

Regional Anesthesiology and Acute Pain Medicine Fellowship

Educational Goals, Objectives, Skills and Competencies:

The Duke Regional Anesthesiology and Acute Pain Medicine (RAAPM) Fellowship is a one-year formal structured PGY-5 fellowship designed to prepare trainees for a role as leaders in academic regional anesthesiology and acute pain medicine. In addition to exposure to a broad range of knowledge, theory, skills, procedures and techniques, trainees will be instructed in research methodology and will focus much of their time in scholarship, inquiry and the dissemination of new knowledge through publication and presentation of their work at scientific meetings. Development of teaching skills is also a priority, and trainees are mentored throughout the year to gradually take on a role as educators for junior trainees under the supervision of core faculty. Trainees will spend clinical time in three distinct areas: the operating room and preoperative block area; the Inpatient Pain Service; and on the Chronic Pain Service.

Medical Knowledge

Upon completion of the program, the fellow will be able to:

1. Match specific patient and surgical procedure requirements to an appropriate regional anesthesia selection using sound clinical judgment. Debate the advantages/disadvantages of regional vs. general anesthesia for various procedures and patients in regard to patient recovery, patient outcome, operating room efficiency, and cost of care.
2. Perform a preoperative evaluation and optimization of clinical status; perform a detailed neurologic history and physical exam with particular attention to pre-existing neurologic deficits and their impact on the anesthetic plan
3. Describe the anatomy and physiology of pain and pain pathways (e.g. nociceptive, inflammatory, neuropathic)
4. Use evidence-based medicine to select local anesthetics and adjuncts for neural blockade.

5. Local Anesthetics:

- i) Understand and explain the pharmacokinetics of local anesthetics: absorption, distribution, metabolism, and excretion.
- ii) Understand and explain mechanism of action of local anesthetics.
- iii) Understand and explain structure of amino-amides and amino-esters.
- iv) Understand and explain of minimum effective concentration of local anesthetic
- v) Understand and explain effective concentrations, toxic dosage, influence of site of injection, and vasoconstrictor use in regard to clinical practice.
- vi) Compare attributes of various local anesthetics: motor vs. sensory blocking discrimination and relative toxicity.
- vii) Understand and explain lipid solubility, protein binding, pKa and their influence on onset, potency, and duration of block.
- viii) Describe signs, symptoms, and treatment of local anesthetic toxicity

4. Make sound clinical decisions regarding the administration of systemic and neuraxial opioids, NSAIDs, gabapentinoids, ketamine, and other non-opioid adjuncts for analgesia.

5. Skillfully and efficiently describe and perform a wide variety of modern regional anesthesia techniques including single-shot and continuous peripheral nerve block, spinal and combined spinal- epidural anesthesia, thoracic epidural, and nerve stimulator- and ultrasound-guided approaches (See detailed list below).

6. Describe the use of spinal anesthesia, including:

- i) Understand and explain the cardiovascular and pulmonary physiologic effects of spinal anesthesia.
- ii) Understand and explain local anesthetics for intrathecal use: agents, dosage, surgical, and total duration of action, as well as adjuvants commonly employed in neuraxial techniques.
- iii) Describe baricity of spinal local anesthetic solutions and how to espouse its influence on block level for a variety of surgical procedures.
- iv) Describe the indications and contraindications for spinal anesthesia.
- v) Understand and explain side effects of agents and complications and management of inadequate anesthesia, hypotension, and ventilatory insufficiency.
- vi) Define post-dural puncture headache and describe symptoms, etiology, natural history of the disorder, and risk factors and management strategies.
- vii) Understand and explain the use of spinal anesthesia in an ambulatory surgery setting.

