Introduction

Since we're in residency in the 21st century, I don't have to convince you about the benefits of nerve blocks for patients. So let's figure out how to do these at KCH and UHB. Below is a guide of nerve blocks we can perform in the ED. Remember its an extensive list but some of these blocks are not commonly done in the ED which is emphasized below.

Head and Neck Blocks

- Auricular
- Inferior Alveolar
- Infraorbital
- Mental
- Occipital (not commonly done in ED)
- Posterior Superior Alveolar
- Superficial Cervical Plexus
- Supraorbital

Upper Extremity Blocks

- Axillary
- Interscalene Brachial Plexus
- Medial Antebrachial Cutaneous (not commonly done in ED)
- Median
- Musculocutaneous (not commonly done in ED)
- Radial
- Supraclavicular Brachial Plexus
- Ulnar Nerve

Torso Blocks

- Erector Spinae
- PECS-II (Interpectoral Plane and Pectoserratus Plane Block) (not commonly done in ED)
- Penile
- Perianal
- Rectus Sheath (not commonly done in ED)
- Serratus Anterior Plane
- Transersus Abdominis Plane (not commonly done in ED)

Lower Extremity Blocks

- Fascia Iliaca
- Lateral Femoral Cutaneous
- Pericapsular Nerve Group (PENG)
- Popliteal Sciatic
- Posterior Tibial
- Saphenous

Assessment

So you have a patient with a fracture or soft tissue injury amenable to a nerve block. The first thing you need to ask yourself is "Is it safe for me to perform this nerve block?" Specifically, if I block this nerve, will I potentially mask an underlying compartment syndrome? Highland US has a useful chart below to consider these questions.

Always document a complete neurological exam before a block.

If this is an orthopedic case it is worth letting the orthopedic resident that you're going to do a block. They may want their own exam before this, but the patient's comfort is paramount here

Block OK

- Shoulder dislocation
- Clavicle fracture
- Proximal humerus fracture
- Low energy distal radius fracture
- Hand and digit injuries
- Hip fracture and dislocation
- Low energy foot and ankle fractures

Contact orthopedic surgery as soon as possible for any patients to be admitted or patients who will require in ED consultation, but do not delay block placement.

Block after Consultation

- Humeral shaft fracture
- Elbow fracture
- Both bone forearm fracture
- Femoral shaft fracture

Perform and document detailed neurologic exam and consult with orthopedic service before block is placed.

No Block

High risk for compartment syndrome

- Tibial fracture
- · High emergency forearm fracture
- High Energy foot fracture
- Any injury with evidence of neurovascular injury or clinical concern for a possible compartment syndrome

Perform block only after requested by Trauma and Orthopedic service attending.

Universal precautions

- Appropriate splinting, protection, icing of any injured extremity.
- · Appropriate analgesic administration.
- Block placement should not delay other time sensitive interventions.
- Appropriate consideration of and patient discussion of the risks and benefits of any block.
- · Documentation of consent.
- Thorough, detailed, and appropriately documented neurologic exam before block is performed.
- Thorough, detailed, and appropriately documented compartment exam before block is performed.
- Safe and sterile procedural technique appropriately documented including but not limited to: pre-procedure timeout with confirmation correct patient, indication, and side; appropriate patient monitoring; use of real-time ultrasound-guidance with avoidance of needle to nerve contact and vascular puncture; aspiration and small volume (3-5mL) injection of appropriately dosed local anesthetic.
- Presence of necessary resuscitation equipment and intralipid in case of local anesthetic toxicity reaction.
- Clear marking of blocked extremity and documentation of block details in the medical record.
- Verbal communication of block details with participating clinical teams prior to discharge or transfer from ED.
- Appropriate post block care of weakened or insensate extremity to prevent falls and limb injury.

Materials

Ok, so you've decided the block is reasonable. You looked through the Universal Precautions part of the figure above and have discussed with the patient the risks and benefits, and the patient wants the block. Great! Let's gather the materials.

Thanks to Dr. Hanuscin, all the materials needed can be found in Tray 79 in CCT.

EQUIPMENT

- Anesthetic

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- Short (2-3 hours): Lidocaine
 - Long (6-8 hours): Bupivacaine
 - Will need to call Pharmacy (7130) to expedite delivery
- Note: We dont carry chloroprocaine, mepivacaine, or ropivacaine at KCH
- Needles
 - Superficial nerves: 22g needle
 - There are 22g long needles specifically for nerve blocks, as well as blunt tipped needles, but we currently do not stock these
 - Currently we utilize 20g Quincke (cutting) needles
 - Deeper nerves: 20g spinal needle
 - 18g needle to draw anesthetic
- Chloraprep
- Syringes
 - If superficial, can use one 10 mL syringe
 - If deep, can use two 20 mL syringe
- Saline
 - Usually same amount as anesthetic
- 3 Way Stop Cock
 - If doing large amount of anesthetic
- Extension tubing
- Sterile probe cover, sterile gloves, sterile cover

If you plan on a superficial injection (such as forearm, face, dental, or ankle), you usually wont need extension tubing, stop cock, sterile field, and a 2nd operator to help.

