



Al Rasheed College University

Nursing Department

**Lectures in
Adult Nursing II
NUR 206**

by

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Part 1: Nursing Management of Patients with Nervous System Disorders

Lecture 1: Neurological Assessment and Diagnostic tests

Objectives

- List five components that make up the neuro exam of the critically ill patient
- Name the most sensitive component of the neuro assessment
- Describe the difference between decorticate & decerebrate posturing
- Describe pupillary assessment and what to report to MD
- Describe the difference in the neuro assessment of the conscious –vs- unconscious patient

Neuro Assessment

- **Purpose**
 - Evaluate the function of the nervous system
 - Detect nervous system dysfunction
 - Monitor response to treatment
 - Evaluate patient outcomes
 - Identify teaching needs
 - Determine the highest level of functional ability
- **Components**
 - History
 - Physical Exam
 - Precipitating Events
 - Family History
 - Medical Surgical History

Physical Exam

- **Components**
 1. Vital Signs
 2. Consciousness
 3. Glasgow Coma Scale
 4. Motor Function
 5. Sensory Function
 6. Cranial Nerve Function
 7. Reflexes

Glasgow Coma Scale

- Quick and easy way to describe baseline LOC
- Tests
 - **Eye Opening**
 - **Verbal**
 - **Motor Response**
- Highest score possible: 15
- Lowest score possible 3

Level of Consciousness

- LOC is the MOST important part of a Neuro exam!!

- A change in LOC is the earliest & MOST sensitive indication of a change in the patient's neuro status!
- Sedation should be stopped or decreased for an accurate assessment
- **Arousal:** lowest level. Focuses on the patient's ability to respond to verbal or noxious stimuli in an appropriate manner. Vs.
- **Awareness:** higher-level function. Assesses orientation to person, place, time, & events
- **Full Consciousness:** Alert, awake, responds appropriately to stimuli, follows commands.
- **Confusion:** Disoriented, short attention span, agitated, restless, may have hallucinations.
- **Lethargic:** Drowsy, delayed response to stimuli, slow in speech and mental process, & may drift off to sleep during the exam.
- **Obtunded:** Able to arouse with stimulation very drowsy. The response is minimally maintained. Indifference to external stimuli exists.
- **Stuporous:** Minimal spontaneous movement. Verbal responses are minimal & incomprehensible. Requires vigorous stimuli to elicit a response.
- **Comatose:** Awareness & arousal are absent. No response to verbal or painful stimuli.

Motor Exam

- **Strength Scale**
 - 0 = Flaccid
 - 1 = Muscle Contraction
 - 2 = Lateral movement only
 - 3 = Raise against gravity but unable to sustain
 - 4 = Can raise and sustain against gravity
 - 5 = Normal
- ✓ **Key element:**
 - Compare strength between the right and left sides of the body
- **Noxious Stimuli = PAIN**
- Two categories
 - Central: the brain responds
 - Peripheral: the spine responds
- ✓ Note: Use the least amount of stimulus to elicit a response

Cerebellar Exam

- Upper Extremity Coordination
 - Finger to Nose Testing
 - Rapid Alternating Finger Movements
 - Rapid Alternating Hand Movements
 - Place palm and then the dorsal side of the hand on thigh rapidly
- Lower Extremity Coordination
 - Heel to Shin
 - Gait

Central Pain Stimulus

- Trapezius Squeeze: angle where neck & shoulder meet. Using your thumb & two fingers take hold and squeeze.
- Sternal Rub: usually done with the knuckles in a grinding motion. (if done repeatedly, this will bruise the patient's chest)

Peripheral Pain Stimulus

- Nail bed pressure: Using a pen or pencil across the cuticle's base, apply firm pressure.
- ✓ **Note:** Elicited response may be a reflex response and may not be a true indicator of the level of consciousness.

Posturing

- Decorticate: flexion posturing
- Decerebrate: rigid extension

Sensory Exam

- Dermatomes

Cranial Nerves

Pupillary Response

- Extremely small pupils
 - Possible narcotic/sedative overdose
 - Therapeutic levels of narcotics/sedatives
 - Lower brain stem compression
 - Bilateral damage to the Pons
- Large pupils
 - Instillation or use of Atropine, scopolamine
 - Indication of extreme stress

Pupillary Changes

- Change or inequality in pupil size, and reaction, especially in patients who have NOT shown this discrepancy before, IS A SIGNIFICANT neurological sign!
- Unilateral pupil dilation may indicate herniation and should be reported IMMEDIATELY

Rapid Neuro Exam

Conscious Patient	Unconscious Patient
LOC	LOC
CN assessment	CN assessment
Motor assessment	Motor assessment
Sensory assessment	
Respiratory pattern	Respiratory pattern
VS	VS
Change in status	Change in status

Analyzing the Data

- What do I see?
- What does it mean?
- How does it relate to the previous assessment?
- How am I going to proceed?

