

April 18, 2011

*Axillary Temperature Taking Tools: The Evidence for Change*

**Clinical Question**

<b>P</b> (population/problem)	Among pediatric patients ages 2 months to 21 years
<b>I</b> (intervention)	does taking their axillary temperature using a chemical dot thermometer
<b>C</b> (comparison)	versus an electronic thermometer
<b>O</b> (outcome)	improve the accuracy and efficiency of the temperature taken, decrease cost, and maintain infection control standards?

**Target Population:** Children 2 months to 21 years of age

*List relevant CCHMC policies / procedures:  
VI-101 Assessment Guidelines*

**Recommendation-** (See Table of Recommendation Strength following references)

It is recommended that the chemical dot thermometer be used to measure axillary temperature among pediatric patients over the age of 2 months (Barton, Gaffney, Chase, Rayens, & Piyabanditkul, 2003 [4a], El Radhi, & Patel, 2007 [4b], Khorshid, Eser, Zaybak, & Yapucu, 2005 [4a], Van den Bruel, Aertgeerts, DeBoeck, & Buntinx, 2005 [4a], local data [5]).

**Note 1:** The chemical dot axillary temperature measurements were statistically as equally accurate as the electronic temperature measurements with an average difference (bias) of 0.76° F (95% limits of agreement 2.35 and -0.84) (Barton, 2003 [4a]).

**Note 2:** Local cost of purchasing chemical dot thermometers is less than the cost of purchasing, maintaining and providing probe covers for the electronic thermometer (local data [5]).

**Note 3:** The disposable nature of the chemical dot thermometer may prevent the spread of infection among patients (Barton, 2003 [4a]).

**Discussion/summary of evidence**

One study of the use of the chemical dot thermometer versus an electronic thermometer with axillary temperature measurement among children (n = 146, ages 2 months to 16 years) was found. The authors concluded that chemical dot axillary temperature measurements were statistically as accurate as the electronic temperature measurements with an average difference (bias) of 0.76° F (95% limits of agreement 2.35 and -0.84) (Barton, et al., 2003 [4a]).

Other studies compared axillary chemical dot versus oral electronic thermometer temperature measurements (El-Radhi, & Patel, 2007 [4b]), axillary chemical dot versus axillary mercury-in-glass thermometer temperature measurements (Khorshid, et al., 2005, [4a]), and axillary chemical dot versus oral mercury-in-glass thermometer temperature measurements (Van den Bruel, et al., 2005 [4a]). These studies found the axillary chemical dot thermometer to be an accurate alternative to the mercury-in glass thermometer at either the axillary or oral site and to the electronic thermometer at the oral site. When using any instrument for axillary site monitoring, the cut-off point of 37.5 or 37.6° C, yielded the highest sensitivity and specificity (El-Radhi, & Patel, 2007 [4b], Van den Bruel, 2005 [4a]).

Longer placement time for axillary thermometers increased accuracy of the temperature measurement (Craig, 2000 [1a]). Consult the Manufacturer’s recommended as placement time for each instrument used.

The cost for the electronic thermometer used at our institution is \$1400.00 each and probe covers cost \$0.30 apiece. Maintenance costs were not available. The cost for the chemical dot thermometer used at our institution is \$0.07 apiece (local data [5]).

The grade for the body of evidence is moderate.

**Health Benefits, Side Effects and Risks**

Falsely high or low temperature readings could result in unnecessary diagnostic procedures and treatment and/or missed diagnosis.

Use of medical equipment, without proper cleaning between patients, may increase risk of cross-contamination.

**References/citations** (evidence grade in [ ]; see *Table of Evidence Levels following references*)

Barton, S. J., Gaffney, R., Chase, T., Rayens, M. K., & Piyabanditkul, L. (2003). Pediatric temperature measurement and child/parent/nurse preference using three temperature measurement instruments. *Journal of Pediatric Nursing, 18*(5), 314-320 [4a].

Craig, J., Lancaster. (2000, April 29). Temperature measured at the axilla compared with rectum in children and young people: Systematic review. *British Medical Journal, 320*, 1174-1178 [1a]

El-Radhi, A. S., & Patel. (2007). Temperature measurement in children with cancer: An evaluation. *British Journal of Nursing, 16*(21), 1313-1316 [4b].

