

Revolutionizing Acute Pain in the ED: Implementing a Curriculum for Residents

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Introduction:

Ultrasound-guided regional anesthesia (UGRA) is a safe and effective modality of pain control well-suited to the ED setting. Implementing UGRA in the emergency department (ED) has been shown to decrease disposition times, increase patient satisfaction, and decrease need for opioid usage in the ED¹. While point of care ultrasound (POCUS) is taught to all emergency medicine (EM) residents, few programs teach the concept of regional anesthesia. Studies show that nerve blocks can be effectively taught to residency programs in simulation sessions², and acquisition of key techniques and knowledge can be measured using a pre- and post-test. In this manner we demonstrated effective implementation of a nerve block curriculum in our residency program.

Purpose:

Demonstrate an effective curriculum design for implementation of regional anesthesia in the ED

Methods:

The design of our curriculum was compiled based on an expert panel recommendation that comprised 13 ultrasound faculty members from 12 institutions³. Using these recommendations, an IRB-exempt curriculum was created for the UT Southwestern Emergency Medicine program. We began by designating specific nerve blocks that we felt that our residents should know into three various simulation sessions based on block distribution (Figure 1).

Prior to each simulation date, we developed a pre-test (Figure 2) comprised of questions pertaining to safe administration of nerve blocks and administered it to trainees. Residents then attended a session where they learned the anatomy of each block on standardized patients. Longitudinal needle guidance was

taught by ultrasound faculty with the use of an ultrasound guided IV simulator. After the session, residents took a post test to analyze retention.

Throughout the year, procedural data was collected on how many blocks were conducted in the ED. Our ultrasound faculty provided quality assurance review for every block.

Results:

Through this spaced repetition-style education, retention was demonstrated with a marked improvement on pre and post-tests. Subsequently, this education has led to a large increase in the use of regional anesthesia to treat pain in patients in our ED. We have seen preliminary data indicating decreases in need for procedural sedation and increase in patient satisfaction so this is a concept that we hope to continue to refine at UT Southwestern.

One of the most difficult aspects of creating our curriculum though was delineating which blocks the general emergency physician should know. We have noticed through retrospective analysis that some blocks are being used more than others but it is difficult to say whether this is by happenstance of patient presentation or provider preference. Further surveys and internal research will need to be conducted.

Conclusion:

An ultrasound-guided nerve block curriculum can be safely implemented in a residency program, but a systematic approach must be taken to ensure that physicians are properly trained. Displaying and justifying the steps for each part of the process helps to demonstrate a proven method of introducing US-guided nerve blocks to a residency.

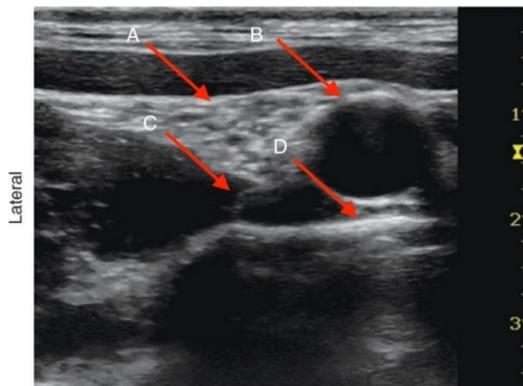
Nerve blocks are currently underused in the ED despite their potential to reduce opioid use and provide more pain control options to better serve our patients. We have an opportunity to broaden our practice by introducing nerve block education programs in residencies to improve patient care.

Figure 1:

Simulation Session	Specific Nerve Block
Upper Extremity	Interscalene/Supraclavicular
Upper Extremity	Median/Radial/Ulnar
Truncal	ESP/Serratus
Truncal	Rectus Sheath/TAP
Lower Extremity	Adductor Canal/Popliteal Sciatic
Lower Extremity	Fascia Iliaca

Figure 2:

