South Australian Paediatric Clinical Practice Guideline

Children with Fever aged 1-2 months

Note:

This guideline provides advice of a general nature. This statewide guideline has been prepared to promote and facilitate standardisation and consistency of practice, using a multidisciplinary approach. The guideline is based on a review of published evidence and expert opinion.

Information in this statewide guideline is current at the time of publication.

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Health practitioners in the South Australian public health sector are expected to review specific details of each patient and professionally assess the applicability of the relevant guideline to that clinical situation.

If for good clinical reasons, a decision is made to depart from the guideline, the responsible clinician must document in the patient's medical record, the decision made, by whom, and detailed reasons for the departure from the guideline.

This statewide guideline does not address all the elements of clinical practice and assumes that the individual clinicians are responsible for discussing care with consumers in an environment that is culturally appropriate and which enables respectful confidential discussion. This includes:

- The use of interpreter services where necessary,
- Advising consumers of their choice and ensuring informed consent is obtained,
- Providing care within scope of practice, meeting all legislative requirements and maintaining standards of professional conduct, and
- Documenting all care in accordance with mandatory and local requirements

Explanation of the aboriginal artwork:
The aboriginal artwork used symbolises the connection to country and the circle shape shows the strong relationships amongst families and the aboriginal culture. The horse shoe shape design shown in front of the generic statement symbolises a woman and those enclosing a smaller horse shoe shape depicts a pregnant women. The smaller horse shoe shape in this instance represents the unborn child. The artwork shown before the specific statements within the document symbolises a footprint and demonstrates the need to move forward together in unison.

Cultural safety enhances clinical safety.

To secure the best health outcomes, clinicians must provide a culturally safe health care experience for Aboriginal children, young people and their families. Aboriginal children are born into strong kinship structures where roles and responsibilities are integral and woven into the social fabric of Aboriginal societies.

Australian Aboriginal culture is the oldest living culture in the world, yet Aboriginal people currently experience the poorest health outcomes when compared to non-Aboriginal Australians.

It remains a national disgrace that Australia has one of the highest youth suicide rates in the world. The over representation of Aboriginal children and young people in out of home care and juvenile detention and justice system is intolerable.

The cumulated effects of forced removal of Aboriginal children, poverty, exposure to violence, historical and transgenerational trauma, the ongoing effects of past and present systemic racism, culturally unsafe and discriminatory health services are all major contributors to the disparities in Aboriginal health outcomes.

Clinicians can secure positive long term health and wellbeing outcomes by making well informed clinical decisions based on cultural considerations.

