Queensland Paediatric Guideline

Emergency

Febrile illness - Emergency management in children

Purpose

This document provides clinical guidance for all staff involved in the care and management of a child presenting to an Emergency Department (ED) with a febrile illness in Queensland.

This guideline aims to identify those infants and children at risk of serious bacterial infection or other significant illness who need timely treatment, while avoiding unnecessary investigations in the majority. The management of children with an unexplained fever for greater than one week or who have recently returned from overseas travel is beyond the scope of this guideline. For oncology patients refer to the Management of Fever in a Paediatric Oncology Patient Guideline.

This guideline has been developed by senior ED clinicians and Paediatricians across Queensland, with input from Infectious Disease specialist staff, Queensland Children's Hospital, Brisbane. It has been endorsed for use across Queensland by the Queensland Emergency Care of Children Working Group in partnership with the Queensland Emergency Department Strategic Advisory Panel and the Healthcare Improvement Unit, Clinical Excellence Queensland.

Key points

- Consider sepsis early in any patient with signs or symptoms that indicate possible infection.
- Fevers in most children under five years of age have a viral aetiology and extensive investigation is not required.
- Careful assessment will identify a focus on infection in most patients.
- The recommended management of febrile infants and children without an evident focus of infection is guided by the risk of serious bacterial infection.
- Neonates (age less than 28 days) and children who are not fully immunised are at greater risk of a serious bacterial infection.

Introduction

Fever is one of the most common paediatric ED presentations. Identifying a focus of infection can be challenging especially in very young children. While most children fully recover, infection remains the leading cause of death in children aged less than five years.

Definition

Fever is defined as a temperature greater than or equal to 38°C.

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Pyrexia of unknown origin (PUO) refers to any fever lasting 10 - 21 days without a cause identified on history, examination and basic investigations and is beyond the scope of this guideline.

Measurement

In neonates (age less than 28 days) temperature should be measured using an electric thermometer in the axilla. For children over 28 days an infra-red tympanic thermometer may also be used. Forehead chemical thermometers are unreliable and not recommended.

A parent's touch has been shown to have high sensitivity and low specificity for identifying a fever, however parental concern should be taken seriously.

Pathophysiology

Fever is a physiological response most often caused by an infective process, when exogenous pyrogens induce endogenous pyrogens, resulting in an elevated body temperature. The thermoregulatory centre then raises and maintains the body temperature to the new set point. This gives most children a degree of malaise and may negatively stress children with pre-existing cardiac, respiratory or neurological diseases. Fever is a generally beneficial adaptive response that promotes the immune response and inhibits the invading pathogen, potentially reducing the duration of certain infections.

Aetiology

In most children less than five years of age, fever is caused by a viral infection.[1]

Less common causes include serious bacterial infection (SBI) such as urinary tract infection (UTI), pneumonia, bacteraemia, meningitis, or bone and joint infections, or conditions such as Kawasaki disease, vaccination reactions, arthritis, connective tissue disorders, malignancies, drug fever, or inflammatory bowel disease. The most common SBI in children is a UTI followed by pneumonia.

Post-vaccination fever is common with a typical onset within 24 hours of immunisation and duration of two to three days.

Teething does not cause fever greater than 38.5°C.

Assessment

The aim of the assessment (history and clinical examination) is to identify children who:

- have a focus of infection (to enable appropriate investigations and, if needed, treatment)
- do not have an infective focus but require further investigation

History

Questioning should include specific information on:

- immunisation history
- immunosuppression (either by medical condition or treatment)
- history of fever and use of anti-pyretic
- current or recent antibiotic use
- recent overseas travel

This guideline also does not consider the approach to fever in the returned traveller – refer to Assessing fever in the returned traveller [2]

Age

Febrile infants aged less than three months have a higher risk of SBI, with the risk greatest in the neonatal period. Young infants are more likely to present with nonspecific features (they lack the hypothalamic and immune system maturity to localise the infection) and can deteriorate rapidly. Some infants less than three months may not mount a fever in response to SBI, and hypothermia or temperature instability can also be signs of SBI.

In addition to the pathogens seen in older children, *Group B Streptococcus, E. Coli, Herpes Simplex* virus, *Listeria monocytogenes*, *Salmonella* and *Parechovirus* infections are more common in neonates. Detecting other viral infections in children aged less than three months (most commonly RSV) lowers but does preclude a SBI.[3] The estimated incidence of a UTI amongst infants less than three months with laboratory-confirmed RSV infection ranges from 3.3 to 5%.[4,5]

Children aged between three months and three years who have their immunity boosted with vaccinations are at a lower risk of SBI than younger children. In this age group, the presence of a recognisable viral syndrome (including bronchiolitis) predicts a very low incidence of bacteraemia or SBI.

