Children and Infants with Fever - Acute Management

Summary Basic Clinical Practice Guidelines for the acute treatment of infants and children with fever.

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Branch contact 9391 9503

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Audience Emergency Depts;Paediatric Units

INFANTS AND CHILDREN: ACUTE MANAGEMENT OF FEVER

PURPOSE

The *infants and children*: *acute management of fever* clinical practice guideline (attached) has been developed to provide direction to clinicians and is aimed at achieving the best possible paediatric care in all parts of the state.

The clinical practice guideline was prepared for the NSW Department of Health by an expert clinical reference group under the auspice of the state wide Paediatric Clinical Practice Guideline Steering Group.

MANDATORY REQUIREMENTS

This policy applies to all facilities where paediatric patients are managed. It requires all Health Services to have local guidelines/protocols based on the attached clinical practice guideline in place in all hospitals and facilities likely to be required to assess or manage children with fever.

The clinical practice guideline reflects what is currently regarded as a safe and appropriate approach to the acute management of fever in infants and children. However, as in any clinical situation there may be factors which cannot be covered by a single set of guidelines. This document should be used as a guide, rather than as a complete authoritative statement of procedures to be followed in respect of each individual presentation. **It does not replace the need for the application of clinical judgement to each individual presentation**.

IMPLEMENTATION

Chief Executives must ensure:

- Local protocols are developed based on the *infants and children: acute management of fever* clinical practice guideline.
- Local protocols are in place in all hospitals and facilities likely to be required to assess or manage paediatric patients with fever.
- Ensure that all staff treating paediatric patients are educated in the use of the locally developed paediatric protocols.

Directors of Clinical Governance are required to inform relevant clinical staff treating paediatric patients of the revised protocols.

REVISION HISTORY

Version	Approved by	Amendment notes
December 2004 (PD2005_388)	Director-General	New policy
October 2010 (PD2010_063)	Deputy Director-General Strategic Development	Second edition

ATTACHMENT

1. Infants and Children: Acute Management of Fever – Clinical Practice Guideline.

Infants and children: Acute Management of Fever

second edition

CLINICAL PRACTICE GUIDELINES

NSW HEALTH

NSW DEPARTMENT OF HEALTH
73 Miller Street
North Sydney NSW 2060
Tel. (02) 9391 9000
Fax. (02) 9391 9101
www.health.nsw.gov.au

This Clinical Practice Guideline booklet is extracted from the PD2010_063 and as a result, this booklet may be varied, withdrawn or replaced at any time. Compliance with the information in this booklet is mandatory for NSW Health.

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A revision of this document is due in 2013.

September 2010 - second edition

Contents

Introduction

These Guidelines are aimed at achieving the best possible paediatric care in all parts of the State. The document should not be seen as a stringent set of rules to be applied without the clinical input and discretion of the managing professionals. Each patient should be individually evaluated and a decision made as to appropriate management in order to achieve the best clinical outcome.

The formal definition of clinical practice guidelines comes from the National Health and Medical Research Council:

> *'systematically developed statements to **assist** practitioner and patient decisions about appropriate health care for specific clinical circumstances.' (National Health and Medical Research Council A Guide to the Development, implementation and evaluation of Clinical Practice Guidelines, Endorsed 16 November 1998, available from **www.nhmrc.gov.au/publications/synopses/cp30syn.htm**)*

It should be noted that this document reflects what is currently regarded as a safe and appropriate approach to care. However, as in any clinical situation there may be factors, which cannot be covered by a single set of guidelines, this document should be used as a guide, rather than as a complete authoritative statement of procedures to be followed in respect of each individual presentation. It does not replace the need for the application of clinical judgment to each individual presentation.

This document represents basic clinical practice guidelines for the acute management of fever in children and infants. Further information may be required in practice; suitable widely available resources are included as appendix two.

Each Area Health Service is responsible for ensuring that local protocols based on these guidelines are developed. Area Health Services are also responsible for ensuring that all staff treating paediatric patients are educated in the use of the locally developed paediatric guidelines and protocols.

