

Obstetric Anesthesia CME Program

Module 3

Editorial Comment from Patricia Dailey, M.D., Associate Editor:

Reduction of health care-associated infections is a Joint Commission safety goal. In addition, Medicare announced recently that it will no longer pay the extra costs of treating preventable errors, injuries, and infections that occur in hospitals. Private insurers are considering similar changes. What do we know about preventing infection when we provide anesthesia for labor and cesarean delivery? The following article discussed the incidence of infections associated with regional anesthesia and recommendations developed by the American Society of Regional Anesthesia and Pain Medicine for aseptic techniques for regional anesthesia.

CSA now is offering its second journal and web-based CME program. This program's topic is obstetric anesthesia and consists of four modules. The third module appears in this issue of the *Bulletin*. The first and second modules were offered in the last two issues of the *Bulletin*, and the next module will appear in the Winter 2008 issue.

Mark Rosen, M.D., editor and chair of this program, is professor and vice chair and director of the residency training program at the University of California, San Francisco. He also is professor of obstetrics, gynecology, and reproductive sciences, and director of obstetric anesthesia at UCSF.

Registration: The registration page and test questions for this module are at the end of this article. The 10 questions must be answered and submitted to the CSA in order to receive the CME credit. Your CME certificate will be mailed from the CSA office.

Alternatively, the full text of each module of this CME program, along with references, will be accessible through the CSA Web Site, www.csahq.org, in the Online CME Program

section, and as part of the online *CSA Bulletin*. To complete Module 3 online, please read the information pages, read and study the text of the module, complete the self-assessment and the evaluation, and then print your CME certificate. Members will need their usernames and passwords to do the modules online.

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Fees: This is a free service for CSA members. Nonmembers will be charged \$25 per CME credit hour.

Availability: This module is available from September 30, 2007, until September 30, 2010.

Target Audience: This program is intended for all licensed physicians, including anesthesiologists, residents, and physicians with an interest in obstetric anesthesia.

Faculty and Disclosures for Module 3:

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Dr. Hughes discloses that he attended a half-day seminar sponsored by Enturia entitled "Healthcare-Associated Infections: A Growing Challenge."

CME Sponsor/Accreditation: The California Society of Anesthesiologists is accredited by the Accreditation Council for Continuing Medical Education to sponsor continuing medical education for physicians.

The California Society of Anesthesiologists Educational Programs Division designates this educational activity for a maximum of 1 *AMA PRA Category 1 Credit*[™].

Evaluation: An evaluation of Module 3 of this series is offered after the test questions. Please fill in your responses and return them to the CSA office. If you choose to do the self-assessment on the CSA Web Site at www.csahq.org, you may complete the evaluation of Module 3 online also.

Objectives: Upon completion of this activity, participants will be able to:

- Describe the infectious risks related to regional anesthesia in obstetrics.
- Define sterile technique as it applies to central neuraxial anesthesia and evaluate their practice for changes that might decrease risk of infection.
- Discuss the American Society of Regional and Pain Medicine's suggested recommendations regarding aseptic technique for regional anesthesia.

Resources: These materials, including questions, are offered on the CSA Web Site at www.csaahq.org. Instructions for the *Bulletin* version are on the registration page.

Regional Anesthesia and Infection Control: Are We Doing Enough?

By Samuel C. Hughes, M.D.

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Introduction

Anesthesiologists serve important roles in the prevention of nosocomial and hospital-acquired infections with wide ranging responsibilities that include appropriate timing of antibiotic administration, administration of drugs in a sterile manner, and use of sterile technique with placement of central lines, peripheral blocks, and neuraxial regional blocks. Inappropriate sterile technique places patients at risk for preventable infections.¹ In New Zealand, an anesthesiologist may have exposed 590 patients to hepatitis and human immune deficiency virus (HIV) because the physician allegedly reused disposable syringes.² Similar regrettable cases have occurred in the U.S. as well.

This article will focus on sterile technique applied to regional anesthesia for obstetrics. Just what does “sterile technique” mean to you? This term, although often stated, is not well defined in standard textbooks or journal articles. Before donning sterile gloves, is it necessary to do a full surgical scrub? Are face masks and head caps necessary? What about sterile gowns? The following topics will be discussed:

1. What are the infection-related risks in obstetric anesthesia?
2. What comprises appropriate sterile technique for regional anesthesia, and how reliable are the supportive data
3. What are current recommendations for regional neuraxial blocks, and do they apply to obstetric anesthesia?

