UNEXPECTED PERIOPERATIVE NEUROLOGIC COMPLICATIONS

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Perianesthesia Nursing Challenges

- Baseline ~ known, assessed, documented??
- TLKW (pre)
- Anesthetic agents ~ effects last longer than surgery
- Increasing awareness of impact of anesthesia on p-op cognition
- Surgical complications ~ or expected outcomes
- Meaningful neuro exam
- Adverse, unexpected, emergent…..

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Pre-operative Evaluation

- Baseline- essential for postoperative assessment
- Surgery specific deficits
  - LBP, LLE weakness/numbness d/t disc (for example)
  - Balance, weakness, speech (brain)
- Orientation:
  - Self, date, time, situation
  - Independent @ baseline or assisted by family/other
- Assistive devices: cane, w/c, person, "furniture walker"
- Speech: fluent, word-searching
- Documentation

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Pre-operative Evaluation

- By whom
- Where- in-person, virtual, POTEL
- When?
  - Month
  - Week
  - Day of?

https://link.springer.com/chapter/10.1007/978-1-4939-1737-2_2

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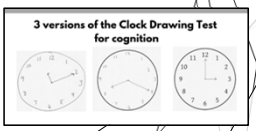
Cognitive Screening?

- Patient selection (?):
  - Age
  - Suspicion
  - Surgical type
  - Duration of anes/surgery/admission
  - Risk factors
- Mini-Cog
- Clock in the Box



https://eatspeakthink.com/3-versions-clock-drawing-test/

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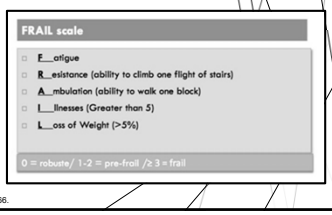
Preoperative Frailty and Cognitive Dysfunction Assessment

- Pre-op screening
- ? Predictor of p-op delirium
- ? Better predictor than mini-cog



Rubin, D. & Peden, C. (2020). *Anesthesiology, 133*(6), 1164-1166.

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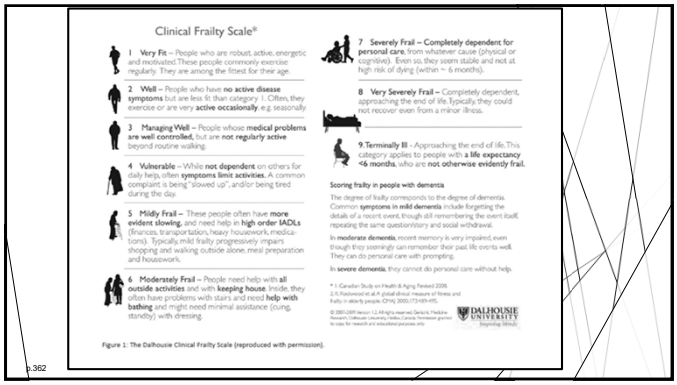

p.362

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Neuro Exam?

- MAE/strengths
- Ambulation
- Cranial nerves
  - ? Surgery specific
  - Pupils

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Smell (I): Lemon, coffee

Eyes: visual fields (II),
pupil size (III),
reactivity to light (II, III),
look up, down, in (II, IV, VI),
assess level of eyelids (III)

Face: touch face w/ cotton ball,
clench teeth, corneal reflex (V),
smile, frown (VII)

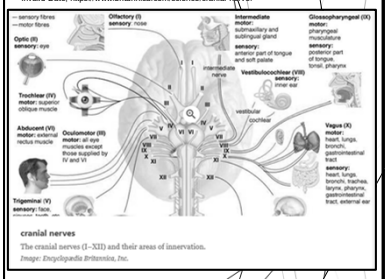
Hearing, balance (VIII): cover one ear,
assess for hearing in the other

Gag reflex: tongue blade (X, XI)

Neck, shoulder: turn head, shrug shoulders (XI)

Tongue: stick out tongue (XII)

Britannica, The Editors of Encyclopaedia. "Cranial nerve". Encyclopedia Britannica, Invalid Date, https://www.britannica.com/science/cranial-nerve.



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Alterations in Neuro Function: Initial PACU Assessment

- Unresponsive
- Minimally arousable
- Restless and agitated
- Confused
- *Not* MAE
- Deficits
- Why??????

