South Australian Paediatric Practice Guidelines

fever without focus

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.

SA Health does not accept responsibility for the quality or accuracy of material on websites linked from this site and does not sponsor, approve or endorse materials on such links.

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

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

Government of South Australia
SA Health

Management summary and flowchart for fever

Age	Description	Management
< 1 month	Axillary temperature **≥ 38°C**	Referral for immediate investigation at an appropriate facility should be strongly considered. Full sepsis work-up and admission for empiric antibiotics
1-3 months	Axillary/tympanic temperature **≥ 38°C**	Referral for immediate investigation at an appropriate facility should be strongly considered. Full sepsis workup: CBE, blood culture, urine culture (SPA/catheter), CXR ± LP If child previously healthy, looks well, WCC 5 000 – 15 000, urine microscopy normal, CXR clear, and negative CSF (if taken), admit for observation off antibiotics or *consider* discharge home (see main text for criteria) If child unwell or above criteria are not all satisfied, admit to hospital for observation ± empiric iv antibiotics

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

3 months-3 years	Axillary/tympanic temperature **>39°C** and no clear source of infection	Child well appearing, fully immunised, and over 6 months of age	Check urine Discharge home on symptomatic treatment; Arrange medical review within 24 hrs, or sooner if deteriorates
		Child looks unwell, is younger than 6 months or is not fully immunised	Check urine Bloods: WCC, CRP, blood culture Consider antibiotics and discharge, or observation in hospital off antibiotics. *See guidelines below for details*
		Child toxic	Assess and treat for shock. Referral for immediate investigation at an appropriate facility. Full sepsis workup: CBE, CRP, electrolytes, venous blood gas, blood culture, SPA or catheter urine, CXR (if respiratory symptoms / signs or WCC>20,000), lumbar puncture. *Note*: *LP should not be performed in a child with impaired conscious state or focal neurological signs.* Admit for empiric i.v antibiotics Consider referral to PICU

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

Definitions and abbreviations

- **Fever:**
  - Temperature may be measured at the axilla, rectally, orally or via the ear (tympanic). Rectal temperatures are considered the gold standard. Tympanic temperatures have been found to correlate well with rectal temperatures especially in those over 2 years of age. Axillary temperatures have a lower correlation. If there is any doubt about a child's temperature, it should be repeated, and measurement of rectal temperature should be considered in infants less than 2 years of 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).
  - Fever is defined as a rectal temperature ≥38°C measured in the hospital or on parental history. This correlates with a tympanic or axillary temperature of approximately 37.5°C.
  - 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 be evaluated for infection.
  - 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 of all age groups.
  - ***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.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

- **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) may have investigations performed to confirm the viral aetiology (such as an NPA for respiratory viruses) but should also be assessed for other sources of bacterial infection as outlined below.
  - **Fever of unknown origin (FUO**) or **Pyrexia of unknown origin (PUO)** is defined as a fever without focus that has been present for 3 weeks or more (sometimes defined as one week or more). This should be considered as a separate entity from simple fever without a focus, and its investigation and management are not part of the scope of this guideline.

Important points

- Children under 36 months with fever should have a bacterial source of infection sought clinically on history and examination.
- Children at higher risk of serious bacterial infection include:
  - infants under 3 months of age with temperature ≥38°C;
  - infants aged 3-6 months with temperature >39°C; and
  - children aged 6-36 months who are not fully immunised or appear unwell.

