

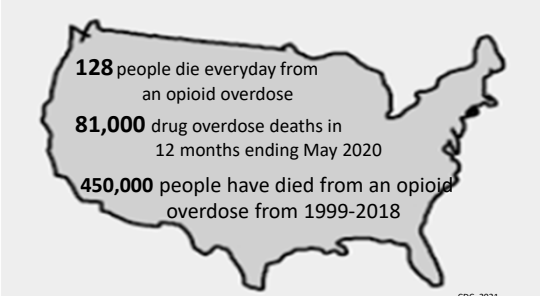
**Peripheral Nerve Blocks**

## Your Tackle Box to Tackle Blocks

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### OPIOID Crisis




**128** people die everyday from an opioid overdose  
**81,000** drug overdose deaths in 12 months ending May 2020  
**450,000** people have died from an opioid overdose from 1999-2018

CDC, 2021

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### 'Surgery – RISK FACTOR for development of chronic opioid use'

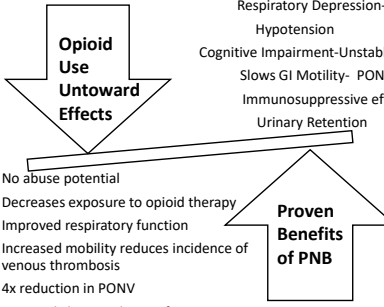
(Kandarian, 2019)



- 6% of patients prescribed a SINGLE DAY supply of opioids continued use at 1 year
- 25% of patients continued using prescription medications after a 12 day supply of opioids
- Refilling a prescription just ONE TIME doubled the risk of using opioids after 1 year (Shah, 2017)
- 'Prescription opioids contribute to more overdose deaths than any other drug' (CDC, 2017)

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### Opioid Therapy is High Risk



**Opioid Use Untoward Effects**

- Highly addictive
- Respiratory Depression- Hypoxia
- Hypotension
- Cognitive Impairment-Unstable Gait/Falls
- Slows GI Motility- PONV, Constipation
- Immunosuppressive effects
- Urinary Retention

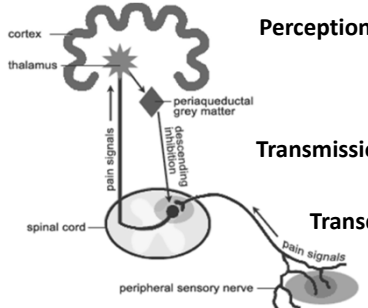
**Proven Benefits of PNB**

- No abuse potential
- Decreases exposure to opioid therapy
- Improved respiratory function
- Increased mobility reduces incidence of venous thrombosis
- 4x reduction in PONV
- Extremely low incidence of nerve injury

Translates to:

- Decreased Postop Pain
- Decreased hospital LOS
- Increased Patient Satisfaction

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**Perception**

- Preoperative Education
- Preemptive medications
- Acetaminophen
- Opioids
- Gabapentin/anticonvulsants
- Ketamine / NMDA antagonist

**Transmission**

- Spinal/Epidural Anesthesia
- NSAIDs - Celebrex

**Transduction**

- Peripheral Nerve Blocks
- Local Anesthetics
- NSAIDs

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### PREVENTATIVE

PREVENTATIVE		
PREEMPTIVE	POSTOPERATIVE	
PREOP	OR	PACU
PNB	PNB	PNB

Regional Anesthesia interrupts Pain Signals BETTER than any current modality

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## What is Regional Anesthesia?

