

Application of Technology and Novel Teaching Methods for Adult Learners

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Learner Audience: There are two components to this hands-on multiscreen multimedia workshop: learning for physicians as well as learning for nurses. The purpose of the first aspect of the conference is to offer anesthesiologists and acute pain specialists to understand current concepts in ultrasound guided regional anesthesia and embrace this new technology in their clinical practice for effective control of pain. Emphasis will be placed on the blending of scientific knowledge into clinical practice. We limit participation to 60 physicians to maintain a high quality of education. For regular floor nurses, a parallel hands on workshop is meant to teach them how to help physicians perform interventional pain procedures and how to then assess and manage these patients once on the floor.

Background: There are two components to this workshop, and after discussing the ideology behind this unique teaching style for physicians, the ideology of teach the nurses will be explained.

This program is specifically tailored to accommodate for the differences in adult learning. Adult learning is very different from how we have learned in elementary school, middle school, high school, college, and even medical school. We have traditionally been taught by the didactic format - we have one teacher that teaches to a class of students. Even at that level, more and more people are seeing that is not the best way to learn. In Dr. Boddu's experiences as a teacher and a student in his Masters of Medical Education, he learned that young brains are like a sponge in that they retain lots of information, but they are not able to translate what they learn into practical applications. Adults have the ability to translate what they learn into clinical applications in their practice to provide patient care, but the ability to learn and retain information is decreased. The participants of this workshop are not only adult students, but very academically knowledgeable and accomplished people. The teaching structure implemented in this workshop is designed specifically to optimize their educational experience.

When teaching the anatomy of a block, if adult learners are taken to a cadaver lab and then experience a gap of half a day to one day before trying to apply this knowledge to using ultrasound on a human subject, adult learners may not be able to recollect the anatomy they had learned 2 days before until some aspects of that anatomy are applied in a way that will be useful in clinical practice. Keeping adults in mind, this workshop is designed to teach adult learners individual nerve blocks in depth, starting from the applied anatomy of that block on a dissected cadaver. This is displayed on the first screen. On the next screen, this knowledge of anatomy is integrated with surface land marks of that block in reference to the conventional approach of the block on a human volunteer. On the screen next to that, live ultrasound images of the block on a human volunteer appears. All this information is depicted simultaneously on three screens. The fourth screen is for power point to cover any aspects of that block that can not be demonstrated on a cadaver, human volunteer or ultrasound. This multi-screen multimedia correlation taught along with the lesson in anatomy allows for better retention. Adult learners are not able to learn from a strictly didactic based method of learning, even internationally in Nepal, India, and Columbia. This format of the workshop was well received internationally, and interestingly it shows that this adult learning optimization requirement is not unique to the United States.

Acute pain management is teamwork between physicians and nurses. Expectations for nurses attending this course differ from those for physicians. This course is not designed to train nurses how to perform these procedures, but rather to teach nurses how to assist physicians effectively during procedures. Also, once the patients arrive on the floor, if the census of the acute pain service is large, it is very difficult for a single physician to effectively monitor and assess all the patients. If floor nurses can be trained to assess and evaluate the pain patients, as well as to appropriately report back to the physician to make recommendations and decisions, the teamwork between the

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physician and nurse is enhanced and more patients can be cared for effectively. Additionally, by training regular floor nurses to manage pain patients, it cuts down the cost of having to hire specialized pain nurses.

Needs Assessment: Ultrasound guided regional anesthesia is a relatively new concept and has only been around for approximately 10 years. Many anesthesiologists who completed their training before the introduction of ultrasound into regional anesthesia did not receive training in ultrasound applications. This workshop is an excellent opportunity for this population to acquire and practice skills required to integrate ultrasound into their practice. Many anesthesia residents graduate from programs that do not offer enough ultrasound experience for residents to feel proficient in the utilization of ultrasound in their practice upon graduation, and they are looking for an opportunity to brush up their skills and increase their comfort level with using ultrasound in performing regional anesthesia. This workshop is an ideal opportunity for them to do so. Many teaching faculty are only comfortable with performing certain types of blocks and shy away from others because they have not had the opportunity to perform them before. Learning how to do the block on a new patient is hardly an ideal situation by which to gain proficiency in a new technique, let alone teach a resident how to perform the block. Because this workshop allows you to not only consult one-on-one with experts on live models, but also allows you to perform these blocks on anesthetized pigs, this workshop provides an excellent opportunity to anesthesiologists to become proficient in blocks that are not a part of their existing repertoire.

