

TREATMENT OF INFECTION IN THE NEUTROPENIC OR IMMUNO-COMPROMISED PATIENT



For septic shock follow SORT guidelines

<http://www.sort.nhs.uk/Media/Guidelines/Guidelineforthemangementofseveresepsis.pdf>

For initial management of suspected febrile neutropenia see [Flowchart 1](#)

For management of non-neutropenic fever see [Flowchart 2](#)

For ongoing management of febrile neutropenia at 48 hours see [Flowchart 3](#)

For ongoing management of febrile neutropenia at 96 hours see [Flowchart 4](#)

For early discharge protocol see [Flowchart 5](#)

Immuno-compromised child develops fever > 38° C

Child known to be neutropenic

Child may or may not be neutropenic but is clinically unwell

Child clinically well and unlikely to be neutropenic

Follow guidelines for neutropenic sepsis:

see [Flowchart 1](#)

If child is septic resuscitate appropriately and follow SORT guidelines.

Rapid assessment and early antibiotics (within 60 minutes of temperature) are essential.

Assess clinically but do not give antibiotics until neutrophil count known.

see [Flowchart 2](#)

If child becomes unwell revert to [Flowchart 1](#)

Flowchart 1: Emergency Management of Neutropenic Sepsis

If unwell, ask for senior review
Fever $\geq 38^{\circ}\text{C}$
And Neutrophils ≤ 0.5
(Consider starting antibiotics if neutrophil count ≥ 0.5 but falling counts or if other risk factors
(e.g. mucositis, Down Syndrome or stem cell transplant.)

If child septic follow SORT guidelines and print SORT drug calculator to help with resuscitation.
<http://www.sort.nhs.uk/Media/Guidelines/Guidelineforthemangementofseveresepsis.pdf>

History & examination ([Table 1](#))
Urgent bloods: blood culture, FBC, renal, liver, CRP, blood gas and lactate
Urinalysis if < 5 yrs, CXR if signs or symptoms
Viral throat swab (in viral transport medium) if cough/coryza ([Table 1](#))
Use modified Alexander score to assess risk of septic complications ([Table 2](#))

Commence intravenous antibiotics within 60mins
Review history of previous isolates
Check for penicillin allergy and not receiving high dose IV methotrexate.
If not unwell give single agent Piperacillin/Tazobactam 90mg/kg (max 4.5g) 6hrly
If penicillin allergy or receiving high dose MTX use Meropenem 20mg/kg (max 2g) 8hrly.
add Gentamicin 7mg/kg OD as second antibiotic if signs of severe sepsis or shock
Reduce dose if renal impairment / caution if recent cisplatin chemotherapy.

Confirm neutropenia: If not neutropenic, continue antibiotic(s) if clinically indicated.

Perform regular PEWS assessments, review by senior paediatrician within 24 hours,
Continue intravenous antibiotic(s) for at least 48 hours

At 48hrs repeat modified Alexander score to decide if Low or Standard Risk ([Table 2](#))

Standard Risk

Follow [Flowchart 3](#)

Low Risk

Follow [Flowchart 5](#)

Flowchart 2: Treatment of fever in immuno-compromised children without neutropenia

