

APPENDIX E: REGIONAL ANESTHESIA – RECOMMENDATIONS

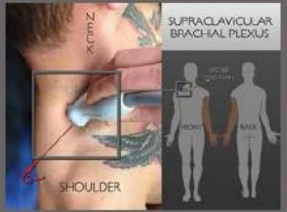
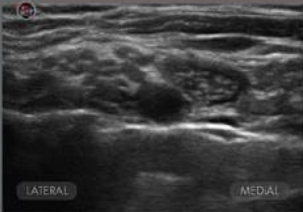
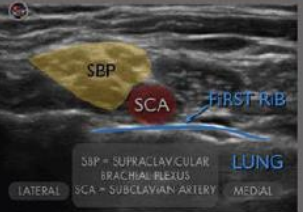
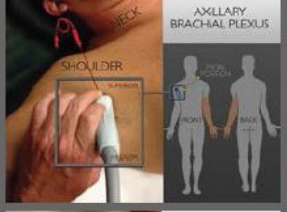
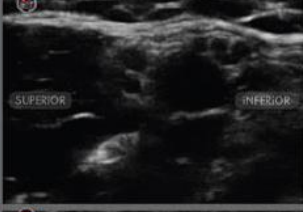
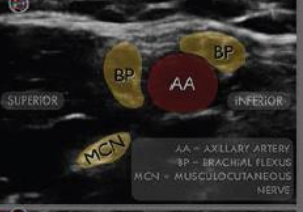
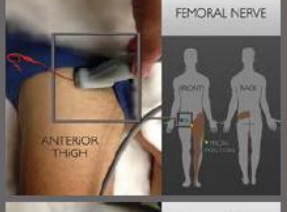
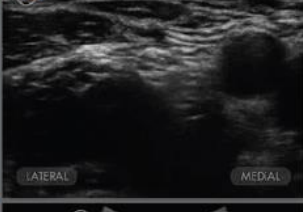

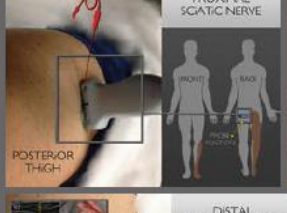





REGIONAL ANESTHESIA - RECOMMENDATIONS	
WORKING DEFINITION	It is a useful technique of local anesthetic agent injection adjacent to a single nerve or a nerve bundle, that can markedly reduce or eliminate limb-related pain without negative systemic effects such as respiratory depression, sedation or hypotension.
BEFORE ATTEMPTING - COMPETENCY IN ANY BLOCK PERFORMED MUST BE DOCUMENTED ULTRASOUND GUIDANCE IS THE PREFERRED MODALITY FOR BLOCKS	
BENEFITS	HOW TO MINIMIZE RISK:
<ul style="list-style-type: none"> Superior pain control in patients with limb injuries. Successful block decreases your patient's need for systemic analgesia. May need less or none at all. It is logistically easier to take care of a patients who doesn't need heavy sedation or systemic analgesia. 	<ul style="list-style-type: none"> Know the drugs you have available and ensure you have easy access to procedural references prior to deployment. Establish baseline neurological function of a given extremity prior to block. Calculate the maximum total dose of local anesthetic for your patient and never exceed it when performing multiple blocks. Use local anesthetics with epinephrine for all blocks to facilitate immediate recognition of intravascular injection. Use blunt-tip needles to minimize nerve injury. Monitor your patient during the injection & for 15-20 minutes after the procedure. Use pulse oximetry with audible signal as the minimum monitoring device when performing regional nerve blocks. Mark & date all the block sites with a permanent marker on the skin. Pad all the pressure points Know how to manage LAST syndrome (see checklist).
RISK	
<ul style="list-style-type: none"> LAST (local anesthetic systemic toxicity) - serious cardiovascular & CNS toxicity from accidental injection into the blood vessels or from absorption into systemic circulation - know signs & symptoms; stay out of blood vessels when injecting local anesthetics! Accidental nerve damage from needle or injection into the nerve - don't inject against resistance! Increased risk of unrecognized compartment syndrome or local pressure wounds given patient cannot provide feedback due to lack of sensory (+/- motor) function in a blocked extremity. Risk from injury to surrounding structures such as blood vessel injury or a pneumothorax. 	
SYMPTOMS & SIGNS OF LAST:	RECOMMENDED LOCAL ANESTHETIC
<ul style="list-style-type: none"> NERVOUS SYSTEM: <ul style="list-style-type: none"> perioral numbness, tingling, metallic taste, tinnitus, muscle twitching, visual disturbance, extreme anxiety, screaming, impending death feeling, SEIZURE, COMA CARDIOVASCULAR SYSTEM: <ul style="list-style-type: none"> chest pain, shortness of breath, diaphoresis, ARRHYTHMIA, HYPOTENSION, CARDIOVASCULAR COLLAPSE 	<p>ROPIVACAINE (0.2 % - 2mg/mL or 0.5% - 5mg/mL) is the local anesthetic of choice due to its excellent efficacy and improved cardiovascular safety profile.</p> <p>MAXIMUM CUMULATIVE DOSE: 3 mg/kg (all blocks at multiple sites combined)</p> <ul style="list-style-type: none"> 0.2% solution: 1.5mL/kg 0.5% solution: 0.6mL/kg <p>ONSET & DURATION: approximately 20 minutes from injection to onset of block. An effective dose provides 4-8 hours of anesthesia. The analgesic effect lasts for 5-12 hours.</p>
RECOMMENDED MODALITIES:	
<ul style="list-style-type: none"> Ultrasound-guidance for real-time visualization of targeted nerves, needle & anesthetic spread. It is recommended for any block performed (except digital blocks). Paresthesia/anatomical technique may be used for distal nerve blocks if no ultrasound available. 	