Children over three years of age have mature immune systems so are at a lower risk of SBI. The ability of older children to verbalise symptoms assists in identifying a focus of infection.

Immunisations and immune status

The *Haemophilus influenzae type b* (Hib) and pneumococcal immunisations have dramatically reduced the risk of occult bacteraemia and SBI. Children who have received at least two doses of the 13-valent conjugate pneumococcal (13vPCV) and Hib vaccinations (three dose course given as part of the National Immunisation Program at two, four and six months of age) have greater than 95% protection.

Children with congenital immune deficiency syndrome, sickle cell disease, HIV, asplenia, cancer, nephrotic syndrome, intracranial shunt, cochlear implant, immunosuppressive therapy or who are of Indigenous or Torres Strait Islander origin are at a greater risk for SBI, independent of vaccination status.

History of fever, prior antibiotic use and use of anti-pyretics

The height and duration of the fever and the response to antipyretics have failed to show any ability to differentiate severe from mild illness, or bacterial from viral infection.[6]

While not addressed within this guideline, consider a diagnosis of Kawasaki disease in children with a fever lasting more than five days.

Antibiotic therapy prior to presentation can mask the signs and symptoms of a bacterial illness.

Examination

The examination should identify a source for the fever if possible, and specifically assess for any signs of toxicity or early markers of the possibility of SBI.

Pay attention to concerns expressed by the caregiver, particularly any reported changes in usual behaviour.

Features of a toxic presentation
• altered mental state • lethargy • inconsolable irritability • tachypnoea, increased work of breathing, grunt or weak cry • marked/persistent tachycardia • moderate to severe dehydration (feeding/urine output reduced by more than 50%) • poor perfusion (mottled cool peripheries, delayed central capillary refill) • seizures

Clinical features concerning for SBI	
Feature	**What to look for on assessment**
Pallor	• ask parent if child is their usual colour
Decreased level of alertness	• not smiling • less social interaction than is normal (ask parent) • decreased movement • sleepy • difficulty to wake • cry that is not strong
Moderate respiratory distress	• nasal flaring • increased RR (over 50 bpm in child aged 6-12 months and over 40 bpm in child over 12 months) • SpO2 <95% room air • crackles in chest
Decreased perfusion	• sluggish capillary refill • poor feeding • persistent tachycardia • reduced urine output
Other	• rigors • swelling of limb or joint

Differentiating toxic children from the wider group who are well but have a fever with appropriate physiological response can be challenging, especially in infants.

Careful and **repeated** examination is essential.

Normal range for vital signs by age			
Age	**Heart Rate (bpm)**	**Minimum Systolic BP (mmHg)**	**Respiratory Rate (bpm)**
Term	100-180	60	40-60
6 months	100-180	70	30-50
1 year	100-170	70	20-40
2 years	100-160	70	20-30
4 years	80-130	75	20-30
8 years	70-110	80	16-25
12 years	60-110	90	16-25
16 years +	60-100	90	10-16

Refer to the following guidelines as indicated:

- fever and respiratory symptoms in child aged less than 12 months - see Bronchiolitis Guideline
- fever and urinary symptoms – see UTI Guideline
- fever and severe localised joint pain – see Limp Guideline

ALERT – Consider sepsis in any patient with signs or symptoms that indicate possible infection. See Sepsis Guideline.

Seek urgent senior emergency/paediatric advice as per local practice for a child with fever and any of:

- toxic features (in child of any age)
- age less than 29 days
- age 29 days to 3 months without typical respiratory illness

Investigations

Refer to the relevant guidelines if the following conditions are suspected:

- Sepsis
- Meningitis
- UTI
- Septic arthritis
- Bronchiolitis

Age three months or more

Most children aged three months or older who are fully immunised, have no comorbidities and appear well do not require extensive investigation. Refer to the flowchart in Appendix 1 for the approach to investigations in these children. A child with PUO may require more specialised investigations that are not included here.

Age less than three months

Refer to the flowchart in Appendix 2 for the approach to investigations in febrile infants aged less than three months.

Due to the higher risk of SBI and the challenges in reliable clinical assessment of toxicity in neonates (corrected age less than 29 days) a consistent approach to investigation is recommended, irrespective of clinical appearance.

Owing to the lower risk of SBI, infants aged 29 days to 3 months can be managed in a step-by-step approach with sequential evaluation of general appearance, urinalysis, and results of bloodwork.[7] With careful clinical assessment, this approach allows identification of a group of infants at low risk of SBI who can be safely managed as outpatients without requiring a lumbar puncture or empiric antibiotics.