In the interests of patient care it is critical that contemporaneous, accurate and complete documentation is maintained during the course of patient management from arrival to discharge.

Parental anxiety should not be discounted: it is often of significance even if the child does not appear especially unwell.

Changes to previous clinical practice guidelines

The following outlines significant changes to the document:

- Now includes children up to 5 years of age (previously up to 3 years of age).
- Following the introduction of pneumococcal vaccination, the rates of occult bacteraemia have markedly decreased. Accordingly non-toxic febrile children older than 3 months of age who have no obvious source of infection are no longer screened for occult bacteraemia.
- Urinalysis has been introduced as a screening investigation for non-toxic febrile children older than 3 months of age who have no obvious source of infection.
- Increased emphasis has been placed upon the timely diagnosis of urinary tract infection, Meningococcal disease and Kawasaki disease.

Overview

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 clinical examination.

Our aim is to detect those children with serious causes of fever such as meningitis, pneumonia and pyelonephritis without subjecting too many children to too many procedures or tests. This requires a combination of clinical judgement, specific investigations and serial observation.

Fever changes rapidly over time and a parent's perception of the presence of fever in a child prior to presentation should not be discounted.

Key factors are:

- the child's age
- presence of signs of toxicity
- presence of a focus of infection

When dealing with children suspected of having an infectious disease, **it is essential that infection control measures be implemented** to prevent cross contamination and spread.

Rationale for clinical approach

(1) Age

Neonates and young infants:

- May not have the characteristic signs of serious infection (temperature can be high or low).
- Localising features may be absent.
- Can deteriorate rapidly.
- May be infected with organisms from the birth canal.

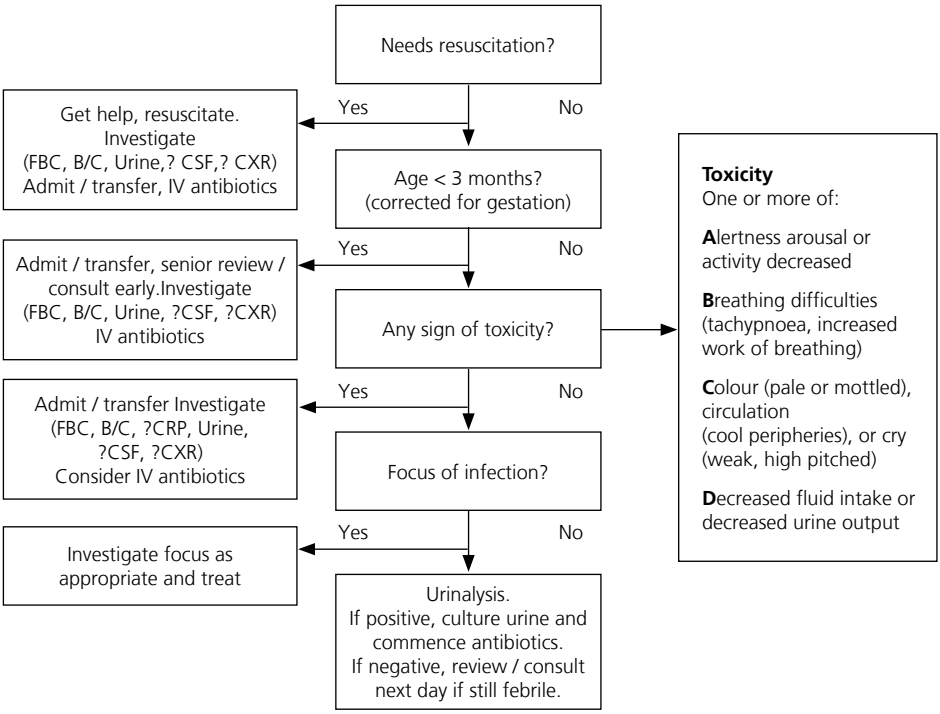
Young infants with fever, especially those under three months of age, need rapid assessment and investigation, and admission to hospital. Consult a senior colleague about the extent of investigations (full blood count, cultures of blood, urine and CSF, chest x-ray) and the administration of antibiotics.