How Common are Infections in Obstetric Anesthesia?

The two main infectious complications of obstetric regional anesthesia are epidural abscess and meningitis after neuraxial anesthesia. However, the true incidence of these infectious complications remains extremely difficult to determine. In a review of the literature between 1966–1998, Loo et al.³ found only eight published cases of epidural abscess related to regional techniques in obstetric anesthesia, and five cases of spontaneous infection (without regional anesthetic). A recent meta-analysis suggested the incidence of deep epidural infection was one in 145,000 women having an epidural for childbirth. This was based on larger, more recent studies published after 1990, with more than 1.19 million women.⁴ An older series in the United Kingdom (U.K.) found one epidural abscess in 506,000 epidural blocks in obstetrics.⁵

Meningitis is likely the most common serious neurological complication after neuraxial analgesia for labor. Post-dural punctate meningitis is not a national notifiable disease to the Centers for Disease Control and remains unrecognized as a nosocomial disease. The incidence in the U.S. is unknown but often is quoted to be one in 10,000 to one in 50,000. A national Swedish survey study estimates the incidence of meningitis to be one in 53,000 spinal anesthetics, but there were no cases of meningitis in obstetric patients.⁶ Smaller series have suggested a higher incidence of infection (one in 12,709), which is similar to a recent review article, but the true incidence remains elusive.^{7,8} However, meningitis is more common than an epidural abscess and has been clearly linked to regional anesthesia. While meningitis can occur with labor epidurals, the highest risk group seems to be patients who receive spinal analgesia in labor; at least 27 cases have been reported in this setting.⁹ Meningitis and abscess each accounted for 23 percent of the cases of injuries to the neuraxis in obstetric regional anesthesia claims in the ASA closed claims database between 1980-1999 (six each of 26 total cases), compared to 3 percent each of the nonobstetric regional anesthesia cases (two each of 58 total cases).¹⁰ Overall, in this database of 368 obstetric and 453 nonobstetric neuraxial anesthesia claims, obstetric cases had a higher proportion of claims with temporary and low-severity injuries.

Sterile Technique: Some Choices and Controversies

Just what is good “strict aseptic technique” or “routine sterile technique”? Both terms are used frequently in academic papers and standard textbooks, as well as on our medical records, but there is no general acceptance as to what this includes. What is vital or essential to one practitioner may not be to another. Sellors et al.¹¹ surveyed obstetric anesthesiologists in Australia and New Zealand to learn what practitioners considered essential aseptic precautions

when inserting an epidural catheter for labor analgesia. Of those responding, 86 percent (316) removed a watch or bracelet before washing for the technique, but only 55 percent removed rings. A facemask was worn by 71 percent, only 26 percent wore a cap, but 87 percent would wear a sterile gown. Oddly, three people (1 percent) would not wear gloves, which virtually everyone would consider vital to protect both the patient and practitioner.

Hand washing and Skin Disinfection

Do you wash your hands before gloving for an epidural? Universal or standard precautions apply to regional anesthesia as well as the rest of our practice. Hand washing between individual patient contact is vital and part of national recommendations to reduce hospital-acquired infections.^{12,13} This has had a renewed focus in American hospitals where one in 10 patients acquired iatrogenic infections. Ignaz Semmelweis, M.D., (1818-1865) taught us this lesson long ago (Vienna, circa 1847), but over 150 years later, it still is not widely practiced. Dr. Semmelweis noted that the death rate from infection on a maternity ward was three times higher on the physician service compared to the midwife service. With admission to one or the other service on alternating days, the women of Vienna also became aware of this and sought out the midwives. Semmelweis correctly deduced the reason for the higher infection rates and recognized the need for hand washing between patients. He became known as the savior of mothers at a time when death from puerperal fever was extremely common and likely iatrogenic in many cases. It wasn't until after his death that Louis Pasteur introduced the germ theory of disease and thus discovered the basis for the problem.

