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Editorial

COMPETENCY IN HEALTH CARE: CHANGES IN CERTIFICATION & RECERTIFICATION

Competence has been defined as, possession of required skill, knowledge, qualification, or capacity. As consumers, we want assurance that every health care provider is competent. However, identifying competency in health care practice is very difficult. We trust that a facility, organization, or agency is assuring each health care provider is competent. But exactly who is responsible for assuring that health care providers maintain competency throughout their professional life? State licensing boards and some facilities set standards, but those standards are often established by using outside agencies such as specialty boards and private certifying organizations. It is unusual to find a facility or state health care licensing board that has established competency standards more rigorous than most private professional certifying organizations. Only after a pattern of poor care does a state board or individual facility identify a provider as being incompetent. We seldom, if ever, ask how the professional certifying organizations have failed us in these situations. Instead we ask just the opposite. We tend to ask how an incompetent individual was able to meet the standards expected of the professional organization. As consumers become more involved in their health care decisions, they are starting to ask tougher questions about competency and how it is judged.

It was not long ago that the health care industry relied on an initial certifying exam as a means to identify competent health care providers without any consideration to continued competence. We assumed that each health care provider took the responsibility to maintain their competence as health care information and practices changed throughout the years. This was a poor assumption. Studies have found that over time, without continuing education, experienced health care providers could not maintain the necessary knowledge to keep pace with changing information and technology. It was consumer organizations that took the lead in questioning the value of a lifetime certification and started to demand assurance of continuing competency through recertification. During the 1970s and 80’s most health care organizations started to view assurance of continuing competency as essential. Initially, many organizations established singular methods of encouraging or demonstrating continuing competence. Required continuing education was adopted by many health care professions and state licensing boards. Some organizations required testing for recertification. Over time, most health care certifying organizations evolved to require a blend of educational requirements and demonstration of skills and knowledge through a variety of assessment methods.

Researchers have evaluated the impact of recertification requirements on competency and patient outcome. Although complexities in evaluating competency and patient outcome have made definitive studies impossible, it has become apparent that continuing education without demonstration of retained knowledge and demonstration of knowledge through testing by itself are both poor predictors of competence. However, a combination of directed lifelong learning activities combined with demonstration of knowledge and/or skills in core practice areas has shown promise in improving patient outcome.

While most providers will point to their individual or group performance as evidence of competency, it must be kept in mind that competence and performance are not necessarily synonymous. The health care system has built in mechanisms that help maximize performance through collaboration, supervision, or cooperative efforts in order to protect patients from incompetent providers in most situations. It might be a department that assigns the
least complex cases to the less competent provider, or a political infrastructure that protects or conceals information that might expose incompetence. Either way, the health care system as a whole is set up to maximize performance, but does not do a good job at exposing incompetence. Some providers feel that self-evaluation or peer review is sufficient to assure competence. A landmark study entitled, “Unskilled and Unaware of it: How Difficulties in Recognizing One’s Own Incompetence Lead to Inflated Self Assessments” shows just how useless self-assessment can be. Although peer review has some redeeming factors, politics and peer pressure can diminish its value.

With improved patient outcome as the goal in any recertification program, health care certifying organizations must work toward improving their recertification mechanisms. The aim of any recertification program should be to encourage lifelong learning. Any testing of knowledge should be based on core competencies that provide for safe patient care in all areas of practice, and not obscure theoretical or specialized information. Resistance to change is inevitable, but professional organizations must recognize that the weakest provider in the profession might very well be the standard for which the public views the profession. Every effort must be made to elevate that standard to a level where every provider can demonstrate they possess contemporary knowledge in critical areas of patient safety, and that knowledge is maintained throughout the provider’s professional life.

Steven R. Wooden, DNP, CRNA
Member, National Board of Certification and Recertification for Nurse Anesthetists


Abstract

Purpose The purpose of this study was to compare the amount of glycine absorbed during operative hysteroscopy between women who receive general anesthesia vs. local anesthesia with sedation.

Background Operative hysteroscopy is a common procedure for diagnosis and treatment of abnormal uterine bleeding that is unresponsive to medical management. Glycine 1.5%, is an electrolyte-free, hypotonic solution commonly used as a distention medium because it provides good optical and conductive properties. However, because it is hypotonic it can result in fluid overload and water intoxication that can lead to hyponatremia, hypoosmolarity, cerebral and pulmonary edema, visual disturbances, and death in severe cases. The most common complication of operative hysteroscopy is excessive glycine absorption, with a reported incidence of 6%.

The type of anesthesia administered has been hypothesized to affect the amount of glycine absorbed. Previous research suggests that epidural anesthesia is associated with increased glycine absorption when compared to general anesthesia. In contrast, a previous study by the investigators’ in this study found general anesthesia administration was associated with higher glycine absorption when compared to local anesthesia with sedation.

Methodology This was a randomized controlled trial of 95 ASA I and II women scheduled for operative hysteroscopy. Patients who were > ASA III, had a history of diabetes, history of previous endometrial resection, or required a specific type of anesthesia were excluded. Patients were randomized to receive either general anesthesia or local anesthesia with sedation. Randomization was stratified based on premenopausal status and use of gonadotropin-releasing hormone analogs for endometrial thinning. All patients had serum sodium levels drawn prior to induction of anesthesia or administration of sedation and again upon arrival in the recovery room.

Operative hysteroscopies were performed by one of three gynecologists. Glycine 1.5% was used for irrigation at a flow rate of 300 mL/min under a continuous pressure of 100 mm Hg. The pressure was electronically controlled. The amount of glycine absorbed was calculated as the amount that entered the uterine cavity minus the volume collected in the vacuum chamber. Irrigation fluid that collected on the drapes or on the floor was counted as well. The surgeon was notified of glycine absorption once the amount absorbed exceeded 500 mL.
The primary outcome was the median amount of glycine absorbed. Secondary outcomes included:

- percent of patients with < 500 mL, 500-1,000 mL, and > 1,000 mL of glycine absorbed
- decrease in serum sodium of < 5 mEq/L, 5-10 mEq/L, and > 10 mEq/L
- incidence of severe hyponatremia (< 125 mEq/L)
- discontinuation of surgery due to excessive glycine absorption.

