocortisone; begin de-resuscitation

Example weaning curve — norepinephrine dose (µg/kg/min)



GOLDEN PEARL

Every shift, ask: can this patient have a little less vasopressor? The answer is often yes.

‹ Back to Step 70 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

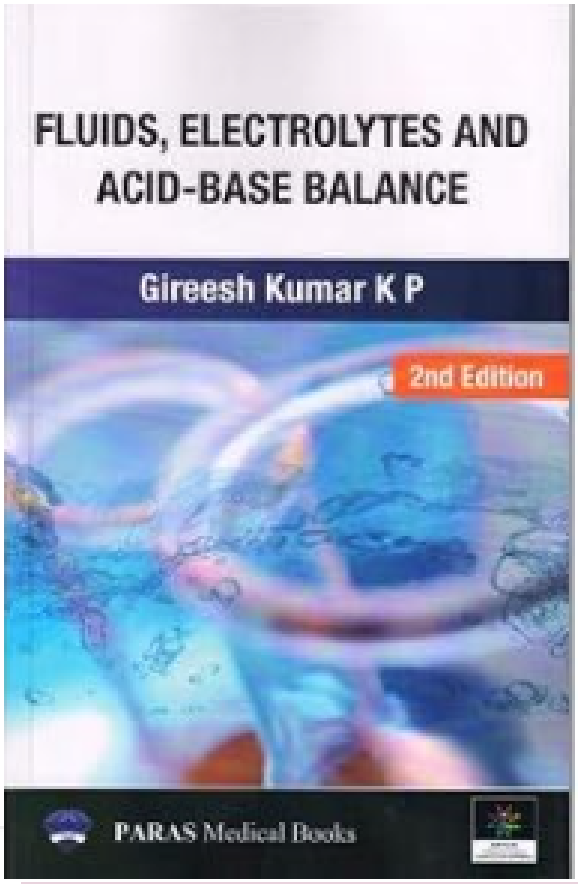
Abbreviations: CRT – capillary refill time; **MAP** – mean arterial pressure; **NE** – norepinephrine (noradrenaline)
Drug information (RxList — tap): Norepinephrine · Vasopressin · Hydrocortisone


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Fluids, Electrolytes and Acid-Base Balance

Fluid, electrolyte and acid-base management made practical — the perfect companion to the resuscitation and de-resuscitation steps.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 71

Lung-protective ventilation

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Use lung-protective mechanical ventilation — tidal volume about 6 mL/kg predicted body weight and plateau pressure ≤ 30 cm H_2O — for sepsis-induced ARDS.

WHY IT MATTERS

Sepsis is the commonest cause of ARDS. Large tidal volumes overstretch the small “baby lung” and cause ventilator-induced lung injury. Low tidal volume ventilation reduced mortality from 39.8% to 31.0% in the ARMA trial and remains a strong, high-certainty recommendation.

HOW TO DO IT AT THE BEDSIDE

- Calculate predicted body weight from height (not actual weight).
- Set Vt 6 mL/kg PBW (range 4–8); RR up to 35 to maintain pH ≥ 7.25–7.30.
- Check plateau pressure (inspiratory hold 0.5 s) — keep ≤ 30 cm H_2O; driving pressure (Pplat − PEEP) ≤ 15.
- Without ARDS, 6–8 mL/kg PBW is suggested (not lower).
- Accept permissive hypercapnia if pH ≥ 7.20 and no raised ICP.

WATCH OUT

- Measuring the patient's height takes 1 minute; guessing it causes most Vt errors — especially in women and short patients.
- Patient–ventilator dyssynchrony (double triggering) can double the delivered volume.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

ARDS: low tidal volume (6 mL/kg) over high (> 10 mL/kg) and plateau pressure ≤ 30 cm H_2O (strong, high). Hypoxaemic failure without ARDS: 6–8 mL/kg rather than 4 to < 6 mL/kg.
Strong · High / Conditional · Low

EVIDENCE & FURTHER READING — TAP TO OPEN

ARDSNet ARMA (NEJM 2000) · Amato 2015: driving pressure (NEJM) · Berlin definition (JAMA 2012) · Radiopaedia: ARDS chest X-ray · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 71 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ARDS – acute respiratory distress syndrome; **PBW** – predicted body weight; **PEEP** – positive end-expiratory pressure; **Pplat** – plateau pressure; **RR** – respiratory rate; **Vt** – tidal volume


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 71

Lung-protective ventilation

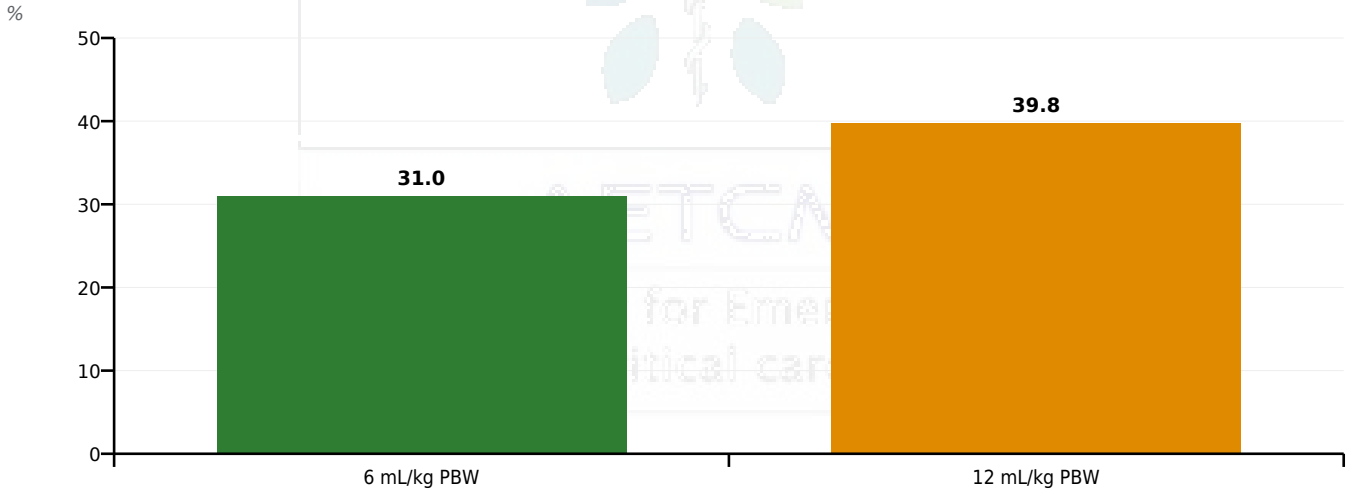
5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Predicted body weight and 6 mL/kg tidal volume

Height	PBW male	Vt male (6 mL/kg)	PBW female	Vt female (6 mL/kg)
150 cm	48 kg	287 mL	43 kg	260 mL
155 cm	52 kg	314 mL	48 kg	287 mL
160 cm	57 kg	341 mL	52 kg	314 mL
165 cm	61 kg	369 mL	57 kg	342 mL
170 cm	66 kg	396 mL	62 kg	369 mL
175 cm	71 kg	423 mL	66 kg	396 mL
180 cm	75 kg	451 mL	71 kg	424 mL
185 cm	80 kg	478 mL	75 kg	451 mL

PBW (male) = 50 + 0.91 × (height cm − 152.4); PBW (female) = 45.5 + 0.91 × (height cm − 152.4). Driving pressure = plateau pressure − PEEP (target ≤ 15 cm H_2O).

ARMA trial: mortality (%)



SEE THE X-RAY — ARDS ON RADIOPAEDIA (TAP TO OPEN)

Radiopaedia: acute respiratory distress syndrome — chest X-ray cases

GOLDEN PEARL

Ventilate the lung the patient has left, not the lung you wish they had. Measure the height.

‹ Back to Step 71 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: PBW – predicted body weight; **PEEP** – positive end-expiratory pressure; **Vt** – tidal volume


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 72

Titrate PEEP and FiO_2

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Titrate PEEP and FiO_2 to maintain oxygenation while minimising barotrauma and haemodynamic compromise.

WHY IT MATTERS

PEEP keeps alveoli open and improves oxygenation, but excessive PEEP over-distends the lung and reduces venous return. For moderate–severe ARDS a higher PEEP strategy is suggested; aggressive recruitment manoeuvres with incremental PEEP titration (ART trial) caused harm and are not recommended.

HOW TO DO IT AT THE BEDSIDE

- Use the ARDSNet PEEP/FiO_2 table — the higher-PEEP table for moderate–severe ARDS.
- Target SpO_2 88–95% / PaO_2 55–80 mmHg.
- Watch the response: oxygenation, driving pressure, compliance, BP.
- Avoid prolonged FiO_2 > 0.6 when possible.
- Do not use staircase recruitment manoeuvres.

WATCH OUT

- High PEEP can unmask hypovolaemia or RV failure — check BP and echo after increases.
- Unilateral lung disease may worsen with high PEEP (over-distension of the good lung).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Moderate–severe ARDS: suggest higher PEEP over lower PEEP; recommend against incremental PEEP titration/recruitment strategies.
Conditional · Moderate / Strong · Moderate

EVIDENCE & FURTHER READING — TAP TO OPEN

ALVEOLI (NEJM 2004) · ART trial (JAMA 2017) · Briel 2010: higher vs lower PEEP meta-analysis · Radiopaedia: ARDS chest X-ray · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 72 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ARDS – acute respiratory distress syndrome; **BP** – blood pressure; **FiO_2** – fraction of inspired oxygen; **PaO_2** – arterial partial pressure of oxygen; **PEEP** – positive end-expiratory pressure; **RV** – right ventricle; **SpO_2** – peripheral oxygen saturation


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 72

Titrate PEEP and FiO_2

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

ARDSNet LOWER PEEP / FiO_2 table

FiO_2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0
PEEP	5	5	8	8	10	10	10	12	14	14	14	16	18	18–24

ARDSNet HIGHER PEEP / FiO_2 table (moderate–severe ARDS — SSC 2026)

FiO_2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.5-0.8	0.8	0.9	1.0
PEEP	5	8	10	12	14	14	16	16	18	20	22	22	22–24

Oxygenation and safety targets

Parameter	Target
SpO_2 / PaO_2	88–95% / 55–80 mmHg
Plateau pressure	≤ 30 cm H_2O
Driving pressure	≤ 15 cm H_2O
pH	≥ 7.25–7.30 (permissive hypercapnia)

SEE THE X-RAY — ARDS ON RADIOPAEDIA (TAP TO OPEN)

Radiopaedia: acute respiratory distress syndrome — chest X-ray cases

GOLDEN PEARL

PEEP is a dose: prescribe it from a table, watch its side-effects, and never recruit with a staircase.

‹ Back to Step 72 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ARDS – acute respiratory distress syndrome; **FiO_2** – fraction of inspired oxygen; **PaO_2** – arterial partial pressure of oxygen; **PEEP** – positive end-expiratory pressure; **SpO_2** – peripheral oxygen saturation; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 73

Prevent ventilator-associated pneumonia

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Keep the head of the bed elevated 30–45° in ventilated patients and apply the full VAP-prevention bundle.

WHY IT MATTERS

Ventilator-associated pneumonia adds days of ventilation, antibiotic exposure and mortality. Simple bundle measures reduce it. The 2026 guideline adds selective digestive decontamination (SDD) for ventilated patients in units with low antimicrobial resistance.

HOW TO DO IT AT THE BEDSIDE

- Head-up 30–45° unless contraindicated (spinal injury, unstable pelvis).
- Daily sedation interruption and spontaneous breathing trials (Step 74).
- Subglottic secretion drainage tubes for expected ventilation > 48–72 h; cuff pressure 20–30 cm H_2O.
- Oral care (toothbrushing); avoid routine chlorhexidine oral rinse.
- SDD only where resistance prevalence is low — not suitable for most Indian ICUs with high MDR prevalence.

WATCH OUT

- Supine position during transport and procedures is the commonest bundle breach.
- Over-diagnosis of VAP is common — use clinical + radiological + microbiological criteria.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest selective digestive decontamination in mechanically ventilated adults in units with low antimicrobial resistance.
Conditional · Moderate certainty (new)

EVIDENCE & FURTHER READING — TAP TO OPEN

SuDDICU (JAMA 2022) · Drakulovic 1999: semi-recumbent position (Lancet) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 73 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: MDR – multidrug-resistant; **SDD** – selective digestive decontamination; **VAP** – ventilator-associated pneumonia


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 73

Prevent ventilator-associated pneumonia

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

VAP prevention bundle

Element	Standard	Check
Head of bed	30–45°	Every shift
Sedation	Light (RASS 0 to −2); daily interruption	Daily
SBT	Daily when criteria met	Daily
Cuff pressure	20–30 cm H_2O	Every 8 h
Subglottic drainage	If ventilation > 48–72 h expected	At intubation
Oral care	Toothbrushing twice daily	Every shift
Circuit	Change only if soiled	—
SDD	Only in low-resistance units	Unit policy

Suspected VAP — diagnostic criteria (practical)

Domain	Finding
Radiology	New or progressive infiltrate
Clinical	Fever > 38°C or WBC > 12 000/< 4 000, purulent secretions, worsening oxygenation
Microbiology	Quantitative ETA ≥ 10^5 CFU/mL or BAL ≥ 10^4 CFU/mL
Timing	≥ 48 h after intubation

Academy for Emergency, Trauma & Critical care Medicine

GOLDEN PEARL

Head up, sedation down, mouth clean, cuff checked — four habits that prevent a pneumonia.

‹ Back to Step 73 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **BAL** – bronchoalveolar lavage; **CFU** – colony-forming units; **ETA** – endotracheal aspirate; **SBT** – spontaneous breathing trial; **SDD** – selective digestive decontamination; **VAP** – ventilator-associated pneumonia; **WBC** – white blood cell count
RASS (Richmond Agitation–Sedation Scale): Sedation–agitation scale from +4 (combative) to −5 (unarousable); target 0 to −2. Calculator / source › see Step 86 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 74

Daily awakening and breathing trials

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Perform daily spontaneous awakening trials paired with spontaneous breathing trials when clinically safe.

WHY IT MATTERS

Pairing sedation interruption with a breathing trial (the ABC trial) reduced ventilator days and improved survival at one year. Every day of unnecessary ventilation adds risk of VAP, delirium and weakness.

HOW TO DO IT AT THE BEDSIDE

- Morning safety screen for SAT: no seizures, alcohol withdrawal, escalating sedation, NMB, raised ICP, active ischaemia.
- Stop sedatives (continue analgesia for pain) — pass if the patient opens eyes to voice or tolerates 4 h without distress.
- SBT screen: $FiO_2 \leq 0.5$, PEEP ≤ 8, haemodynamically stable on minimal vasopressor, spontaneous effort.
- SBT 30–120 min on pressure support 5–8 / PEEP 5 or T-piece.
- Pass: RR < 35, $SpO_2 \geq 90\%$, HR/BP stable, no distress → consider extubation; RSBI < 105.

WATCH OUT

- High-risk patients (age > 65, chronic cardiorespiratory disease) benefit from extubation to HFNC or NIV.
- Failed SBT: find the cause (fluid overload, weakness, secretions, cardiac) before the next trial.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Not separately graded in SSC 2026 — supported by PADIS guidance and ABC trial evidence.

Practice standard (PADIS 2018)

EVIDENCE & FURTHER READING — TAP TO OPEN

ABC trial (Girard, Lancet 2008) · PADIS guideline (Devlin 2018) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 74 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **BP** – blood pressure; **FiO_2** – fraction of inspired oxygen; **HFNC** – high-flow nasal cannula; **HR** – heart rate; **NIV** – non-invasive ventilation; **NMB** – neuromuscular blockade; **PEEP** – positive end-expiratory pressure; **RR** – respiratory rate; **RSBI** – rapid shallow breathing index; **SAT** – spontaneous awakening trial; **SBT** – spontaneous breathing trial; **SpO_2** – peripheral oxygen saturation; **SSC** – Surviving Sepsis Campaign; **VAP** – ventilator-associated pneumonia

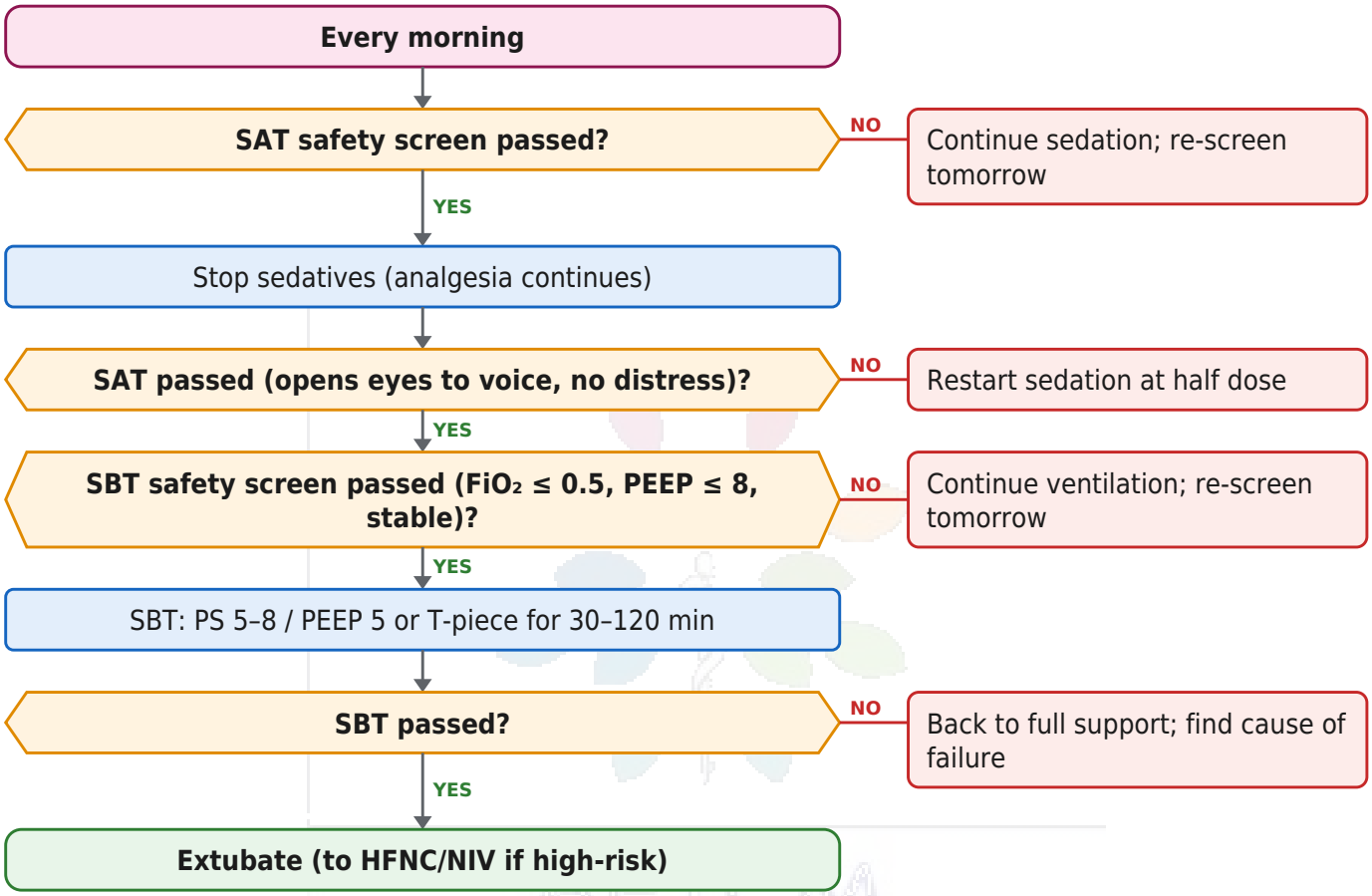

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 74

Daily awakening and breathing trials

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Wake up and breathe — the daily protocol



Rapid shallow breathing index (RSBI) = RR ÷ Vt (litres)

RR	Vt	RSBI	Meaning
20	0.45 L	44	Likely success
30	0.30 L	100	Borderline
38	0.25 L	152	Likely failure

GOLDEN PEARL

Every morning, give the patient the chance to show you they no longer need the ventilator.