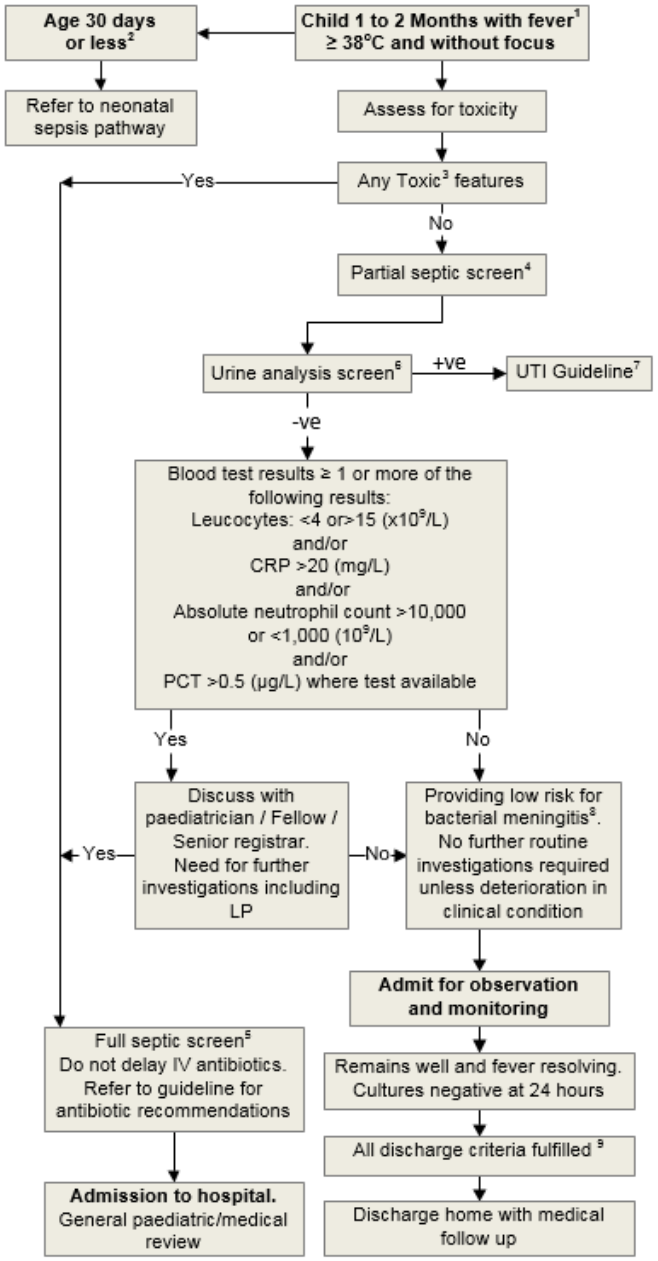
The term 'Aboriginal' is used to refer to people who identify as Aboriginal, Torres Strait Islanders, or both Aboriginal and Torres Strait Islander. This is done because the people indigenous to South Australia are Aboriginal and we respect that many Aboriginal people prefer the term 'Aboriginal'. We also acknowledge and respect that many Aboriginal South Australians prefer to be known by their specific language group(s)

Government of South Australia

Purpose and Scope of PCPG

The Management of the Children with Fever aged 1-2 months Clinical Guideline is primarily aimed at medical staff working in any of primary care, local, regional, general or tertiary hospitals. It may also assist the care provided by other clinicians such as nurses. The information is current at the time of publication and provides a minimum standard for the assessment (including investigations) and management of children with fever aged 1-2 months; it does not replace or remove clinical judgement or the professional care and duty necessary for each specific case.

Flowchart



1. Fever
≥ 38°C in ED or GP practice or at home in last 24hrs.
Infants who "felt hot" to parents but are afebrile in ED should be discussed with a senior clinician.

2. Age
Corrected gestational age for infants born <37weeks.

3. Toxic (at any assessment)
A: Activity abnormal (lethargic, irritable)
B: Breathing difficulties
C: abnormal Colour, Circulation or Cry
D: Decreased feeding (<half normal) or Decreased urine output (<4 wet nappies in 24hrs).

4. Partial septic screen
Blood culture, FBC, CRP, procalcitonin where available, sterile site PCR electrolytes, urea, creatinine **and**
urine dipstick & culture (catheter/clean-catch) **and**
Chest x-ray if strong suspicion of pneumonia (see text).
Stool specimen for enteric pathogens if indicated.

5. Full septic screen
Partial screen **plus**
Lumbar puncture (if not contraindicated) **and**
Chest x-ray.
Stool specimen for enteric pathogens if indicated.

6. Positive urinalysis
Dipstick +ve for leucocytes & nitrates **and/or** urine microscopy >10 cells.

7. Urinary tract infections
Isolated UTI without bacteraemia may be managed without LP in 1-3 months old infants.

8. Full term (≥ 37 weeks gestation)
No prolonged NICU stay.
No chronic medical problems.
No systemic antibiotics within 72 hours.
Well appearing and easily consolable.
No focus of infection on examination.

9. Discharge criteria (see text)
Infant is able to maintain adequate oral intake to maintain hydration.
Consideration of social circumstances of child, family, transport, with consideration of supports.
Education with parent information sheet, agreement with and compliance of management plan by parent/care provider.
Review by medical practitioner within 24hrs.