LOCATION

- All materials gathered. Now we have to decide where we're going to do this. The hallway is not the place to be putting a needle in someone's neck. The Ortho room (may require a bit of cleaning), room 17, or even the Gyn room are ideal. At UHB, you can try to replace a patient into a room, or quickly move to the resuscitation room if available.

Common Terminology

Term	Definition	Example
Hydrodissect	To inject fluid in order to separate nerves from surroundings or adjacent structures, usually fascia	FEMORAL NERVE BLOCK FEMORAL FEMORAL NERVE FEMORAL NERVE FEMORAL FEMO
Hydrolocate	To inject small volume of fluid to visualize spread within tissues in order to reveal the position of the needle tip	
Out-of-plane or Short axis	Needle enter skin perpendicular to long axis of transducer (think US IV)	
In-plane or Long Axis	Needle enters parallel to long axis of transducer	

General Principles

- Always visualize your needle tip

- May need to hydrolocate to do this
- Easiest to do in Long Axis

- Never touch the nerve with the needle

- Goal is to surround the nerve sheath with anesthetic, which can then diffuse across. Many times you are aiming for the fascial sheath the nerves are in.

- <u>Always aspirate as you advance to ensure no intravascular injection. Inject</u> as you withdrawal

- In each of the blocks below we wont be reiterating this point as we describe the technique section

- Use saline to find the correct plane

- When not sure you are in the correct fascia or area to inject, first use NS to hydrodissect to confirm you are in the right spot.

- Know your max dose of local and dose of intralipid

- Watch this video

- https://www.coreultrasound.com/nb_basics/

LAST and Intralipid

LAST: Local Anesthetic Systemic Toxicity

- The most dangerous complication. Incidence is variable. 0-79 reports of LAST per 10,000 nerve blocks.
- Intravascular injection or toxic amounts of local anestheic increase risk of LAST. Always consult the chart below when considering nerve blocks to know the max dose
- Presents as CNS changes, with initial agitation, confusion, drowsiness, tinnitus, perioral numbness, metallic taste that can rapidly progress to seizures, respiratory arrest, and coma. Most common symptom is seizure
- Hypotension and bradycardia are often the first signs of cardiac toxicity, but be on the lookout for arrhythmias like bradyarrhythmias.
- Treatment includes ABCs, benzos for seizures, ACLS, ect. but when you suspect LAST, you have to consider lipid emulsion therapy

Intralipid:

- An **initial bolus of 1.5 ml/kg** or **100 ml 20% lipid emulsion** followed by an infusion starting at **0.25 ml/kg/min** is crucial to reverse toxicity and prevent recurrence
- Always calculate dose of intralipid before starting a local block (it's a good habit to develop)

Local Anesthetic Dosing Guide For Regional Anesthesia						
Drug	Dose (mg/kg) [DO NOT EXCEED]	50 kg (ml)	70 kg (ml)	90 kg (ml)	Max Dose	Notes
Ropivacaine 0.5% (5mg/ml)	3mg/kg	150mg (30ml)	210mg (42 ml)	270mg (54ml)	300mg (60ml)	4-24 hr block. Powerful, have intralipid!
Ropivacaine 1% (10mg/ml)	3mg/kg	150mg (15ml)	210mg (21 ml)	270mg (27ml)	300mg (30ml)	Dilute 1% solution 1:1 with NS.
Bupivacaine 0.5% (5mg/ml)	2 mg/kg	100mg (20ml)	140mg (28ml)	175mg (35ml)	175 mg (35ml)	Greater risk of toxicity than lido. Contraindicated in pregnancy.
Lidocaine 1% (10mg/ml)	4.5 mg/kg	225mg (22ml)	300mg (30ml)	300 mg (30ml)	300mg (30ml)	Do not repeat within 2 hours.
Lidocaine 1% w/ epi (10mg/ml)	7 mg/kg	350mg (35ml)	490mg (49ml)	500mg (50ml)	500mg (50ml)	OK to use on face, penis, digits if no peripheral vascular disease.
Mepivacaine 1.5% (15mg/ml)	4 mg/kg	200mg (13ml)	280mg (18ml)	300 mg (20ml)	300mg (20ml)	Contraindicated in pregnancy.
Chloroprocaine 3% (30mg/ml)	11 mg/kg	500mg (16ml)	700mg (23ml)	900mg (30ml)	1000mg (33ml)	Ultra short blocks (60-90m). Pregnancy safe.
Lyons/Herring 2016						