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Differential Diagnosis

- Baseline
- Anesthesia-related
- Surgery ~ expected
- Surgery ~ unexpected
- *I have no idea*

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Review of Anesthetic Medications

- Inhalation gases- sedative effects
- NDMRs (residual)
- Opiates
- Benzo
- Antiemetics
- Pre-op meds ~ ERAS ~ inpatient
- *Reminder that sedative effects last longer than the anesthetic*

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Level of Consciousness

- Align w/ anesthetic agents
  - ? MAC w/ significant propofol infusion
  - ? Long anesthetic/surgery (isoflurane vs sevo)
- Anesthesia evaluation
- Minimally arousable to voice, tactile, noxious
- Or none……
- Pupils
- ? Reversal agents
- Observe and monitor and document or…

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Neuro Assessment: Patients Following Commands

- Observe pt for spontaneous movement
- Speak to pt: respond to voice, loud voice, touch, noxious stimuli
- LOC: orientation, memory, attention span
- Language
- Cranial nerves
- Motor: move all extremities: strength, equality
- Sensory: feel sensation in all extremities
- Coordination: arms extended, finger to nose

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Safety √

- Never leave the side of an unresponsive patient
  - Aspiration risk
  - Harm to self
- Position on side per surgery
- Frequently assess airway patency

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Prolonged Effects of Anesthesia

- Advanced age
- Decreased metabolism (liver) and clearance (renal)
- TIVA
- Isoflurane/long anesthetic
- Toxic encephalopathy
  - Pre-medication(s)
    - ERAS protocols ~ anticonvulsants
    - Benzodiazepines
    - Serotonergic agents
    - Opiates
  - Drug interactions

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Toxic Encephalopathy

- Serotonin syndrome: neuro changes r/t meds that cause > levels of serotonin to accumulate
  - Changes in autonomic, neuromotor, cognitive behavior
  - SSRIs/SNRIs ~ antidepressants
  - Opioids: fent, meperidine
  - Antiemetics: Zofran, reglan
- Sxs:
  - Shivering
  - Confusion
  - Restlessness
  - Lack of coordination

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Case Study

- 88 F s/p gyn procedure ~ 23 obs
- Scopolamine patch pre (n/v prevention)
- Family notes odd behavior @ home – ED
- Admitted to inpt unit, confused, not oriented to place/events
- Placed @ nurses' station ~ witnessed fall ~ hip fracture
- Evaluated p-fall by RRN/NP who notes "patch" behind ear ~ removed
- Sensorium returns – pt overall did well.

- n.b.: American Geriatric Society ~ Beers Criteria

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Paediatric emergence delirium: a comprehensive review and interpretation of the literature

- Emergence excitement:
  - Crying, sobbing, thrashing, disoriented
- Inconsolable crying, severe restlessness

PAED scale

1. The child makes eye contact with the caregiver
2. The child's actions are purposeful
3. The child is aware of his/her surroundings
4. The child is restless
5. The child is inconsolable

Table 3 Proposed contributors to emergence delirium

Proposed contributors to emergence delirium
Volatile anaesthetics
Type of surgery
Patient age
Parental anxiety
Patient anxiety
Patient pre-existing behaviour
Patient and parent interaction with health-care providers

Mason, K.P. (2017). *British Journal of Anaesthesia, 118*(3), 335-343.

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Nursing Assessment & Management

- PPI
- Anes: pharmacologic strategies
- Safety
- Family presence
- Continuity of staff
- Attention to pain and comfort

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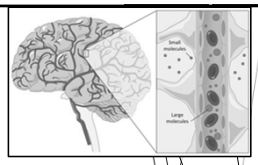
Blood – Brain Barrier



- Semipermeable border of endothelial cells
- Protects the brain from toxic substances in blood
- Meds that can cross the BBB ~
  - Drugs of misuse/abuse
  - Opiates
  - Anesthetic agents
  - Antimuscarinic

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Acute Anti-Cholinergic Syndrome

- Competitive antagonism of acetylcholine @ muscarinic receptors
  - excess ACh d/t inhibition of acetylcholinesterase
- Sxs: hyperactive delirium, confusion, restlessness, picking @ objects
- Antimuscarinic meds:
  - Scopolamine
  - Atropine
  - Haldol
  - Diphenhydramine
  - Promethazine
  - Meperidine
  - Methadone
- Rx: Physostigmine (antilirium)

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Metabolic Encephalopathy

- Renal failure
- Liver failure
- Hypercapnia and hypoxia
- Hypoglycemia
- Hyponatremia, e-lyte disturbances
- Hyperosmolality
- Acidemia
- Septic encephalopathy

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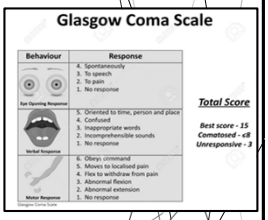
Neurologic Assessment Toolbox

- Assessing LOC/brain injury: GCS
- Assessing stroke: NIHSS
- Assessing spinal cord injury: ISNCSCI
- Assessing delirium: CAM-ICU
- Assessing sedation/agitation:
  - SAS/RASS



Mink, J. (2012). *Nursing Critical Care*, 7(3), 12-17.