  These groups should usually have investigations performed.
- Well appearing children 6-36 months with temperature ≥39°C may have a less invasive approach to management.
- Children who appear toxic should be assessed and treated for shock immediately, a full septic screen should be done and empiric antibiotics should be commenced.
- See also **MANAGEMENT SUMMARY and FLOWCHART**

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 with serious causes of fever and to find those at high risk for bacteraemia, without subjecting too many children to too many procedures or tests. This requires a combination of clinical judgement, specific investigations and observation. If the source of fever is found, then the appropriate guideline for that diagnosis should be followed.
- This guideline should not be used for children with 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 immune deficiency, long term steroid treatment).
- If the child is already taking antibiotics, abnormal clinical signs may be more subtle and a higher index of suspicion is needed for partially treated infections.
- The degree of fever, its speed of onset and its response to antipyretics are poor predictors of serious illness by themselves. Any febrile child who appears unwell or 'toxic' should be investigated and treated, irrespective of the degree of fever.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

Assessment

South Australian Ambulance Service (SAAS) Assessment and Referral:

- Primary and secondary survey should be completed, with a focus on assessing for signs of toxicity (see table below), including:
  - Lethargy, poor conscious state;
  - Respiratory distress;
  - Evidence of poor perfusion such as pallor, mottled or cool skin.
- Any child with features of toxicity should be assessed for signs of shock.
  - If shock is present it should be immediately managed with IV fluids per appropriate pre-hospital protocols.
  - 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.
  - After stabilisation, toxic infants and children should be immediately referred for further medical management.
- 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 either axillary or tympanic routes. 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 assessment.
- Non-toxic infants aged 0-3 months with a recorded or reported temperature ≥38 degrees should usually be assessed promptly in a setting where investigations such as blood cultures, lumbar puncture and urinalysis can be performed.
- Non-toxic infants aged 3 months – 36 months with a recorded or reported fever over 39 degrees should usually receive further assessment from a medical practitioner.
- Antipyretics (such as paracetamol or ibuprofen) 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. For Paracetamol and Ibuprofen dosing recommendations, see APPENDIX 3.

- **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 degree of illness.
- The child's immunisation status must also be checked, especially regarding Pneumococcal, Meningococcal and Haemophilus immunisations.
- Young 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.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

- **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 indrawing RR>60 Grunting
Colour / Circulation	Normal lips, skin and tongue colour	Pallor per caregiver	Pale, mottled Blue, ashen
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
Other		New lump >2 cm	Appears very unwell to healthcare professional

NB: *Any child assessed as being "toxic" must be seen by the most experienced medical officer available and should be admitted to hospital for parenteral antibiotics.*

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

Investigations and management of fever without focus

Investigations all age groups:

- Children at higher risk of SBI should usually have appropriate investigations performed according to their age and risk group, outlined below.
- Studies performed prior to the introduction of universal pneumococcal vaccination showed that the total WCC could be used as a predictor of pneumococcal bacteraemia.
  However, with invasive pneumococcal disease now uncommon, the total WCC, CRP and other parameters such as procalcitonin have not proven reliable as absolute predictors of serious bacterial infection and should be used with caution.
- CRP is often measured as a marker of illness progression – its initial value should not influence initial management of the febrile child, but serial levels may provide assistance for ongoing management.

Infants less than 1 year of age:

- Referral for immediate investigation at an appropriate facility should be strongly considered in all infants less than 1 month of age with fever seen by any health provider.
- Investigations - the following investigations should usually be done on all patients:
  - CBE with differential and CRP
  - Blood culture
  - Urinalysis and culture (SPA/catheter – see APPENDIX 1 for appropriate specimen collection methods)
  - Lumbar puncture
  - Chest X-ray
  - Stool culture should be strongly considered in the appropriate clinical setting
- Antibiotic treatment is usually indicated pending blood culture results and should be dosed according to the following:
  - If CSF negative (see APPENDIX 2 for CSF interpretation):
    - Ampicillin
      week 1 of life: 25 mg/kg/dose iv 12 hourly
      week 2-4 of life: 25 mg/kg/dose iv 6 hourly **plus**
    - Gentamicin* – see APPENDIX 3 for neonatal dosing guidelines. Gentamicin levels should be monitored according to local guidelines.
      **A 3rd generation cephalosporin is recommended instead of gentamicin in some literature and may be considered in some circumstances*
    - NB: add flucloxacillin if Staphylococcal infection is suspected
      (e.g. broken skin).
      week 1 of life: 25-50 mg/kg/dose iv 12 hourly
      week 2-4 of life: 25-50 mg/kg/dose iv 8 hourly