Of Note: Kings County and SUNY Downstate only carry Lidocaine and Bupivacaine

Additional Resources

- Apps:
 - Nerve Block, free with great information
 - **TPA (The POCUS Atlas)**, co-founded by a former County grad Dr. Riscinti, for reference examples of nerve blocks
 - **NYSORA Nerve Blocks** has the most in-depth knowledge about these, but many of the blocks are behind a paywall :(

- Websites:

- <u>https://www.nysora.com/topics/equipment/introduction-ultrasound-guided-regiona</u> <u>l-anesthesia/</u>
- https://www.coreultrasound.com/5ms/
- http://highlandultrasound.com/
- https://www.youtube.com/@regionalanesthesiology

Head and Neck

- Auricular

Indication	Lacerations, I&D of hematoma or abscess
Contraindications and Complications	Infection overlying injection site
US and Sterility	Blind procedure, no sterile field
Patient Position	Supine or Sitting
Technique	 After cleaning, insert needle into skin inferior to the attachment of the earlobe to the head and advance needle anterior to the tragus (#3 below) then redirect and advance needle posterior and superior (#4 below) Remove needle and reinsert superior to the attachment of the helix to the scalp Advance needle anterior to the tragus (#1 below) then redirect the needle posterior to the ear (#2 below)
Area of Anesthesia	
Video	https://www.youtube.com/watch?v=6ZiB_9eNpcA

- Inferior Alveolar

Indication	Dental pain, fractures, lingual lacerations
Contraindications and Complications	 Infection over injection site Parotid gland injection leading to iatrogenic Bell's palsy. Occurs if bone is not felt during approach. Redirect the needle anteriorly until bone is felt. Carotid sheath injection leads to horners from stellate ganglion block Carotid artery puncture
US and Sterility	Blind procedure, no sterile field
Patient Position	Sitting and position yourself opposite side of injection site
Technique	 Palpate coronoid notch with your non-injection thumb and place index finger of same hand externally over the ramus of the mandible to retract the tissue Visualize the pterygomandibular triangle Hold the syringe parallel to the surface of teeth and angle so that the barrel of the syringe lies between the 1st and 2nd premolars on the opposite side (see image below). Advance needle until bone is felt and inject as you withdrawal
Area of Anesthesia	 Mandibular teeth (excluding buccal gingiva), lower lip, chin, and tongue Buccal block Inferior alveolar artery Inferior alveolar artery Inferior alveolar nerve Lingual nerve
Video	https://www.youtube.com/watch?v=tLXwq2xn5Y

- Infraorbital

Indication	Trauma or need for procedure in this region
Contraindications and Complications	Infection overlying injection site
US and Sterility	Blind procedure, no sterile field
Patient Position	Sitting up or lying down
Technique	 Apply anesthetic soaked q-tip to the mucosa opposite the upper 2nd premolar (bicuspid) for 1 minute Palpate infraorbital foramen by having the patient look straight ahead and draw an imaginary line vertically from the pupil toward the inferior border of the infraorbital ridge, keep finger here Retract cheek and introduce needle below finger, advance 1.5 to 2.5 cm max to avoid entering orbit and keep parallel to long axis of the bicuspid
Area of Anesthesia	Lower eyelid Side of nose Upper lip
Video	https://www.youtube.com/watch?v=3nzXe_NYKlg

- Mental

Indication	Trauma or need for procedure in this region
Contraindications and Complications	Injection over injection site
US and Sterility	Blind procedure, no sterile field
Patient Position	Sitting or semi-recumbent
Technique	 Locate mental foramen by retracting the cheek laterally and palpating between the 2 lower premolar teeth Insert needle along the lower gum in the buccal hold between the premolar teeth without placing directly into foramen
Area of Anesthesia	<image/>
Video	https://www.youtube.com/watch?v=KBnGZmvxmbl

- Occipital

Indication	 Occipital neuralgia, cluster HA, cervicogenic HA, migraine HA localized to occiput
Contraindications and Complications	Injection overlying injection site
US and Sterility	Blind procedure, no sterile field
Patient Position	Upright
Technique	 Identify greater occipital nerve (GON) by palpating the occipital protuberance and the mastoid process and measure 1/3 the distance between the two points starting from the occipital protuberance. Stay superior to the nuchal line to remain over the cranium Insert needle at 90 degree angle toward the occiput until a bony endpoint is felt Inject 1cc at GON, 1cc medial to nerve, 1 cc lateral to nerve There are other methods to identify the GON
Area of Anesthesia	Gener Gener Gener Bener Boos Boos Boos Boos
Video	https://www.youtube.com/watch?v=6Dj5zYbvLxo

