PRACTICAL SUMMARIES IN

ACUTE CARE

Enclosed in this issue: CME Evaluation

A Focused Topical Review of the Literature for the Acute Care Practitioner

Reducing Pain in Venipuncture

Author: **Sheri Knepel, MD**, Assistant Professor of Emergency Medicine, The Ohio State University, Columbus, OH.

Peer Reviewer: **Moira Davenport, MD**, Assistant Professor of Emergency Medicine, Allegheny General Hospital, Drexel University College of Medicine, Pittsburgh, PA.

Introduction

In 2002, 28.6 million intravenous (IV) catheters were placed in U.S. emergency departments (EDs).[1] Venous cannulation for IV starts and blood draws is the most common procedure in the acute care setting, and cannulation causes moderate to severe pain in a significant number of patients.[2]

Multiple guidelines from national and international organizations, including the American Academy of Pediatrics, the American Pain Society, and the Society of Infusion Nurses, have been issued for minimizing the predictable pain of IV initiation. However, a survey of U.S. EDs showed that few institutions have practice protocols for decreasing the pain of cannulation.[3]

This article reviews recent literature on a variety of approaches to decreasing the pain associated with IV cannulation in both adult and pediatric patients.

Topical Skin Coolant for IV Insertion in Adults: No Pain Relief

Source: Harstein BH, et al. Mitigation of pain during intravenous catheter placement using topical skin coolant in the emergency department. *Emerg Med J* 2008;25:257-261.

The authors of this study sought to evaluate if cryoanesthesia, the use of a topical coolant to reduce pain, was an alternative to cutaneous analgesia for IV cannulation in an ED setting. The proposed mechanism for this type of anesthesia is that the rapid evaporation of the agent cools the skin and temporarily disrupts interpretation of pain signals.

The study was an unblinded, randomized, controlled study of a convenience sample of adults at two tertiary care centers. They used a skin coolant (1,1,1,3,3-pentafluropropate and 1,1,1,2-tetrafluoroethane) applied for 2–4 seconds and immediately followed by IV insertion. The outcome evaluated was decrease in pain of IV cannulation, and secondary outcomes were patient anxiety and projection of future anxiety, patient's pain during skin preparation, staff evaluation of vein visualization, and staff perception of the effect of the spray on procedural success. Outcomes were all evaluated via questionnaire responses.

The study found that the mean pain scores, using a 100 mm Visual Analogue Scale (VAS), were 27 mm (95% CI 19.9–34.1) in the study group and 28 mm (95% CI 20.4–35.6) (p=0.934) in the control group. There was no statistically significant difference between the two groups. Pain of preparation was slightly increased, anxiety regarding future IV cannulation attempts was less, and vein visualization was slightly improved in the study group. Sixty-eight percent of staff said they would use the spray again, and 72% of study participants reported that they would choose the spray prior to future cannulation attempts.

Volume 4 • Number 11 • November 2009 • Pages 81-88

AHC Media LLC Home Page—www.ahcmedia.com • CME for Physicians—www.cmeweb.com

Statement of Financial Disclosure: Executive Editor, Ann M. Dietrich, MD, FAAP, FACEP; Dr. Knepel (author); and Dr. Davenport (peer reviewer) reported no financial relationships with companies having ties to this field of study.

AHC Media LLC

■ **COMMENTARY**

Cryoanesthesia is typically easy to use, cost effective, and instantaneous in effect, potentially making it an ideal method for decreasing the pain of IV cannulation in an acute care setting. Unfortunately, evaluation of this method, which has been studied many times, has yielded mixed results. In this study, there is no statistical significance in pain reduction. Interestingly, however, both the patient and operator would opt to use this method for future cannulations.

Subscriber Information

Customer Service: 1-800-688-2421.
Customer Service E-Mail: customerservice@ahcmedia.com
World-Wide Web: www.ahcmedia.com

Subscription Prices

United States
$299 per year. Add $17.95 for shipping & handling
(Student/Resident rate: $144.50).
Multiple Copies
Discounts are available for group subscriptions, multiple copies, site-licenses or electronic distribution. For pricing information, call Tria Kreutzer at 404-262-5482.
Outside the United States
$329 per year plus GST (Student/Resident rate: $159.50 plus GST).

Practical Summaries in Acute Care, ISSN 1075-6914, is published monthly by AHC Media LLC, 3525 Piedmont Rd., NE, Bldg. 6, Suite 400, Atlanta, GA 30305.
ASSOCIATE PUBLISHER: Coles McKagen
MANAGING EDITOR: Allison Weaver
DIRECTOR OF MARKETING: Schandale Kornegay
GST Registration Number: R128870672.
Periodicals Postage Paid at Atlanta, GA 30304 and at additional mailing offices.