Investigations for children with an unexplained fever		
Investigation type	**Utility**	**Notes**

Urinalysis, microscopy and culture	Recommended for the following children:
	• age less than 29 days
	• age 29 days to 3 months with no respiratory symptoms
	• age 3 months or older with no identified focus of infection who are
	  ○ not fully immunised
	  ○ fully immunised with fever for more than 48 hours
	Consider for infants aged 29 days to 3 months with respiratory symptoms.
		Method of collection is crucial – see table below.
		See UTI Guideline for urinalysis interpretation.

Chest X-ray	Consider for febrile child with cough and ANY of: • tachypnoea • SpO2 less than or equal to 93% in room air • increased work of breathing (chest recession, tracheal tug, use of accessory muscles) • temperature more than 39°C and WBC greater than 20 x 10^9 (as a screen for occult pneumonia)[8]	Cannot reliably distinguish viral from bacterial pneumonia[9]

Investigations for children with an unexplained fever		
Blood culture	Recommended for children with suspected bacteraemia. Use lower threshold in young infants and unimmunised children especially if appear otherwise well due to higher bacteraemia rates and risk of septicaemia.	Contamination rate is often higher than true positive rate – careful attention to technique and larger blood volumes minimise contamination. Culture sensitivity increases with blood volume. Recommended volume for aerobic culture: • 4 mL (green top bottle) • for neonates, 1 mL (yellow top bottle) Collection of anaerobic blood culture is not needed.
Full blood count (FBC)	Recommended for the following children: • age less than 29 days • age 29 days to 3 months with no respiratory symptoms • age 3 months or older, not fully immunised with no identified focus of infection	Must **always** be correlated with clinical findings. See further information below.
Lumbar Puncture (LP)	Consider in the young febrile infant with nonspecific features such as vomiting, lethargy / drowsiness, irritability or poor feeding.	Refer to Meningitis guideline.
Stool microscopy and culture	Consider in the following children: • age less than 3 months infant with diarrhoea • mucoid, bloody or prolonged diarrhoea	

Additional investigations (e.g. serum electrolytes, glucose and venous blood gas) may be required based on the clinical presentation. Viral diagnostic studies are not routinely recommended to exclude a SBI.

Full blood count and risk of SBI

Despite being widely used, there is little evidence to support the use of a FBC in the risk stratification for well appearing, immunised children.[10]

A systematic review found WCC of no value in ruling out a SBI in immunised children and less valuable than CRP for ruling in SBI.[11] A prospective cohort study found that total WCC and absolute neutrophil count were not sufficiently accurate to be used as screening tests for febrile children with possible SBI.[12] For infants less than 60 days, no parameters on the FBC have been found to accurately predict the risk of a SBI.[13]

Meningococcal, salmonella & staphylococcal bacteraemias do not typically elevate the WCC.

The current NICE guidelines[1] use a WCC less than 5 x 10^9/L or greater than 15 x 10^9/L as risk factors for SBI in infants less than three months. Using an absolute neutrophil count of less than 10 x 10^9/L in these infants has been validated as a reliable method of identifying those at low risk of SBI.[7]

For children who are not fully immunised, WCC may be a more reliable indicator of a SBI.

C reactive protein and risk of SBI

CRP is an acute phase reactant and concentrations start to rise four to six hours after the onset of inflammation and peak around 36 - 50 hours. CRP is better than the FBC for detecting SBI, especially if used after 12 hours of fever, however establishing a level of CRP which can reliably determine low risk of SBI is challenging. A systematic review found a CRP of greater than 80 mg/L was associated with a 72% risk of SBI, and a CRP or less than 20 mg/L with a 5% risk of SBI.[11] A more recent study suggested a CRP level of less than 20 mg/L in infants between 22-90 days identified infants at low risk of SBI.[7] In the absence of a definitive cut off value, CRP should be only be used for screening on advice from senior clinicians and according to local practice.

