Regional Anesthesia, Global Relief
Stories from Haiti and Beyond

This month’s theme, regional anesthesia, is bolstered in this issue by first-hand accounts of ASA members who treated the injured after the January earthquakes in Haiti. Read their stories, and the stories of the leaders in regional anesthesia, inside.
On January 12, 2010, people across the world were riveted by dramatic stories and images of the human toll of a cataclysmic earthquake. The shattering of a quiet Tuesday afternoon by the violence of nature was a stark reminder of the fragility of human life. When I was asked to volunteer in the medical relief effort two days later, I quickly agreed and was on a plane to Haiti on January 16, 2010. (The trip was made possible by the University of Miami Miller School of Medicine through its Global Institute for Community Development and in partnership with Project Medishare, founded in 1994 by Drs. Barth Green and Arthur Fournier.)

Edgard Pierre, M.D. was first on the scene from our anesthesiology department. The Edgard J. Pierre Foundation edgardjpierrefoundation.org is a nonprofit organization that funds an orphanage in Port-au-Prince, Haiti. The orphanage consists of a 10-room facility that houses over 60 children from 5 to 13 years of age. Fortunately, this orphanage did not suffer any human loss of life. He filled me in on what he encountered minutes before I boarded the flight.

Getting off the plane in Port-au-Prince, I was nervous. I had only seen the images from the news, and although these images were horrifying, they did not fully prepare me for the medical devastation our team encountered.

Ralf Gebhard, M.D. (Director of Regional Anesthesia at the University of Miami), Stefan Otzmeguine, M.D. and I worked together that first night on a 14-year-old boy who needed an arm amputation secondary to gangrenous infection. We had no operating room, just the stars above our heads. There was no anesthesia machine. A team from Anesthesia Associates of Massachusetts worked side-by-side with us in our efforts. One administered the intravenous medication while another took a manual blood pressure, and another bag-ventilated the intubated patient without an oxygen tank. We performed 12...
The next morning, on Sunday, January 17, we began surgery in a small, makeshift O.R. area that we had set up overnight in one of the tents. It consisted of two regular tables surrounded by boxes with supplies and was only separated from the other patients by some wall dividers. One manual blood pressure cuff and one small, portable finger pulse oximeter were our only monitors for both tables. We performed 12 cases on that day, 10 of which were upper- and lower-extremity amputations. All amputations received nerve blocks prior to surgery, exclusively performed by nerve stimulation due to the lack of ultrasound equipment. For lower-extremity amputations, we performed combined femoral and sciatic blocks. Interscalene blocks were utilized for amputation above and axillary blocks for amputations below the elbow. If necessary, patients received sedation, mainly with midazolam and ketamine. Minor extremity procedures such as wound debridement and washouts were performed just under sedation with midazolam and ketamine. I decided to avoid nerve blocks around the clavicle, which carry a potential for pneumothorax, since suction was not available on site and such a complication could have resulted in a devastating outcome.

In the following days, we were joined by other regional specialists from our group in Miami – Alexandru Visan, M.D. and Joni Maga, M.D. We continued the anesthetic concept as described above and constantly increased the case number day by day, up to 35 cases on Friday, January 22. That night, I was relieved by another colleague from our Regional Anesthesia Division, Jeffrey Frohock, M.D., and left Haiti. In a six-day time period, we had performed 140 surgeries, of which approximately 100 utilized peripheral nerve blocks as the anesthetic technique. We encountered zero mortality in the perioperative period despite the absence of oxygen, blood supplies and adequate monitoring. Postoperative pain medication requirements in the recovery area were minimal and PONV an absolute rarity.

The advantages of peripheral nerve blocks in a scenario like the one in Haiti cannot be highlighted enough: many patients were already suffering from sepsis at the time they received their first intervention, others were hypovolemic. General or even neuraxial anesthesia most likely would have resulted in more complications and maybe even in mortalities. With little information of past medical history, no knowledge regarding hemoglobin, electrolytes or coagulation status, and in the absence of sufficient monitoring and oxygen, peripheral nerve blocks provided tailored and effective anesthesia with minimal systemic effects. They also allowed us to have rapid turnover times since emergence from general anesthesia was not necessary. With only very limited recovery space and personnel, this was crucial in order to accommodate the caseload.