Power and statistical analysis were appropriate. An intention-to-treat analysis was completed. A P < 0.05 was significant.

**Result**  No significant differences were found between groups in baseline demographics or operative times. Two patients in the local anesthesia group required general anesthesia for excessive anxiety.

Glycine absorption was almost two times greater in the general anesthesia group than the local anesthesia group (P = 0.005; Figure 1). In the general anesthesia group median glycine absorption was 480 mL (range 76-1,300) compared to 253 mL (range 70-728) in the local anesthesia group. In the general anesthesia group, 20% of patients had more than 1,000 mL of glycine absorbed compared to only 4% in the local anesthesia group (Figure 1). Similarly, the decrease in serum sodium was greater in the general anesthesia group (-2 mEq vs. -0.5 mEq, P = 0.0001; Figure 2). In the general anesthesia group four patients (8%) had their surgery discontinued because of excessive glycine absorption compared to two patients (4%) in the local anesthesia group (P = NS). One patient in the general anesthesia group required admission to the intensive care unit for severe hyponatremia (serum sodium 115 mEq/L).

**Conclusion**  Glycine absorption was much greater with general anesthesia compared to local anesthesia with sedation in women undergoing operative hysteroscopy. Anesthesia providers should consider local anesthesia with sedation for women undergoing hysteroscopy when glycine is used as the distending medium.

**Comment**  This is an important study because it reminds us of the potential complications associated with the use of hypotonic irrigating solutions such as glycine. The complications reported in this study remind me of TURP syndrome. The measures taken to
minimize the complication include minimizing operative time and infusion pressure, and monitoring the total amount of glycine absorbed. The American College of Gynecologists recommends discontinuing surgery when the glycine absorption exceeds 1,000 to 1,500 mL.

With TURP syndrome spinal anesthesia was commonly administered because it allowed one to monitor the patient’s level of consciousness and detect the onset severe of hyponatremia. However, the investigators reported that in previous research, investigators found higher glycine absorption with epidural anesthesia rather than general anesthesia. In this study, the investigators found general anesthesia was associated with an almost two-fold greater amount of glycine absorption when compared to local anesthesia with sedation. It is hypothesized that general anesthetics lead to pelvic vasodilation, which makes it easier for glycine to be systemically absorbed. Similarly, the sympathectomy associated with neuraxial anesthesia may increase glycine absorption.

After reading this study I might consider offering patients undergoing a hysteroscopy local anesthesia with sedation if glycine will be used for uterine distention. If deep sedation is avoided, then it is easier to monitor for early neurological changes associated with hyponatremia. The problem is that you need a cooperative patient, who can tolerate having her legs in stirrups and being in a head down position. You also would need a gentle surgeon, who is comfortable performing the procedure under a paracervical block with sedation. Anesthesia providers should weigh the risks and benefits of both techniques and ensure they maintain close communication with the surgeon and nurse. The anesthesia provider should keep a close eye on the total glycine absorbed and consider drawing a serum sodium if there is any concern.

Dennis Spence, PhD, CRNA

The views expressed in this article are those of the author and do not reflect official policy or position of the Department of the Navy, the Department of Defense, the Uniformed Services University of the Health Sciences, or the United States Government.
Obstetric Anesthesia

**Maternal Cardiac Output Changes After Crystalloid or Colloid Coload Following Spinal Anesthesia for Elective Cesarean Delivery: A Randomized Controlled Trial**

Anesth Analg 2011;113:803–10
McDonald S, Fernando R, Ashpole K, Columb M

**Abstract**

**Purpose**  The purpose of this study was to determine if a phenylephrine infusion combined with a coload of 1 L of 6% hydroxyethyl starch solution (Hespan) would result in greater cardiac output when compared to a 1 L coload of Ringers Lactate (LR) in parturients undergoing elective cesarean delivery.

**Background**  Hypotension is common after administration of spinal anesthesia for cesarean delivery. The sympathectomy associated with spinal anesthesia increases venous capacitance and thus produces a relative hypovolemia. To maintain blood pressure there needs to be a compensatory increase in cardiac output (CO) or systemic vascular resistance (SVR). Phenylephrine has been found to be more efficacious than ephedrine in treating hypotension in parturients after spinal anesthesia. However, research is conflicting as to the optimal fluid type, volume, and timing of administration. Recent research suggests that a coload of fluid as opposed to a preload may be more effective (rapid administration of a bolus during placement of the spinal anesthetic vs. administration prior to placement of the spinal anesthetic). However, further research is needed to determine if the combination of a phenylephrine infusion and a coload of a colloid such as Hespan or a crystalloid (LR) are more effective in maintaining cardiac output in parturients undergoing spinal anesthesia for cesarean delivery.

**Methodology**  The investigators conducted a randomized, double-blind, controlled study comparing two coload techniques combined with a phenylephrine infusion in 60 healthy term parturients undergoing cesarean delivery with spinal anesthesia. Parturients were excluded if they weighed < 50 kg or > 100 kg, were < 149 cm tall or > 212 cm tall, had multiple pregnancy, gestational age < 37 weeks, cardiac disease, preeclampsia, or sepsis. Patients were randomized to receive either a 1 L coload of Hespan or LR at the time of spinal injection. The coload was completed within 5 minutes. The anesthesia provider was blinded to the fluid type used. All patients had continuous infusion of phenylephrine started at 100 mcg/min; the infusion was continued if the blood pressure was at or below the patient’s baseline. Blood pressure was checked every minute. If two consecutive readings of hypotension (SBP < 80% baseline) were noted, then a bolus of phenylephrine 100 mcg was administered with a second syringe. If the BP did not improve then ephedrine 6 mg was administered. The phenylephrine infusion was stopped for HR < 50 if the systolic blood pressure was at the patient’s baseline. Glycopyrrolate 0.2 mg was administered for 2 consecutive readings of bradycardia with hypotension.
A combined spinal epidural (CSE) was placed at the L3-4 interspace and 12 mg of hyperbaric 0.5% bupivacaine with fentanyl 15 mcg was injected over 30 seconds. The patient was placed in the supine position with a 15 degree left lateral tilt position. No further intravenous fluid was administered until after delivery. Cardiac output (CO) was measured using a suprasternal Doppler flow technique. CO was measured in the left lateral tilt position prior to placement of the CSE, then at 5 minute intervals for 20 minutes after CSE placement. Surgery started after CO measurements and verification of a T-5 sensory level.

