1. **Compartment S/S**

- Risk factors
  - Cast – newly applied or applied too early
- Manifestations
  - ***Pain – unrelieved by meds; intense when passively moved***
  - **Paralysis** (late) – motor weakness, inability to move IDs major nerve damage **LATE** manifestations
  - **Paresthesia** (early) – numb, burning, and tingling = **EARLY** manifestations
  - Pallor – tissue is pale and nail beds are cyanotic
  - **Pulselessness – LATE** manifestation
  - Edematous/ hard muscles d/t swelling

2. **Neurovascular assessment**

- Components of assessment
  - Pain
  - Sensation
  - skin temp
  - cap refill
  - pulses
  - movement
- When to perform assessment
  - After traction applied – assess circulation of the foot w/in 15-20min and then q1-2hr
- Assess q1hr for first 24hr and then q4hr after that
- Normal versus abnormal findings
  - Normal: pink/ warm/ pulses present and equal bilaterally/ cap refill <3 seconds
  - Abnormal: cyanotic/ cold, cap refill >3 seconds, no or irregular pulses present

3. **When is it appropriate to remove traction** – Doctor's order or if life-threatening

4. Amputation care

Nursing interventions

- Prevent hypovolemia, pain, infection
- Assess surgical site for bleeding
- **Monitor tissue perfusion on stump (residual limb)**
- Monitor for signs of infection and non-healing incisions; infection can lead to osteomyelitis
- Perform ROM exercises
- Place pt in prone positioning for 20 – 30 min several times a day to help prevent hip flexion contractures ***(opens up hips)
- Elevate extremity for 24 - 48 hrs --- > NOT after 72 hrs

Preparing for prosthesis

Nursing interventions

Residual limb must be shaped and shrunk prior to prosthesis
Shrinkage interventions:

- Wrap stump using ACE bandage (figure-8 wrap) to prevent blood flow restriction and decrease edema
- Use stump shrinking sock (easier for pt to apply)
- Use air splint: inflated to protect and shape residual limb and for easy access to inspect the wound

5. Complications related to amputations

Complications

- Cardiopulmonary complications r/t co-morbid conditions
- DVT
- Stump hematoma
- Infection
- Need for re-amputation/ revision
- Phantom limb pain – pt to push down on pillow w/ affected extremity
- Flexion contracture

6. Post-op amputation care

Preparing for prosthesis

Nursing interventions

Residual limb must be shaped and shrunk prior to prosthesis
Shrinkage interventions:

- Wrap stump using ACE bandage (figure-8 wrap) to prevent blood flow restriction and decrease edema
- Use stump shrinking sock (easier for pt to apply)
- Use air splint: inflated to protect and shape residual limb and for easy access to inspect the wound

- Encourage dependent positioning of the residual limb
- Inspect for presence and amount of drainage
- Implement shrinkage intervention of the residual limb
- Monitor for phantom pain
- Assess for pt feelings of body image changes

7. Complications r/t casts

- Compartment Syndrome
- Fat Emboli
- Infection - osteomyelitis

8. Osteomyelitis nursing interventions - Chronic inflammation r/t infectious penetration d/t trauma or surgical repair

S/S:

- Bone pain that is constant, pulsating, localized, and worse with movement
- Fever (older adults might not have a fever)
- Leukocytosis and elevated ESR
- Untreated = **SEPSIS**

**** Monitor for signs of infection and non-healing incisions; infection can lead to osteomyelitis ****

9. Osteomyelitis treatments

Treatment:

- Antibiotics needed for **3** months
  - High risk for contracting **C. Diff**

10. Fat emboli S/S

- Manifestations
  - Dyspnea/resp distress/ Tachypnea (increased RR)/ Decreased O2 sat/ Chest pain
  - Tachycardia (increased HR)
  - Confusion (d/t hypoxia)

11. Cast care

- Keep clean & dry
- Frequent neuro assessments
- Educate pt no objects inside cast
- RICE
- Alleviate itching w/cool hair dryer
- Carry cast with palms of hands, not fingertips

12. Dementia and delirium s/s

Dementia:

- Irreversible, progressive, downhill
- Last 2-20 years
- Slow onset unless due to ischemic attack symptoms are abrupt
- Speech lacks meaning
- Repeats words and sounds

- Dysarthria (impaired speech)
- Loss of all voluntary activity
- Lost in familiar places
- Disorientated to time, place, and person
- Loss of recent memory

Delirium:

- Reversible with treatment
- Lasts 1 day-1 month
- Rapid, acute onset
- S/S of underlying disease
- Alter level of Consciousness (hypo alert-Hypoactive)
- Short attention span/disorganized thinking
- Hallucinations
- Delusions
- Fear
- Anxiety
- Paranoia
- Tremors
- Clouding of consciousness