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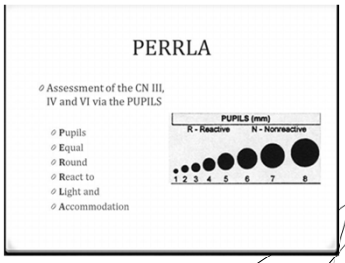
Pupillary Assessment



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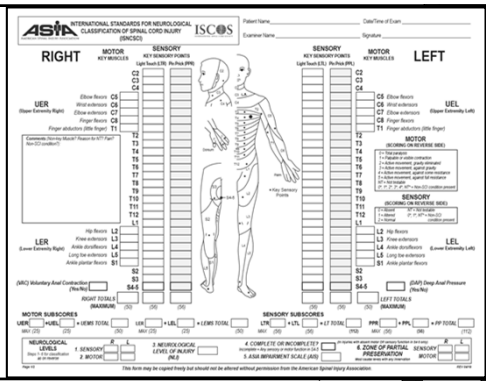

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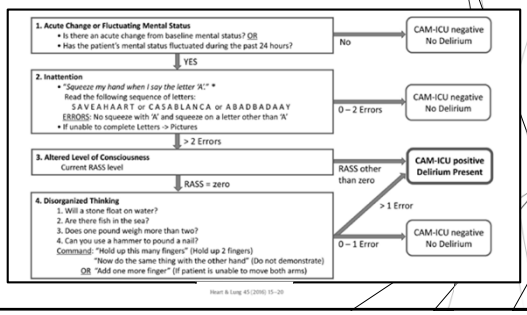
CAM-ICU



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Richmond & Riker Sedation Agitation Scales

RASS score

Richmond Agitation & Sedation Scale

Score		Description
+4	Combative	Violent, immediate danger to staff
+3	Very agitated	Pulls at or removes tubes, aggressive
+2	Agitated	Frequent non-purposeful movements, fights ventilator
+1	Restless	Anxious, apprehensive but movements not aggressive or vigorous
0	Alert & calm	
-1	Drowsy	Not fully alert, sustained awakening to voice (eye opening & contact >10 secs)
-2	Light sedation	Briefly awakens to voice (eye opening & contact < 10 secs)
-3	Moderate sedation	Movement or eye-opening to voice (no eye contact)
-4	Deep sedation	No response to voice, but movement or eye opening to physical stimulation
-5	Un-rousable	No response to voice or physical stimulation

Voice

Touch

core	Category	Description
7	Dangerous agitation	Pulling at endotracheal tube, trying to remove catheters, climbing over bedrail, striking at staff, thrashing side-to-side
6	Very agitated	Does not calm despite frequent verbal reminding of limits, requires physical restraints, biting endotracheal tube
5	Agitated	Anxious or mildly agitated, attempting to sit up, calms down on verbal instructions
4	Calm, cooperative	Calm, easily arousable, follows commands
3	Sedated	Difficult to arouse, awakens to verbal stimuli or gentle shaking but drifts off again, follows simple commands
2	Very sedated	Arouses to physical stimuli but does not communicate or follow commands, may move spontaneously
1	Unarousable	Minimal or no response to noxious stimuli, does not communicate or follow commands

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Restless, Agitated, Confused

- **Assess adequate oxygenation**
- Assess potential noxious stimulants:
  - Pain
  - Urinary retention/indwelling foley catheter
  - Lack of visual/auditory aides
  - Position
  - Hypothermia
  - Head-toe assessment, s-s

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Risk factors for emergence agitation in adults after general anesthesia: A systematic review and meta-analysis

Acta Anaesthesiologica Scandinavica

TABLE 4 Meta-analysis of adjusted data

Risk factor	Studies	Odds ratio	95% CIs	Heterogeneity (I^2, %)	Statistic difference (P)
Pre-operative risk factor					
Age	5	1.23	1.08, 1.40	98	.002
Male	6	2.28	1.27, 4.08	89	.006
Smoking	3	1.74	1.36, 2.22	0	<.0001
History use of benzodiazepines	2	2.99	0.25, 36.15	72	.39
History substance misuse	2	4.97	2.32, 10.65	0	<.0001
Intraoperative risk factors					
Use of benzodiazepines	4	3.24	1.65, 6.37	54	.0007
Anesthesia (inhalational vs. Intravenous)	4	2.27	1.21, 4.25	84	.01
Urinary catheter	4	5.63	3.11, 10.19	67	<.00001
Complain of pain	4	3.08	1.54, 6.16	85	.001
Analgesic drug use in PACU	3	1.97	1.43, 2.70	8	<.0001
Length of anesthesia (min)	5	1.01	1.00, 1.01	67	.09

Abbreviation: PACU, post-anesthetic care unit.

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Delirium *vs Dementia vs Depression*

- Acute onset
- Fluctuating LOC
- Limited attention span
- Disorientation
- Delusions/hallucinations

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Management of hospital-acquired delirium

THINK DR. DRE[10]

THINK: factors to consider when delirium is present

T Toxic situations: shock, dehydration, deliriogenic medications, new organ failure
H Hypoxemia
I Infection: sepsis, immobilization
N Nonpharmacologic interventions: hearing aids, eyeglasses, reorientation, sleep protocols, music, noise control, ambulation
K Potassium or electrolyte imbalances

DR. DRE: strategies to consider when delirium is present

DR Disease remediation: sepsis, chronic obstructive pulmonary disease, heart failure
DR Drug removal: substance abuse testing, benzodiazepines, opioid discontinuation
E Environmental modifications: immobilization, day- and nighttime sleep, hearing aids, eyeglasses

Adapted with permission from: Critical Illness, Brain Dysfunction, and Survivorship Center. For medical professionals: terminology and mnemonics. 2019. www.icudelirium.org/terminology.html.