POSTMASTER: Send address changes to ***Practical Summaries in Acute Care***, P.O. Box 740059, Atlanta, GA 30374.

Accreditation

AHC Media LLC is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

AHC Media LLC designates this educational activity for a maximum of 20 *AMA PRA Category 1 Credits™*. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Approved by the American College of Emergency Physicians for 20 hours of ACEP Category 1 credit.

Practical Summaries in Acute Care has been reviewed and is acceptable for up to 12 Prescribed credits by the American Academy of Family Physicians. AAFP accreditation begins 06/01/08. Term of approval is for one year(s) from this date. (This/Each) (element, volume, issue, monograph, tape, web cast, etc) is approved for 1 Prescribed credits. Credit may be claimed for one year(s) from the date of (this/each) (issue, webcast, etc.)

This CME activity is intended for emergency, urgent care, and family practice physicians. It is in effect for 24 months from the date of the publication.

Questions & Comments

Please email **Allison Weaver,** Managing Editor, allison.weaver@ahcmedia.com, or call (617) 629-5951.

AHC Media LLC

Topical Skin Coolant for IV Insertion in Children: Pain Relief

Source: Farion KJ, et al. The effect of vasocoolant spray on pain due to intravenous cannulation in children. *CMAJ* 2008;179:31-36.

In this study, Farion and colleagues evaluated the effectiveness of a vasocoolant spray to decrease the pain of IV cannulation in children.

This was a randomized, placebo-controlled, double-blind trial in 80 children age 6–12 years who were receiving IV cannulation at an academic tertiary children's hospital. A skin coolant (1,1,1,3,3-pentafluropropate and 1,1,1,2-tetrafluroethane) was sprayed for 4–10 seconds, until skin blanching occurred; that was followed by cannulation within 60 seconds. Primary outcome was patient-reported pain. Secondary outcomes were success rate on first attempt and rating of patient's pain by parents, nurses, and child life specialists (who were present and provided distraction at every IV attempt).

This study found a significant reduction in patient-reported pain on a 100 mm VAS in the study group versus the control group (mean difference 19 mm, 95% CI 6–32 mm; $p < 0.01$). Evaluation of pain by parents, nurses, and child life specialists was significantly decreased with the study group, as well. Additionally, cannulation on the first attempt was 85% in the study group versus 62% in the control group, making the number needed to treat to prevent cannulation failure five.

■ **COMMENTARY**

In this study, the same vasocoolant spray was used to evaluate effect on pain during IV cannulation in children as was used in the previous study with adults. Interestingly, the results of these two studies were very different. This study showed a clinically significant decrease in pain as perceived by the patient, parents, nurses, and child life specialists.

This yields the questions: What was the difference between the two studies? Was it the difference in technique used (a 2- to 4-second application in the first study versus a 4- to 10-second application until skin blanching was achieved in the second study)? Was it the change in patient population? Or was there another variable that caused the difference in the study results?

Overall Pain Relief from Topical Skin Coolant During IV Cannulation

Source: Hijazi R, et al. Effect of topical alkane vapocoolant spray on pain with intravenous cannulation in patients in emergency departments: Randomised double blind placebo controlled trial. *BMJ* 2009;338;b215.

This is another recent study in which the authors evaluated the effectiveness of a topical vasocoolant spray prior to IV cannulation in decreasing the pain of the procedure.

This was a randomized, double-blind, placebo-controlled trial in 201 adults at a teaching hospital in Melbourne, Australia. In the study group, a vasocoolant spray (a combination of propane, butane, and pentane) was sprayed for two seconds followed by IV cannulation within 15 seconds. The primary outcome was measurement of pain with

cannulation. The secondary outcomes evaluated included discomfort with skin preparation, success rate with first IV attempt, preference for spray use for future cannulations, and skin irritation at five days.

The results showed a significant reduction in pain with IV insertion in the study group (12 mm, 95% CI 5–40) versus the control group (36 mm, 95% CI 19–51) ($p<0.001$). Additionally, no significant pain with skin preparation was noted, and a significant number of study participants would choose the spray for future IV insertions. Cannulation success rate was increased in the study group, but the result was not significant. Two patients reported transient erythema at the site, but no persistent effects were noted.

■ **COMMENTARY**

In this third study using a different vasocoolant in an adult population, a statistically significant reduction in pain was found in the study group. Additionally, participants again would prefer the intervention for future IV insertions.

At this point, no study yet definitively answers if this intervention provides clinically significant pain decrease in all patient populations. However, this well done study does add weight to the pro argument.