Older infants/toddlers:

- Localise infection better than neonates, but may still be pre verbal.
- Frequently exposed to infectious diseases in group childcare.
- Get viral infections as well as the 'typical' bacterial infections of pneumococcus, meningococcus and Hib (incidence of these infections significantly lessened by immunisation).

Assessment and initial management

Flowchart for child < 5 years old with fever (>38ºC axillary)



Unimmunised children are at increased risk of serious bacterial infection

- Axillary measurement of temperature is preferred in the 0-5 years age group.
- Oral and rectal measurements are not recommended because of safety concerns.
- Tympanic measurements may be inaccurate.

- When in doubt, ask for advice. No febrile child should be discharged from an Emergency Department without senior advice, particularly a child referred by a general practitioner, or a child representing with a febrile illness.
- At discharge the parent(s) should be educated on the detection and significance of toxicity, arrangements made for review, and a Fever Fact sheet and discharge summary provided.
- Err on the side of caution. If you are worried, admit / transfer the child.

- Only do a procedure or a test if it is going to contribute to a clinical decision. Use the flowchart to work out what tests you need. If in doubt about a child's clinical condition consult with someone more experienced such as a paediatric specialist. If a specialist is not available, call NETS (the Newborn and paediatric Emergency Transport Service) on 1300 36 2500.

Older children:

- Usually verbalise and localise symptoms well.
- More tolerant to fluid loss – less likely to need IV rehydration.
- Can get 'typical' childhood organisms plus others such as mycoplasma and infectious mononucleosis.

(2) Toxicity: ABCD

Use this simple system to work out how sick a child appears to be:

'A' is for **arousal, alertness or activity decreased**

'B' is for **breathing difficulties (tachypnoea, increased work of breathing)**

'C' is for **poor colour (pale or mottled), poor circulation (cold peripheries, increased capillary refill time) or cry (weak, high pitched)**

'D' is for **decreased fluid intake (less than half normal) and/or decreased urine output (fewer than four wet nappies a day)**

The presence of any of these signs places the child at high risk of serious illness.

The presence of more than one sign increases the risk.

A 'toxic' child appears drowsy, lethargic or irritable, pale, mottled or tachycardic. Children with any of these signs must be seen urgently, investigated and treated as a priority.

The majority of children with signs of toxicity will receive antibiotic therapy.

The decision to administer antibiotics will be based upon age, degree of toxicity, height of fever, and height of white cell count and acute phase reactants.

(3) Focus of infection

Children with a definite focus of infection should only have investigations specific to that focus unless they are very young or toxic. For example, a mildly unwell child with definite acute otitis media does not need a urine culture, but a very unwell child who has acute otitis media needs a more thorough work-up as the child may have secondary bacteraemia, meningitis or an abscess.

Subjective features

Subjective features such as mild reddening of the throat or tympanic membranes should be interpreted with great caution especially in young children. Ask a more senior doctor to review the patient if the signs are mild or subjective.

Rash and fever

Not all rashes associated with fever are viral or 'non-specific'. Meningococcal disease and Kawasaki disease are two important causes of rash which require timely diagnosis and therapy (see Box 1 and Box 2). If in any doubt ask a senior colleague for advice.

Box 1: Meningococcal disease

- Although the classical features of meningococcal disease are well known, children may present early with non-specific symptoms (half of all children with meningococcal disease are sent home at first presentation [Riordan et al, 1996]).
- May have pre-existing coryzal illness.
- May present with gastrointestinal symptoms but no rash.
- May present with a blanching, non-purpuric, rash.
- Earliest specific presentation may be with leg pain, cold extremities and abnormal skin colour.
- Serial observations for signs of toxicity either in the Emergency Department or by the parents at home are important aids to early diagnosis.