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Important Points

- The flow diagram included in this document has been locally adapted from the Children's hospital at Westmead. The upper limit of normal for cut off values for both CRP and PCT investigations have been lowered to better reflect local SA clinical practice. These changes along with others however may invalidate the published findings from this protocol, in particular reducing the specificity and sensitivity of identifying severe bacterial infection (SBI).
- Children assessed as non-toxic but having any abnormal laboratory findings in this document do not automatically proceed to a full septic work up. The South Australian consensus recommendation is that they discuss the need for any additional investigations with a senior doctor first. This would generally include a consultant paediatrician, fellow or senior registrar. While this approach is likely to result in a reduction in the number of LP's performed compared to the published recommendations, there is also the potential for missing meningitis cases.
- All infants under 2 months of age with fever should have a bacterial source of infection sought clinically from history, examination and appropriate directed investigations. There is a difficult balance between missing SBI and unnecessarily invasive diagnostic testing and risks of unnecessary antibiotic exposure in early life. There is no single test, combination of tests or clinical findings that can reliably predict SBI with 100% accuracy in children. Hence the variation in approaches from the literature.
- All infants under 30 days of age should be managed according to the NEONATAL SEPSIS PATHWAY and any children requiring resuscitation should be also assessed and managed immediately according to the PAEDIATRIC SEPSIS GUIDELINE before following the fever without focus guideline.

Abbreviations

mg	milligram(s)
L	litre(s)
µg	microgram(s)
µL	microlitre(s)
kg	kilogram(s)
cm	centimetre
PCR	polymerase chain reaction
HSV	herpes simplex virus
VZV	varicella-zoster virus
UTI	urinary tract infection
IV	intravenous
IM	intramuscular
LP	lumbar puncture
NPA	nasopharyngeal aspiration
CNS	central nervous system
RR	respiratory rate
CBC	complete blood count
CRP	C-reactive protein
CSF	cerebrospinal fluid
URTI	upper respiratory tract infection
WBC	white blood cell count
WCC	white cell count
NICU	neonatal intensive care unit
CFU	colony-forming unit

Definitions

Fever	> For the purposes of this guideline fever is defined as axillary temperature>=38 in hospital, or GP practice or home in the last 24 hours. > For routine monitoring of stable patients, temperature may be measured at the axilla, rectally, orally or via the ear (tympanic). Rectal temperatures are considered the gold standard as they correlate better with core temperature. Axillary temperatures have a lower correlation. Tympanic temperature measurements are less reliable and should not be preferentially used. If there is any doubt about a child's temperature, it should be repeated, and measurement of rectal temperature should be considered in infants 1-2 months age where other methods have been unsuccessful (this is rarely required in practice and appropriate local procedures should be followed as this is an invasive procedure). > It should be noted that children, but particularly neonates, may respond to serious bacterial infection with hypothermia, thus any child with low temperature or other signs of toxicity should also be evaluated for infection/ bacteraemia. > A fever recorded by thermometer at home should be approached in the same manner as a fever recorded in the hospital.
Serious Bacterial Infection (SBI)	> Includes urinary tract infection, pneumonia, meningitis, bacteraemia or septicaemia, bone and joint infection, skin and soft tissue infection and bacterial enteritis. > The risk of SBI increases with the height of fever in children less than 6 months compared to over 6 months of age. > **Note that SBI can be present with low-grade fever, in the absence of fever or with hypothermia particularly in the very young.** > In febrile children, the rate of SBI increases with decreasing age (13-25% age 0-4 weeks, 8% age 4-8 weeks, children aged 3-36 months ranges from 2 to 12%)
Occult Bacteraemia	> Defined as bacteraemia in a child who has no clinical focus of infection. > Conjugated Pneumococcal vaccine has dramatically reduced the incidence of occult Pneumococcal bacteraemia. There is, however, still too little clear epidemiological data upon which changes to the recommendations for empiric therapy of the febrile child can be based.
Fever without a focus	> Literature suggests that SBI continues to occur in the presence of concomitant viral infections, with as many as 5% of patients with confirmed viral sources having urinary tract infections or other SBIs. Infants and children presenting with a fever and signs of a viral illness (URTI, bronchiolitis, croup, skin or mucosal lesions) may have investigations performed to confirm the viral aetiology (such as an NPA for respiratory viruses and sterile site PCR on blood for HSV, VZV, enterovirus, parechovirus) but should also be assessed for bacterial infections as outlined below.

