The American Society of Regional Anesthesia and Pain Medicine and the European Society of Regional Anaesthesia and Pain Therapy Joint Committee Recommendations for Education and Training in Ultrasound-Guided Regional Anesthesia

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Abstract: Ultrasound-guided regional anesthesia (UGRA) is a growing area of both clinical and research interest. The following document contains the work produced by a joint committee from ASRA and the European Society of Regional Anesthesia and Pain Therapy. This joint committee was established to recommend to members and institutions the scope of practice, the teaching curriculum, and the options for implementing the medical practice of UGRA.

This document specifically defines the following:

1. 10 common tasks used when performing an ultrasound-guided nerve block,
2. the core competencies and skill sets associated with UGRA,
3. a training practice pathway for postgraduate anesthesiologists, and
4. a residency-based training pathway.

In both the residency and postgraduate pathways, training, competency, and proficiency requirements include both didactic and experiential components. The Joint Committee recommends that the decision to grant UGRA privileges be based at the individual institution level. Each institution that conducts UGRA is encouraged to support a productive quality improvement process.

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Mission Statement: The American Society of Regional Anesthesia and Pain Medicine (ASRA) and the European Society of Regional Anaesthesia and Pain Therapy (ESRA) Joint Committee was established to recommend to members and institutions the scope of practice, the teaching/learning curriculum, and the options for implementing the medical practice of ultrasound-guided regional anesthesia (UGRA) services.

This document does not represent a form of credentialing and is not intended to be the sole process by which interested physicians can gain education and training in UGRA. The Joint Committee does not intend for this document to represent the only clinical approach to the utilization of ultrasound in facilitating the performance of regional anesthesia. The ASRA and ESRA support the proficient and safe use of nerve localization techniques without endorsing the superiority of one technique over another.

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The use of ultrasound by anesthesiologists has dramatically increased over the last 5 years. This is evidenced by the plethora of peer-reviewed articles and educational events dedicated to techniques of ultrasound-guided regional anesthesia (UGRA).[1–3] Ultrasound provides noninvasive information regarding both normal and abnormal anatomy. Ultrasound allows anesthesiologists to follow needle trajectory, navigate away from adjacent structures, observe injected solution, and make real-time adjustments that are necessary for effective perineural spread of injectate.

The following document represents an international collaborative effort by anesthesiologists to define the scope of practice of UGRA. Specifically, our objectives are as follows:

1. define and structure the common tasks used when performing an ultrasound-guided nerve block,
2. articulate the core competencies and skill sets associated with UGRA,
3. suggest a training process for both established practitioners and residents, and
4. recommend the establishment of a quality improvement (QI) process for UGRA.

By articulating a scope of practice for UGRA, the Joint Committee's primary aims are to optimize the quality of the UGRA practice and to support interested clinicians in learning and integrating this technology into their practices. Therefore, the target audience for this document includes both anesthesiologists in practice and those physicians who are currently enrolled in anesthesiology training programs. This document should also prove valuable to individuals involved with medical education and training. We consider the ultrasound scope of practice to consist of the indications for and the range of procedures centered around the use of this technology to facilitate the performance of regional anesthesia by properly trained anesthesiologists.

There are multiple examples of other specialties and organizations that have defined their scopes of practice for the use of ultrasound. In the United States, these documents have often been driven by recommendations of the American Medical Association (AMA). In 1999, the AMA drafted Resolution 802 stating, "The AMA affirms that ultrasound imaging is within the scope of practice of appropriately trained physicians."[4] The AMA went on to state that ultrasound has a broad range of applications and that hospitals should grant ultrasound privileges based on each individual medical specialty's self-defined scope of practice. The AMA resolution recommends that specialties using ultrasound develop specialty-specific recommendations for its use. The American College of Emergency