*It is an injection of local anesthetic near or around a cluster of nerves, or between fascial planes, that will cause numbness and possible motor weakness in a specific part or region of the body.*

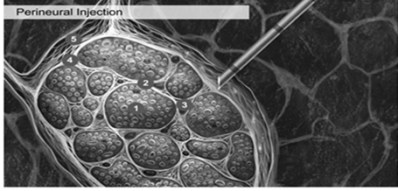
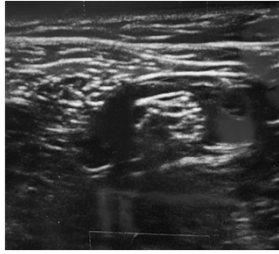


Image courtesy of NYSORA

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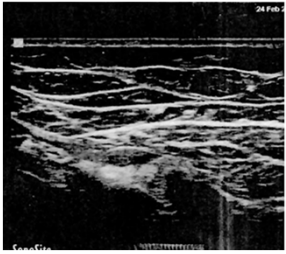
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### Nerve Plexus



Popliteal Sciatic Nerve Block

### Fascial Plane



Infiltration between Popliteal Artery and Capsule of the Knee/ IPACK

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Single Shot	VS	Catheter
<ul style="list-style-type: none"> <li>Provide pain relief 12-18 hours</li> <li>Abdominal procedures; preferred with trauma</li> <li>Aseptic technique</li> <li>Requires trained physician</li> <li>Allow for early mobility/ Ambulatory Units</li> <li>Less expensive</li> <li>Adjuvants to enhance block Exparel = 72 – 96 hours</li> </ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="font-size: x-small;">Other Considerations:</p> <ul style="list-style-type: none"> <li>How painful the procedure</li> <li>Surgeon preference</li> <li>Area needed to block</li> <li>Recovery</li> </ul> </div>		<p style="font-size: x-small;"><u>Continuous Nerve Block Catheter /CNB</u></p> <ul style="list-style-type: none"> <li>Provide pain relief for 2-6 days – months</li> <li>Limb procedures</li> <li>Sterile procedure</li> <li>Requires trained physician; more challenging</li> <li>Patient teaching – Care for CNB at home</li> <li>Greater risk of complications:               <ul style="list-style-type: none"> <li>Nerve injury / rare</li> <li>Prolonged numbness and motor weakness</li> <li>Nerve catheter dislodgement</li> <li>Infection</li> </ul> </li> </ul>


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### What are the Contraindications to having a PNB?

- Allergy to local anesthetics
- Systemic infection and/or Infection at the site
- Significant Coagulopathies
- Unusual anatomy or pathology
- Combative or agitated
- Patient refusal





**Anticoagulation guidelines for Regional Anesthesia**

- **PNB – low risk of bleeding**
- Aspirin and NSAIDS – continue
- Antiplatelet therapy (ie. Plavix)

Discontinue when high risk –deep PNB procedures

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### Local Anesthetic Agents used for Peripheral Nerve Blocks (PNB)

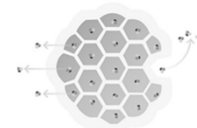
Drug	Onset	Duration	Comments
<b>Amino Amides:</b>			
Lidocaine	Rapid	1-2 hours	CNS toxicity: seizures
Mepivacaine	Slow	45-90 minutes	Great for PNB
*Bupivacaine	Slow	2-4 hours	Sensory block > Motor CV toxicity: Hypotension, heart blocks; dysrhythmias
*Ropivacaine	Rapid	4-6 hours	Sensory block >> Motor Motor blockade < than Bupivacaine < CV toxicity Safe for OB use
* Longer acting			

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### Adjuvants – Enhance effectiveness of the PNB

- ❖ **Epinephrine** - Vasoconstrictor – Slows absorption of LA – Prolong PNB
- ❖ **Dexamethasone** - Prolong duration PNB - IV = LA + PNB
- ❖ **Alpha 2 Agonists** – Precedex (Dexmedetomidine) – quick onset + prolong PNB and reduced opioid use
- ❖ **Exparel – Liposomal bupivacaine** – Prolong PNB – 72-96 hours
  - Only used with LA = BUPIVACAINE
  - Wrist band – avoid add LA – lead to LAST
  - Expensive
  - Approved for selective cases




Source: www.exparel.com

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**Patient Preparation for PNB**

- ✓ History and Physical
- ✓ Educate 'what to expect'
- ✓ Pre-procedure Checklist – **TIME OUT**
- ✓ IV Sedation
- ✓ Patient Positioning
- ✓ Monitoring




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**Block Nurse Role: Assist Anesthesia with Placement of PNB**

