Date: May 21, 2012

Title: Use of irrigation solution**,** warm versus room temperature, for irrigation procedures in the Emergency Department and Urgent Care

Clinical Question:

P (population)	Among pediatric patients presenting to the Emergency Department or Urgent Care needing a simple procedure that requires irrigation
I (intervention)	does using warm irrigation solution
C (comparison)	compared to using room temperature irrigation solution
O (outcome)	lead to increased comfort and improved patient experience?

Target Population: Pediatric patients (0-21yrs old) presenting to the Emergency Department or Urgent Care requiring solution irrigation for simple laceration repairs, eye or ear irrigations. There are no exclusion criteria for using warm irrigation solution if irrigation is required.

Recommendation: It is recommended that solution be warmed to 32.2 - 37.8°C (equivalent to 90 - 100°F) before performing irrigation on lacerations, ears or eyes to improve patient comfort (Ernst, A. A., Gershoff, L., Miller, P., Tilden, E., & Weiss, S. J., 2003 *[2a]*; Ernst, A. A., Takakuwa, K. M., Letner, C., & Weiss, S. J., 1999 *[2a]*; Ernst, A. A., Weiss, S. J., Thomson, T., & Haynes, M. L., 1998 *[2a]*).

Discussion/Summary of Evidence Related to the Recommendation:

- The literature search identified 3 randomized, single-blind crossover trials that directly compared room temperature solution to warm solution for irrigation on lacerations, eye and ears as it relates to patient comfort and preference (Ernst et al., 2003 *[2a]*; Ernst et al., 1999 *[2a]*; Ernst et al., 1998 *[2a]*).
- Two studies evaluated the participants' reported level of discomfort using the visual analog scale (VAS) (Ernst et al., 1999 *[2a]*; Ernst et al., 1998 *[2a]*). With the VAS, participants report their level of discomfort using a 0-100 scale where "0" indicates "no pain" and "100" indicates "the worst pain ever." In the two studies, the mean VAS scores reported by participants for warm solutions were "13" and "15" respectively whereas the mean VAS scores for room temperature were "34" and "39" - indicating patients' level of discomfort was lower when the warm solution was used (Ernst et al., 1999 *[2a]*; Ernst et al., 1998 *[2a]*).
- No statistically significant difference was found between the mean VAS scores of warm and room temperature solution irrigation in the laceration study (Ernst et al., 2003, *[2a]*). In this study a local anesthetic was injected at the affected site prior to laceration repair as part of standard clinical practice. This clinical practice may have influenced patients' pain perception and thus the reported VAS scores. However the authors reported that anesthetics do not block temperature fibers so all study participants could distinguish the temperature of the saline and thus could provide feedback regarding solution temperature preference (Ernst et al., 2003 *[2a]).*
- A majority of participants (63%, 80% and 98% respectively) preferred the use of warm solution over the room temperature solution (Ernst et al., 2003 *[2a]*; Ernst et al., 1999 *[2a]*; Ernst et al., 1998 *[2a]*).
- In addition to patient comfort, the authors reported data about negative experiences reported by patients when simple procedures were performed using both warm and room temperature solution for irrigation. In one study, 25% of patients having their ears irrigated with room temperature solution complained of "dizziness" as compared to 5% when warm solution was used (Ernst et al., 1999, *[2a]*). In another study, complaints of

"burning" during eye irrigation were reported by 26% of patients when room temperature solution was used as compared to 9% with warmed solution (Ernst et al., 1998 *[2a]*).

- It should be noted that all three studies were conducted with adults and should readily translate to a pediatric population.

Dimensions for Judging the Strength of the Recommendation:

Reflecting on your answers to the dimensions below and given that more answers to the left of the scales indicates support for a stronger recommendation, complete one of the sentences above to judge the strength of this recommendation.
(Note that for negative recommendations, the left/right logic may be reversed for one or more dimensions.)