Volland, J. et al. (2020). *Nursing Management, 51*(9), p. 23.

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Delirium by the Numbers

- Affects/ed 2.6 million US
- Preventable: 30%-40%
- Cost: $164 billion
- Savings by preventing: $49 billion

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PERIOPERATIVE BRAIN HEALTH INITIATIVE

American Society of Anesthesiologists®

- Collaborative effort w/ AARP
- Reduce perioperative neurocognitive disorders (PND)
- 6 tips to limit p-op confusion:
  - Pre-op cognitive test
  - Family/caregiver stays/visits p-op to support/report
  - Check w/ MD re: p-op meds for anxiety, szs, etc
  - Sensory aids ASAP p-op
  - Window in p-op destination
  - Pack family photo, clock, calendar, familiar objects from home ~ orientation

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Hospital Elder Life Program (HELP) for Prevention of Delirium

A comprehensive patient-care program that ensures optimal care for older adults in the hospital. HELP prevents delirium (a sudden state of confusion or change in mental state) and loss of functioning.

American Geriatrics Society CoCare: HELP HOSPITAL ELDER LIFE PROGRAM

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Acute Stroke

- Acute brain disorder of vascular origin~ alteration neuro function
- Ischemic
  - Thromboembolism (most common)
  - Fat embolism
  - Air embolism
  - Hemodynamic hypoperfusion
- Hemorrhagic: intracerebral (ICH) or subarachnoid (SAH)

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Acute Stroke

- Risks:
  - d/c anticoags pre
  - Surgical-associated
  - Anticoag use peri-op
  - Hemodynamic variables peri-op

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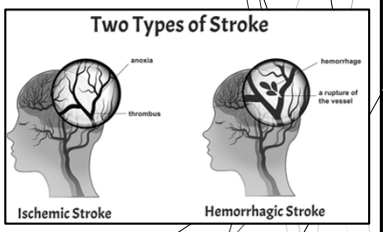
Acute Stroke

- Presents focal deficits = area of brain affected
- Time LKW (pre-op)
- Assess:
  - Face
  - Arm
  - Smile
  - Time (as above)
- SAH:
  - Headache
  - N/V
  - Hemiparesis
  - Aphasia



https://www.neofect.com/us/blog/what-are-the-different-types-of-stroke

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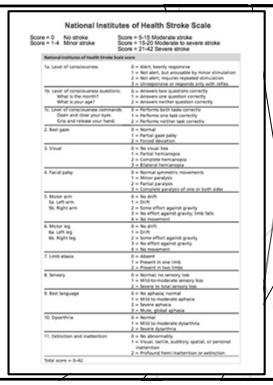
NIHSS Stroke Assessment Scale

- LOC
- Gaze
- Visual
- Facial palsy
- Motor UE/LE
- Sensory
- Speech
- Attention



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Stroke Intervention

- Timely identification essential
- "Brain attack"
- CT imaging [contrast- RF]
- Embolic: ?? tPA ? Anticoagulant TLKW
- Hemorrhagic
  - Critical BP control [monitor alarms; pharmacology]
  - Vasospasm
  - E-lytes- track NA (SIADH)

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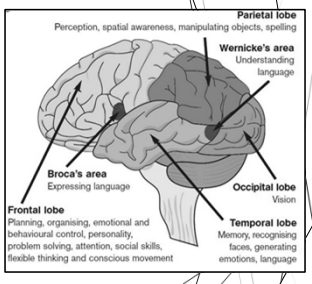
Brain Injuries

- Seizures/status
- Anoxic/ischemic global injury



https://www.neofect.com/us/blog/what-are-the-different-types-of-stroke

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Neuro Assesment: GCS

- Trauma
- Max= 15
- < 8- poor prognosis

Glasgow coma scale		Score
Eye opening	spontaneously	4
	to speech	3
	to pain	2
	none	1
Verbal response	orientated	5
	confused	4
	inappropriate	3
	incomprehensible	2
	none	1
Motor response	obeys commands	6
	localises to pain	5
	withdraws from pain	4
	flexion to pain	3
	extension to pain	2
	none	1
Maximum score		15

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Pupil Assessment

- CN III- oculomotor nerve
- Size, shape, reactivity to light- bilateral/equality
  - Anisocoria: unequal pupils ~ pre-op??
- Effects of anesthesia
  - Miotic (constricting):
    - Opiates
    - Cholinergics- pilocarpine, neostigmine, barbituates
  - Mydiatric (dilating):
    - Anticholinergic: atropine, naloxone, epi, norepi, isuprel
    - Noncatecholamine: ephedrine, phenylephrine,