- Posterior Superior Alveolar

Indication	Dental pain, periapical abscess, dentoalveolar trauma
Contraindications and Complications	Infection overlying injection site
US and Sterility	Blind procedure, no sterile field
Patient Position	Sitting or semi-recumbent
Technique	 Retract upper lip laterally and superiorly. At the root of the upper second molar, insert the syringe at 45 degree angle posteriorly, superiorly, and medially. Advance 1-2cm until contact with bone. Drawback to ensure you have not accessed the vascular space. Inject 2-3mL anesthetic into the tissue and allow to diffuse Remember, the anterior and middle superior alveolar can be blocked with the infraorbital block
Area of Anesthesia	Ministry Affering Bareling Affering Middle Affering
	Posterior superior 2-2.5 cm Vecdle entry at the upper second molar Second molar Vecdle entry at the upper second molar Figure 2: For the posterior superior alveolar nerve, enter just posterior to the root of the second molar. [1]
Video	https://www.youtube.com/watch?v=yzfQGWpTJco https://www.youtube.com/watch?v=FeJdTeECz28

- Superficial Cervical Plexus

Indication	Clavicle fracture, painless IJ, earlobe and submandibular I&D, Lac
Contraindications and Complications	Injection overlying injection site, previous neck surgery/radiation
US and Sterility	Linear probe In-plane, no sterile field
Patient Position	• Supine
Technique	 Place transducer transverse at the superior pole of the thyroid cartilage and identify IJ, carotid artery, and SCM Move the probe lateral to identify the fascial plane just inferior to the SCM and above the levator scapula muscle (LSM). The LSM contains the superficial cervical plexus In plane visualization of needle with lateral to medial approach with slow injection in the fascial plane between SCM and LSM Inject 2-5 ml of anesthetic
Area of Anesthesia	
Video	https://www.coreultrasound.com/superficial-cervical-plexus-block/ https://youtu.be/hmfvUldlvfY?t=324

- Supraorbital

Indication	Trauma or need for procedure in this region
Contraindications and Complications	Injection overlying injection site
US and Sterility	Blind procedure, no sterile field
Patient Position	Supine or sitting
Technique	 Palpate the supraorbital foramen over the medial aspect of the supraorbital ridge and advance needle towards foramen (5-10 mm) Inject 1-3 cc and massage area, which you should be doing for all head neck blocks except superficial cervical plexus
Area of Anesthesia	<image/>
Video	https://www.youtube.com/watch?v=yjXE1fyVy5U https://www.youtube.com/watch?v=RXy5SwDn9nw

Upper Extremity

- Axillary

Indication	Laceration or abscesses of deltoid
Contraindications and Complications	Infection overlying injection site
US and Sterility	Linear probe, no sterile field
Patient Position	Patient in prone position
Technique	 Place probe in-plane with long axis of humerus. Nerve is located around 4 cm inferior to the posterior aspect of the acromion in the quadrangular space Look for the teres minor medially and deep to the deltoid muscle Laterally the axillary nerve runs adjacent to the posterior humerus circumflex artery Advance needle toward the plane deep to the deltoid muscle and target the area adjacent to the posterior circumflex artery Inject 2-5 cc of saline to confirm then inject anesthetic (5-10 cc)
Area of Anesthesia	<image/>
Video	https://www.youtube.com/watch?v=ebsM-DeDeN0

- Interscalene Brachial Plexus

Indication	• Humerus fractures, shoulder dislocation, deltoid abscess, lacerations
Contraindications and Complications	 Injection overlying injection site, concern for compartment syndrome Risk of PTX and phrenic nerve paralysis (diaphragmatic hemiparesis) Careful with patient on AC given as this is a noncompressible site
US and Sterility	• Linear probe, sterile field, consent, 2 person team, 3-way stop-cock
Patient Position	Supine on table, head turned to contralateral side
Technique	 20 G spinal needle In-plane view, identify the carotid artery which is deep to the SCM. Slide probe posteriorly until a stack of cords (Stop-sign C5-C6-C7) is seen in between the anterior and middle scalenes (interscalene space) Insert needle from lateral to medial toward this stack and hydrodissect with saline (10 cc) and then inject anesthetic (10 cc) to bathe plexus
Area of Anesthesia	Intercaiene Brachial Piccus Block 1) Find familiar landmarks (internal juguar vein (UV) and carcotid artery) 2) Approx at tevel of cricotid arterior Biternocleidomastidi (SCM) + visualization Biternocleidomastidi (SCM) + visualization Bit
Video	https://www.coreultrasound.com/interscalene-brachial-plexus-nerve-block/ https://youtu.be/5_EKD83UvNY?t=144