I strongly believe that our experience in Haiti will result in a paradigm shift in terms of emergency medical care for earthquake victims. In a scenario dictated by extremity injuries and especially open fractures, regional anesthesia can be quickly deployed and can be practiced independently from oxygen supplies and electricity (nerve stimulators are battery operated) and, if necessary, with only limited monitoring. Early availability of orthopedic surgeons and regional anesthesia-trained anesthesiologists for future catastrophes may allow for timely treatment of open fractures and compartment syndromes and allow for salvage of limbs that otherwise would certainly require amputations.
Several surgeries that first day. Regional anesthesia consisting of an interscalene block for an arm amputation or a femoral and sciatic block for leg amputation became our specialty. Ketamine was the drug of choice for dressing changes. We had no failed blocks and no complications.

At 4 a.m. that night, we responded to a young man in cardiac arrest. Not many of us have performed ACLS without monitors. We worked as a team, but our efforts were unsuccessful. If he had arrested in a hospital with life-saving equipment, we may have been able to save him.

Over the next few days, we treated hundreds of critically injured casualties in the most primitive of conditions – a 200-stretcher tent facility made possible by former NBA superstar Alonzo Mourning. We built a makeshift operating room with two tables in one of the tents. Food, water and sanitary facilities were in very short supply. People sat with injuries and growing infections by the side of our makeshift hospital, hoping that doctors and nurses would alleviate their pain. The screams never stopped, and adrenaline kept me up all night as I tried to save as many patients as possible.

Suffering and death were around all of us in Port-au-Prince. Many of the casualties we witnessed resulted from the collapse of buildings, including schools and hospitals. I felt frustrated that my abilities as a physician were limited because of a lack of fundamental equipment, but still I worked vigorously to save as many lives as I could. We had no oxygen for patients. We administered narcotics for pain with no monitors and had to make sure that other health providers had not re-dosed narcotics. This made the medical relief efforts challenging. To help us track dosages and treatments, we used notebook paper to document what time a patient received pain medications and antibiotics. Families would show me these papers during hourly pain rounds.

During my time in Haiti, I truly remembered why I became a doctor. When someone is sick, disabled, in pain, hurt or dying, medicine expects an altruistic impulse from the physician. In other words, the physician must draw closer to the patient, putting the interests of others above those of self, even at some sacrifice to oneself. The key ingredient to helping is empathy.

I am grateful that I was able to use my medical training and experience to aid the relief effort and encourage other doctors to do the same over the coming months.
Educational Evolution in Regional Anesthesia

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How did you learn regional anesthesia as a resident? Were you assigned to a room and did whatever came your way? Did you have a series of lectures and then were told to get on with it? Did you poke the patient a few times, then the mentor took over, got the block in and were told “... better luck next time ...”? Now that you are in practice, how are you learning new techniques?

This leads to a larger question. What are effective ways to teach and learn? Unfortunately, most of us, when in a teacher role, simply emulate those who taught us, both the good and the bad. Within anesthesia education, we are trying to change that. The consequences, especially for a procedurally oriented set of skills such as regional anesthesia, are more efficient transfer of knowledge, better retention of skills, and thus better and safer patient care.

A fundamental of effective education is that any exercise should have clearly stated objectives. These are learner-focused, based on what the student needs to learn, rather than teacher-focused, where the instructor only presents the things that interest him or her. We are seeing this evolution in continuing medical education (CME). In the past, when putting together a CME event, one would choose speakers, ask them what they would like to talk about, and plan a program. Now the approach is to identify a gap in the knowledge of your proposed audience and then choose speakers and topics that fill that gap. Within regional anesthesia education, the objectives need to be discrete enough so that you can evaluate whether or not you are fulfilling them as the learners move through your program. It is necessary to organize them so that foundational objectives are achieved before more sophisticated objectives are attempted; for example, before introducing ultrasound into a regional anesthesia skill-set, demonstrated familiarity with the sonoanatomy as well as operation of the machine must be shown. Not only does this approach help to ensure that all material is covered, but if there are barriers to learning, they can be more easily identified and dealt with.

One of the challenges of teaching an adult audience is that adults learn differently than children or pre-adults. Adults are more active learners. They have more life experiences that can be connected to the new information. Adults learn more effectively in an environment that is personal and when appropriate feedback is given in a timely fashion to reinforce learning. They tend to be more goal-oriented and want to know how a particular educational activity will help achieve their goals. They want to know why what they are learning is important. In short, when learning something new, adult learners want to know “what’s in it for me?” This reinforces the necessity for clear, well-organized objectives to be stated before beginning an exercise and that these objectives are followed with adequate time for interaction and feedback.