1. Grade of the Body of Evidence	X High	☐ Moderate	☐ Low
Comments: 3 RCT that were appraised at level 2a (Ernst et al., 2003 [2a]; Ernst et al., 1999 [2a]; Ernst et al., 1998 [2a]).			
2. Safety / Harm (Side Effects and Risks)	X Minimal	☐ Moderate	☐ Serious
Warming methods will need to be monitored to maintain the solution between 32.2 - 37.8°C (equivalent to 90-100°F) (Ernst et al., 1998 *[2a]*).			
3. Health benefit to patient	X Significant	☐ Moderate	☐ Minimal
Comments: In addition to providing the optimum wound healing environment (Hampton & Collins 2003[5a]), *use of warmed solution may improve comfort with the procedure and foster a positive patient/family experience* (Kolcaba & Dimarco, 2005 [5a]; Lenz et al., 1997 [5a]; Lindholm et al., 2008 [3a]; Nader, Mahrer, & Gold, 2010, [4a]).			
4. Burden on patient to adhere to recommendation	X Low	☐ Unable to determine	☐ High
Comments: No burden on the patient to adhere to recommendation			
5. Cost-effectiveness to healthcare system	☐ Cost-effective	X Inconclusive	☐ Not cost-effective
Comments: Cost of implementing the recommendation is undetermined at this time. Studies did not address the cost involved with the use of warmed versus room temperature solution irrigation fluids. Cost will be dependent upon the warming method chosen by the organization.			
6. Directness of the evidence for this target population	☐ Directly relates	X Some concern of directness	☐ Indirectly relates
Comments: Cell pathophysiology is the same for both children and adults. The research studies included in this recommendation were based on studies with adult participants. However the evidence generated supporting use of warmed solution upon level of comfort among an adult patient population should readily translate to a pediatric population.			
7. Impact on morbidity/mortality or quality of life	X High	☐ Medium	☐ Low
*Comments: Improved patient care experience due to reduced discomfort could assist with less emotional stress for subsequent visits (*Lindholm, T., et al 2008 [3a]; Nager, A., Mahrer, N., & Gold, J., 2010 [4a]; Kolcaba & Dimarco, 2005 [5a]; Lenz et al., 1997 [5a])			

Reference List:

Ernst, A. A., Weiss, S. J., Thomson, T., & Haynes, M. L. (1998). Warmed versus room temperature saline for ocular irrigation. *Annals of Emergency Medicine, 32*, 676-9. [2a]

Ernst, A. A., Takakuwa, K. M., Letner, C., & Weiss, S. J. (1999). Warmed versus room temperature saline solution for ear irrigation: A randomized clinical trial. *Annals of Emergency Medicine, 34*, 347-350. [2a]

Ernst, A. A., Gershoff, L., Miller, P., Tilden, E., & Weiss, S. J. (2003). Warmed versus room temperature saline for laceration irrigation: A randomized clinical trial. *Southern Medical Journal, 96*(5), 436-439. [2a]

Hampton, S., & Collins, F. (2003) Tissue viability: A comprehensive guide. London: Whurr Publications. [5a]

Kolcaba, K., DiMarco, M. A., (2005). Comfort theory and it's application to pediatric nursing. Pediatric Nursing, 31(3), 187-194. [5a]

Lenz, E., Gift, A., Pugh, L., Milligan, R., (1997). The middle-range theory of unpleasant symptoms: an update. Advances in Nursing Science, 19(3), 14-27. [5a]

Lindholm, T., Sjoberg, R., Pedroletti, C., Boman, A., Olsson, G., Sund, A., & Lindblad, F., (2008). Infants' and toddlers' remembering and fogetting of a stressful medical procedure. Journal of Pediatric Psychology, 34(2), 205-216.[3a]

Nager, A., Mahrer, N., & Gold, J., (2010). State trait anxiety in the emergency department: An analysis of anticipatory and life stressors. Pediatric Emergency Care, 26(12), 897-901. [4a]

Young, T. (1995). Common problems in wound care: wound cleansing. British Journal of Nursing, 4, 286-289.[5a]

SUPPORTING INFORMATION

Background/Purpose of BESt Development: Patient experiences in the Emergency Department or Urgent Care have a big impact on both the child and the parent. Some sources of anticipatory stress and anxiety frequently encountered during an Emergency Department or Urgent Care visit include fear of pain, fear of separation from parents, needles or shots (Nager, Mahrer, & Gold, 2010, [4a]). The Comfort Theory (Kolcaba & Dimarco, 2005 [5a]) and The Middle-Range Theory of Unpleasant Symptoms (Lenz, 1997, [5a]) address the issue of patient comfort and provide guidance for incorporating appropriate interventions in practice. Lindholm et al. (2008, [3a]) found that stressful life experiences among preverbal children (age 12-78 weeks) still provoked a distressed behavioral response when later exposed to similar stressful stimuli (p.213) supporting the notion that previous experiences might impact behavior during subsequent visits with the health care system. Therefore, it is essential that healthcare providers use appropriate interventions to address pain, anxiety and stress associated with needing to have simple procedures. By addressing the pain, anxiety and stress associated with simple procedures healthcare providers may impact the child and family's level of satisfaction with and perception of the health care encounter.

From a cell pathophysiology standpoint, maintenance of temperature homeostasis contributes to wound healing. According to Hampton (2003, [5a]) cell pathophysiology stresses the importance of maintaining cell temperature at 36-37°C. Differences of just two degrees can contribute to delays in essential steps of the healing process such as mitotic activity (delayed 4 hours), fibroblast activity (delayed for up to 8 hours) and leucocyte activity (delayed for up to 12 hours) (Hampton 2003, [5a]). Young (1995 [5a]) recommends that solution for wound cleaning be used at body temperature to prevent a drop in temperature in the wound bed. Normal cell cleaning agents (i.e. macrophages) can be delayed if not maintained at body temperature.