Box 2: Kawasaki disease

- The clinical features of Kawasaki disease include high fever for more than five days, conjunctival injection, polymorphous rash, changes in mucous membranes, changes in the extremities and cervical lymphadenopathy.
- Many children will not have all the diagnostic features, however. A high index of suspicion needs to be maintained, particularly for children with high persistent fever, unresponsive to antibiotic therapy.
- Abnormal laboratory investigations often include neutrophilia with toxic changes, thrombocytosis, raised acute phase reactants, elevated transaminases and low serum albumin.

(4) Investigations

Perform an investigation only if the result is likely to alter management.

In urgent cases, such as a toxic child, do not wait for local anaesthetic to work. Get senior help immediately and get on with it.

Blood for **culture** should be taken whenever a blood count is performed on children with toxicity and/or a focus of infection.

White cell count and acute phase reactants can serve as a guide to the introduction of antibiotic therapy in children with toxicity and/or a focus of infection.

Chest x-ray is most useful if the child has signs of respiratory illness such as cough, tachypnoea, dullness or crackles. If there are no respiratory signs perform other investigations before the CXR.

Lumbar puncture should be considered in a young infant, toxic child, irritable child or a child with complex febrile convulsions, especially if the child is

already on antibiotics. However, if the child is drowsy or requires resuscitation, resuscitation and antibiotics take precedence – do not delay. Please refer to Bacterial meningitis Clinical Practice Guideline.

Urine culture should be performed in all febrile children <3 months of age and all children who are toxic. A clean catch urine is appropriate however, timely collection is often difficult. Bag urine samples are inappropriate because of high contamination ratios. When it is urgent to get a urine specimen, a catheter urine sample is the recommended invasive technique.

Urine culture is essential prior to the commencement of antibiotics for suspected urinary tract infection.

For non-toxic, febrile children >3 months, dipstick urinalysis is an appropriate screening investigation, with urine culture being performed if the urinalysis is positive for leucocyte esterase or nitrites.

However, because of the difficulties in collecting satisfactory urine specimens in young children yet to be toilet trained, and because of concerns about possible renal damage associated with urinary tract infections during infancy, many practitioners will elect to simultaneously send urine for culture in these children, regardless of the urinalysis result.

Antipyretics

Antipyretics may provide comfort to a distressed child with fever. The presence of fever does not demand the use of antipyretics. There may be advantages to the child in not treating the fever.

Recommended doses	
Paracetamol	15mg/kg per dose given up to four-hourly up to a maximum of four doses each 24 hours. [ref Paracetamol Use PD2009_009, 26 Feb 2009]
Ibuprofen	(**not** recommended for children less than 6 months old). 10mg/kg per dose, given up to 6 hourly up to a maximum of four doses each 24 hours.

Alternating paracetamol and ibuprofen is theoretically unwise and not recommended. The response of fever to antipyretics is not of use in assessing the significance of an infection.

Tepid sponging

Tepid sponging and other physical methods of reducing temperature are not recommended and may be counterproductive. Unwrapping an overdressed child is appropriate.

Follow-up

- Children who are discharged home from an Emergency Department with fever should generally be followed up the following day, to assess progression of infection, response to treatment and results of investigations.
- Each facility will have in place its own system to facilitate this review and

these arrangements should be relayed to the parent(s) in writing.

- Although a child may be non-toxic when seen, no test can exclude the child becoming toxic and unwell later.
- Parents should be encouraged to look for toxicity every four to six hours, and to seek clinical review if the child becomes toxic or unwell.
- Clear communication from a doctor with empathy for the parents may enhance safety and improve the functioning of stressed families. A Fever fact sheet should be provided.
- The discharging Emergency Department doctor should write a note to the family doctor with the clinical diagnosis and a list of investigations performed.

Evidence base for the acute management of fever

NHMRC DESIGNATION OF LEVELS OF EVIDENCE

I strong evidence obtained from a systematic review of all relevant randomised controlled trials.

