

## Evidence Table:

## RCH Temperature Management Clinical Practice Guideline (Nursing)

**Keywords:** The following terms were searched in interchanging combinations: Paediatrics, children, infants and/or neonates. Thermoregulation, temperature management and/or temperature assessment. Fever, febrile, pyrexia, normothermia, hypothermia, or hyperthermia. Inpatient and/or hospital.

Articles were selected based on relevance to the proposed guideline and date of publishing, excluding out-dated literature.

Reference	Evidence Level (I-VII)	Methods, key findings, outcomes or recommendations
Oguz, F., Yildiz, I., Varkal, M. A., Hizli, Z., Toprak, S., Kaymakci, K., ... Unuvar, E. (2018). Axillary and tympanic temperature measurement in children and normal values for ages. <i>Pediatric Emergency Care</i> , 34(3), 169-173. doi:10.1097/PEC.0000000000000693	IV	<ul style="list-style-type: none"> <li>- <b>Observational cross-sectional study, evaluating normal axillary and tympanic body temperatures based on temperature measurements of 1364 healthy children (aged 0-17 years).</b></li> <li>- Axillary routes obtain temperature readings lower than tympanic routes for any given core body temperature.</li> <li>- Fever was defined as 38°C and hypothermia 35°C for the exclusion criteria of this study.</li> </ul>
Printz, V., Hobbs, A. M., Teuten, P., & Paul, S. P. (2016). Clinical update: assessment and management of febrile children. <i>Community Practitioner</i> , 89(6), 32-37.	VII	<ul style="list-style-type: none"> <li>- <b>An overview of recent literature exploring the assessment and management of febrile children.</b></li> <li>- Fever is usually a normal physiological response to an inflammatory or infective cause, however can be a prominent feature in non-infectious conditions (eg. Kawasaki disease).</li> <li>- Thorough assessment of a febrile child is important, to screen for any significant illness and possible further management</li> <li>- Temperature readings should be evaluated in context of entire patient presentation</li> </ul>
Işler, A., Aydın, R., Güven, Ş. T., & Günay, S. (2014). Comparison of temporal artery to mercury and digital temperature measurement in pediatrics. <i>International Emergency Nursing</i> , 22(3), 165-168. doi:10.1016/j.ienj.2013.09.003	IV	<ul style="list-style-type: none"> <li>- <b>An observational cross-sectional study of 218 children (aged 0-18 years), comparing the differences in temperature values when using temporal artery, mercury and digital devices.</b></li> <li>- Axillary temperatures measure approximately 1°C lower than rectal temperatures.</li> <li>- Digital axillary temperatures were measured after ensuring subject armpits were dry and clean, for accurate results.</li> </ul>
Trevisanuto, D., Testoni, D., & de Almeida, M. F. (2018). Maintaining normothermia: why and how? <i>Seminars in Fetal &amp; Neonatal Medicine</i> , 23(5), 333-339. doi:10.1016/j.siny.2018.03.009	VII	<ul style="list-style-type: none"> <li>- <b>An overview of neonatal normothermia management and its importance, referencing 60 sources.</b></li> <li>- Neonatal normothermia is listed as 36.5°C -37.5°C</li> <li>- An admission temperature should be recorded in order to oversee trends and predict outcomes</li> <li>- Interventions towards preventing heat loss in neonates are outlined in a table, referring to mechanisms of heat loss (conduction, radiation, evaporation and convection).</li> </ul>
Weiss, S. L., & Pomerantz, W. J. (2019). Septic shock in children: rapid recognition and initial resuscitation (first hour). <i>Up to Date</i> . Retrieved from	VII	<ul style="list-style-type: none"> <li>- <b>Up To Date information piece on the recognition and initial management of septic shock in children.</b></li> </ul>