Physicians followed in 2001 and issued a policy statement on emergency ultrasound guidelines.[5] In a similar fashion, the Society of Cardiac Anesthesiologists and the American Society of Echocardiography formulated a scope of practice and certification mechanism for the use of perioperative transesophageal echocardiography by anesthesiologists.[6] The National Institute of Clinical Excellence in the United Kingdom published guidelines in 2002 for elective ultrasound-guided central venous access.[7] Furthermore, the European Federation of Societies for Ultrasound in Medicine and Biology has published minimum training recommendations for the practice of medical ultrasound.[8]

The Joint Committee, formed by members from both the American Society of Regional Anesthesia and Pain Medicine (ASRA) and the European Society of Regional Anaesthesia and Pain Therapy (ESRA), created this scope of practice document. Committee members were selected based on clinical and research expertise in either UGRA or education. The suggestions and recommendations in this document represent the opinions and clinical experience of the members. With definitive evidence-based medicine lacking, a scope of practice document such as this should prove valuable for physicians contemplating how to proceed with education, training, and implementation of ultrasound in their practices. The document represents unanimous agreement regarding the specific recommendations for both best practice and training as it pertains to the utilization of ultrasound to facilitate the performance of regional anesthesia. Each area was discussed and reviewed over an 18-month period by use of e-mail, telephone conferences, and personal meetings. The content was discussed in open forums sponsored by the ESRA, the ASRA, and the American Society of Anesthesiologists. Before submission for formal peer review, the document was reviewed by residency program directors, fellowship directors, academic anesthesiologists, private practice anesthesiologists, and trainees. Suggestions, modifications, and concerns were incorporated into the Joint Committee recommendations.

The limitation of a "best practice guideline" such as this is that it may become a historical document. New knowledge will inevitably accumulate in this subject area, and some of the material may become out-of-date and perhaps even inaccurate. As new research, knowledge, and clinical experience are described, there will inevitably be the need to modify these recommendations. The Joint Committee recommends that the guidelines be reviewed on a periodic basis and is committed to publication of updates and modifications to these recommendations when appropriate.

Finally, there may be organizational barriers to the adoption of this document. These barriers include disagreement with content and departmental limitations of both monetary and personnel resources. With respect to content, it is the hope of the Joint Committee that the international nature of the collaboration and the peer-review process will minimize any major structural problems with the recommendations. The commitment to update the recommendations represents an opportunity to incorporate feedback from individuals not involved in the creation of the original document. Beyond the costs of ultrasound equipment, supplies, and maintenance, there will be costs related to supporting both anesthesia trainees and established practitioners. These costs should be limited, however, as the training suggestions in this document can be accomplished through traditional continuing medical education (CME) programs and on-the-job training. In addition, costs may be offset if evidence supports enhanced efficiency and effectiveness from the use of UGRA.

INDICATIONS AND SCOPE OF PRACTICE

Ultrasound is used for anatomic evaluation and to facilitate the performance of both neuraxial and peripheral nerve blocks. This technology is applicable to most patients requiring regional anesthesia and may be particularly useful in patients with obscure anatomic landmarks, coagulopathy, neural pathology, and severe extremity trauma. Furthermore, ultrasound provides an opportunity to visualize individual typical and atypical anatomy. Ultrasound-guided regional anesthesia is performed by anesthesiologists and pain specialists in a procedure room or within an operating room.

The following list consists of 10 tasks that are helpful in performing an ultrasound-guided nerve block. These tasks are not necessarily sequential and may not be appropriate for all block types and block scenarios.