1. Which Structure Below is a Nerve?



2. What is required for monitoring patients during nerve blocks?
 - a. Pulse oximeter
 - b. End-tidal CO₂
 - c. Cardiac Monitoring
 - d. Blood Pressure Cuff Monitoring
 - e. All of the Above
3. What is proper patient positioning during an Interscalene Nerve Block?
 - a. Patient sitting at a 45 degree angle
 - b. Left Lateral Decubitus
 - c. Patient sitting at 90 degree angle
 - d. Lying Flat
 - e. Trendelenburg
4. Select complications that may occur from nerve blocks
 - a. Local Anesthetic Systemic Toxicity
 - b. Intraneural Injection
 - c. Hemorrhage

- d. Injection Site Infection
 - e. Intravascular Injection
5. What is the maximum dose for Ropivacaine 1% without epinephrine?
 - a. 2 mg/kg
 - b. 3 mg/kg
 - c. 4.5 mg/kg
 - d. 6 mg/kg
 6. What is the usual initial sign of local anesthetic systemic toxicity?
 - a. Seizures
 - b. Numbness/Perioral Tingling
 - c. Dysrhythmias
 - d. Loss of Consciousness

Figure 3:

Provider Details

Procedure performed by: Attending or Midlevel Resident or Fellow

- > Consent
- > Universal protocol
- > Indications
 - Indications pain relief procedural anesthesia
- > Location
 - Body area head upper extremity trunk lower extremity
 - Laterality left right bilateral
- > Pre-procedure details
 - Neurovascular status intact deficits
 - Skin preparation 2% chlorhexidine alcohol Hibiclens povidone-iodine
 - Preparation Patient was prepped and draped in usual sterile fashion
- > Skin anesthesia (see MAR for exact dosages)
 - Skin anesthesia method none topical application local infiltration
- > Procedure details (see MAR for exact dosages)
 - Block needle gauge 14 G 18 G 21 G 24 G 27 G 16 G 20 G 22 G 25 G 30 G
 - Needle Type Pajunk Pajunk SonoPlex Pajunk SonoTap
 - Guidance Doppler fluoroscopy ultrasound
- Anesthetic injected bupivacaine 0.25% WITH epi bupivacaine 0.5% w/o epi lidocaine 2% WITH epi Ropivacaine 0.25% w/o epi bupivacaine 0.25% w/o epi lidocaine 1% WITH epi lidocaine 2% w/o epi Ropivacaine 0.5% WITH epi bupivacaine 0.5% WITH epi lidocaine 1% w/o epi Ropivacaine 0.25% WITH epi Ropivacaine 0.5% w/o epi
- Steroid injected none betamethasone dexamethasone methylprednisolone triamcinolone
- Additive injected none sodium bicarbonate clonidine
- Injection procedure anatomic landmarks identified incremental injection negative aspiration for blood anatomic landmarks palpated introduced needle
- Paresthesia none immediately resolved prolonged
- > Post-procedure details
 - Dressing none sterile dressing
 - Outcome anesthesia achieved pain relieved pain improved pain unchanged pain worsened
 - Patient tolerance of procedure tolerated well, no immediate complications procedure terminated at patient's request tolerated with difficulty
- > Comments

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References:

1. <https://www.cambridge.org/core/journals/canadian-journal-of-emergency-medicine/article/simulation-based-ultrasound-guided-regional-anesthesia-curriculum-for-anesthesiology-residents/D1D0C49A18B1EA7F6F6350FA05A281C0>. BCH; KTET. Simulation-based ultrasound-guided regional anesthesia curriculum for anesthesiology residents. *Korean journal of anesthesiology*. <https://pubmed.ncbi.nlm.nih.gov/30481945/>.
2. Tucker RV, Peterson WJ, Mink JT, et al. Defining an ultrasound-guided regional anesthesia curriculum for emergency medicine. *Wiley Online Library*. <https://onlinelibrary.wiley.com/doi/10.1002/aet2.10557>.
Published December 11, 2020.
3. Wiercigroch D, Ben-Yakov M, Porplycia D, Friedman SM. Regional anesthesia in Canadian emergency departments: Emergency physician practices, Perspectives, and barriers to use: *Canadian Journal of Emergency medicine*. *Cambridge Core*. <https://www.cambridge.org/core/journals/canadian-journal-of-emergency-medicine/article/regional-anesthesia-in-canadian-emergency-departments-emergency-physician-practices-perspectives-and-barriers-to-use/D1D0C49A18B1EA7F6F6350FA05A281C0>.
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