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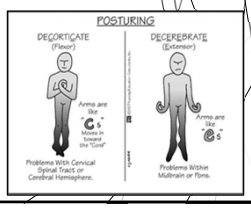
Reflexes

- Oculocephalic (doll's eyes); brain stem
  - N= doll's eyes reflex present
    - Turn head to side; eyes deviate to opp direction
  - Abn= doll's eyes absent
    - Eyes move w/ head; fixed gaze
- Posturing
  - Decorticate
  - Decerebrate
- Babinski (pos)
  - Nl up to 2 yrs old



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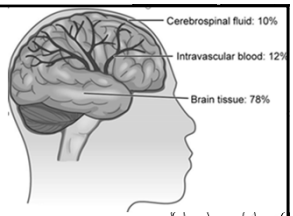
Brain

- Brain is a closed compartment
  - Brain tissue (80%)
  - Blood volume
  - Cerebrospinal fluid
  - > in size, amount of 1 of the 3 that overpowers accommodation: > ICP
- < brain tissue oxygen: change in LOC
- > CO2= vasodilatation= > blood volume= > ICP



https://quizlet.com/282375589/week-9-intracranial-pressure-acute-head-injury-flash-cards/

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P-op Assessment & Monitoring

- Surgical/surgeon specific
- Frequent neuro AND document
- Ensure adequate EHR neuro assessment tool
  - May need more than routine PACU documentation
  - Caution w/ 'WDL/WNLs'
- Ensure required elements are assessed and documented
- Alterations: expected or unexpected
- Timely provider notification
- TIME IS BRAIN!

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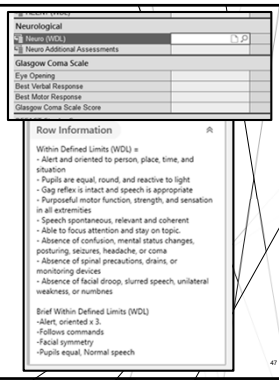
Routine Neuro Assessment

- Caution w/ WDL/BWDL
- Recommend comprehensive assessment



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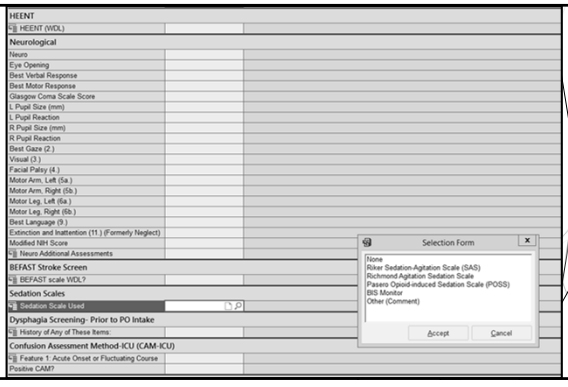

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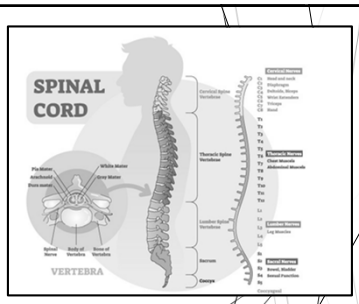
Spinal Surgery

- Discectomy
- Laminectomy
- Fusion/instrumentation
- Trauma repair
- Tumor excisionl
- Pain procedures
  - Implantable devices
  - Injections



https://orthosportsmed.com/how-the-spinal-cord-works/

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Nursing Assessment & Management

Neuro assessment (c/w baseline)

Movement/Sensation/Proprioception

- Pain
- Function
- Safety
  - Fall risk/Care at home

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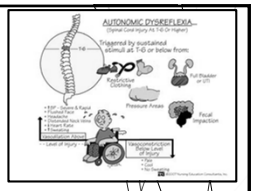
Postoperative Complications

- Bleeding
- New neuro deficits
- Increase in existing deficits
- Spinal shock
- Autonomic dysreflexia (pre-existing)
- Respiratory distress
- Spinal instability
- Spasticity



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Case Study

- 48 yo male, scoliosis, chronic back pain
- Sought surgical intervention nationally
- Planned procedure:
  - Laminectomy
  - Instrumentation
  - Fusion
- PMHx: not significant
- ASA II

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Case Study

- Long OR case, > 10 hours
- No untoward intraop events
- Planned intubation ON, ICU disposition
- Arrived in PACU @ 19:30
  - Intubated, sedated on propofol
  - VSS, temp 96
- Neuro assessment
  - Moving UE on command, not moving LE

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Case Study

- Chest x-ray done per DOS to confirm ETT placement
- Surgical orders for L/S spine films not performed
- One hour later transferred to ICU, no change in neuro assessment
- ICU:
  - Neuro eval: LE deficit
  - L/S films: screw transected cord
  - Emergent OR/delay

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Case Study

- Several spinal ops
- Permanent paraplegia
- Transferred to rehab HD # 14
- Large decubitus- returned to hospital for care, skin grafting
- Job loss, insurance issues….