Urine collection methods

Urine collection methods in children		
Collection method	**Utility**	**Notes**
Supra-pubic bladder aspiration (SPA)	• age <6 months and toxic • phimosis or labial adhesion	• invasive • gold standard as lowest contamination rate • success rate varies (23 - 90%) depending on operator, use of ultrasound and the presence of at least 20mL of urine • ultrasound significantly increases success rate
Urethral catheterisation (CSU) **"in-out catheter"**	• age >6 months and toxic • age <6 months and toxic with failed SPA • non-urgent collection where CCU/MSU not possible/failed	• invasive • low contamination rate • highest success rate • risk of iatrogenic infection
Clean catch specimen (CCU)	• non-urgent collection and unable to void on request	• non-invasive • high false positive rate if poor collection technique - refer to How to collect a clean urine specimen Factsheet. • research supports the Quick Wee method[7,10-12]
Midstream urine (MSU)	• non-urgent collection and able to void on request	• preferred method for toilet-trained children who can void on request
Bag specimens	• not recommended	• unacceptably high contamination rate so **CANNOT** be used for UTI diagnosis[13]

Management of fever

Refer to the flowcharts for a summary of the recommended emergency management of febrile children less than three months (Appendix 1) and greater than or equal to three months (Appendix 2). Management is based on the risk of SBI.

Supportive

Remove excess layers of clothing from the child. Over-enthusiastic physical cooling can be counterproductive by stimulating shivering and other heat-retaining reflexes. Oral fluids, if tolerated, should be encouraged to maintain hydration.

Antipyretics

Antipyretics may be prescribed for an awake child to provide relief from discomfort caused by the fever or the underlying cause of the fever. Educate parents regarding fever (immune system's response to infection) and role of antipyretics (do not treat or shorten illness or prevent a febrile convulsion).

Avoid aspirin as the uncommon possibility of Reye's syndrome increases with varicella or influenza-like illnesses.

Antipyretic dosing for the treatment of fever in children	
Antipyretic	**Dose**
Paracetamol (Oral)	15 mg/kg up to every four hours, maximum four doses in twenty-four hours
Ibuprofen (Oral)	10 mg/kg (maximum 400 mg) up to every six hours, maximum three doses in twenty-four hours Avoid in children less than three months or if significantly dehydrated.

There is some evidence to suggest that Ibuprofen reduces fever and discomfort faster than Paracetamol.[14] While the popular dual therapy dosing regimens reduce the time with fever compared to monotherapy, there is no significant difference in resolution of discomfort.[15] Alert parents to the safety concerns that have been raised over recommending two drugs with different dosing regimens for little gain.[1]

Management of fever with petechial rash

Seek senior emergency/paediatric advice as per local practice for unwell child with purpuric rash not consistent with Henoch-Schonlein purpura

A child with toxic features (see Assessment) or a purpuric rash (greater than 2 mm lesions) not consistent with typical Henoch-Schonlein purpura (HSP), should be managed presumptively for meningococcal disease with resuscitation as required and a third generation cephalosporin whilst investigations are conducted.

A well-appearing child with a fever and petechiae caused by local pressure or only in the distribution of the superior vena cava (e.g. following coughing/vomiting) may usually be discharged with early review.

The management of a non-toxic child with a fever and petechial rash that is not obviously mechanical or in the distribution of the superior vena cava, will depend on availability of senior/expert opinion, and the ability to observe the child over several hours. Refer to the flowchart (Appendix 3) as a guide to management. The role of blood tests in risk stratification as opposed to close serial clinical evaluation

remains controversial, however documentation of a normal platelet count, collection of a blood culture, and consideration of risk stratification according to WCC and CRP are suggested. A WCC between 5-15 and CRP < 8 in the context of fever and petechial rash have been shown to have low risk of meningococcal disease, with these parameters being less reliable if the rash has been present for less than 12 hours.[16] Risk stratification using this approach and an observation period of 4-6 hours has been shown to be safe.[17]

Escalation and advice outside of ED

Clinicians can contact the services below to escalate the care of a paediatric patient as per local practices. Transfer is recommended if the child requires a higher level of care.

Refer to the guideline for sepsis, meningitis, UTI, septic arthritis and bronchiolitis as indicated.

Child is critically unwell or rapidly deteriorating

Includes the following children (as a guide):

- physiological triggers based on age (see below)

Less than 1 year	1-4 years	5-11 years	Over 12 years
• RR >50 • HR <90 or >170 • sBP <65 • SpO2 <93% in oxygen or <85% in air • GCS ≤12	• RR >40 • HR <80 or >160 • sBP <70 • SpO2 <93% in oxygen or <85% in air • GCS ≤12	• RR >40 • HR <70 or >150 • sBP <75 • SpO2 <93% in oxygen or <85% in air • GCS ≤12	• RR >30 • HR <50 or >130 • sBP <85 • SpO2 <93% in oxygen or <85% in air • GCS ≤12

Reason for contact	Who to contact
For immediate onsite assistance including airway management	The most senior resources available onsite at the time as per local practices. Options may include: • paediatric critical care • critical care • anaesthetics • paediatrics • Senior Medical Officer (or similar)
Paediatric critical care advice and assistance	Onsite or via Retrieval Services Queensland (RSQ). If no onsite paediatric critical care service contact RSQ on **1300 799 127**: • for access to paediatric critical care telephone advice • to coordinate the retrieval of a critically unwell child RSQ (access via QH intranet) **Notify early of child potentially requiring transfer.** **Consider early involvement of local paediatric/critical care service.** In the event of retrieval, inform your local paediatric service.