There is also a large need for nurses trained in assessing and managing patients on a pain service. The Pain Championship Workshop trains nurses in monitoring of patient vitals during block placement, and teaches them how to help the physician in the placement of blocks. By training the nurses very well as to what the physician is expecting of the nurses at the time of block placement in addition to how to care for them when the patients go to the floor, the physician's life will be made easier. It is very beneficial to train floor nurses as pain champions so that they know the relation of anticoagulants to block placement, how to assess patient safety for ambulation, understand the concept of continuous pain vs. intermittent pain, and learn to appreciate motor and sensory expectations after a block. Nurses should also learn when to go up on a dose versus when to change lockout intervals when managing a pump. These simple to understand concepts can be easily conveyed to nurses to facilitate teamwork between the physician and nurse with the ultimate goal being to optimize patient care.

Hypothesis: After attending the course, anesthesiologists should gain proficiency in each of the educational objectives listed below:

- Discuss gross anatomy of peripheral nerves of upper/lower limbs, relevant for regional anesthesia
- Discuss the basic principles of using ultrasound machines for regional anesthesia
- Identify peripheral nerves in upper/lower limbs using ultrasound and stimulation techniques
- Identify peripheral nerves and describe the technique for performing ultrasound guided rescue blocks
- Discuss the use of continuous peripheral nerve catheters for regional anesthesia
- Discuss the use of continuous peripheral nerve catheters for post-operative pain management
- Perform tunneling of the catheters
- Discuss complications of regional anesthesia
- Discuss methods of optimal pain management after removal of nerve catheters
- Identify the classic landmarks and have basic knowledge in the ultrasound assisted nerve blocks in children
- Perform the most commonly used nerve blocks in children and discuss indications and safety issues related to regional anesthesia in children
- Describe current trends for performing regional anesthesia in the pediatric population
- Perform hydro-dissection and identify spread of local anesthetic around the nerves
- Explain ethical issues for regional anesthesia

Curriculum Design: Keeping adult learners in mind, we developed unique techniques of teaching for each nerve block with simultaneous cadaver anatomy, surface landmarks and conventional approaches of the nerve block, ultrasound guided technique, application of artistic images, MRI & CT images applicable to that nerve block. Finally, to make the learning experience the best, each participant of the workshop practice localizing nerves and vessels

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on human volunteers with ultrasound and use stimulating needles and stimulating catheters under ultrasound on live anesthetized pigs.

The facilitators of the workshop meet the evening before the workshop so that everyone has a clear goal of what goals and objectives the participants can take away from this experience. The primary goal is participant satisfaction and that they should go home with a lot of knowledge. We take a survey of the participants initial level of knowledge at the start of the course, and then we tailor the educational experience to the results obtained from the initial survey. In order for the survey to optimally benefit and influence the participants' learning experience, we utilize an audience response system. We continue to utilize the audience response system extensively throughout the learning experience in the form of pre and post quizzes before and after a block is taught. This keeps the audience attentive, distracts from boredom, breaks monotony and creates fun in the learning environment. The participants also greatly benefit from another application of modern technology in this new method of teaching.

This workshop is very different from other regional anesthesia workshops because it is interactive, multimodal, and has a large hands on component. The most important aspect of regional anesthesia is having a good understanding of anatomy. In other ultrasound guided regional anesthesia workshops, the participants were first taken to an anatomy lab to see cadaver dissections, and then brought to the human volunteers to practice the knowledge they should have acquired in the anatomy lab. Because most of the participants are adult learners, they were not able to retain what they learned in the anatomy lab and were not able to apply that knowledge when practicing with the ultrasound machine on human volunteers. That is what led to his idea to create a multi-screen, multi-modal approach to learning where every aspect of each block can be visualized at the same time. One screen displays cadaver anatomy, another screen displays ultrasound images from the human volunteer, and also to cover the conventional blocks we have the surface landmarks of the same human volunteer on one screen. The fourth screen is for powerpoint presentations where any of the things you can not teach by surface landmarks, cadaver dissection, or ultrasound images such as MRI, CT, and some of the graphics can be displayed. In this way, every aspect of every block can be covered at one time so retention is much better. There is a real time camera in the cadaver lab so that the expert performing the dissection is available to answer audience questions as they arise and can revisit certain aspects of the dissection as necessary.