1. Visualize key landmark structures including blood vessels, muscles, fascia, and bone.
2. Identify the nerves or plexus on short-axis imaging.
3. Confirm normal anatomy and recognize anatomic variation(s).
4. Plan for a needle approach that avoids unnecessary tissue trauma.
5. Maintain an aseptic technique with respect to the ultrasound equipment.
6. Follow the needle under real-time visualization as it advances toward the target.
7. Consider a secondary confirmation technique, such as nerve stimulation.
8. When the needle tip is presumed to be in the correct position, inject a small volume of a test solution. If solution is not visualized during this test injection, presume that the needle tip is intravascular or out of the imaging plane.
9. Make necessary needle adjustments if an undesired pattern of local anesthetic spread is visualized. The visualization of local anesthetic should occur through the entirety of the injection to avoid an intravascular injection.
10. Maintain traditional safety guidelines including the presence of resuscitation equipment, frequent aspiration, intravascular test dosing, standard monitoring, patient response, and assessment of injection characteristics.

Contraindications

There are no known absolute contraindications to the use of ultrasound. With respect to safety, the US Food and Drug Administration has stated, "Even though there are no known risks, ultrasound energy heats the tissues and may have other biologic effects. It can also produce small pockets of gas in body fluids or tissues (cavitation). The long-term effects of tissue heating and cavitation are not known."[9]

Procedures

Commonly performed ultrasound-guided nerve blocks are listed in Table 1. The Joint Committee recognizes that there are different levels of difficulty for the various procedures. Characteristics that tend to increase the level of difficulty include (1) deep blocks resulting in the degradation of both the ultrasound and needle image, (2) blocks that have the potential to cause serious injury such as pneumothorax and unintentional neuraxial injection, (3) blocks that involve small nerves that are difficult to image, (4) blocks that involve nerves lacking distinct ultrasonographic interfaces resulting in difficulties with distinguishing the nerve from surrounding tissues, (5) patient-related factors such as obesity, and (6) catheter-based techniques that

TABLE 1. Commonly Performed Nerve Blocks

Upper Extremity	Lower Extremity	Other
Interscalene	Posterior lumbar plexus	Ilioinguinal
Supraclavicular	Femoral	Iliohypogastric
Infraclavicular	Saphenous	Rectus sheath
Axillary	Sciatic-transgluteal	Neuraxial-spinal
Mid humeral	Sciatic-subgluteal	Neuraxial-epidural
Forearm: median	Sciatic-popliteal	Neuraxial-caudal
Forearm: ulnar	Common peroneal	Pediatric blocks
Forearm: radial	Tibial	Paravertebral
Suprascapular	Ankle-tibial	Sympathetic ganglia blocks
Deep cervical	Ankle-deep peroneal	Trigger point injections
	Ankle-sural	
	Obturator	

This list is not meant to represent a complete or exhaustive list. Other blocks or approaches may be possible with ultrasound guidance.

require simultaneous transducer stabilization, needle manipulation, and catheter threading.

Proficiency

Ultrasound used to facilitate regional anesthesia requires various skills during different aspects of the procedure. These skills can be divided into four *major* categories: (1) understanding device operations, (2) image optimization, (3) image interpretation, and (4) visualization of needle insertion and injection of the local anesthetic solution. For each one of these categories, the Joint Committee recognizes a defined skill set. These skill sets are explained in Table 2.

TRAINING

The Joint Committee recognizes 2 distinct pathways for obtaining UGRA training. These are hereby known as the *practice pathway* and the *residency-based pathway.* The practice pathway is designed to meet the needs of physicians who have completed their formal anesthesiology training. The residency-based pathway is designed to satisfy training requirements for anesthesiology training programs.

The following curricula represent the Joint Committee's recommendations for learning UGRA, but are not intended as mandates. The recommendations are made in the context of the incomplete science surrounding teaching, learning, and optimal skill acquisition. The Joint Committee recognizes that the exact number of procedures and educational events required by an individual to master the skills surrounding UGRA will inevitably vary as a function of the person's level of experience and expertise.

Practice Pathway Recommendations

The Joint Committee recognizes the existence of different practice patterns (ie, private vs academic, solo vs group), varying institutional processes for adopting new technology and techniques, and individual styles of learning. As such, several options are available for the established practitioner to begin to acquire the skill sets associated with UGRA.