When to notify the Physician

- If neurological status deteriorates with or without changes in hemodynamic status
- If CSF drainage develops
- New onset of seizures

Emergency!!!

- Notify MD Immediately
- Unilateral pupil dilation
- New onset of posturing
- Loss of Cutaneous Reflexes (cough and gag)

Conclusion

- The neuro exam should be organized, thorough, & simple.
- Findings should ALWAYS be evaluated in comparison to previous exams
- ANY neurological deficit identified that is NEW or DIFFERENT from that of the last assessment, should be focused on in detail & reported.

Lecture 2: Cranial Nerve Examination

During the head-to-toe nursing assessment, you will be assessing the cranial nerves. In this lecture, I want to break down how to assess cranial nerves I through XII (1-12) as a nurse.

Why do we assess cranial nerves? In short, to see if the neuron/nerve works!

Why wouldn't a cranial nerve "work"? In many **neuro** diseases, the neurons that supply a particular nerve is damaged, which makes the nerve not function properly.

For example, in multiple sclerosis, the myelin sheath of the central nervous system's neurons is damaged, leading to some sensory and motor problems. Many patients with MS can have speech and vision problems. The vision problems are from damage to the optic nerve that can lead to nystagmus, blurry vision, double vision, etc. Therefore, you can assess this nerve (cranial nerve II) for any type of abnormalities.

Cranial Nerve I

To test cranial nerve I..... olfactory nerve: Have the patient close their eyes and place something with a pleasant smell under the nose and have them identify it.



Cranial Nerve II

To test cranial nerve II.... optic nerve: Perform the confrontation visual field test and visual acuity test with a Snellen chart.

Confrontation Visual Field Test



Assesses peripheral vision:

- Stand arm's length from the patient.
- Cover your left eye, while the patient covers their right eye.
- Have the patient look at your nose (tell the patient NOT to look at your fingers)
- In the top and bottom of the visual field (test it with yours) hold up random numbers with your fingers and have the patient recite them back to you.
- Repeat again with the other eye (cover your right eye while the patient covers their left eye).

Visual Acuity: use a Snellen chart and have the patient wear glasses or contact lenses if they normally wear them



E		arrows/ shutterstock
1	20/200	
F P		
2	20/100	
T O Z		
3	20/70	
L P E D		
4	20/50	
P E C F D		
5	20/40	
E D F C Z P		
6	20/30	
FELOPZD		
7	20/25	
DEFPOTEC		
8	20/20	
LEFODPCT		
9		
FDPLTCEO		
10		
VEZOLCFVE		
11		SUBSCRIPTION

- Have the patient stand 20 feet from the chart

- First the patient will cover the right eye, then the left eye, and lastly read the chart with both eyes.
- Covering the right eye first, have the patient recite the lowest line they can read with ease.
- Repeat this with the left eye and then both eyes.

Results: If the patient can read line 8, their vision is 20/20, which means that the patient can see the same line of letters at 20 feet that a person with normal vision can see at 20 feet. However, let's say the patient can only read line 6 with the left eye, which means the patient has 20/30 in this eye. This means the patient can see at 20 feet what a person with normal vision can see at 30 feet.

Cranial Nerve III, IV, VI

To test cranial nerve III (oculomotor nerve), IV (trochlear), VI (abducens):

- Have the patient follow your pen light by moving it 12-14 inches from the patient's face in the six cardinal fields of gaze (start in the midline)
 - Watch for any **nystagmus** (involuntary movements of the eye)



- **Reactive to light?**
 - Dim the lights and have the patient look at a distant object (this dilates the pupils)
 - Shine the light in from the side of each eye.
 - Note the pupil response: The eye with the light shining in it should constrict (note the dilatation size and response size (ex: pupil size goes from 3 to 1 mm) and the other side should constrict as well.



- **Accommodation?**

- Make the lights normal and have the patient look at a distant object to dilate pupils, and then have the patient stare at the penlight and slowly move it closer to the patient's nose.
 - Watch the pupil response: The pupils should *constrict and equally move to cross*.



If all these findings are normal you can document **PERRLA**.

Cranial Nerve V

To test Cranial Nerve V.... trigeminal nerve: This nerve is responsible for many functions and mastication is one of them.

- Have the patient bite down and feel the masseter muscle and temporal muscle
- Then have the patient try to open the mouth against resistance



Cranial Nerve VII

- **To test cranial nerve VII...facial nerve:** have the patient close their eyes tightly, smile, frown, and puff out his cheek. Can they do this with ease?



Cranial Nerve VIII

To test cranial nerve VIII...vestibulocochlear nerve:

- Test the hearing by occluding one ear and whispering two words and have the patient repeat them back. Repeat this for the other ear.

Cranial Nerve IX and X

To test cranial nerve IX (glossopharyngeal) and X (vagus) have the patient say “ah” ...the uvula will move up (cranial nerve IX intact) and if the patient can swallow with ease and has no hoarseness when talking, cranial nerve X is intact.