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

- If CSF positive or unknown (bloody tap, child too sick for LP etc):
  - Ampicillin
    week 1 of life: 100 mg/kg/dose iv 12 hourly
    week 2-4 of life: 100 mg/kg/dose iv 6 hourly **plus**
  - Cefotaxime – see APPENDIX 3 for neonatal dosing guidelines
  - Consider aciclovir if the child has had contact with a person with a herpes infection (see APPENDIX 3 for neonatal dosing guidelines)
- In the case of difficult IV access where ***all appropriate cultures have already been sent***, single IM doses of ampicillin and cefotaxime should be considered prior to transport to an tertiary facility where IV access can be obtained.

- The use of paracetamol should not be routine for all febrile infants, but it should be considered in those who appear distressed or unwell. For Paracetamol dosing recommendations, see APPENDIX 3.
- Admission Criteria
- All infants <1 month of age with fever without source should usually be hospitalised. 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 are shocked, unrousable 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.

Infants 1-3months of age:

- Referral for immediate investigation at an appropriate facility should be strongly considered in all infants aged 1-3 months of age with fever seen by any health provider.
- Investigations - the following investigations should usually be done on all patients:
  - CBE with differential and CRP
  - Blood culture
  - Urinalysis and culture (SPA/catheter)
  - Lumbar puncture (may be omitted in the child without signs of toxicity who is going to be observed off antibiotics but should be done prior to any antibiotics being started)
  - Chest X-ray
  - Stool culture should be strongly considered in the appropriate clinical setting
- Admission & Discharge Criteria
  - Any infant 1-3 months of age with fever without source who is identified as high-risk clinically (appears unwell or toxic) or by laboratory data (WCC >15 000 or <5000 or positive findings on other investigations) should usually be hospitalised and commenced on parenteral antibiotics immediately. If this necessitates transfer from a rural facility, the first dose of antibiotics should usually be given prior to transfer.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

- Low-risk infants (appears well, WCC 5,000-15,000 and all other investigations normal) 1-3 months of age may be managed as outpatients or inpatients **off** antibiotics.
  This decision must take into consideration:
- family circumstances (such as access to transportation, proximity to follow-up services, etc).
- availability of review (must be reviewed within 24 hrs by primary care provider).

- Antibiotic treatment when indicated should be:
  - If CSF negative (see APPENDIX 2 for CSF interpretation):
  - Ampicillin 25 mg/kg/dose iv 6 hourly **plus**
  - Gentamicin* 8 mg/kg iv daily. Gentamicin levels should be monitored according to local guidelines.
    **A 3rd generation cephalosporin is recommended instead of gentamicin in some literature and may be considered in some circumstances*
  - NB: add flucloxacillin 25-50 mg/kg/dose iv 6 hourly if Staphylococcal infection is suspected (e.g. broken skin)
  - If CSF positive or unknown (bloody tap, child too sick for LP etc):
  - Ampicillin 25 mg/kg/dose iv 6 hourly **plus**
  - Cefotaxime 50 mg/kg iv 6 hourly
  - Consider aciclovir if the child has had contact with a person with a herpes infection (see APPENDIX 3 for neonatal dosing guidelines)
- In the case of difficult IV access where ***all appropriate cultures have already been sent***, ceftriaxone 100mg/kg IM may be considered - either as a single dose prior to transport to a tertiary facility, or daily as an inpatient at an outlying hospital until cultures are all negative.
- The use of paracetamol should not be routine for all febrile infants, but it should be considered in those who appear distressed or unwell. For Paracetamol dosing recommendations, see APPENDIX 3.
- Referral Criteria
- Infants with fever who are shocked, unrousable 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.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

Children 3-36 months:

- **Child looks well, is older than 6 months AND is fully immunised:**
  - Check urine (see APPENDIX 1 for appropriate specimen collection).
  - Discharge for review by GP within 24hrs unless:
    - concerns that review will not be possible
    - adverse psychosocial factors e.g. live long distance from medical care
  - The use of antipyretics should not be routine for all febrile children, but they should be considered in those who appear distressed or unwell. The use of either paracetamol or ibuprofen is recommended over 3 months of age, but they should not be administered simultaneously or alternately. If the child does not respond to the first dose of one agent, then the alternative drug should be considered as a substitute. For dosing recommendations, see APPENDIX 3.
- **Child looks unwell, is not fully immunised *OR* is younger than 6 months of age:**
  - Check urine (see APPENDIX 1 for appropriate specimen collection).
  - CBE, CRP and blood culture should be strongly considered in all patients
  - If WCC > 20,000, CXR should usually be performed irrespective of symptoms
  - Consider lumbar puncture, especially in children younger than a year of age who appear unwell (meningism can be unreliable in this age group).
  - Children in this category who appear stable after a period of observation in the outpatient setting may be managed with a single dose of parenteral antibiotics (such as ceftriaxone 50mg/kg IV/IM) with discharge and review by a primary care provider within 24 hrs.
  - If there are concerns about the child's clinical status, about review occurring or psychosocial concerns, consider overnight admission in an appropriate facility with or without parenteral antibiotics, or referral for a community nurse to review at home within 24 hours where this is available.
  - If cultures are positive for *Streptococcus pneumoniae*, a single dose of ceftriaxone 50 mg/kg IV/IM is felt to be therapeutic unless the child remains unwell or deteriorates when reassessment and possible admission will be required.
  - The use of antipyretics should not be routine for all febrile children, but they should be considered in those who appear distressed or unwell. The use of either paracetamol or ibuprofen is recommended over 3 months of age, but they should not be administered simultaneously or alternately. If the child does not respond to the first dose of one agent, then the alternative drug should be considered as a substitute. For dosing recommendations, see APPENDIX 3.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

- **Child toxic appearing:**
  - Assess airway, breathing and circulation and if shock is present, treat immediately per local protocols.
  - Once stabilised, infants or children with fever who are shocked, unrousable or showing signs of meningococcal disease should be urgently reviewed by an experienced paediatrician.
  - Full septic screen
    - CBE, CRP, electrolytes, venous blood gas and blood culture
    - Definitive urine sample
    - CXR (if respiratory symptoms or signs or WCC>20,000)
    - Lumbar puncture. *Note:* ***LP should not be performed*** *in a child with impaired conscious state or focal neurological signs*
  - Commence antibiotics immediately:
    - If CSF negative:
      - Ceftriaxone 50 mg/kg iv daily **plus**
      - Flucloxacillin* 25-50 mg/kg/dose iv 6 hourly **consider vancomycin if high prevalence / risk of MRSA*
    - If CSF positive or unknown (bloody tap, child too sick for LP etc):
      - Ceftriaxone 100 mg/kg iv daily **plus**
      - Flucloxacillin 25-50 mg/kg/dose 6 hourly
      - Consider adding vancomycin 30 mg/kg iv 12 hourly if meningitis suspected (to cover Pneumococcus).
  - Antipyretic medications may be considered (see APPENDIX 3).
  - Admit to hospital, or transfer to appropriate facility for admission after first dose of antibiotics is given. The admitting doctor should be notified as soon as possible to facilitate appropriate ongoing management.
  - Referral Criteria
  - Infants and children who are shocked, unrousable or show signs of meningococcal disease should have urgent consideration given to referral to a paediatric intensive care unit. Retrieval to intensive care, if required, should be arranged by calling MedSTAR kids on (08) 8222 4222.

