

# Pediatric thermometry:

## “You want me to put it WHERE?”

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Rectal, oral, axillary, tympanic or temporal thermometers: Which one is the most accurate for obtaining a core temperature in children and for which age group? We have researched this subject extensively and repeatedly over the last several years. The reality is that for about 98% of our population IT DOES NOT REALLY MATTER! We teach over and over again the actual height of the temperature is not important, it is how the child looks with the fever, especially after being given an appropriate dose of an antipyretic (Eiland, & Berger, 2003; Payne, 2003; Wong, 2001). In addition, most caregivers are able to tell you that their child has a fever without using a thermometer.

Although the degree of the fever does not necessarily reflect the severity of the illness, there are a few instances where accurate temperature measurement can be the sole determining factor for treatment (immunocompromised, infants less than three months) (Leduc, & Woods, 2005; Bolick et al., 2004). Even in these cases, most clinicians will be looking at the whole clinical picture and not just the temperature (Leduc, & Woods, 2005; Bolick et al., 2004). It is taught that infants can be hypothermic or normothermic when they are fighting infection, and our treatment is based on all the symptoms not just the fact that their temperature is increased or decreased (Leduc, & Woods, 2005; Bolick et al., 2004).

Fever is the body’s way of demonstrating outwardly that it is fighting an infection (Wong, 2001). The body heats up to make the environment more inhospitable for the bacteria or virus to flourish (Eiland, & Berger, 2003). Children get fevers more frequently than adults do and that is why it is a major issue in pediatric emergency nursing and medicine (Wong, 2001). The big question seems to be where to take that temperature and how reliable it is. So, let’s look at this issue by route and then you can evaluate which method is the most appropriate for your clinical setting.

### Rectal

The Canadian Pediatric Society states that a rectal temperature is the gold standard for taking a temperature in the less than two-year age and it should also be used as the definitive diagnostic route in the less than five-year age (Leduc, & Woods, 2005). It is thought to be the most accurate for

obtaining a true core temperature (Payne, 2003; Pray, 2002; University of California, 2005; Bernardo, Henker, & O’Connor, 1999). However, it is also identified that it is slow to change in relation to core temperature and may be affected by the depth of measurement or the presence of stool (Leduc, & Woods, 2005; Pray, 2002; Bernardo, Henker, & O’Connor, 1999). Caution is also advised if using a glass thermometer due to environmental concerns. The glass could easily break spilling the mercury (Payne, 2003; Leduc, & Woods, 2005; Pray, 2002). Rectal perforations have also been a consideration with this route (Payne, 2003; Leduc, & Woods, 2005; Pray, 2002). Very little evidence of rectal perforation is provided. In fact, one article states that the actual documented incidence of rectal perforation is less than one in two million (Morley, Hewson, Thorton, & Cole, 1992). Some people, especially caregivers, view taking a rectal temperature as physically and emotionally uncomfortable or even abusive (Bernardo, Henker, & O’Connor, 1999). However, our personal experience in the clinical setting is that infants (less than three months) don’t seem to mind having a rectal thermometer inserted. It is argued that, in the infant, this is the only way to truly know if they have a fever and, therefore, require further investigation (e.g., septic work-up) (Leduc, & Woods, 2005).

Infants less than three months and neonates (zero to one month) are the group that most of the controversy surrounds. The literature contradicts itself in the area of rectal versus axilla temperature-taking methods in the neonatal population. While one research article stated that neonates with their decreased brown fat will have core temp in the axilla area, others stated that rectal is still the definitive method, and the environment, as well as neonate position, will affect the outcome of other methods (Leduc, & Woods, 2005; Dollberg, Lahav, & Mimouni, 2001; Haddock, Mellow, & Swanson, 1996; Jirapaet, & Jirapaet, 2002). One product that was approved by the FDA in the USA (Penguin®) in 2001 is an electronic rapid rectal thermometer. Only one study was found in testing this thermometer, but it shows promising results for good reliability in term and near-term infants (Dollberg, Lahav, & Mimouni, 2001).

### Axillary

Most hospitals have temperature probes with disposable covers that can be used orally and axillary. The main difficulty in the pediatric population with the axillary method is simply time and proper positioning of the probe. It needs to remain in place

for five to six minutes. Furthermore, it is not reliable and is the least accurate for definitive measurement as the skin temperature is largely influenced by environmental conditions and can vary greatly from the core temperature (Eiland, & Berger, 2003; Leduc, & Woods, 2005; Pray, 2002; University of California, 2005; Bernardo, Henker, & O'Connor, 1999; Cusson, Madonia, & Taekman, 1997). As stated above, the rectal method is generally agreed upon as the definitive measurement of temperature-taking in the neonate and infant populations. However, the axillary method can be used for routine screening in low-risk populations. It is accepted as a less-invasive and reasonably accurate alternate form of temperature measurement (Leduc, & Woods, 2005; Cusson, Madonia, & Taekman, 1997).