Cranial Nerve XI

Test cranial nerve XI.... accessory nerve: Have the patient move the head from side to side and up and down and shrug shoulders against resistance.



Cranial Nerve XII

Test cranial nerve XII.... hypoglossal: have patient stick tongue out and move it side to side



Cranial nerves examination NCLEX Questions

1. There are 14 pairs of cranial nerves.

- ☐ True
- ☐ False

2. The optic nerve is known as cranial nerve X (ten).

- ☐ True
- ☐ False

3. Cranial nerve IV is known as?

- a. Oculomotor
- b. Trigeminal
- c. Hypoglossal
- d. Trochlear

4. The abducens nerve is known as the cranial nerve.

- a. VI
- b. VIII
- c. II
- d. I

5. Vestibulocochlear nerve is known as cranial nerve VIII.

- ☐ True
- ☐ False

6. Cranial nerve X is known as?

- a. Vagus
- b. Accessory
- c. Trochlear
- d. Optic

7. The oculomotor nerve is called the cranial nerve.

- a. IX
- b. IV
- c. III
- d. X

8. Cranial nerve I am called the olfactory nerve.

- ☐ True
- ☐ False

9. Cranial nerve V is known as the facial nerve.

- ☐ True
- ☐ False

10. Hypoglossal nerve is known as the cranial nerve.

- a. XI
- b. II
- c. VIII
- d. XII

11. The facial nerve is called the cranial nerve.

- a. IX
- b. VIII
- c. VII
- d. X

12. Glossopharyngeal is also called the cranial nerve IX.

- ☐ True
- ☐ False

13. Cranial nerve XI is called the optic nerve.

- ☐ True
- ☐ False

14. Which nerve does NOT play a role in swallowing?

- a. Glossopharyngeal
- b. Hypoglossal
- c. Vagus
- d. Olfactory

15. The function of cranial nerve I is?

- a. hearing
- b. moving the eyeballs
- c. sight
- d. smell

16. This cranial nerve arises from the cranial and spinal roots which control swallowing movements and govern the movement of the head and shoulders.

- a. IX
- b. X
- c. XI
- d. VIII

17. Cranial nerve II's function is eyesight.

- ☐ True
- ☐ False

18. This nerve controls the PNS which stimulates contraction and relaxation of the smooth muscle in the GI tract.

- a. X
- b. V
- c. VI
- d. VII

19. Cranial nerve _____ moves the eyeballs/eyelids and adjusts the pupils and lens of the eye.

- a. VII
- b. X
- c. I
- d. III

20. Glossopharyngeal nerve is responsible for?

- a. swallowing and speech
- b. hearing and equilibrium
- c. swallowing, taste, and secreting saliva
- d. none of the options are correct

21. Cranial nerves _____ move the eyeballs.

- a. I, II, III
- b. III, IV, VI
- c. III, V, X
- d. III, IV

22. This is the largest cranial nerve that controls facial muscles, chewing, and facial sensations.

- a. X
- b. IV
- c. VIII
- d. V

23. Tears, saliva, taste, and facial expressions are caused by cranial nerve?

- a. VI
- b. VII
- c. II
- d. I

24. Vestibulocochlear nerve (cranial nerve VIII) is responsible for auditory.

- ☐ True
- ☐ False

25. Cranial nerve X is known as the vagus nerve.

- ☐ True
- ☐ False

Lecture 3: Increased Intracranial Pressure

You will learn the following from this lecture:

- Definition of increased ICP
- Pathophysiology
- Signs and Symptoms
- Nursing Interventions
- Medications
- Treatments

What is increased intracranial pressure?

It's where the pressure inside the skull has increased. This is a medical emergency!

Intracranial pressure is the pressure created by the cerebrospinal fluid and brain tissue/blood within the skull. It can be measured in the lateral ventricles.

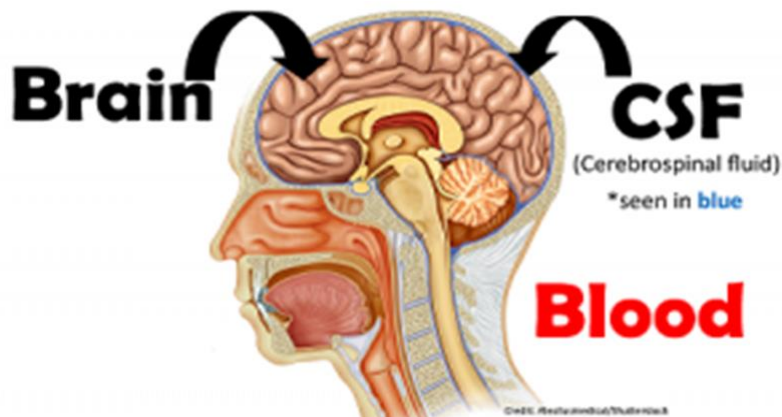
What is a normal ICP: 5-15 mmHg (>20 mmHg...needs treatment)

Pathophysiology of Increased Intracranial Pressure

The skull is very hard and is limited on how much it can expand when something inside the skull experiences a change that leads to increased pressure.