Warm Topical Patches and Pain Relief During IV Insertion

Source: Singer AJ, et al. Warm lidocaine/ tetracaine patches versus placebo before pediatric intravenous cannulation: A randomized controlled trial. *Ann Emerg Med* 2008;52:41-47.

SINGER AND COLLEAGUES COMpared a topical lidocaine/tetracaine patch versus placebo for reducing the pain of IV cannulation in a pediatric ED. The patch evaluated was a transdermal patch that included an oxygen-activated heating pod with a eutectic mix of lidocaine and tetracaine that has been FDA-approved for dermal anesthesia over intact skin.

This was a randomized, controlled, double-blind trial in 45 patients age 3–17 years who presented to a pediatric ED and required non-emergent IV insertion. A lidocaine/tetracaine patch or an identical placebo patch was placed while in triage for patients in whom the need for IV placement was anticipated. The patch was placed at least 20 minutes prior to cannulation. After cannulation, the patient's pain was measured on a 100 mm VAS or on the Wong Baker Faces scale. Secondary outcomes included cannulation success, parent assessment of adequate anesthesia, parental preference for future use of the patch, nursing assessment of pain, and presence of adverse events.

The median pain of IV cannulation in the active treatment group (18 mm) was significantly lower than in the placebo group (35 mm) ($p=0.04$). The number of successful IV cannulations was similar. Parent assessment of adequate pain relief was more common in the study group (75%) versus the control group (35%). Additionally, nursing satisfaction was higher with the intervention group and more parents would request it for future use, but these results were not statistically significant. The number of adverse events was similar.

■ **COMMENTARY**

This study showed moderate success in decreasing the pain of IV cannulation in a relatively small patient population with the lidocaine/tetracaine patch versus placebo. The heating element, which expedites absorption and decreases the pretreatment time to 20 minutes, makes it a reasonable pre-intervention treatment option in the acute care setting for non-emergent patients, especially if placed in the triage setting. An advantage to the patch is that it is similar in appearance to an adhesive bandage and may be more easily accepted and less anxiety-provoking for children than some other interventions. Interestingly, although not statistically significant, a greater number of parents would request the patch again for future cannulations. A larger study with increased power would be helpful in evaluating the benefits of this product and the significance of the secondary outcomes.

Laser-assisted Topical Anesthesia and IV Insertion Pain

Source: Singer AJ, et al. Laser-assisted anesthesia prior to intravenous cannulation in volunteers: A randomized, controlled trial. *Acad Emerg Med* 2005;12: 804-807.

ABSORPTION OF TOPICAL ANESTHEsia is limited by the stratum corneum, the outer layer of the epidermis. In this study, the authors hypothesized that removing a 6 mm diameter area of this layer with a single pulse of a lightweight, portable, FDA-approved erbium:yttrium-aluminum-garnet (Er:YAG) laser would lead to enhanced uptake of a topical numbing agent and decrease the pain of IV cannulation.

This was a randomized, controlled, double-blind clinical trial in 30 healthy adult volunteers. One hand in each subject was treated with the laser and the other hand with a sham laser. Topical lidocaine (4%) cream was then applied for five minutes bilaterally, and an IV was placed. Primary outcomes were pain of skin preparation and pain of

IV cannulation. Secondary outcomes were success of IV cannulation and the presence of a burn, infection, or scarring at one week and three months.

The mean pain of cannulation after laser-assisted topical anesthesia was significantly less than after sham laser treatment (13 mm, 95% CI = 8–19 versus 29 mm, 95% CI 22–36). No significant erythema or scarring occurred, and cannulation was successful in all attempts. Of note, 80% of subjects would prefer laser treatment prior to future IV cannulation.

■ **COMMENTARY**

This study is an inventive approach to expediting the time for topical anesthetic to be effective. The cost is moderately prohibitive at $2,000/laser and an additional $6/application (versus $0.20 for an application of vasocoolant spray), and logistics may be difficult in an acute care setting. At this time, the technology may better serve a non-acute care setting, but the concept has potential.

Does Jet-injected Anesthesia Provide Pain Relief During IV Insertion in Children?

Source: Zempsky WT, et al. Needle-free powder lidocaine delivery system provides rapid effective analgesia for venipuncture or cannulation pain in children: Randomized, double-blind, comparison of venipuncture and venous cannulation pain after fast-onset needle-free powder lidocaine or placebo treatment trial. *Pediatrics* 2008;121:979-987.

THIS STUDY EVALUATES THE USE OF a novel, needle-free, powdered lidocaine delivery system versus a sham placebo to provide analgesia for pediatric vein cannulation. The active device is a sterile, single-use, pre-filled, disposable system that uses pressurized helium gas in a microcylinder to deliver lidocaine powder at a velocity significant enough to penetrate the epidermis and to allow for rapid absorption and anesthesia. The sham placebo device looked and sounded the same without delivering a pressurized dose of anesthetic. The goal of the study was to determine if effective local analgesia could be achieved in 1–3 minutes for venipuncture and peripheral IV procedures in children with this device.