The structure of the conference is unusual in that most people do not have the opportunity to be taught in this way, in addition to the workshop being very complex to organize. Interestingly, this is the method that has been proven successful and well received by participants. Gaining approval for the first workshop was the hardest because of the new concept of a multi-screen, multi-media, and multi-modal approach. We had a hard time selling the concept to the CME office due to the huge amount of coordination required. Several audio-visual people, 4 camera men, a cadaver, and 15 human volunteers had to be synchronized, in addition to having to set up 4 projectors. Also, a large amount of teaching faculty are required to be present (3 on stage), plus the additional help of experts is needed to coordinate with human volunteers. Once the approval for the very first conference was obtained from the CME office, we have been gaining success and efficiency at organizing these conferences, and have just performed our 8th biannual conference. Once a system was in place, the workshops became easier to coordinate.

Nurses have didactics in morning, and then are taken to human volunteers. The facilitators of the conference have trained the volunteers to mimic local anesthetic toxicity at time of test dose, and to fake convulsions. In addition, tegaderm is applied to the abdomen of the volunteers so as to on abdomen mimic a sensory block with the ice test. Volunteers are taught to mimic motor weakness of leg so nurses learn how to assess motor weakness and to assess appropriateness for ambulation.

In the afternoon, nurses are taken to the pig lab, and they perform epidurals and pass radio-opaque catheters into the epidural space under visualization provided by a c-arm. They then inject radio contrast material into the epidural space to see the local anesthetic spread. They experience loss of resistance, and are then deliberately instructed to do a dural tap so they can understand how this feels and the importance of such an event. They are

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then deliberately instructed to inject epinephrine into the pig's IV so they can see the vitals change after epinephrine administration and can learn the importance of monitoring vitals before and after the procedure.

The nurses are then taken to another pig station where there are anesthetized pigs for the purpose of nerve blocks, and they are taught how to help the physician in conducting nerve blocks under ultrasound guidance and with the nerve stimulation technique. Sterile techniques, marking, sterile preparation of site dressing, and how to help the physician to guide the nerve stimulator are taught to the nurses. They also learn to appreciate the twitch response and current correlation, and how to help physician to adjust an image on the ultrasound machine by manipulating the gain, contrast, and depth measurement using the caliper method of measuring distances of various structures to skin.

Outcome: At the end of this workshop, the participants were interviewed and the consensus that this experience had been extremely beneficial to them was unanimous. Some participants commented in regards to the workshop that, "It is like star wars movie". Others commented that they had "never attended a workshop of this high tech before" and that it was the "best workshop I have ever attended, better than any ASRA workshops I have attended." Participants also felt that "there is no room to feel sleepy in this workshop, and we were learning every minute we spent here."