Inside the skull are **three structures** that can alter intracranial pressure:

- **brain**
- **cerebrospinal fluid (CSF)**
- **blood**



To understand the patho of increased intracranial pressure, you must understand the Monro-Kellie hypothesis. It deals with how ICP is affected by CSF, the brain's blood, and tissue and how these structures work to maintain **cerebral perfusion pressure (CPP)**.

In a nutshell, this hypothesis says that if the volume of **one of these structures increases**, the others must **decrease their volume** to help *alleviate pressure*. When there is an increase in intracranial pressure, the body can temporarily compensate for it by shifting CSF to other areas of the brain or spinal cord (or decreasing its production) and altering blood volume going to the brain through vasoconstriction, but if the **pressure is continuous, it is unable to compensate**.

Intracranial pressure fluctuates and this can depend on many factors like:

- person's body temperature
- oxygenation status, especially CO₂ and O₂ levels
- body position
- arterial and venous pressure
- anything that increases intra-abdominal or thoracic pressure (vomiting, bearing down, etc.)

For the brain to receive proper nutrients to work it must receive a certain amount of cerebral blood flow. This is the amount of blood flowing to the brain's tissue. It does this by altering the cerebral perfusion pressure via vasoconstriction or vasodilation. For example, if carbon dioxide levels are abnormally high (>45) vasodilation occurs, which allows more blood volume to enter the brain. However, this is not good if a patient has increased ICP because this will further increase the ICP.

Cerebral perfusion pressure can become compromised during increased intracranial pressure. Therefore, there must be sufficient cerebral perfusion pressure so that the brain is properly maintained.

What is a normal CPP? **60-100 mmHg**

NOTE: When CPP falls too low the brain is not perfused and brain tissue dies. If the patient's mean arterial pressure (MAP) starts to fall to the patient's ICP, then the cerebral perfusion pressure will drop. Therefore, maintaining a sufficient MAP is essential.

So How is CPP calculated?

Equation: **CPP = MAP - ICP**

You need to know the following:

BP: 90/42

ICP: 19

First, the MAP must be calculated:

MAP = Diastolic BP x 2 + SBP divided by 3

42 x 2 = 84

84 + 90 = 174 divided by 3 = 58 (MAP)

58 - 19 = **CPP 39**.... very low...normal 60-100 mmHg

What can cause **increased pressure** within the skull that leads to increased intracranial pressure?

- **injury** (head trauma)
- **increased in cerebrospinal fluid**
- **hemorrhage** (hemorrhagic stroke...aneurysm bursts)
- **hematoma** (subdural and epidural...bleeding in between structures in the brain)

- **hydrocephalus:** the buildup of CSF in the brain...normally flows through the brain and spinal cord and enters the bloodstream (blocked, too much is made)
- **tumor:** putting pressure on the brain
- **encephalitis** (inflammation of brain tissue) or **meningitis** (inflammation of the membrane covering the spinal cord and brain)

What happens with increased intracranial pressure? Limited cerebral blood flow due to decreased cerebral perfusion from building pressure in the brain. The brain is getting squeezed and this leads to ischemia. All of this can lead to swelling and edema, which will eventually (if not treated) lead to herniation or displacement of the brain. The displacement of the brain can compress important areas of the brain like the brain stem (specifically medulla and vagus nerve).

When CPP falls too low the **body tries to increase systolic blood pressure to make more blood go to the brain, but *this makes things worst!!*** During this time the arteries will start to dilate because of the retention of carbon dioxide. This causes more blood to flow to the brain but compresses veins and limits blood flow to the heart. Hence, leading to more swelling and even more ICP. As all this progresses the patient's signs and symptoms will start to become worst. Therefore, it is essential to know the **EARLIEST** signs and symptoms (mental status changes) of increased ICP.

Signs and Symptoms of Increased ICP

“Mind Crushed”

Mental Status Changes ***Very earliest!! remember this for the exam!! (Restless, confused, problems performing normal movements and responding to questions)

Irregular breathing (slowdown of respirations and irregular...**Cheyne stokes**...hyperventilation then apnea cyclic) ***late**

Nerve changes to the optic and oculomotor nerve: double vision, swelling of the optic nerve (**papilledema**), pupil changes (decreased, increased, or unequal size), abnormal doll's eyes: oculocephalic reflex...in an unconscious patient open the eyes and move the head from side to side....if eyes don't move in the opposite direction but stay fixed in a mid-line position this is a very bad sign....indicates brain stem damage

Decerebrate or **decorticate** posturing or flaccid

- **Decorticate** (flexor posturing): brings upper extremities to the **core** of the body (middle)
 - adduction and flexion of arms, leg rotated internally, feet flexed



- **Decerebrate**: (Extension posturing): extends upper extremities from the body ***worst of the two** (remember all the E's in decerebrate and think EXTEND arms)
 - adduction and extension of arms with pronation, and feet flexed