‹ Back to Step 74 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **FiO₂** – fraction of inspired oxygen; **HFNC** – high-flow nasal cannula; **NIV** – non-invasive ventilation; **PEEP** – positive end-expiratory pressure; **PS** – pressure support; **RR** – respiratory rate; **RSBI** – rapid shallow breathing index; **SAT** – spontaneous awakening trial; **SBT** – spontaneous breathing trial; **Vt** – tidal volume


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 75

Prone positioning for severe ARDS

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Use prone positioning for > 12 hours daily in moderate–severe ARDS (P/F < 150) despite optimised ventilator settings.

WHY IT MATTERS

Prone positioning recruits dorsal lung, improves V/Q matching and spreads stress more evenly. In PROSEVA, early prolonged proning in severe ARDS halved 28-day mortality (16.0% vs 32.8%).

HOW TO DO IT AT THE BEDSIDE

- Indication: P/F < 150 on FiO_2 ≥ 0.6 and PEEP ≥ 5 after 12–24 h of optimisation.
- Prone for at least 12–16 consecutive hours per day.
- Team of 4–5 with a checklist: secure tube and lines, eye protection, pad pressure points, ECG leads on the back.
- Continue daily sessions until P/F ≥ 150 with PEEP ≤ 10 and FiO_2 ≤ 0.6 four hours after supining.
- Consider intermittent neuromuscular blocker boluses for dyssynchrony; ECMO in experienced centres if proning fails.

WATCH OUT

- Pressure injuries (face, chest, knees), accidental extubation, line dislodgement.
- Relative contraindications: unstable spine, open abdomen, raised ICP, recent sternotomy, pregnancy (modified).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Moderate–severe ARDS: suggest prone ventilation > 12 h daily; intermittent NMB boluses over continuous infusion; VV-ECMO in experienced centres for severe refractory ARDS.
Conditional · Moderate / Low

EVIDENCE & FURTHER READING — TAP TO OPEN

PROSEVA (Guérin, NEJM 2013) · EOLIA (Combes, NEJM 2018) · ROSE (NEJM 2019) · Radiopaedia: ARDS chest X-ray · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 75 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ARDS – acute respiratory distress syndrome; **ECG** – electrocardiogram; **ECMO** – extracorporeal membrane oxygenation; **FiO_2** – fraction of inspired oxygen; **NMB** – neuromuscular blockade; **PEEP** – positive end-expiratory pressure; **ROSE** – Rescue, Optimisation, Stabilisation, Evacuation

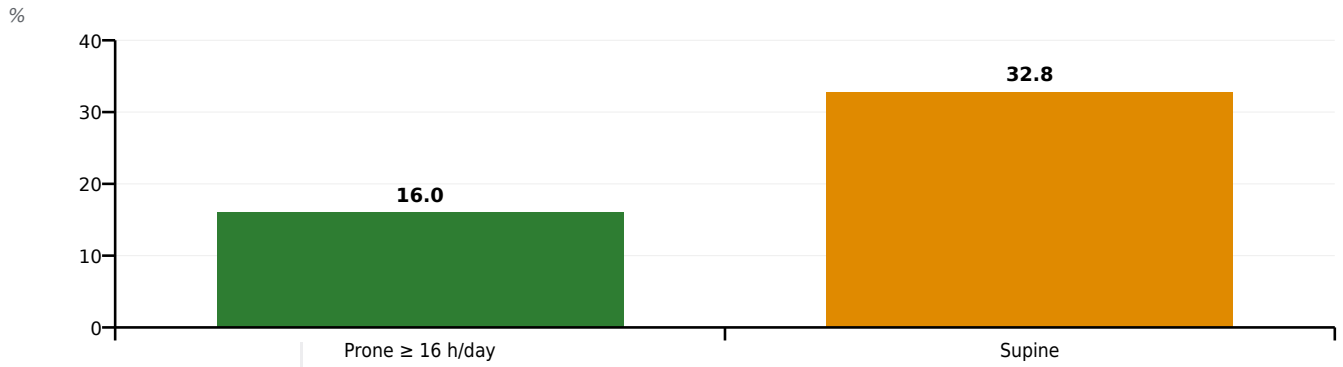

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 75

Prone positioning for severe ARDS

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

PROSEVA: 28-day mortality (%)



Proning checklist

Before	During	After
Pre-oxygenate FiO_2 1.0	Leader at head controls tube	Check tube position, $EtCO_2$
Stop feeds 1 h before	Lines/tubes aligned along body	Pad face, chest, pelvis, knees
Eye care, tape eyes	Log-roll in 3 steps (side, turn, adjust)	Swimmer's position, alternate arms 2-hourly
Secure tube and lines	Move ECG leads to back	ABG at 1 h

Severe ARDS escalation

P/F < 150 despite Vt 6 mL/kg, higher PEEP

↓

Prone ≥ 12–16 h/day

↓

Improving after prone sessions?

NO → Neuromuscular blocker boluses; refer for VV-ECMO if P/F < 80 / pH < 7.25 with $PaCO_2$ ≥ 60

YES ↓

Continue until P/F ≥ 150 supine with PEEP ≤ 10, FiO_2 ≤ 0.6

SEE THE X-RAY — ARDS ON RADIOPAEDIA (TAP TO OPEN)

Radiopaedia: acute respiratory distress syndrome — chest X-ray cases

GOLDEN PEARL

Turn the patient, not the FiO_2 knob. Proning is the most effective free therapy in severe ARDS.

‹ Back to Step 75 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

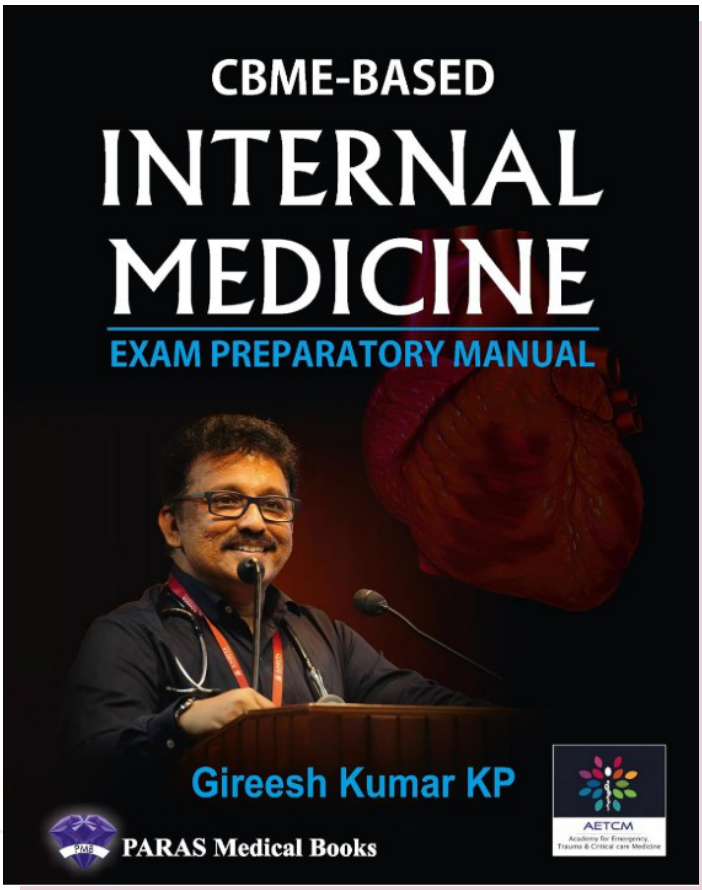
Abbreviations: ABG – arterial blood gas; **ARDS** – acute respiratory distress syndrome; **ECG** – electrocardiogram; **ECMO** – extracorporeal membrane oxygenation; **$EtCO_2$** – end-tidal carbon dioxide; **FiO_2** – fraction of inspired oxygen; **$PaCO_2$** – arterial partial pressure of CO_2; **PEEP** – positive end-expiratory pressure; **Vt** – tidal volume


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



CBME-Based Internal Medicine

Internal medicine for the CBME MBBS final examination — exam-focused and curriculum-mapped.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 76

Hourly urine output and AKI staging

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Monitor urine output hourly via an indwelling catheter to track kidney perfusion and acute kidney injury.

WHY IT MATTERS

AKI occurs in more than half of patients with septic shock and is strongly associated with mortality. Oliguria is an early marker of hypoperfusion and AKI, detectable hours before creatinine rises.

HOW TO DO IT AT THE BEDSIDE

- Insert a urinary catheter in septic shock; record hourly volume.
- Stage AKI by KDIGO (creatinine and urine output).
- Oliguria: check catheter patency (flush), MAP, volume status, abdominal pressure, nephrotoxins.
- Remove the catheter as soon as hourly monitoring is no longer needed (CAUTI).

WATCH OUT

- Do not treat oliguria with repeated fluid boluses in a non-responsive patient.
- Intra-abdominal hypertension (bladder pressure > 12–20 mmHg) causes oliguria — measure it.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

AKI without a definite RRT indication: suggest against RRT; supportive care with perfusion optimisation.
Conditional · Moderate

EVIDENCE & FURTHER READING — TAP TO OPEN

KDIGO AKI guideline 2012 | Bellomo 2017: septic AKI review (ICM) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 76 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **CAUTI** – catheter-associated urinary tract infection; **KDIGO** – Kidney Disease: Improving Global Outcomes; **MAP** – mean arterial pressure; **RRT** – renal replacement therapy


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 76

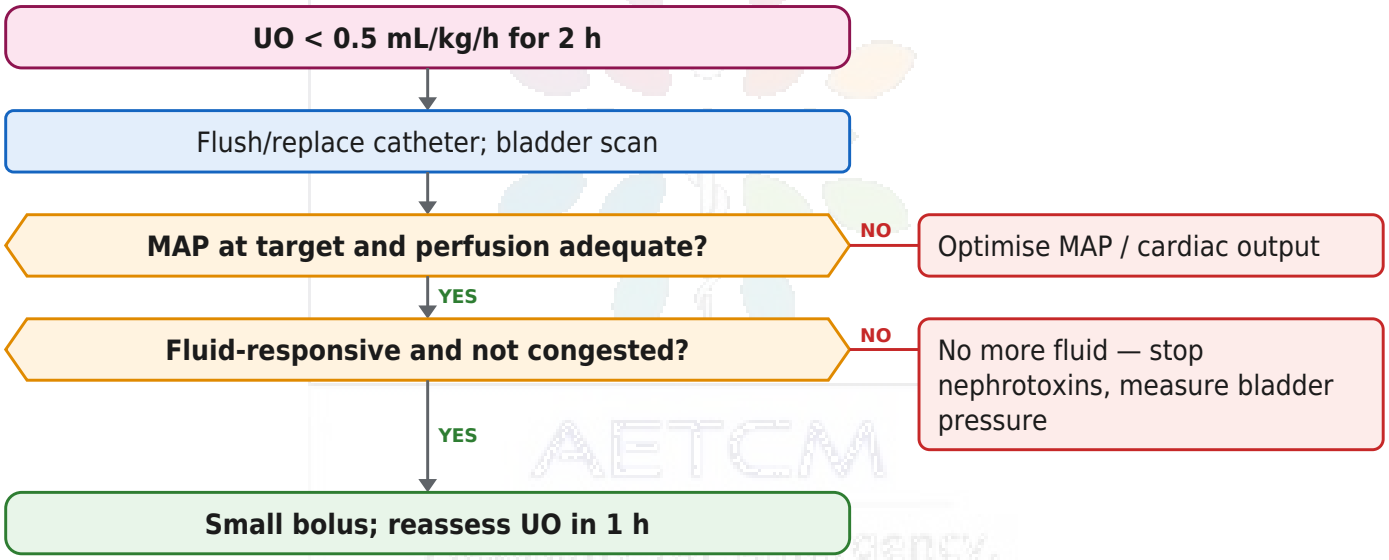
Hourly urine output and AKI staging

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

KDIGO AKI staging

Stage	Serum creatinine	Urine output
1	1.5–1.9 × baseline OR ≥ 0.3 mg/dL rise in 48 h	< 0.5 mL/kg/h for 6–12 h
2	2.0–2.9 × baseline	< 0.5 mL/kg/h for ≥ 12 h
3	3.0 × baseline OR ≥ 4.0 mg/dL OR RRT started	< 0.3 mL/kg/h for ≥ 24 h OR anuria ≥ 12 h

Oliguria in septic shock



GOLDEN PEARL

Urine is the kidney's report card, written every hour. Read it.

‹ Back to Step 76 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **KDIGO** – Kidney Disease: Improving Global Outcomes; **MAP** – mean arterial pressure; **OR** – odds ratio; **RRT** – renal replacement therapy; **UO** – urine output


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 77

Avoid nephrotoxins

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Avoid nephrotoxins whenever safe alternatives exist.

WHY IT MATTERS

Septic kidneys are vulnerable: a second hit from aminoglycosides, vancomycin, NSAIDs or contrast can turn reversible AKI into dialysis dependence. Each nephrotoxin added increases the risk.

HOW TO DO IT AT THE BEDSIDE

- Review the drug chart daily for nephrotoxins — stop or substitute.
- Avoid NSAIDs; use paracetamol (≤ 2–3 g/day in liver disease) and opioids for pain.
- Aminoglycosides: single daily dose, shortest course (≤ 3–5 days), monitor levels.
- Vancomycin: AUC-guided dosing; avoid combination with pip-tazo where alternatives exist.
- Contrast: do not withhold a needed CT; use the lowest dose and ensure euvolaemia.

WATCH OUT

- ACE inhibitors and ARBs should be held during shock and AKI.
- Withholding a diagnostic contrast scan can be more dangerous than the contrast.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Supportive kidney care; TDM case-by-case for nephrotoxic antimicrobials.
Conditional

EVIDENCE & FURTHER READING — TAP TO OPEN

KDIGO AKI guideline · Vancomycin + pip-tazo AKI meta-analysis · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 77 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ACE – angiotensin-converting enzyme; **AKI** – acute kidney injury; **ARBs** – angiotensin-receptor blockers; **AUC** – area under the concentration–time curve; **CT** – computed tomography; **KDIGO** – Kidney Disease: Improving Global Outcomes; **NSAIDs** – non-steroidal anti-inflammatory drugs; **TDM** – therapeutic drug monitoring
Drug information (RxList — tap): Vancomycin · Paracetamol


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 77

Avoid nephrotoxins

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Common nephrotoxins and safer alternatives

Nephrotoxin	Mechanism	Safer option
NSAIDs	Afferent vasoconstriction	Paracetamol, opioids
Aminoglycosides	Tubular toxicity	β-lactam; short once-daily course with levels
Vancomycin (high trough)	Tubular toxicity	AUC dosing; linezolid if appropriate
Vancomycin + pip-tazo	Combined	Vancomycin + cefepime / meropenem
Colistin	Tubular toxicity	Newer agents if susceptible (ceftazidime–avibactam)
Amphotericin B deoxycholate	Vasoconstriction, tubular	Liposomal amphotericin
ACE inhibitors / ARBs	Efferent dilation	Hold during shock / AKI
Iodinated contrast	Vasoconstriction, tubular	Lowest dose, iso-osmolar; do not withhold if needed

GOLDEN PEARL

Every morning, cross out one drug the kidney does not need.

‹ Back to Step 77 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ACE – angiotensin-converting enzyme; **AKI** – acute kidney injury; **ARBs** – angiotensin-receptor blockers; **AUC** – area under the concentration–time curve; **NSAIDs** – non-steroidal anti-inflammatory drugs

Drug information (RxList — tap): Meropenem · Cefepime · Ceftazidime · Vancomycin · Linezolid · Colistin · Amphotericin · Paracetamol



Medicine @ Your Fingertips

Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes

BUY NOW ›

STEP 78

Renal replacement therapy — for clear indications

THE GOLDEN STEP

Start renal replacement therapy for refractory fluid overload, severe hyperkalaemia, severe metabolic acidosis or uraemic complications — not pre-emptively.

WHY IT MATTERS

Early "pre-emptive" RRT did not improve survival (AKIKI, STARRT-AKI) and exposes patients to catheters, anticoagulation and hypotension; many patients recover without it. Continuous and intermittent modalities have similar outcomes.

HOW TO DO IT AT THE BEDSIDE

- Indications (AEIOU): Acidosis pH < 7.15, Electrolytes (K^+ > 6.5 or rising despite therapy), Intoxication (dialysable), Overload refractory to diuretics, Uraemia (encephalopathy, pericarditis).
- CRRT if haemodynamically unstable; intermittent HD or SLED if stable.
- CRRT effluent dose 20–25 mL/kg/h (prescribe 25–30 to deliver 20–25).
- Dose antibiotics for CRRT (often near-normal β-lactam doses).
- Bicarbonate for pH ≤ 7.2 with AKI stage 2–3 may avoid RRT (BICAR-ICU).

WATCH OUT

- Watch for hypophosphataemia, hypothermia and drug under-dosing on CRRT.
- Catheter-related infection and bleeding risk with anticoagulation — use citrate where available.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

AKI without definite RRT indications: suggest against RRT; when RRT is warranted, continuous or intermittent. Septic shock with pH ≤ 7.2 and AKIN 2–3: suggest bicarbonate.

Conditional · Moderate / Low / Very low

EVIDENCE & FURTHER READING — TAP TO OPEN

STARRT-AKI (NEJM 2020) · AKIKI (NEJM 2016) · BICAR-ICU (Lancet 2018) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 78 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **AKIN** – Acute Kidney Injury Network; **CRRT** – continuous renal replacement therapy; **HD** – haemodialysis; **ICU** – intensive care unit; **RRT** – renal replacement therapy; **SLED** – sustained low-efficiency dialysis


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 78

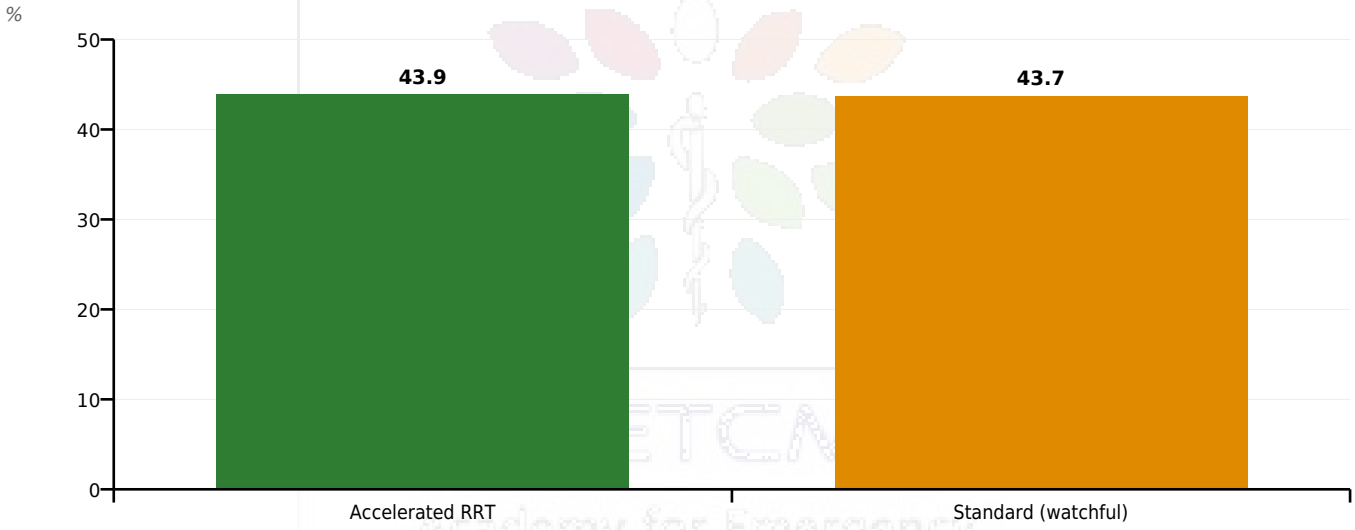
Renal replacement therapy — for clear indications

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Indications for urgent RRT (AEIOU)

Letter	Indication	Threshold
A	Acidosis	pH < 7.15 (metabolic) despite therapy
E	Electrolytes	K^+ > 6.5 mmol/L or ECG changes, refractory
I	Intoxication	Lithium, methanol, ethylene glycol, salicylate, metformin
O	Overload	Pulmonary oedema refractory to diuretics
U	Uraemia	Encephalopathy, pericarditis, bleeding; urea very high

STARRT-AKI: 90-day mortality (%)



In STARRT-AKI (3 019 patients), accelerated RRT did not reduce mortality and increased RRT dependence at 90 days (10.4% vs 6.0%); about 38% of the standard group never needed RRT.