Antiseptic solutions with alcohol, or alcohol solutions alone, are superior disinfection agents compared to routine soaps or nonalcoholic antiseptics alone (e.g., povidone iodine or chlorhexidine). Alcohol works by protein denaturation, which requires water—so a solution of 60 to 95 percent alcohol is most effective and rapidly germicidal, but alcohol has little persistent activity. Alcohol-based solutions with 2 or 4 percent chlorhexidine gluconate appear to have the best-extended antimicrobial activity. Chlorhexidine antiseptics reduce the rate of blood culture contamination and is effective against all nosocomial pathogens—and primary bacterial resistance is rare. Although the protein-rich biomaterial of the skin surface can neutralize the germicidal activity of povidone-iodine, proteinaceous material has little effect on the antibacterial activity of chlorhexidine. Povidone iodine alone is a less effective germicidal agent, but iodophor in isopropyl alcohol (e.g., DuraPrep 3M) may be more effective (greater decrease in positive skin cultures and less/slower regrowth). Povidone iodine works by releasing iodine that penetrates cell walls, but this takes several minutes to work. If this agent is used, it is best to apply

immediately after opening the epidural kit, allowing sufficient time for the agent to work.

Alcohol-based chlorhexidine antiseptic solutions for skin disinfection are likely more effective than povidone iodine (faster onset with stronger bactericidal effect) and are widely used in many European centers as well as many American hospitals.¹⁴ However, neither agent has been specifically approved by the FDA for use before neuraxial anesthesia owing to lack of clinical testing and controversial studies of potential neuraxial toxicity. The guidelines for aseptic technique during regional anesthesia recently published by ASRA support the use of chlorhexidine.¹⁵

Lack of Evidence Regarding Hand Washing

While the data for effect of alcohol combined with other antiseptics are encouraging, there have been no randomized controlled trials evaluating the effect of hand washing on reducing neuraxial infections. Does regional anesthesia have the same risks as surgical infection? Certainly our exposure time is brief when placing an epidural compared with an abdominal surgical case, for example. However, I agree with James Hebl when he noted “in an effort to maximally reduce the risk of clinical infections and cross-contamination from patient to patient, adherence to these recommendations (hand washing!) may be warranted before performing a regional anesthetic technique.”¹⁵

Fingernails, Artificial Nails, and Jewelry

Artificial nails are more likely to harbor gram-negative pathogens both before and after hand washing, than natural fingernails.^{16,17} The CDC has evidence of a fungal infection being passed from an anesthesia provider to an obstetric patient who subsequently died of fungal meningitis. Length of natural fingernails may not matter since the bacterial growth occurs along the proximal one mm of nail next to the subungual skin. Good nail care may decrease the rare but real risks associated with central neuraxial blocks.

Removal of practitioner’s jewelry is not common in the U.S. when placing neuraxial blocks. However, there is evidence that removing rings decreases microbial counts after hand washing.¹⁸ While surgeons routinely remove rings and watches before scrubbing, there is no direct evidence (e.g., randomized clinical trial) that this reduces neuraxial infection. Personally, I believe this is a very minor and simple step to take to potentially avoid a disastrous complication.

Surgical Masks

Some anesthesiologists think it’s useless to wear masks.^{7,11,19} In the U.K., a postal survey by Pannikar and Yentis¹⁹ found that 51 percent of

anesthesiologists did not wear a mask when placing central neuraxial blocks, and recently this topic was debated at the ASA. No randomized control trial will likely be performed to prove conclusively that wearing a mask is purposeful. While there are studies suggesting that surgical wound infection is not decreased by wearing a mask, there is an increased risk of meningitis when performing neuraxial anesthesia without a mask. The organisms that cause meningitis reside in the upper airway passages. In a study designed to investigate the question of wearing a face mask for spinal insertion, Philips et al.²⁰ found a fresh face mask virtually abolished bacterial contamination of a culture plate placed at 30 cm distance from the mouth. After 15 minutes of wearing the mask, the counts began to increase. Thus it is important to wear a fresh face mask for each patient. Hubble et al.²¹ found that bacterial counts in laminar flow theatres increased four times when hats were not worn, 15 times when masks were omitted, and 22 times when both were omitted. While several investigators have confirmed the work by Philips, the report by Schneeberger et al.²² brings this into clear clinical focus. These authors reported a cluster of four patients who developed streptococcal meningitis after spinal anesthesia performed by the same anesthesiologist, who was under treatment for recurrent tonsillitis; he did not wear a mask and spoke during the procedures. Do you know if you are a chronic nasal carrier of staphylococcus aureus? I think the evidence is clear: wear a hat and a fresh mask. This cheap intervention will protect you from splash and may well decrease neuraxial infections.