Cushing's Triad: **LATE SIGN...herniation of the brain stem**

- **Increased systolic blood pressure (widening pulse pressure: increase in SBP and decrease in DBP), decreased heart rate, and abnormal breathing**
- Increased SBP (due to the body trying to get more blood to the brain...thinks it's helping)
- Baroreceptor reflex (parasympathetic response by dropping the heart rate to decrease the blood pressure and there may be compression of the vagus nerve due to compression from the swelling in the brain ->
- The compression on the medulla of the brain leads to abnormal respirations Cheyne-stokes

Reflex positive Babinski (toe fan out...abnormal)

Unconscious **LATE**

Seizures

Headache

Emesis (vomiting) without nausea projectile

Deterioration of motor function (hemiplegia)...weakness on one side of the body

Nursing Interventions for Increased Intracranial Pressure

Focus on preventing further increase ICP and monitoring ICP (if monitoring device inserted)

"PRESSURE"

Position the head of the bed: 30 to 45 degrees (helps blood return to the heart), proper alignment of the head (midline) **NO flexion** of neck (decreases venous return) or hips (increases intra-abdominal/thoracic pressure) ...watching moving around in bed

Respiratory: **Prevent HYPOXIA and HYPERCAPNIA!** When blood oxygen levels drop or carbon dioxide levels increase, vasodilation occurs, and this increases intracranial pressure.

- monitor blood gases, oxygen level, suctioning as needed only (no longer than 15 seconds...increase ICP) hyper oxygenated before and after
- mechanical ventilation to keep PaCO₂ low 30-35 **WHY?** Vasoconstriction helps decrease ICP by decreasing blood flow.... keeping the PEEP low...increases intrathoracic pressure

Elevated temperature **PREVENT this!**

- Monitor temperature
 - If the patient is unconscious best to take the tympanic, temporal or rectal route **NOT** orally or axillary....

- Why is there a risk for hyperthermia? The patient may have damage to the hypothalamus, infection, dehydration, etc.... a high temp. increases ICP, cerebral blood flow, and metabolic needs of the patient
- Can give antipyretics per MD order, remove extra blankets, decrease room temperature, cool baths...**prevent shivering (increases metabolic needs and ICP)**

Systems to monitor: Glasgow Coma Scale

- neuro checks per protocol
- **ventriculostomy** (external ventricular drain): monitors ICP. It's a catheter inserted in the lateral ventricle area to assess ICP and drains CSF during increased pressure readings.
 - monitor for **ICP levels greater than 20 mmHg and report to MD....** patients with increased ICP are not a candidate for lumbar puncture.... risk of brain herniation.

Straining activities AVOIDED: vomiting, coughing, sneezing, Valsalva, agitation (keep the environment calm), avoiding restraints as necessary

Unconscious patient care: avoid over-sedating with narcotics or sedatives, lung sounds, and suction as needed, immobile (skin breakdown, monitor nutrition, at risk for renal stones, constipation, passive range of motion with extremities) nutrition, eye care with solutions and ointments, maintain GI tubes for feeding (monitor residuals.... poor gastric emptying more than 100 ml), blood clot formation (SCDs, passive range of motion), talk to the patient as you would a conscious patient

Rx: Barbiturates: to help decrease brain metabolism and BP which in turn decreases ICP, Vasopressors/IV fluids or antihypertensive to maintain SBP greater than 90 but less than 150, anticonvulsants meds, hyperosmotic drugs (leads to the next point of edema management)

Edema management: dehydrating the brain (must be done carefully...watching blood pressure and renal function)

Mannitol: it's a concentrated type of sugar

When this drug enters the blood, it is very concentrated and draws water pooling in the brain back into the blood.

This type of diuretic is filtered through the glomerulus and not reabsorbed through the renal tubules, and because of this, it creates an osmotic pressure that will pull water and electrolytes (sodium, chloride) from the blood (won't be reabsorbed) and be excreted out.

Watch for fluid overload (water intoxication) and depletion.

FVO: signs and symptoms of heart failure, pulmonary edema (lung and heart sounds)

- monitor renal function, UOP, electrolytes
- not for patients with cerebral hemorrhage or anuria (no urine output)
- patient will report dry mouth and thirst...provide mouth care

watch fluids (IV, oral), UOP, I and O's (retention of urine?)