Uncomfortable procedures that are frequently performed in the Emergency Department and Urgent Care include laceration repair, eye or ear irrigations. One way to address stress and anxiety is to take appropriate measures to ensure the patient is as comfortable as possible while undergoing these procedures. This issue led to the PICO question

about whether using warmed irrigation solution instead of room temperature would increase a patient's comfort when undergoing simple procedures and thus contribute to an improved experience for our patients and their families.

Definitions:

- Warm solution is solution that is warmed to 32.2 - 37.8°C (equivalent to 90-100°F) (Ernst et al., 1998 *[2a]*)
- Room temperature solution is solution that is approximately 21.1°C (equivalent to 70°F) (Ernst, et al., 1998, *[2a]*)
- Simple procedures include simple lacerations, ear and eye irrigations.

Applicability Issues:

This practice can be used in the Emergency Department and Urgent Cares when requiring irrigation solutions for simple procedures such as lacerations, eye or ear irrigations.

Warming Method: There are several ways to effectively warm irrigation solutions and each institution will need to adopt a method that conforms to regulatory standards and fits the institution's clinical practice environment.

Cost: The cost associated with purchasing warming equipment and having adequate space to house equipment could be a potential barrier and will depend upon the warming method selected by the organization.

Staff Education: Staff will need to be educated in rationale for warming irrigation solutions and the appropriate steps for warming (depending on the warming method chosen by the organization) to ensure consistency of practice.

Outcome or Process Measures:

- Patient comfort as measured by no change or a decrease in before and after simple procedure pain assessment scores when a developmentally appropriate pain scale is used.
- Positive patient experience for patient and family as measured by parent/patient report of satisfaction with experience via formal survey or per parent/patient report.
- Patient tolerance of simple procedure per staff report
- Consistency in practice (increase in total % of simple procedures requiring irrigation that are using warm irrigation fluid once a warming method has been implemented)

Search Strategy:

Databases used: MEDLINE, CINAHL, Cochrane Library, National Guideline Clearinghouse
Keywords: warm saline, irrigation, comfort, laceration, experience, pediatrics
Limits: English only; 1995-present
Last search performed on March 29, 2012
Children's Hospital Association inquiry returned 2 responses and neither hospital warm solutions for irrigation.

Relevant CCHMC Evidence-Based Documents*:*

CCHMC Clinical Practices Policy Pain Management *Policy Number* CPC-I-226 *Effective Date* 11/12/2010 "Pharmacological intervention as well as alternative therapies must be considered in the plan for pain management"

Group/Team Members*:*

Team Leader: Diane Morris RNIII, Emergency Service staff nurse – Urgent Care
Support/Consultant: Carolyn Smith MSN, RN, Evidence-Based Practice Mentor – Center for Professional Excellence, Research & EBP

Conflicts of Interest Declared for each Team Member:

X No financial conflicts of interest were found.
☐ The following financial conflicts of interest were disclosed:

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, dimensions table above)*

Table of Evidence Levels *(see note above)*

Quality level	***Definition***
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
5a or 5b	General review, expert opinion, case report, consensus report, or guideline
5	Local Consensus

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

Table of Recommendation Strength *(see note above)*

Strength	***Definition***
It is strongly recommended that… It is strongly recommended that… not…	There is consensus that benefits clearly outweigh risks and burdens (or visa-versa for negative recommendations).
It is recommended that… It is recommended that… not…	There is consensus that benefits are closely balanced with risks and burdens.
There is insufficient evidence and a lack of consensus to make a recommendation…	

Copies of this Best Evidence Statement (BESt) and related tools (if applicable, e.g., screening tools, algorithms, etc.) 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/best.htm
Examples of approved uses of the BESt include the following:

- copies may be provided to anyone involved in the organization's process for developing and implementing evidence based care;
- hyperlinks to the CCHMC website may be placed on the organization's website;
- the BESt may be adopted or adapted for use within the organization, provided that CCHMC receives appropriate attribution on all written or electronic documents; and
- copies may be provided to patients and the clinicians who manage their care.

Notification of CCHMC at EBDMinfo@cchmc.org for any BESt adopted, adapted, implemented, or hyperlinked by the organization is appreciated.

Please cite as: Cincinnati Children's Hospital Medical Center: Best Evidence Statement-Use of irrigation solution, warm versus room temperature, for irrigation procedures in the Emergency Department and Urgent Care, http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/best.htm, BESt 133, pages 1-6, May 21, 2012.

This Best Evidence Statement has been reviewed against quality criteria by 2 independent reviewers from the CCHMC Evidence Collaboration.

For more information about CCHMC Best Evidence Statements and the development process, contact the Evidence Collaboration at EBDMinfo@cchmc.org.

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.