- Medial Antebrachial Cutaneous

Indication	Medial forearm laceration or injury
Contraindications and Complications	Infection overlying injection site
US and Sterility	Linear probe, no sterile field
Patient Position	Supine with arm abducted and supinated
Technique	 Place probe in transverse plane on the medial aspect of the upper extremity, midway along the arm, and identify the biceps and triceps muscles as well as the neurovascular bundle containing brachial artery, basilic vein, median nerve The medial antebrachial cutaneous nerve (MACN) is superficial to the tricep muscle and medial to the biceps and neurovascular bundle In plane visualization, introduce needle from lateral to medial and maintain superficial to the neurovascular bundle Inject anesthetic (5 cc) deep to MACN
Area of Anesthesia	
	N _{eedle} MACN 5 mm
	Biceps
Video	https://www.youtube.com/watch?v=Li24tMuHx2w

- Median

Indication	 Laceration, foreign body removal, I&D, or other procedures needed in this distribution. Larger area of anestehsia than digital block
Contraindications and Complications	Injection overlying injection site, concern for compartment syndrome
US and Sterility	Linear probe, no sterile field
Patient Position	Arm extended, supinated, palm up
Technique	 Wrist: This is one of 2 approaches, can either approach nerve from wrist or elbow Probe in-plane position over the middle of the forearm. The hyperechoic structure between the FDS and FDP muscles is the median nerve Insert needle until the tip is adjacent to nerve and hydrodissect with 1-2 cc of saline to confirm placement then inject anesthetic (3-8 cc)
Area of Anesthesia	<image/>
Video	https://www.coreultrasound.com/median-nerve-block/ https://youtu.be/d24sbly6szQ?t=99

- Musculocutaneous

Indication	Lateral forearm laceration or injury
Contraindications and Complications	Infection overlying infection site
US and Sterility	Linear probe, no sterile field
Patient Position	Supine with upper extremity abducted
Technique	 The musculocutaneous nerve (MCN) in the distal axilla runs in the facial plane between the biceps and the coracobrachialis muscles (arrow in picture below) apart from the axillary neurovascular complex (dotted circle below) In-plane needle visualization Inject local anesthetic (10-15 cc) inferior to the MCN
Area of Anesthesia	<image/>
Video	https://www.youtube.com/watch?v=YPb4m5IRQ34 https://www.youtube.com/watch?v=TuZHqh978_k https://www.youtube.com/watch?v=ngGi9htgclw

- Radial

Indication	Laceration or other procedure needed in this distribution
Contraindications and Complications	Infection overlying infection site or concern for compartment syndrome
US and Sterility	Linear probe, no sterile field
Patient Position	Arm extended, supinated, palm up
Technique	 Wrist: This is one of 2 approaches, can either approach the nerve from wrist or elbow. Note if done above the elbow, the nerve contains both sensory and motor nerves and so will result in a transient wrist drop Place the US in transverse orientation, 3-4 cm proximal to the volar wrist and locate radial artery. Nerve should be radial to the artery. If the nere is too close to the artery trace proximally to allow separation between the two Surround nerve with anesthetic (3-8 cc)
Area of Anesthesia	<image/>
Video	https://www.coreultrasound.com/radial-nerve-block/ https://youtu.be/d24sbly6szQ?t=180

- Supraclavicular Brachial Plexus

Indication	Deltoid abscess, humeral fracture, elbow dislocation/reduction, distal radius fracture/reduction, so forth
Contraindication and Complications	 Injection overlying injection site, concern for compartment syndrome Risk of PTX and phrenic nerve paralysis (lower risk than interscalene block) Careful with patient on AC given as this is a noncompressible site
US and Sterility	Linear probe, sterile field, consent, 2 person team, 3-way stop-cock
Patient Position	• Supine on table, head turned to contralateral side, head of bed elevated ~30
Technique	 20 G spinal needle Place the probe parallel to the clavicle along the superior border and locate the subclavian artery. The brachial plexus will be visible lateral to the SCA. Use color doppler while doing this lock In-plane visualization and enter laterally. Potentially a palpable pop when entering brachial plexus sheath Inject 10 cc of saline to confirm placement then inject anesthetic (20-23 cc) above and below brachial plexus
Area of Anesthesia	<complex-block></complex-block>
Video	https://www.coreultrasound.com/supraclavicular-brachial-plexus-nerve-block/ https://youtu.be/m3GU11ZRzGc
Of Note	• There is an axillary brachial plexus black and an infraclavicular brachial plexus block however a supraclavicular brachial plexus block will cover the same sensory distribution and more!