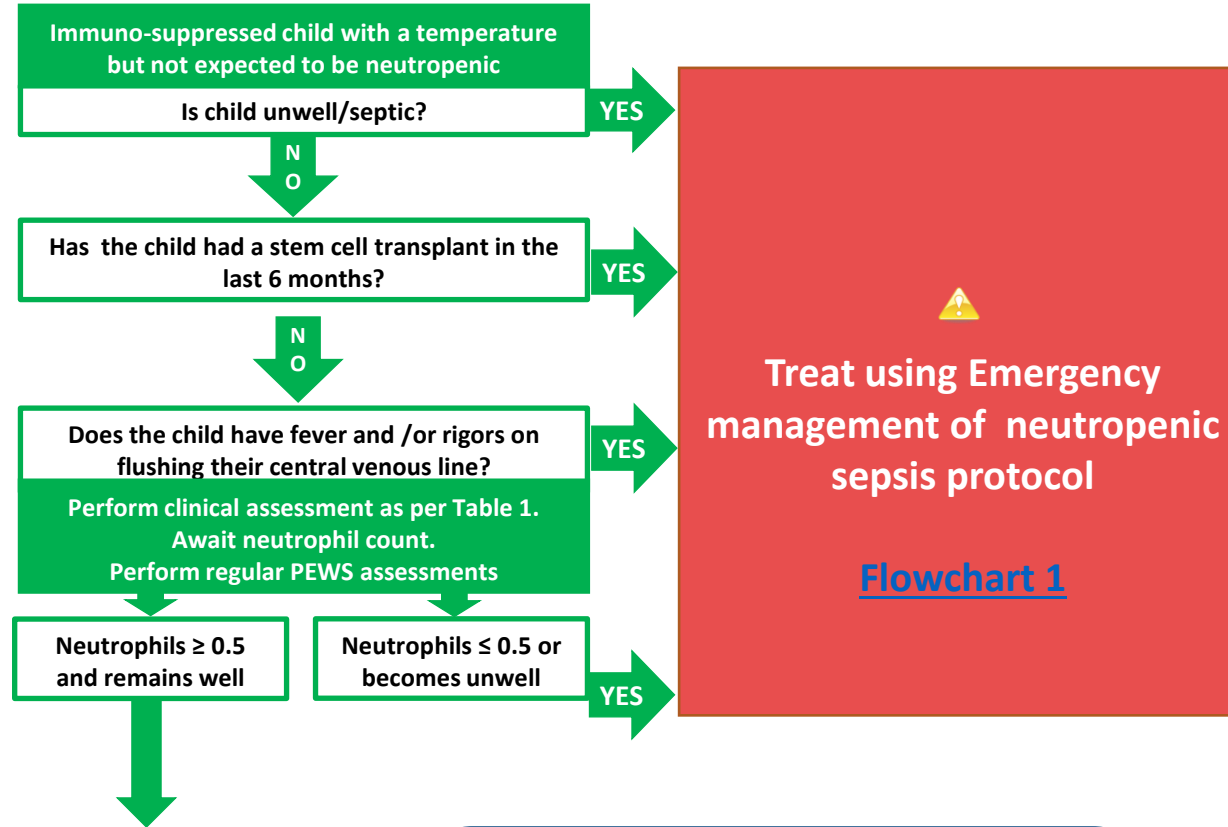
Examination tips

Examine along central venous catheter line and exit site for cellulitis. Swab if inflamed.

Examine all in situ shunts and endo-prostheses.

If infection is suspected, discuss with the Primary Treatment Centre and the child's lead neurosurgeon/orthopaedic surgeon.