The primary outcome was the difference in CO between the two groups. Secondary outcomes included other CO measurements, phenylephrine dose, incidence of hypotension or hypertension, block height, nausea and vomiting incidence, umbilical cord gases and Apgar scores (hypotension: SBP < 80% baseline; hypertension: >120% baseline SBP). Sample size and statistical analyses were appropriate.

**Result**  
A total of 60 parturients completed the study. No significant differences were found in baseline demographics, with the exception of height, between the two groups. Parturients were approximately 34.5 ± 5 years old, with a weight of 76 ± 11 kg. Patients in the Hespan group were about 4 cm taller than in the LR group (P = 0.03).

No significant differences were found between the two groups in baseline CO, stroke volume, peak velocity or corrected flow time. At 5 min. after the block, CO was significantly higher than baseline in both the Hespan and LR groups (P = 0.002). At 10 minutes CO was significantly higher in the Hespan group compared to baseline. At all other time points in both groups CO was similar to baseline. No differences were found in stroke volume between the two groups, however stroke volume was significantly higher when compared to baseline at every time point in the Hespan and LR groups (P = 0.002). Stroke volume in both groups increased on average 11.6 mL. In the Hespan group, peak velocity and corrected flow time were significantly higher at all time points as compared to baseline (P < 0.05).

Overall blood pressure, heart rate, and total phenylephrine administered were similar between the two groups. However, patients in the LR group had a higher incidence of hypotension, hypertension, and phenylephrine requirement that was statistically insignificant when compared to the Hespan group (Table 1). The overall incidence of hypotension was 50%. The incidence of >1 episode of hypotension was 27% in the LR group and 7% in the Hespan group (P = NS). The lowest blood pressure occurred 4 minutes after the spinal injection in the LR group and at 6 minutes in the Hespan group. Six patients in the LR group and four patients in the Hespan group experienced bradycardia (P = NS). One patient in each group required glycopyrrolate for bradycardia. Both patients were normotensive and the events occurred at approximately 14 minutes after the spinal injection. No significant differences were found in the incidence of nausea or vomiting between the groups. Apgar scores and cord gases were similar between the two groups.
Table 1. Secondary Outcomes

<table>
<thead>
<tr>
<th></th>
<th>LR group n = 30</th>
<th>Hespan group n = 30</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total phenylephrine (mcg)</td>
<td>2509 ± 1005</td>
<td>2210 ± 900</td>
<td>0.14</td>
</tr>
<tr>
<td>≥1 boluses of phenylephrine</td>
<td>27%</td>
<td>10%</td>
<td>0.18</td>
</tr>
<tr>
<td>Hypotension</td>
<td>60%</td>
<td>40%</td>
<td>0.20</td>
</tr>
<tr>
<td>&gt;1 episode of hypotension</td>
<td>27%</td>
<td>7%</td>
<td>0.08</td>
</tr>
<tr>
<td>Hypertension</td>
<td>40%</td>
<td>30%</td>
<td>0.64</td>
</tr>
<tr>
<td>&gt;1 episode of hypertension</td>
<td>20%</td>
<td>7%</td>
<td>0.08</td>
</tr>
<tr>
<td>Maximal SBP (mm Hg)</td>
<td>147 ± 15</td>
<td>144 ± 16</td>
<td>0.50</td>
</tr>
<tr>
<td>Minimal SBP (mm Hg)</td>
<td>94 ± 19</td>
<td>100 ± 18</td>
<td>0.23</td>
</tr>
<tr>
<td>Block height at 20 min</td>
<td>T-2</td>
<td>T-2</td>
<td>0.64</td>
</tr>
</tbody>
</table>

**Conclusion**  
No differences were found in any of the cardiac output parameters, or in blood pressure or vasopressor requirements between the two groups. There was no benefit in administering colloid over crystalloid when a phenylephrine infusion was combined with a coload of fluid for spinal anesthesia for elective cesarean delivery.

**Comment**  
In recent years the coloading technique has become popular because it is more efficacious at maintaining blood pressure after induction of spinal anesthesia for cesarean delivery when compared to a preloading technique. Preloading is not always effective at preventing hypotension before induction of spinal anesthesia because the preload may stimulate atrial natriuretic peptide release which can cause vasodilation. If there is a delay in administration of the spinal after the preload then a majority of the crystalloid administered may be redistributed, and thus may not prevent hypotension. I like the coload technique because I have control over when and how much fluid is administered.

The investigators found no difference in cardiac output or the incidence of hypotension between the two groups. It is not surprising that cardiac output parameters were increased in both groups after the coload. While there were no statistically significant differences in blood pressure between the groups, the LR group required more phenylephrine and appeared to have more blood pressure swings. This was probably due to the more frequent need to administer a phenylephrine bolus in the LR group. Unfortunately, this study was underpowered to examine many of these secondary outcomes. I suspect with a larger sample size differences in some of these outcomes may have been found.

What is unique about this study is that the investigators evaluated the effects of a crystalloid or colloid coload in combination with a phenylephrine infusion on cardiac output and blood pressure. I imagine many anesthesia providers do not routinely use a phenylephrine infusion for elective cesarean deliveries. However, previous research suggests a phenylephrine infusion might be a useful technique. Ngan Kee et al found that the incidence, frequency and severity of hypotension was significantly less when a prophylactic phenylephrine infusion protocol (as described in this current study) was compared to intermittent bolus of phenylephrine to treat hypotension in parturients who were not administered a preload or coload. They also found a lower
incidence of nausea and vomiting with a prophylactic phenylephrine infusion (4% vs. 21%, P = 0.09). Despite lower BP in the intermittent bolus group, no differences were found in cord gases or Apgar scores in the Ngan Kee et al study. These results may make me consider trying a phenylephrine infusion to prevent hypotension after spinal anesthesia. However, it would be important to closely monitor the blood pressure and heart rate because reactive hypertension is probably fairly common with this technique.