- viii) Explain the relative importance of factors affecting intensity, extent, and duration of block such as dose, volume, and baricity of injectate.
 - ix) Describe differential blockade during neuraxial blockade.
 - x) Describe advantages and disadvantages of continuous spinal anesthesia.
7. Describe the use of epidural anesthesia, including:
- i) Understand and explain the physiology of epidural anesthesia.
 - ii) Describe the contents of the epidural space.
 - iii) Understand and explain the local anesthetics available for epidural use: agents, dosage, adjuncts, and duration of action.
 - iv) Differentiate between spinal and epidural anesthesia with regard to reliability, latency, duration, and segmental limitations.
 - v) Describe the indications and contraindications for epidural anesthesia.
 - vi) Understand and explain side effects, complications and management of inadequate anesthesia, hypotension, total spinal, accidental dural puncture, systemic toxicity, and the use of appropriate test dosing to minimize some of these complications.
 - vii) Describe the volume-segment relationship and the effect of patient age, pregnancy, position, and site of injection on resultant block.
 - viii) Understand and explain combined spinal-epidural anesthesia as distinguished from lumbar epidural anesthesia, including advantages/disadvantages, dose requirements, complications, indications and contraindications. Understand and explain caudal epidural and thoracic epidural anesthesia as distinguished from lumbar epidural anesthesia, including advantages/disadvantages, dose requirements, complications, indications and contraindications.
8. Describe the use of various nerve localization techniques, including:
- i) Understand principles, operation, advantages, and limitations of peripheral nerve stimulation to identify and anesthetize peripheral nerves.
 - ii) Principles of paresthesia-seeking, perivascular, or transvascular approaches to nerve localization
 - iii) Understand principles, operation, advantages, and limitations of ultrasound to identify and anesthetize peripheral nerves. Subcategories of knowledge in ultrasound include:
 - a) Applied anatomical principles to nerve block procedures
 - b) Physics and technical aspects of image generation
 - c) Machine controls for image optimization
 - d) Transducer manipulation for image optimization

- e) Sonoanatomic appearance of nerves and other tissues
- f) Needle guidance approaches
- g) Injectate appearance and optimization

9. Describe the theory and techniques for upper extremity nerve block, including:

- i) Describe the anatomy of the brachial plexus in relation to sensory and motor innervation.
- ii) Understand and explain local anesthetics for brachial plexus block: agents, dosage, duration of action, and adjuvants.
- iii) Understand and explain side effects, complications, and management: inadequate anesthesia, systemic toxicity, blockade of adjacent neural structures (phrenic, sympathetic chain and neuraxis), neuropathy, neuropraxia.
- iv) Describe the various approaches to brachial plexus blockade, along with the indications/contraindications, advantages/disadvantages, and complications specific to each.
- v) Describe peripheral nerve block in the upper extremity of the median, ulnar and radial nerves, with indications, contraindications, and complications.
- vi) Understand and explain the use and advantages/disadvantages of nerve localizing techniques including transarterial, perivascular, nerve stimulator, and paresthesia- seeking techniques.
- vii) Understand and explain the use and advantages/disadvantages specific to continuous brachial plexus anesthesia and analgesia.
- viii) Describe clinical implications of each individual nerve or plexus blockade specific to surgical procedure types, implications for intraoperative care, and postoperative recovery needs and how these differ from the patient undergoing similar procedures without regional techniques.

10. Describe the theory and techniques for lower extremity nerve block, including:

- i) Describe anatomy of the lower extremity: sciatic, femoral, lateral femoral cutaneous, obturator nerves in relation to sensory and motor innervation.
- ii) Understand and explain local anesthetics for lower extremity block: agents, dosage, duration of action, and adjuvants.
- iii) Describe the various approaches to lower extremity blockade, along with the indications/contraindications, advantages/disadvantages, and complications specific to each.
- iv) Understand and explain side effects, complications, and management of lower extremity blockade: inadequate analgesia, systemic toxicity, blockade of adjacent neural structures, and post-operative neuropathy.

- v) Differentiate individual blockade of the femoral, lateral femoral cutaneous, and obturator nerves from the anterior and posterior approaches to the lumbar plexus.
- vi) Differentiate individual blockade of the tibial and peroneal nerves from the classic and popliteal approaches to the sciatic nerve.
- vii) Describe clinical implications of each individual nerve or plexus blockade specific to surgical procedure types, implications for intraoperative care, and postoperative recovery needs and how these differ from the patient undergoing similar procedures without regional techniques.