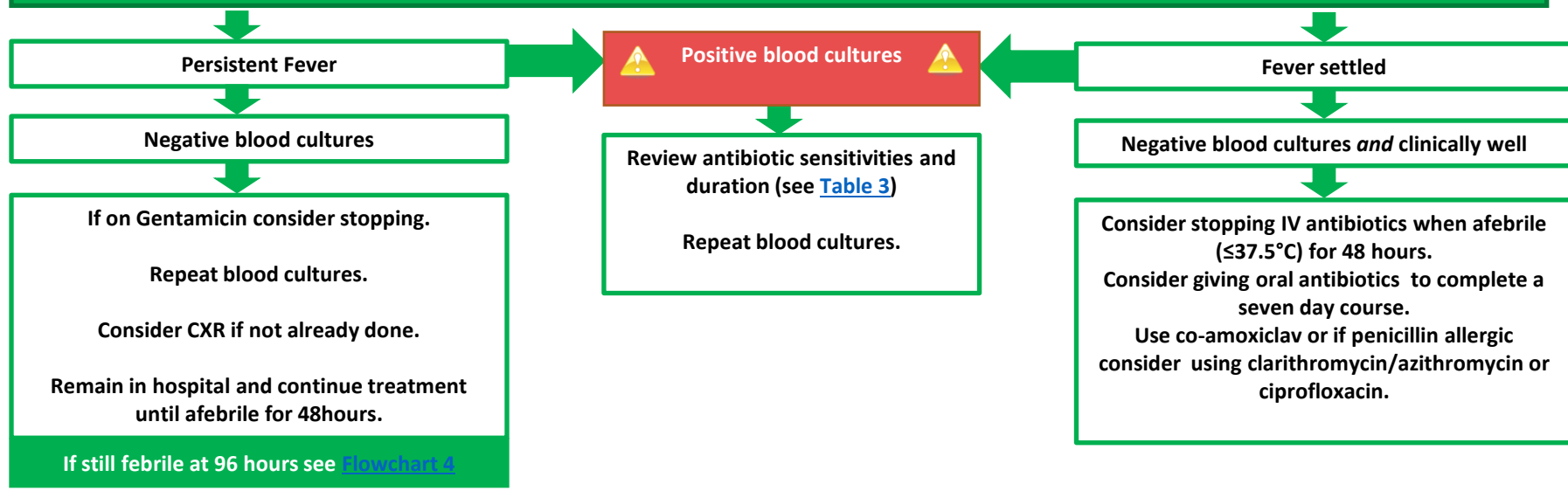
Do not aspirate without prior discussion with PTC/surgical team.



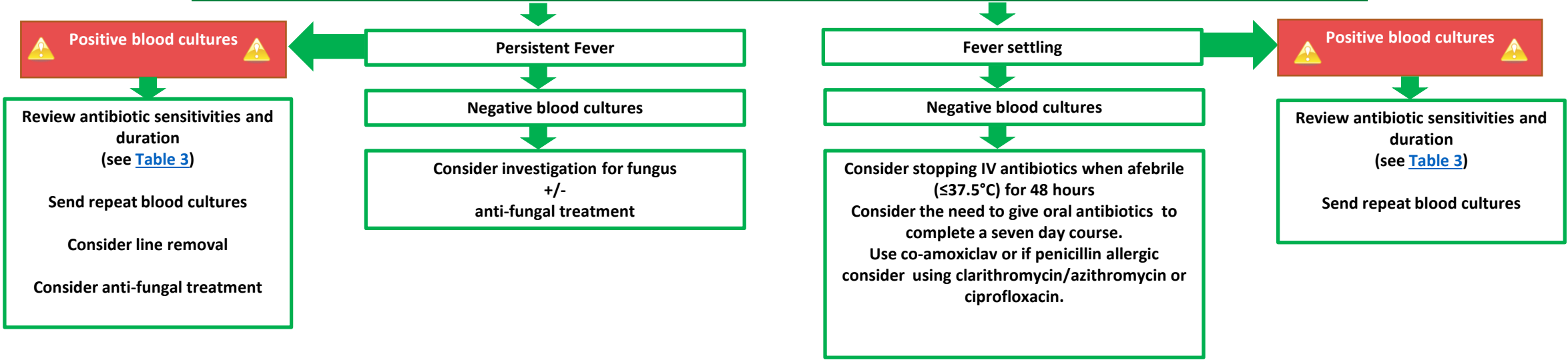
Consider need for antibiotics
Treat according to clinical findings.
If child has been started on antibiotics and subsequently found not to be neutropenic, continue antibiotics if clinically indicated,

Is there a CVL in situ?
Does the child have a VP shunt or endo-prosthesis that could be infected?
Is the neutrophil count likely to be falling?
Distance for family to travel if unwell?
If unsure check with local senior +/- PTC