Regional Anesthesia – Recommendations (Continued)

REGIONAL ANESTHESIA - WORKSHEET	
PATIENT'S WEIGHT [kg]:	MAXIMUM CUMULATIVE DOSE:
RECOMMENDED UPPER EXTREMITY BLOCKS: SEE REGIONAL ANESTHESIA REFERENCE - ULTRASOUND-GUIDED NERVE BLOCKS <input type="checkbox"/> SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK (must be performed under ultrasound guidance; inject 20-25mL of local anesthetic) <input type="checkbox"/> AXILLARY BRACHIAL PLEXUS BLOCK (preferably under ultrasound guidance; inject 15-20mL of local anesthetic) <input type="checkbox"/> WRIST BLOCK: radial, median & ulnar nerves (ultrasound use is optional; inject a total of 10mL of local anesthetic for all 3 nerves) <input type="checkbox"/> DIGITAL BLOCK (inject < 5mL of local anesthetic)	TECHNIQUE: <ul style="list-style-type: none"> ● Identify target nerve according to training ● Gather equipment and place the patient on monitor: <ul style="list-style-type: none"> <input type="checkbox"/> MINIMUM: pulse oximetry with audible signal <input type="checkbox"/> BETTER: add blood pressure monitoring <input type="checkbox"/> BEST: full monitor with EKG leads ● Prepare & label the syringes with local ANESTHETIC ● Clean (preferably sterile) procedure: cleanse injection site with chlorhexidine (preferred), betadine or alcohol, & use gloves (best sterile) ● Ensure good verbal and visual communication with the patient prior to injection ● Introduce needle and aspirate for blood; then inject 1 mL of anesthetic, and if no resistance, then aspirate again & slowly inject 3-5mL, and wait 60 seconds to monitor for toxicity. STOP IF if any signs or symptoms of toxicity or other adverse events occur ● Continue injection if no changes occur ● Always aspirate before any injection ● Slowly inject your target dose for a given block in 5-mL increments given over 10-15 sec each, and always aspirate for blood between each 5-mL increment ● Mark and date each block site
RECOMMENDED LOWER EXTREMITY BLOCKS: SEE REGIONAL ANESTHESIA (3) ULTRASOUND-GUIDED NERVE BLOCKS REFERENCE <input type="checkbox"/> FEMORAL NERVE BLOCK (use ultrasound guidance; inject 10-20mL of local anesthetic) <input type="checkbox"/> PROXIMAL SCIATIC NERVE BLOCK (subgluteal approach; use ultrasound guidance; inject 15-20mL of local anesthetic) <input type="checkbox"/> DISTAL SCIATIC NERVE BLOCK (popliteal approach; use ultrasound guidance; inject 20mL of local anesthetic) <input type="checkbox"/> SAPHENOUS BLOCK (ultrasound use is optional: proximal approach at tibial tuberosity; inject 10mL of local anesthetic) <input type="checkbox"/> ANKLE BLOCK: saphenous, sural, posterior tibial, superficial & deep peroneal nerves; ultrasound use is optional; inject a total of 20mL of local anesthetic for all 5 nerves) <input type="checkbox"/> DIGITAL BLOCK (inject < 5mL of local anesthetic)	
CONTRAINDICATIONS: <ul style="list-style-type: none"> ■ UNTRAINED PROVIDER ■ Refusal & inability to communicate with patient ■ Infants, children, elderly ■ Infection at the injection site ■ Trauma or history of trauma at the injection site ■ Systemic anticoagulation/coagulopathy ■ Pre-existing neurological disease 	
Local Anesthetic Systemic Toxicity (LAST) checklist: <ul style="list-style-type: none"> ■ STOP injection at first sign or symptom! ■ Airway management: use 100% oxygen ■ Seizure management: benzodiazepines are preferred; can give propofol (25-50mg) if hemodynamically stable ■ Use ACLS protocols for cardiovascular collapse ■ 20% LIPID EMULSION is the antidote: <ul style="list-style-type: none"> <input type="checkbox"/> 1 mL/kg every 3-5 minutes IV, up to 3mL/kg IV during ACLS <input type="checkbox"/> Follow with continuous infusion 0.25mL/kg/min <input type="checkbox"/> Double the infusion rate to 0.5mL/kg/min if blood pressure remains low <input type="checkbox"/> Continue infusion for at least 10 minutes once hemodynamically stable <input type="checkbox"/> Upper limit: approx. 10mL/kg IV over 30 minutes 	