Introduction

- Fever is one of the most common acute presentations in childhood.
- Many children will be only mildly unwell and will have a focus of infection identified on history and examination. The majority of febrile illnesses in young children are caused by viruses, but up to 5% of young children with a significant fever will have a bacterial cause
- The aim of this guideline is to detect those children at risk from serious bacterial infection (SBI) presenting with fever without focus. This requires a combination of clinical judgement, specific investigations and a period of observation. If the source of fever is found, then the appropriate treatment guideline for that diagnosis should be followed.
- This guideline **MUST NOT** be used for :
    1) Neonates, 30 days of age or less, refer to NEONATAL FEVER/SEPSIS GUIDELINE available at: https://extapps2.sahealth.sa.gov.au/PracticeGuidelines/.
    2) Children with any underlying disorders that affect their immunity or might otherwise increase their risk for serious bacterial or viral infections e.g. cystic fibrosis, oncology patients, known acquired or congenital immune deficiency, those on long term immunosuppressive therapy. Refer to individual guidelines (e.g. FEBRILE NEUTROPENIA IN PAEDIATRICS) or seek specialist guidance.
    3) Any patient that meets criteria for sepsis or severe sepsis/septic shock please refer to local sepsis guidelines and seek specialist paediatric advice.
    4) Children aged >2 months of age.

    If a child is already receiving antibiotics, any clinical signs may be more subtle and clinicians require a higher index of suspicion for the possibility of partially treated infections.
- The degree or height of fever, its speed of onset and its response to antipyretics are all poor predictors of serious illness by themselves. Any febrile child who appears unwell or 'toxic' should be investigated and treated according to the PAEDIATRIC SEPSIS PATHWAY irrespective of the degree or height of fever.

Assessment

South Australian Ambulance Service (SAAS) Assessment and Referral

- Primary and secondary survey should be completed, with a focus on assessing for the signs of toxicity as outlined in the table 1 below.
    - If shock is present it should be immediately managed with IV fluid resuscitation and intravenous antibiotics as per the NEONATAL OR PAEDIATRIC SEPSIS PATHWAY guideline available at: https://extapps2.sahealth.sa.gov.au/PracticeGuidelines/.
    - In toxic infants with or without a petechial/purpuric rash, consideration should be given to a single immediate dose of IV/IM benzylpenicillin.

    This should be done in consultation with the on duty ambulance service medical officer / clinical support.
- Prehospital measurement of temperature may not be possible or reliable, and a domestic thermometer may read falsely low. If temperature can be formally assessed, it should be done via the axilla. A fever measured at home by the parents should be accepted as a documented fever. If temperature cannot be measured but the infant/child appears unwell or toxic to either prehospital providers or the parents, the child should receive further formal medical assessment.
- Non-toxic infants aged 1-2 months with a recorded or reported temperature ≥38 degrees should be formally and promptly assessed by a medical practitioner in a clinical setting where investigations such as blood cultures, lumbar puncture and urinalysis can be safely performed.

- Antipyretics are not necessary in the pre-hospital setting if a fever is present - they are primarily a comfort measure but do not prevent complications such as febrile convulsions. Parents may decide to give antipyretics at their own discretion (If used, paracetamol is preferred).

Primary care / outpatient history and examination

- Every child presenting with fever should have a thorough history taken and examination focusing on symptoms and signs of specific infections as well as general assessment to their degree of illness (table 1).
- The child's immunisation status must also be checked, especially regarding Pneumococcal, Meningococcal and Haemophilus immunisations
- Younger infants usually present with non-specific symptoms and signs of illness, and localising signs of disease are often lacking. General aspects of the child's behaviour and appearance provide the best indication of whether a serious infection is likely.
- Because bacteraemia can occur with focal infections, it is recommended that when a source of infection is identified on physical examination, further evaluation be considered if the doctor judges that focal findings are insufficient to explain the degree of the child's fever and illness. If the source of the fever is found, then appropriate management should be instituted.