<p><a href="https://www.uptodate.com/contents/septic-shock-in-children-rapid-recognition-and-initial-resuscitation-first-hour">https://www.uptodate.com/contents/septic-shock-in-children-rapid-recognition-and-initial-resuscitation-first-hour</a></p>		<ul style="list-style-type: none"> <li>- Early recognition and initial management of sepsis in neonates and paediatrics is paramount, and if left untreated can lead to severe morbidities and mortality.</li> </ul>
<p>Derieg, S. (2017). An overview of perioperative care for paediatric patients. <i>The Journal of Perioperative Nursing in Australia</i>, 30(3), 23-29. doi:10.26550/303/23-29</p>	<p>VII</p>	<ul style="list-style-type: none"> <li>- <b>A single-authored overview of perioperative care for paediatric patients, including temperature management.</b></li> <li>- Paediatric temperatures should be &gt;36°C before starting procedures.</li> <li>- Hypothermia should be prevented within theatres using approaches such as passive insulation and forced air-warming devices.</li> <li>- Post-operatively, nurses should return or maintain patient normothermia as soon as possible, utilising active-warming devices if appropriate.</li> </ul>
<p>Leduc, D. Woods, S. (2013). Position statement: temperature measurement in paediatrics. <i>Canadian Paediatric Society</i>. Retrieved from <a href="https://www.cps.ca/en/documents">https://www.cps.ca/en/documents</a></p>	<p>VII</p>	<ul style="list-style-type: none"> <li>- <b>The Canadian Paediatric Society Position Statement (2013) on temperature measurement in paediatrics</b></li> <li>- Rectal thermometry is considered the gold stand of temperature measurement, but bowel perforation is a known risk and the majority of paediatric patients and parents dislike this method.</li> <li>- Proposed normal temperature ranges of axillary, ear and rectal methods listed in table.</li> </ul>
<p>El-Radhi A.S. (2018). Measurement of body temperature. In El-Radhi A. (Ed.) <i>Clinical Manual of Fever in Children</i> (pp. 69-84). Retrieved from <a href="https://doi.org/10.1007/978-3-319-92336-9_4">https://doi.org/10.1007/978-3-319-92336-9_4</a></p>	<p>VII</p>	<ul style="list-style-type: none"> <li>- <b>2018 published book ‘Clinical Manual of Fever in Children’, with a list of references at the conclusion of each chapter.</b></li> <li>- Variations in body temperature readings exist depending on the selected method and route of measurements.</li> <li>- Axillary temperature measurements are suggested to be as accurate as rectal thermometer measurements in the neonatal population, if taken in a stable-temperature environment and when using appropriate technique (i.e., on dry skin).</li> <li>- Tympanic thermometer probes must be directed towards the tympanic membrane for an accurate readings</li> </ul>
<p>Asher, C., &amp; Northington, L. K. (2008). Position statement for measurement of temperature/fever in children. <i>Journal of Pediatric Nursing</i>, 23(3), 234-236. doi: 10.1016/j.pedn.2008.03.005</p>	<p>VII</p>	<ul style="list-style-type: none"> <li>- <b>Society of Paediatric Nurses Position Statement (2008) on the measurement of temperature and fever in children.</b></li> <li>- Tympanic thermometers can be accurately used for infants older than 6 months</li> <li>- Factors including age, activity level, time of day, ambient temperature and clothing can influence body temperature</li> <li>- Not all fevers need to be medically treated, and often indicate a normal immune response to a bacterial or viral illness.</li> </ul>
<p>Hay, A. D., Costelloe, C., Redmond, N. M, Montgomery, A. A., Fletcher, M., Hollinghurst, S., &amp; Peters, T. J. (2008). Paracetamol plus ibuprofen for the treatment of fever in children (PITCH): randomised controlled trial. <i>British Medical Journal</i>, 337(7672), 729-733. doi:10.1136/bmj.a1302</p>	<p>II</p>	<ul style="list-style-type: none"> <li>- <b>A randomised controlled trial (blinded, three-armed), investigating whether ibuprofen, paracetamol or a combination of both provides superior fever-based relief and longer afebrile periods in 156 febrile children ages 6 months-6 years.</b></li> <li>- Both paracetamol and ibuprofen are suggested to provide symptomatic relief for febrile infants and children</li> </ul>