GOLDEN PEARL

Dialyse the indication, not the creatinine.

‹ Back to Step 78 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury; **ECG** – electrocardiogram; **RRT** – renal replacement therapy
Drug information (RxList — tap): Metformin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 79

Glucose control — insulin at ≥ 180 mg/dL

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Start insulin when blood glucose is ≥ 180 mg/dL (10 mmol/L), targeting about 144–180 mg/dL with a protocol that avoids hypoglycaemia.

WHY IT MATTERS

Stress hyperglycaemia is common in sepsis and worsens outcomes, but tight control (81–108 mg/dL) increased mortality and severe hypoglycaemia in NICE-SUGAR. A moderate target is safest.

HOW TO DO IT AT THE BEDSIDE

- Two consecutive values ≥ 180 mg/dL → start IV insulin infusion by protocol.
- Target 144–180 mg/dL (8–10 mmol/L).
- Check glucose every 1–2 h until stable, then every 4 h.
- Use arterial or venous samples rather than capillary in shock (capillary values unreliable).
- Provide a glucose source (feeds or dextrose) when insulin is running.

WATCH OUT

- Hypoglycaemia ≤ 70 mg/dL increases mortality — act immediately.
- Stopping feeds without adjusting insulin is the commonest cause of hypoglycaemia.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend initiating insulin at a glucose level of ≥ 180 mg/dL (10 mmol/L).
Strong · Moderate certainty

SLIDING SCALE IS NOT A GOOD CHOICE IN THE SICK PATIENT

Reactive “sliding-scale” subcutaneous insulin treats hyperglycaemia only after it has happened, causes swings between high and low glucose, and is unreliably absorbed in shock and oedema. In critically ill septic patients **use a nurse-driven IV insulin infusion protocol** that adjusts the rate to both the current value and its rate of change (e.g., the Yale Insulin Infusion Protocol), linked to the feeding plan. Convert to basal–bolus subcutaneous insulin once the patient is stable and eating.

Yale Insulin Infusion Protocol

EVIDENCE & FURTHER READING — TAP TO OPEN

NICE-SUGAR (NEJM 2009) · Van den Berghe 2001 (NEJM) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 79 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: IV – intravenous
Drug information (RxList — tap): Insulin

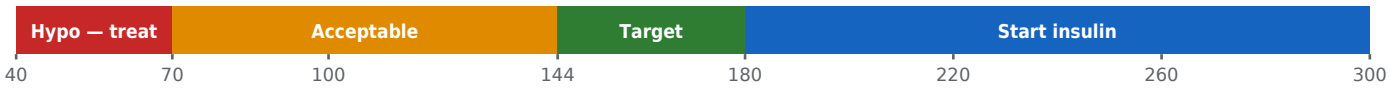

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 79

Glucose control — insulin at ≥ 180 mg/dL

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

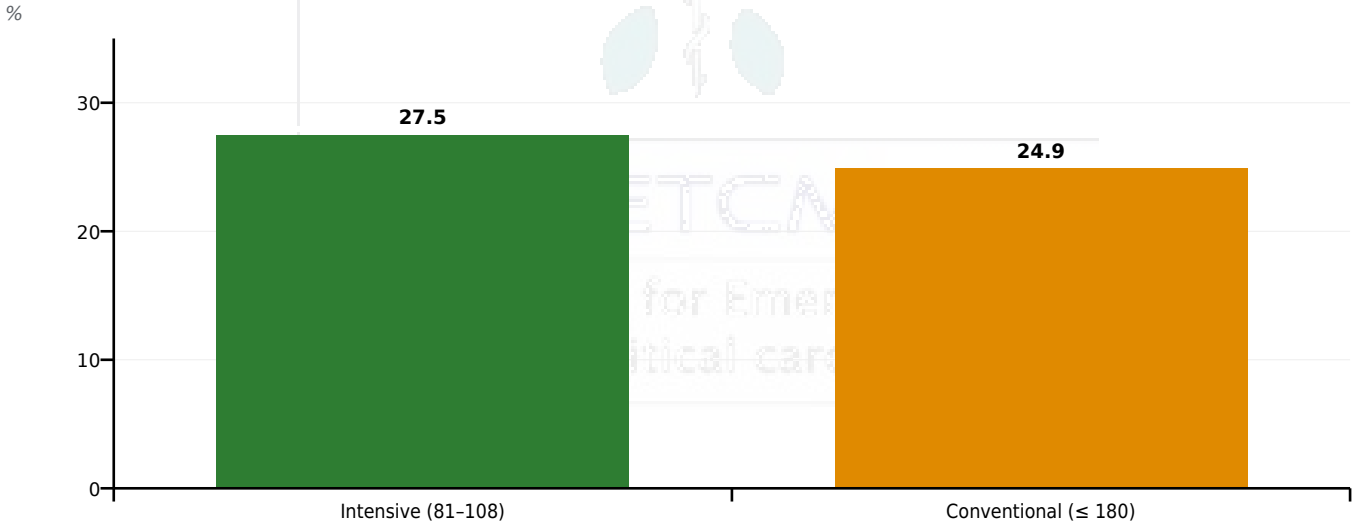
Blood glucose in sepsis (mg/dL)



Simple insulin infusion guide (50 U regular insulin in 50 mL = 1 U/mL)

Glucose (mg/dL)	Action
< 70	STOP insulin; 25 mL 50% dextrose IV; recheck 15 min
70–110	Stop infusion; recheck 1 h
111–144	Reduce rate by 50%
145–180	Continue current rate
181–250	Increase by 1 U/h (start 2 U/h if not running)
> 250	Increase by 2 U/h; check potassium

NICE-SUGAR: 90-day mortality (%)



GOLDEN PEARL

In sepsis, 180 is the ceiling and 70 is the floor — and the floor is the more dangerous one.

‹ Back to Step 79 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: IV – intravenous
Drug information (RxList — tap): Insulin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 80

Frequent point-of-care glucose

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Check point-of-care glucose frequently during insulin infusions and whenever nutrition rates change.

WHY IT MATTERS

Insulin needs change rapidly in sepsis as stress hormones, steroids, feeds and renal function change. Frequent measurement is the only protection against hypoglycaemia and wide variability, both of which are associated with death.

HOW TO DO IT AT THE BEDSIDE

- Hourly checks on starting insulin or after rate changes; 2-hourly when stable within range ×3; 4-hourly when very stable.
- Recheck within 1 h whenever feeds are stopped, reduced, or steroids are started/stopped.
- Prefer arterial/venous blood on a blood-gas analyser in shock and on vasopressors.
- Link the insulin protocol to the feeding protocol (stop feed → halve or stop insulin).

WATCH OUT

- Capillary glucose overestimates in shock and anaemia — confirm unexpected values.
- Hydrocortisone raises glucose — anticipate higher insulin needs.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Insulin at ≥ 180 mg/dL with protocolised monitoring.

Strong · Moderate certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

NICE-SUGAR (NEJM 2009) · Krinsley 2008: glycaemic variability and mortality · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 80 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Drug information (RxList — tap): Hydrocortisone · Insulin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 80

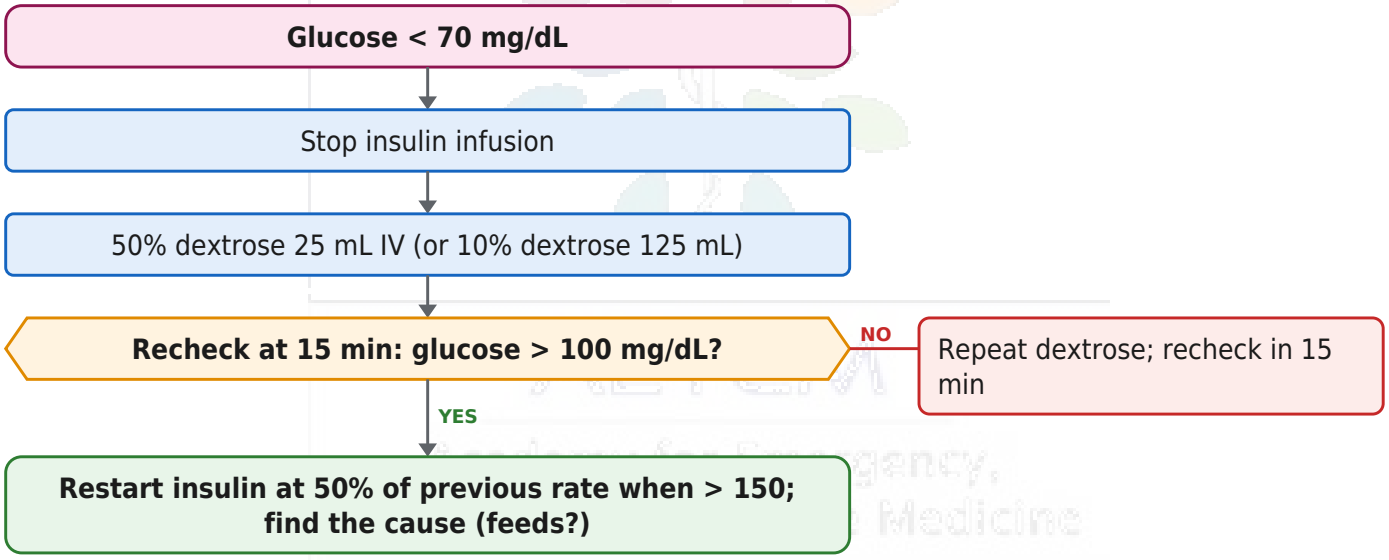
Frequent point-of-care glucose

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Glucose monitoring frequency

Situation	Check glucose
Starting insulin / any rate change	Every 1 h
Stable in range × 3 readings	Every 2 h
Stable for 12–24 h	Every 4 h
Feeds stopped or reduced	Within 1 h, then hourly until stable
Steroids started / stopped	Every 2 h for 12 h
Glucose < 70 mg/dL treated	Every 15 min until > 100

Hypoglycaemia protocol



GOLDEN PEARL

The insulin protocol and the feeding protocol must hold hands — stop one, adjust the other.

‹ Back to Step 80 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

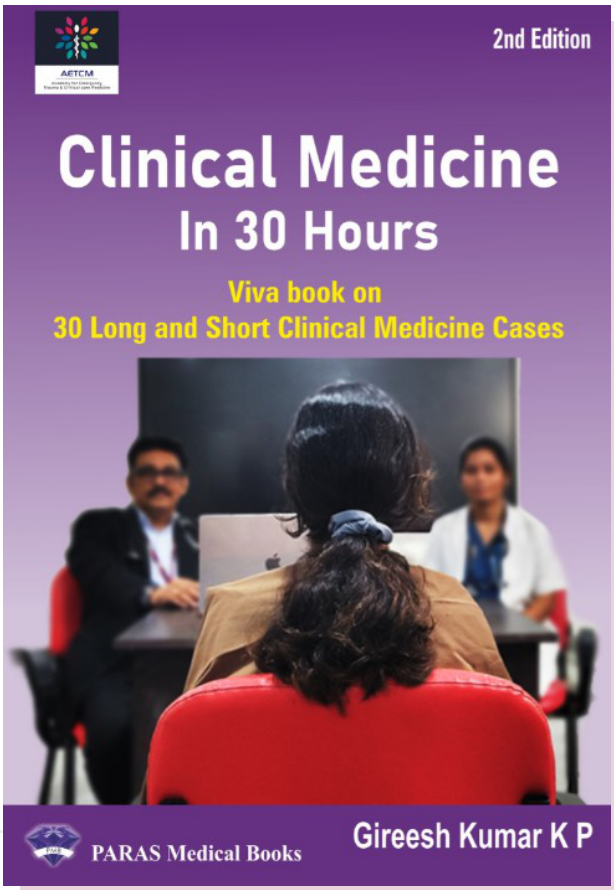
Abbreviations: IV – intravenous
Drug information (RxList — tap): Insulin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Clinical Medicine in 30 Hours

Thirty long and short cases presented the way they are asked at the bedside and in the viva.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 81

Pharmacological VTE prophylaxis

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Give pharmacological VTE prophylaxis — preferably low-molecular-weight heparin — unless contraindicated by bleeding or severe thrombocytopenia.

WHY IT MATTERS

Septic patients are at high risk of venous thromboembolism from immobility, inflammation, central lines and vasopressors. Pharmacological prophylaxis reduces DVT and PE; LMWH is preferred over unfractionated heparin.

HOW TO DO IT AT THE BEDSIDE

- Enoxaparin 40 mg SC once daily (30 mg daily if CrCl < 30; consider 40 mg twice daily if BMI > 40).
- UFH 5 000 U SC 8–12-hourly when CrCl < 30 or high bleeding risk requiring rapid reversal.
- Start within 24 h of admission once bleeding risk is acceptable.
- Pharmacological prophylaxis alone — routine addition of IPC is not needed.

WATCH OUT

- Contraindications: active bleeding, platelets < 30–50 × 10^9/L, recent neurosurgery, epidural catheter timing.
- Monitor platelets — HIT is rare with LMWH but possible.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend pharmacological VTE prophylaxis unless contraindicated; LMWH over UFH; suggest pharmacological prophylaxis alone over combined pharmacological and mechanical.

Strong · Moderate / Conditional · Moderate

EVIDENCE & FURTHER READING — TAP TO OPEN

PROTECT (NEJM 2011) · PREVENT (NEJM 2019): adjunctive IPC · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 81 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **BMI** – body mass index; **CrCl** – creatinine clearance; **DVT** – deep vein thrombosis; **HIT** – heparin-induced thrombocytopenia; **IPC** – intermittent pneumatic compression; **LMWH** – low-molecular-weight heparin; **PE** – pulmonary embolism; **SC** – subcutaneous; **UFH** – unfractionated heparin; **VTE** – venous thromboembolism

Drug information (RxList — tap): Enoxaparin · Heparin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 81

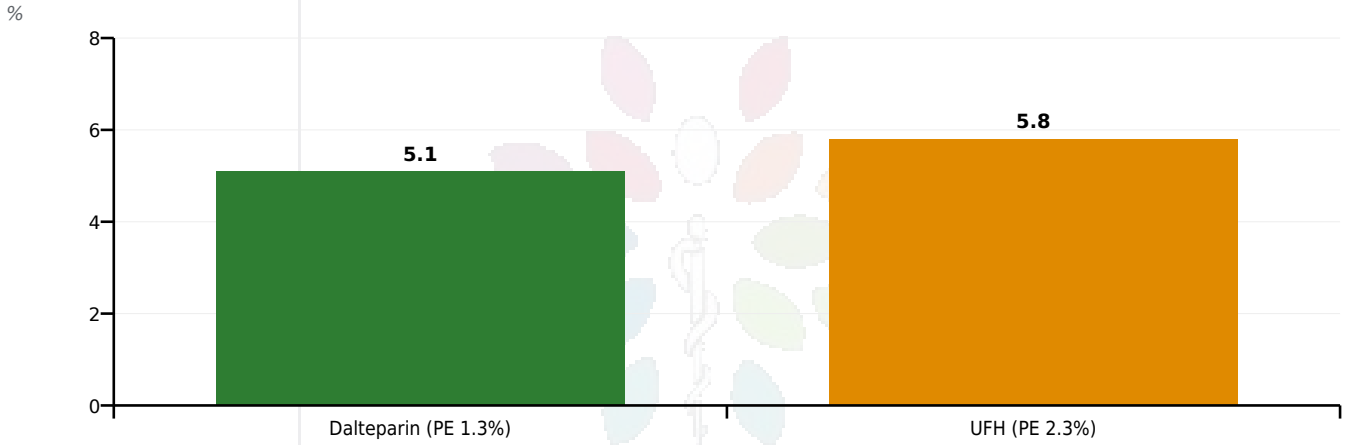
Pharmacological VTE prophylaxis

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

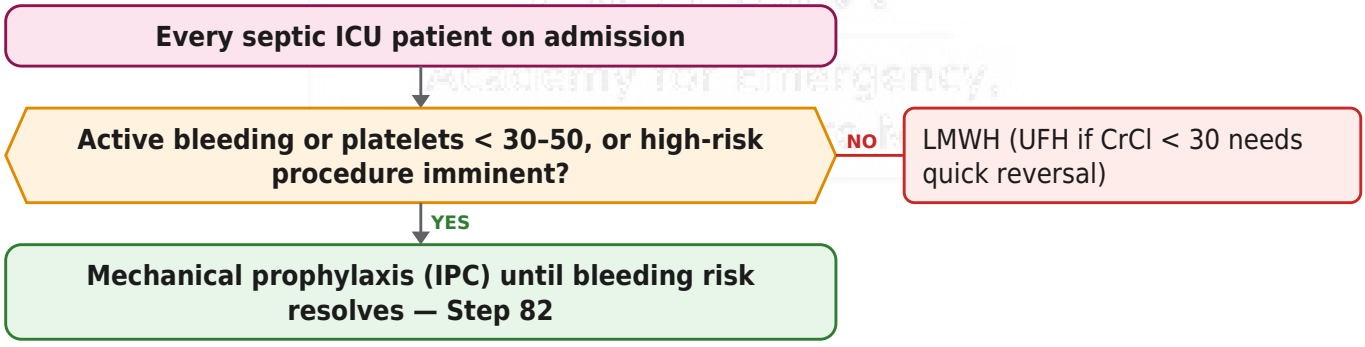
VTE prophylaxis doses (adult)

Drug	Standard dose	CrCl < 30	Obesity (BMI > 40)
Enoxaparin	40 mg SC daily	30 mg SC daily	40 mg SC 12-hourly
Dalteparin	5 000 U SC daily	Use with anti-Xa monitoring	7 500 U daily
Unfractionated heparin	5 000 U SC q8–12h	No change	7 500 U q8h
Fondaparinux (HIT history)	2.5 mg SC daily	Avoid if < 30	—

PROTECT: proximal DVT (%) — dalteparin vs UFH



Choosing VTE prophylaxis



GOLDEN PEARL

Prophylaxis is a daily prescription — check it every morning, especially after procedures and when platelets change.

‹ Back to Step 81 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BMI – body mass index; **CrCl** – creatinine clearance; **DVT** – deep vein thrombosis; **HIT** – heparin-induced thrombocytopenia; **ICU** – intensive care unit; **IPC** – intermittent pneumatic compression; **LMWH** – low-molecular-weight heparin; **PE** – pulmonary embolism; **SC** – subcutaneous; **UFH** – unfractionated heparin; **VTE** – venous thromboembolism
Drug information (RxList — tap): Enoxaparin · Dalteparin · Heparin · Fondaparinux


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 82

Mechanical prophylaxis when anticoagulation is contraindicated

THE GOLDEN STEP

Use intermittent pneumatic compression (IPC) devices when pharmacological prophylaxis is contraindicated.

WHY IT MATTERS

When bleeding risk forbids heparin, IPC is the only protection against DVT. Adding IPC to pharmacological prophylaxis did not reduce DVT further in PREVENT, so IPC is a substitute, not an add-on.