II evidence obtained from at least one properly designed randomised controlled trial.

III-1 evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).

III-2 evidence obtained from comparative studies with concurrent controls and allocation not randomised (cohort studies), case-control studies, or interrupted time series with a control group.

III-3 evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group.

IV evidence obtained from case series, either post-test or pre-test and post-test.

What is fever?

- A fever is a rise in temperature, above normal, allowing for diurnal variation. Normal body temperature varies with time of day, but is generally less than 37.5°C centrally [Level III-2].
- Fever is commonly **defined** as a rectal temperature >38°C, which is approximately two standard deviations above the mean for infants under 3 months old (Herzog and Coyne 1993). In some circumstances, however, a lower temperature will be abnormal [Level IV].
- Children can have severe sepsis with no or minimal fever [Level IV].

How should temperatures be measured?

- Rectal temperatures are the 'gold standard' for measuring central body temperature [Level IV]. There are safety concerns (particularly in the very young) with its routine use as well as issues concerning lack of acceptability.
- Other methods of measurement such as axillary and tympanic membrane temperatures are less accurate and

less reliable than rectal temperatures [Level 1: Duce 1996, Craig et al 2000].

- In a study comparing axillary and rectal temperatures, a neonate's rectal temperature was on average 0.2°C higher than axillary, whereas the mean difference was 0.9°C for older children [Craig et al 2000, Level 111 - 2]. However, the confidence intervals were wide.
- Oral temperature measurement has not been systematically compared to rectal temperature. There are also concerns surrounding safety and acceptability.

Clinical recommendations

Recommendation 1:

Axillary measurement of temperature is recommended for routine clinical use, but staff should be aware that axillary temperatures are up to 1°C lower than rectal temperatures. Rectal and oral temperatures are not recommended because of safety concerns and problems with acceptability. There is also a lack of data for oral temperatures. Tympanic temperatures are not recommended as they are unreliable.

Age of child

The younger the febrile infant, the greater is the incidence of a serious bacterial infection. For febrile neonates (0–4 weeks) the incidence is 12–32% [Level 111 - 2] (Neto 2004, Baker 1999, Kadish 2000) .

For febrile infants aged 1–3 months, the risk of serious bacterial infection is somewhat lower but still significant (15–21% pre-pneumococcal immunisation) (Neto 2004, Baker 1999, Kadish et al 2000, Roberts et al 1977, Caspe et al 1983).

A variety of criteria eg Rochester, have been devised to attempt to identify a population of low risk infants aged 1–3 months who can be managed as outpatients (Dagan et al 1985, Dagan et al 1988). Estimations of the risk of an undetected serious bacterial infection in these low risk populations vary from 0.2% to 2% (Neto 2004, Baraff et al 1992, Klassen et al 1992).

Recommendation 2:

All febrile neonates should have a full septic workup and be admitted for parenteral antibiotics.

Infants aged 1–3 months will generally be managed in a similar fashion but there may be a place for outpatient management in carefully selected infants who are non-toxic, clinically stable over a period of observation, have reassuring pathology investigations and in whom close follow-up is assured.

Clinical assessment

The sensitivity of a 'toxic appearance' in detecting serious bacterial infection varied from 11% to 100% in different studies (Neto 2000) [Level I].

The most reliable infant observation scales were the Yale Observation Scale (McCarthy et al 1992) which examined quality of cry, reaction to parents, arousal, colour, hydration and social response, and the

Melbourne Study (Hewson et al 1990) which found the best predictors of serious bacterial infection to be feeding, breathing, hydration, activity, drowsiness and a history of being both pale and hot [Level II].

In older children with 'occult bacteraemia', the clinical appearance is very poorly predictive of the presence of bacteraemia, hence the term occult. Now much less common since the introduction of pneumococcal immunisation (Kuppermann et al 1998, Bulloch 2000) [Level I].

Recommendation 3:

Any child assessed as being 'toxic' should be admitted to hospital for investigation and, under most circumstances, administration of parenteral antibiotics.