Table 1 — Extended assessment of Toxicity

	Well	Unwell	Toxic
Alertness / Activity	Strong cry or not crying Content, smiles Stays awake Normal response to social cues	Drowsy / decreased activity Poor smile/response to social cues Irritable	Wakes only with prolonged stimulation or unable to rouse Weak/high pitched or continuous cry Bulging fontanelle
Breathing	Normal work of breathing	Nasal flaring	Chest in-drawing RR>60 Grunting
Colour / Circulation	Normal lips, skin and tongue colour	Pallor per caregiver	Pale, mottled Blue, ashen Cool Peripheries Bounding pulses or wide pulse pressure
Fluid / Urine output	Normal skin and eyes Moist mucous membranes	Poor feeding in infant Dry mucous membranes Reduced urine output	Reduced skin turgor Bilious vomiting Decreased fluid intake by <1/2 normal Decreased urine output less than 4 wet nappies over 24 hours
Other		New lump >2cm	Rigors, seizure Petechial rash Appears very unwell to healthcare professional Persistent tachycardia

Note: Any child assessed as being "toxic" must be seen by the most experienced Medical Officer available as soon as possible.

Investigations and Management of fever without focus

Investigations

- Children at higher risk of SBI should usually have appropriate investigations performed according to their age and risk group, as per flow chart.

Infants aged <1 month

Assessment and management

- Refer to NEONATAL SEPSIS PATHWAY for assessment, investigation and management for all infants less than 30 days of age available at: https://extapps2.sahealth.sa.gov.au/PracticeGuidelines/.

Admission Criteria

- All neonates with fever and without a source of infection should be hospitalized. If this necessitates transfer from a rural facility, the first dose of antibiotics should usually be given prior to transfer.

Referral Criteria

- Infants with fever who show any signs of toxicity and/or showing signs of meningococcal disease should be urgently reviewed by an experienced paediatrician and consideration given to referral to paediatric intensive care after need for any fluid resuscitation and antibiotics have been given.
- Retrieval to intensive care, if required, should be arranged by calling MedSTAR kids.

Infants aged 1-2 months

- Referral for immediate investigations at an appropriate facility should be strongly considered in all infants aged 1-2 months of age presenting with fever and without focus.

Toxic on assessment

High risk category

- All Infant 1-2 months with any signs or symptoms in the “toxic” category should be assessed for sepsis/shock and receive appropriate resuscitation measures first.
- Infants should receive a full septic screen as below including LP (providing no contraindications) and commence empiric intravenous antibiotic therapy as soon as possible.
- The following investigations are recommended as minimum for a full septic screen:
  - CBE with differential (+/- film)
  - Blood culture
  - Sterile site PCR panel from blood (HSV, VZV, enterovirus, parechovirus, pneumococcal, meningococcal)
  - CRP
  - Pro-calcitonin (where testing is available)
  - Urinalysis and urine microscopy, urine culture (SPA/catheter/clean catch specimen)
  - Lumbar puncture (LP) should be performed in any child with signs or symptoms of meningitis and/or those appearing “toxic” and without contra-indications.
  - CSF request should include Microscopy/Gram staining/Culture/ PCR panel for CNS pathogens and biochemistry where ever possible.
- Chest X-ray, especially if increased work of breathing OR any respiratory symptoms or low oxygen saturation (<=93% in room air) OR fever >39 C and WBC>20,000 (as screen for occult bacterial pneumonia).
- Combined nose/throat swab for respiratory viral screen if appropriate.