1. Participation in an accredited CME event in which the skill sets listed under the Proficiency section are covered. It is recommended that this educational event include both didactic and hands-on experience, with a duration of at least 8 hours. Additional educational resources are available including Web-based training, video, lectures, textbooks, and simulator-based programs. These materials can help supplement the information learned during the CME activity.
2. Practice ultrasound scanning techniques and learn sono-anatomy by imaging oneself and colleagues.
3. Practice needle insertion techniques using simulators and phantoms.[10]
4. Whenever possible, spend time with experienced individuals observing and learning techniques of UGRA.
5. Incorporate ultrasound into a pre-existing regional anesthetic practice. If the infrastructure exists within a given institution, the Joint Committee recommends that the novice's initial clinical experience be mentored and supported by an individual experienced in UGRA. Within

TABLE 2. Skill Sets Associated With Proficiency

Understanding Ultrasound Image Generation and Device Operations	Image Optimization (Non–Device Related)	Image Interpretation	Needle Insertion and Injection
Understanding basic technical principles of image generation	Learn the importance of transducer pressure	Identify nerves	Learn the in-plane technique, maximizing needle visualization
Selection of the appropriate transducer	Learn the importance of transducer alignment	Identify muscles and fascia	Learn the out-of-plane technique
Selection of the appropriate depth and focus settings	Learn the importance of transducer rotation	Identify blood vessels, distinguish artery from vein	Learn the benefits and limitations of both techniques
Understanding and appropriate use of both time gain compensation and overall gain	Learn the importance of transducer tilting	Identify bone and pleura	Learn to recognize intramuscular needle location
Understanding and application of color Doppler		Identify common acoustic artifacts	Learn to recognize correct and incorrect local anesthetic spread
Archiving images		Identify common anatomic artifacts (pitfall errors)	Conduct proper ergonomics
Follow ASRA-ESRA standardization for screen orientation to the patient		Identify vascularity associated with needle trajectory	Minimize unintentional transducer movement
			Identify intraneuronal needle location

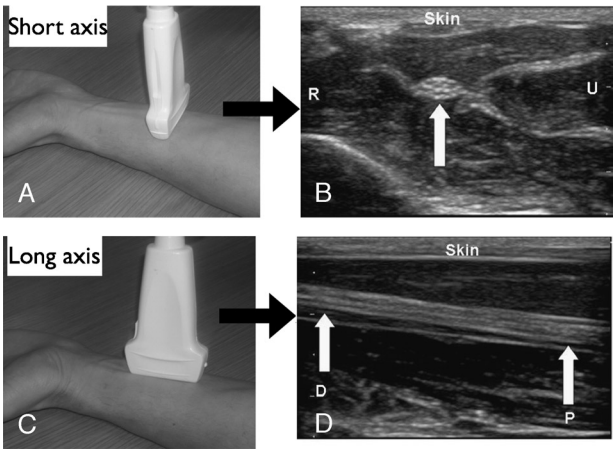

FIGURE 1. Ultrasound terminology for describing non–needle-related structures. Figure 1A and 2B demonstrate the short-axis (transverse) imaging of the median nerve in the forearm. When the transducer is turned 90 degrees in either a clockwise or counterclockwise direction, the long-axis (longitudinal) view is generated. The long-axis view is represented in Figure 1C and 1D. The arrows in Figure 1B and 1D indicate the median nerve. R, radial side of the arm; U, ulnar side of the arm; D, distal part of the nerve; P, proximal part of the nerve.

the practitioner's home institution, this individual would be known as the UGRA coordinator. (Please see Appendix I for details of the UGRA coordinator.)

During the initial exposure to UGRA, the Joint Committee recommends that a block log be maintained with documentation of block success and complications including intravascular injection, pneumothorax, nerve damage, and infection.

The Joint Committee suggests that each anesthesiology department's leadership and the UGRA coordinator (where applicable) monitor the progress and initial clinical experience of the novice. A training system that verifies the qualifications of a practitioner is an important aspect of a quality UGRA program. The breadth and depth of clinical experience needed to achieve competency in the aforementioned skill sets will vary among individuals.