HOW TO DO IT AT THE BEDSIDE

- Apply IPC to both legs (unless leg injury/DVT) for at least 18 h/day.
- Re-assess bleeding risk daily and switch to pharmacological prophylaxis as soon as possible.
- Check skin under the sleeves every shift.
- Graduated compression stockings alone are less effective — prefer IPC.

WATCH OUT

- Do not apply IPC on a leg with known DVT, severe peripheral arterial disease, or skin breakdown.
- Removed devices are not working devices — audit compliance.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Pharmacological prophylaxis alone over pharmacological plus mechanical; mechanical when pharmacological is contraindicated.

Conditional · Moderate certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

PREVENT (Arabi, NEJM 2019) | CLOTS 3 (Lancet 2013): IPC after stroke | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 82 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: DVT – deep vein thrombosis; **IPC** – intermittent pneumatic compression
Drug information (RxList — tap): Heparin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 82

Mechanical prophylaxis when anticoagulation is contraindicated

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Mechanical VTE prophylaxis

Method	Effectiveness	Use	Avoid if
Intermittent pneumatic compression	Reduces DVT when heparin is contraindicated	First choice when anticoagulants contraindicated	Acute DVT, leg ischaemia, skin injury
Graduated compression stockings	Weak alone	Not recommended as sole method	PAD, neuropathy, leg oedema/ulcers
Early mobilisation	Supportive	All patients when safe	—

Bleeding risk — when to choose IPC instead of heparin

Situation	Choice
Active bleeding	IPC
Platelets < 30–50 × 10^9/L	IPC
Intracranial haemorrhage (acute)	IPC; reassess at 24–48 h
Recent neuro/spinal surgery	IPC per surgeon
Severe coagulopathy (INR > 2, DIC with bleeding)	IPC
None of the above	LMWH alone

AETCM
Academy for Emergency, Trauma & Critical care Medicine

GOLDEN PEARL

If you cannot thin the blood, squeeze the legs — and ask again tomorrow.

‹ Back to Step 82 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **DIC** – disseminated intravascular coagulation; **DVT** – deep vein thrombosis; **INR** – international normalised ratio; **IPC** – intermittent pneumatic compression; **LMWH** – low-molecular-weight heparin; **PAD** – peripheral arterial disease; **VTE** – venous thromboembolism
Drug information (RxList — tap): Heparin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 83

Stress ulcer prophylaxis for those at risk

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Give stress ulcer prophylaxis — a proton-pump inhibitor — to patients with risk factors for GI bleeding.

WHY IT MATTERS

Clinically important GI bleeding is uncommon but serious in septic ICU patients. Prophylaxis reduces bleeding in at-risk patients; routine use in low-risk patients adds C. difficile and possibly pneumonia risk without benefit.

HOW TO DO IT AT THE BEDSIDE

- Risk factors: mechanical ventilation > 48 h, coagulopathy (platelets < 50, INR > 1.5), shock, chronic liver disease, RRT, high-dose steroids + NSAIDs, previous GI bleed.
- Pantoprazole 40 mg IV/PO daily (or H_2-blocker such as famotidine 20 mg q12h).
- Stop when risk factors resolve or enteral feeding is well established.
- Do not continue at discharge without an indication.

WATCH OUT

- PPIs are among the drugs most often continued unnecessarily after ICU.
- C. difficile infection risk rises with acid suppression and antibiotics.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest stress ulcer prophylaxis with proton-pump inhibitors for patients with risk factors for GI bleeding.

Conditional · Moderate certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SUP-ICU (Krag, NEJM 2018) · REVISE (Cook, NEJM 2024) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 83 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: GI – gastrointestinal; **ICU** – intensive care unit; **INR** – international normalised ratio; **IV** – intravenous; **NSAIDs** – non-steroidal anti-inflammatory drugs; **PO** – by mouth; **RRT** – renal replacement therapy; **SUP** – stress ulcer prophylaxis
Drug information (RxList — tap): Pantoprazole · Famotidine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 83

Stress ulcer prophylaxis for those at risk

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Who needs stress ulcer prophylaxis?

Risk factor	Prophylaxis?
Mechanical ventilation > 48 h	Yes
Coagulopathy (platelets < 50, INR > 1.5)	Yes
Shock on vasopressors	Yes
Chronic liver disease	Yes
Renal replacement therapy	Yes
Previous GI bleed in last year	Yes
None of the above, eating	No

Drugs

Drug	Dose	Notes
Pantoprazole	40 mg IV or PO daily	Preferred (SSC 2026)
Esomeprazole	40 mg IV/PO daily	Alternative
Famotidine	20 mg IV/PO 12-hourly (daily if CrCl < 50)	H_2-blocker alternative

GOLDEN PEARL

Prescribe the PPI for a reason, and stop it when the reason goes.

‹ Back to Step 83 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CrCl – creatinine clearance; **GI** – gastrointestinal; **INR** – international normalised ratio; **IV** – intravenous; **PO** – by mouth; **PPI** – proton-pump inhibitor; **SSC** – Surviving Sepsis Campaign
Drug information (RxList — tap): Pantoprazole · Esomeprazole · Famotidine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 84

Early low-dose enteral nutrition

THE GOLDEN STEP

Start early low-dose (trophic) enteral nutrition within 48–72 hours once shock is controlled and the gut is perfused.

WHY IT MATTERS

Enteral nutrition maintains gut barrier function and immunity and is associated with fewer infections than parenteral nutrition. In the first days, full-calorie feeding brings no benefit; a gradual increase is safer.

HOW TO DO IT AT THE BEDSIDE

- Start within 48–72 h once on stable or decreasing vasopressors and lactate is falling.
- Begin trophic feeds 10–20 mL/h, advance over 5–7 days.
- Energy target ~20–25 kcal/kg/day by day 5–7; protein 1.2–2.0 g/kg/day progressively.
- Head-up 30–45°; prokinetic (metoclopramide/erythromycin) for intolerance.
- Check phosphate, potassium, magnesium before and during the first days (refeeding).

WATCH OUT

- Signs of gut ischaemia (distension, rising lactate, pain) — stop feeding immediately.
- Do not use gastric residual volumes alone to stop feeding.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest early enteral nutrition, within 72 hours.

Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

NUTRIREA-2 (Lancet 2018) · EDEN (JAMA 2012) · ESPEN ICU guideline (Singer 2023) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 84 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit
Drug information (RxList — tap): Metoclopramide · Erythromycin

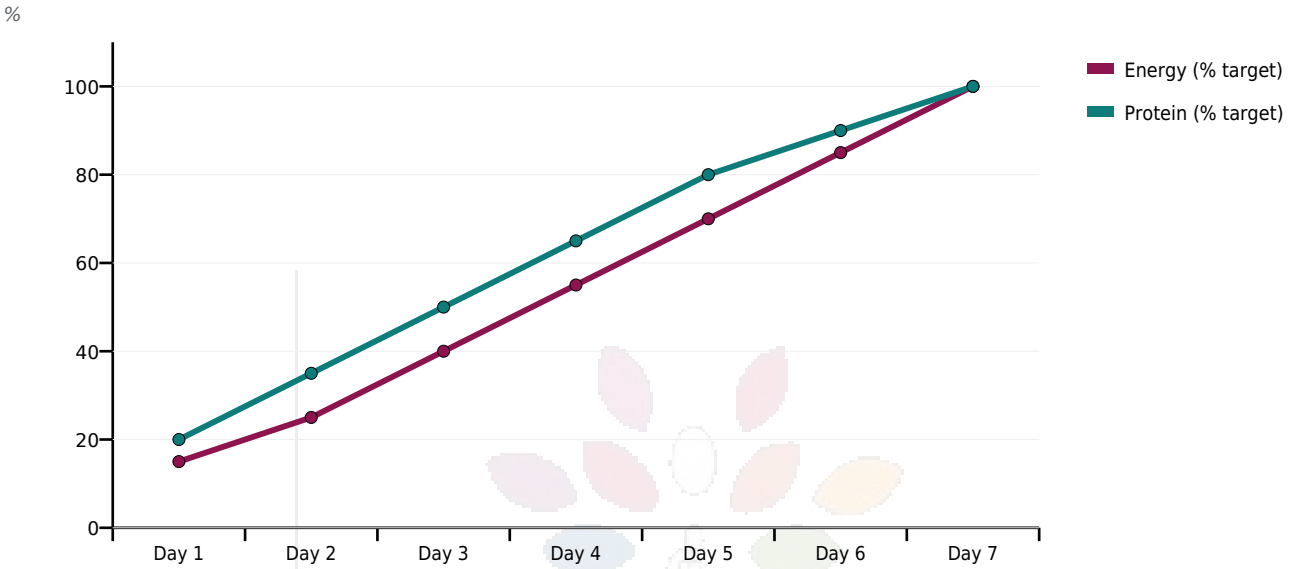

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 84

Early low-dose enteral nutrition

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Suggested feeding ramp — % of energy target (illustrative)



Nutrition targets (ESPEN)

Parameter	Target
Start	Within 48–72 h, trophic 10–20 mL/h
Energy (acute phase)	≤ 70% of expenditure for first 3 days, then 80–100%
Energy (simple)	20–25 kcal/kg/day by day 5–7
Protein	1.3 g/kg/day progressively
Refeeding risk	Phosphate < 2 mg/dL: restrict calories 48 h, replace

GOLDEN PEARL

Feed the gut slowly and early. Trophic feeds protect the gut; full feeds can wait a few days.

‹ Back to Step 84 · Next step › · Contents


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 85

No aggressive feeding in unresolved shock

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Avoid aggressive early full-calorie feeding — and parenteral nutrition — during unresuscitated or worsening shock.

WHY IT MATTERS

Feeding a gut that is not perfused can precipitate non-occlusive mesenteric ischaemia. In NUTRIREA-2, early full-calorie enteral feeding in shock increased bowel ischaemia compared with parenteral nutrition. Early full parenteral feeding increased infections (EPaNIC).

HOW TO DO IT AT THE BEDSIDE

- Hold or keep feeds trophic while vasopressors are escalating, lactate rising, or MAP unstable.
- Resume/advance when MAP is stable on low or decreasing vasopressor doses.
- Delay supplemental parenteral nutrition until day 7 in well-nourished patients.
- Severely malnourished patients: consider early low-dose PN if enteral is impossible.

WATCH OUT

- Abdominal distension, high gastric output, ileus, rising lactate, GI bleeding = possible intolerance or ischaemia.
- Propofol provides 1.1 kcal/mL as lipid — count it.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Early enteral nutrition within 72 hours is suggested; aggressive feeding in shock is avoided (ESPEN).
Conditional · Very low certainty

REFEEDING SYNDROME IN SICK, EMACIATED PATIENTS

Starved patients switch to fat metabolism and lose intracellular phosphate, potassium and magnesium. When carbohydrate is reintroduced, insulin drives these into cells → **hypophosphataemia, hypokalaemia, hypomagnesaemia, thiamine deficiency and fluid retention** → arrhythmia, respiratory muscle weakness, heart failure, seizures, Wernicke's encephalopathy and death. It typically appears within 2–5 days of starting feeds (enteral or parenteral). High-risk: cachexia, alcohol misuse, chronic illness, cancer, prolonged fasting. Start low, go slow, replace electrolytes and give thiamine first.

EVIDENCE & FURTHER READING — TAP TO OPEN

NUTRIREA-2 (Lancet 2018) · EPaNIC (Casaer, NEJM 2011) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 85 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: GI – gastrointestinal; **MAP** – mean arterial pressure; **PN** – parenteral nutrition
Drug information (RxList — tap): Propofol · Insulin · Thiamine

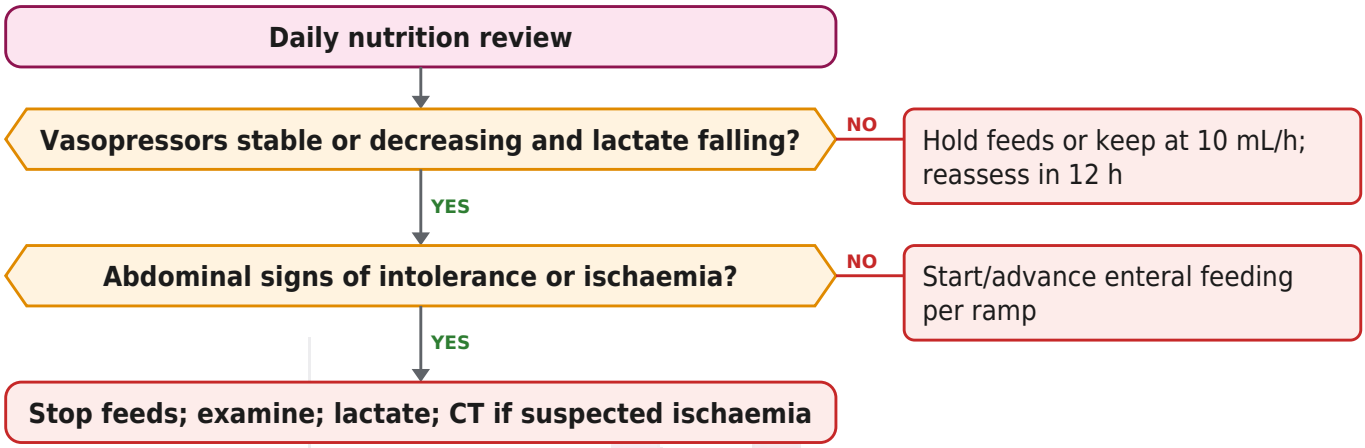

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 85

No aggressive feeding in unresolved shock

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Can I feed this patient today?



NUTRIREA-2 (2 410 ventilated patients in shock)

Outcome	Enteral (full)	Parenteral (full)
28-day mortality	37%	35%
Acute bowel ischaemia	2%	< 1%
Vomiting / diarrhoea	More	Less

Refeeding syndrome — risk and management (NICE CG32)

Step	Detail
High risk if ONE of	BMI < 16; weight loss > 15% in 3–6 months; little/no intake > 10 days; low K, PO_4 or Mg before feeding
…or TWO of	BMI < 18.5; weight loss > 10% in 3–6 months; little/no intake > 5 days; alcohol misuse or insulin, chemotherapy, antacids, diuretics
Start	10 kcal/kg/day (5 kcal/kg/day if BMI < 14 or no intake > 15 days); increase slowly over 4–7 days
Thiamine	200–300 mg/day (IV in ICU) before and for first 10 days; plus B-complex
Electrolytes	Check PO_4, K, Mg, Ca daily; replace PO_4 0.3–0.6 mmol/kg/day, K 2–4 mmol/kg/day, Mg 0.2–0.4 mmol/kg/day
Fluid	Avoid overload; daily weight and balance
If PO_4 < 0.6 mmol/L	Halve the calories, replace aggressively, then advance again

GOLDEN PEARL

A shocked gut cannot digest. Wait for perfusion before you push calories.

‹ Back to Step 85 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

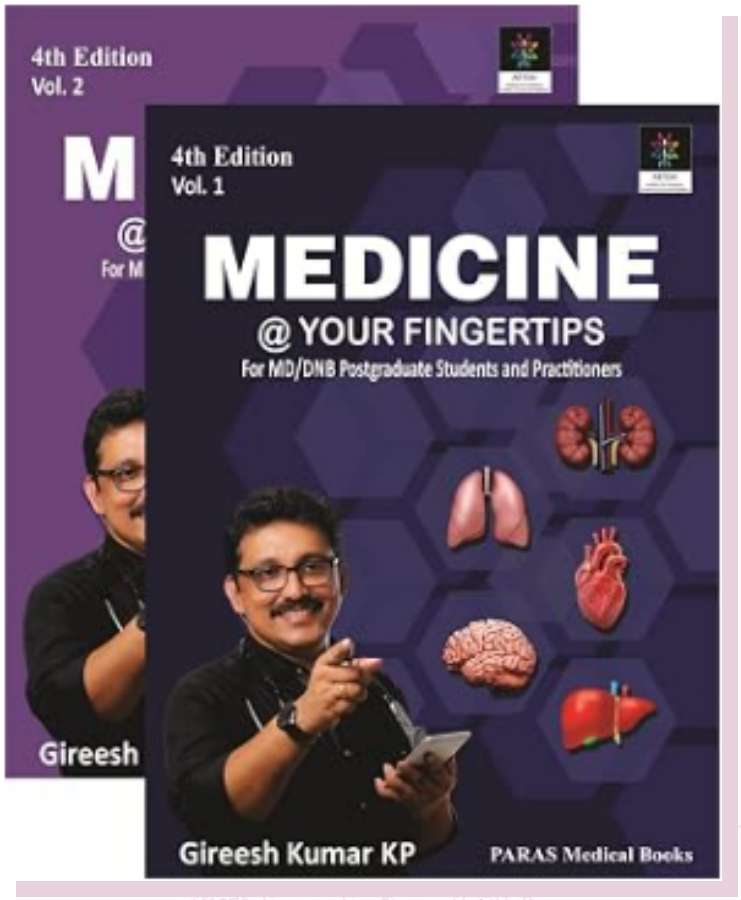
Abbreviations: BMI – body mass index; **CT** – computed tomography; **ICU** – intensive care unit; **IV** – intravenous; **PO** – by mouth
Drug information (RxList — tap): Insulin · Thiamine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Medicine @ Your Fingertips

Clinical medicine at a glance — a high-yield reference for MD/DNB postgraduates and practitioners.

BUY NOW ›

Scan to buy

See all books by the author ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 86

Light sedation, analgesia first

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Minimise deep sedation; favour light sedation and an analgesia-first approach in ventilated patients.

WHY IT MATTERS

Deep sedation is associated with longer ventilation, more delirium and higher mortality. Treating pain first (analgo-sedation) often removes the need for hypnotics. Propofol or dexmedetomidine are preferred over benzodiazepines.

HOW TO DO IT AT THE BEDSIDE

- Assess pain (CPOT or BPS) and sedation (RASS) at least 4-hourly.
- Target RASS 0 to −2 unless deep sedation is specifically needed (severe ARDS, NMB, raised ICP).
- Analgesia first: fentanyl 25–100 µg/h; then propofol or dexmedetomidine if needed.
- Avoid continuous benzodiazepines (except alcohol withdrawal, seizures).
- Pair with daily SAT (Step 74).

WATCH OUT

- Propofol: hypotension, hypertriglyceridaemia, propofol infusion syndrome (> 4 mg/kg/h for > 48 h).
- Dexmedetomidine: bradycardia, hypotension.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Not separately graded in SSC 2026 — PADIS 2018 guideline: light sedation, propofol or dexmedetomidine over benzodiazepines.

Practice standard (PADIS)

EVIDENCE & FURTHER READING — TAP TO OPEN

PADIS guideline (Devlin 2018) · MENDS2 (Hughes, NEJM 2021) · Radiopaedia: ARDS chest X-ray · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 86 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ARDS – acute respiratory distress syndrome; **BPS** – Behavioural Pain Scale; **CPOT** – Critical-Care Pain Observation Tool; **NMB** – neuromuscular blockade; **SAT** – spontaneous awakening trial; **SSC** – Surviving Sepsis Campaign
RASS (Richmond Agitation–Sedation Scale): Sedation–agitation scale from +4 (combative) to −5 (unarousable); target 0 to −2. Calculator / source › table ›
Drug information (RxList — tap): Propofol · Fentanyl · Dexmedetomidine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 86

Light sedation, analgesia first

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Richmond Agitation–Sedation Scale (RASS)

Score	Term	Description
+4	Combative	Violent, danger to staff
+3	Very agitated	Pulls tubes, aggressive
+2	Agitated	Frequent non-purposeful movement, fights ventilator
+1	Restless	Anxious, not aggressive
0	Alert and calm	TARGET 0 to −2
−1	Drowsy	Eye contact to voice > 10 s
−2	Light sedation	Eye contact to voice < 10 s
−3	Moderate sedation	Movement to voice, no eye contact
−4	Deep sedation	Movement only to physical stimulation
−5	Unarousable	No response

Analgo-sedation drugs

Drug	Dose	Notes
Fentanyl	25–100 µg/h (bolus 25–50 µg)	First-line analgesia
Morphine	2–4 mg/h	Avoid in AKI (metabolites)
Propofol	5–50 µg/kg/min (0.3–3 mg/kg/h)	Rapid offset; hypotension
Dexmedetomidine	0.2–1.4 µg/kg/h	Light, cooperative sedation; less delirium
Midazolam	Avoid infusion	Delirium, accumulation
Ketamine	0.1–0.5 mg/kg/h	Opioid-sparing, haemodynamically neutral

GOLDEN PEARL

Treat the pain, then ask whether the patient still needs sleep. Usually they do not.