Traditionally, many procedures were learned using the “see one, do one, teach one” model, with patients as the educational medium. Reflect upon the first epidural you performed and how you might have performed differently had there been the opportunity to practice on something that wouldn’t say “ouch.” With the ability to practice and refine complex psychomotor tasks in a low-pressure environment using a task trainer, it may be safer and more comfortable for both the learner and the
patient when the time comes to perform a procedure. This has proved valuable, particularly in the case of ultrasound-guided regional anesthesia, where the fine movements required for success can be made more difficult by inexperience, fatigue and anxiety on the part of the proceduralist.

There are a growing number of commercial task trainer products for regional anesthesia currently on the market. The simplest are composed of a gel block containing simulated nerve and vascular structures, which are excellent for learning how to scan, identify structures and optimize the image using pressure, angle, rotation and tilt movements. More complex anatomic models demonstrate typical neurovascular structures particular to a given block, which assists in learning anatomic relationships, how to scan the patient to obtain optimal imaging for the desired block, and how to obtain and maintain adequate needle imaging while keeping the target structures in view. Some are also able to allow injection of simulated local anesthetic to aid with learning the ultrasonic appearance of injection. There are also trainers available for spinal and epidural anesthesia with interchangeable components to simulate normal, obese and elderly patients. If cost is a concern, it can also be useful to place targets such as dowels in a block of tofu, which can then be used for ultrasound practice, albeit for a limited amount of time. As technology continues to improve, further advances into virtual reality-based simulation will allow for more nuanced simulations, including increased anatomic variability and more accurate tactile feedback for the user.

In addition to clinical exposure and task trainers, full-scale simulation can play a role in regional education. The well-rounded anesthesiologist must have skills in dealing with rare and catastrophic events. In regional anesthesia, there are a number of such critical events, not all of which are related to the administration of a local anesthetic. Given that they are rare, any one trainee would only manage a minority of these during a residency, if at all. Furthermore, given the acuity of most of these critical events, more senior personnel would likely assume the bulk of the management. Utilizing full-scale simulation, i.e., mannequin in a simulated clinical space, learners can “try out” management schemes for uncommon and acute events. It is an opportunity to both learn new things as well as to “rehearse” the management of clinical problems. It is also an opportunity to learn how to work as a team during high-stress situations. In post-event analysis of cases with poor outcomes, poor communication is commonly listed as a contributing factor. Simulation of a critical event is an opportunity to learn, analyze and review crew resource management techniques that may help to avoid such communication issues. In our simulation center, we have a variety of challenging cases that learners may experience during their regional anesthesia experience, including both cardiac and neurotoxicity from local anesthetic, anaphylaxis, fat embolus during surgery, high spinal, oversedation and cardiac ischemia.

An ideal regional anesthesia curriculum takes into account that learners possess adult learning styles and that they may possess differing levels of experience with the goal tasks. In our residency program, the residents complete a two-month rotation in regional anesthesia with competency-based progression toward ultrasound use. To ensure adequate clinical experience and educational opportunities, there are no more than three residents per rotation. At the beginning of the rotation, the residents are expected to begin their experience by using landmark-based techniques. While they are becoming proficient at these techniques, the residents participate in an interactive didactic series regarding ultrasound physics, machine operation, correct ergonomics while performing blocks, typical ultrasonic appearance of structures and sonoanatomic pattern recognition. They practice scanning with phantoms, pre- and post-block scanning of patients when using landmark-based techniques, and scanning themselves to hone their skills. They also practice bi-manual coordination of the probe and needle using task trainers. Only after passing a hands-on competency evaluation based on a clinical scenario are they allowed to begin to use ultrasound. Throughout the rotation, faculty present weekly education sessions. These include didactic sessions with the opportunity for questions and discussion throughout, problem-based learning discussions (PBLDs) with a focus on regional anesthesia, and journal club-style literature reviews, with each resident assigned to review and evaluate one article. In addition, each group of residents participates in full-scale simulation. Feedback is given to learners regularly and typically is given during or immediately following the task or educational session.

We have discussed utilizing educational fundamentals to optimize a regional anesthesia curriculum. Although it might seem that this applies primarily to people in residency, similar principles apply to continuing medical education. There will be increasing emphasis on stating objectives before an offering and then evaluating the program to see if learners are achieving those objectives. CME offerings will be designed to fill a “gap” in the knowledge or skill-set of the audience. There will increasingly be a move away from lecture formats and toward formats that require active participation on the part of the audience. This may range from something as simple as an audience response system to problem-based learning discussion sessions to hands-on clinics and exercises. Full-scale simulation will be a part of this as well, allowing learners to actually “try out” strategies. In fact, as part of the American Board of Anesthesiology’s Maintenance of Certification in Anesthesia (MOCA®) program, a simulation-based experience will be required at least once per 10-year cycle.