This was a randomized, double-blind, sham-placebo-controlled phase 3 study of the device. The study was called COMFORT-003 (Comparison of Venipuncture and Venous Cannulation Pain After Fast Onset Powdered Lidocaine or Placebo Treatment). Five hundred seventy-nine patients age 3–18 years were randomly enrolled in six hospitals to receive lidocaine via the needle-free system or the sham placebo 1–3 minutes prior to cannulation. The authors measured patient pain (via the Wong-Baker Faces scale and on a 100 mm VAS), parent's perception, and safety of the device.

Results revealed mean Wong-Baker Faces scores of 1.77 versus 2.1 in the study versus the control groups, which reflected a statistically significant decrease in pain (p=0.11). Parental assessments of the child's pain were also lower and side effects were transient and mild (primarily erythema and petechiae).

■ **COMMENTARY**

This was a large phase 3 trial done over six hospital systems. The results indicated that this device has the potential to provide safe, well-tolerated, rapid administration of topical anesthesia which decreased pain perception by the patients and parents. The cost of the device was not discussed, and it could potentially be prohibitive for mass use to mitigate pain with cannulation. There was also potential for bias in the study, which was sponsored by the manufacturer. However, this device does have potential applications in the acute care setting.

Jet-injected Anesthesia vs. Placebo for IV Insertion in Children

Source: Auerbach M, et al. A randomized, double-blinded controlled study of jet lidocaine compared to jet placebo for pain relief in children undergoing needle insertion in the emergency department. *Acad Emerg Med* 2009;16:388-393.

THE OBJECTIVE OF THIS STUDY BY Auerbach and colleagues was to determine if needle-less, jet-delivered lidocaine decreased the pain of needle insertion in children. The system evaluated was a low-cost ($2/dose), FDA-approved device that uses pressurized carbon dioxide gas to deliver buffered 1% lidocaine or placebo (normal saline) at a velocity great enough to penetrate the epidermis.

This was a randomized, placebo-controlled, double-blind study of 150 children age 5–18 years undergoing needle insertion. A separate, non-concurrent phase of the study was an unblinded, non-intervention control group of 47 patients to evaluate any inherent placebo effect of the jet device. Treatment was delivered 60 seconds prior to cannulation. Patients reported pain on a 100 mm Color Analogue Scale (CAS). Operators reported their ability to visualize the vein. Both patients and operators reported satisfaction with the device.

The mean pain score was statistically similar between the jet lidocaine and jet placebo groups (28 mm versus 34 mm) (p=0.2277). Both were statistically lower than the no-intervention group (52 mm)

($p<0.05$). The majority of patients receiving the jet device would request it in the future. Providers did not report a change in visibility or patient cooperation between the two groups.

■ **COMMENTARY**

Interestingly, this study found that there was a decrease in pain with jet injection of lidocaine or jet injection placebo versus no intervention, but it did not find that jet injection of lidocaine was superior to jet injection of placebo. The results differ from the results in the previously discussed study.

In this study, there was active jet-injection of the placebo device instead of a placebo device that looked and sounded like the active device without delivering pressure. This elicits the question of whether the outcome is due to the placebo effect or if the mechanism is the delivery of pressure to the area, causing a transient attenuation of pain signals. Another study of just the device with normal saline versus sham placebo would help elicit the answer. Demonstrated again, patients in the intervention group would request it for future cannulations.

Nitrous Oxide for Pain Relief During IV Insertion in Children

Source: Furuya A, et al. The effective time and concentration of nitrous oxide to reduce venipuncture pain in children. *J Clin Anesth* 2009;21:190-193.

NITROUS OXIDE HAS RAPID ONSET and both analgesic and mild sedative effects. This study was designed to investigate the time of administration and the optimal concentration of inhaled nitrous oxide needed to decrease the pain associated with IV cannulation.

This was a prospective, randomized study conducted in a pediatric operating room prior to IV start for general anesthesia. Seventy-three patients age 6–15 years presenting for elective surgery were randomly assigned to one of the following four groups:

- Group 1 – 50% N_2O in O_2 for three minutes;
- Group 2 – 50% N_2O in O_2 for five minutes;
- Group 3 – 70% N_2O in O_2 for three minutes;
- Group 4 – 70% N_2O in O_2 for five minutes.