Dennis Spence, PhD, CRNA


**EDITOR’S NOTE:** In consultation with Dr. Spence, we’d like to add **one more thing** to the comment on this article. A continuous infusion of phenylephrine at 100 mcg/min strikes both of us as on the high side for pregnant women. The most current research has debunked the former thinking that only ephedrine could be used to treat maternal hypotension and phenylephrine in lower (bolus) doses has been shown to be safe, at least in healthy women. Nonetheless, we are not aware of studies demonstrating the safety of a sustained infusion of phenylephrine at this dose. Might 100 mcg/min phenylephrine result in uterine artery constriction and fetal hypoxia in some women? We don’t think that is known at this time. There is evidence that decreased SVR plays a significant role in maternal hypotension during regional anesthesia.

Increasing SVR with a phenylephrine infusion, at a lower dose, may be reasonable in at least some clinical circumstances. We are *not*, however, recommending the routine use of a 100 mcg/min phenylephrine infusion for maternal hypotension at this time.

The views expressed in this article are those of the author and do not reflect official policy or position of the Department of the Navy, the Department of Defense, the Uniformed Services University of the Health Sciences, or the United States Government.
Programmed intermittent epidural bolus versus continuous epidural infusion for labor analgesia: the effects on maternal motor function and labor outcome. A Randomized double-blind study in nulliparous women

Anesth Analg 2011;113:826-31
Capogna G, Camorcia M, Stirparo S, Farcomeni A

Abstract

Purpose The purpose of this study was to compare the incidence of motor block and mode of delivery in women receiving labor analgesia with either a Programmed Intermittent Epidural Bolus (PIEB) or a Continuous Lumbar Epidural infusion (CLE).

Background Neuraxial anesthesia techniques such as CLE are the most effective techniques for managing labor pain. CLEs provide the parturient with a smoother analgesic experience, and when combined with patient controlled epidural analgesia, they decrease the number of anesthesia administered top-up boluses for breakthrough pain. However, recent research suggests that Programmed Intermittent Epidural Bolus infusions may result in better spread of local anesthetic than Continuous Lumbar Epidural infusions. Unfortunately, none of the previous studies on Programmed Intermittent Epidural Bolus had a large enough sample size to examine PIEB effects on motor function and mode of delivery.

Methodology This was a prospective, randomized, double-blind study comparing a Programmed Intermittent Epidural Bolus against Continuous Lumbar Epidural infusion in 150 nulliparous parturients. Both groups received patient controlled epidural analgesia (PCEA) in addition to their primary mode of epidural local anesthetic delivery. Parturients were enrolled if they were in active labor, < 4 cm dilated, and with a pain score of > 50 mm on a 100 mm visual analogue scale. All parturients had a lumbar epidural placed in the L3-4 or L4-5 interspace. A closed-end, multiorifice epidural catheter was inserted 3-4 cm into the epidural space. No test dose was administered. All parturients received a 20 mL loading dose of 0.0625% levobupivacaine plus sufentanil 10 mcg. The PCEA was programmed on a separate infusion pump to administer a 5 mL bolus of 0.125% levobupivacaine with a lockout of 10 minutes and a maximum of 3 boluses per hour. If parturients reported pain >10 mm on a 0 to 100 visual analogue scale or requested a PCEA bolus within 30 minutes of the initial bolus they were excluded from the analysis.

Parturients in the Programmed Intermittent Epidural Bolus group received an hourly 10 mL bolus of 0.0625% levobupivacaine with 0.5 mcg/mL sufentanil beginning 60 minutes after the initial epidural loading dose. Parturients in the Continuous Lumbar Epidural group received a continuous infusion of 0.0625% levobupivacaine plus 0.5 mcg/mL sufentanil at 10 mL/h.
The primary outcome was incidence of motor block and secondary outcome was the incidence of instrumental vaginal delivery (Table 1). Pain scores and motor function were evaluated every 60 minutes starting 30 minutes after the initial epidural bolus and continued until full cervical dilation. Statistical and power analysis was appropriate. A P < 0.05 was considered significant.

**Table 1. Breen Modification of Bromage Scale**

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>complete block</td>
</tr>
<tr>
<td>2</td>
<td>almost complete block</td>
</tr>
<tr>
<td>3</td>
<td>partial block</td>
</tr>
<tr>
<td>4</td>
<td>detectable weakness of hip flexion while supine</td>
</tr>
<tr>
<td>5</td>
<td>no detectable weakness of hip flexion while supine</td>
</tr>
<tr>
<td>6</td>
<td>able to stand and perform partial knee bend</td>
</tr>
</tbody>
</table>

**Result** A total of 145 parturients completed the study (PIEB n = 75 vs. CLE n = 70). The odds of motor block were 21 times higher in the Continuous Lumbar Epidural group (95% CI: 4.9 – 129.3; Figure 1). Parturients in the Continuous Lumbar Epidural group experienced motor block earlier when compared to the Programmed Intermittent Epidural Bolus group (8 hours vs. 10 hours, P = 0.008). Parturients in the Continuous Lumbar Epidural group had a 3 times greater risk of needing an instrumental delivery when compared to the Programmed Intermittent Epidural Bolus group (P=0.03; Figure 1). If parturients had motor block at the time of full cervical dilation, they were significantly more likely to require instrumental vaginal delivery (P = 0.002). There was no difference in the cesarean delivery rate between groups. Longer labor was associated with a greater risk of instrumental delivery (P < 0.001). Parturients in the Continuous Lumbar Epidural group received approximately 6 mg more levobupivacaine, and 3 more micrograms of sufentanil than the Programmed Intermittent Epidural Bolus group (P < 0.05).