13. Osteomyelitis s/s

S/S:

- Bone pain that is constant, pulsating, localized, and worse with movement
- Fever (older adults might not have a fever)
- Leukocytosis and elevated ESR
- Untreated = **SEPSIS**

**** Monitor for signs of infection and non-healing incisions; infection can lead to osteomyelitis ****

14. Causes of fat emboli

- Long bone fracture
- Adults 70 years or older
- 24-48 hr postop

15. Increased intracranial pressure (ICP) s/s – there are a few questions

Manifestations

ICP: Early (LOC, HA, eye, wX)

- Change in LOC
    - Change in condition (restless, confused, increased drowsiness, increased resp effort, purposeless mvmnt)

- Pupillary changes (PPP or dilation) / impaired ocular mvmnt
    - Weakness in one extremity/one side/hemiplegia
    - HA: constant, increasing in intensity, or aggravated by movement or straining

ICP: Late (RR/ VS (CUSHING'S TRIAD), emesis, LOC – coma/ stupor)

- Resp and vasomotor changes

- VS:
    - increase in SBP + temp
    - decrease/ irregular HR
    - widening pulse pressure
    - slowing of HR -- >
    - pulse may fluctuate rapidly from tachycardia to bradycardia, temp increase
        - **Cushing's triad: HTN, bradycardia, bradypnea (opposite of shock sx)**
    - Projectile vomiting
    - Deterioration of LOC; stupor to coma
    - Hemiplegia, decortication, decerebration, flaccidity
    - Resp pattern alterations: Cheyne-Stroke and arrest
    - Loss of brainstem reflexes; pupil, gag, corneal, and swallowing

16. Increased ICP nursing care/actions – there are a few questions

- Nursing interventions
    - Elevate HOB **at *least 30 degrees*** (promote venous drainage)

        - Avoid extreme flexion, extension, or rotation of head
        - maintain the body in a midline neutral position
        - Maintain patent airway
        - Administer O2 to keep PaO2 >60
        - Consider hyperventilation to decrease ICP
        - Maintain c-spine stabilization
        - Maintain safety and seizure precautions
    - *Must know normal ICP*
        - 10 -15 mmHG

17. Meningitis s/s

Viral Meningitis s/s:

- Headache and fever are early manifestations
- Nuchal rigidity is a tell-tale sign of meningitis
- Positive Kernig sign
- Positive Brudzinski sign
- Client may complain of photophobia
- Petechial rash or purpuric lesions
- Seizures (late sign) r/t increased ICP

Bacterial Meningitis s/s:

- Nuchal rigidity
- Altered mental status/Fever/Chills
- Tachycardia
- Photophobia/Seizures
- Nausea/Vomiting
- Severe headache
- Positive Kernig/Brudzinski sign
- Restlessness/Irritability
- Red macular rash

Nursing interventions:

- Isolate the client as soon as meningitis is suspected/ Maintain isolation precautions per hospital policy.
    - The nurse should initiate droplet precautions, which require a private room. Continue droplet precautions until antibiotics have been administered for 24 hr and oral and nasal secretions are no longer infectious. Clients who have bacterial meningitis might need to remain on droplet precautions continuously.

        - Standard precautions are implemented for all clients who have meningitis.
    - Implement fever-reduction measures, such as a cooling blanket, if necessary.
    - Report meningococcal infections to the public health department.
    - Decrease environmental stimuli/ Provide a quiet environment
    - Minimize exposure to bright light (natural and electric)
    - Maintain bed rest with the head of the bed elevated to 30°
    - Monitor for increased IC
        - Tell the client to avoid coughing and sneezing, which increase ICP
    - Maintain client safety, such as seizure precautions
        - Replace fluid and electrolytes as indicated by laboratory values
    - Older adult clients are at an increased risk for secondary complications, such as pneumonia
        -

Pharmacologic treatment options:

- **Rifampin******
- Ceftriaxone or cefotaxime in combination with vancomycin: Antibiotics given until culture and sensitivity results are available. Effective for bacterial infections
- Phenytoin: Anticonvulsants given if ICP increases or client experiences a seizure.
- Analgesics for headache and/or fever.
    - *******Nonopioid to avoid masking changes in the level of consciousness**

Prophylactic treatment if exposed:

- Ceftriaxone or cefotaxime in combination with vancomycin: Antibiotics given until culture and sensitivity results are available. Effective for bacterial infections

18. Ways to diagnose and test for meningitis

- CT scan
    - Fluid shift and/or meningeal inflammation
- MRI
- Lumbar puncture
    - CSF cultures
    - Gram staining
    - Cloudy w/halo ring