Non-toxic on assessment

Low risk category

> A child is considered lower risk from serious infection providing they:

a) Do not have any of the following abnormal laboratory results including: WCC >15 000 or <4000, or absolute neutrophil counts >10,000 or < 1,000, and /or raised CRP>20, and/or PCT >0.5.
b) Were born at full term (>37 weeks gestation)
c) Have had no previous prolonged NICU stay
d) Have no chronic medical problems/diagnoses
e) Did not receive antibiotic within 3 days of presentation
f) Well appearing and easily consolable
g) No evidence of any infection clinically

Lower-risk infants without any toxic features on assessment and with normal investigations above still require hospital admission for a period of regular observation. Some of these infants may then be discharged providing they improve clinically and meet the discharge criteria.

Intermediate category

A non-toxic appearing child is considered may be considered at intermediate risk from serious infection if they have 1 or more of the following abnormal laboratory results including WCC >15 000 or <4000, or absolute neutrophil counts >10,000 or < 1,000, and /or raised CRP>20, and/or PCT >0.5.

These infants may require further investigations including full septic screen as above, before considering any empiric antibiotic therapy.

It is recommended that these infants are always discussed with a senior doctor (Paediatrician/Fellow or senior Registrar) before performing any additional investigations.

All children in this category will require admission to hospital for observation and treatment if clinically indicated.

Recommended empiric antibiotic therapy

> Infants requiring a full sepsis screen should be commenced and continued on empiric therapy below, until meningitis can be excluded or if the CSF status is unknown or unable to be interpreted (i.e. bloody tap, child too sick for LP, previous antibiotic therapy) then commence as per eTGA guidelines:

- **Cefotaxime 50 mg/kg IV 6 hourly**

  PLUS

- **Amoxicillin 50mg/kg/Dose IV 6 hourly**

> **Consider adding intravenous acyclovir (20mg/kg/dose 8 hourly) for empiric treatment of HSV if this is clinically suspected or has if patient has had known contact with a person with active HSV infection.**

For infants at increased risk of MRSA infection (see below) add vancomycin to the above regimens 30mg/kg/dose up to 1.5 g IV 12 hourly.

Risk factors for infection with MRSA include:

- residence in an area with a high prevalence of MRSA (e.g. Northern Territory; remote communities in northern Queensland; regions north of metropolitan Perth in Western Australia, especially the Kimberly and Pilbara)
- previous colonisation or infection with MRSA, particularly if recent or associated with the current episode of care.
- frequent stays, or a current prolonged stay, in a hospital with a high prevalence of MRSA, particularly if associated with antibiotic exposure or recent surgery
- exposed to a care giver colonised or infected with MRSA.

If Meningitis can be excluded in infants aged 1-2 months:

- Where all CSF parameters are considered to be within the normal range (see APPENDIX 2) and Gram stain is negative then it would be reasonable to give according to the eTGA guidelines:
  - **Amoxicillin 50mg/kg/dose IV 6 hourly**

    PLUS
  - **Gentamicin* 7.5 mg/kg IV once daily.**

  Gentamicin levels should be monitored according to local guidelines.

  *If gentamicin cannot be used then Amoxicillin plus Cefotaxime is recommended using the doses as above.

  For infants at increased risk of MRSA infection (see criteria above) add vancomycin to the above regimens 30mg/kg/dose up to 1.5 g IV 12 hourly.
- The use of antipyretics should not be routine for all febrile infants, but it should be considered in those who appear distressed or unwell.

Referral Criteria

- Infants with fever who are shocked, unarousable or showing signs of meningococcal disease should be urgently reviewed by an experienced paediatrician and consideration given to referral to paediatric intensive care after appropriate antibiotics have been given.
- Retrieval to intensive care, if required, should be arranged by calling MedSTAR kids on (08) 8222 4222.

References

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2. Aldridge P, Rao A, Sethumadavan R, et al. Fever under 3 months and the full septic screen: Time to think again? A retrospective cohort study at a tertiary-level paediatric hospital. J Paed Child Health, 2018;54:272-273.
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Document Ownership & History

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If so, which version? **V2**
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If so, which policy (title)? **Fever without Focus in Children (excluding neonates)**

Approval Date	Version	Who approved New/Revised Version	Reason for Change
04/03/20	V3	Deputy Chief Executive, Department for Health and Welfare	Name change and formal review in line with 1-5 year scheduled review timeline.
01/07/13	V2	SA Safety and Quality Strategic Governance Committee	Formally reviewed in line with 2 year scheduled timeline for review
09/03/12	V1	SA Safety and Quality Strategic Governance Committee	Original SA Safety and Quality Strategic Governance Committee approved version.