11. Describe the theory and techniques for truncal blockade, including:

- i) Understand and explain the anatomy of intercostal, paravertebral, rectus sheath, quadratus lumborum, ilioinguinal/iliohypogastric, pectoralis, serratus, erector spinae plane (ESP) and transversus abdominus plane (TAP) blockade.
- ii) Understand and explain local anesthetics for truncal blockade: agents, dosage, and duration of action.
- iii) Understand and explain the indications and contraindications for truncal blockade.
- iv) Understand and explain the side effects, complications, and management: inadequate anesthesia, systemic toxicity, and pneumothorax.
- v) Describe clinical implications of each individual nerve or plexus blockade specific to surgical procedure types, implications for intraoperative care, and postoperative recovery needs and how these differ from the patient undergoing similar procedures without regional techniques.

12. Describe the theory and techniques for Intravenous Regional Anesthesia (IVRA), including:

- i) Understand and explain the mechanism of action of IVRA.
- ii) Understand and explain agents for IVRA: local anesthetic choice, dosage, and use of adjuvants.
- iii) Describe the indications and contraindications, advantages and disadvantages of IVRA.
- iv) Understand and explain the complications and management: systemic toxicity, inadequate anesthesia, and phlebitis.

13. Complications of regional anesthesiology and acute pain medicine including the diagnosis and management of:

- i) hemorrhagic complications
- ii) infectious complications
- iii) neurologic complications

- a) This knowledge must include the interpretation of tests recommended following plexus/nerve injury, including electromyography, nerve conduction studies, somatosensory evoked potentials, and motor evoked potentials
 - iv) complications due to medicines, including local anesthetic systemic toxicity and opioid- induced respiratory depression
 - v) other complications including pneumothorax
14. Describe the use of neuraxial opioids, including:
- i) Understand and explain available drugs, effective dose, and duration of action.
 - ii) Understand and explain the incidence of complications and side effects, monitoring, prevention, and therapy.
 - iii) Describe the indications/contraindications for the use of neuraxial narcotics for acute pain management.
 - iv) Describe the mechanism of action of neuraxial narcotics.
 - v) Differentiate intrathecal vs. epidural administration relative to dose, effect and side effects and how hydrophilic and hydrophobic drug pharmacokinetics differ.
15. Describe the use of systemic opioids, including:
- i) Understand and explain the pharmacokinetics of opioid analgesics: bioavailability, absorption, distribution, metabolism, and excretion.
 - ii) Understand and explain the site and mechanism of action of opioids
 - iii) Understand and explain the differences of chemical structure of the various opioids.
 - iv) Describe challenges of post-procedure analgesic management in the patient with chronic pain and/or opioid tolerance
16. Describe the use of non-opioid adjuncts, including:
- i) Describe the concept of multimodal analgesia and its impact on functional restoration after surgery.
 - ii) Understand and explain the pharmacology of acetaminophen, NSAIDs, COX-2 inhibitors, NMDA antagonists, alpha-2 agonists, and gabapentinoid agents with respect to optimizing postoperative analgesia.
17. Describe the management of patients who have chronic pain, including:
- i) Management of the chronic pain patient who presents with acute surgical or non-surgical pain
 - ii) Describe the rational management of opioid medications including the conversion between agents and the principles of opioid weaning
 - iii) Describe the use of screening tools for opioid prescribing

- iv) Describe the presentation and management of complex regional pain syndrome, herpes zoster and other neuropathic pain syndromes
- v) Describe the evaluation and management of the pain with cancer pain, including options for medical and interventional treatment of the pain symptoms

Patient Care

Upon completion of the program, the fellow should be able to:

1. Demonstrate rational selection of regional anesthesia for specific clinical situations.
2. Recognize and intervene to manage inadequate regional anesthetic techniques with supplemental blockade or alternate anesthetic approaches.
3. Properly prepare to manage rare but serious complications of regional anesthesia including local anesthetic toxicity and total spinal anesthesia.
4. Conduct appropriate follow up on his/her block patients in order to assess outcomes of regional anesthesia and analgesia procedures. This includes evaluating patients immediately post-block, post-surgery, and POD #1.
5. Properly perform and teach correct technique for many of the following listed regional blocks to achieve a high success and low complication rate. The demonstration of capabilities in the education of junior trainees is part of what is felt to distinguish a clinician expert.
 - i) Basic Techniques and Approaches:
 - Superficial cervical plexus block
 - Axillary brachial plexus block
 - Intercostobrachial nerve block
 - Wrist Block
 - Intravenous regional anesthesia (Bier block)
 - Saphenous nerve block
 - Ankle block
 - Spinal anesthesia
 - Lumbar epidural anesthesia
 - Combined spinal-epidural anesthesia
 - Femoral nerve block
 - ii) Intermediate Techniques and Approaches:
 - Deep cervical plexus block
 - Interscalene block
 - Supraclavicular block

- Infraclavicular block
- Pectoralis 1 and 2 blocks, Serratus plane block
- Erector spinae plane (ESP) block
- Sciatic nerve block: posterior approaches
- Lumbar plexus block
- Popliteal block
- Suprascapular nerve block
- Intercostal nerve block
- Thoracic epidural anesthesia

iii) Advanced Techniques and Approaches:

- Continuous interscalene block
- Continuous infraclavicular block
- Continuous axillary block
- Thoraco-lumbar paravertebral block: single or continuous
- Continuous femoral nerve block
- Obturator nerve block
- Continuous sciatic nerve block
- Continuous popliteal block: all approaches
- Quadratus lumborum (QL) block

6. Inpatient Pain Management Service (IPS)

With attending faculty supervision, demonstrate management of patients at the level of a consultant whose diagnoses require consultation of the Acute Pain Management Service. Tasks will include the administration and coordination of multi-modal analgesic regimens to include such techniques as neuraxial and peripheral nerve catheters, local anesthetic and narcotic infusions, and non-narcotic analgesic adjuvants. The fellow as a consultant will understand and consider the indications, contraindications, side effects, potential complications, and daily management implications of these therapies. The fellow will also develop administrative skills as they related to managing a team of trainees, mid-level providers and advanced practice nurses. Fellows will be expected to make triage decisions and allocation of team members as appropriate for consultations, procedures, and follow-up visits.

Upon completion of the program, the fellow should understand how the acute pain medicine service (IPS) addresses:

- i) surgical regional anesthetic techniques (as placed by the regional team)

- ii) the perioperative use of analgesic techniques by the IPS
- iii) The provision of acute pain medicine services directed toward the patient with chronic pain who is also experiencing acute pain
- iv) the provision of acute pain management to select non-surgical patients, such as those with sickle cell disease or other conditions known to cause acute pain

Practice-based learning/scholarship/teaching

Upon completion of the program, the fellow should:

1. Evaluate and apply evidence from scientific studies, expert guidelines, and practice pathways.
2. Use information technology to obtain and record patient information, access institutional and national policies and guidelines, and participate in self education.
3. Evaluate own practice with respect to patient outcomes (esp. success and complications from regional block) and compare to available literature.
4. Identify strengths, deficiencies, and limits in knowledge and expertise
5. Set learning and practice improvement goals
6. Identify and perform appropriate learning activities, including didactic lectures and hands-on demonstrations that promulgate safety
7. Incorporate formative evaluation feedback into daily practice
8. Participate actively in clinical research as a major activity of the year-long fellowship. This includes completing the appropriate Deduce training, Redcap training, eIRB training.
9. Understand the process of generating a research question, developing a hypothesis, and developing a methodology by which to test that hypothesis.
10. Understand basic statistics and how to generate a sample size calculation as well as powering a study to an appropriate primary outcome measure
11. Be able to successfully navigate the eIRB portal and submit a protocol for approval by the IRB.
12. Have a publication accepted to a journal, or have a manuscript in preparation for submission
13. Expect to guest review manuscripts and/or book chapters for the faculty who serve as editors of peer-reviewed journals to gain knowledge of manuscript preparation, when possible.