- Decreased Glucose
- **o** Elevated WBC/Protein/CSF pressure

19. Spinal cord injury s/s

Injury to cervical spine = quadriplegia
Injury below T1 = paraplegia

- * the level involved dictate the consequences of the spinal cord
- Autonomic dysreflexia interventions

******r/t spinal cord injury:** secondary to SNS stimulation and *inadequate* compensatory response by the PNS
SNS > PNS ****
Only seen in pt's with lesions above T6
Stimulation of SNS:

- causes **extreme HTN**
- sudden severe HA (BP increased)
- pallor ***below*** level of spinal cord's lesion dermatome
- blurred vision (BP increased)
- diaphoresis (BP increased)
- restlessness
- nausea
- piloerection (goosebumps)

****INITIAL interventions: Sit pt in a sitting position to decrease HTN**

Stim of PNS:

- Bradycardia
- flushing ***above*** dermatome
- nasal stuffiness

Risk factors:

- Male clients age 16-30
- high risk activities (extreme sports or high speed driving)
- participation in impact sports
- acts of violence (GSW or knife wounds)

- alcohol or drug use
- disease (metastatic cancer or arthritis of spine)
- falls (especially older adults)

20. Autonomic dysreflexia s/s

Only seen in pt's with lesions above T6
Stimulation of SNS:

- causes **extreme HTN**
- sudden severe HA (BP increased)
- pallor ***below*** level of spinal cord's lesion dermatome
- blurred vision (BP increased)
- diaphoresis (BP increased)
- restlessness
- nausea
- piloerection (goosebumps)

Stim of PNS:

- Bradycardia
- flushing ***above*** dermatome
- nasal stuffiness

21. Autonomic dysreflexia nursing actions

- **Autonomic dysreflexia interventions**
  - Prevent further damage to the spinal cord***
    - Admin corticosteroids, plasma expanders, H2 agonists
    - Minimize movement until spine is stabilized via traction or surgery
    - Adequate O2 to decrease ischemia of the spinal cord
  - **Sit the client up to decrease BP secondary to postural hypotension**
  - Determine the cause, then tX
    - Distended bladder d/t kinked cath, retention, or calculi
    - Fecal impaction
    - Cold stress or drafts on lower part of the body
    - Tight clothing
    - Undiagnosed injury or illness r/t kidney infection or stone, lower extremity fracture)

        - Monitor VS for severe HTN and BRADYcardia
            - Admin antihypertensives – Nitrates or Hydralazine
    - Risk factors (trauma/MVC/diving/gunshot wounds)
        - Males 16-30 y/o
        - High-risk activities - extreme sports or high-speed driving
        - Impact sports - football or diving
        - Acts of violence – gunshot, knife wounds
        - Alcohol or drug use
        - Disease – metastatic cancer or arthritis of the spine
        - Falls – esp. older adults

22. Treatment of ICP

Pharmacologic treatment of ICP

- Mannitol – osmotic diuretic – **decrease cerebral edema**
    1. Monitor urine output w/ foley
- IV fluids to maintain cerebral perfusion to decrease cerebral edema
- Barbiturates (pentobarbi***tal*** and thiopen***tal***)
    ii. **Induce coma** to decrease cellular demand until ICP can be decreased

23. ICP positioning

- Nursing interventions
    - Elevate HOB **at *least 30 degrees*** (promote venous drainage)
    - Avoid extreme flexion, extension, or rotation of head
    - maintain the body in a midline neutral position
    - Maintain patent airway
    - Administer O2 to keep PaO2 >60
    - Consider hyperventilation to decrease ICP
    - Maintain c-spine stabilization
    - Maintain safety and seizure precautions
- *Must know normal ICP*
    - 10 -15 mmHG

24. Increased ICP complications

- Causes

  - **A**lcohol or AAA
  - **E**pilepsy, hepatic **encephalopathy**
  - **I**nsulin (hypoglycemia)
  - **O**piates or overdose
  - **T**rauma, **temperature (hypothermia, hyperthermia)**
  - **I**nfections **(sepsis, meningitis**)**
  - **P**sychogenic, PE, poisoning
  - **S**pace lesions, stroke, shock, seizure

  - **I**nfection/ sepsis (elderly/ very young)
  - **W**ithdrawal from substance
  - **A**cute metabolic causes – hypoglycemia
  - **T**rauma/ temp
  - **C**NS causes – psychogenic
  - **H**ypoxia/ PE
  - **D**eficiencies (nutritional)/ electrolyte imbalance - Na**
  - **E**ndocrinopathies
  - **A**cute vascular causes, AAA, alcohol
  - **T**oxins or drugs (opioids/ OD)
    - **H**eavy metals