More edema management meds may be ordered:

loop diuretics to remove fluid from the brain and maintain a negative fluid balance....
corticosteroids

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Increased Intracranial Pressure (ICP) NCLEX Questions

- 1. Select the main structures below that play a role in altering intracranial pressure:**
 - a. Brain
 - b. Neurons
 - c. Cerebrospinal Fluid
 - d. Blood
 - e. Periosteum
 - f. Dura mater
- 2. The Monro-Kellie hypothesis explains the compensatory relationship among the structures in the skull that play a role in intracranial pressure. Which of the following are NOT compensatory mechanisms performed by the body to decrease intracranial pressure naturally? Select all that apply:**
 - a. Shifting cerebrospinal fluid to other areas of the brain and spinal cord
 - b. Vasodilation of cerebral vessels
 - c. Decreasing cerebrospinal fluid production
 - d. Leaking proteins into the brain barrier
- 3. A patient is being treated for increased intracranial pressure. Which activities below should the patient avoid performing?**
 - a. Coughing
 - b. Sneezing
 - c. Talking
 - d. Valsalva maneuver
 - e. Vomiting
 - f. Keeping the head of the bed between 30- 35 degrees
- 4. A patient is experiencing hyperventilation and has a PaCO₂ level of 52. The patient has an ICP of 20 mmHg. As the nurse, you know that the PaCO₂ level will?**
 - a. cause vasoconstriction and decrease the ICP
 - b. promote diuresis and decrease the ICP
 - c. cause vasodilation and increase the ICP
 - d. cause vasodilation and decrease the ICP
- 5. You're providing education to a group of nursing students about ICP. You explain that when cerebral perfusion pressure falls too low the brain is not properly perfused**

and brain tissue dies. A student asks, “What is a normal cerebral perfusion pressure level?” Your response is:

- a. 5-15 mmHg
- b. 60-100 mmHg
- c. 30-45 mmHg
- d. >160 mmHg

6. Which patient below is at MOST risk for increased intracranial pressure?

- a. A patient who is experiencing severe hypotension.
- b. A patient who is admitted with a traumatic brain injury.
- c. A patient who recently experienced a myocardial infarction.
- d. A patient post-op from eye surgery.

7. A patient with increased ICP has the following vital signs: blood pressure 99/60, HR 65, Temperature 101.6 °F, respirations 14, and oxygen saturation of 95%. ICP reading is 21 mmHg. Based on these findings you would?

- a. Administered PRN dose of a vasopressor
- b. Administer 2 L of oxygen
- c. Remove extra blankets and give the patient a cool bath
- d. Perform suctioning

8. A patient has a ventriculostomy. Which finding would you immediately report to the doctor?

- a. Temperature 98.4 °F
- b. CPP 70 mmHg
- c. ICP 24 mmHg
- d. PaCO₂ 35

9. External ventricular drains monitor ICP and are inserted where?

- a. Subarachnoid space
- b. Lateral Ventricle
- c. Epidural space
- d. Right Ventricle

10. Which of the following is contraindicated in a patient with increased ICP?

- a. Lumbar puncture
- b. Midline position of the head
- c. Hyperosmotic diuretics
- d. Barbiturates medications

11. You’re collecting vital signs on a patient with ICP. The patient has a Glasgow Coma Scale rating of 4. How will you assess the patient’s temperature?

- a. Rectal
- b. Oral
- c. Axillary

12. A patient who experienced a cerebral hemorrhage is at risk for developing increased ICP. Which sign and symptom below is the EARLIEST indicator the patient is having this complication?

- a. Bradycardia

- b. Decerebrate posturing
- c. Restlessness
- d. Unequal pupil size

13. Select all the signs and symptoms that occur with increased ICP:

- a. Decorticate posturing
- b. Tachycardia
- c. Decrease in pulse pressure
- d. Cheyne-stokes
- e. Hemiplegia
- f. Decerebrate posturing

14. You're maintaining an external ventricular drain. The ICP readings should be?

- a. 5 to 15 mmHg
- b. 20 to 35 mmHg
- c. 60 to 100 mmHg
- d. 5 to 25 mmHg

15. Which patient below with ICP is experiencing Cushing's Triad? A patient with the following:

- a. BP 150/112, HR 110, RR 8
- b. BP 90/60, HR 80, RR 22
- c. BP 200/60, HR 50, RR 8
- d. BP 80/40, HR 49, RR 12

16. The patient has a blood pressure of 130/88 and ICP reading of 12. What is the patient's cerebral perfusion pressure, and how do you interpret this as the nurse?

- a. 90 mmHg, normal
- b. 62 mmHg, abnormal
- c. 36 mmHg, abnormal
- d. 56 mmHg, normal

17. According to question 16, the patient's blood pressure is 130/88. What is the patient's mean arterial pressure (MAP)?

- a. 42
- b. 74
- c. 102
- d. 88

18. During the assessment of a patient with increased ICP, you note that the patient's arms are extended straight out and toes pointed downward. You will document this as:

- a. Decorticate posturing
- b. Decerebrate posturing
- c. Flaccid posturing

19. While positioning a patient in bed with increased ICP, it important to avoid?

- a. Midline positioning of the head
- b. Placing the HOB at 30-35 degrees
- c. Preventing flexion of the neck
- d. Flexion of the hips

20. During the eye assessment of a patient with increased ICP, you need to assess the oculoccephalic reflex. If the patient has brain stem damage, what response will you find?

- a. The eyes will roll down as the head is moved side to side.
- b. The eyes will move in the opposite direction as the head is moved side to side.
- c. The eyes will roll back as the head is moved side to side.
- d. The eyes will be in a fixed mid-line position as the head is moved side to side.