After N_2O administration, an IV was established. Patient pain was assessed using the revised Bieri face scale by a parent and by a nurse. Pain scores from parents in Groups 3 and 4 were significantly lower than in Groups 1 and 2. Pain scores from nursing in Group 3 were lower than in Group 1. Parental and nursing scores did not differ between Groups 3 and 4. Additionally, there were no episodes of bradycardia or hypoxia in any participant. Side effects of tearing, excitement, and crying developed in seven of the 73 patients. Frequency of side effects was similar among all four groups.

The authors concluded that inhalation of 70% nitrous oxide for three minutes prior to IV cannulation was effective in decreasing pain.

■ **COMMENTARY**

This is a practice that may not be ready for prime time in most acute care settings. However, it offers an interesting concept for EDs currently with N_2O sedation capabilities.

This study supports the use of 70% N_2O in O_2 for three minutes prior to venous cannulation versus other protocols of N_2O in O_2 sedation in the pediatric population. However, 70% N_2O is frequently associated with side-effects of excitement, restless movements, and nausea or vomiting in children. Nearly 10% of patients in this study experienced side effects. This seems to be a fairly high incidence when other alternatives may offer equivalent relief in pain and anxiety with a lower side-effect profile. There is also the question of how the risk/benefit and side effect profile would translate into an adult population.

Jet-injection of Lidocaine vs. Topical Anesthesia for IV Pain in Children

Source: Spanos S, et al. Jet injection of 1% buffered lidocaine versus topical Ela-Max for anesthesia before peripheral intravenous catheterization in children. *Pediatr Emerg Care* 2008;24:511-515.

SPANOS AND COLLEAGUES COMpared J-tip needle-free jet injection of 1% lidocaine to a 30 minute application of 4% Ela-Max for anesthesia prior to insertion of a peripheral IV.

This study was a prospective, randomized, controlled trial in 70 children age 8–15 years presenting to a pediatric ED. The primary outcome was patient's pain. Subjects rated their pain on a VAS, and the procedure was videotaped and reviewed by a single-blinded reviewer for observer reported VAS pain score. Secondary outcomes evaluated included pain of the injection, anxiety, nursing satisfaction, and success rates of IV placement.

Patient reported pain was significantly reduced in the jet-injection group (17.3 versus 44.6, $p<0.001$). Blinded reviewer VAS scores trended lower in the jet injection group, as well, but the result was not statistically significant. Difference in anxiety was not different between the two groups, and there was no significant difference in nursing sat-

isfaction or success rates, although trends favored jet-injection.

■ **COMMENTARY**

This study is unique in that it compares the standard method of decreasing the pain of pediatric peripheral IV insertions, topical cream, to the jet injection. Results favored jet injection of lidocaine with a significant decrease in patient reported procedural pain. Additionally, a blinded observer rated pain. Interestingly, this decrease in pain was not as significant as patient reported decrease, which brings into question the possible placebo effect of the jet injection changing perception of the pain experienced. Regardless, this is perhaps worth consideration at $2.10/dose.

Lidocaine: Better than Vasocoolant and N_2O for Pain Relief in IV Insertion in Adults

Source: Robinson PA, et al. Lignocaine is a better analgesic than either ethyl chloride or nitrous oxide for peripheral intravenous cannulation. *Emerg Med Australas* 2007;19:427-432.

THIS STUDY COMPARED THREE DIFferent methods for reducing pain prior to peripheral IV insertion. Robinson and colleagues compared intradermal lidocaine, ethyl chloride topical vasocoolant spray, and inhaled 50% N_2O in O_2.

The study was a randomized, controlled trial of 300 subjects older than 15 years at a large tertiary care center in New Zealand with four study groups:

- No anesthesia and immediate cannulation;
- One-minute inhalation of 50% N_2O;
- Ethyl chloride spray for 5–10 seconds prior to cannulation;
- 0.1 mL of 1% lidocaine injected prior to cannulation.

Patients rated their pain on a 100 mm VAS immediately after cannulation. Patients with no intervention reported the most pain (VAS 20 mm, 95% CI 15–25), and those who received the 1% lidocaine injection reported the least pain (VAS 1 mm, 95% CI 0–6) ($P< 0.001$). Cannulation success was not effected. Pain with N_2O and ethyl chloride spray was less than with no intervention, but it was not statistically significant.

■ **COMMENTARY**

This study was ambitious in that it directly compared three methods of anesthesia prior to IV cannulation. Two questions come to light: First, were the optimum application of N_2O and topical vasocoolant spray chosen? Second, which method provided the greatest patient satisfaction? Of note, was the pain of lidocaine insignificant, or did the pain of injection negate the decrease in pain of cannulation in patients' rating of satisfaction? Despite the limitations, it does reiterate that some intervention is better than none.