- Ulnar

Indication	Boxers fracture, hand lacerations, I&D, or other procedure needed in this distribution
Contraindications and Complications	Infection overlying injection site, concern for compartment syndrome
US and Sterility	Linear probe, no sterile field
Patient Position	Arm extended, supinated, palm up
Technique	 Wrist: This is one of 2 approaches, can either approach nerve from wrist or elbow With in-plane view, find the ulnar nerve Immediately ulnar to the artery. If they are too close trace proximally to separate the two Surround the nerve with 3-8 cc of anesthetic
Area of Anesthesia	Unar nerve Ulnar artery reeque ulna
Video	https://www.coreultrasound.com/ulnar-nerve-block/ https://youtu.be/d24sbly6szQ?t=144



- Erector Spinae

Indication	Chest wall trauma, posterior rib fractures, zoster or post-herpatic neuralgia, vertebral compression fracture
Contraindications and Complications	Infection overlying injection site
US and Sterility	• Linear probe, sterile field, consent, 2 person team, 3-way stop-cock
Patient Position	Prone, lateral decubitus, or leaning forward in seated position
Technique	 20 G spinal needle Place probe over midline, oriented vertically and identify spinous process then move probe laterally to identify transverse process (the next most superficial bone) Continue to move probe laterally until transverse process (TP) abruptly disappears and ribs appear Insert needle in-plane and advance toward posterior surface of TP. you will feel resistance once making contact with TP Inject saline (1-3 cc) and monitor for separation of erector spinae muscle from TP, then inject 25-30 cc of anesthetic
Area of Anesthesia	<image/>
Video	https://www.youtube.com/watch?v=O9RB0K7f8pM https://www.youtube.com/watch?v=gsyeeDLnEx4

- PECS-II (Interpectoral Plane and Pectoserratus Plane Block)

Indication	Analgesia to axilla, laceration or abscess in axilla
Contraindications and Complications	Infection overlying injection site
US and Sterility	Linear probe, sterile field, 2 person team, 3-way stop-cock
Patient Position	Supine and head turned to contralateral side
Technique	 Place probe in sagittal plane at mid-clavicular line and identify clavicle, pectoralis muscles, axillary artery and vein Move probe caudad until in 3rd and 4th intercostal space and rotate probe 45 degrees to find thoracoacromial artery (between pectoralis major and minor) In-plane, enter needle medially and deposit 5-10 cc to separate facial plane between PMa and PMi Advance needle to place between PMi and serratus anterior and deposit 20 cc anesthetic
Area of Anesthesia	
Video	https://www.youtube.com/watch?v=YFWneF4pwOA https://www.youtube.com/watch?v=0g_PGLYy0gw

- Penile

Indication	Priapism, penile laceration or fracture
Contraindications and Complications	Infection overlying injection site
US and Sterility	Blind procedure, no sterile field
Patient Position	• Supine
Technique	 Insert needle at 2 and 10 o'clock positions at the base of the penis for dorsal nerve block or for a complete block inject anestehtic in complete ring around base of penis
Area of Anesthesia	Skin and superficial fascia Injection underneath Superficial dorsal vein Injection underneath Dorsal nerve Injection underneath Dorsal nerve Injection underneath Dorsal nerve Injection underneath Corpora cavernosum Injection underneath Corpora spongiosum & Injection underneath Deep artery Injection underneath Corpora spongiosum & Injection underneath Urethra Injection underneath Dorsal nerve Injection underneath Period Injection underneath Deep artery Injection underneath Corpora spongiosum & Injection underneath Drethra Injection underneath Dorsal nerves Injection underneath Penie base Injection underneath Injection underneath Injection underneath Injection underneath<
Video	https://www.youtube.com/watch?v=LPE-RUyu8JE

- Perianal

Indication	 Rectal foreign body removal, external hemorrhoid excision, rectal prolapse, anorectal abscess drianage
Contraindications and Complications	Infection overlying injection site
US and Sterility	Blind procedure, no sterile field
Patient Position	Prone with pillow or blankets under hips
Technique	 Use tape to separate buttocks and clean the perianal area then inject so that you perform a ring block around the anus
Area of Anesthesia	A 4 Perianal Block Technique 49 Image: Construction of the construction of th
Video	https://www.youtube.com/watch?v=TpHjQ-zmZd0&t=24s (honestly, not the greatest video, concept is fairly simple though)

- Rectus Sheath

Abdominal wall laceration, injury, or I&D for abscess
Infection overlying infection site
• Linear probe, sterile field, 2 person team, 3-way stop-cock
• Supine
 Place probe in transverse orientation cephalad and lateral to the umbilicus and identify the linea alba and the anterior and posterior portions of the rectus sheath surrounding the rectus abdominis muscle Use color doppler to identify and avoid epigastric arteries In-plane insertion form medial to lateral and advance needle to posterior rectus sheath Inject saline to confirm needle between rectus abdominis muscle and posterior rectus sheath and inject 10 cc of anesthetic
<complex-block></complex-block>
https://www.youtube.com/watch?v=7Slg2AprMW8