21. A patient is receiving Mannitol for increased ICP. Which statement is INCORRECT about this medication?

- a. Mannitol will remove water from the brain and place it in the blood to be removed from the body.
- b. Mannitol will cause water and electrolyte reabsorption in the renal tubules.
- c. When a patient receives Mannitol, the nurse must monitor the patient for both fluid volume overload and depletion.
- d. Mannitol is not for patients who are experiencing anuria.

22. What assessment finding requires immediate intervention if found while a patient is receiving Mannitol?

- a. An ICP of 10 mmHg
- b. Crackles throughout lung fields
- c. BP 110/72
- d. Patient complains of dry mouth and thirst.

Lecture 4: Glasgow Coma Scale (GCS) Assessment Nursing

The Glasgow Coma Scale (GCS) is used to assess a patient's level of consciousness. Level of consciousness is how alert and responsive a patient is to their environment and stimuli around them.

The Glasgow Coma Scale is a very helpful tool for evaluating a patient who has experienced a traumatic brain injury or other conditions where brain function or consciousness is altered. To assess the GCS a baseline score should be obtained, and then it should be reassessed often through the nursing shift per the facility's protocol to assess if the patient is improving, staying the same, or deteriorating.

It's important to note that assessing a patient's level of consciousness is very important because any changes in it could indicate something serious is happening to the patient and it needs to be investigated.

What does the Glasgow Coma Scale Assess?

The GCS scale assesses THREE responses by the patient to a type of *stimuli*.

These *three responses* are: **Eye-opening response, Verbal response, Motor response**

Stimuli used during the assessment can range from verbal or audible stimuli to painful/pressure stimuli.

There are two types of painful/pressure stimuli that can be used to achieve a response in a patient. These types include central and peripheral stimuli

Central stimuli: pressure or pain is applied to the center of the body (hence its core) to create pain. This tests the brain's response to it.

- Used first is the **trapezius squeeze**



- To do this: use the index finger and thumb and squeeze 1 ½ to 2 inches of this trapezius muscle.
 - Start with slight pressure and then increase the pressure for up to 10 seconds... **note the patient's motor movement**
- No response...move to the **supraorbital pressure**:



- Find the notch under the inner part of the eyebrow
 - Apply pressure to this notch with the thumb and gradually increase pressure for up to 10 seconds.... **note the patient's motor movement**
- Sternal rub is no longer recommended because it can cause bruising (*BMJ case reports, 2014*).

Peripheral stimuli: pressure or pain is applied to a peripheral extremity like the fingernail bed to create pain. This tests the spinal cord's response to pain.



GCS Scoring

Glasgow Coma Scale scores can range from **3 to 15**.

As pointed out above this scale is useful with patient's who've sustained a head/brain injury. The score can be used to describe the injury.

3-8: severe brain injury

9-12: moderate brain injury

13-15: mild brain injury

*A GCS is never higher than 15 or lower than 3....the higher the score the better for the patient.

GCS 15: fully alert and awake

GCS 8 or less: the patient is in a coma and requires intubation due to the inability of airway reflexes that protect us from aspiration to work

GCS 3: lowest score possible and very high death rate...deep coma, severe brain injury

Each response category of the GCS has its own points, which are added up to give the total GCS. A total GCS score is obtained from adding up all the responses. Now the overall score is important but so are the subscores. The subscores are the scores from each of the three responses.

For example, you may see a Glasgow Coma Scale score reported like GCS 7 (E2 V2 M3).

GCS 7 is the total score, while E2 V2 M3 are the subscores that describe each patient response category of the scale.

Before Assessing the GCS....



Eye Swelling affects Eye-opening response *credit: PAPA WOR/shutterstock.com*

Before conducting the assessment, see the patient's baseline scores and if they have anything that would affect their response to stimuli or make testing a specific response category (eye-opening, verbal, motor) more difficult.

Examples of this would include that the patient is: *sedated, hard of hearing, has mental deficits, is paralyzed, intubated, has an injury to bones, swelling, etc.*



Intubation affects the verbal response

For example, let's say the patient is intubated. Well, it will be hard to get a verbal response out of the patient because they have a tube in their throat, so you can't test this response category. Therefore, this part would be labeled NT for not being testable. Note: you would not give them 1 point (no response) because you can't test it and don't know if they could respond verbally if they could.

So, the GCS may look like this GCS 7T (E3 Vt M4). This tells us the overall score is 7 but the patient is intubated (capital T tells us this).