Meningococcal disease

Invasive meningococcal group B disease continues to cause substantial morbidity and mortality. There is very commonly an early non-specific stage indistinguishable from a self-limiting viral illness.

Observational studies have associated leg pain, cold extremities and abnormal skin colour with developing invasive meningococcal disease (Thompson et al 2006).

Serial observation of febrile infants and children by experienced observers is an important strategy in the early detection of meningococcal disease (Theilen et al 2008).

Kawasaki disease

Kawasaki disease is an acute self-limited systemic vasculitis of unknown etiology which mainly affects infants and young children. Up to 25% of affected children, if untreated, develop coronary artery aneurysms.

The diagnosis is a clinical one, although there are often significant abnormalities of laboratory investigations. Timely diagnosis is important as the introduction of treatment, particularly with intravenous immunoglobulin, is efficacious in reducing symptoms and decreasing the formation of new coronary artery aneurysms (Newburger et al, 2004, Royle et al, 2005, Brogan et al, 2002, Oates-Whitehead, 2005).

Urinary tract infection

In febrile infants, history of a previous urinary tract infection, temperature higher than 40°C and suprapubic tenderness are the findings most useful for identifying those with a urinary tract infection. Lack of circumcision among males, abdominal pain, back pain and lower urinary tract symptomatology also increase the likelihood of urinary infection (Nader et al 2007).

Urinary tract infection is the commonest serious bacterial infection in a febrile child with no clinically apparent focus of infection (Moyer 2004).

In a febrile non-toxic child with no risk factors for urinary tract infection, urinalysis is an appropriate screening investigation. A completely normal urinalysis in these circumstances makes urinary tract infection unlikely (Whiting, 2005, Gorelick, 1999, Huicho, 2002, Deville, 2004).

Recommendation 4:

The possibility of urinary tract infection needs to be considered in all febrile children who do not have an obvious source of infection. Although urinalysis is a useful screening investigation in these children, urine culture is essential prior to the commencement of antibiotics for suspected urinary tract infection.

Antipyretics

The response to antipyretics does not help distinguish bacterial from viral infections (Torrey et al 1985, Weisse et al 1987, Yamamoto et al 1987, Bonadio et al 1993) [Level III-2].

Ibuprofen is comparable as an antipyretic to paracetamol (Wilson et al 1991) [Level III–3].

Both the risks and benefits of paracetamol may have been exaggerated as parents are unable to guess from their child's behaviour whether they received paracetamol or placebo (Kramer et al 1991) [Level II].

NSW Health. PD 2009_009. Paracetamol Use. February 2009.

Recommendation 5:

The response to antipyretics should not be used as a diagnostic tool to try to differentiate bacterial from viral infection.

Appendix One – References

What is fever?

Herzog LW, Coyne LJ. What is fever? Normal temperatures in infants less than three months old. Clin Pediatr 1993:32:142–6.

How should temperatures be measured?

Duce SJ. A systematic review of the literature to determine optimal methods of temperature measurement in neonates, infants and children. Cochrane Library 1996, 1–124. DARE–978207.

Craig JV, Lancaster GA, Williamson PR, Smyth RL. Temperature measured at the axilla compared with rectum in children and young people:systematic review. BMJ 2000:320:1174–8.

Age of child

Neto G. Fever in the young infant. In: Moyer VA (ed), Evidence Based Pediatrics and Child Health, 2nd edn. London: BMJ Books, 2004:257–66.

Baker MD, Bell LM. Unpredictability of serious bacterial illness in febrile infants from birth to 1 month of age. Arch Pediatr Adolesc Med 1999: 153:508–11.

Kadish HA, Loveridge B, Tobey J, Bolte RG, Corneli HM. Applying outpatient protocols in febrile infants 1–28 days of age: can the threshold be lowered? Clin Pediatr (Phila) 2000:39:81–8.

Roberts KB, Borzy MS. Fever in the first eight weeks of life. Johns Hopkins Med J 1977:141:9–13.