Children older than 36 months:

Significant bacterial infection without a clinical focus is rare in this age group. The majority of children can be managed with symptomatic treatment. However, if the child is clinically toxic appearing, they should have appropriate investigations and treatment as per the recommendations for the child 3-36 months of age.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

Children with chronic medical conditions:

For children who have chronic medical conditions, it is advisable to speak with the child's usual paediatrician or specialist when they present with a febrile illness. Where the child's usual doctor is unavailable, consideration should be given to speaking with an on-call paediatrician or specialist at the Women's and Children's hospital, by calling (08) 8161 7000.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

Appendicies

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 (eg 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)**
   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 >10^4 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 2 ml in the first syringe which should be discarded if sufficient urine is collected with the 2nd syringe.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

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.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

APPENDIX 2 – CSF INTERPRETATION

NORMAL VALUES

	White cell count		Biochemistry	
	Neutrophils (x 10^6/L)	Lymphocytes (x 10^6/L)	Protein (g/L)	Glucose (CSF:blood ratio)
Normal (<1 month of age)	0	<11	<1.0	>0.6 (or >2.1mmol/L)
Normal neonate (>1 month of age)	0	<5	<1.0	>0.6 (or >2.5mmol.L)

- 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 pending cultures.
- CSF white cell count and protein level are higher at birth than in later infancy and fall fairly rapidly in the first 2 weeks of life. In the first week, 90% of normal neonates have a white cell count less than 18, and a protein level < 1.3 g/L.

INTERPRETATION OF CSF RESULTS

	White cell count		Biochemistry	
	Neutrophils (x 10^6/L)	Lymphocytes (x 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

- 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.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

- 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

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.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

Additional tests

1. **PCR**

   PCR is routinely available for Neisseria meningitidis, Pneumococcus, Herpes Simplex and Enterovirus.
   As results are not immediately available, they will only help with decisions concerning discontinuing treatment.
   Enterovirus PCR should be requested on CSF from patients with clinical and/or CSF features of viral meningitis.
   HSV PCR should be requested for patients with clinical features of encephalitis.
   Meningococcal and Pneumococcal PCR are particularly useful in patients with a clinical picture consistent with meningococcal meningitis, but who have received prior antibiotics.

2. **Bacterial antigens**

   CSF bacterial antigen tests have low sensitivity and specificity. They should therefore never influence treatment decisions and have little role (f any) in current management.

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

APPENDIX 3 - DRUG DOSAGE GUIDELINES

GENTAMICIN

Gestation (corrected age)	Dose (IV)	Dosing frequency
<33 weeks	6 mg/kg	Every 48 hours
33-35 weeks	4.5 mg/kg	Every 24 hours
36-41 weeks	5 mg/kg	Every 24 hours
42-44 weeks	7.5 mg/kg	Every 24 hours
Older infants	8 mg/kg	Every 24 hours

CEFOTAXIME

Gestation	Current age	Dose	Dosing frequency
< 30 weeks	<28 days	25-50 mg/kg/dose	Every 12 hours
	>28 days	25-50 mg/kg/dose	Every 8 hours
30-37 weeks	<14 days	25-50 mg/kg/dose	Every 12 hours
	>14 days	25-50 mg/kg/dose	Every 8 hours
>37 weeks	<7 days	25-50 mg/kg/dose	Every 12 hours
	>7 days	25-50 mg/kg/dose	Every 8 hours

ACICLOVIR

Gestation	Dose (IV)	Dosing frequency
<34 weeks	20 mg/kg/dose	Every 12 hours
>34 weeks	20 mg/kg/dose	Every 8 hours

PARACETAMOL

ORAL, RECTAL: 15 mg/kg/dose 4-6 hourly.
In an unsupervised, community setting limit dosage to 60 mg/kg/24 hrs for up to 48 hrs.
Up to 90 mg/kg/24 hrs can be used under medical supervision. Review after 48 hrs.
RECTAL: 20-40 mg/kg as a once-off dose, rounded to appropriate suppository strength

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

IBUPROFEN (Infants over 3 months and children)
Use with caution in children with dehydration or asthma