Gowns: Say It Isn't So!

Gowns are rarely worn in the U.S. for regional anesthesia, although they are considered part of "full aseptic precautions" by surgeons. Wearing a gown is common in the U.K. for epidural placement, but not in France and the U.S.¹⁴ However, Professor Felicity Reynolds from the U.K. suggested, "It is expensive and unsupported by good evidence, but it can only be safer to do so."⁹

There is clear evidence that full sterile precautions (cap, mask, gown, large drape) and use of 2 percent chlorhexidine decrease central-line infection and are now the standard care. Because the incidence of CVP line infection was so high, the benefit (decreased infection rate and decreased health care costs) from full sterile precautions was easy to prove. But what about neuraxial anesthesia? There simply are no data at present that support the use of gowns for neuraxial anesthesia.²³ While I have an open mind on this topic, I think it is more important to follow hand washing and skin disinfection recommendations and to wear sterile gloves, fresh face masks, and caps.

ASRA convened a practice advisory panel on the infectious complications associated with regional anesthesia and pain medicine at its 2004 Annual

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Meeting and, after extensive review, published their recommendations in 2006.¹⁵ The recommendations should be viewed as guidelines, not standards. They are based on literature ranging from randomized clinical trials to individual case reports. We must accept that some of these issues will not be settled by evidence-based medicine alone, because the incidence of neuraxial infection is so low. What has been done is to devise safety practices—using hard evidence when available, common sense, and logic—as well as dissect out what we can learn from case reports and our clinical experience.

ASRA Recommendations in Brief

(from Hebl JR,¹⁵ condensed and annotated by Dr. Hughes)

1. Thorough hand washing should occur before performing any regional anesthetic technique. Alcohol-based antiseptic solutions provide maximal antimicrobial activity with extended duration when compared to non-alcoholic antimicrobial or nonantimicrobial preparations. (Grade A)
2. Removing jewelry (rings, watches) decreases microbial counts and it may be prudent to remove jewelry before hand washing (Grade B).
3. Use sterile surgical gloves, but they are no replacement for hand washing. (Grade A)
4. Data concerning use of sterile surgical gowns is lacking. Gowns have NOT been shown to reduce infection in several ICU studies. There is insufficient data to make recommendations regarding this issue.
5. Surgical masks have been shown to decrease the likelihood of site contamination from upper airway microorganisms. While they have not been shown to decrease neuraxial infection, it seems more likely they do. It is inexpensive and easy, and it may protect you as well. Wear a fresh mask. (Grade B)
6. Currently, the literature does not support the use of bacterial filters with short-term (i.e., days) of epidural infusions. (Grade B)
7. “Therefore, alcohol-based chlorhexidine solutions should be considered the antiseptic of choice before regional anesthetic techniques.” (Grade A) It should be noted that chlorhexidine solutions and povidone iodine have not received specific FDA approval for use before regional anesthesia because of a lack of clinical testing; they have been approved for the preparation of the patient’s skin prior to surgery.

The reader would be well advised to review the full ASRA recommendations along with the supporting evidence in detail.

Some Personal Clinical Notes and Suggestions to Consider

1. Paint with antiseptic of choice before drawing-up solutions, etc. Time matters in their effect; give the antiseptic a chance to work.
2. Drape carefully—put a cap on the patient? Limit people in the room? Keep the family and friends from breathing/talking, etc., onto your field or patient's back/shoulder.
3. Avoid touching any equipment (epidural catheter tip, needle tips) that will enter the patient to the degree possible. I try not to touch the tip of the spinal needle or epidural catheter tip in case there has been a break in my technique—the so-called “touchless technique.”
4. If there are any doubts about sterility of equipment or break in technique when placing a central neuraxial block, discard the kit/equipment and begin again.
5. Finally, remember no technique will be fail-proof; consider the possibility of an infectious complication and follow your patient so the diagnosis can be made promptly and treated!