Non-critical child

May include children with:
• suspected SBI • purpuric rash not consistent with Henoch-Schonlein purpure • age less than three months, especially if considering discharge • no focus of fever evident but clinical concerns

Reason for contact	Who to contact
Advice (including management, disposition or follow-up)	Follow local practice. Options: • onsite/local paediatric service • Queensland Children's Hospital experts via Children's Advice and Transport Coordination Hub (CATCH) on 13 CATCH (13 22 82) (24-hour service) • local and regional paediatric videoconference support via Telehealth Emergency Management Support Unit TEMSU (access via QH intranet) on 1800 11 44 14 (24-hour service)
Referral	First point of call is the onsite/local paediatric service

Inter-hospital transfers

Do I need a critical transfer?	• discuss with onsite/local paediatric service • view Queensland Paediatric Transport Triage Tool
Request a non-critical inter-hospital transfer	• contact onsite/local paediatric service • contact RSQ on 1300 799 127 for aeromedical transfers • contact Children's Advice and Transport Coordination Hub (CATCH) on 13 CATCH (13 22 82) for transfers to Queensland Children's Hospital

Non-critical transfer forms	• QH Inter-hospital transfer request form (access via QH intranet)
	• aeromedical stepdown (access via QH intranet)
	• commercial aeromedical transfers:
	  ○ Qantas
	  ○ Virgin
	  ○ Jetstar

When to consider discharge from ED

Consider discharge **ONLY** on senior emergency/paediatric advice for:

- all febrile children aged 29 days to 3 months
- children aged 3 months or more with features of SBI who are not fully immunised

Consider discharge for children who meet ALL of the following criteria:

- no toxic features
- no other investigations or IV treatment required
- no features of SBI
- able to maintain adequate oral intake to maintain hydration
- can be safely managed at home and return in the event of deterioration (consider time of day, parent/carer comprehension and compliance, access to transport and distance to local hospital)

On discharge, provide parent/caregiver with a Fever fact sheet and advice to seek medical attention earlier if symptoms worsen or they have other concerns about their child' health prior to their scheduled appointment.

Follow-up

- with GP within 24 – 48 hours to check progress and receive outstanding test results.

Follow-up **must** be arranged prior to discharge for children aged 29 days to 3 months.

When to consider admission

Admission is required for the following febrile children:

- suspected sepsis
- age less than 28 days
- need for ongoing management

Consider admission for the following children:

- age 29 days to 3 months (even if appear well may require longer period of observation)
- features suggestive of SBI
- inability to maintain adequate oral intake to maintain hydration
- unplanned return within 24 hours of initial assessment
- parents/caregivers unable to safely care for child at home and return in the event of deterioration

Related documents

Guidelines

- Sepsis
- Meningitis
- Management of Fever in a Paediatric Oncology Patient
- Urinary Tract Infection
- Assessing fever in the returned traveller

Factsheets

- Fever
- How to collect a clean urine specimen factsheet

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Guideline approval

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Disclaimer

This guideline is intended as a guide and provided for information purposes only. The information has been prepared using a multidisciplinary approach with reference to the best information and evidence available at the time of preparation. No assurance is given that the information is entirely complete, current, or accurate in every respect. We recommend hospitals follow their usual practice for endorsement locally including presenting it to their local Medicines Advisory Committee (or equivalent) prior to use.

The guideline is not a substitute for clinical judgement, knowledge and expertise, or medical advice. Variation from the guideline, taking into account individual circumstances may be appropriate.

