
Clinical Guidance

Paediatric Critical Care: Oncological Emergencies

Summary

Guidance on management of patients who are suffering an oncology emergency.

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<p>This clinical guideline has been produced by the South Thames Retrieval Service (STRS) at Evelina London for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children.</p> <p>This guideline represents the views of STRS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.</p>	

Terms used: G-CSF: granulocyte-colony stimulating factor
 PTC: primary treatment centre
 GvHD: Graft vs Host Disease

Change History		
Date	Change details, since approval	Approved by

Paediatric Oncological Emergencies

Febrile Neutropenia / Neutropenic Sepsis

- Single oral temperature $\geq 38^{\circ}\text{C}$, or signs of sepsis
- Neutrophil count $<0.5 \times 10^9 / \text{L}$ / falling / unknown (nadir at 5-10 days post chemotherapy)

High Risk Tumours / Patients

- Acute haematological malignancies (Leukaemias Lymphomas)
- Patients with chronic immune suppression
- Indwelling central venous catheter (CVC)

Presentation and Investigations

- Typically warm shock; bounding pulses, wide pulse pressure, hypotensive (BUT consider chemotherapy induced cardiotoxicity due to anthracyclines)
- Meticulous examination for focus of infection (incl. mucositis)
- Infection screen: blood cultures (central + peripheral), cultures of indwelling devices & other potential sources, urinalysis, CXR if respiratory signs or symptoms, Urgent blood tests: FBC, coagulation screen, CRP, U&E, LFTs

Treatment

- Resuscitation: Usually fluid responsive, average 40-100ml/kg
- Early inotropes (typically require vasoconstrictors)
 - 1st line peripheral dopamine 5-10microgram/kg/min,
 - 2nd line Noradrenaline, (place new central line if indwelling line induces instability)
- Early non-invasive ventilation for cardio-respiratory support
- Intubate if fluid or inotrope resistant shock or coma
 - Ketamine 2mg/kg, Fentanyl 2microg/kg for induction
- **Immediate antibiotics within 1 hour**
 - 1) Piperacillin Tazobactam 90mg/kg 6hrly & Gentamicin 8mg/kg daily (level pre-2nd dose).
 - 2) Add Teicoplanin 10mg/kg or Vancomycin 15mg/kg for suspected tunnel/port infection - give through line
 - 3) Meropenem 40mg/kg if suspected meningitis
 - 4) Change Gent ->Ciprofloxacin if bone tumour/renal impairment & Tazocin to Ciprofloxacin in penicillin allergy
 - 5) Liposomal Amphotericin for suspected fungal infection 3 mg / kg (max 1mg) test dose then 1mg/kg 1hr later
 - 6) Consider Lenogastrim (G-CSF) – d/w oncologist
 - 7) Consider central line removal if: Refractory shock, falling platelets, bacterial showering during use, persistent positive blood cultures >96 hrs or obvious line tract / port infection – d/w primary treatment centre (PTC)

Hyperleukocytosis (WCC $>50 \times 10^9$)

10-30% leukaemias. AML type M5 = highest risk
At risk of leukostasis/ hyperviscosity syndrome (cerebral/ pulm/ renal infarction or haemorrhage), Tumour lysis syndrome, coagulopathy.
May need urgent leukopheresis

Investigations

Urgent blood film (+ call on-call haematologist), clotting+fibrinogen, X-match, U&E, urate, LFTs, Ca^{2+} , PO_4 ; viral serology (VZV, CMV, Hepatitis), LDH, immunophenotyping, CXR

Management

- **WBC $>100 \times 10^9$ or rapidly rising + symptomatic** (any neurological / respiratory) = transfer to PICU within 2 hours
- **WBC $>100 \times 10^9$ + asymptomatic**=urgent transfer to PTC with PICU
- **WBC $50-100 \times 10^9$** = d/w PTC- elective transfer plus monitor
- Avoid red cell transfusion if possible. If required, maximum 5mls/kg over 4 hours
- Accept platelets $>30 \times 10^9/\text{L}$ unless active bleeding/coagulopathy
- 0.9% sodium chloride & 5% glucose at 3L/m²/day. **NO added K⁺**

Paediatric oncology centres

Royal Marsden, Sutton: 0208 642 6011

GOSH: 0207 405 9200

References: NICE CG151, Creutzig. Ped Blood Canc 2016, Pan London Paed Haem Onco Supp Care Protocols 2014.