‹ Back to Step 86 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: AKI – acute kidney injury
RASS (Richmond Agitation–Sedation Scale): Sedation–agitation scale from +4 (combative) to −5 (unarousable); target 0 to −2. **Calculator / source › table ›**
Drug information (RxList — tap): Ketamine · Propofol · Fentanyl · Morphine · Midazolam · Dexmedetomidine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 87

Screen for delirium

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Screen for ICU delirium every shift and apply non-pharmacological sleep and reorientation measures.

WHY IT MATTERS

Delirium affects most ventilated septic patients and is associated with mortality, longer stay and long-term cognitive impairment. It is often hypoactive and missed unless screened for with a validated tool.

HOW TO DO IT AT THE BEDSIDE

- Use CAM-ICU (or ICDSC) at least once per shift.
- Apply the ABCDEF bundle: Assess pain, Both SAT/SBT, Choice of sedation, Delirium monitoring, Early mobility, Family engagement.
- Non-pharmacological: daylight, clocks, glasses and hearing aids, sleep hygiene at night, family visits.
- Treat causes: hypoxia, sepsis, drugs (benzodiazepines, anticholinergics), withdrawal, urinary retention, pain.
- Antipsychotics only for distressing agitation endangering the patient — not to prevent or treat delirium routinely.

WATCH OUT

- Hypoactive delirium (quiet, withdrawn) is more common and more dangerous than agitated delirium.
- Haloperidol did not improve survival in delirium (AID-ICU, MIND-USA).

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Not separately graded in SSC 2026 — PADIS 2018: routine delirium monitoring; no routine antipsychotics.
Practice standard (PADIS)

EVIDENCE & FURTHER READING — TAP TO OPEN

CAM-ICU (Ely, JAMA 2001) · MIND-USA (Girard, NEJM 2018) · ABCDEF bundle (Pun 2019) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 87 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICDSC – Intensive Care Delirium Screening Checklist; **ICU** – intensive care unit; **SAT** – spontaneous awakening trial; **SBT** – spontaneous breathing trial; **SSC** – Surviving Sepsis Campaign
CAM-ICU (Confusion Assessment Method for the ICU): Acute change/fluctuation + inattention + (altered consciousness or disorganised thinking) = delirium. Works in ventilated patients. **Calculator / source › table ›**
Drug information (RxList — tap): Haloperidol

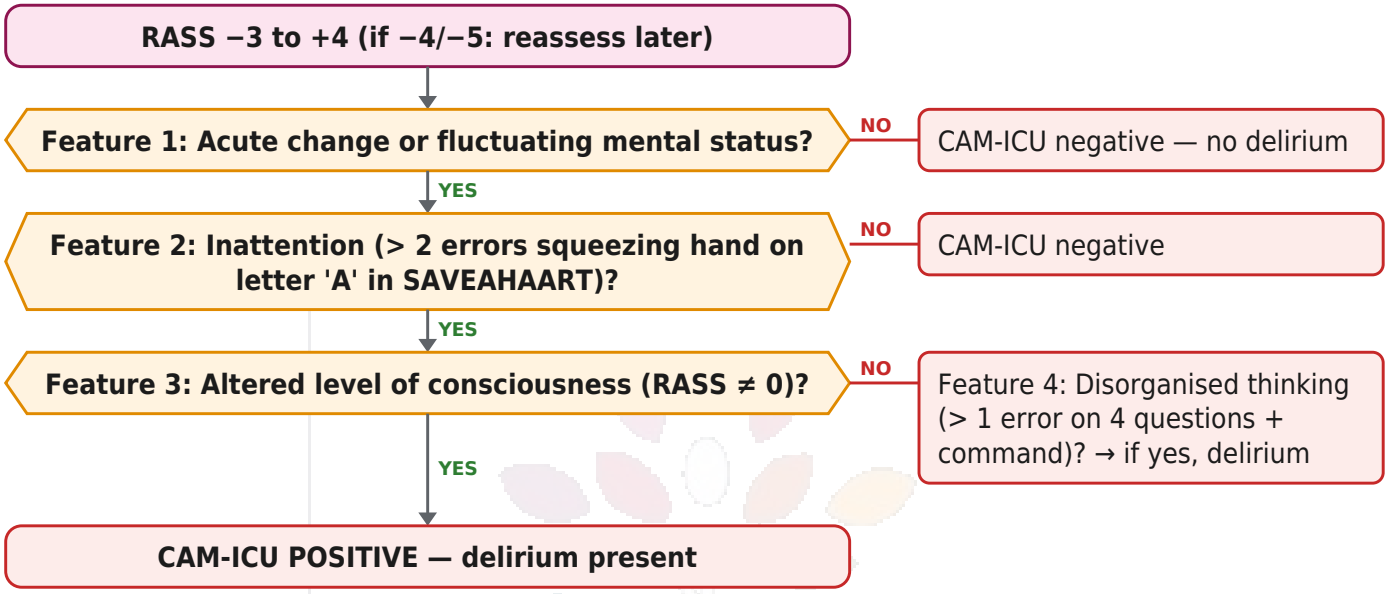

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 87

Screen for delirium

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

CAM-ICU



ABCDEF bundle

Letter	Element
A	Assess, prevent and manage pain
B	Both SAT and SBT
C	Choice of analgesia and sedation
D	Delirium: assess, prevent, manage
E	Early mobility and exercise
F	Family engagement and empowerment

GOLDEN PEARL

If you do not look for delirium, you will not find it — and the quiet patient is the one you will miss.

‹ Back to Step 87 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit; **SAT** – spontaneous awakening trial; **SBT** – spontaneous breathing trial
CAM-ICU (Confusion Assessment Method for the ICU): Acute change/fluctuation + inattention + (altered consciousness or disorganised thinking) = delirium. Works in ventilated patients. Calculator / source › table ›
RASS (Richmond Agitation–Sedation Scale): Sedation–agitation scale from +4 (combative) to −5 (unarousable); target 0 to −2. Calculator / source › see Step 86 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 88

Restrictive red-cell transfusion

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Transfuse red cells restrictively — generally at haemoglobin < 7 g/dL — unless there is active haemorrhage, myocardial ischaemia or another specific indication.

WHY IT MATTERS

Liberal transfusion (Hb > 9) did not improve survival in septic shock (TRISS) and adds infection, TACO, TRALI and cost. A restrictive threshold is a strong recommendation.

HOW TO DO IT AT THE BEDSIDE

- Transfuse one unit at a time when Hb < 7 g/dL, then reassess.
- Consider higher thresholds (8 g/dL) for acute coronary syndrome, active bleeding or severe hypoxaemia.
- One unit raises Hb by about 1 g/dL in a 70-kg adult.
- Minimise phlebotomy losses (small-volume tubes, avoid unnecessary tests).

WATCH OUT

- Do not transfuse to raise $ScvO_2$ or lower lactate in stable patients.
- Transfusion-associated circulatory overload — slow rates and diuretics in at-risk patients.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend a restrictive over a liberal transfusion strategy.
Strong · Moderate certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

TRISS (Holst, NEJM 2014) | TRICC (Hébert, NEJM 1999) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 88 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: Hb – haemoglobin; **$ScvO_2$** – central venous oxygen saturation; **TACO** – transfusion-associated circulatory overload; **TRALI** – transfusion-related acute lung injury


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 88

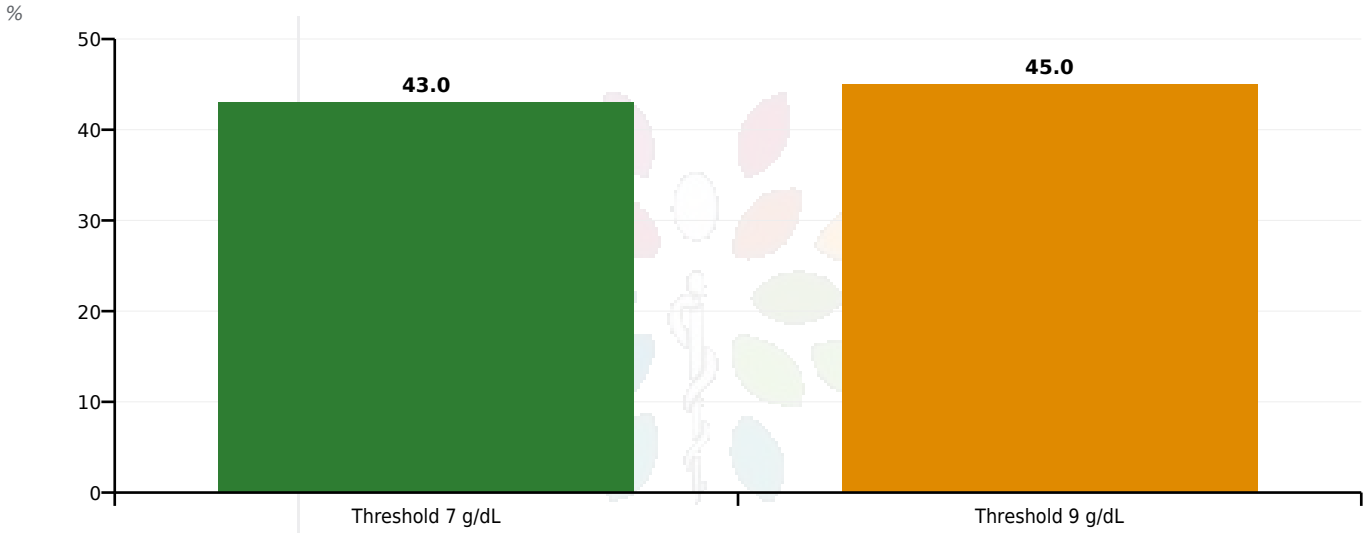
Restrictive red-cell transfusion

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Haemoglobin threshold for red-cell transfusion (g/dL)



TRISS: 90-day mortality (%)



Red-cell transfusion — practical points

Item	Guide
Units	One at a time, reassess
Expected rise	~1 g/dL per unit (70 kg)
Rate	Each unit over 1.5–2 h (max 4 h); slower if TACO risk
Exceptions	Active haemorrhage, ACS, severe hypoxaemia with low O_2 delivery

GOLDEN PEARL

Seven is enough for most septic patients. One unit, then think.

‹ Back to Step 88 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ACS – acute coronary syndrome; **TACO** – transfusion-associated circulatory overload


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 89

Avoid routine plasma and platelet transfusion

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Do not give plasma or platelets routinely in the absence of bleeding or a planned invasive procedure, unless platelets are severely low.

WHY IT MATTERS

Coagulation tests and platelet counts are often abnormal in sepsis, but correcting numbers without bleeding brings no benefit and exposes patients to transfusion reactions and volume overload.

HOW TO DO IT AT THE BEDSIDE

- Platelets: prophylactic transfusion if < 10×10^9/L; < 20 with high bleeding risk; < 50 for active bleeding, surgery or invasive procedure.
- FFP 15 mL/kg only for bleeding or procedures with significant coagulopathy (INR > 1.5–2).
- Cryoprecipitate when fibrinogen < 1.5 g/L with bleeding.
- Ultrasound-guided CVC insertion is safe with mild coagulopathy without correction.

WATCH OUT

- Platelets are contraindicated in TTP and HIT unless life-threatening bleeding.
- Vitamin K deficiency is common in septic patients on antibiotics with poor intake — give vitamin K 10 mg IV.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Restrictive transfusion is recommended; products are not given to correct laboratory values without bleeding (SSC 2021 statements on plasma unchanged in principle).

Strong · Moderate (restrictive)

EVIDENCE & FURTHER READING — TAP TO OPEN

TRISS (NEJM 2014) | Stanworth 2013: prophylactic platelets (TOPPS) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 89 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **CVC** – central venous catheter; **FFP** – fresh frozen plasma; **HIT** – heparin-induced thrombocytopenia; **INR** – international normalised ratio; **IV** – intravenous; **SSC** – Surviving Sepsis Campaign; **TTP** – thrombotic thrombocytopenic purpura
Drug information (RxList — tap): Vitamin k


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 89

Avoid routine plasma and platelet transfusion

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

Platelet thresholds

Platelet count (×10⁹/L)	Transfuse if
< 10	Always (prophylactic)
10–20	High bleeding risk (fever, sepsis, DIC)
< 50	Active bleeding, surgery, LP, invasive procedure
< 100	Neurosurgery, ocular surgery, intracranial bleeding

Plasma products — doses

Product	Indication	Dose
FFP	Bleeding / procedure with INR > 1.5–2	15 mL/kg (≈ 4 units in 70 kg)
Cryoprecipitate	Fibrinogen < 1.5 g/L with bleeding	1 unit/10 kg (≈ 10 units adult)
Platelets	As table above	1 apheresis or 4–6 pooled units (raises ~20–40)
Vitamin K	Prolonged INR, poor intake, antibiotics	10 mg IV slowly

GOLDEN PEARL

Treat the patient who is bleeding, not the INR that is printing.

‹ Back to Step 89 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **DIC** – disseminated intravascular coagulation; **FFP** – fresh frozen plasma; **INR** – international normalised ratio; **IV** – intravenous; **LP** – lumbar puncture
Drug information (RxList — tap): Vitamin k


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 90

Daily multidisciplinary rounds

5. Organ Support & ICU Bundle Care · Page 1 of 2 — the step

THE GOLDEN STEP

Conduct daily multidisciplinary ICU rounds reviewing every organ system and the necessity of every line, tube and drug.

WHY IT MATTERS

Septic patients have many problems and many carers. Structured daily rounds with nurses, pharmacists, physiotherapists, dietitians and microbiologists catch errors, reduce complications and shorten ICU stay.

HOW TO DO IT AT THE BEDSIDE

- Use a system-based checklist (e.g., FAST HUGS BID).
- Pharmacist review of every drug: dose, renal adjustment, interactions, duration.
- Daily goals written and shared with the nurse and the family.
- Review every line and catheter: still needed today?

WATCH OUT

- Rounds without the bedside nurse lose the most important information.
- "Same plan" in the notes often means nobody looked.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend hospital performance-improvement programmes; structured handoffs at transitions.
Strong · Moderate / Conditional

EVIDENCE & FURTHER READING — TAP TO OPEN

Vincent 2005: FAST HUG | Kim 2010: multidisciplinary care and ICU mortality | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 90 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 90

Daily multidisciplinary rounds

5. Organ Support & ICU Bundle Care · Page 2 of 2 — tables, graphs & algorithm

FAST HUGS BID — daily ICU checklist

Letter	Item	Question
F	Feeding	Enteral started/advanced? Target reached?
A	Analgesia	Pain score acceptable?
S	Sedation	RASS target? SAT done?
T	Thromboprophylaxis	LMWH prescribed? Bleeding risk?
H	Head of bed	30–45°?
U	Ulcer prophylaxis	Still indicated?
G	Glucose	144–180 mg/dL? Hypoglycaemia?
S	Spontaneous breathing trial	Done? Extubation plan?
B	Bowel care	Bowels open? Laxatives?
I	Indwelling catheters	Each line and catheter still needed?
D	De-escalation	Antibiotic time-out done? Stop date?

GOLDEN PEARL

A checklist is not bureaucracy — it is the memory of the whole team, written down.

‹ Back to Step 90 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

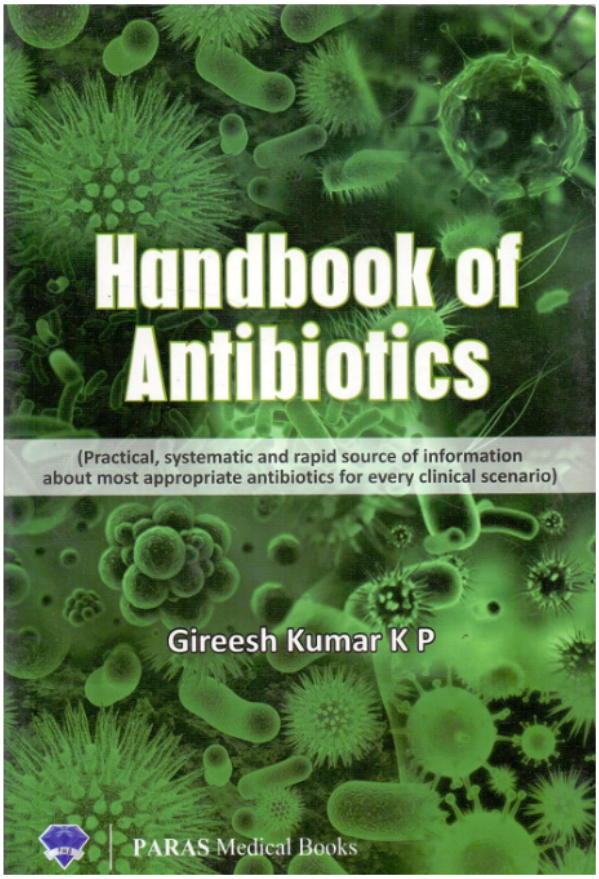
Abbreviations: ICU – intensive care unit; **LMWH** – low-molecular-weight heparin; **SAT** – spontaneous awakening trial
RASS (Richmond Agitation–Sedation Scale): Sedation–agitation scale from +4 (combative) to −5 (unarousable); target 0 to −2. Calculator / source › see Step 86 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Handbook of Antibiotics

A practical bedside guide to choosing, dosing and monitoring antibiotics — the natural companion to the antimicrobial steps of this book.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 91

Track organ-support trends every shift

6. Recovery, Disposition & Follow-Up · Page 1 of 2 — the step

THE GOLDEN STEP

Track trends across SOFA components, lactate, vasopressor requirements and organ-support needs every shift.

WHY IT MATTERS

Recovery and deterioration both show first as trends. A falling SOFA, vasopressor dose and lactate signal response; a plateau or rise by day 3 should trigger a structured search for the reason.

HOW TO DO IT AT THE BEDSIDE

- Record SOFA components daily and vasopressor dose, lactate and fluid balance each shift.
- Use a trend chart at the bedside or in the electronic record.
- Define day-3 review: if SOFA not improving → new source? wrong antibiotic? resistant organism? complication? goals of care?
- Share trends with the family to explain progress.