This guideline does not address all elements of standard practice and accepts that individual clinicians are responsible for:

- Providing care within the context of locally available resources, expertise, and scope of practice
- Supporting consumer rights and informed decision making in partnership with healthcare practitioners including the right to decline intervention or ongoing management
- Advising consumers of their choices in an environment that is culturally appropriate and which enables comfortable and confidential discussion. This includes the use of interpreter services where necessary
- Ensuring informed consent is obtained prior to delivering care
- Meeting all legislative requirements and professional standards
- Applying standard precautions, and additional precautions as necessary, when delivering care
- Documenting all care in accordance with mandatory and local requirements

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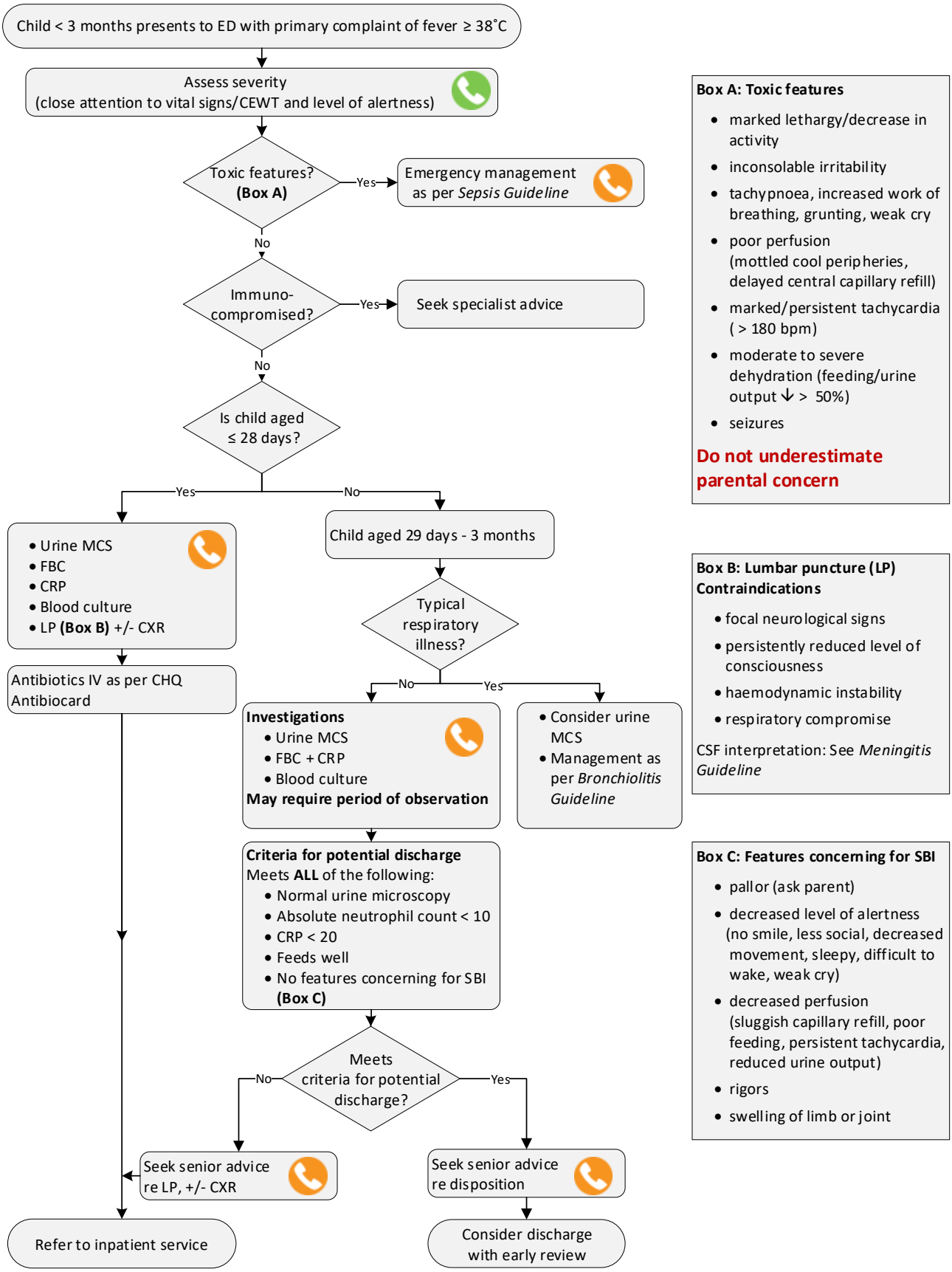