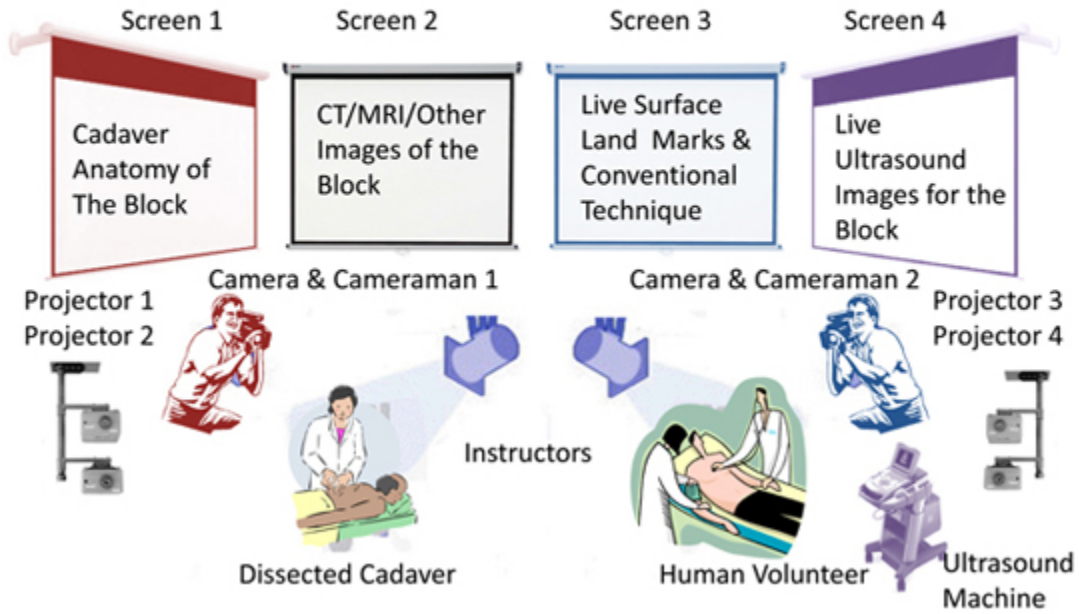
Some of the participants had completed their residency before the introduction of ultrasound into the practice of regional anesthesia. While interested in using ultrasound in their practice, they had not had formal training in the utilizing ultrasound and therefore did not feel comfortable to do so. After attending the workshop, they now felt they could start to use ultrasound in their practice. Faculty at teaching institutions who were interviewed reported that after having the chance to practice blocks that were not normally a part of their repertoire, they now felt comfortable to introduce these techniques into their practice and felt comfortable to share their knowledge with residents. Residents that were in attendance at the workshop reported that the exposure to such a wide variety of blocks under ultrasound and ability to practice them on the pigs greatly increased their proficiency in utilizing these techniques. Overall, this workshop proved beneficial to all in attendance.

The multi-modal, multi-screen approach is not too much information for people and not distracting. People do not complain that they are missing any of the information. This information is supplementing each other and no comments were obtained that the method is too complex to follow.

Where is the conference going? It has been taken internationally to three separate countries. We have submitted a request for ASA to attend this workshop, and the president of the ASA has attended and is speaking currently speaking with the ASA committee. The learning style offered in this course is something that can be translated to other aspects of anesthesiology. Multi-media, multi-screen approach will be helpful in teaching airway workshops and transesophageal echocardiogram. Participants will experience an optimized learning experience, and experts in the fields can adopt this teaching style into their own teaching workshops.

Many medical schools have gone to a multi-modal approach. Anatomy, physiology, embryology, pathology of a single organ system are taught in one block because it allows students to translate what they have learned. Regular teaching of residents that come to a program can be translated, but it takes a lot of coordination and there needs to be a team approach of making it happen. Residents will get a lot of benefit in this type of teaching style.

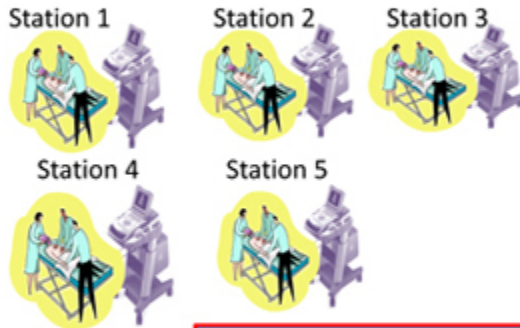
**Stage Set up for Day 1 of
Hands-on Ultrasound Guided Regional Anesthesia Workshop**
(Course Director: Dr. Krishna Boddu)



Human Volunteer Stations Set up for Day 2 of Hands-on Ultrasound Guided Regional Anesthesia Workshop

(Course Director: Dr. Krishna Boddu)

Upper Limb Blocks



Lower Limb Blocks



Advanced Nerve Blocks & Vascular Access



**Animal Lab Set up for Day 2 of
Hands-on Ultrasound Guided Regional Anesthesia Workshop**

(Course Director: Dr. Krishna Boddu)

**Identification of Nerves With
Ultrasound , Confirmation with
Nerve Stimulator + Hydro dissection**

Pig Station 1



Pig Station 2



**Technique of Using Stimulating Catheters
& Tunneling of Catheters
+ Hydro dissection**

Pig Station 3

Pig Station 4

**Cannulation of Vessels, Identification of Pleura,
Intercostal Space, Peritoneum with Ultrasound
+ Hydro dissection**

Pig Station 5