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Failure to Assess, Failure to Notify MD for Change in Condition

- Neuro assessment performed on admission to PACU
- Pt able to participate despite propofol
  - Presumed meaningful neuro exam
- No movement LE
- No documentation that anyone informed
- Ordered spine films not performed
  - Order (electronic) not visible to PACU staff/not accessed
- Unclear as to report to ICU regarding neuro exam
- Delay in care, timely intervention

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Vascular Surgery

- Carotid Endarterectomy
- Blood supply to the brain
- Baseline
- Stroke/TIA risk
- Tight BP control

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Nursing Neuro Assessment

LOC, pupils, CN:
- VII- facial- smile
  - Contralateral inability- poss stroke
  - Ipsilateral inability- nerve damage
- IX- glossopharyngeal- swallow
- X- vagus- swallow, voice
- XI- spinal accessory- voice, shrug shoulders, gag
- XII- hypoglossal- tongue midline

Change LOC, vomiting: MD

Hyperperfusion syndrome- rare; emergency
Severe HA, HTN, szs. Etiology unknown

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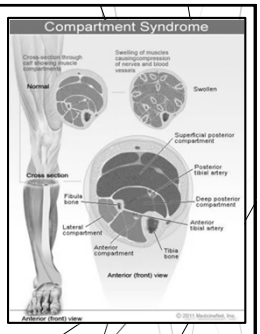
Compartment Syndrome ~ the Ps

- > pressure w/in muscle compartment
- Pain- passive flexion affected limb- out of proportion to injury
- Pallor
- Paresthesia (compression sensory nerve)
- Pulselessness- late sign
- Paralysis



https://www.medicinenet.com/compartment_syndrome/article.htm

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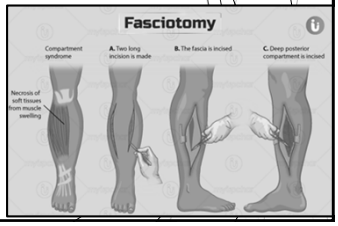
Nursing Assessment & Management

- Pain assessment ~ out of proportion to analgesic regimen
- Assess & document pulses/sensation/movement
- Notify provider ASAP
- Labs: > CK
- Maintain limb @ heart level (neutral)
- Remove ice- vasoconstrictor
- Rx: Fasciotomy



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Neurologic Complications a/w Regional Anesthesia

- Neuropathy
- Epidural hematoma
- Epidural abscess
- Orthostatic headache (PDPH)
- Aseptic meningitis
- Central toxicity (LAST)
- Worsening/relapse of previous injury
- Accidental total spinal anesthesia

Table 2. Neurologic Complications After Regional Anesthesia

Type of Anesthetic Block	Relative Incidence
Central Neuraxial Blocks	
Spinal anesthesia	3.78/10,000 (0.04%)
Epidural anesthesia	2.19/10,000 (0.02%)
Peripheral Nerve Blocks	
Interscalene brachial plexus block	2.84/100 (2.84%)
Axillary brachial plexus block	1.48/100 (1.48%)
Femoral nerve block	0.34/100 (0.34%)

https://www.anesthesiologynews.com/Review-Articles/Article/10-18/Regional-Anesthesia-and-The-Patient-with-Preexisting-Neuropathy/52857?sub=18B6FB481095D7BC19BD4443D1E418A1B702E4567ADF7A14C8F1793819A46D

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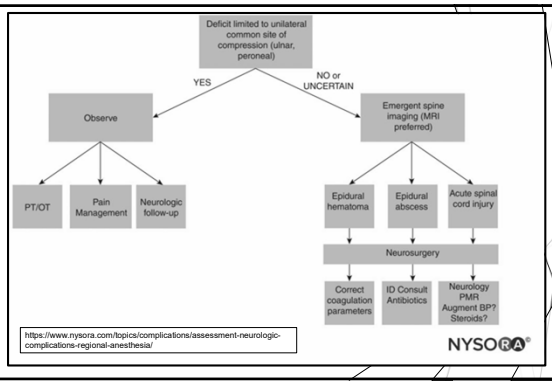

https://www.nysora.com/topics/complications/assessment-neurologic-complications-regional-anesthesia/

NYSORA

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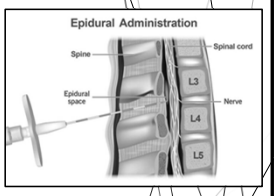
Epidural

- Neuroaxial anesthesia ~ epidural space btwn spinal meninges & sides of vertebral canal
- Single shot/continuous infusion
- Local anesthetic +/- opiate
- Goal: sensory block to encompass discomfort a/w surgical insult



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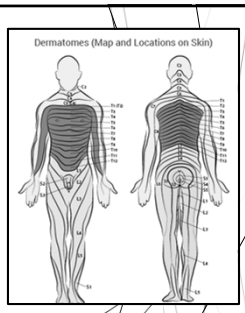
Nursing Care & Assessment