**Conclusion** In nulliparous parturients, the maintenance of labor analgesia with a Programmed Intermittent Epidural Bolus + PCEA infusion resulted in less motor block and need for instrumental delivery when compared to a Continuous Lumbar Epidural + PCEA infusion.
Comment

The goal of neuraxial techniques for labor analgesia is to maximize pain relief while minimizing motor block. It is argued that denser blocks that result in lower extremity motor blockade is undesirable because they may decrease pelvic muscle tone and result in inability of the fetal head to rotate appropriately, and thus increase the need for instrumental delivery. In most studies, motor blockade is used as a surrogate marker for pelvic muscle tone. It is important to point out that this assertion is still unproven.

The investigators of this study hypothesized that an hourly intermittent bolus of local anesthetic would provide similar analgesia with less motor block and need for instrumental delivery. The theory is that with a continuous infusion there is a higher extraneural concentration of local anesthetic around motor neurons which results in higher intraneural local anesthetic concentrations, and thus increases the risk of motor block. With a Programmed Intermittent Epidural Bolus using dilute local anesthetics, the likelihood of motor blockade is less because the total amount of local anesthetic in the nerve is insufficient to cause motor block.

The results of this study are pretty impressive. Patients in the Continuous Lumbar Epidural group were over 20 times more likely to have some degree of motor block, and they were at almost a 3 times greater risk of instrumental delivery. It is important to point out that the Bromage Scale used in this study is more sensitive in detecting motor block, and thus these results may be skewed towards identifying a higher incidence of motor block when compared to other studies. Also parturients in the Programmed Intermittent Epidural Bolus group did not receive their first bolus until after the end of the first hour, therefore parturients in the Continuous Lumbar Epidural group where always ahead in total local anesthetic. Also the decision to do an instrumental delivery was at the discretion of the obstetrician, and individual practices may vary. However, obstetricians, data collectors and patients were blinded to group assignment.

Despite these limitations, I think the Programmed Intermittent Epidural Bolus is a novel technique which in the next few years may find a place in obstetric anesthesia. Clinically, the technique makes sense because you probably get a better spread of local anesthetic with a larger bolus volume. The problem with this technique is that two infusion pumps are required. I look forward to seeing newer pumps come out with the Programmed Intermittent Epidural Bolus capability in the future.

Dennis Spence, PhD, CRNA

The views expressed in this article are those of the author and do not reflect official policy or position of the Department of the Navy, the Department of Defense, the Uniformed Services University of the Health Sciences, or the United States Government.
Epidural and Spinal Anesthesia Use During Labor: 27-State Reporting Area 2008

Osterman M, Martin J

Abstract

Purpose  The purpose of this report was to describe the characteristics of women and the circumstances of the birth when spinal or epidural analgesia was used.

Background  The American College of Obstetricians and Gynecologists (ACOG) has encouraged the use of spinal and epidural analgesia for pain relief during labor and delivery. Current information from the United States Department of Health and Human Services data collection forms required for every live birth in the United States contains a reporting method for spinal, epidural, and combined methods of analgesia for labor and delivery. Since this data has been collected, starting in 2003, there has been a trend of increased use of pharmaceutical pain management methods, and specifically neuraxial analgesia. This has helped to provide a more comfortable delivery experience when compared to non-pharmaceutical methods such as Lamaze.

Methodology  The information collected for this report on neuraxial analgesia in laboring patients included all patients who had a registered birth in 27 states during the year 2008 (Table 1).

Cesarean deliveries and multiple births were excluded from the report. The report included 1,829,302 singleton vaginal births which represented 65% of all births in the United States during 2008. The report included information for race, age, parity, marital status, education, and state of residence. Additionally, the report included information about pregnancy related characteristics such as:

- prenatal care
- attendant at birth
- method of delivery
- fetal presentation
- gestational age
- birth weight
- pregnancy related risk factors
- fever during labor
- fetal distress.

Result  More than 3 out of 5 women (60%) received neuraxial analgesia for labor and delivery in

<table>
<thead>
<tr>
<th>States Included in Report</th>
</tr>
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<tbody>
<tr>
<td>California</td>
</tr>
<tr>
<td>Indiana</td>
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the 27 states covered in the report. White, Cuban, and
Puerto Rican women received neuraxial analgesia
more often than other races. Other characteristics of
women who used neuraxial analgesia the most were
those with increased education, first child, difficult
pregnancies, and larger infants. Higher education
influenced the use of neuraxial analgesia, with women
having a college education receiving neuraxial
analgesia twice as often as those with an 8th grade
education.

The use of neuraxial analgesia varied greatly from
state to state. In Kentucky, 78% of laboring women
received neuraxial analgesia while in New Mexico
only 22% received neuraxial analgesia. Use of
neuraxial analgesia was influenced by parity.
Neuraxial analgesia use decreased as parity increased.
Married women were more likely to receive an
epidural than unmarried women. Those who received
early prenatal care were more likely to receive
neuraxial analgesia. Women who were attended by
physicians were far more likely to receive neuraxial
analgesia than those attended by Certified Nurse
Midwives.

The rate of neuraxial analgesia use in women with
instrument assisted deliveries (forceps or vacuum) was
84% while women who had deliveries without
instrument assistance received neuraxial analgesia
only 60% of the time. Women with chronic
hypertension received neuraxial analgesia 74% of the
time compared with 60% of those without the
condition. Eighty seven percent of women with fever
during labor had received neuraxial analgesia, while
45% of those without fever received neuraxial
analgesia. There was no mechanism in the report to
indicate the suspected source of fever, and there are
many reasons besides neuraxial analgesia that may
have been the cause. Finally, 78% of women who had
deliveries requiring fetal resuscitation had received
neuraxial analgesia compared to 45% of women who
had not received neuraxial analgesia.