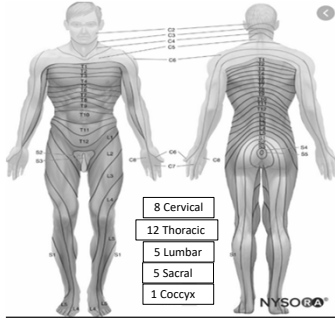
- Sterile set up – catheter tray
- Assist with Ultrasound machine
- Assist with injection of LA
- Secure catheter and apply dressing
- Knowledgeable of site specific considerations
- Monitor for signs/symptoms of LAST

\*Block RN Team – Orientation and competency checklist



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**DERMATOMES: Area of SKIN supplied by a SINGLE SPINAL NERVE**



Sensory Level	Cutaneous Level	Surgical Procedure
C3	Neck	Carotid Endarterectomy
C5	Clavicles	Shoulder procedures
T4	Nipple	Cesarean section Upper abdomen Uterine
T6-7	Xiphoid	Lower abdomen
T10	Umbilicus	Hip Genitourinary
T12	Groin	
L1-3		Lower extremities
L4	Knees	
S2-5	Genitalia/Buttock	

8 Cervical  
12 Thoracic  
5 Lumbar  
5 Sacral  
1 Coccyx

Image courtesy of NYSORA  
Source: ASPAN Redi-reference, 2015

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**How to Assess for Sensory / Motor Block**

**Sensory Assessment**

- Check sensation using alcohol/ice
- First place on unaffected area to establish baseline
- Ask patient close eyes and indicate when and where feel coldness
- Always compare with non affected side


**Motor Assessment**

0/5 = No movement  
1/5 = Flicker – not enough to move  
2/5 = Unable to overcome gravity  
3/5 = Overcome gravity, no resistance  
4/5 = Overcome some resistance  
5/5 = Normal strength

**\*First have Sensory loss followed by Motor Loss  
-on return of function - Motor returns, then Sensation\***

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**Charlie Brown**  
Peanuts character




17

**Cervical Plexus Block**

- LA spread around the superficial cervical plexus or deep into sternocleidomastoid muscle
- Provides anesthesia of the skin of anterolateral neck, ear regions and skin inferior to clavicle on chest wall

C2 – C4



**Surgical Indications:**

- Carotid endarterectomy
- Lymph node dissections
- Thyroidectomy
- Plastic repairs
- Superficial neck surgery
- Proximal clavicle fractures

**Nursing Considerations:**

- Allows patient to be awake for continuous neurological monitoring

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**Interscalene Nerve Block**


- Injection of LA in the neck
- Affects parts of the clavicle, scapula, and whole shoulder
  - \* Weakness of deltoid muscle and some hand muscles
  - \* Numbness extends to digits 1-3
- C5 – C7

**Surgical Indications:**

- Any surgery on shoulder or muscles supporting the shoulder
- ORIF of clavicle or scapula
- Mid humoral shaft fracture

**Nursing Considerations:**

- Diaphragmatic paralysis on the blocked side - from phrenic nerve block
- Near 100% occurrence
- 25% reduction in pulmonary function
- Pneumothorax
- HORNER'S Syndrome:
  - TEMPORARY hoarse voice
  - constricted pupil
  - drooping eyelid
  - nasal congestion
 (Stellate Ganglion nerves blocked)
- Bezold-Jarisch reflex: Bradycardia + Hypotension
- Local Anesthetic Systemic Toxicity/ LAST
- Safety measures - Sling



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**Horner Syndrome**

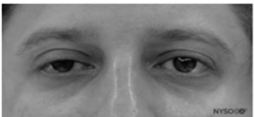
Common side effect after interscalene block

Blockade of the stellate ganglion C6-7 nerve plexus causes:

- Hoarseness** (10-20%)
- Ptosis** – drooping of upper eyelid on affected/blocked side
- Myosis** – constricted pupil on affected/blocked side
- Anhidrosis** – decreased sweating
- Nasal congestion**—on affected/blocked side

**Nursing Considerations:**

- Patient experience is disconcerting but symptoms resolve with resolution of block
- Provide patient reassurance