WATCH OUT

- A single good value can hide a bad trend.
- Improving numbers with worsening mental state or new fever still need attention.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Continually reassess the patient; goals-of-care discussions within 72 hours. **Good practice / Conditional**

EVIDENCE & FURTHER READING — TAP TO OPEN

Ferreira 2001: serial SOFA and outcome (JAMA) · Sepsis-3 (2016) · SSC 2026 (ESICM) · Medscape · Radiopaedia

Tables, graphs & algorithm for Step 91 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. Calculator / source › see Step 3 ›
Sepsis-3: 2016 definitions: sepsis = infection + acute SOFA rise ≥ 2; septic shock = vasopressor for MAP ≥ 65 + lactate > 2 despite fluids. Calculator / source › see Step 2 ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 91

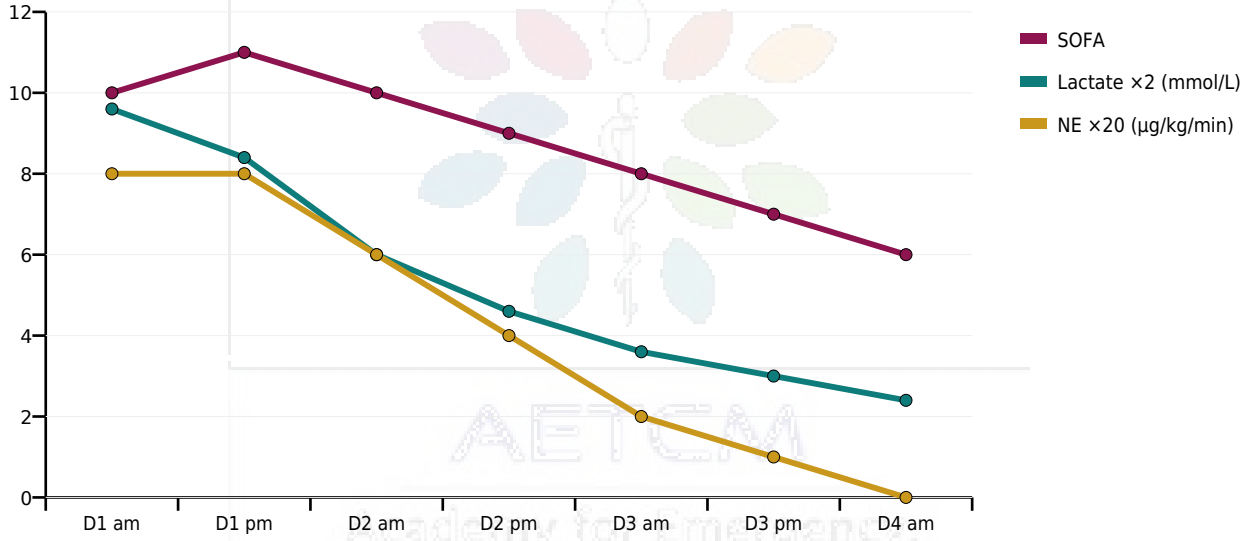
Track organ-support trends every shift

6. Recovery, Disposition & Follow-Up · Page 2 of 2 — tables, graphs & algorithm

Serial SOFA and ICU mortality (Ferreira 2001)

SOFA change over first 48 h	Approximate mortality
Decreasing	< 27%
Unchanged (initial 2–7)	~27–35%
Unchanged (initial 8–11)	~60%
Increasing	> 50%

Shift trend sheet — example patient (illustrative)



GOLDEN PEARL

Day three is decision day. If the trend is not turning, look for the reason.

‹ Back to Step 91 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit; **NE** – norepinephrine (noradrenaline)
SOFA (Sequential Organ Failure Assessment): Six organ systems scored 0–4 (respiration, coagulation, liver, cardiovascular, CNS, renal); acute rise ≥ 2 = sepsis. **Calculator / source › see Step 3 ›**

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 92

Remove unnecessary lines and catheters

6. Recovery, Disposition & Follow-Up · Page 1 of 2 — the step

THE GOLDEN STEP

Remove unnecessary invasive lines — central lines, arterial lines and urinary catheters — as soon as clinically appropriate.

WHY IT MATTERS

Every day a device stays in place adds risk of bloodstream infection, urinary infection, thrombosis and immobility. Many devices remain simply because nobody asked whether they were still needed.

HOW TO DO IT AT THE BEDSIDE

- Daily device review on rounds: indication, insertion date, site condition.
- Arterial line: remove when off vasopressors and frequent ABGs are not needed.
- CVC: remove when vasopressors/irritant drugs stop; use peripheral or midline for prolonged antibiotics.
- Urinary catheter: remove when hourly UO no longer needed; bladder scan for retention.
- Document the removal date and site check.

WATCH OUT

- Do not remove the only reliable access in a patient likely to need it again within hours.
- Midline or PICC for long antibiotic courses instead of leaving the CVC.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Rapid evaluation and removal of intravascular devices that are a possible source; indwelling catheter review (FAST HUGS BID).

Good practice

EVIDENCE & FURTHER READING — TAP TO OPEN

Pronovost 2006: CLABSI reduction | CDC CAUTI guideline 2009 | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 92 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CAUTI – catheter-associated urinary tract infection; **CLABSI** – central line-associated bloodstream infection; **CVC** – central venous catheter; **UO** – urine output


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 92

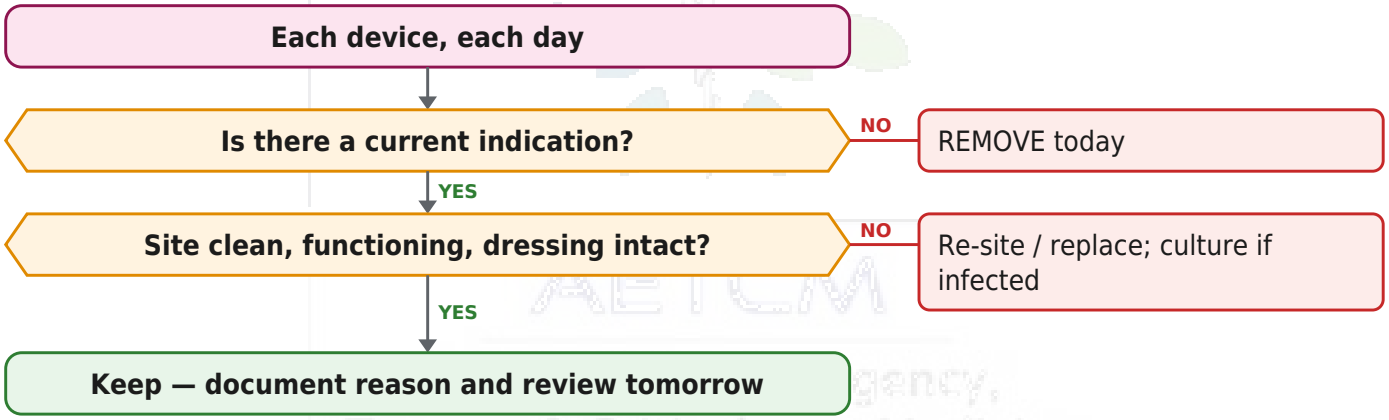
Remove unnecessary lines and catheters

6. Recovery, Disposition & Follow-Up · Page 2 of 2 — tables, graphs & algorithm

Device removal criteria

Device	Remove when	Risk if left
Central venous catheter	Off vasopressors/TPN; irritant drugs stopped	CLABSI, thrombosis
Arterial line	Off vasopressors; ABGs < 2/day	Infection, ischaemia
Urinary catheter	Hourly UO not needed; no retention	CAUTI, trauma, immobility
Nasogastric tube	Eating safely	Sinusitis, aspiration
Dialysis catheter	Renal recovery	Bacteraemia
Peripheral cannula	Not used for 24 h / phlebitis	Phlebitis, S. aureus bacteraemia

Daily device review



GOLDEN PEARL

Every line in, every day, ask: why is this still here?

‹ Back to Step 92 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CAUTI – catheter-associated urinary tract infection; **CLABSI** – central line-associated bloodstream infection; **TPN** – total parenteral nutrition; **UO** – urine output


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 93

Screen for secondary infections

6. Recovery, Disposition & Follow-Up · Page 1 of 2 — the step

THE GOLDEN STEP

Screen for hospital-acquired secondary infections if fever or clinical deterioration recurs.

WHY IT MATTERS

Sepsis-induced immunosuppression, devices and prolonged stay make secondary infections common after the first week. They are frequently caused by resistant organisms and fungi, and they explain many late deaths.

HOW TO DO IT AT THE BEDSIDE

- New fever, rising lactate, new vasopressor need or worsening oxygenation → full infection screen.
- Culture blood (peripheral + lines), urine, respiratory secretions; check C. difficile if diarrhoea.
- Examine lines, wounds, pressure areas, sinuses, abdomen (acalculous cholecystitis).
- Consider CMV/HSV reactivation and invasive fungal infection in prolonged ICU stays.
- Exclude non-infectious causes: VTE, drug fever, pancreatitis, transfusion reaction.

WATCH OUT

- Do not reflexively escalate to broader antibiotics without cultures and a source search.
- Candidaemia and CRE infections carry high mortality — obtain cultures before switching.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Continually reassess; obtain cultures before antimicrobials; source evaluation. **Strong / Good practice**

EVIDENCE & FURTHER READING — TAP TO OPEN

van Vught 2016: ICU-acquired infections after sepsis (JAMA) | Hotchkiss 2013: sepsis immunosuppression | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 93 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: CMV – cytomegalovirus; **CRE** – carbapenem-resistant Enterobacterales; **HSV** – herpes simplex virus; **ICU** – intensive care unit; **VTE** – venous thromboembolism


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 93

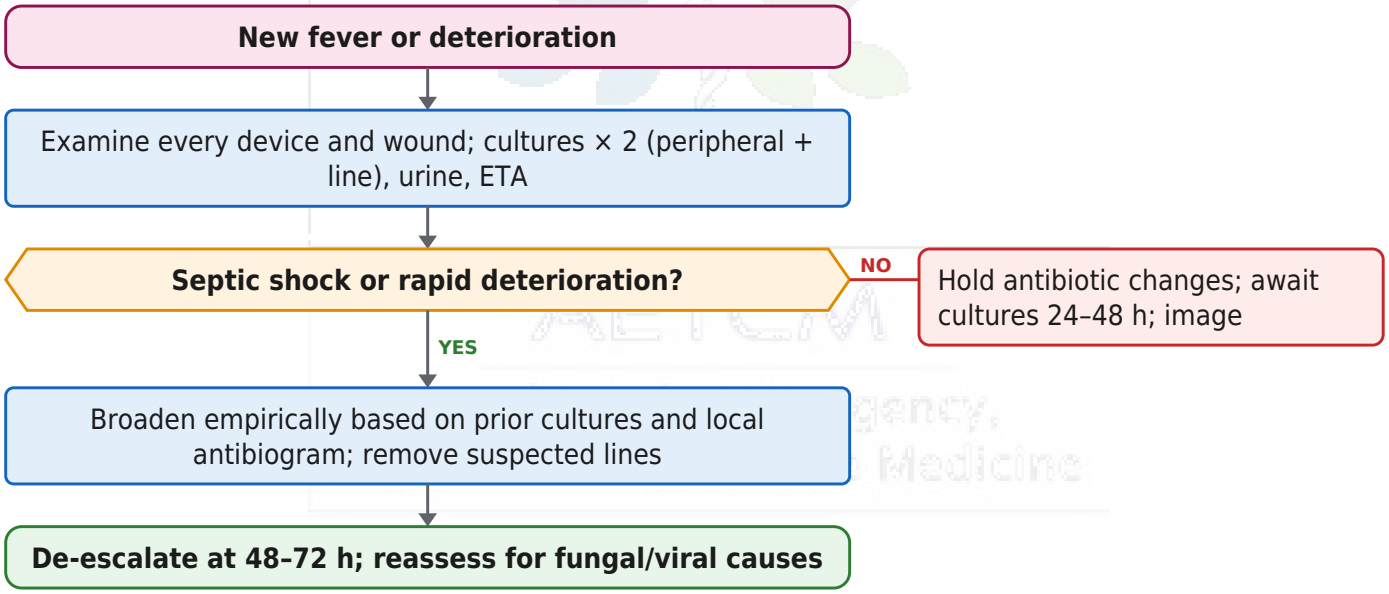
Screen for secondary infections

6. Recovery, Disposition & Follow-Up · Page 2 of 2 — tables, graphs & algorithm

New fever in the ICU — the differential

Infectious	Non-infectious
VAP / HAP	Venous thromboembolism
CLABSI (line)	Drug fever (β-lactams, phenytoin)
CAUTI	Acalculous cholecystitis (ischaemic)
C. difficile colitis	Pancreatitis
Sinusitis (NG/nasal tubes)	Transfusion reaction
Surgical site / pressure ulcer infection	Adrenal insufficiency, thyroid storm
Candidaemia / CMV reactivation	Alcohol or drug withdrawal

Recurrent fever after day 5



GOLDEN PEARL

The second infection is not the first infection coming back — look for a new source.

‹ Back to Step 93 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **CAUTI** – catheter-associated urinary tract infection; **CLABSI** – central line-associated bloodstream infection; **CMV** – cytomegalovirus; **ETA** – endotracheal aspirate; **HAP** – hospital-acquired pneumonia; **ICU** – intensive care unit; **NG** – nasogastric; **VAP** – ventilator-associated pneumonia


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 94

Goals-of-care conversations early

THE GOLDEN STEP

Hold goals-of-care discussions early — within 72 hours — for high-risk, frail or end-stage patients, integrating palliative-care principles.

WHY IT MATTERS

Many patients with sepsis are elderly or have advanced chronic disease. Early, honest discussions align treatment with the patient's values, avoid burdensome treatment that does not match their wishes, and support families. The 2026 guideline suggests addressing goals of care within 72 hours.

HOW TO DO IT AT THE BEDSIDE

- Identify the decision-maker and any advance directive on admission.
- Use a structured approach (e.g., SPIKES): setting, perception, invitation, knowledge, empathy, summary.
- Discuss prognosis honestly, including uncertainty; consider a time-limited trial of ICU treatment.
- Integrate palliative principles (symptom control, family support) for all; involve specialist palliative care when needs are complex.

WATCH OUT

- Do not equate age with poor prognosis — frailty and function matter more.
- Routine formal palliative-care consultation for all septic patients was not shown to help — target it.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Discuss goals of care and prognosis (GPS); address within 72 hours (conditional, low); integrate palliative principles (GPS); suggest against routine formal palliative care consultation.
Good practice / Conditional · Low

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Clinical Frailty Scale (Rockwood 2005) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 94 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: GPS – good practice statement; **ICU** – intensive care unit; **SPIKES** – Setting, Perception, Invitation, Knowledge, Empathy, Summary; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 94

Goals-of-care conversations early

6. Recovery, Disposition & Follow-Up · Page 2 of 2 — tables, graphs & algorithm

SPIKES framework for difficult conversations

Step	What to do
S — Setting	Private room, sit down, key family, nurse present, phone silenced
P — Perception	“What have you understood so far?”
I — Invitation	“How much detail would you like?”
K — Knowledge	Plain language, warning shot, small chunks, no jargon
E — Empathy	Name the emotion, pause, allow silence
S — Summary & strategy	Plan, time-limited trial, next meeting, document

Clinical Frailty Scale (summary)

Score	Description
1–3	Very fit to managing well
4	Living with very mild frailty
5	Mildly frail — help with IADLs
6	Moderately frail — help with bathing, stairs
7	Severely frail — dependent for personal care
8–9	Very severely frail / terminally ill

GOLDEN PEARL

The right treatment is the one the patient would choose. Ask early, while there is still time to choose.

‹ Back to Step 94 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: IADLs – instrumental activities of daily living; **SPIKES** – Setting, Perception, Invitation, Knowledge, Empathy, Summary


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 95

Communicate honestly with families

THE GOLDEN STEP

Give clear, honest prognosis updates to families and surrogate decision-makers.

WHY IT MATTERS

Families of ICU patients have high rates of anxiety, depression and PTSD (post-intensive care syndrome–family). Regular, consistent, compassionate communication reduces this burden and builds trust.

HOW TO DO IT AT THE BEDSIDE

- Daily update by a senior doctor with the bedside nurse; one consistent spokesperson.
- Use the VALUE approach in family meetings.
- Explain trends rather than single values; use the teach-back method.
- Document what was said and who was present.
- Offer written sepsis information to patients and families.

WATCH OUT

- Conflicting messages from different teams undermine trust.
- Avoid false reassurance and avoid unnecessary bluntness — be honest and kind.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Provide written and verbal sepsis education to patients and families; discuss goals of care and prognosis.
Conditional · Very low / GPS

EVIDENCE & FURTHER READING — TAP TO OPEN

Lautrette 2007: proactive family communication (NEJM) | Davidson 2017: family-centred care guideline | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 95 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit; **PTSD** – post-traumatic stress disorder


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 95

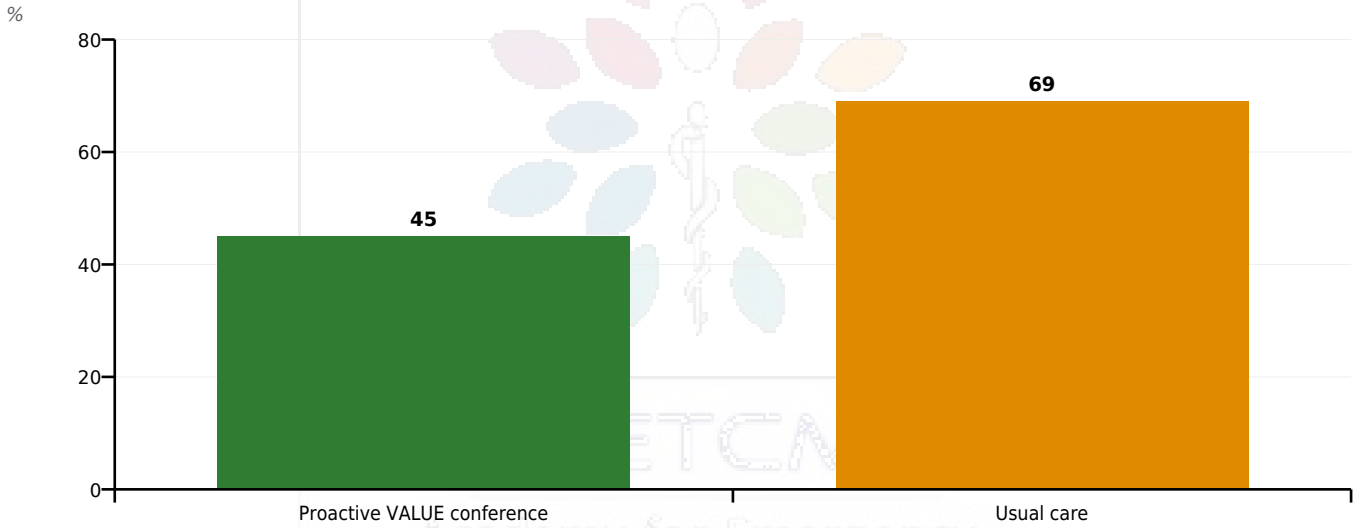
Communicate honestly with families

6. Recovery, Disposition & Follow-Up · Page 2 of 2 — tables, graphs & algorithm

VALUE — family meetings

Letter	Action
V	Value what the family says
A	Acknowledge their emotions
L	Listen
U	Understand the patient as a person — ask about them
E	Elicit questions

Lautrette 2007: family PTSD symptoms at 90 days (%)



In Lautrette 2007, a structured proactive end-of-life conference with a bereavement brochure reduced symptoms of PTSD, anxiety and depression in family members.

GOLDEN PEARL

Families remember how they were told long after they forget what the numbers were.

‹ Back to Step 95 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

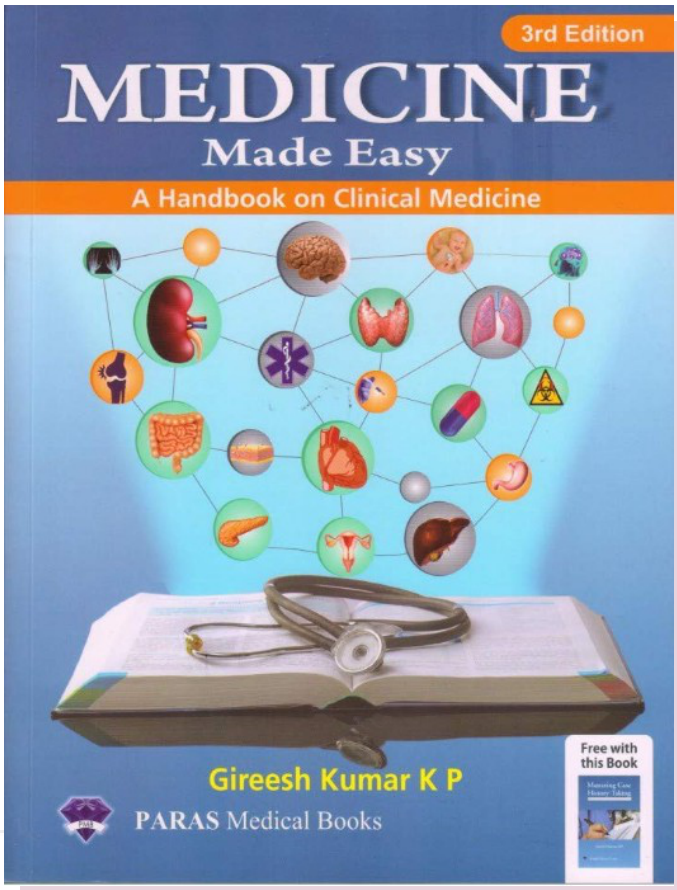
Abbreviations: PTSD – post-traumatic stress disorder


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Medicine Made Easy

A concise, easy-to-read handbook of clinical medicine.

