ICR-LEU-047

Critical care · hematology

Updated 21 Jun 2026

CRITICAL CARE ORDER SET

Acute Leukemia

ICU management of acute leukemia and its emergencies. Four threats move fast and kill — tumor lysis, neutropenic sepsis, leukostasis, and APL coagulopathy. Get hematology in immediately, don't wait for confirmation to start ATRA when APL is suspected, and be cautious with red-cell transfusion before cytoreduction. Adapt every threshold to your protocol.

FOUR TIME-CRITICAL EMERGENCIES — SCREEN ON ARRIVAL

Tumor lysis
↑K, ↑PO_4, ↑uric acid, AKI · §3

Neutropenic sepsis
Fever → abx in 1 h · §4

Leukostasis
WBC >50–100k + sx · §5

APL / DIC
Start ATRA early · §6–7

01 Admission & initial orders

LEVEL OF CARE / MONITORING

- [ ] Admit **Medical ICU**, full monitoring — cardiac telemetry, pulse oximetry, NIBP **q15–60 min** until stable
- [ ] Neuro checks **q1–2h** if concern for leukostasis, CNS bleed, or encephalopathy

ACCESS

- [ ] ≥ 2 large-bore peripheral IVs; **CVC** if vasopressors, exchange transfusion, frequent draws, or RRT anticipated

DIAGNOSTICS ON ARRIVAL

- [ ] CBC + differential, **manual smear** (blasts, Auer rods, schistocytes)
- [ ] CMP, Ca, Mg, phosphate; uric acid, LDH
- [ ] **Coags** — PT/INR, aPTT, **fibrinogen, D-dimer**
- [ ] Type & screen / crossmatch; VBG/ABG + lactate

- [ ] Baseline troponin & BNP if cardiac symptoms / history
- [ ] **Blood cultures ×2** (peripheral ± CVC); UA + urine culture
- [ ] CXR (CT chest if alternative pathology); resp viral panel / COVID PCR per practice

LEUKEMIA-SPECIFIC & IMAGING

- [ ] Bone marrow aspirate/biopsy (timing per heme); cytogenetics, flow cytometry, molecular (FLT3, NPM1, …) per heme
- [ ] **Noncontrast CT head** for focal deficit, AMS, severe headache, or platelets < 10–20k with any neuro change; CT chest/CTA if PE vs leukostasis vs pneumonia

02 General supportive care

DIET & ACTIVITY

- [ ] NPO until aspiration risk assessed → **neutropenic diet**, texture per swallow eval; bedrest if leukostasis risk, then mobilize as safe

DVT PROPHYLAXIS

- [ ] Enoxaparin 40 mg SC daily or UFH 5000 units SC q8–12h — **hold if platelets < 30–50k**, active bleeding, suspected CNS bleed, or DIC with high bleeding risk
- [ ] **SCDs for all**, especially if pharmacologic prophylaxis held

GI · GLUCOSE · GOALS

- [ ] PPI / H2-blocker if intubated, high-dose steroids, or high GI bleed risk
- [ ] Glucose `140–180 mg/dL` per ICU protocol
- [ ] **Clarify & document code status early**; discuss prognosis with heme early (relapsed/refractory, or APL with multi-organ failure)

03 Tumor lysis syndrome — prophylaxis & treatment

> **SEE ALSO** Full detail in the **TLS order set (ICR-TLS-046)**. High risk — very high WBC, rapidly proliferative / bulky disease, baseline renal dysfunction, high uric acid / LDH.

FLUIDS & URIC ACID

- [ ] **0.9% NaCl ~100–150 mL/h** (adjust for age / HF / renal); urine output **≥ 100 mL/h** if not overloaded; avoid routine alkalinization
- [ ] High risk / elevated uric acid — **rasburicase 0.1–0.2 mg/kg IV ×1** (or fixed 3–6 mg); **avoid in G6PD deficiency** → use allopurinol
- [ ] Moderate risk / rasburicase contraindicated — **allopurinol 300 mg PO daily** (or 100 mg TID) before cytoreduction

MONITORING & COMPLICATIONS

- [ ] Electrolytes, creatinine, uric acid, phosphate, Ca **q4–6h** in high-risk / active TLS
- [ ] Hyperkalemia per protocol; hyperphosphatemia → binders (**avoid IV calcium unless symptomatic**); AKI → early nephrology, CRRT if unstable

04 Infection management — neutropenic / immunocompromised

≤ 1 HOUR **Fever ≥ 38.0–38.3 °C or suspected infection → empiric antibiotics within 1 hour** (after cultures, but do not delay).

FIRST-LINE MONOTHERAPY

Cefepime	**Pip-tazo**	**Meropenem**
`2 g IV q8h`	`4.5 g IV q6–8h`	`1 g IV q8h` recent broad-spectrum / resistance

ESCALATE / ADD

- [ ] Add **vancomycin** (or MRSA coverage) if hemodynamic instability, suspected line / SSTI, or pneumonia with MRSA risk
- [ ] Add **mold-active antifungal** (voriconazole, liposomal amphotericin B) if persistent fever > 4–5 days on broad-spectrum, or high-risk induction per heme-onc

PROPHYLAXIS — per heme-onc & neutropenia duration

- [ ] Antibacterial — levofloxacin (prolonged neutropenia, not on tx-dose β-lactam)
- [ ] Antiviral — acyclovir / valacyclovir
- [ ] PJP — TMP-SMX or alternative if indicated

05 Leukostasis — recognition & emergency management

Suspect when

WBC often **> 50–100k** (AML esp. monocytic; ALL) plus: **respiratory** (dyspnea, hypoxemia, infiltrates), **neuro** (headache, visual change, confusion, focal deficit, coma), or priapism / limb / myocardial ischemia.