25. Right/left sided stroke manifestations (alterations you will see in your pt)

- Right versus left hemisphere (manifestations of each)
  - **Right Hemisphere – Visual and Spatial Awareness and Proprioception**
    - Unilateral neglect syndrome (cannot see left side objects) ***
    - Hemianopsia (visual changes)
    - Poor impulse control and judgement
    - Loss of depth perception
    - Left hemiplegia or hemiparesis
  - **Left Hemisphere – Language, Math, Analytics --- ALL A'S**
    - Aphasia (inability to speak and understand language)
    - Agnosia (inability to recognize familiar objects)
    - Alexia (inability to read)

- Agraphia (inability to write)
- Right extremity hemiplegia (paralysis) or hemiparesis (weakness)

Wernicke-Korsakoff syndrome manifestations:

- Confusion and loss of mental activity that can progress to coma and death
- Loss of muscle coordination (ataxia) that can cause leg tremor
- Vision changes such as abnormal eye movements (nystagmus), double-vision, eyelid drooping
- Loss of memory
- Inability to form new memories
- Hallucinations
- Confabulation – making up stories

26. Types of strokes and their s/s

- **Hemorrhagic (manifestations, signs/symptoms)**
  - Increased ICP
  - Vomiting
  - HA
  - **Nuchal rigidity**
  - Sluggish pupil reaction
  - Speech difficulty
  - Visual disturbances – blown pupil
  - **Facial drooping**
  - **Severe HA**
  - **Rapid decline in LOC**
  - **Worsening neuro function and herniation**
  - **Changes in ICP**

- **Ischemic (manifestations, signs/symptoms)**
  - Sudden, severe headache
  - Confusion or change in mental status
  - Numbness or weakness of the face, arm, or leg
  - Difficulty in walking
  - Dizziness
  - Loss of balance or coordination
  - Visual disturbances

- Trouble speaking or understanding speech

27. Traumatic brain injury nursing actions

- Maintain patent airway
- Assist w/intubation and vent if needed
- Suction as needed
- Turn pt every 2 hr
- Encourage coughing and deep breathing
- Observe drainage and dressing

28. Dementia and delirium nursing actions

- Assess cognitive status, memory, judgement, and personality changes
- Provide a safe environment
    1. Frequent visual checks
    2. Keep client away from stairs and exits
- Maintain a sleeping schedule
- Check skin weekly for breakdown
- Provide cognitive stimulation
    1. Walks, music, crafts
- Be consistent and repetitive

29. Difference between dementia and delirium

Dementia:

- Irreversible, progressive, downhill
- Last 2-20 years
- Slow onset unless due to ischemic attack symptoms are abrupt
- Speech lacks meaning
- Repeats words and sounds
- Dysarthria (impaired speech)
- Loss of all voluntary activity
- Lost in familiar places
- Disorientated to time, place, and person
- Loss of recent memory

Delirium:

- Reversible with treatment
- Lasts 1 day-1 month
- Rapid, acute onset
- S/S of underlying disease
- Alter level of Consciousness (hypo alert-Hypoactive)
- Short attention span/disorganized thinking
- Hallucinations
- Delusions
- Fear
- Anxiety
- Paranoia
- Tremors
- Clouding of consciousness

30. Traumatic amputation care

Nursing interventions

- Stop bleeding and apply direct pressure w/gauze or clean cloth
- Place severed extremity in plastic bag and ice
- Prevent hypovolemia, pain, infection
- Assess surgical site for bleeding
- **Monitor tissue perfusion on stump (residual limb)**
- Monitor for signs of infection and non-healing incisions; infection can lead to osteomyelitis
- Perform ROM exercises
- Place pt in prone positioning for 20 – 30 min several times a day to help prevent hip flexion contractures ***(opens up hips)
- Elevate extremity for 24 - 48 hrs --- > NOT after 72 hrs

31. Traction nursing care

Contrast skeletal versus skin traction

Skeletal traction: uses **pins, wires, or screws** attached to bone (skeleton) to treat fractures of femur or when great force needs to be applied to the affected area