Flowchart 3: Treatment for 'Standard Risk' children with febrile neutropenia after 48 hours of intravenous antibiotics



Flowchart 4: Treatment for 'Standard Risk' children with febrile neutropenia after 96 hours of intravenous antibiotics



Flowchart 5: Early discharge protocol for 'Low Risk' children with febrile neutropenia after 48 hours of intravenous antibiotics

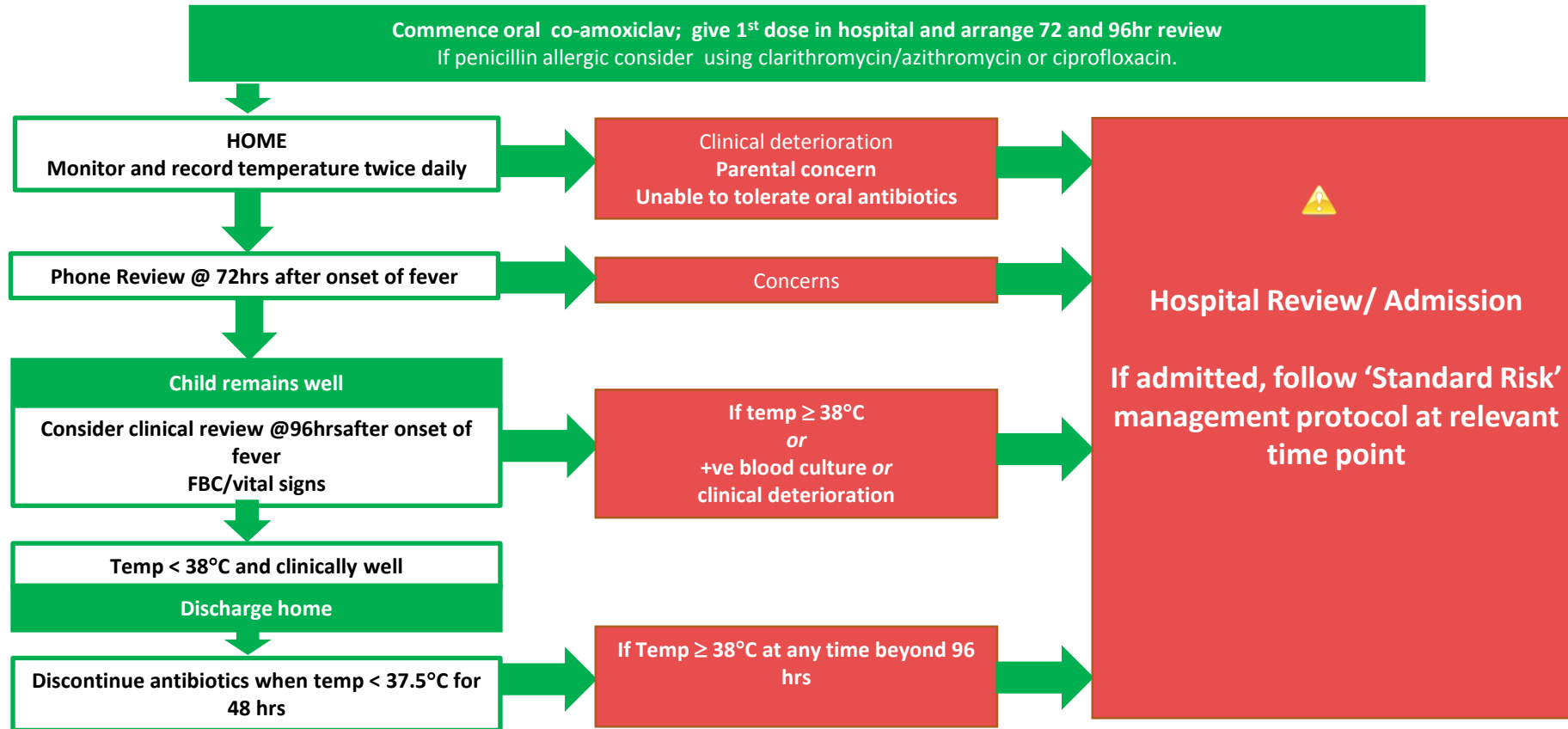


Table 1
Screening investigations
for suspected febrile
neutropenia

Assessment for all patients	
Detailed history and examination	To include ears, mouth and throat for mucositis, line site for exit site or tunnel infections, endo-prosthesis for local infection, peri-anal area, any recent lumbar puncture/bone marrow sites.
Scoring system (see Table 2)	To assess risk of septic complications, to be performed at presentation and at 48hours.
Blood Cultures	Take at least 1-2mls from each central line lumen (max 4 mls), Take a peripheral culture if no central line (take 4mls for children aged >36mths, at least 1ml for 1-36mths and at least 0.5mls if under 1 month).
Bloods	Arrange urgent FBC, Renal function, LFT's including albumin, CRP, blood gas and lactate.
Urinalysis	If <5yrs or has urinary symptoms ;ideally before starting antibiotics but don't delay treatment if unwell.
Assessments to consider	
Chest X-ray	If signs and/or symptoms
Stool	If diarrhoea; request virology for rotavirus, adenovirus, <i>C. difficile</i> toxin and MC&S (cultures will identify fungi in addition to bacteria, but specifically request cryptosporidium). If prolonged diarrhoea and culture negative, request norovirus - this usually requires discussion with virology.)
Sputum/NPA/viral throat swab	If signs of respiratory tract infection
Swabs for culture	Look for areas of redness and tenderness: note that pus is not usually present when neutropenic.

Table 2
Risk assessment of severity
Modified Alexander score

- If any of the listed risk factors are present at presentation or at 48hours - child should be treated as 'Standard Risk'