- Serratus Anterior Plane

Indication	 Rib fractures, thoracic lacerations, anesthesia prior to chest tube placement for spontaneous PTX
Contraindications and Complications	Infection overlying injection site
US and Sterility	Linear probe, no sterile field
Patient Position	Lateral decubitus with target side facing up and raise arm
Technique	 Place probe in midaxillary line, marker facing pectoralis In-plane enter from posterior side and target the fascial plane superficial to the serratus muscle. If elderly with poor anatomy, hit the rib, back up, then inject Inject 15-20 cc of anesthetic
Area of Anesthesia	Nede Serratus Anterior Muscle Pleural Line Rib with shadow
	beconditions of the service of the s
Video	https://www.coreultrasound.com/serratus/ https://youtu.be/vQSW-K-Fw5Y?t=127

- Transersus Abdominis Plane

Indication	Abdominal wall laceration or injury	
Contraindications and Complications	Infection overlying injection site	
US and Sterility	• Linear probe, sterile field, consent, 2 person team, 3-way stop-cock	
Patient Position	Supine with arm raise	
Technique	 Palpate inferior costal margin and iliac crest and position transducer in transverse plane between them In-plane needle insertion anterior to the probe at a steep angle and advance to plane between internal oblique and transversus abdominis muscles Open potential space with saline to confirm then 15-20 cc of anestehtic 	
Area of Anesthesia	<image/>	
Video	https://www.youtube.com/watch?v=xJJinDyHZ0k https://www.youtube.com/watch?v=ab8Dvjauk_U https://www.youtube.com/watch?v=OqedcP9OPvc	

Lower Extremity

- Fascia Iliaca

Indication	 Femur fractures, proximal tibial fractures, patella fractures, anterior thigh lacerations and I&D
Contraindications and Complications	Infection overlying injection site, concern for compartment syndrome
US and Sterility	• Linear probe, sterile field, consent, 2 person team, 3-way stop-cock
Patient Position	Supine
Technique	 Place probe in transverse orientation inferior to the inguinal crease in the medial third of the inguinal crease Identify femoral artery with nerve just lateral to it Laterally, identigy iliacus muscle with the sartorius muscle superior to this The fascial plane between these muscles that surrounds the femoral nerve is the fascia iliaca Introduce needle lateral to medial, in-plane view, inject saline into fascia, once confirmed, inject 20-40 cc of anestheic
Area of Anesthesia	Image: service
Video	https://youtu.be/T7Mp4t08tT8?t=160 https://www.coreultrasound.com/fascia-iliaca-nerve-block/ https://youtu.be/IjSjpsP-fxg?t=187 https://www.coreultrasound.com/sifi_5ms/ (suprainguinal version)
Note	• This block covers the same sensory area as the femoral nerve block and more!

- Lateral Femoral Cutaneous

Indication	Lacerations, I&D to lateral thigh
Contraindications and Complications	Infection overlying injection site
US and Sterility	Linear probe, no sterile field
Patient Position	• Supine
Technique	 Place probe in transverse plane 2 cm medial and inferior to ASIS and find the sartorius and tensor fascia latae (TFL) muscles The LFC nerve is superficial and between the sartorius and TFL Insert needle lateral and in-plane and inject 5cc of anestheic
Area of Anesthesia	Image: state stat
Video	https://www.youtube.com/watch?v=gdX1mvdGiJ0 https://www.youtube.com/watch?v=8WvP1X_mTs8

- Pericapsular Nerve Group (PENG)

Indication	 Intertrochanteric hip and femoral neck fractures, acetabulum and pubic rami fractures 	
Contraindications and Complications	Infection overlying injection site	
US and Sterility	• Linear or curvilinear probe, sterile field, 2 person team, 3-way stop-cock	
Patient Position	Supine	
Technique	 Place probe transverse on proximal thigh parallel and adjacent to inguinal ligament and identify femoral artery and femoral head Keep femoral artery in view and move probe up to bring ilium into view Identify anterior iliac spine and iliopubic eminence. The injection target is the bony surface of the iliam lateral to the psoas tendon Insert needle lateral to medial, in-plane visualization and pass through iliopsoas and reset needle against ilium Inject saline to confirm position then inject area with 20 cc of anesthetic slowly 	
Area of Anesthesia	ASIS AIIS BIIS FH DEF Ilium Lateral Source: Highland Ultrasound	
Video	https://youtu.be/mvqvDk0N0w0?t=118 https://www.coreultrasound.com/5ms_peng/	

- Popliteal Sciatic

Indication	Distal tib/fib fractures, achilles tendon rupture, burns, foot injuries	
Contraindications and Complications	Infection overlying injection site or concern for compartment syndrome	
US and Sterility	Linear probe, no sterile field	
Patient Position	• Prone	
Technique	 Place probe in transverse orientation in popliteal fossa and find popliteal artery and vein. Then move up to find common peroneal nerve and tibial nerve joining to form distal sciatic nerve Insert needle lateral to medial in-plane view Inject 15-20 cc of anestehtic around nerve bundle 	
Area of Anesthesia	Image: Distal Sclatic Nerve Image: Distal Sclatic Nerve Image: Distal Sclatic Nerve	
Video	https://www.coreultrasound.com/sciatic-nerve-block/ https://youtu.be/IUkTv5U0F18?t=154	
Note	• This block covers the same sensory area as the common peroneal nerve block and more!	