Conclusion

Infection risks from medical intervention always have been a concern. Fortunately, the evolution in the practice of medicine has made infectious complications related to central neuraxial techniques somewhat uncommon and most often easily treated. However, both epidural abscess and meningitis do occur and can be devastating, and at times their cause may be traced to the practice of the anesthesiologist. There is increasing awareness that the definition of “good sterile technique” varies widely and some professionals may be too casual in their approach to the issue. As in much of medicine, guidelines are being developed. The ASA has been discussing the issue of guidelines for regional anesthesia in various forums for several years and will likely develop them in the near future. In the meantime, the ASRA recommendations are extremely useful, and the reader is urged to review these and consider their own practice. The lessons of Ignaz Semmelweis from the mid-19th century in Vienna are still vital today if we are to avoid the uncommon but tragic consequences of central neuraxial infection related to regional anesthesia. Wash your hands!

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Obstetric Anesthesia CME Program

In this issue of the *Bulletin*, Module 3 of the new Obstetric Anesthesia CME Program is available. Modules 1 through 3 are now available on the CSA Web Site www.csahq.org. The online module is a self-assessment where you can complete the test and evaluation, and then print your CME certificate. You also may contact the CSA office at 800-345-3691, and we will send you the materials by fax or mail.

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Questions

Only one correct answer for each:

1. Anesthesiologists play an important role in preventing nosocomial and hospital-acquired infection:
 - a. True
 - b. False
2. An epidural abscess or deep epidural infection:
 - a. Has not been reported in obstetric patients.
 - b. Occurs at a rate of 1:10,000 cases.
 - c. Never occurs spontaneously.
 - d. Has been reported to occur at a rate of one to 150,000.
3. Meningitis associated with regional blocks in obstetric anesthesia:
 - a. Is not reportable to the CDC and remains unrecognized as a nosocomial disease.
 - b. May occur at a rate of 1:10,000 to 1:50,000 but the true incidence is unknown.
 - c. Is associated more frequently with spinal anesthesia or dural puncture.
 - d. All of the above.
4. The use of "routine sterile technique" or "strict aseptic technique" when placing central neuraxial blocks is clearly defined and a well-established standard.
 - a. True
 - b. False
5. Hand washing as a technique to reduce infectious risks is:
 - a. A more recently recognized method.
 - b. The "standard of care" when placing regional blocks.
 - c. Best accomplished with an antiseptic solution with alcohol.
 - d. Easily accomplished with 4 percent chlorhexidine alone.
6. Artificial nails are more likely to harbor gram-negative pathogens both before and after hand washing.
 - a. True
 - b. False
7. When considering aspects of sterile technique for central neuraxial blocks, the following statement(s) are true:
 - a. The use of a fresh face mask will decrease bacterial contamination and protect the practitioner from splash.
 - b. The use of a surgical cap and a face mask decreased the bacterial counts in an experimental model.
 - c. Povidone iodine works by releasing iodine, which penetrates cell walls taking several minutes to be effective.
 - d. All of the above.

Regional Anesthesia & Infection Control (cont'd)

8. The use of a surgical gown when placing central neuraxial blocks:
- Is common practice in the U.S. and part of our evolving standard.
 - Has been shown to decrease the incidence of meningitis in obstetric anesthesia.
 - Is not supported by evidence and would be costly to use routinely.
 - None of the above.
9. Which of the following statement(s) about the ASRA recommendations concerning aseptic techniques are true:
- Thorough hand washing with alcohol-based antiseptic solutions provides maximal antimicrobial activity.
 - The use of sterile gloves is adequate to protect the patient.
 - While face masks may decrease contamination from upper airway microorganisms, this is not important with regard to the organisms commonly associated with meningitis.
 - All of the above.
10. When placing a regional block in obstetrics, if there is any doubt about the sterility of the equipment or a break in technique, it is best to discard the kit and begin again.
- True
 - False

Evaluation of Module 3

As part of the CSA Educational Programs Division's ongoing efforts to offer continuing medical education, the following evaluation of this program is requested. This is a useful tool for the EPD in preparing future CME programs.

1. How well were the learning objectives of this program met?
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| Very Well | 5 | Above Average | 4 |
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