**Conclusion** The report provided a large
amount of information related to labor, delivery, and
maternal characteristics. There are a number of issues
reported that may or may not have been directly
associated with the neuraxial analgesia, but instead
were results of circumstances that were not apparent
in this report. As an example, fever can be caused by a
number of issues not related to neuraxial analgesia,
but further studies may be valuable in determining
how neuraxial analgesia impacts issues such as fever,
fetal resuscitation, and other important factors. It may
also be important to determine why race, education,
and cultural issues are associated with the ability or
desire for women to receive pain relief during labor.

**Comment** We do not often have the opportunity to study 100%
of a population. This report did indeed provide
information for 100% of deliveries in 27 states, but
most of the important issues related to complications
and bad outcomes can only be considered a casual
association between labor and the administration of
neuraxial analgesia without further evidence. I do
however think this report is very important for a
number of reasons. We must ask why neuraxial
analgesia is only provided to 22% of laboring mothers in one state while the national average for neuraxial analgesia is over 60%. We must also look at the characteristics of women who receive neuraxial analgesia and ask if those numbers reflect the personal choice of individuals or is there some sort of discrimination or unnecessary obstruction occurring which might prevent access to neuraxial analgesia for certain populations. Only further study could address these questions, but this report provides a framework for focus. When I look at the issues presented in this report concerning fetal resuscitation, maternal fever, instrument delivery, and other concerns, it is not possible to determine if neuraxial analgesia had anything to do with any of them. However, this report brings the possibility to light that our pain management techniques may have a negative impact on laboring patients. If this report does nothing more than help us focus on potential issues related to pain management during labor, then it has done its job. I hope it will lead to further study into these issues.

Steve Wooden, DNP, CRNA

If any readers of Anesthesia Abstracts has an interest in reviewing the details of this report, it can be found at: http://www.cdc.gov/nchs/data/nvsr/nvsr59/nvsr59_05.pdf
Patient Safety

**DEFINING EXCELLENCE IN ANAESTHESIA PRACTICE: THE ROLE OF PERSONAL QUALITIES AND PRACTICE ENVIRONMENT**

Br J Anaesth 2011;106:38-43

Smith AF, Glavin R, Greaves JD

**Abstract**

**Purpose** To define “excellence” from an intra-professional perspective and examine how promoting excellence could be integrated into anesthesia education.

**Background** In 2007, Great Britain’s Secretary of State for Health established an independent inquiry to examine medical specialist education. The inquiry’s report, entitled ‘Aspiring to Excellence’ was critical of the United Kingdom’s competency-based educational approach and encouraged educators to find ways to promote excellence in future physicians. Unfortunately, the report did not define “excellence.” The report also lacked suggestions for how particular medical specialties could promote excellence. In response to these limitations, an investigation was designed to define excellence and explore strategies for incorporating the concept in anesthesia education.

**Methodology** A modified Delphi survey approach was used for this investigation. In the first stage of the survey, 135 educator and trainee members of the Great Britain’s Society for Education in Anaesthesia were contacted by e-mail and asked to identify six important characteristics of excellent anesthesiologists. For the second stage of the study, first round participants attended a day-long workshop that included discussions and interviews. Sixteen of the original participants and a public representative attended this workshop. They categorized responses, ranked order of importance, and identified strategies for incorporating the highest-ranked characteristics into the anesthesia curriculum. Lastly, they compared their findings with professional standards published by the UK General Medical Council and the Royal College of Physicians and Surgeons of Canada.

**Result** Twenty-seven categories of characteristics were identified by 45 participants in the first round. The characteristics were further refined into 18 attributes by second round participants. The four highest-ranked attributes are summarized in the following table.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
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<tbody>
<tr>
<td>Strives for excellence</td>
<td>Proactive, conscientious, constantly trying to improve by reviewing one’s own practice (including errors).</td>
</tr>
<tr>
<td>Innovative</td>
<td>Not willing to accept the <em>status quo</em>, open-minded, visionary, and willing to innovate.</td>
</tr>
<tr>
<td>Clinical Skills</td>
<td>Fundamentally invaluable and indispensable.</td>
</tr>
<tr>
<td>Good communicator</td>
<td>Quality interaction with patients and staff, including diplomacy and being able to resolve conflict, negotiate, and apologize.</td>
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Academic excellence and active participation in research were not highly rated. Instead, there was an emphasis on the ability to “wield” knowledge. Other less highly rated attributes included experience, awareness of limitations, and caring.

**Conclusion**  Excellence was defined mostly by personal qualities, particularly the drive to seek out and learn from challenges. This behavior is characteristically different from the familiar repetitive practice of the “experienced non-expert.” Because success in developing these characteristics likely depends on interaction between the individual and his surroundings, departmental environment becomes critical. Department heads should assure that appropriate challenges are available for all clinicians, high standards of practice are promoted, practice is reviewed, new developments are detected and discussed critically, and trainees are expected to rise to these standards.

**Comment**  This study is the latest in a series of publications from Great Britain’s Royal College of Anaesthetists’ excellence project. When interpreting the findings, perhaps one of the most important caveats is that the investigators have reported an intra-professional perspective on excellence. It would be interesting to know whether patients or other individuals affected by our practice would define excellence similarly. In the end, we are left with excellence in anesthesia practice being defined foremost by a ‘striving for excellence.’ As a general rule, one would not define a word using the word itself, so it seems more accurate to describe the primary characteristic of excellence as an unrelenting striving: the notion that we should never be satisfied with our performance. Smith and Greaves contrast this pursuit with the practice of the “experienced non-expert” (a term borrowed from M. M. Kennedy) who maintains familiar routines.

Admittedly, this study lacks the panache of studies about the latest drugs or techniques; still, the authors’ findings are timely. As nurse anesthetists, we are in the midst of considering change from our current processes for recertification to the National Board on Certification and Recertification of Nurse Anesthetists’ (NBCRNA) new vision for continuing competence. Smith and Greaves concluded that the responsibility for establishing this new culture falls on the shoulders of those of us in leadership positions. Coincidently, the American Association of Nurse Anesthetists (AANA) recently revised its mission statement and core values to emphasize excellence. Although the organization’s strategic framework, as released to the general membership, provides no details regarding how excellence is defined, measured, or to be achieved; Smith and Greaves have provided us with a starting point: whether for our individual practices, for...
educators preparing the next generation of professionals, or for consideration by state and national organizations.