- **SKELETAL = BEST *FOR BONE* ALIGNMENT**
  - Can use heavier weights (15 – 30lbs)
  - Can do for longer periods of time
  - **Continuous** traction
  - immobilize, position, and align a fractured femur, tibia or cervical spine
  - Greater wt (11 – 18kg/ 15 – 30 lbs)
  - Passes a metal pin or wire through the bone under local anesthesia, avoiding nerves, blood vessels, muscles, tendons, and joints
  - Applied using ropes and weights attached to the end of the pin
  - Surgeon applies traction using surgical asepsis
- **Skin traction:** uses tape, straps, boots, cuff, wraps; sometimes uses weights for resistance as prescribed
  - **Short term**
  - Stabilize fractured leg, control muscle spasms, immobilize area before surgery
  - Applied by weights attached to pt w/ Velcro, tape, straps, boots, or cuffs
  - Wt applied mustn't exceed tolerance of the skin
  - No more than 2 - 3.5 kg used on an extremity
  - Pelvic: 2.5 - 9kg
  - **Buck's,**- post-op for hip fractures in adult pt's
  - chin halter strap (tx of chronic neck pain), and pelvic belt (treat lower back pain)
  - **Bryant's-** congenital hip dislocation in kids

Skeletal traction

Nursing interventions

- Prior to procedure-
  - Inquire about anticoagulant use and assess skin

- Obtain informed consent
- Instruct the client that the needle insertion is uncomfortable
- Instruct the client not to take any stimulants or sedatives for 24 hrs before the procedure to ensure accurate results
- Inform the client that slight bruising may occur at the needle insertion sites
- Mild analgesics can be used for the pain

- Post procedure –
  - Assess neurovascular status of the affected body part every hour for 24 hrs and every 4 hr after that
  - Maintain body alignment and realign if the client seems uncomfortable or reports pain
  - Avoid lifting or removing weights
  - Ensure that weights hang freely and are not resting on the floor
  - If the weights are accidentally displaced, replace the weights; if the problem is not corrected, notify the provider
  - Ensure that pulley ropes are free of knots, fraying, loosening, and improper positioning at least every 8 to 12 hrs
  - Routinely monitor skin integrity and document
  - Use heat/massage as prescribed to treat muscle spasms
  - Use therapeutic touch and relaxation techniques

32. Glasgow coma scale

- Best possible score is 15
- Score </= 8 associated w/ severe head injury and coma
- Score 9-12 indicates moderate head injury
- Score >13 associated with minor head trauma

33. Thrombolytic therapy uses and when not to use

Indications and contraindications

- used in the instance of a ischemic stroke (embolic or thrombotic)
- **given w/on 3 – 4.5 hrs of onset of s/s (if unknown – the last time pt presented "normal"
  - no tPA = if pt is on anticoagulant (ie: heparin, warfarin), head trauma w/in last few months, recent spinal surgery/cranial surgery in PSHx
- TPA Inclusion criteria
- Clinical diagnosis of ischemic stroke causing measurable neurologic deficits
- Onset of symptoms <4.5 hrs before beginning treatment; if exact time not known it is defined as the last time the client was known to be normal
- Age >18
- TPA Exclusion criteria
- Stroke or head trauma in the previous 3 months
- Previous intracranial hemorrhage
- Intracranial neoplasm, AV malformation, or aneurysm
- Recent intracranial or intraspinal surgery
- Arterial puncture at a non-compressible site in the previous 7 days
- Symptoms suggestive of subarachnoid hemorrhage
- Persistent BP elevation (SBP >185 or DBP >110)
- Active internal bleeding
- Age >80
- **Oral anticoagulant use ***********_**regardless of INR**_
- Severe stroke (NIHSS score >25)
  -

o Methods of communication
- Talk at a normal rate/talk to them like any other patient
- Do not have lengthy conversations; be brief
  - Know your time (3-4 hr)!

34. Cerebral perfusion pressure (CPP)

- What is it, what is a normal value?
  - MAP s/b **70 – 100**
    - Less than 50 indicates permanent neuro damage ***
    - **CPP = MAP-ICP (mean arterial pressure of ICP)**
    - **How to calculate MAP: systolic + diastolicX2 / 3**

35. **Normal Intracranial pressure (ICP)** = **10 - 15 mmHg**

36. Normal findings of skeletal traction

Expected findings of patient

- Mild to moderate discomfort post-procedure

Expected findings of traction system

- Ensure that weights hang freely and are not resting on the floor
- If the weights are accidentally displaced, replace the weights; if the problem is not corrected, notify the provider
- Ensure that pulley ropes are free of knots, fraying, loosening, and improper positioning at least every 8 to 12 hrs

Ideal outcomes/goals

- Prevent soft tissue injury
- Realign of bone fragments
- Decrease muscle spasms and pain

37. Cushing's Triad

- **Cushing's triad – Late s/s of increased ICP:**
  - **HTN, bradycardia, bradypnea (opposite of shock sx)**
  - **Severe HTN, widening puls pressure**

- This is a LATE manifestation of increased ICP