ORAL: 5-10 mg/kg/dose 6-8 hourly

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

References

Several Guideline sites were consulted for existing guidelines regarding "fever" and "febrile", including:

- National Guideline Clearing House http://www.guideline.gov/
- National Institute for Health and Clinical Excellence (NICE) http://guidance.nice.org.uk/CG/published
- New Zealand Guidelines Group http://www.nzgg.org.nz/
- Scottish Intercollegiate Guidelines network (http://www.sign.ac.uk/guidelines/published/)
- British Medical Journal (http://bmj.bmjjournals.com/cgi/collection/guidelines)
- UK NHS (http://libraries.nelh.nhs.uk/guidelinesFinder/)
- National Institute of Clinical Studies http://www.nhmrc.gov.au/nics/index.htm
- National Health and Medical Research Council (http://www.nhmrc.gov.au/publications/index.htm)
- Royal College of Nursing Guidelines http://www.rcna.org.au/Default.aspx?SiteSearchID=360&ID=/results
- Royal Australian College of Physicians http://www.racp.edu.au/page/search
- NHS National Library of Guidelines http://www.library.nhs.uk/guidelinesfinder/

The following guideline was found to be suitable for adaptation using the AGREE tool (http://www.agreecollaboration.org/pdf/agreeinstrumentfinal.pdf):
UK NICE guidelines on Fever less than 5 years of age
(http://www.nice.org.uk/nicemedia/live/11010/30525/30525.pdf)

A literature search was also performed on www.pubmed.com using the terms "fever" "febrile" "child" and "infant" since the date of publication of the NICE guideline. In order to extend the guideline's applicability to the office setting, the search was broadened to include the terms "office" and "ambulatory" from 2000-present to ensure the office setting was not excluded, and "Prevenar", "Prevnar" and "pneumococcal vaccine" from 2000-present to ensure that appropriate literature had been sought regarding our vaccinated population.
The following articles were found to be relevant:

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

1. Allen L. Hsiao, Lei Chen and M. Douglas Baker Incidence and Predictors of Serious Bacterial Infections Among 57- to180-Day-Old Infants *Pediatrics* 2006;117;1695-1701
2. Andreola B, Bressan S, Callegaro S, Liverani A, Plebani M, Da Dalt L. Procalcitonin and C-Reactive Protein as Diagnostic Markers of Severe Bacterial Infections in Febrile Infants and Children in the Emergency Department. Pediatric Infectious Disease Journal. August 2007;26(8):672-677.
3. Antonyrajah B, Mukundan D. Fever without apparent source on clinical examination. Current Opinion in Pediatrics: February 2008; 20(1): 96-102.
4. Carstairs KL, Tanen DA, Johnson AS, Kailes SB, Riffenburgh RH. Pneumococcal Bacteremia in Febrile Infants Presenting to the Emergency Department Before and After the Introduction of the Heptavalent Pneumococcal Vaccine. Ann Emerg Med. 2007;49:772-777.
5. Craig JC, Williams GJ, Jones M, Codarini M, Macaskill P, Hayen A, Irwig L, Fitzgerald DA, Isaacs D, McCaskill M. The Accuracy of Clinical Symptoms and Signs for the Diagnosis of Serious Bacterial Infection in Young Febrile Children: Prospective Cohort Study of 15781 Febrile Illnesses. BMJ. 2010;340:c1594
6. Gabriel M**,** Aiuto L, Kohn N, Barone SR. Management of Febrile Children in the Conjugate Pneumococcal Vaccine Era. Clinical Pediatrics 2004; 43(1):75-82.
7. Galetto-Lacour A, Zamora SA, Andreola B, et al. Validation of a laboratory risk index score for the identification of severe bacterial infection in children with fever without source. *Arch Dis Child* published online June 1, 2010
8. Grace M. Lee, Gary R. Fleisher and Marvin B. Harper Management of Febrile Children in the Age of the Conjugate Pneumococcal Vaccine: A Cost-Effectiveness Analysis. *Pediatrics* 2001;108;835-844
9. Herz AM, Greenhow TL, Alcantara J, Hansen J, Baxter RP, Black SB and Shinefield HR. Changing epidemiology of Outpatient Bacteremia in 3- to 36-Month-Old Children After the Introduction of the Heptavalent-Conjugated Pneumococcal Vaccine. Pediatr Infect Dis J 2006;25: 293–300.
10. Klein JO. Management of the febrile child without a focus of infection in the era of universal pneumococcal immunization. Pediatr Infect Dis J, 2002;21:584–2.
11. Kourtis AP, Sullivan DT, Sathian U. Practice Guidelines for the Management of Febrile Infants Less Than 90 Days of Age at the Ambulatory Network of a Large Pediatric Health Care System in the United States: Summary of New Evidence. *Clin Pediatr*. 2004;43:11-16.
12. Lacour AG, Zamora S, Gervaix A. A Score Identifying Serious Bacterial Infections in Children With Fever Without Source. Pediatric Infectious Disease Journal 2008;27(7):654-656.
13. Lise E. Nigrovic, MD, and Richard Malley. valuation of the Febrile Child 3 to 36 Months Old in the Era of Pneumococcal Conjugate Vaccine: Focus on Occult Bacteremia. *Clin Ped Emerg Med 5:13-19.*