**FIGURE 12.** Horner syndrome is common after interscalene block and consists of ptosis, myosis, and enophthalmia.

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**Supraclavicular**

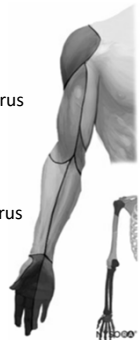
- Injection of LA between the trapezius muscle and clavicle
- Affects arm below mid humerus
  - Motor and Sensory loss entire arm below elbow

**Surgical Indications:**

- Any surgery midshaft humerus
- Biceps tendon repair
- ORIF elbow
- Surgery of forearm
- Surgery of hand and digits

**Nursing Considerations:**

- Phrenic nerve involvement Less than ISB, around 50%
- Pneumothorax/ hemothorax
- Horner's Syndrome
- Safety measures- sling



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**Pecs and Serratus Plane Blocks**

**PECs**

- LA injected in the fascial plane between pectoralis major and minor muscles; C5-T1

**Serratus Plane Block**

- LA injected in the fascial plane of serratus anterior muscles- to block upper intercostal nerves; T3-T9

**Surgical Indications:**

- After breast surgery
- Following thoracotomy
- Rib fractures
- Procedures axilla, medial upper arm and posterior shoulder

**Nursing Considerations:**

- SENSORY Block
- Low Risk
- Sling - if limb affected

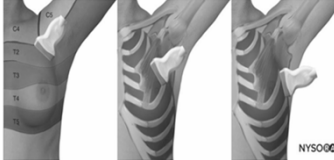


Figure 8 - Transverse position for Pecs blocks. Also, refer to Figure 9 and 11.

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**Paravertebral Block**

- LA injected alongside THORACIC or LUMBAR vertebra close to where spinal nerves emerge from vertebral column
- T1-T6

**Surgical Indications:**

- Breast Procedures
- Thoracotomy incisions
- Noninvasive heart surgery
- Rib fractures
- Abdominal procedures

**Nursing Considerations:**

- High epidural/spinal blockade can occur
- Pneumothorax
- LAST

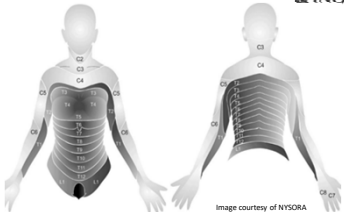


Image courtesy of NYSORA.

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**Erector Spinae Plane Block**

Paraspinal fascial plane block

- LA injected deep into erector spinae muscles (vertical back muscles) superficial to thoracic processes of vertebrae
- Sensory block T3-T9 – spreads vertically and wraps around to front of chest and upper abdomen

**Surgical Indications:**

- Rib fractures
- Thoracic surgery (ie. VATS)
- Breast surgery
- Bariatric surgery
- Option cardiac surgery

**Nursing Considerations:**

- Best positioning -upright to place block
- Low risk
- Continuous catheter or single shot

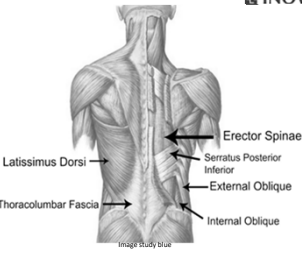


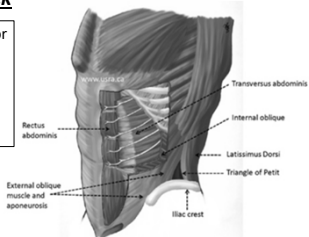
Image courtesy of NYSORA.