Lidocaine: Better than Topical Cream for Pain Relief in IV Insertion in Adults

Source: McNaughton C, et al. A randomized, crossover comparison of injected buffered lidocaine, lidocaine cream, and no analgesia for peripheral intravenous cannula insertion. *Ann Emerg Med* 2009;54:214-220.

MCNAUGHTON AND COLLEAGUES chose to directly compare the pain and anxiety of peripheral IV insertion with no anesthesia, topical 4% lidocaine, or intradermal 1% buffered lidocaine in a group of health care providers who acted as their own controls.

This was a randomized, unblinded, crossover design study in which three peripheral IVs were inserted into 70 medical students and nurses at IV workshops. After each insertion, pain, anxiety, and preference for future use on self and as a provider were rated on a 10-point scale.

Median pain scores were 7 with no local anesthesia, 3 with topical cream, and 1 with injected 1% lidocaine. Anxiety scores were 4 without anesthesia and 2 with anesthesia. Seventy percent of subjects reported they would request buffered lidocaine prior to peripheral IV insertions.

■ **COMMENTARY**

This study is interesting for two reasons. First, it directly compares topical and subcutaneous lidocaine. Second, it compares the use of them on providers. Results favored the injection of buffered 1% lidocaine, and 70% of the providers stated they would request it on themselves in the future. Of note, use of either numbing technique significantly reduced anxiety. Additionally, after participating in this study, the providers stated the experience would influence their future practice.

Conclusion

THE IDEAL APPROACH TO DECREASing the pain of cannulation would have the following characteristics: high efficacy, convenient and easy to use, rapid onset, low cost, needle free, good safety profile, with no complex or special equipment and no detrimental effect on procedural success. At this time, a variety of approaches exist, but none has all of the desirable characteristics.

First, there is the topical vasocoolant. This is cheap and easy with a rapid onset and a good safety pro-

file. Unfortunately, there are mixed results in multiple studies, some of which were reviewed in this article, in regards to efficacy.

Next, there are topical numbing agents. They are relatively inexpensive and effective, with good ease of use and a low side-effect profile. The main downside to these products is the time to onset. Due to the need for the product to cross the outer layer of the epidermis, average time to effect is about 45 minutes if there is no intervention. One intervention reviewed was the topical warming patch, which decreased time to effectiveness to 20 minutes. This has definite potential but may still take too long for application in the acute care setting. Another approach has been to remove a very small portion of the stratum corneum, as was done in the laser study. This was effective but costly, and it may be worth revisiting as technology advances.

Finally, there is injected lidocaine. This is cheap and probably the most effective. When injected with a needle, there is associated pain, anxiety, and increased potential for needle sticks. A new approach has been to use a jet injection system to avoid the extra needle stick. This, too, has yielded mixed results. Interestingly, the pressure of the jet injector itself causes some pain relief even without lidocaine. This could lead to interesting future explorations.

At this time, it does not seem that there is yet a perfect answer to the problem of providing anesthesia for peripheral cannulation. It is worth noting two things: First, patients prefer something to nothing, even if the intervention caused no significant decrease in pain. Second, in head-to-head trials with vasocoolant, topical creams, and N_2O, 1 mL of injected buffered 1% lidocaine provided the greatest pain relief and was preferred by patients.

References

1. Pitts SR, et al.National Hospital Ambulatory Medical Care Survey : 2006 Emergency Department Summary. National Health Statistics Report. 2008 Aug; no 7. Hyattsville, MD: National Center for Health Statistics, 2008.
2. Singer AJ, et al. Comparison of patient and practitioner assessment of pain from commonly performed emergency department procedures. *Ann Emerg Med* 1999;33:652-658.
3. Bhargava R, et al. Procedural pain management patterns in academic pediatric emergency departments. *Acad Emerg Med* 2007;14:479-482.

CME OBJECTIVES

Upon completing this program, participants will be able to:

- Summarize the most recent significant studies in emergency medicine/urgent care related to a single topic;
- Discuss up-to-date information about new drugs, techniques, equipment, trials, studies, books, teaching aids, and other information pertinent to the stated topic;
- Evaluate the credibility of published data and recommendations about the stated topic.

CME INSTRUCTIONS

Physicians participate in this continuing medical education program by reading the articles, using the provided references for further research, and studying the CME questions. Participants should select what they believe to be the correct answers, then refer to the list of correct answers to test their knowledge. To clarify confusion surrounding any questions answered incorrectly, please consult the source material.

After completing this activity, participants must complete the evaluation form provided at the end of each semester and return it in the reply envelope provided to receive a credit letter. When an evaluation form is received, a credit letter will be mailed to the participant.