Caspe WB, Chamudes O, Louie B. The evaluation and treatment of the febrile infant. Pediatr Infect Dis J 1983:2:131–5.

Baraff LJ, Oslund SA, Schringer DL, Stephen ML. Probability of bacterial infection in febrile infants less than three months of age:a meta-analysis. Pediatr Infect Dis J 1992:11:257–64.

Klassen TP, Rowe PC. Selecting diagnostic tests to identify febrile infants less than 3 months of age as being at low risk for serious bacterial infection:a scientific overview. J Pediatr 1992:121:671–6.

Dagan R, Powell KR, Hall CB, Mengus MA. Identification of infants unlikely to have serious bacterial infection although hospitalized for suspected sepsis. J Pediatr 1985:107:855–60.

Dagan R, Sofer S, Philip M, Shachak E. Ambulatory care of febrile infants younger than two months classified as being at low risk for having serious bacterial infections. J Pediatr 1988:122:355–60.

Clinical assessment

McCarthy PL, Sharpe MR, Spiesel SZ et al. Observation scales to identify serious illness in young children. Pediatrics 1982:70:802–9.

Hewson PH, Humphries SM, Roberton DM, McNamara JM, Robinson MJ. Markers of serious illness in infants under 6 months old presenting to a children's hospital. Arch Dis Child 1990:65:750–6.

Meningococcal disease

Thompson MJ, Ninis N, Perera R, Mayon–White R, Phillips C, Bailey L, Harnden A, Mant D. Clinical recognition of meningococcal disease in children and adolescents. The Lancet 2006:367:397–403.

Theilen U, Wilson L, Wilson G, Beattie JO, Qureshi S, Simpson D. Management of invasive meningococcal disease in children and young people: summary of SIGN guidelines. BMJ 2008: 336:1367–70.

Kawasaki disease

Newburger JW, Takahashi M, Gerber MA et al. Diagnosis, treatment, and long-term management of Kawasaki disease: a statement for health professionals from the Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association. Pediatrics 2004:114:1708–33.

Royle J, Burgner D, Curtis N. The diagnosis and management of Kawasaki disease. J Pediatr Child Health 2005:41:87–93.

Brogan PA, Bose A, Burgner D et al. Kawasaki disease: an evidence based approach to diagnosis, treatment, and proposals for future research. Arch Dis Child 2002:86:286–90.

Japanese Circulation Society Joint Research Group. Guidelines for diagnosis and management of cardiovascular sequelae in Kawasaki disease. Pediatr Int 2005:47:711–32.

Oates-Whitehead RM, Baumer JH, Haines L et al. Intravenous immunoglobulin for the treatment of Kawasaki disease in children. The Cochrane Database of Systemic Reviews 2003:(4):Art No CD004000.

Urinary tract infection

Nader Shaikh et al, Does This Child Have A Urinary Tract Infection? JAMA Dec 26 2007: Vol 298:24:2895–2904

Moyer VA, Craig J. Acute urinary tract infection. In: Moyer VA (ed), Evidence-Based Pediatrics and Child Health, 2nd edn. London: BMJ Books, 2004:429–36

Whiting P, Westwood M, Watt I, Cooper J, Kleijnen J. Rapid tests and urine sampling techniques for the diagnosis

of urinary tract infection (UTI) in children under five years: a systematic review. BMC Pediatr 2005:5:4.

Gorelick MH, Shaw KN, Screening tests for urinary tract infection: a meta-analysis. Pediatrics 1999: 104:e54.

Huicho L, Campos-Sanchez M, Alamo C. Meta-analysis of urine screening tests for determining the risk of urinary tract infection in children. Pediatr Infect Dis J 2002:21:1–11.

Deville W LJM, Yzermans J C, Van Duijn NP, Bezemer PD, van der Windt D, Bouter L. The urine dipstick test useful to rule out infections. A meta-analysis of the accuracy. BMC Urology 2004: 4:1–14

Antipyretics

Torrey S, Heinritig F, Fleisher G. Temperature response to antipyretic therapy in children. Relationship to occult bacteremia. Am J Emerg Med 1985:3:190–6.