Appendices

APPENDIX 1 – Urine Collection Methods

Screening methods

1. Bag Urine

Useful for collecting urine for urinalysis for screening purposes in infants and children who cannot void on request (approx. 0-3 years - not recommended in neonates)

This method is only valid if negative and clinical suspicion is low. There is a high risk for contamination and it is therefore unreliable if positive even when a pure growth of organism is cultured.

A bag sample of urine should only be sent to the laboratory for urinalysis and culture if a definitive sample cannot be obtained and treatment needs to be started urgently (e.g. a septic neonate with dry tap on suprapubic aspiration [SPA]).

(*Some centres use sterile cotton balls in a nappy (after cleaning the area) to collect a sample equivalent to a bag specimen in non-toxic looking babies. There is some evidence for this.)*

2. Clean Catch

Requires careful cleansing of skin and good technique

These specimens can be readily contaminated by skin commensals.

A pure growth of > 10^5 cfu/ml in association with pyuria may indicate infection, but is less reliable than a definitive sample though better than a bag sample.

Definitive methods

1. Midstream specimen of urine (MSU)

This can be obtained from children who can void on request. Clean catch specimens, particularly in females, are frequently contaminated.

A pure growth of > 10^5 cfu/ml (for coliforms) or >104 for Gram positive pathogens in association with pyuria indicates infection.

2. In-Out Catheter Specimens

Useful from about 6 months of age but can be performed as young as neonates.

These samples, once obtained, should always be sent for culture irrespective of microscopy screening results. Any growth >10^5 cfu/ml (for coliforms) in association with pyuria indicates infection. Note: the first part of the specimen can be contaminated and should ideally be discarded. Consider aspirating the catheter with 2 syringes and taking the 1st 3 ml in the first syringe which should be discarded if sufficient urine is collected with the 2nd syringe.

3. Supra-pubic aspiration (SPA)

Mostly used for infants less than 12 months but can be used up to 2 years of age.

These samples, once obtained, should always be sent for culture irrespective of microscopy results. Any pure growth from SPA urine usually indicates infection but contamination by skin commensals or faecal flora may produce a mixed growth.

Before attempting SPA, ultrasound guidance or a bladder scanner should be considered to demonstrate presence of urine in the bladder where this is available.

Urine microscopy>10 WCC/ uL with or without organisms should raise suspicion of possible UTI. Urine dipstick analysis provides clinicians with rapid result and should be performed on all urine collected for suspected UTI.

APPENDIX 2 – CSF Interpretation

Normal values

- The presence of any neutrophils in the CSF is unusual in normal children and should raise concern about bacterial meningitis
- Meningitis can occur in children with normal CSF microscopy. If it is clinically indicated, children who have a 'normal' CSF should still be treated with IV antibiotics +/- IV antiviral if indicated pending STERILE SITE PCR panel and routine culture result.

	White cell count		Biochemistry	
	Neutrophils ($\times 10^6$/L)	**Lymphocytes** ($\times 10^6$/L)	**Protein** (g/L)	**Glucose** (CSF: blood ratio)
Normal (>1 month of age)	0	<5	<1.0	>0.6 (or >2.5mmol.L)

Interpretation of CSF results

- Gram stain may be negative in up to 60% of cases of bacterial meningitis even without prior antibiotics.
- Neither a normal Gram stain, nor a lymphocytosis excludes bacterial meningitis.
- Neutrophils may predominate in viral meningitis even after the first 24 hours.
- CSF findings in bacterial meningitis may mimic those found in viral meningitis (particularly early on). It may be possible with modest accuracy to judge whether bacterial or viral is more likely based on CSF parameters. However if the CSF is abnormal the safest course is to treat as if it is bacterial meningitis