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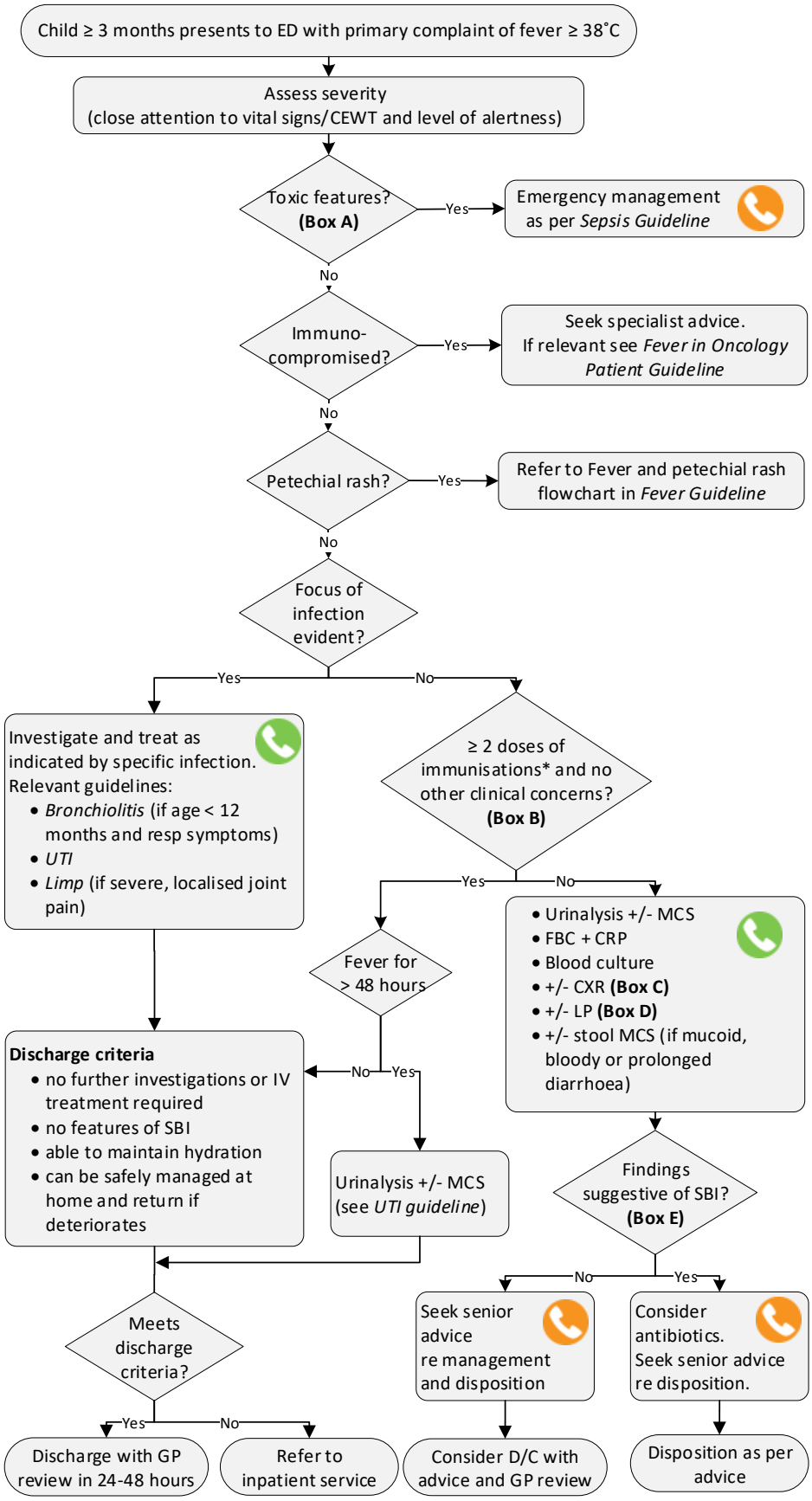

Box A: Toxic
- marked lethargy/decrease in activity
- altered mental status
- inconsolable irritability
- tachypnoea, increased work of breathing, grunting, weak cry
- poor perfusion (mottled cool peripheries, delayed central capillary refill)
- marked/persistent tachycardia
- moderate to severe dehydration
- seizures

Box B: Clinical concerns
- potential partial treatment of infection (antibiotics prior to presentation)
- parental concern
- persistent tachycardia or irritability

Box C: Consider chest X-ray (CXR) if any of:
- increased work of breathing
- cough
- persistent tachypnoea
- SpO2 ≤ 93% in room air
- T > 39˚C and WCC > 20

Box D: Lumbar puncture (LP)

Indications
Vomiting, lethargy, drowsiness and reduced oral intake

Contraindications
- focal neurological signs
- persistently reduced level of consciousness
- haemodynamic instability
- respiratory compromise

Box E: Findings suggestive of serious bacterial infection (SBI)
- WCC > 15 if not fully immunised
- CXR focal changes
- presumptive UTI (see *UTI Guideline* for criteria)
- CSF consistent with meningitis (see *Meningitis Guideline* for CSF interpretation)

* *Haemophilus influenza type b* and 13-valent conjugate pneumococcal (3 dose course given as part of The Australian National Immunisation Program at age 2, 4 and 6 months)

Consider seeking emergency/paediatric advice as per local practices

Seek senior emergency/paediatric advice as per local practices.