The Joint Committee recommends that individuals who engage in UGRA have significant exposure to continuing education. Many formats for continuing education exist such as departmental conferences, review courses, self-study, preceptorships, hands-on training courses, and other CME established formats. The CME attendance should be in accordance with specialty and local guidelines. In addition, following initial exposure to UGRA, continual use of ultrasound skills is recommended to maintain proficiency and personal comfort level with performing UGRA.

Residency-Based Pathway Recommendation

A residency-based pathway should be the primary mode for anesthesiology residents to attain competency in UGRA during Accreditation Council for Graduate Medical Education–accredited or equivalent programs. The training program should incorporate the 6 core competencies as defined by the Accreditation Council for Graduate Medical Education (Appendix II).

Anesthesiology residency program directors should have flexibility to present the curriculum over the duration of a residency period. The UGRA coordinator will be the individual responsible for coordinating and organizing the education of the residents and ensuring the attainment of the aforementioned core competencies. For programs committed to teaching UGRA, it is necessary that an ultrasound machine be available for the anesthesiology residents and faculty to use consistently during the residents' training.

The didactic component should consist of the resident completing a defined UGRA curriculum that addresses the following 4 major categories: (1) understanding device operations, (2) image optimization, (3) image interpretation, and (4) visualization of needle insertion and injection as described under the Proficiency section. Alternatively, a resident may attend an introductory UGRA course as defined for the practice pathway.

The Joint Committee recommends that each resident perform enough ultrasound-guided nerve blocks to satisfy the attainment of the aforementioned core competencies and skill sets. The Joint Committee also recommends that each resident have exposure to varying types of blocks. Each resident should keep a database log of his or her procedures (see Practice Pathway Recommendations).

Residents are encouraged to record and store static images and video clips of the critical aspects of each procedure. The resident should periodically review static images and video with appropriate supervision to confirm proper scanning and needle insertion techniques.

The Joint Committee anticipates that the residency program director will work with the UGRA coordinator to ensure the achievement of the competencies outlined in Appendix II.

QUALITY IMPROVEMENT

Each institution may wish to organize an electronic media library consisting of static and video examples of the UGRA procedures. This image collection would ideally contain important teaching points, such as examples of incorrect versus correct local anesthetic spread. It is recommended that any images and video captured be transferred to this database for periodic independent review and quality assurance activities conducted by the UGRA coordinator or designee. All members of the department should be encouraged to contribute to the library as well as to study it.

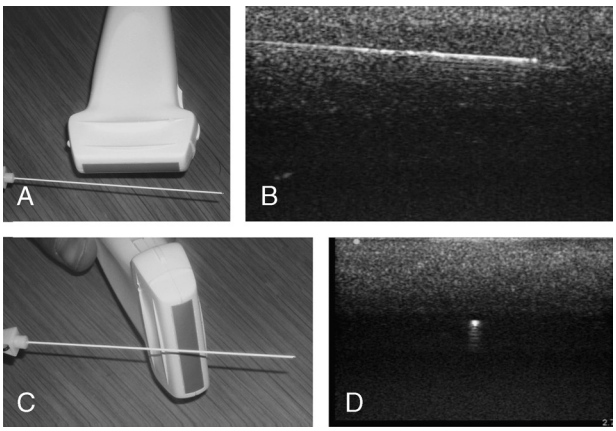

FIGURE 2. Ultrasound terminology for describing needle insertion techniques. A and B represent the in-plane approach to needle insertion. In this approach, a long-axis view of the needle is being generated. C and D represent the out-of-plane approach to needle insertion. In this approach, a short-axis view of the needle is generated.

Quality improvement should be implemented within the UGRA program to evaluate successes and complications. To facilitate the QI process, it is recommended that the UGRA coordinator use direct UGRA supervision, recorded image review, logbook review, or other sources of information.