CME Questions

50. Which of the following is the most commonly performed procedure in the emergency department?

a. Peripheral IV cannulation
b. Lumbar puncture
c. Incision and drainage
d. Intubation

51. A good topical anesthetic includes which of the following characteristics?

a. Easy to use
b. Cost effective
c. Good safety profile
d. All of the above

52. Which of the following is the major barrier associated with laser-assisted topical anesthesia?

a. Cost of the technology
b. Scarring
c. Absorption after removal of the stratum corneum
d. Effectiveness

53. Which of the following statements is correct?

a. Jet-injection of lidocaine uses a needle to puncture the skin.
b. 50% N_2O in O_2 is the optimal concentration for anesthesia prior to peripheral IV start.
c. Vasocoolants work by rapid evaporation of the agent cooling the skin and disrupting the pain signals.

54. Which of the following statements is correct?

a. Vasocoolants are clearly, without any doubt, the most effective approach to relieving the pain associated with peripheral IV starts.
b. Patients prefer some intervention to no intervention, even if pain reduction is not clinically significant.
c. N_2O has no known associated side effects.

Answers: 50. a; 51. d; 52. a; 53. c; 54. b

United States Postal Service

Statement of Ownership, Management, and Circulation

1. Publication Title	2. Publication No.	3. Filing Date
Practical Summaries in Acute Care	1 9 3 0 - 1 1 0 3	10/1/09
4. Issue Frequency	5. Number of Issues Published Annually	6. Annual Subscription Price
Monthly	12	$299.00
7. Complete Mailing Address of Known Office of Publication *(Not Printer) (Street, city, county, state, and ZIP+4)*		Contact Person: Robin Salet
3525 Piedmont Road, Bldg. 6, Ste. 400, Atlanta, Fulton County, GA 30305		Telephone: 404/262-5489

8. Complete Mailing Address of Headquarters or General Business Office of Publisher *(Not Printer)*

3525 Piedmont Road, Bldg. 6, Ste. 400, Atlanta, GA 30305

9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor *(Do Not Leave Blank)*

Publisher *(Name and Complete Mailing Address)*

Robert Mate, President and CEO
AHC Media LLC, 3525 Piedmont Road, Bldg. 6, Ste. 400, Atlanta, GA 30305

Editor *(Name and Complete Mailing Address)*

Allison Weaver, same as above

Managing Editor *(Name and Complete Mailing Address)*

Coles McKagen, same as above

10. Owner *(Do not leave blank. If the publication is owned by a corporation, give the name and address of the corporation immediately followed by the names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, give the names and addresses of the individual owners. If owned by a partnership or other unincorporated firm, give its name and address as well as those of each individual. If the publication is published by a nonprofit organization, give its name and address.)*

Full Name	Complete Mailing Address
AHC Media LLC	3525 Piedmont Road, Bldg. 6, Ste 400 Atlanta, GA 30305

11. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities. If none, check box → ☐ None

Full Name	Complete Mailing Address
Thompson Publishing Group Inc.	805 15th Street, NW 3rd Floor Washington, D.C. 20005

12. Tax Status *(For completion by nonprofit organizations authorized to mail at nonprofit rates.) (Check one)*
The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes:
☐ Has Not Changed During Preceding 12 Months
☐ Has Changed During Preceding 12 Months *(Publisher must submit explanation of change with this statement)*

PS Form **3526**, September 1998 *See instructions on Reverse)*

13. Publication Name	14. Issue Date for Circulation Data Below
Practical Summaries in Acute Care	September 2009

15. Extent and Nature of Circulation			Average No. of Copies Each Issue During Preceding 12 Months	Actual No. Copies of Single Issue Published Nearest to Filing Date
a. Total No. Copies *(Net Press Run)*			186	364
b. Paid and/or Requested Circulation	(1)	Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541. *(Include advertiser's proof and exchange copies)*	67	73
	(2)	Paid In-County Subscriptions *(Include advertiser's proof and exchange copies)*	0	0
	(3)	Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Non-USPS Paid Distribution	9	9
	(4)	Other Classes Mailed Through the USPS	37	25
c. Total Paid and/or Requested Circulation *(Sum of 15b(1) and 15b(2)*			113	107
d. Free Distribution by Mail *(Samples, Complimentary and Other Free)*	(1)	Outside-County as Stated on Form 3541	19	22
	(2)	In-County as Stated on Form 3541	0	0
	(3)	Other Classes Mailed Through the USPS	0	0
e. Free Distribution Outside the Mail *(Carriers or Other Means)*			20	20
f. Total Free Distribution *(Sum of 15d and 15e)*			39	42
g. Total Distribution *(Sum of 15c and 15f)*			152	149
h. Copies Not Distributed			34	215
i. Total *(Sum of 15g, and h.*			186	364
Percent Paid and/or Requested Circulation *(15c divided by 15g times 100)*			74%	72%

16. Publication of Statement of Ownership
Publication required. Will be printed in the November 2009 issue of this publication. ☐ Publication not required.