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au

14. Luginbuhl LM, Newman TB, Pantell RH, Finch SA and Wasserman RC. Office-Based Treatment and Outcomes for Febrile Infants With Clinically Diagnosed Bronchiolitis. Pediatrics 2008;122;947-954.
15. Machado BM, Cardoso DM, de Paulis M, de Ulhôa Escobar AM, Gilio AE. Fever without source: evaluation of a guideline. *J Pediatr (Rio J). 2009;85(5):426-432.*
16. Mintegi S, Benito J, Gonza´lez M, Astobiza E, Sanchez J, Santiago M. Impact of the Pneumococcal Conjugate Vaccine in the Management of Highly Febrile Children Aged 6 to 24 Months in an Emergency Department. Pediatric Emergency Care 2006; 22(8):566-569.
17. Olaciregui I, Hernández U, Muñoz JA, Emparanza JI, Landa JJ. Markers that predict serious bacterial infection in infants under 3 months of age presenting with fever of unknown origin. *Arch Dis Child* 2009;94:501-505.
18. Pantell RH, Newman TB, Bernzweig J; et al. Management and Outcomes of Care of Fever in Early Infancy. *JAMA*. 2004;291(10):1203-1212.
19. Pratt A and Attia MW. Duration of fever and markers of serious bacterial infection in young febrile children. *Pediatrics International* (2007) 49, 31–35
20. Pusic MV. Clinical management of fever in children younger than three years of age. Paediatr Child Health 2007;12(6):469-472.
21. Steere M, Sharieff GQ and Stenklyft PH. Fever in Children Less Than 36 Months of Age – Questions and Strategies for Management in the Emergency Department. Journal of Emergency Medicine 2003, 25(2): 149–157.
22. Sur DK, Bukont EL. Evaluating Fever of Unidentifiable Source in Young Children. Am Fam Physician 2007;75:1805-11.
23. Tolan RW Jr. Fever Without a Focus. eMedicine Pediatrics: General Medicine.
24. Waddle E, Jhaveri R. Outcomes of febrile children without localising signs after pneumococcal conjugate vaccine. *Arch Dis Child* 2009;94:144-147.

Version control and change history

PDS reference: OCE use only

Version	Date from	Date to	Amendment
1	August 2013	current	Original version

ISBN number: 978-1-74243-528-2
Endorsed by: South Australian Paediatric Clinical Guidelines Reference Committee. South Australian Child Health Clinical Network
Last Revised:
Contact: South Australian Paediatric Clinical Guidelines Reference Committee: cywhs.paediatricclinicalguidelines@health.sa.gov.au