A dedicated biomedical engineering department should be in charge of periodic assessment and services of the ultrasound equipment as per the manufacturers' recommendations (or scheduled device maintenance by the manufacturer). Ultrasound equipment should be disinfected after each patient contact according to institutional policy.

CREDENTIALING AND PRIVILEGING

The Joint Committee omitted any specific recommendations for the credentialing or privileging of individual practitioners to perform UGRA. Because UGRA is practiced internationally and within a wide spectrum of anesthesiology practice settings, the Joint Committee believes that each institution must develop an individualized process for credentialing and privileging. Any decisions regarding the need for an UGRA credentialing and privileging process should be made at the local hospital level through collaboration among the UGRA coordinator, department of anesthesiology, and the institution. Nonetheless, it is the hope of the Joint Committee that this document can provide a framework for anesthesiology departments and institutions to establish the highest quality of training and ongoing QI that will ensure the safe and effective conduct of UGRA worldwide.

CONCLUSIONS

The use of ultrasound to facilitate regional anesthesia is within the scope of practice of an appropriately trained anesthesiologist. This scope of practice includes the performance of plexus, selective peripheral nerve, and neuraxial blocks. Key aspects of training and conduct of UGRA discussed in this document include the following:

1. a suggested pathway for practicing anesthesiologists to gain the knowledge and skills necessary to gain clinical competence in conducting UGRA;
2. a suggested residency-based program for trainees in anesthesiology to gain the knowledge and skills necessary to gain clinical competence in conducting UGRA;
3. suggested training, competency, and proficiency requirements for UGRA, including didactic and experiential components; and
4. the adoption of a UGRA coordinator within each anesthesiology department to oversee training and conduct of UGRA as well as to ensure QI through peer review.

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APPENDIX I: THE ULTRASOUND-GUIDED REGIONAL ANESTHESIA COORDINATOR

Each department of anesthesiology at which UGRA is being performed or is sought to be performed may choose to identify a staff member, an UGRA coordinator, who will help facilitate the safe and skilled implementation of UGRA. The UGRA coordinator should be the designee of the anesthesiology department and will support the education and supervision of anesthesiologists practicing UGRA. The UGRA coordinator in a training institution would likely be responsible for developing and coordinating the educational process for residents learning and achieving core competencies in UGRA.

The Joint Committee suggests that the UGRA coordinator designation be granted to an individual following a review by the departmental leadership.

The Joint Committee recommends that the candidate obtain the following:

1. letter of recommendation from department leadership;
2. a written description of clinical experience including case volume, length of experience, and safety; and
3. participation in at least one accredited ultrasound workshop (as described in the Training section).

APPENDIX II: CORE COMPETENCIES FOR RESIDENCY TRAINING IN UGRA

The following list overlaps with the skills defined in the proficiency section of the Practice Pathway:

Patient care

- Perform gentle ultrasound examinations, providing appropriate sedation

- Demonstrate proper patient selection
- Use appropriate monitoring during UGRA
- Demonstrate proper nerve localization techniques
- Perform effective and safe nerve blocks

Ultrasound knowledge
- Understand the general principles of ultrasound physics
- Understand benefits and limitations of UGRA techniques
- Understand differences between in-plane vs out-of-plane techniques and their indications
- Understand key artifacts and pitfall errors associated with UGRA
- Develop an intimate knowledge of 2-dimensional ultrasound anatomy of the major neurovascular structures of the upper and lower extremities
- Appreciate common nonneural pathological states that are diagnosed by ultrasound: atherosclerotic disease and venous thrombosis
- Establish familiarity with the major scientific literature related to UGRA
- Learn techniques for UGRA (see list of applications in Table 1)
- Understand the applications of color Doppler interrogation
- Understand equipment specifications
- Infection control and equipment cleaning