- Pain ~ surgical site assessment ~ efficacy
- Movement
- Dermatome levels ~ ice
- Dsg
- Tubing security
- Medication verification



https://www.emedicinehealth.com/dermatomes/article_em.htm

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Complications

- Inadequate/ineffective analgesia
  - Test dose
- Alterations in LE movement
  - Hematoma
  - Test dose/local
- Pruritis
- Hypotension
- N/V

https://coreem.net/core/spinal-epidural-hematoma/

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Case Study

- 66 M s/p TKR ~ epidural for analgesia
- POD#2 OOB to chair, > pain ~ s/b anesthesia
  - Bolus dose of bupi
- Witnessed cardiac arrest ~ ROSC ~ intubated to ICU
- Intubated/sedated ~ differential dx:
  - PE
  - Cardiac event
- POD#5/ICU#3 sedation < ~ unable to move LE

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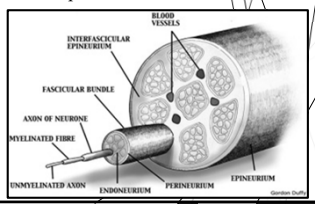
Peripheral Nerve Catheters

- Single shot/continuous infusion
- Local anesthetic regionally proximate to pain source
  - Surgical
  - Trauma



https://www.bjaed.org/article/S2058-5349(18)30115-X/fulltext

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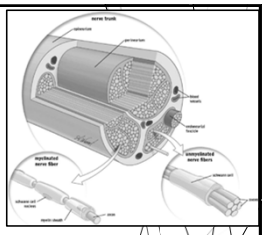
Complications

- LAST
- Lack of efficacy
- Catheter dislodgment
- Patient dissatisfaction d/t altered sensation
- Neurologic injury
- Myonecrosis
- Pulmonary effects (location specific)
- Hematoma



https://www.researchgate.net/figure/Peripheral-nerve-anatomy-image-courtesy-of-Myoscience_fig1_304365497

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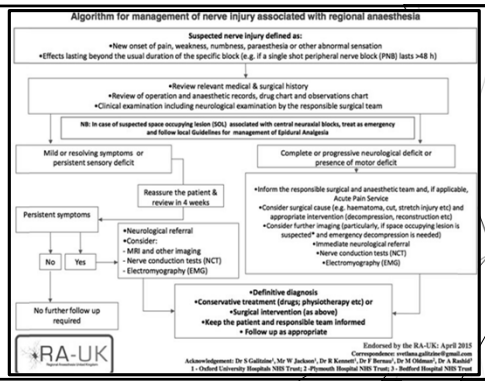

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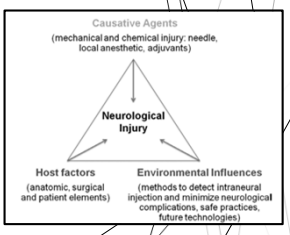
Factors Associated With Risk of Neurologic Complications After Peripheral Nerve Blocks: A Systematic Review

- Causative:
  - Mechanical trauma
    - Needle trauma
    - Pressure injury
  - Chemical insult: LA/neurotoxicity
    - Time/concentration dependent
- Host
- Environment
  - PNC placement



Sondeloppam, R. & Tsui, B. (2017). *Anesthesia-Analgesia, 124*(2), 645-660.

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Complications Associated With Peripheral Nerve Blocks: Lessons From the ASA Closed Claims Project

- N=189
- 69% ASA 1 or 2
- Majority outpt
- Complications:
  - Nerve injury
  - Death
  - PTX
- 68% temporary/non-disabling

Table 1. *Types of Peripheral Nerve Blocks in ASA Closed Claims Database*

Block Type	n (% of 189 Claims)*
Interscalene	79 (42)
Axillary	50 (26)
Intravenous regional anesthesia	20 (11)
Femoral	8 (4)
Ankle block	8 (4)
Supraclavicular	7 (4)
Unspecified brachial block	6 (3)
Intercostal blocks	3 (2)
Other blocks†	8 (4)

Lee, L et al. (2011). *Anesthesia Clinics, 29*(3), 56-67.

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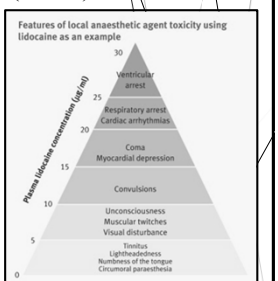
Local Anesthetic Systemic Toxicity (LAST)

- Circumoral, tongue numbness
- Lightheadedness
- Tinnitus
- Visual disturbance
- Slurred speech
- Muscle twitch
- Irrational conversation
- Grand mal
- Coma



DOI: https://doi.org/10.1016/j.mpaic.2007.01.012

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Lipid Rescue

- Excess local anesthetic binds w/ lipid emulsion= reduced plasma drug level
- Dose:
  - Initial bolus: 20% lipid 1.5 ml/kg rapidly
  - Cont. infusion: 0.25 ml/kg/min
  - Add" bolus if needed
  - Max dose: 10 ml/kg
  - ? CPB
  - ? ICU

https://www.asra.com/docs/default-source/guidelines-articles/local-anesthetic-systemic-toxicity-rqb-b0f7sfvrsn=33b3484_2