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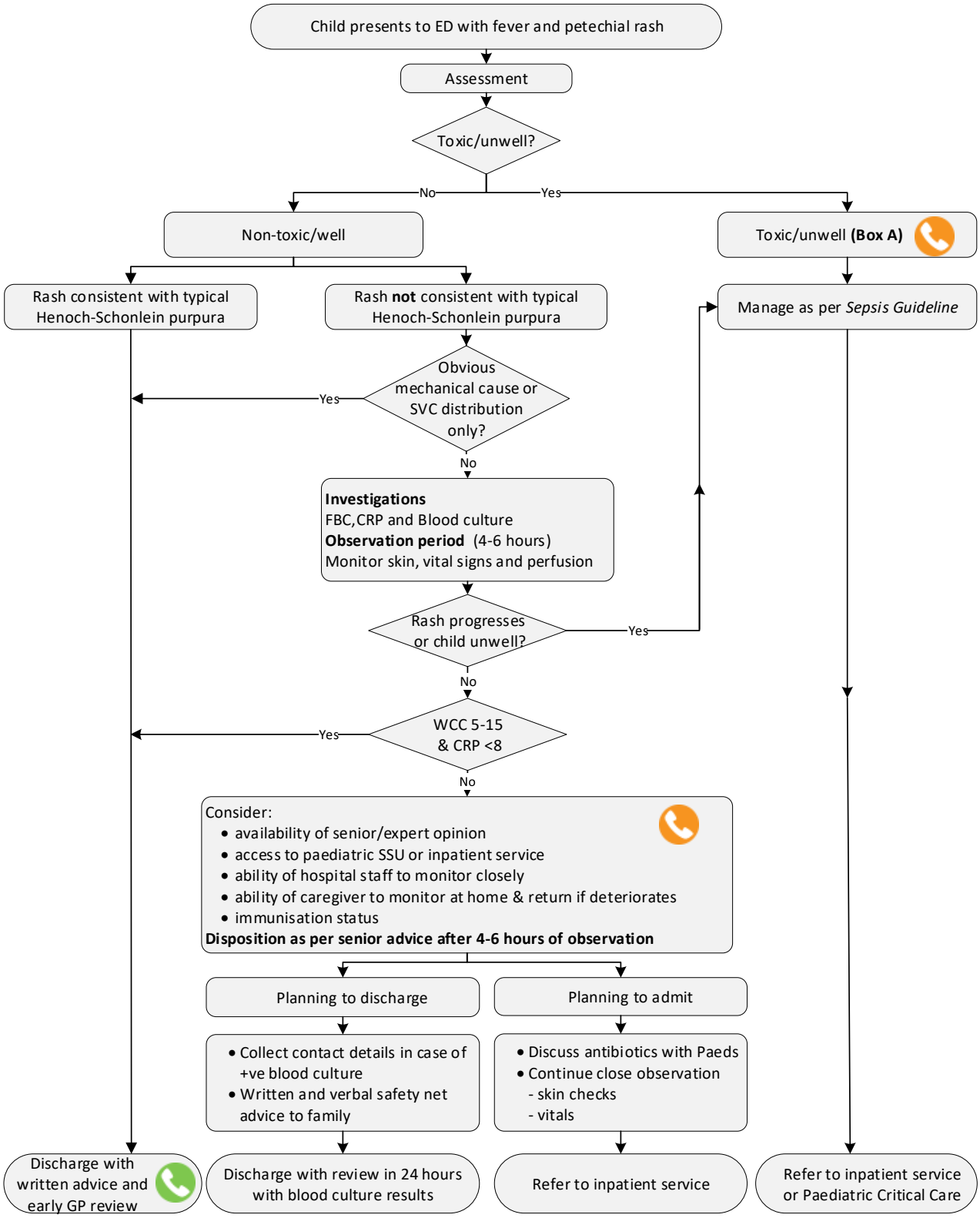

Box A: Toxic features

- Altered mental state
- Inconsolable irritability
- Marked lethargy/decrease in activity
- Poor perfusion (mottled cool peripheries, delayed central capillary refill)
- Moderate to severe dehydration (feeding/urine output ↓ by > 50%)
- Tachypnoea, increased work of breathing, grunt, weak cry
- Marked/persistent tachycardia
- Seizures

Seek senior emergency/paediatric advice as per local practices

Consider seeking senior emergency/ paediatric advice as per local practices

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