Alfred E. Lupien, PhD, CRNA, FAAN


Does an objective system-based approach improve assessment of perioperative risk in children? A preliminary evaluation of the ‘NARCO’

Br J Anaesth 2011;106:352-8

Abstract

Purpose  The purpose of this study was to develop and then determine if an objectively designed measurement tool had greater reliability in determining perioperative risk than the traditional ASA physical status classification scoring system for the pediatric patient.

Background  Clinical scoring systems such as the ASA physical status classification are meant to provide standardized measures of one’s health condition or functional status. These systems provide important metrics used for quality improvement processes, research, benchmarking, planning care, allocation of resources, and to guide clinical decisions. Many maintain that the ASA physical status classification was not meant to assess ‘surgical risk’ as it does not consider the impact of the surgical procedure itself on perioperative outcomes. The surgical procedure is an important variable however, and should be taken into consideration.

Several studies of the correlation between ASA physical status classification and perioperative morbidity and mortality have been conducted with varying results. There have been reports of high degrees of inter-rater reliability in the assignment of ASA physical status classification scores. Very little research has been conducted evaluating the efficacy of the ASA physical status classification for the pediatric patient, yet it is the only risk assessment tool used for children. (And it should be noted that it is not truly a risk assessment tool). Anesthesia care providers describe several limitations of the ASA physical status classification specific to the pediatric patient including:

- difficulty in operationally defining functional limitations
- no consideration given for those with self-limiting illness or congenital abnormality
- non-specific timing of ‘when’ the assessment is or should be done
- questions about its reliability and validity

Additional data is needed to support the use of the ASA physical status classification. Several have argued for a new grading system designed specifically for children that is comprehensive, objective, and can be used to determine perioperative risk.

Methodology  With the goal of developing a functional pediatric risk assessment tool with a high degree of reliability and validity, the first step in the process was to complete an extensive literature review. Following the literature review factors were identified that were associated with increased risk of perioperative ‘events’ in children. Acknowledging these factors, the resultant instrument considered...
multiple ‘physiologic descriptors’ and common and uncommon childhood illnesses while developing 5 assessment categories:

I. Neurological
II. Airway
III. Respiratory
IV. Cardiovascular
V. Other

Each category and its corresponding set of descriptors were then graded by severity using a scale from 0-2:

- 0 = no risk factors
- 1 = mild risk
- 2 = moderate to severe risk

The scoring was devised to create the four-point risk level NARCO I-IV. The classification considered both the sum of the scores across categories (NARCO) and the contribution of any isolated high score in a single category that may lead to increased risk. Finally, a surgical severity score was developed as a sub component of NARCO. This graded the degree of risk the surgical procedure itself posed.

The final product was the NARCO-SS perioperative risk assessment tool. Following determination of content validity, pediatric anesthesia experts were instructed to use the tool and review a total of 340 pediatric cases. Children aged newborn to 18 years who underwent a general anesthetic in the preceding 6 months were included. Each electronic medical record was analyzed by 3 pediatric anesthesiologists not involved in the original care and there was no knowledge disseminated regarding post operative outcomes. Reviewers then independently assigned a NARCO-SS score (2 reviewers) or an ASA physical status classification score (1 reviewer) for each record.

The process was repeated 3 months later for test-retest reliability purposes. Research assistants, blinded to the assessor’s scores, then obtained patient data including post operative outcomes and the originally assigned ASA physical status classification scores. NARCO-SS scores were compared with ASA physical status classification scores and tested for significance. Other statistical measurements were used to determine if relationships existed between scoring and outcomes.

Result A total of 308 cases were ultimately reviewed and the NARCO and surgical severity scoring instrument completed for each case. Content validity testing completed for the developed tool was found to be excellent for relevancy in measuring physical status, anesthetic risk, and for the adequacy of scoring. NARCO and ASA physical status classification scores were moderately correlated and this supported the criterion validity of the NARCO as a measure of physical status. Correlations between the NARCO score and the ASA physical status classification scores and outcomes improved slightly when the surgical severity score was factored in. Interrater reliability amongst those doing the NARCO scoring was moderate to excellent for the total NARCO scores and for the 5 individual categories with the exception of the airway category. The airway category also had a poor rating in terms of relevancy as a measure of risk. The correlations between each NARCO composite measure and most of the perioperative outcomes were fair to moderate. Of importance to note: the odds of a child needing a higher level of care and having adverse events in the
perioperative time frame were significantly higher in cases where the NARCO or ASA physical status classification scores were greater than III.

**Conclusion** The newly developed NARCO-SS measurement tool was reliable, except for the airway component, when determining risk for the pediatric patient. It had an acceptable degree of content validity while demonstrating predictive validity for levels of perioperative risk. The greater the NARCO score the more likely the patient was to need a higher level of care, be admitted to the hospital, have a longer hospital length of stay, and to have a greater prevalence of adverse events and mortality.

**Comment**

I am always amazed at the different ASA scores assigned to the same patient by different providers. The best example I can think of is the trauma patient who presents to us with no known comorbidities. They are in need of surgery, have undergone a serious traumatic event, but are relatively stable when we initiate our care. Is there such a thing as an ASA IE? I have asked this to many experts and I have received a variety of answers!

Clearly the ASA physical status classification scoring, as we use it, demonstrates poor inter-rater reliability. It appears to me that we utilize the system differently and we do not all have the same understanding of its purpose. Additionally, we interpret how to score differently. This can clearly make it useless in the clinical setting. This study demonstrated a great degree of agreement amongst providers when utilizing the NARCO scoring system versus the ASA physical status classification scoring system for the pediatric patient. Additionally the NARCO system acknowledges true perioperative risk; something that the ASA-PS is not intended to do. If a better way exists to determine perioperative risk and if this better way can guide us in improved planning and to administer care that has the potential to improve outcomes and quality, then I am all for it. I am also convinced that we are not getting much out of our current scoring system. While the NARCO-SS scoring and this particular study did have some limitations, I applaud the researchers for attempting to find something better! I hope they continue to refine it into an ever improved scoring system for determining perioperative risk. It will only help to improve care.