Interpersonal/communication skills
- Communicate sensitively and effectively with patients and their families regarding ultrasound findings
- Explain any complexities of UGRA in terms that the patient can understand
- Demonstrate team leadership/management skills for the management of an effective regional anesthesia service

Professionalism
- Be open to constructive criticism regarding ultrasound skills

System-based practice
- Recognize costs associated with UGRA practice
- Collaborate with other members of the health care team to ensure quality patient care
- Use evidence-based, cost-conscious strategies in caring for all patients

Practice-based learning and improvement
- Identify and acknowledge gaps in personal knowledge and skills in the care of patients presenting for UGRA
- Use textbook and online and computer-based resources to broaden knowledge base regarding UGRA techniques
- Perform electronic searches of the medical literature to identify articles that address the medical issues surrounding UGRA
- Understand and critically evaluate outcome studies related to the influence of UGRA on perioperative outcome
- Attend the department's required teaching conferences
- Develop time management skills to perform the required tasks in a reasonable amount of time with satisfactory quality

APPENDIX III: RECOMMENDED ULTRASOUND CURRICULUM

Equipment Specifications: Minimal specifications include a machine with a linear transducer that has a frequency of 8 MHz or higher, color Doppler technology, and image storage capabilities.

Curriculum Content: Scanning Techniques

- The role of physics for UGRA; understand terminology (eg, piezoelectric effect, frequency, resolution, attenuation, echogenicity, color Doppler)
- The role of instrumentation in image acquisition (eg, image mode, gain, time gain compensation, transducer types)
- Equipment requirements: types of transducers (linear, curved and phased array for different indications and scanning at different depths), footprint length, frequency (range, 2–15 MHz)
- Ultrasound acoustic artifacts and imaging artifacts (pitfalls). These include reverberation artifacts, acoustic enhancement, acoustic shadowing, gain-related artifacts, resolution-related artifacts, mistaking tendon or muscle for nerve[11,12]
- Techniques to perform effective ultrasound examinations; appreciate the Joint Committee recommended "PART" maneuvers for generating optimal imaging: Pressure, Alignment, Rotation, and Tilting (see Appendix IV)

Curriculum Content: UGRA Procedures

Define indications and contraindications
- Practice procedural technique on available organic and inorganic simulators
- Define relevant anatomy in each region including the ability to identify muscle, pleura, nerve, tendon, and bone
- Define needle insertion technique using the Joint Committee–recommended terminology (in-plane vs out-of-plane: see Appendix V)
- Understand potential difficulties and pitfalls
- Describe ultrasound appearance of common anatomical variations seen during upper and lower extremity block
- Recognize correct and incorrect distributions of local anesthetic
- Appreciate Joint Committee–recommended standardization of patient-screen relationships (see Appendix VI)

APPENDIX IV: RECOMMENDED TECHNIQUE FOR ULTRASOUND SCANNING

1. Find landmark vascular structure (possibly assisted by color Doppler), bone, or muscle
2. Find nerve or plexus on short-axis imaging (transverse scan)
3. Place machine focus on target structures
3. Place depth setting at 1 cm deep to target structures
5. Adjust gain, time gain compensation, and frequency as necessary
6. Initiate the "PART" maneuvers to optimize image quality
   a. Pressure: varying degrees of transducer pressure on skin
   b. Alignment: sliding movement of the transducer to define the lengthwise course of the nerve
   c. Rotation: the transducer is turned in either a clockwise or counterclockwise direction to optimize the image
   d. Tilting: the transducer is tilted in both directions to maximize the angle of incidence of the ultrasound beam with the target nerve