Khorshid, L., Eser, I., Zaybak, A., & Yapucu, U. (2005). Comparing mercury-in-glass, tympanic and disposable thermometers in measuring body temperature in healthy young people. *Journal of Clinical Nursing, 14*, 496-500 [4a].

Local Data: Cost associated with the purchase of temperature taking tools during BEST development timeframe [5].

Van den Bruel, A., Aertgeerts, B., DeBoeck, C., & Buntinx, F. (2005). Measuring the body temperature: How accurate is the Tempa Dot®? *Technology and Health Care, 13*, 97-106 [4a].

Note: Full tables of evidence grading system available in separate document:

- [Table of Evidence Levels of Individual Studies by Domain, Study Design, & Quality](#) (abbreviated table below)
- [Grading a Body of Evidence to Answer a Clinical Question](#)
- [Judging the Strength of a Recommendation](#) (abbreviated table below)

**Table of Evidence Levels** (see note above)

<i>Quality level</i>	<i>Definition</i>
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5	Other: General review, expert opinion, case report, consensus report, or guideline

†a = good quality study; b = lesser quality study

**Table of Recommendation Strength** (see note above)

<b>Strength</b>	<b>Definition</b>
“Strongly recommended”	There is consensus that benefits clearly outweigh risks and burdens (or visa-versa for negative recommendations).
“Recommended”	There is consensus that benefits are closely balanced with risks and burdens.
No recommendation made	There is lack of consensus to direct development of a recommendation.

**Dimensions:** In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.

1. Grade of the Body of Evidence (see note above)
2. Safety / Harm
3. Health benefit to patient (*direct benefit*)
4. Burden to patient of adherence to recommendation (*cost, hassle, discomfort, pain, motivation, ability to adhere, time*)
5. Cost-effectiveness to healthcare system (*balance of cost / savings of resources, staff time, and supplies based on published studies or onsite analysis*)
6. Directness (*the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome]*)
7. Impact on morbidity/mortality or quality of life

## Supporting information

**Introductory/background information:**

It was noted that some nursing staff did not understand the correct techniques for the available equipment to obtain the most accurate temperature on each patient. Inconsistent practice across nursing units decreased the accuracy of axillary temperatures.

**Group/team members:**

- Group/Team Leader:* Amy Hall-Haering, DNP(c), RN, CPN, A6N/A7C, Patient Services
- Other group/team members:* Gigi Honn, BSN, RNII, CPN, Neighborhood Locations
- Jennifer Willoughby, BSN, RN, CPN, Care Manager, Division of Pediatric Gastroenterology, Hepatology and Nutrition
- Lorna Frank, MSN, RN, BC, Education Consultant, Center for Professional Excellence/Education
- Lisa Devoto, BSN, RN, CPN, RRT, AE-C, Asthma Coordinator, Division of Respiratory Care
- Support personnel:* Barbara Giambra MS, RN, CPNP, Evidence-Based Practice Mentor, Center for Professional Excellence/Research and Evidence-Based Practice

**Search strategy:**

Databases used: Medline, CINAHL, Cochrane databases  
 Key words used: Pediatric, temperature, axillary, chemical dot, electronic, digital  
 Filters/limits: English language  
 Date range searched: all through August 1, 2010

**Known conflicts of interest:**

The authors do not have any conflict of interest to report.

**Applicability issues:**

Appropriate equipment must be easily accessible to the staff for use. Clear policies and procedures detailing the appropriate use and cleaning (if necessary) of the equipment must be put into place. Education of the staff on the proper use of each piece of equipment is essential for best practice. Education regarding documentation of the type of equipment used and the site of temperature taking is also important to clinical assessment. .

Copies of this Best Evidence Statement (BEST) are available online and may be distributed by any organization for the global purpose of improving child health outcomes. Website address: <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/default.htm>

Examples of approved uses of the BEST include the following:

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## **Note**

**This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.**

**Reviewed against quality criteria by two independent reviewers**