- Posterior Tibial

Indication	Foreign body plantar foot, I&D, calcaneus fracture	
Contraindications and Complications	Infection overlying the injection site	
US and Sterility	Linear probe, no sterile field	
Patient Position	Slight hip external rotation, knee either straight or flexed, expose medial malleolus	
Technique	 Place the probe just superior to medial malleolus, identify tibial artery/vein using doppler. Tibial nerve will be lateral or posterior to the vascular bundle Introduce needle from posterior aspect in-plane visualization. May need to go more proximal to avoid going through achilles tendon. Inject 3-8 cc of anesthetic 	
Area of Anesthesia	<image/>	
Video	https://www.coreultrasound.com/posterior-tibial-nerve-block/ https://youtu.be/ak6QA3Zb7vE?t=17	

- Saphenous

Indication	Lac to medial lower leg, I&D
Contraindications and Complications	Infection of overlying injection site
US and Sterility	Linear probe, no sterile field
Patient Position	Supine, elevate and externally rotate extremity
Technique	 Place probe in transverse plane along middle inner thigh about 10 cm from proximal knee. Target is fascial plane between the medial sartorius and proximal vastus medialis on screen, holds saphenous nerve medial and femoral artery lateral Insert needle from anterior aspect, in-plane needle visualization and inject 5-10 cc of anesthetic around the saphenous nerve
Area of Anesthesia	Variation Variation
	superficial femoral artery SonoSite HFL50xp/15-6 UVA Nerve MI: 08 TIS: 0.2 Saphenous nerve MI: 08 TIS: 0.2
Video	https://drive.google.com/file/d/0B0pEWsxV4N3CTFIIVWY2OXIvV0E/view?r esourcekey=0-IAhXMvqP_BYMhqCtzkByig https://www.youtube.com/watch?v=_lp1rKuqzsk

One-Pager



Nerve Block

consult this chart:

Block OK

- Shoulder dislocation Clavicle fracture Proximal humerus fracture Low energy distal radius fracture Hand and digit injuries Hip fracture and dislocation
- Low energy foot and ankle fractures

Contact orthopedic surgery as soon as possible for any patients to be admitted or patients who will require in ED consultation, but do not delay block placement.

Block after Consultation

- · Humeral shaft fracture
- Elbow fracture
- Both bone forearm fracture
- Femoral shaft fracture

Perform and document detailed neurologic exam and consult with orthopedic service before block is placed.

No Block

High risk for compartment syndrome

- Tibial fracture
- High emergency forearm fracture High Energy foot fracture Any injury with evidence of neurovascular injury or clinical concern for a possible compartment syndrome

Perform block only after requested by Trauma and Orthopedic service attending.

review these:

Universal precautions

- Appropriate splinting, protection, icing of any injured extremity.
- Appropriate analgesic administration. Block placement should not delay
- other time sensitive interventions.
- Appropriate consideration of and patient discussion of the risks and benefits of any block.
- · Documentation of consent.
- Thorough, detailed, and appropriately documented neurologic exam before block is performed.
- Thorough, detailed, and appropriately documented compartment exam before block is performed.
- Safe and sterile procedural technique appropriately documented including but not limited to: pre-procedure timeout with confirmation correct patient, indication, and side; appropriate patient monitoring; use of real-time ultrasound-guidance with avoidance of needle to nerve contact and vascular puncture; aspiration and small volume (3-5mL) injection of
- appropriately dosed local anesthetic. • Presence of necessary resuscitation equipment and intralipid in case of local anesthetic toxicity reaction.
- Clear marking of blocked extremity and documentation of block details in the medical record.
- Verbal communication of block details with participating clinical teams prior to discharge or transfer from ED. Appropriate post block care of
- weakened or insensate extremity to prevent falls and limb injury.

Calculate local dose

Bupivacaine 0.5% (5mg/ml)	2 mg/kg
Lidocaine 1% (10mg/ml)	4.5 mg/kg
Lidocaine 1% w/ epi (10mg/ml)	7 mg/kg

Calculate intralipid dose

20% lipid emulsion:

1.5 mL/kg as an initial bolus, followed by

0.25 mL/kg/min for 30-60 minutes

Gather materials



Perform the block