Weisse M, Miller G, Brien J. Fever response to acetaminophen in viral vs bacterial infections. Ped Inf Dis J 1987:6: 1091–5.

Yamamoto L, Widger H, Flinger D. Relationship of bacteremia to antipyretic therapy in febrile children. Ped Emerg Care 1987:3: 223–7.

Bonadio W, Bellomo T, Brady W, Smith D. Correlating changes in body temperature with infectious outcome in febrile children who receive acetaminophen. Clin Ped 1993:32: 343–6.

Wilson JT, Brown D, Kearns GL, et al. Single-dose, placebo-controlled comparative study of ibuprofen and acetaminophen antipyresis in children. J Pediatr 1991:119:803–11.

Kramer MS, Naimark LE, Roberts-Brauer R, McDougall A, Leduc DG. Risks and benefits of paracetamol antipyresis in young children with fever of presumed viral origin. Lancet 1991:337:591–4.

NSW Health. PD 2009_009. Paracetamol Use. February 2009.

New References

Craig JC, Williams GJ, Jones M, Codarini M, Macaskill P, Hayen A, Irwig L, Fitzgerald D, Isaacs D, McCaskill M. The accuracy of clinical symptoms and signs for diagnosis of serious bacterial infection in young febrile children: prospective cohort study of 15 781 febrile illnesses. BMJ 2010: 340:c1594.

Mackowiak, PA. Concepts of fever. Archives of Internal Medicine 1998: 158(17): 1870-1881.

Appendix Two – Resources

Fuller details may be necessary in practice, especially for the management of children with fever. Possible sources include:

NSW Health Department CIAP web site, Managing young children and infants with fever in Hospitals at: www.ciap.health.nsw.gov.au

Paediatrics Manual, The Children's Hospital at Westmead Handbook, Second Edition, 2009.

Appendix Three – Parent information

A Fever fact sheet jointly developed by the John Hunter Children's Hospital, Sydney Children's Hospital and Children's Hospital at Westmead is available at:

www.kaleidoscope.org.au/parents/factsheets.htm

www.sch.edu.au/health/factsheets

www.chw.edu.au/parents/factsheets

Disclaimer:
The fact sheet is for educational purposes only. Please consult with your doctor or other heath professional to ensure this information is right for your child.

Appendix Four – Working party members

Dr Des Mulcahy *(Chair)*	Paediatrician	Orange Base Hospital
Dr Shanika Attale	Paediatric Registrar	John Hunter Children's Hospital
Ms Lucy Bates	Policy Officer	Northern Child Health Network
Ms Leanne Crittenden	Co-ordinator	Northern Child Health Network
Dr Michael Fasher	General Practitioner	Adjunct Associate Professor Western Clinical School
Dr Mark Birch	Infectious Diseases	John Hunter Children's Hospital
Mr Audas Grant	CNC Emergency / Critical Care	Greater Southern (Albury)
Dr Brett Ireland	RMO	John Hunter Children's Hospital
Prof David Isaacs	Immunologist	Children's Hospital at Westmead
Mr Paul Kaye	After Hours Bed Manager / After Hours Nurse Manager	Greater Western Area Health Service, (Broken Hill)
Mr Martin Madejski	Transitional Nurse Practitioner	Emergency Department, Children's Hospital at Westmead
Dr Matthew O'Meara	Paediatric Emergency Physician	Sydney Children's Hospital
Dr Susan Piper	Medical Director	Paediatric Ambulatory Care Unit, Wyong
Dr Jo Rainbow	Paediatrician	Orange Base Hospital
Mr Thomas Ratoni	CNC Paediatrics	North Coast Area Health Service (Lismore)
Ms Rhonda Winskill	CNC Paediatrics	Northern Child Health Network (Maitland)

SHPN (SSD) 090177