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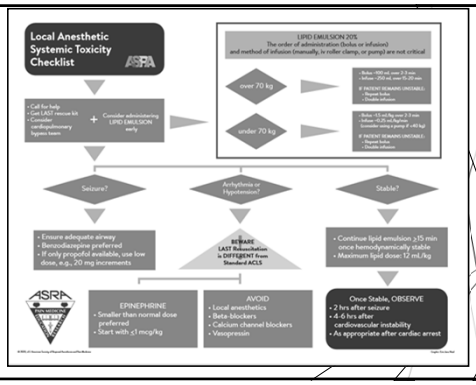

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Nursing Monitoring & Assessment

- Catheter integrity
- **Tubing connections**/infusion
- Pain and comfort
- Motor assessment
- Neuro assessment & monitoring
- Dsg integrity
- Mobility assessment r/t ambulation

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Postdural Puncture Headache (PDPH)

- Most often frontal or occipital
- Related to large needle size
- Worsened by sitting or standing
- Onset usually after 24-72 hours
- Rx: hydration, analgesics, position flat
- Epidural blood patch

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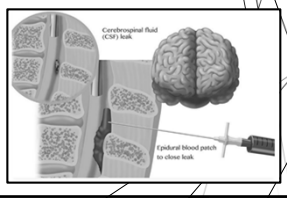
Epidural Blood Patch

- IV site for blood removal ~ 15-20 ml
- LP preparation
- Blood injected into epidural space
- Post procedure
  - Assess HA severity
  - Fluids, caffeine
  - BR, HOB flat



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Awareness Under Anesthesia

- N=271
- 1950-2005
- Internat'l anes pub literature

Table 8. Potential Risk Factors and Causes of Awareness

	Percentage of case reports
Potential risk factors	
History of awareness	1.6
Absence of volatile anesthetic or propofol during maintenance of anesthesia	23
Cause of awareness	
Overly light anesthesia	87
Increased anesthetic requirement	7
Machine malfunction	5
Misuse of machine	4

The percentages of the case reports for which each characteristic was reported or could be clearly inferred were 89%, 70%, and 42% for history of awareness, absences of volatile anesthetic or propofol during maintenance of anesthesia and causes of awareness, respectively.

Ghoneim, M. et al. (2009). *Anesth Analg 2009,108*, 532.

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Intraoperative Awareness

From Neurobiology to Clinical Practice

George A. Mashour, M.D., Ph.D.,* Beverley A. Orser, M.D., Ph.D.,† Michael S. Avidan, M.B., B.Ch.‡

Table 1. Michigan Awareness Classification Instrument

Class 0: No awareness
Class 1: Isolated auditory perceptions
Class 2: Tactile perceptions (*e.g.*, surgical manipulation or endotracheal tube)
Class 3: Pain
Class 4: Paralysis (*e.g.*, feeling one cannot move, speak, or breathe)
Class 5: Paralysis and pain
An additional designation of "D" for distress is included for patient reports of fear, anxiety, suffocation, sense of doom, sense of impending death, etc.

- Underdosing the anesthetic
  - Unsafe d/t hemodynamic [in]stability
  - Failure in delivery of anesthesia ~ human/equipment
  - Anesthetic technique
  - Patient's needs are underappreciated
  - Pt specific characteristic ~ benzo, other usage
- PACU role: ID and NOTIFY ANESTHESIA IMMEDIATELY

Anesthesiology 2011; 114:1218 –33

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Final Thoughts

- Meticulous neurologic assessment
  - Not just on n/s patients!
- Timely notification of provider
- Accurate documentation ~ likely more than routine PACU flowsheet
  - GCS
  - Sedation assessment
  - Pupillary assessment on sedated/unresponsive pts
- Expect the unexpected!

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IT HAS BEEN AN HONOR!!!!

MAUREEN.F.MCLAUGHLIN@LAHEY.ORG

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Question

The PACU nurse is caring for a 30 year old male patient s/o ORIF left lower extremity. The patient continues to self-report 10/10 pain despite receiving 4 mg of intravenous hydromorphone as well as oral analgesics. The nurse is concerned the patient may be experiencing:

a. compartment syndrome
b. narcotic withdrawal
c. drug-seeking behavior
d. juvenile attitude disorder

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Question

After notifying the provider, the PACU nurse should:

a. review the patient past medical record for a history of opiate use disorder
b. prepare to transfer the patient to the inpatient unit since the provider has been notified
c. apply ice for comfort
d. assess for distal pulses, sensation and movement

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Question

The PACU nurse is caring for a 90-year-old male patient s/p cystoscopy. He is agitated, restless and confused, attempting to get out of bed. After ensuring side rails are up and secure, the nurse should assess:

a. residual urine in the bladder via bladder scan
b. cognitive status using the Mini Cog exam
c. pupil reaction to light
d. oxygen saturation

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