		<ul style="list-style-type: none"> <li>- No benefit was found for reducing fever-related discomfort between children only receiving paracetamol or ibuprofen, or a combination of both.</li> <li>- Adverse effects of anti-pyrexia administration did not differ between these groups.</li> </ul>
Barbi, E., Marzuillo, P., Neri, E., Naviglio, S., & Krauss, B. S. (2017). Fever in Children: Pearls and Pitfalls. <i>Children</i> , 4(9), 81-99. doi:10.3390/children4090081	VII	<ul style="list-style-type: none"> <li>- <b>A 2017 literature review, evaluating fever in children, sourcing 145 references.</b></li> <li>- Human core body temperature is subject to variations between and within individuals, with numerous factors affecting temperature.</li> <li>- For clinical and research purposes, fever is often defined as a core temperature of 38°C.</li> <li>- Fever occurs through modification of the hypothalamic set-point due to exposure of endogenous pyrogens, whereas hyperthermia occurs due to a failure in the body's thermoregulation.</li> <li>- Hyperthermia is a lot less common in paediatrics, as opposed to fever.</li> </ul>
Bharti, P., Chauhan, M., & Ahmed, K. (2017). Comparison of rectal, infra red tympanic and infra red skin temperature in term neonates. <i>International Archives of Integrated Medicine</i> , 4(3), 43-49. Retrieved from <a href="https://search.ebscohost-com.ezp.lib.unimelb.edu.au/login.aspx?direct=true&amp;db=a9h&amp;AN=122002190&amp;site=eds-live&amp;scope=site">https://search-ebscohost-com.ezp.lib.unimelb.edu.au/login.aspx?direct=true&amp;db=a9h&amp;AN=122002190&amp;site=eds-live&amp;scope=site</a>	III	<ul style="list-style-type: none"> <li>- <b>A prospective, non-randomised study of 300 term neonates comparing rectal, infra-red tympanic and infra-red skin thermometers in terms of accuracy and effectiveness.</b></li> <li>- The differences in rectal thermometer readings and infra-red tympanic thermometer readings were statistically significant for this age group (1-29 days old).</li> </ul>
National Institute for Health and Clinical Excellence (NICE). (2013). <i>Feverish illness in children: assessment and initial management in children younger than 5 years</i> . London: Royal College of Obstetricians and Gynaecologists. Retrieved from <a href="https://www.nice.org.uk/guidance/cg160">https://www.nice.org.uk/guidance/cg160</a>	VII	<ul style="list-style-type: none"> <li>- <b>NICE Clinical Guideline (2013 update) exploring the proposed assessment and management of fever in children &lt;5 years. A thorough, 310 page document.</b></li> <li>- NICE concluded that no consensus could be obtained from the Guideline Development Group for using tympanic thermometers in infants &lt;3 months.</li> <li>- Children with fever should not be underdressed or over-wrapped</li> <li>- Paracetamol and ibuprofen can be used for symptomatic management of fevers; they should not be utilised for the sole purpose of lowering the fever.</li> </ul>
Knobel, R. B. (2014). Fetal and neonatal thermal physiology. <i>Newborn and Infant Nursing Reviews</i> , 14(2), 45-49. doi: 10.1053/j.nainr.2014.03.003	VII	<ul style="list-style-type: none"> <li>- <b>A single-authored article, reviewing literature and providing an overview of foetal and neonatal thermal physiology</b></li> <li>- Neonatal heat transfer to the environment may be caused through radiation, convection, conduction and evaporation.</li> <li>- Maintaining a neutral thermal environment and ensuring thermal stability promotes a stable neonatal body temperature at rest.</li> </ul>
Freer, Y., & Lyon, A. Temperature monitoring and control in the newborn baby. (2011). <i>Paediatrics and Child Health</i> , 22(4), 127-130. doi:10.1016/j.paed.2011.09.002	VII	<ul style="list-style-type: none"> <li>- <b>A neonatology symposium-derived article outlining temperature control of neonates</b></li> <li>- Poor management of body temperature in vulnerable neonates (whether a cause or consequence of illness) is related to higher rates of morbidity and mortality.</li> <li>- Variation of normal body temperature exists and is dependent on the route, location, environmental influences and time of day of temperature measurement.</li> <li>- Evaluating temperature trends is more important than concentrating on absolute values of intermittent measurements</li> </ul>

<p>Davie, A., &amp; Amoore, J. (2010). Best practice in the measurement of body temperature. <i>Nursing Standard</i>, 24(42), 42-49. doi: 10.7748/ns2010.06.24.42.42.c7850</p>	<p>VII</p>	<p><b>- An overview of current practices used in the measurement of body temperatures, drawing on literature and thermometer manuals.</b></p> <ul style="list-style-type: none"> <li>- Variation of temperature recordings exist depending on body site and thermometer type utilised</li> <li>- It is important to ascertain the route used when evaluating a body temperature</li> <li>- Consistency in the thermometer route is important for the accurate evaluation of temperature trends.</li> </ul>
<p>Dougherty, L., Lister, S., &amp; West-Oram, A. (2015). Observations. In <i>The Royal Marsden Manual of clinical nursing procedures, 9th ed.</i> (pp. 534-540). West Sussex, UK: The Royal Marsden NHS Foundation Trust.</p>	<p>VII</p>	<p><b>- A contemporary text book presenting a thorough overview on temperature-based definitions, assessment and measurement, drawing on articles throughout the text.</b></p> <ul style="list-style-type: none"> <li>- Definitions of hyperthermia, fever and hypothermia outlined</li> <li>- Current challenges and realistic expectations of current thermometers and temperature assessment is explored, including the lack of a current optimal method.</li> <li>- Patients with medical conditions that affect their basal metabolic rates may possess lower baseline temperature ranges.</li> </ul>