BUY NOW ›

Scan to buy

See all books by the author ›

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 96

Step down only when ready

6. Recovery, Disposition & Follow-Up · Page 1 of 2 — the step

THE GOLDEN STEP

Plan step-down transfer from ICU to a monitored ward only after shock has resolved and organ function is stable.

WHY IT MATTERS

Premature ICU discharge, discharge at night and inadequate handover are associated with readmission and death. A structured transition programme and handoff improve safety at this vulnerable point.

HOW TO DO IT AT THE BEDSIDE

- Criteria: off vasopressors ≥ 12–24 h, stable respiratory status on low O_2, improving organ function, no imminent procedures.
- Avoid night-time discharges when possible.
- Written handover: diagnosis, source, antibiotic and stop date, lines, fluid plan, ceiling of care, outstanding results.
- Follow-up review by critical-care outreach within 24 h on the ward.

WATCH OUT

- NEWS2 ≥ 5 on the ward after step-down → early review, low threshold for readmission.
- Missed antibiotic doses and lost lines are common after transfer.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Suggest a critical care transition programme on ICU-to-floor transfer; structured handoff of critical information.
Conditional · Very low certainty

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Night discharge and outcome (Priestap 2006) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 96 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit; **SSC** – Surviving Sepsis Campaign
NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. **Calculator / source ›** **see Step 1 ›**


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 96

Step down only when ready

6. Recovery, Disposition & Follow-Up · Page 2 of 2 — tables, graphs & algorithm

Ready for step-down?

Criterion	Met?
Off vasopressors ≥ 12–24 h, MAP stable	☐
SpO_2 ≥ 92% on ≤ 4 L/min (or stable chronic need)	☐
Airway safe, secretions manageable	☐
Lactate normal, UO adequate or stable RRT plan	☐
Source controlled, antibiotic plan and stop date	☐
Delirium assessed; mobility plan	☐
Ward handover completed; outreach review booked	☐

ICU → ward handover

Section	Content
Diagnosis	Sepsis source, organism, key events
Treatment	Antibiotics with day and stop date, steroids taper
Devices	Lines, catheters and removal plan
Ongoing issues	Delirium, weakness, nutrition, wounds
Escalation	NEWS2 triggers, ceiling of care

GOLDEN PEARL

Leaving the ICU is the start of recovery, not the end of risk.

‹ Back to Step 96 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit; **MAP** – mean arterial pressure; **RRT** – renal replacement therapy; **SpO_2** – peripheral oxygen saturation; **UO** – urine output
NEWS2 (National Early Warning Score 2): Seven bedside parameters (RR, SpO_2, O_2 use, SBP, HR, consciousness, temperature) each scored 0–3. ≥ 5 urgent review; ≥ 7 emergency response. **Calculator / source** › **see Step 1** ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 97

Reconcile medications at every transition

THE GOLDEN STEP

Reconcile all medications at ICU transfer and hospital discharge, including ongoing antibiotics.

WHY IT MATTERS

ICU drugs (PPIs, antipsychotics, sedatives, insulin) are often continued unnecessarily, while chronic drugs (antihypertensives, anticoagulants, antidepressants, thyroxine) are often forgotten. Medication errors at transitions are common and preventable.

HOW TO DO IT AT THE BEDSIDE

- Compare the pre-admission list with current drugs at each transition.
- Stop ICU-only drugs: SUP, antipsychotics, sedatives, unnecessary insulin.
- Restart chronic drugs when safe; adjust doses for new renal function.
- Clarify antibiotic name, dose, route, start date and stop date in the discharge summary.
- Pharmacist-led reconciliation is suggested.

WATCH OUT

- Antipsychotics started for ICU delirium are frequently continued for months.
- Restarting ACE inhibitors/ARBs too early in recovering AKI — check creatinine.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Comprehensive medication reconciliation at transitions and discharge (GPS); suggest pharmacist-led reconciliation.
Good practice / Conditional · Very low

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Bell 2011: unintentional discontinuation after ICU (JAMA) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 97 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **ACE** – angiotensin-converting enzyme; **AKI** – acute kidney injury; **ARBs** – angiotensin-receptor blockers; **GPS** – good practice statement; **ICU** – intensive care unit; **SSC** – Surviving Sepsis Campaign; **SUP** – stress ulcer prophylaxis
Drug information (RxList — tap): Insulin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 97

Reconcile medications at every transition

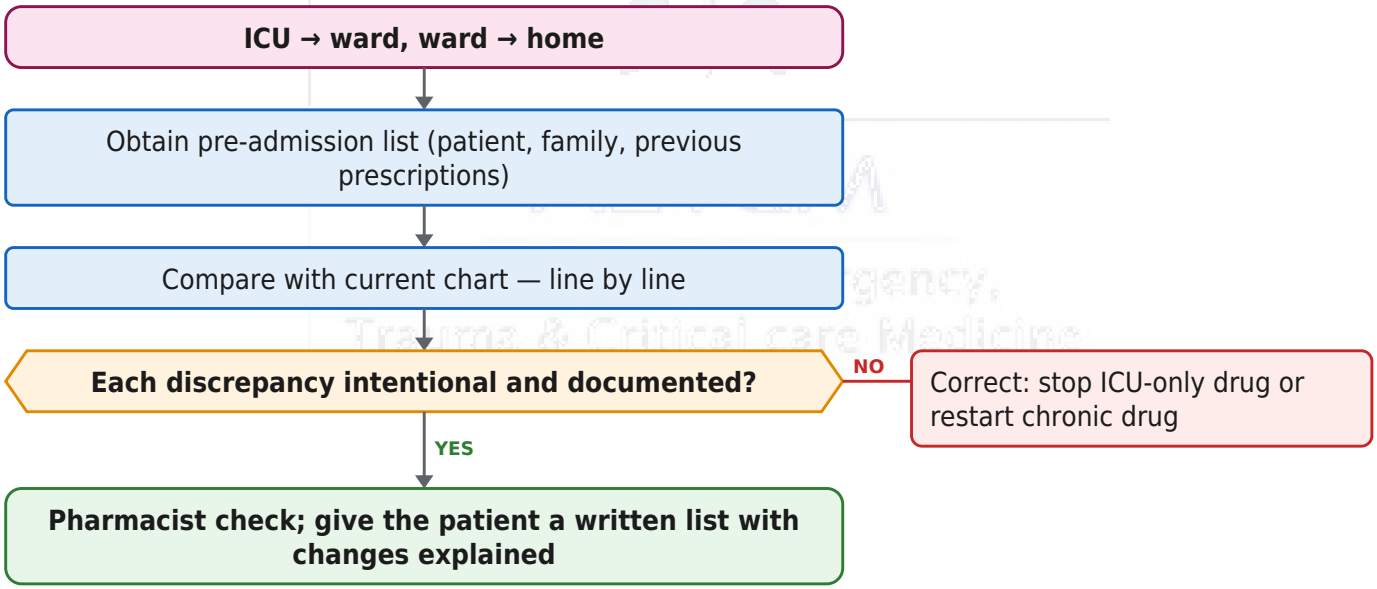
6. Recovery, Disposition & Follow-Up · Page 2 of 2 — tables, graphs & algorithm

Medication reconciliation checklist

Category	Action
Stress ulcer prophylaxis	Stop unless ongoing indication
Antipsychotics / sedatives	Stop or taper; document
Insulin	Return to pre-admission regimen; review targets
Antihypertensives	Restart cautiously when BP allows
Anticoagulants / antiplatelets	Restart when bleeding risk allows — do not forget
Statins, thyroxine, antidepressants, inhalers	Restart
Antibiotics	Name, dose, route, stop date, monitoring (levels, CBC)
Renally cleared drugs	Re-dose to current CrCl

Bell 2011 (JAMA, ~396 000 older adults): admission to hospital — and especially to ICU — increased the risk of unintentional discontinuation of chronic drugs such as statins, antiplatelets, anticoagulants, levothyroxine and inhalers.

Reconciliation at each transition



GOLDEN PEARL

Every transition is a chance to stop one drug and restart another. Take both chances.

‹ Back to Step 97 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: BP – blood pressure; **CBC** – complete blood count; **CrCl** – creatinine clearance; **ICU** – intensive care unit
Drug information (RxList — tap): Insulin


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 98

Screen survivors for PICS

6. Recovery, Disposition & Follow-Up · Page 1 of 2 — the step

THE GOLDEN STEP

Screen sepsis survivors for post-intensive care syndrome — physical weakness, cognitive impairment, anxiety, depression and PTSD.

WHY IT MATTERS

Half of sepsis survivors have new functional, cognitive or mental-health problems. Many are readmitted within 90 days. Early recognition allows rehabilitation and support, and the 2026 guideline places new emphasis on recovery.

HOW TO DO IT AT THE BEDSIDE

- Before discharge: functional assessment (mobility, ADLs), cognitive screen, mood screen.
- Use simple tools: MoCA for cognition, HADS for anxiety/depression, IES-R for PTSD symptoms, 6-minute walk / grip strength for weakness.
- Ask about sleep, swallowing, voice, pain, hair loss, sexual function.
- Refer to mental-health services when indicated.

WATCH OUT

- Cognitive impairment after sepsis can resemble dementia — document a new baseline.
- Family members also experience PICS-F — offer support.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Post-critical illness follow-up services; mental health support services; referral for mental-health symptoms (GPS).
Conditional · Low / GPS

EVIDENCE & FURTHER READING — TAP TO OPEN

Needham 2012: PICS definition (CCM) | Iwashyna 2010: cognitive and functional decline after sepsis (JAMA) | Prescott 2018: enhancing recovery from sepsis (JAMA) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 98 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ADLs – activities of daily living; **GPS** – good practice statement; **HADS** – Hospital Anxiety and Depression Scale; **IES-R** – Impact of Event Scale – Revised; **MoCA** – Montreal Cognitive Assessment; **PICS** – post-intensive care syndrome; **PICS-F** – post-intensive care syndrome – family; **PTSD** – post-traumatic stress disorder


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 98

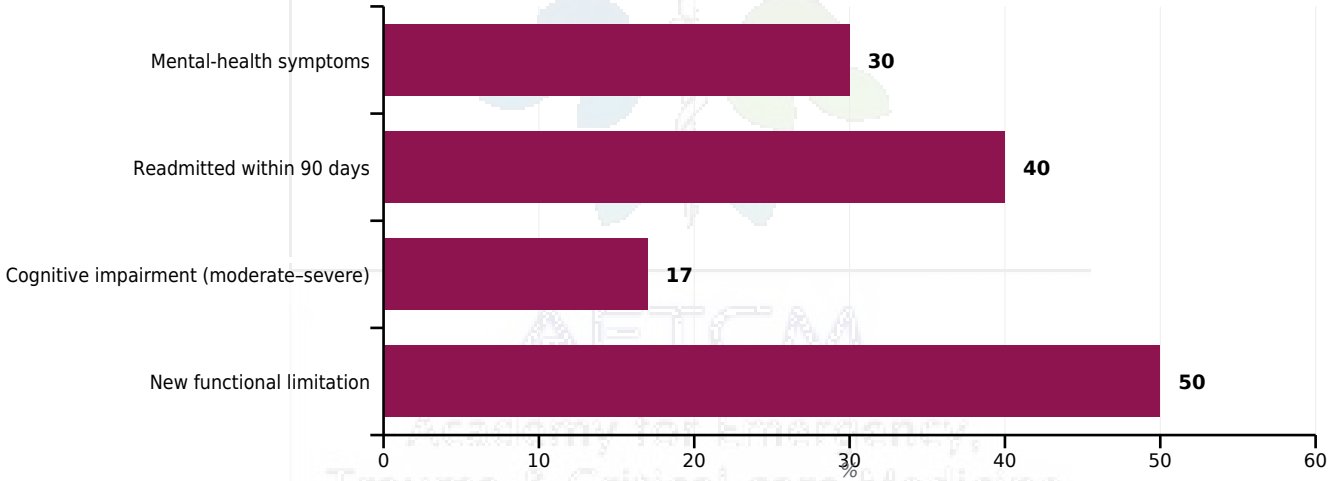
Screen survivors for PICS

6. Recovery, Disposition & Follow-Up · Page 2 of 2 — tables, graphs & algorithm

PICS domains and screening tools

Domain	Problems	Screening tool
Physical	ICU-acquired weakness, fatigue, dysphagia, dyspnoea	MRC sum score, grip strength, 6-minute walk
Cognitive	Memory, attention, executive function	MoCA (< 26 abnormal)
Mental health	Anxiety, depression, PTSD	HADS (≥ 8 per scale), IES-R (≥ 33)
Family (PICS-F)	Anxiety, depression, complicated grief	HADS for carers

Sepsis survivors — approximate burden (%)



Approximate figures from cohort studies (Iwashyna 2010; Prescott & Angus 2018) — local rates vary.

GOLDEN PEARL

Surviving sepsis is not the same as recovering from it. Screen everyone before they go home.

‹ Back to Step 98 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **HADS** – Hospital Anxiety and Depression Scale; **ICU** – intensive care unit; **IES-R** – Impact of Event Scale – Revised; **MoCA** – Montreal Cognitive Assessment; **PICS** – post-intensive care syndrome; **PICS-F** – post-intensive care syndrome – family; **PTSD** – post-traumatic stress disorder


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 99

Rehabilitation and post-sepsis follow-up

6. Recovery, Disposition & Follow-Up · Page 1 of 2 — the step

THE GOLDEN STEP

Arrange early physical and occupational rehabilitation, and primary-care or post-sepsis follow-up.

WHY IT MATTERS

Rehabilitation that starts in the ICU and continues after discharge improves function. The 2026 guideline suggests post-critical illness follow-up services, physical rehabilitation after > 48 h of ventilation and mental-health support, plus sepsis education for patients and families.

HOW TO DO IT AT THE BEDSIDE

- Start early mobilisation in the ICU when stable (sit, stand, walk).
- Physiotherapy and occupational therapy referral before discharge.
- Discharge summary with sepsis diagnosis, organisms, treatment, complications and new impairments — sent to the primary-care doctor.
- Follow-up within 1–2 weeks (primary care) and a post-ICU/sepsis clinic at 6–12 weeks when available.
- Educate: warning signs of recurrent infection, vaccination (influenza, pneumococcal), nutrition.

WATCH OUT

- Survivors have a high risk of recurrent infection and readmission in the first 90 days.
- Low-resource settings: tele-follow-up and community health workers can bridge gaps.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Post-critical illness follow-up services; physical rehabilitation after > 48 h invasive ventilation; mental-health support; written and verbal sepsis education.

Conditional · Low / Very low

EVIDENCE & FURTHER READING — TAP TO OPEN

SSC 2026 adult guideline | Schweickert 2009: early PT/OT in ICU (Lancet) | Taylor 2022: post-sepsis transition programme (IMPACTS) | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 99 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: ICU – intensive care unit; **PT** – prothrombin time; **PT/OT** – physiotherapy / occupational therapy; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 99

Rehabilitation and post-sepsis follow-up

6. Recovery, Disposition & Follow-Up · Page 2 of 2 — tables, graphs & algorithm

Post-sepsis recovery pathway

ICU: early mobilisation, delirium prevention, diary

↓

Ward: PT/OT, nutrition, swallow, mood/cognition screen

↓

Discharge: summary to GP, medication reconciliation, sepsis education leaflet

↓

1–2 weeks: primary-care review (infection signs, meds, function)

↓

6–12 weeks: post-ICU / sepsis clinic — PICS screen, rehab, mental health

Discharge education — tell the patient and family

Topic	Message
Warning signs	Fever, breathlessness, confusion, low urine — seek care early
Recovery	Fatigue and weakness can last months — this is expected
Vaccination	Influenza yearly; pneumococcal per schedule
Medication	Complete prescribed antibiotics; know your stop date
Mental health	Nightmares, anxiety and low mood are common — ask for help

GOLDEN PEARL

Recovery from sepsis is measured in months. Make sure the patient has a guide for the journey home.

‹ Back to Step 99 · Next step › · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **GP** – general practitioner; **ICU** – intensive care unit; **PICS** – post-intensive care syndrome; **PT** – prothrombin time; **PT/OT** – physiotherapy / occupational therapy


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 100

Audit bundle timing and outcomes

6. Recovery, Disposition & Follow-Up · Page 1 of 2 — the step

THE GOLDEN STEP

Audit sepsis bundle timing and outcomes for quality improvement — following institutional emergency protocols such as AIIMS Rishikesh Sepsis and MDRO Management and Emergency Department Sepsis Management.

WHY IT MATTERS

Sepsis programmes that measure performance and feed it back improve outcomes. In New York, mandated sepsis protocols with reporting were followed by faster treatment and lower mortality. The guideline strongly recommends a hospital performance-improvement programme.

HOW TO DO IT AT THE BEDSIDE

- Define the population (all ED/ward sepsis alerts) and time zero consistently.
- Measure process (bundle elements, times) and outcome (mortality, ICU admission, LOS, readmission).
- Feed back monthly to ED, wards and ICU with run charts; celebrate improvements.
- Use PDSA cycles for one change at a time (e.g., pre-packed antibiotic kits).
- Adopt and adapt national and institutional protocols (e.g., ICMR guidance, AIIMS Rishikesh sepsis & MDRO pathway).

WATCH OUT

- Audit is for learning, not blame — a punitive culture hides delays.
- Watch for unintended consequences: over-treatment of non-septic patients.