- If none of the listed risk factors are present at presentation or at 48hours - child can be treated as 'Low Risk'

	Are any of the following risk factors present?
History	<ul style="list-style-type: none"> • Inpatient at onset of FN • Down Syndrome • PICU during last FN episode
Age	<ul style="list-style-type: none"> • < 1 year
Diagnosis / treatment	<ul style="list-style-type: none"> • ALL (except maintenance) • Infant ALL • AML • Intensive B-NHL protocols • Anaplastic lymphomas • Stage IV neuroblastoma • PBSCT pre engraftment • Ewing's • Aplastic anaemia
Clinical features	<ul style="list-style-type: none"> • Shock or compensated shock • Haemorrhage • Dehydration • Metabolic instability • Altered mental status • Pneumonitis • Significant mucositis • Respiratory distress/compromise • Perirectal infection • Soft tissue abscess/infection (other than minimal redness around line site) • Rigors • Irritability/meningism • Organ failure
Compliance with out-patient treatment	<ul style="list-style-type: none"> • Inability to take oral medicines • Poor compliance • Social or family concerns
48 hr assessment	<ul style="list-style-type: none"> • Neuts < 0.1 • Positive blood cultures • Not clinically 'well'

Table 3. Antibiotic plans for children with positive blood cultures (all should be discussed with local microbiologist)

Type of Growth	Notes
Coagulase negative staphylococcus (CONS) isolation from 1 bottle	Repeat blood cultures, and decide clinically whether teicoplanin should be added. If starting teicoplanin treat for 10-14 days.
Coagulase negative staphylococcus (CONS) infection is genuine (in at least 2 bottles ± temperature)	Treat with teicoplanin (confirm sensitivities) for 10 –14 days.
Coagulase positive staphylococcus	Give at least 2 weeks IV treatment then 2-4 week course orally to reduce risk of subsequent deep-seated infection.
Other organisms	Depending on count recovery and microbiology advice.
Candida	Treat for 14 days after last positive culture. Usually remove CVAD.
Stenotrophomonas	Almost always need to remove CVAD.