## Oral

Oral temperature assessment is only an option if the child is old enough to keep the thermometer under the tongue for at least a minute (University of California, 2005). It is easily accessible, but is influenced by ingestion of food and drink and mouth breathing (Leduc, & Woods, 2005; Bernardo, Henker, & O'Connor, 1999). Its accuracy is somewhere between the axillary and rectal methods (Leduc, & Woods, 2005). Also, it is unreliable if the patient is hypothermic. Variable readings will be obtained depending on placement and insertion time (Bernardo, Henker, & O'Connor, 1999). It seems, in the pediatric population, this method is the least used, as quicker easier methods are now available.

## Tympanic

The tympanic method of temperature-taking is widely used. There is a strong correlation to a rectal temperature and it is accurate in the presence of hypothermia (Bernardo, Henker, & O'Connor, 1999). It has been adopted largely due to its quick

assessment time. Most tympanic thermometers take only a few seconds to get a temperature (Payne, 2003; Bailey, & Rose, 2001). This method is not largely recommended for the less than three-month age group as it is thought that the ear canal is too small to register a proper temperature (McKenzie, 2001; Cusson, Madonia, & Taekman, 1997). Most probe tips are about 8mm and the ear canal of the neonate to two-year-old is only 4mm to 5mm (Leduc, & Woods, 2005). Other factors come into play with the tympanic thermometer. If there is too much earwax in the canal, or if it is not properly positioned, the reading may not be accurate (Eiland, & Berger, 2003; Payne, 2003; Bernardo, Henker, & O'Connor, 1999). Yet, some feel that earwax does not significantly alter the temperature (Leduc, & Woods, 2005). Using the baby's ear that has been against the bed or up to the air may also affect the temperature reading (McKenzie, 2001).

## Temporal

This new kid on the block is what sparked us again to look at temperature-taking in our pediatric population. It seems to be a rather slick and fast method where you have a probe that you slide along the child's temporal region. This route poses no risk of injury, eliminates the need for disrobing and is suitable for all ages (Exergen, 2005). One study stated that the temporal artery method correctly reflects a rapid change in core temperature whereas the rectal temperature lags behind (Exergen, 2005). It is more accurate and easy to use than other routes and it works well because the temporal artery is directly connected to the heart through the carotid artery and is close to the skin (Exergen, 2005). It has also been stated that neither temporal nor axillary methods were sufficiently accurate to replace the rectal method (Hebbar, Fortenberry, Rogers, Merritt, & Easley, 2005; Leduc, & Woods, 2005).

**Table One**

	Pros	Cons
<b>Rectal</b>	- Accurate and definitive core temperature	- Must undress infant - If glass thermometer, then hazardous to the environment. - If digital, then hard to keep clean between patients - Slow to change in relation to core temperature - Slow to register (1-3 min)
<b>Axillary</b>	- Non-invasive - Acceptable for all ages - Acceptable for routine screening of low-risk patients	- Difficult to maintain proper positioning for 5-6 minutes - Inaccurate core measurement - Influenced by environmental factors
<b>Oral</b>	- Acceptable correlation to rectal/core temperature - Acceptable for routine screening of low-risk patients	- Only good for the older child - Not accurate for hypothermic patient - Not appropriate for trauma patient
<b>Tympanic</b>	- Acceptable correlation to rectal/core temperature - Accurate with hypothermia - Takes only a few seconds - Acceptable for routine screening of low-risk patients	- Concerns with accuracy in the <2 year age - Proper positioning is needed for accuracy
<b>Temporal</b>	- No risk of injury and non-invasive - No need to disrobe	- Limited research re accuracy

## Conclusion

See Table One. We believe that each individual must make a decision based on the cost and acceptability of risks for each method and tool. There simply is no perfect or right answer in this never-ending debate. The staff (nurses and physicians) must look at what works best for their population and take numerous factors into consideration. At the Alberta Children's Hospital, we still perform a rectal temperature on any child less than three months. We use the tympanic route for the rest of our population, and always consider all of the clinical findings and not just the temperature when evaluating our patients. It is only one vital sign and is rarely a stand-alone criterion for treatment of a patient. Until there is research proving that axillary, tympanic, oral or temporal methods can give us a definitive core temperature, we will continue to use rectal measurements in our less than three-month population. ❏

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