17. Signature and Title of Editor, Publisher, Business Manager, or Owner	Date
President and CEO	9/28/09

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including multiple damages and civil penalties).

Instructions to Publishers

1. Complete and file one copy of this form with your postmaster annually on or before October 1. Keep a copy of the completed form for your records.
2. In cases where the stockholder or security holder is a trustee, include in items 10 and 11 the name of the person or corporation for whom the trustee is acting. Also include the names and addresses of individuals who are stockholders who own or hold 1 percent or more of the total amount of bonds, mortgages, or other securities of the publishing corporation. In item 11, if none, check the box. Use blank sheets if more space is required.
3. Be sure to furnish all circulation information called for in item 15. Free circulation must be shown in items 15d, e, and f.
4. Item 15h., Copies not Distributed, must include (1) newsstand copies originally stated on Form 3541, and returned to the publisher, (2) estimated returns from news agents, and (3), copies for office use, leftovers, spoiled, and all other copies not distributed.
5. If the publication had Periodicals authorization as a general or requester publication, this Statement of Ownership, Management, and Circulation must be published; it must be printed in any issue in October or if the publication is not published during October, the first issue printed after October.
5. In item 16, indicate date of the issue in which this Statement of Ownership will be published.
6. Item 17 must be signed.

Failure to file or publish a statement of ownership may lead to suspension of second-class authorization.

PS Form **3526**, September 1999 *(Reverse)*

PRACTICAL SUMMARIES IN

ACUTE CARE

A Focused Topical Review of the Literature for the Acute Care Practitioner

EMA110109TM

PLEASE NOTE: If your correct name and address do not appear below, please complete the section at left.

Please make label address corrections here or PRINT address information to receive a certificate.

Account # _____

Name: _____

Company: _____

Address: _____

City: _____

State: _____

Zip _____

Fax: _____

Phone: _____

E-mail: _____

CME Evaluation

Please take a moment to answer the following questions to let us know your thoughts on the CME program. Fill in the appropriate space and return this page in the envelope provided. **You must return this evaluation to receive your letter of credit. ACEP members — Please see reverse side for option to mail in answers.** Thank you.

CORRECT ● **INCORRECT** ⊘ ✓ ✗ ⚠

1. If you are claiming physician credits, please indicate the appropriate credential: ○ MD ○ DO ○ Other _____

After participating in this program, I am able to:	**Strongly Disagree**	**Disagree**	**Slightly Disagree**	**Slightly Agree**	**Agree**	**Strongly Agree**
2. Summarize the most recent significant studies in emergency medicine/acute care related to a single topic.	○	○	○	○	○	○
3. Discuss up-to-date information about new drugs, techniques, equipment, trials, studies, books, teaching aids, and other information pertinent to the stated topic.	○	○	○	○	○	○
4. Evaluate the credibility of published data and recommendations about the stated topic.	○	○	○	○	○	○
5. The test questions were clear and appropriate.	○	○	○	○	○	○
6. I detected no commercial bias in this activity.	○	○	○	○	○	○
7. This activity reaffirmed my clinical practice.	○	○	○	○	○	○
8. This activity has changed my clinical practice.	○	○	○	○	○	○

If so, how? _____

9. How many minutes do you estimate it took you to complete this entire semester (6 issues) activity? Please include time for reading, reviewing, answering the questions, and comparing your answers with the correct ones listed. _____ minutes.

10. Do you have any general comments about the effectiveness of this CME program?

_____

I have completed the requirements for this activity.

Name (printed) _____ **Signature** _____

In accordance with ACEP requirements, below we provide the option for ACEP members to submit their answers to this CME activity. If you wish to submit answers to this activity, please refer to *Practical Summaries in Acute Care* Vol. 4, No. 6-11 or to this answer sheet, and circle the correct responses.

JUNE 2009

26. a b c d

27. a b c d

28. a b c d

29. a b c d

30. a b c d

JULY 2009

31. a b c d

32. a b c d

33. a b c d

34. a b c d

AUGUST 2009

35. a b

36. a b c d e

37. a b c d

38. a b c d

39. a b

SEPTEMBER 2009

40. a b c d

41. a b c d

42. a b c d

43. a b c d

44. a b c d

OCTOBER 2009

45. a b c d

46. a b c d

47. a b c d

48. a b c d

49. a b c d

NOVEMBER 2009

50. a b c d

51. a b c d

52. a b c d

53. a b c

54. a b c