Regional Anesthesia – Recommendations (Continued)


REGIONAL ANESTHESIA REFERENCE - ULTRASOUND-GUIDED NERVE BLOCKS

 <p>SUPRACLAVICULAR BRACHIAL PLEXUS</p>	<ul style="list-style-type: none"> TIPS: identify subclavian artery lying on the first rib; the plexus is immediately lateral and superficial to it. PITFALLS: keep needle tip always in sight to avoid pneumothorax, and don't point below the first rib. INJECTION VOLUME: 20-25mL 		 <p>SBP = SUPRACLAVICULAR BRACHIAL PLEXUS SCA = SUBCLAVIAN ARTERY</p>
 <p>AXILLARY BRACHIAL PLEXUS</p>	<ul style="list-style-type: none"> TIPS: identify axillary artery; musculocutaneous nerve is distant from the plexus bundles. PITFALLS: there are multiple vessels in this area - avoid intravascular injection. INJECTION VOLUME: 15-20mL 		 <p>AA = AXILLARY ARTERY BP = BRACHIAL PLEXUS MCN = MUSCULOCUTANEOUS NERVE</p>
 <p>FEMORAL NERVE</p>	<ul style="list-style-type: none"> TIPS: identify femoral artery; femoral nerve is lateral to it; pop the iliac fascia, target the nerve prior to bifurcation of the femoral artery. PITFALLS: beware of motor weakness of quadriceps - fall risk! INJECTION VOLUME: 10-20mL 		 <p>FN = FEMORAL NERVE FA = FEMORAL ARTERY FV = FEMORAL VEIN</p>
 <p>PROXIMAL SCIATIC NERVE</p>	<ul style="list-style-type: none"> TIPS: identify greater trochanter and ischial tuberosity; sciatic nerve can be seen between them. PITFALLS: may need to inject more distally or in long axis of the nerve. INJECTION VOLUME: 15-20mL 		
 <p>DISTAL SCIATIC NERVE</p>	<ul style="list-style-type: none"> TIPS: identify popliteal vessels; inject at confluence of CPN & TN; scan after injection to ensure spread. INJECTION VOLUME: 20mL 		 <p>FA = POPLITEAL ARTERY PV = POPLITEAL VEIN TN = TIBIAL NERVE CPN = COMMON PERONEAL NERVE</p>


GENERAL POINTERS ON TECHNIQUE:

- In cross-section on ultrasound nerves look like honey-comb cereal;
- Find blood vessels and use color Doppler to localize associated nerves;
- Best find the nerve in cross-section & approach with needle-in-plane; some blocks can be done out-of-plane; to see the needle well, avoid steep needle angles in-plane;
- Pop the fascial plane - tight needle-tip-to-nerve proximity is not as important, if you are within the right fascial plane;

- Deposit a small amount of local anesthetic to hydro-dissect the nerve from its surrounding tissues - this hydrolocalization technique will help you see it better;
- Flush the needle with local anesthetic prior to injection, in order to avoid injecting air and resultant poor image quality from artifacts caused by air;
- Local anesthetics are lipophilic - do not simply deposit into surrounding fat tissue.



LINEAR



LINEAR PROBE IS PREFERRED

PRIMARY CONTRIBUTORS:
Katarzyna (Kasia) Hampton, MD; James Reed, CRNA; SFC William H. Poston, 18D