7. Scan anticipated needle trajectory with color Doppler to identify any unsuspected vascularity

APPENDIX V: RECOMMENDED TERMINOLOGY TO DISTINGUISH IN-PLANE TECHNIQUE FROM OUT-OF-PLANE TECHNIQUE

Most peripheral nerves described in the anesthesia literature have been imaged in short axis (transverse or cross section) (Fig. 1, top images). Alternatively, if the transducer is rotated 90 degrees from the short-axis view, the long-axis view (longitudinal scan) is generated (Fig. 1, bottom images). The short-axis view is generally preferred, because it allows the operator to assess the lateral-medial perspective of the target nerve, which is lost in the long-axis view. In the literature, 2 techniques have emerged regarding the orientation of the needle with respect to the ultrasound beam. The in-plane approach generates a long-axis view of the needle, allowing full visualization of the shaft and tip of the needle (Figs. 2A, B). The out-of-plane view generates a short-axis view of the needle (Figs. 2C, D). The in-plane approach has the disadvantage that, because the ultrasound beam is very thin, it can be challenging to maintain continuous needle imaging. The out-of-plane view has the limitation that a small block needle imaged in short axis can be hard to visualize. Furthermore, with the out-of-plane view, distinguishing the needle tip from the shaft may be challenging. Regardless of the technique chosen, the goal is to steer the needle away from neighboring structures such as vessels and pleura and to confirm the spread of local anesthetic within correct fascial compartments and around the target nerves.

APPENDIX VI: RECOMMENDED PROCEDURE FOR CORRELATING ULTRASOUND SCREEN WITH PATIENT SIDEDNESS FOR PATIENTS IN PRONE, SUPINE, AND LATERAL DECUBITUS POSITIONS

Before needle insertion, each neural structure should be referenced to key landmark structures in the anterior-posterior and lateral-medial planes. However, because of the bilateral nature of the peripheral nervous system, variations in patient positioning, differing presets of various ultrasound systems, and the nuances of individual techniques, it would be difficult to standardize the correlation of sidedness of the screen with an anatomical location. This is in contrast to transesophageal echocardiography where, in the transgastric short-axis view of the left ventricle (for example), the anterior aspect of the left ventricle can be standardized to be on the bottom of the ultrasound screen.

Therefore, the Joint Committee recommends this simple procedure for correlation of the ultrasound screen with patient sidedness in any patient position.

1. After the application of the transducer onto the patient's skin, the landmark structure or peripheral nerve is identified. The primary operator states that the top of the ultrasound screen correlates with the patient's skin. To confirm this, pressure is applied with a finger onto the skin. This area should be visualized being compressed on the ultrasound screen.
2. For patients in any position, the operator states that screen left represents a defined anatomical aspect of the patient (eg, cephalad). To confirm this, the primary operator again applies pressure with a finger at this defined site. A corresponding indentation should be visualized on the left aspect of the ultrasound screen. If indentation occurs on screen right, then the operator must turn the transducer 180 degrees. After such a correction, the operator should return to step 1 until correct imaging has been obtained and confirmed.

APPENDIX VII: ASRA-ESRA JOINT COMMITTEE AUTHOR LIST (ALPHABETICAL) AND DISCLOSURES

Author	Institution	Disclosure Code
Vincent Chan	University of Toronto	1. SonoSite, GE, Philips; 2. SonoSite, GE, Philips; 4. SonoSite, GE, Philips; 5. ISURA, Toronto Western Hospital
Giorgio Ivani	Regina Margherita Children's Hospital	GE
Thomas Grau	University Hospital Bergmannsheil Bochum	None
Joseph M. Neal	Virginia Mason Medical Center	None
Zbigniew J. Koscielniak-Nielsen	Rigshospital, Blegdamsvej	1. GE, B.Braun; 4. GE; B.Braun
Brian D. Sites	Dartmouth-Hitchcock Medical Center	4. Philips; 1. GE; 5. Gulfcoast Ultrasound Institute
Robert Weller	Wake Forest University ASRA and ESRA	1. Sonosite *

*The ASRA and ESRA will sponsor CME events related to UGRA.
Disclosure codes: 1 = speaking honorarium, 2 = research support, 3 = major stockholder, 4 = consulting work, 5 = paid CME events.