SURVIVING SEPSIS CAMPAIGN 2026 SAYS

Recommend hospital performance-improvement programmes including sepsis screening, standard operating procedures and quality-improvement measurement.
Strong · Moderate / Very low

EVIDENCE & FURTHER READING — TAP TO OPEN

Seymour 2017 (NEJM) | Levy 2015: SSC performance improvement (CCM) | ICMR antimicrobial treatment guidelines | SSC 2026 (ESICM) | Medscape | Radiopaedia

Tables, graphs & algorithm for Step 100 ›

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

Abbreviations: **ED** – emergency department; **ICMR** – Indian Council of Medical Research; **ICU** – intensive care unit; **LOS** – length of stay; **MDRO** – multidrug-resistant organism; **PDSA** – Plan–Do–Study–Act; **SSC** – Surviving Sepsis Campaign


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

STEP 100

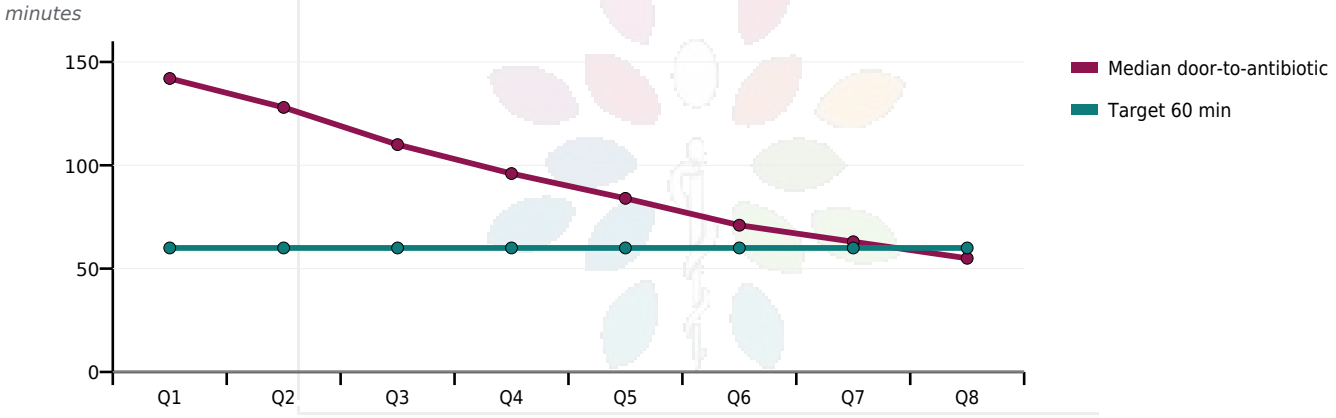
Audit bundle timing and outcomes

6. Recovery, Disposition & Follow-Up · Page 2 of 2 — tables, graphs & algorithm

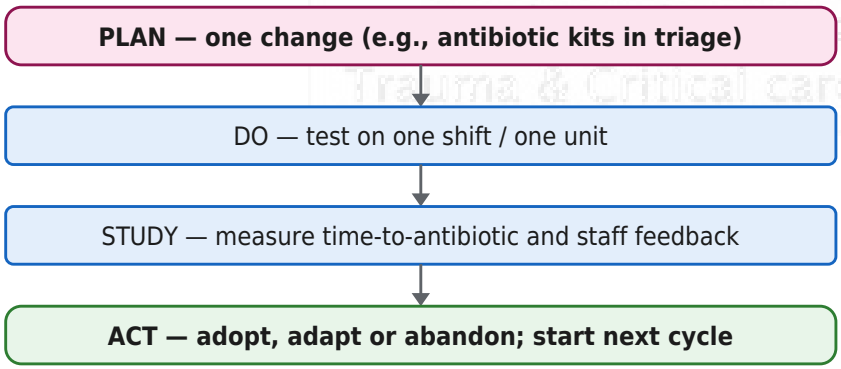
Hour-1 bundle — audit elements

Element	Measure	Target
Lactate	% measured within 1 h of time zero	≥ 90%
Blood cultures	% before antibiotics	≥ 90%
Antibiotics	% within 1 h (shock/probable) / 3 h (possible)	≥ 80–90%
Fluids	% hypoperfused patients receiving 30 mL/kg within 3 h (or documented reason)	≥ 80%
Vasopressors	% with MAP < 65 after fluids started within 1 h	≥ 80%
Repeat lactate	% repeated within 2–4 h if > 2	≥ 80%
Outcome	In-hospital mortality, ICU admission, LOS, 30-day readmission	Trend

Run chart — door-to-antibiotic time, median minutes (illustrative)



PDSA cycle for sepsis improvement



GOLDEN PEARL

What gets measured gets better. Audit every sepsis alert — and share the results with the people who did the work.

‹ Back to Step 100 · Contents

ABBREVIATIONS, SCORES & DRUG LINKS ON THIS PAGE

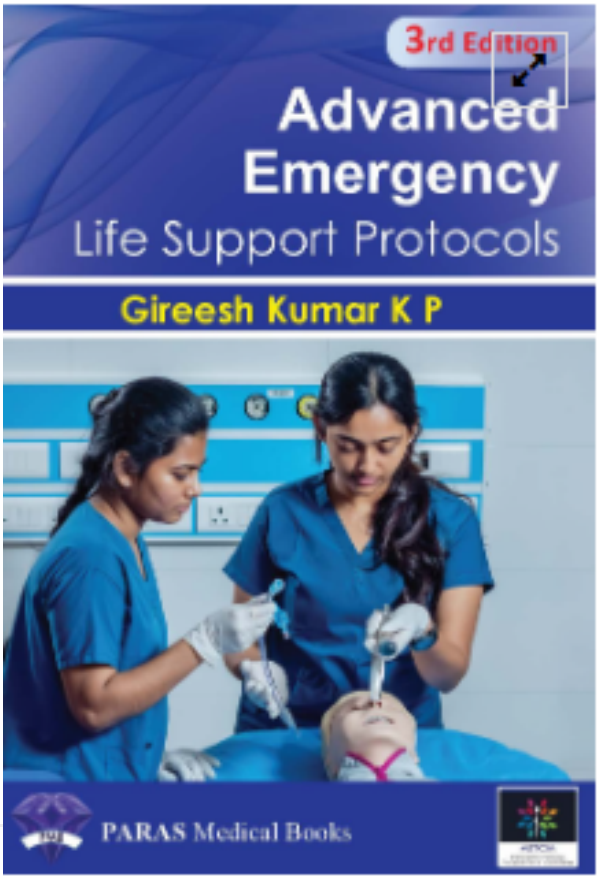
Abbreviations: ICU – intensive care unit; **LOS** – length of stay; **MAP** – mean arterial pressure; **PDSA** – Plan–Do–Study–Act


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

ALSO BY THE AUTHOR

Dr. Gireesh Kumar K.P.

Tap the cover or BUY NOW to order



Advanced Emergency Life Support Protocols

Step-by-step emergency and resuscitation protocols for the emergency department and wards.

BUY NOW ›

Scan to buy

See all books by the author ›


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Notes

Your own protocols, doses, local antibiogram and bedside learning

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Index

Tap a page number to jump there. Magenta numbers open the step; teal numbers open its tables, graphs & algorithm page.

ABG 22, 28, 44, 142
Acute kidney injury 38, 44, 76, 188
Adrenal crisis 50, 133
Airway 20, 53, 56, 61, 100
Albumin 38, 45, 80, 82
Algorithm, code sepsis 20
Amikacin 69, 70, 121, 124, 131
Analgesia 57, 182, 212, 215, 221
Anion gap 38, 44
Antibiogram 68, 229
Antifungal 116
Antiviral 118
ARDS 44, 46, 48, 176, 184
Arterial line 17, 87, 140, 142, 226
Audit 10, 12, 20, 136, 244
Balanced crystalloid 75, 76, 81, 83
Bicarbonate 38, 44, 76, 170, 192
Blood cultures 32, 34, 72, 116, 136
Capillary refill 26, 98, 158
Carbapenem 69, 71, 113, 122, 130
Cardiomyopathy 49, 148, 154, 168
Catheter 34, 108, 110, 144, 188
Central venous catheter 63, 108, 144, 218, 226
Chest radiograph 46
Cholangitis 38, 104, 107, 129
Coagulation 40, 111, 145, 204, 218
Cockcroft-Gault 39, 120
Colloids 80
Corticosteroids 50, 93, 156, 172, 196
Creatinine 10, 38, 120, 166, 188
CRT 26, 98, 158
De-escalation 32, 113, 119, 129, 130
De-resuscitation 164, 166, 168, 173
Delirium 24, 182, 212, 214, 238
DIC 40, 144, 152, 176, 192
Diuretics 166
Dobutamine 13, 149, 153, 154, 159
Dopamine 13, 92, 152
Duration of antibiotics 34, 128, 134, 172, 220
Dynamic measures 86
Echocardiography 50, 86, 108, 154, 168
ECMO 184
Electrolytes 38, 44, 167, 170, 192
Empyema 46, 104, 129
Encephalopathy 23, 24, 192
Enteral nutrition 117, 204, 206, 208, 221
Epinephrine 92, 94, 146, 148, 154
Extended infusion 70, 122
Family communication 12, 24, 132, 214, 220
Febrile neutropenia 36, 69, 116
Fluid balance 88, 165, 224
Fluid challenge 86
Fluid responsiveness 26, 48, 86, 144, 158
Glucose 24, 34, 44, 194, 196
Goals of care 52, 101, 224, 230, 232
HFNC 59
Hydroxyethyl starch 80
Hyperchloraemia 38, 76
Hypoglycaemia 99, 194, 196, 221
Insulin 194, 196, 238
Intubation 56, 59, 60, 181
IPC 202

AETCM
Academy for Emergency, Trauma & Critical care Medicine


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

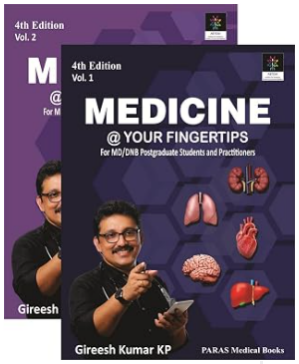
KDIGO 188
Ketamine 56, 213
Lactate 16, 28, 44, 76, 96
Landmark trials 60, 74, 140, 152, 182
Loading dose 21, 64, 70, 122
Lung ultrasound 48, 85, 88, 167
Lung-protective ventilation 60, 86, 176
Magnesium 38, 166, 170, 206
MAP 17
MDRO 68, 113
Medication reconciliation 238, 243
MEWS 8, 14
Mimics 17, 50, 93, 128
Mottling 16, 26, 84, 96, 158
Necrotising soft-tissue infection 26, 35, 68, 104, 107
Nephrotoxins 124, 188, 190
Neuromuscular blockade 58, 184
NEWS2 8, 14, 20, 24, 52
NIV 142
Norepinephrine 92, 94, 146, 148, 154
Older adults 11, 16, 92, 140, 172
Oxygen therapy 12, 22, 44, 58, 60
Palliative care 230
PEEP 45, 176, 178, 182, 184
Peripheral vasopressor 22, 26, 32, 62, 94
Phosphate 38, 170, 206
PICS 240, 243
Piperacillin-tazobactam 71, 121, 122
Plasma-Lyte 76
Platelet transfusion 10, 36, 40, 80, 218
POCUS 46, 48, 62, 74, 88
Potassium 38, 44, 76, 166, 170
Procalcitonin 64, 132, 134
Prone positioning 60, 184
qSOFA 8, 14, 24
Rehabilitation 240, 242
Renal replacement therapy 120, 124, 164, 166, 170
Ringer's lactate 28, 76, 81
RUSH protocol 48
SBAR 52, 100
Scrub typhus 34, 36, 68, 129, 135
Sedation 12, 60, 122, 180, 212
Selective digestive decontamination 180
Sepsis-3 10, 12, 29
Septic shock 10, 16, 32, 74, 156
SIC score 40
SIRS 8, 10, 14, 36
SOFA 8, 10, 12, 14, 224
Source control 16, 34, 96, 106, 134
Spontaneous breathing trial 180, 182, 221
Stress ulcer prophylaxis 204, 239
Surviving Sepsis Campaign 12, 48, 58, 182, 212
Therapeutic drug monitoring 38, 70, 120, 124
Transfusion 40, 170, 216, 218, 228
Triage 8, 14, 24, 136, 245
Tropical infections 34, 36, 68, 129
Urine output 74, 84, 96, 98, 188
Vancomycin 25, 68, 70, 124, 190
VAP 180
Vasopressin 92, 146, 148, 153, 172
Vitamin C 157
VTE prophylaxis 128, 200, 203, 228

AETCM
Academy for Emergency, Trauma & Critical care Medicine

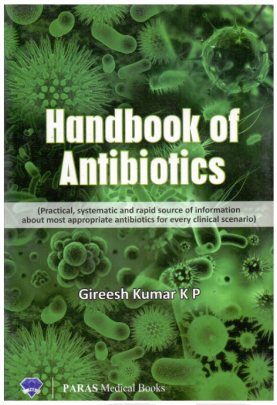

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Books by Dr. Gireesh Kumar K.P.

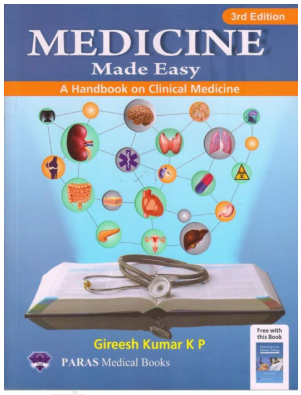
Tap any cover to order



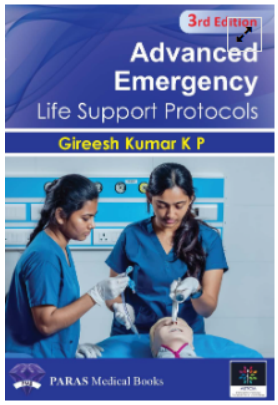
Medicine @ Your Fingertips



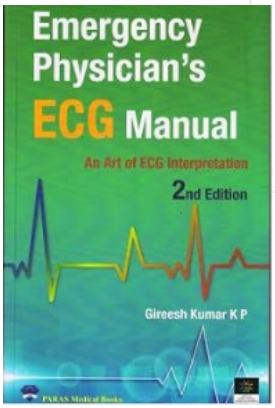
Handbook of Antibiotics



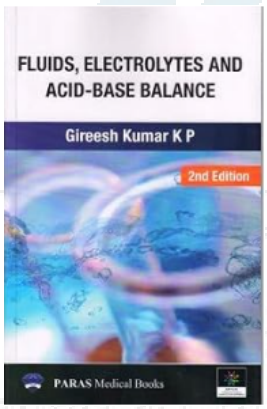
Medicine Made Easy



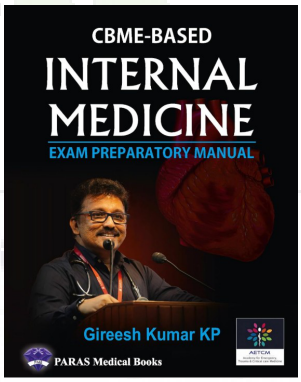
Advanced Emergency Life Support Protocols



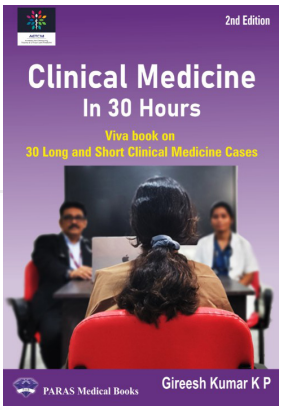
Emergency Physician's ECG Manual



Fluids, Electrolytes and Acid-Base Balance



CBME-Based Internal Medicine



Clinical Medicine in 30 Hours

Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Landmark trials every sepsis doctor should know

Tap a trial name to open it on PubMed. These trials shaped the recommendations in this book and the Surviving Sepsis Campaign 2026 guideline.

Trial	Year	Question	Key result	Step
Rivers EGDT	2001	Protocol-driven early goal-directed therapy	Reduced mortality (single centre)	58
ProCESS / ARISE / ProMISe	2014–15	EGDT vs usual care	No benefit — EGDT abandoned	29
Kumar et al.	2006	Hypotension to effective antibiotics	~7.6% survival fall per hour of delay	25
Seymour (New York)	2017	Time to bundle completion	Each hour of delay ↑ death (OR 1.04/h)	25
Sepsis-3	2016	New definitions	Sepsis = infection + SOFA ≥ 2	2
SAFE	2004	Albumin vs saline	Equivalent; harm in TBI	32
ALBIOS	2014	Albumin to ≥ 3 g/dL	No mortality benefit	32
6S / CHEST	2012	Starch vs crystalloid	More AKI/RRT, death with HES	31
SMART	2018	Balanced vs saline	Fewer kidney events with balanced	30
PLUS / BaSICS	2021–22	Plasma-Lyte vs saline	No mortality difference	30
CLASSIC / CLOVERS	2022–23	Restrictive vs liberal fluids	No mortality difference	66
SOAP II	2010	Dopamine vs norepinephrine	More arrhythmias with dopamine	61
VASST / VANISH	2008–16	Vasopressin added	NE-sparing; no clear mortality difference	59
SEPSISPAM / 65 trial	2014–20	MAP targets	No benefit of higher MAP; 60–65 OK ≥ 65 y	56
ANDROMEDA-SHOCK	2019	CRT vs lactate targeting	CRT at least as good	64
ADRENAL / APROCCHSS	2018	Hydrocortisone (± fludrocortisone)	Faster shock reversal; ↓ mortality with FC	63
ARMA (ARDSNet)	2000	6 vs 12 mL/kg Vt	Mortality 31% vs 40%	71
PROSEVA	2013	Prone positioning	Mortality 16% vs 33%	75
NICE-SUGAR	2009	Tight vs moderate glucose	Tight control ↑ mortality	79
TRISS	2014	Hb 7 vs 9 g/dL	Restrictive = safe	88
STARRT-AKI / AKIKI	2016–20	Early vs standard RRT	No benefit of early RRT	78
BICAR-ICU	2018	Bicarbonate for severe acidosis	Benefit in AKI subgroup	69
NUTRIREA-2	2018	Enteral vs parenteral in shock	More bowel ischaemia with full EN	85
STOP-IT	2015	4-day antibiotics after source control	As good as longer course	54
BLING III	2024	Continuous β-lactam infusion	Supports prolonged infusion	49
LOVIT	2022	IV vitamin C in sepsis	Harm/no benefit	63
PROTECT / PREVENT	2011–19	VTE prophylaxis	LMWH ≥ UFH; IPC add-on no benefit	81
ABC trial	2008	Paired SAT + SBT	Fewer ventilator days, ↓ 1-year mortality	74


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›

Suggested PG dissertation topics in sepsis

For MD/DNB Emergency Medicine, General Medicine, Anaesthesiology and Critical Care residents. Most are feasible as prospective observational studies in a single Indian centre over 12–18 months; a few are suitable for pilot randomised trials. Obtain ethics committee approval and register with CTRI.

No.	Topic
1	Comparison of NEWS2, qSOFA and SIRS for predicting in-hospital mortality in adults with suspected sepsis in an Indian emergency department
2	Door-to-antibiotic time and 28-day mortality in septic shock: a prospective observational study
3	Capillary refill time versus lactate clearance as resuscitation end-points in septic shock — a randomised pilot trial
4	Shock index and modified shock index at triage as predictors of ICU admission in sepsis
5	Diagnostic accuracy of procalcitonin versus CRP in differentiating bacterial sepsis from tropical febrile illness (dengue, scrub typhus, leptospirosis)
6	Procalcitonin-guided antibiotic discontinuation versus standard care in medical ICU patients with sepsis
7	Prevalence of culture-negative sepsis and its outcomes compared with culture-positive sepsis
8	Antimicrobial resistance patterns of blood-culture isolates in ED sepsis and adequacy of empiric therapy
9	Balanced crystalloid versus 0.9% saline and incidence of AKI in septic patients in the ED
10	Point-of-care ultrasound (IVC, lung, VExUS) guided fluid resuscitation versus standard care in septic shock
11	Passive leg raise with VTI to predict fluid responsiveness in spontaneously breathing septic patients
12	Peripheral versus central norepinephrine: safety and extravasation rates in the ED
13	Early (< 1 h) versus delayed norepinephrine initiation and outcomes in septic shock
14	Lung ultrasound B-line score as a guide to stopping fluids in sepsis-induced hypoperfusion
15	Incidence and predictors of sepsis-induced cardiomyopathy on bedside echocardiography and its effect on outcome
16	Role of hydrocortisone in vasopressor-dependent septic shock: time to shock reversal — an observational study
17	Sepsis-induced coagulopathy (SIC) score versus ISTH DIC score for predicting mortality
18	Serum albumin and lactate/albumin ratio as prognostic markers in sepsis
19	Hyperferritinaemia in sepsis: prevalence of HLH-like features and outcomes
20	Time to source control and mortality in abdominal and urosepsis
21	Impact of a ‘code sepsis’ protocol on Hour-1 bundle compliance and mortality — a before–after quality-improvement study
22	Delirium (CAM-ICU / 4AT) incidence in septic patients and association with long-term cognitive impairment
23	Post-intensive care syndrome among sepsis survivors at 3 months: physical, cognitive and mental-health outcomes
24	ROX index for predicting HFNC failure in sepsis-associated hypoxaemic respiratory failure
25	Glycaemic variability and mortality in septic shock: protocolised infusion versus sliding scale
26	Refeeding hypophosphataemia in malnourished septic patients starting enteral nutrition
27	Prehospital recognition of sepsis by ambulance crews using NEWS2 — accuracy and time saved
28	Frailty (Clinical Frailty Scale) as a predictor of outcome in elderly patients with sepsis


Medicine @ Your Fingertips
Dr. Gireesh Kumar K P · high-yield clinical medicine for MD/DNB postgraduates & practitioners · 2 volumes
BUY NOW ›