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### **Transversus Abdominus Plane Block**

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- LA injected in fascial plane between anterior abdominal muscles
- Done bilaterally, T6-L1 Sensory
- Reduces postoperative pain and opioid requirements



#### **Surgical Indications =**

- Any lower abdominal surgery including
- Hernia repair
- Appendectomy
- Cesarean delivery
- Abdominal hysterectomy
- Laparoscopic surgery
- Renal surgery / transplants
- Prostatectomy

#### **Nursing Considerations:**

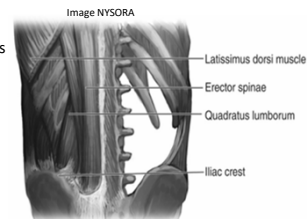
Complications are rare - can include:  
L.A.S.T., nerve injury, bleeding, infection and inadvertent peritoneal puncture

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### **Quadratus Lumborum Block**

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- Fascial plane block of the posterior wall of the abdomen and affects the back muscles
- **SENSORY** block to the abdominal and hip regions; T4-T12, L1
- Approach and patient positioning varies by physician preference



#### **Surgical Indications:**

- Upper and Lower Abdominal Surgeries
- Some Hip Procedures
- Cesarean Section, Hysterectomy
- Renal Transplant, Nephrectomy
- Iliac Crest Bone Graft

#### **Nursing Considerations:**

- Provide somatic and visceral pain relief
- Safe, low risk of LAST

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### **Fascia Iliaca**

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- LA injected under the inguinal ligament and above the iliopsoas muscle; fascial plane
- Affects the upper leg and inside of lower leg
  - Weakness of quadriceps
  - Numbness felt in anterior thigh, medial leg and big toe



#### **Nursing Considerations:**

- Fall Risk
- Protect limb- leg brace

#### **Surgical Indications:**

- Total posterior/lateral hip replacements
- Hip and femoral fractures
- Knee surgeries
- AKA/BKA

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### **Femoral Block**

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- LA is spread adjacent to the femoral nerve
- Patient positioned supine
- Motor and Sensory loss
  - anterior thigh
  - anterior knee
- Sensory loss
  - medial calf/ ankle



#### **Nursing Considerations:**

- FALL RISK
  - motor block/weakness to quadriceps
- Posterior thigh and knee will have FULL SENSATION
  - patients report pain – back of knee - require analgesics

#### **Surgical Indications:**

- Total knee replacement
- ACL reconstruction
- Knee arthroscopy
- ORIF patella
- Procedures – front of thigh
- Analgesia - Hip fractures

Image - NYSORA

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### **Anterior Sciatic Block**

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- LA spread within the sciatic nerve sheath
- MOTOR and SENSORY blockade of
  - posterior knee
  - hamstring muscles
  - entire lower limb below knee- lateral ankle, foot and heel



#### **Surgical Indications:**

- Used with adductor and femoral nerve blocks for TKR
- ACL reconstruction; Knee manipulation
- Below knee amputation
- Foot and Ankle surgery

#### **Nursing Considerations:**

- FALL RISK - limited motor control and sensation to posterior thigh, lower leg and foot
- Foot drop – may occur; patients trip on their toes

NYSORA

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### **I P A C K Block**

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#### **Infiltration between Popliteal Artery and Capsule of the Knee**

- Provides analgesia to posterior knee
- SENSORY block only
- Spares the quad from motor weakness

#### **Surgical Indications:**

- Total knee
- ACL
- Other knee surgeries

#### **Nursing Considerations:**

- FALL RISK
- Assess motor strength prior to ambulation



Image - Krames

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**Popliteal / Sciatic Block:**

- LA injected within sciatic nerve sheath area
- Motor and Sensory block to lower leg below and behind the knee - medial leg and foot not blocked

**Surgical Indications:**

- Foot, Ankle and Achilles tendon surgeries
- Surgeries of lower leg – tibia/fibula fractures

**Nursing Considerations:**

FALL RISK – Motor and Sensory block  
 Position patient – to reduce pressure on sciatic nerve injection site  
 Foot drop, hematoma formation, LAST  
 Contraindicated: Diabetes and Neuropathies




Image - NYSORA

31

**Adductor Canal**

- LA injected inside the adductor canal around the femoral artery
- SENSORY block to anterior and medial knee, leg ankle and big toe

**Surgical Indication:**

- Knee surgeries: ORIF, Arthroscopy, ligament repair
- Tibia/ Fibula surgery
- Ankle surgery

**Nursing Considerations:**

- SENSORY BLOCK, no significant motor weakness
- + PAIN behind the knee or on the lateral side