Other factors affecting results

	White cell count		Biochemistry	
	Neutrophils ($\times 10^6$/L)	**Lymphocytes** ($\times 10^6$/L)	**Protein** (g/L)	**Glucose** (CSF: blood ratio)
Bacterial Meningitis	100-10,000 but may be normal	Usually <100	>1.0 but may be normal	<0.4 but may be normal
Viral Meningitis	Usually <100	10-1000 but may be normal	0.4-1.0 but may be normal	Usually normal

1. **Antibiotics prior to lumbar puncture**

   Prior antibiotics usually prevent the culture of bacteria from the CSF. Antibiotics are unlikely to significantly affect the CSF cell count or biochemistry in samples taken <24 hours after antibiotics.

2. **Seizures**

   Recent studies do not support the earlier belief that seizures can increase cell counts in the absence of meningitis. It is safest to assume that seizures do not cause an increased CSF cell count.

3. **Traumatic tap**

   Some guidelines suggest that in traumatic taps 1 white blood cell can be allowed for every 500 to 700 red blood cells and 0.01g/L protein for every 1000 red cells.

   However, rules based on a 'predicted' white cell count in the CSF are not reliable.

   In order not to miss any patients with meningitis, guidelines relating to decisions about who not to treat for possible meningitis need to be conservative. The safest interpretation of a traumatic tap is to count the total number of white cells, and disregard the red cell count. If there are more white cells than the normal range for age, then the safest option is to treat.

Sterile site PCR

Blood and CSF PCR are routinely available for Neisseria meningitidis, Pneumococcus, Enterovirus, Herpes Simplex, VZV and parechovirus.

As results are not immediately available, they will only help with decisions concerning need for ongoing antibiotic and antiviral therapy.

APPENDIX 3 – Contraindications to Lumbar Puncture

- Coma: absent or non-purposeful response to painful stimulus.
- Signs of raised intracranial pressure: e.g. drowsy, diplopia, abnormal pupillary responses, unilateral or bilateral motor posturing or papilloedema (NB. papilloedema is an unreliable and late sign of raised ICP in meningitis; a bulging fontanelle in the absence of other signs of raised ICP is not a contraindication).
- Cardiovascular compromise/ shock
- Respiratory compromise
- Focal neurological signs or seizures
- Recent seizures (within 30 minutes or not regained normal conscious level afterwards).
- Coagulopathy/thrombocytopenia
- Local infection (in the area where an LP would be performed)
- The febrile child with purpura where meningococcal infection is suspected with risk of disseminated intravascular coagulation.

APPENDIX 4 – Investigations

1. **CXR** should be performed in all infants with fever and no focus under 3 months of age. Indications for those over 3 month's age include: increased respiratory effort, tachypnoea, SaO2<93% in room air and WCC>20,000.
2. **Investigation criteria suggestive of infection in presence of fever:**

   WCC <5,000 OR >15000

   Absolute neutrophil count <1,000 OR >10,000

   CRP>20

   CSF>5 WBC

   Urine microscopy with >10 WBC/uL or bacterial seen

   CXR signs of consolidation, collapse

3. **Lumbar puncture**

   Should be performed (providing no contra-indications) in all infants under 3 months of age with fever and without focus. For older febrile children without focus, indications include: any unwell appearing child (especially under 12 months age where it is difficult to clinically evaluate signs of meningitis), full or bulging fontanelle, vomiting, lethargy and drowsiness, seizures.

APPENDIX 5 – Discharge Criteria

Criteria for discharging and infant or child with fever without focus should usually include:

- Age greater than 3 months
- No toxic appearance features
- No indications for ongoing intravenous therapy
- No higher risk laboratory investigation criteria
- Able to maintain adequate oral intake to maintain hydration
- Consideration of social circumstances of child, family, transport, etc.
- Education with parent information sheet, agreement with and compliance of management by parent/care provider
- Review by medical practitioner within 24 hours