Tumour Lysis Syndrome (TLS)

Caused by rapid cell death: \uparrow Urate, \uparrow potassium (K^+), \uparrow phosphate (PO_4^{2-}), \downarrow calcium (Ca^{2+}). -> Renal failure.

High Risk Tumours/ Predisposing conditions

- B & T Non-Hodgkin's Lymphoma (esp. Burkitt's Lymphoma), T-Cell ALL
- Large bulk solid disease incl. significant hepatosplenomegaly
- Oliguria, dehydration, renal infiltration or renal failure
- $\text{WBC} > 100 \times 10^9/\text{L}$
- Highest risk at presentation and up to 72hrs post induction chemo

Prevention (Anticipation is key)

- High risk – Rasburicase 200micrograms/kg/dose once daily + hyperhydration 0.9% sodium chloride & 5% glucose (**NO K⁺**) 2.5-3L/m²/day (caution if renal/cardiac failure) + 8hrly TLS bloods
- Aim urine output $>3\text{mls/kg/hr}$ (caution if renal/cardiac failure)

Treatment

- Hyperhydrate + rasburicase (as above). 4-6hrly TLS bloods.
- Treat if $\text{K}^+ \geq 5.5 \text{ mmol/L}$ (see STRS Electrolyte Emergencies)
- Aluminium Hydroxide oral 50-150mg/kg/24h If $\text{PO}_4^{2-} \geq 2.1 \text{ mmol}$
- Early haemofiltration if: unresponsive high K^+ & PO_4^{2-} ; symptomatic \downarrow iCa requiring correction if \uparrow PO_4^{2-} ; established renal failure / fluid overload
- Intubation for cardio respiratory compromise, coma, or vascath insertion (ideally CT neck & chest prior to VASCATH insertion)

Upper Airway / SVC Obstruction

Compression of airway or great vessels (affecting pre-load or cardiac output) by anterior mediastinal mass (highest risk: NHL + T-cell ALL, thymoma, teratoma)

Presentation

- Clinical status DOES NOT reflect degree of obstruction
- Respiratory distress with orthopnoea.
- Neurological signs (headaches, dizziness, syncope) + \uparrow ICP
- Cardiovascular compromise

Management

- No sedation to avoid worsening obstruction
- Sit up, face mask oxygen, erect CXR +/- drains (Avoid CT – if done, must be prone/lateral + without sedation)
- IV access (femoral if SVC obstruction) + bloods (minimal handling)
- Immediate consultant anaesthetic review
- BiPAP non-invasive ventilation may be well tolerated
- **HIGH RISK INTUBATION: Anaesthetic/ PICU consultant decide on timing/induction method. Consider cardiothoracics+ ENT team – only if life threatening obstruction.** In theatre. Use reinforced tracheal tubes
- Dexamethasone or hydrocortisone before histology in severe cases (may interfere with histology + risk of TLS. Consult PTC. Consider risk/benefit)
- \uparrow ICP: 2.7% sodium chloride 3mls/kg IVI bolus
- Maintain normal pCO₂ (neuroprotection)
- CT neck & chest on return to PICU, send biopsy (histology)

Transfuse if:

RBCs

- $<70\text{g/L}$ or patient. specific
- AVOID in hyperleukocytosis
- $0.3 \times \text{Wt (kg)} \times \text{desired rise in Hb}$

Platelet threshold

- $<10 \times 10^9/\text{L}$
- <20 + febrile, septic, expected to fall
- <30 + brain tumour
- <50 + bleeding, coagulopathy, on heparin, due LP/surgery
- <100 + life-threatening bleeding

Irradiation (RBCs + platelets)

(residual lymphocytes can cause fatal transfusion-associated GvHD if severely immunocompromised):

- Hodgkin's lymphoma
- BMT patients at induction + if chronic GvHD
- <6 months if blood products in utero
- Severe T-cell immunodeficiency (SCID, DiGeorge syndrome, Wiskott-Aldrich syndrome)

CMV status: d/w PTC – guidelines vary