Image - NYSORA

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Nerve Blocks LA near or around a cluster of nerves (plexus)	Effects/Concerns	Nerve Blocks LA between fascial planes (between muscle layers)
Superficial Cervical Plexus Interscalene Supraclavicular Femoral Popliteal Sciatica Adductor Canal		Erector Spinae Plane Block Pecs I/II; Serratus Plane Paravertebral Transversus Abdominus Plane/TAP Quadrant Laborum/QL Fascia Iliaca (FI); IPACK
	SENSORY	
	MOTOR	(FI)/ -
	Risk of Nerve Injury	NONE
	Risk of IA/IV Injection	MINIMAL

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**Local Anesthetic Systemic Toxicity / LAST**

CNS symptoms – most common	CV symptoms
Early detection of toxicity- CNS Perioral numbness Metallic taste in the mouth Tinnitus, Blurred vision	Hypertension Tachycardia Ventricular Arrhythmias
Late- Muscle Twitching Restlessness, agitation, slurred speech SEIZURE – COMA – RESP ARREST	Hypotension Bradycardia; Conduction delays/Blocks ASTYLE
TREATMENT	
L	20% LIPIDS -- LIPIDS – LIPIDS -- FAST with a FILTER
A	AIRWAY / OXYGEN
S	SEIZURE SUPPRESS
T	Treat CPR

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**ASRA LAST GUIDELINES - 2020**

**Local Anesthetic Systemic Toxicity Checklist**

Call for help  
 Call LAST rescue kit  
 Consider administering LIPID EMULSION early

**LIPID EMULSION 20%**  
 The order of administration (bolus or infusion) and method of infusion (manually, or roller clamp, or pump) are not critical.

- over 70 kg: 1 bolus (1.5 mg/kg) + 1 infusion (0.5 mg/kg)
- under 70 kg: 1 bolus (1.5 mg/kg) + 1 infusion (0.5 mg/kg)

Seizure? → Ensure adequate airway  
 → Benzodiazepine preferred  
 → Low dose propofol (alternative)

Arrhythmia or Hypotension? → **BEFORE LAST Resuscitation is DIFFERENT from Standard ACLS**

Stable? → Continue lipid emulsion ≥15 min once hemodynamically stable  
 → Maximum lipid dose: 12 mL/kg

**Once Stable, OBSERVE**

- 2 hrs after seizure
- 4-6 hrs after cardiovascular instability
- As appropriate after cardiac arrest

**EPINEPHRINE**


- Smaller than normal dose preferred
- Start with 1 mcg/kg

**AVOID**

- Local anesthetics
- Beta-blockers
- Calcium channel blockers
- Vasopressin

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**LAST KIT**



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**Patient Education**

**Safety Measures**

- Slings/ Braces
- Avoid hot/ cold/ pressure
- Fall Precautions

**Catheter Care**

- On Q ball
- How to remove at home

**What to expect**

- Return of sensation
- Multimodal meds
- ICE /Elevate

**Patient Education**

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**New Developments in PNB**

- ❖ PENG Block
- ❖ PNB – one person technique
- ❖ New Single shot additives
- ❖ Use of PCA type electronic pump
- ❖ PNB advancements to provide opioid free surgery
- ❖ PNB beyond the OR - Treat PTSD




Image - NYSORA

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**INOVA**

**Question**

This adjuvant prolongs the duration of the local anesthetic up to 96 hours and can only be combined with bupivacaine. When given this medication, patients wear an armband to alert medical staff from giving any additional local anesthetic.

- a. Epinephrine
- b. Dexamethasone
- c. Exparel
- d. Alpha 2 Agonists

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## Question

The most effective method to prevent wrong sided peripheral nerve blocks is to

- a. Review the patient's history and physical pre procedure
- b. Complete the pre procedure checklist and time out before each block
- c. Ask the patient which side is to be blocked
- d. Have the surgeon initial the side to be blocked

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## Question

The perianesthesia nurse should be concerned about LAST in a patient exhibiting which of the following symptoms?

- a. Confusion
- b. Metallic taste
- c. Ringing in the ears (tinnitus)
- d. All of the above

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