14. Expect to receive mentorship and commitment from the core faculty to help in the production of research, co-author papers as appropriate, and preparation of clinical research proposals with IRB approval prior to the start of the fellowship year.
15. Present a scientific presentation at either Triangle Regional Night or at Anesthesiology Grand Rounds, covering a topic or case relevant to RAAPM.
16. Present original, self-generated research/scholarship at the annual Duke Academic Evening in May.
17. Review and select articles for monthly journal club and moderate each monthly Journal Club session
18. Attend each and every Tuesday afternoon RAAPM fellowship session unless on vacation. Session locations, topics and faculty leads will be published ahead of time.
19. Attend at least 60% of the Thursday afternoon Departmental Fellow lectures
20. Participate in and teach portions of the fresh cadaver anatomy labs organized within the division as external preceptorships.
21. Participate in the Annual American Society of Regional Anesthesia and Pain Medicine Meeting (or other similar scientific meeting) with poster, lecture, or problem-based learning presentations where possible.
22. Develop teaching techniques by instructing residents at the bedside in the preoperative block area under the supervision of faculty.
23. Be responsible for giving a "nuts and bolts" presentation on the first day of each CA-2/CA-3 resident regional rotation, and ensuring new rotating residents have viewed the lecture and been given the opportunity to ask questions if not available on the day it was given (i.e., post call from another service, etc.)
24. Learn teaching techniques by directing the acute pain service (IPS) under the supervision of faculty

Interpersonal and Communication Skills

Upon completion of the program, the fellow should be able to:

1. Provide information to the patient and family with respect to the options, alternatives, risks and benefits of regional anesthesia in a manner that is clear, understandable, ethical, and appropriate.
2. Employ effective listening skills and answer questions appropriately in the process of obtaining informed consent.

3. Work effectively in a team environment, communicating and cooperating with surgeons, nurses, pharmacists, physical therapists, and other members of the perioperative team. This requires the fellow to:
 - i) Appreciate the roles of other members of the team
 - ii) Communicate clearly in a collegial manner that facilitates the achievement of care goals.
 - iii) Help other members of the team to enhance the sharing of information.
 - iv) Formulate care plans that utilize multidisciplinary team skills such as a plan for facilitated recovery (i.e., ERAS, etc.)

Professionalism

Upon completion of the program, the fellow should be able to:

1. Respond to pages promptly and professionally; be punctual and reliable; adhere to departmental and university policies and procedures; exhibit integrity in record keeping and medical records
2. Demonstrate respect, compassion, and responsiveness to patients' needs and concerns
3. Demonstrate independence and initiative befitting a consultant subspecialty physician
4. Continuously conduct the practice of medicine with integrity, honesty, and accountability.
5. Demonstrate a commitment to life-long learning and excellence in clinical practice.
6. Demonstrate a commitment to the fellowship by striving for excellence in clinical and scholarly endeavors
7. Demonstrate consistent subjugation of self-interest to the good of the patient and the health care needs of society.
8. Demonstrate a commitment to ethical principles in providing care, obtaining informed consent, and maintaining patient confidentiality.

Systems-Based Practice

Upon completion of the program, the fellow should be able to:

1. Effectively balance the need for operating room efficiency with a high quality of patient care in the setting of a training program. The fellow will carefully and effectively consider the needs of the surgeons, patients, and be able to employ techniques and

approaches to achieve the best balance possible in order to use regional anesthesia to improve recovery.

2. Work effectively in a consultant physician role within the framework of the interprofessional clinical team, including surgeons, nurses, block nurses, CRNAs, other anesthesiology trainees to enhance patient safety and improve quality
3. Participate in identifying system errors and implementing potential systems solutions
4. Understand the interaction of the Acute Pain Management Service (IPS) with other elements of the health care system including primary surgical and medical teams, other consultant services, nursing, pharmacy, and physical therapy.
5. Demonstrate awareness of health care costs and resource allocation, and the impact of their choices on those costs and resources.
6. Advocate for the patient and their family within the health care system, and assist them in understanding and negotiating complexities in that system.

Revision Date: June 2017