ICU stabilization

- [ ] Early intubation for impending resp failure / ↓ mental status; O_2 to **SpO_2 ≥ 92%**
- [ ] Cautious fluid boluses (TLS / LV dysfunction); vasopressors if MAP < 65 despite fluids

Transfusion caution before cytoreduction

- [ ] **Avoid raising hematocrit sharply** — higher viscosity worsens leukostasis. If Hb < 7 g/dL or symptomatic, transfuse PRBCs **slowly**, ideally after / concurrent with cytoreduction
- [ ] Platelets — keep ≥ **10k** stable, ≥ **20–30k** if infection / line / minor bleeding, ≥ **50k** for procedures / major or CNS bleeding

Leukapheresis · temporizing

- [ ] Symptomatic leukostasis or WBC > 100–150k (AML) with early symptoms — **apheresis service STAT**, large-bore CVC; check Ca/K/coags, plan calcium during procedure
- [ ] Must be followed by chemotherapy. **Avoid in APL**

Cytoreductive chemo · with heme

- [ ] **Hydroxyurea 50–100 mg/kg/day PO** divided q6–8h for rapid cytoreduction while awaiting induction
- [ ] Then formal induction per subtype; if APL, **ATRA is time-critical** (§6)

06 Acute promyelocytic leukemia (APL)

DON'T WAIT High suspicion — promyelocytes on smear, DIC, severe coagulopathy, suspected t(15;17), or path report. **Do not wait for confirmation if clinical / morphologic suspicion is high.**

- [ ] **ATRA (tretinoin) 45 mg/m²/day PO** in 2 divided doses — start immediately
- [ ] **Aggressively correct coagulopathy** (§7) — platelets, cryoprecipitate, FFP
- [ ] **Avoid leukapheresis in APL** (may worsen outcome) — discuss with heme-onc before any apheresis

WATCH Differentiation syndrome — dyspnea, fever, edema, infiltrates, hypotension; treat with dexamethasone and supportive care per heme.

07 Coagulopathy, DIC & bleeding

- [ ] Coags, fibrinogen, D-dimer **q6–12h** if DIC risk / APL / TLS / sepsis

TRANSFUSION THRESHOLDS

Platelets	**≥ 10k** stable · **≥ 20–30k** febrile / minor bleeding · **≥ 50k** major bleeding, procedures, CNS event
Fibrinogen	**≥ 150–200 mg/dL** — cryoprecipitate or fibrinogen concentrate
INR/PT, aPTT	**FFP** for significant elevation with bleeding or before emergent invasive procedure

ANTICOAG DIC is both pro-thrombotic and hemorrhagic — **generally avoid therapeutic anticoagulation** unless a clear indication and acceptable bleeding risk.

08 Respiratory failure in leukemia / leukostasis

- [ ] CXR ± CT chest to differentiate **leukostasis, pneumonia, ARDS, DAH, volume overload**; ABG on high FiO_2 / ventilation

VENTILATOR (IF INTUBATED)

- [ ] **ARDSnet** — VT `4–6 mL/kg PBW`, Pplat ≤ `30`, PEEP/FiO_2 table; early prone for severe ARDS; conservative fluids after resuscitation (esp. ARDS/TLS)

DIFFUSE ALVEOLAR HEMORRHAGE

- [ ] Suspect with hemoptysis, falling Hb, diffuse infiltrates, bloodier BAL aliquots — supportive ventilation, platelets often ≥ `50k`, correct coagulopathy aggressively

09 Neurologic complications

- [ ] **Emergent CT head** for any new focal deficit, sudden severe headache, AMS, seizure, or anticoagulation with thrombocytopenia

IF RAISED ICP SUSPECTED

- [ ] HOB 30°; normocapnia ($PaCO_2$ 35–40, brief hyperventilation only as rescue); avoid hypotension, maintain CPP; **neurosurgery** for hemorrhage / mass effect
- [ ] Seizure prophylaxis **not routine**; treat seizures with levetiracetam or local first-line

10 Renal support

- [ ] **Nephrology** if rising creatinine, oliguria, or refractory TLS
- [ ] Prefer **CRRT** in hemodynamically unstable TLS/AKI
- [ ] **Adjust antibiotics & chemotherapy doses** per renal function (pharmacy)

11 Transfusion strategy summary

PRBC
Hb < 7 g/dL or symptomatic. **More restrictive pre-cytoreduction in leukostasis** unless unstable.

PLATELETS
≥ 10k stable · ≥ 20–30k fever / minor bleed · ≥ 50k procedures or CNS risk/bleed.

COAG PRODUCTS
Fibrinogen ≥ 150–200 mg/dL; correct INR/aPTT per DIC / bleeding status.

12 Coordination & communication

- [ ] **Hematology/Oncology — STAT on admission**
- [ ] **Apheresis** — STAT if leukostasis & leukapheresis considered
- [ ] **Nephrology** — early for TLS / AKI
- [ ] **Neurosurgery** — intracranial hemorrhage / mass effect
- [ ] **Palliative care** — early for complex goals / poor prognosis