Mary A Golinski, PhD, CRNA

**Reliability**: The consistency of a measure. A test or instrument is considered reliable if we get the same result repeatedly. For example, if a test is designed to measure a physiologic derangement then each time the instrument is used, the results should be nearly the same.

**Inter-Rater Reliability**: This type of reliability is assessed by having two or more independent judges score the test/complete the instrument. The results are then compared to determine the consistency of the estimates between raters. One way to test inter-rater reliability is to have each rater assign each item a score. Then calculate the correlation between the ratings by different individuals to determine the level of inter-rater reliability. If the raters agree 8 out of 10 times, the test has an 80% inter-rater reliability rate.

**Validity**: The extent to which a test/instrument measures what it claims to measure. It is vital for a test/instrument to be valid in order for the results to be accurately applied and interpreted. Validity isn’t determined by a single statistic, but by a body of research that demonstrates the relationship between the test and the behavior it is intended to measure.
A novel isotonic-balanced electrolyte solution with 1% glucose for intraoperative fluid therapy in children: results of a prospective multicentre observation post-authorization safety study (PASS)

Abstract

Purpose The purpose of this study was to evaluate the use of a new balanced electrolyte intravenous solution with 1% glucose, termed BS-G1, in a small pediatric population that underwent major surgery. Specific outcome criteria assessed after BS-G1 administration included changes from baseline in acid-base status, glucose, and electrolyte concentrations, as well as any negative alterations in hemodynamic parameters.

Background The administration of IV fluids during surgery for the pediatric patient has historically been determined by recommendations that are now considered antiquated. Current evidence-based clinical trials have demonstrated that the traditional use of hypotonic IV fluids with 5% glucose can lead to profound hyponatremia and hyperglycemia. This in turn has resulted in some untoward outcomes. It is postulated that one risk for developing hyponatremia during a hypotonic solution infusion is related to the release of ADH due to the stress of surgery. Current practice guidelines, based on current research, are now suggesting the infusion of isotonic solutions for the pediatric patient, with or without glucose. The ultimate objective is to avoid the negative consequences of electrolyte and glucose imbalances observed following the infusion of a hypotonic solution.

Methodology This trial was carried out as an observational, prospective, multi-center post-authorization study. Children were enrolled that met the following inclusion criteria:

- Age ranging from neonate to 4 years
- ASA score of I-III
- Able to receive BS-G1 solution during the perioperative period
- Scheduled for major surgery where routine blood gas analysis was to be performed
- Compliant with the institutional fasting guidelines appropriate for age

Prior to and following the anesthetic/surgical procedure, the following data was obtained:

- Arterial blood gas
- Electrolyte and glucose
- Serum lactate
- Anion gap
- Hemoglobin and hematocrit
- Vital sign measurements

Statistical computations indicated that a sample size of 100 would be needed to detect changes and/or adverse reactions related to the BS-G1 IV solution infusion.

Result A total of 107 children were enrolled. Their ages ranged from 1 month to 4 years. The most common surgical procedure was abdominal, followed by urological, ‘other’, cardiothoracic, and trauma. The mean volume of BS-G1 infused was 20 ± 12.6 ml/kg and the mean infusion rate was 10 ± 3 ml/kg/hr. It was noted that 39 children received synthetic...
colloids, and packed red blood cells were transfused in 7 children. There was no cardiovascular instability or adverse reactions related to the IV solution.

During the infusion of BS-G1, the following were noted to have decreased: hemoglobin and hematocrit concentrations, the anion gap, and calcium concentrations. Chloride ion concentration and serum glucose increased, but stayed within the physiologic range. No child exhibited signs of hypo or hyperglycemia. Sodium, bicarbonate, base excess, and lactate measurements remained stable. There was no evidence of serious hyponatremia, defined as sodium <130, before or after infusions of BS-G1.

**Conclusion**  
The intra-operative infusion of an isotonic balanced electrolyte solution with 1% glucose maintained a stable acid base status and stable electrolyte and glucose concentrations in this sample.

**Comment**  
I recently had an opportunity to consult with my colleagues who are very experienced providers of pediatric anesthesia and pediatric healthcare in general. While the majority that I spoke with confirmed that they do not or have not followed for some time, the historical recommendations suggesting the use of hypotonic fluids with 2-5% glucose for the pediatric patient, we all wondered if everyone else was staying abreast of the recent clinical trials and case reports related to pediatric IV fluid therapy. We were specifically referring to the studies and case reports that demonstrated poor outcomes in the pediatric patient when hypotonic solutions were used, and more specifically *WHY* this was.

Hyponatremia and hyperglycemia can result in severe neurological sequelae, especially in the pediatric patient. Often times I wonder if providers view the administration of IV fluids as a routine and necessary component of care but only needed for medication administration and/or resuscitation. I consistently worry that we do not give IV fluid therapy enough serious consideration during the peri-operative period. There is a reason why we use isotonic solutions, hypotonic solutions, and yes even hypertonic solutions. Everyday there appears to be new and emerging evidence regarding what composition and what volume of IV solutions are considered appropriate and safe. It is based on a multitude of factors such as: preexisting co-morbidities, each individual’s physiologic status, age and age ranges, the types of surgery, and certainly the type of anesthesia. With all this information at the forefront of our decision making, we must know the risks and benefits related to the types and volumes of fluid therapy. We must not be ignorant of the reasons why we are using a specific type intravenous of IV fluid or how to calculate the amount to administer. Let us not fall in to the routine of viewing fluid therapy without careful calculation and consideration.

Mary A Golinski PhD, CRNA

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<tr>
<th>Composition of BS-G1 IV solution</th>
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<tr>
<td>Sodium</td>
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<tr>
<td>Potassium</td>
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<td>Calcium</td>
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<td>Magnesium</td>
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<td>Acetate</td>
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<td>Chloride</td>
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<td>Glucose</td>
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