Glasgow Coma Scale in Detail

To help you remember what to assess and how to score it while you're at the bedside remember **EVM = 4,5,6**

E: Eye-opening response: patient can receive a max of 4 points and a minimum of 1 in this part of the scale rating. Therefore, the patient can be assigned either 1,2,3, 4, or NT (non-testable)

4 Points: eyes spontaneously open (walk to the bedside and just look at the patient... are the eyes open?)

3 Points: eyes open to sound, speak in a tone that is loud and clear to be heard (note if the patient has hearing difficulties before attempting or injuries that can prevent hearing clearly)

2 Points: eyes open to pressure applied to the nail bed (use an object like a pen light or pen to gradually increase pressure on the nail bed for up to 10 seconds.... note eye-opening response)

1 Point: no response to any of the above stimuli

*NT: example...eye swelling or an injury that prevents the eyes from opening

V: Verbal response: patient can receive a max of 5 points and a minimum of 1 point or NT (non-testable). Therefore, the patient can be assigned either 1, 2, 3, 4, 5, or NT (non-testable)

5 Points: oriented (ask a series of questions: can you state your name, month and year, where you are at?)

4 Points: confused (answers the questions but with incorrect answers...example they are in the hospital, but they say at home, or they give an incorrect year or name)

3 Points: inappropriate words (says random words that don't make sense to the questions)

2 Points: makes only sounds but no words to the questions

1 Point: no response

*NT: example...patient is intubated

M: Motor response: patient can receive a max of 6 points or a minimum of 1 point or NT (non-testable). Therefore, the patient can be assigned either 1, 2, 3, 4, 5, 6, or NT (non-testable)

6 Points: obeys a motor command (tell the patient to do something that requires two steps.... open your mouth and stick out your tongue or lift your hands and squeeze my fingers and let go)

If the patient doesn't obey a verbal stimulus to perform a motor command, use a central pressure stimulus by using the trapezius muscle squeeze. If no response, use supraorbital pressure.

5 Points: Localizes the pressure/pain (the brain will try to locate and remove the painful stimulus)



- When stimuli is applied (example: trapezius squeeze) the patient bends the elbow (elbow flexion) and moves the arm and hand up above the collar bone trying to remove the pain/pressure. With this movement, the patient is trying to LOCATE (hence localizes) the pressure/pain.

4 Points: Withdrawal (also called normal flexion) ...the brain will try to withdraw from the painful stimulus



- When stimuli is applied (example: trapezius squeeze) the patient flexes and hence bends the elbow (elbow flexion) but quickly withdraws it. The hand and arm **never** make it up to the stimuli or up to the collar bone (so the patient doesn't locate the pain but withdraws from it).

3 Points: Abnormal flexion (decorticate posturing) remember “COR” from the word decorticate



- When stimuli is applied (example: trapezius squeeze) the patient flexes hence bends the elbow **gradually** and moves the arm to the center (hence CORE) of the body with pronation of the forearm and flexion of the wrist and the hands will turn into fists. There won't be the withdrawal from the stimuli like in the previous response. This is NOT a good finding and means the cortex is affected.

2 Points: Extension (decerebrate posturing): Remember all the “e” in decerebrate for Extension.



- When stimuli is applied (for example trapezius squeeze) the patient will extend the arm at the elbow with internal rotation of the arm. This is the worst type of posturing and is not a good sign. It indicates the brainstem is affected.

1 Point: no response

*NT: example...patient on sedation and paralyzed

Let's Practice:

You find the following in your patient:

Eyes open only when pressure is applied to the nail bed, the patient makes only sounds and no words to the questions, and the patient can't obey a verbal motor command but when you apply a trapezius squeeze the patient bends the elbow and moves the arm and hand up above the collar bone trying to remove the pain/pressure.

Answer: GCS 9 (E2 V2 M5)

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Glasgow Coma Scale (GCS) NCLEX Questions

1. The Glasgow Coma Scale (GCS) assesses what areas of response to stimuli? Select all that apply:

- a. Auditory response
- b. Verbal response
- c. Tactile response
- d. Eye-opening response
- e. Motor response

2. During the Glasgow Coma Scale (GCS) assessment the nurse applies a central painful stimulus to test the best motor response. Which of the following is NOT this type of stimulus?

- a. Trapezius squeeze
- b. Fingernail bed pressure
- c. Supraorbital pressure

3. A patient has experienced a brain injury. You note that written in the progress notes the physician says the patient has a GCS 10 (E3 V3 M4). What is the level of brain injury in this patient?

- a. Mild brain injury
- b. Moderate brain injury
- c. Severe brain injury

4. What Glasgow Coma Scale score usually requires intubation because the airway reflexes are affected?

- a. 10 or less

- b. 9 or greater
- c. 8 or less
- d. 10 or greater

5. True or False: The nurse is assessing the Glasgow Coma Scale in a patient, but is unable to assess the best verbal response due to intubation. Therefore, the nurse should be assigned 1 point for the best verbal response.

6. A patient with a traumatic brain injury has sustained multiple fractures to the face and eyes. When testing the best motor response, the nurse notes the patient is unable to perform a motor command based on a verbal stimulus. The nurse attempts to use a pressure stimulus to test the motor response. What type of pressure or painful stimuli should the nurse avoid in this patient?

- a. Fingernail bed pressure
- b. Trapezius squeeze
- c. Supraorbital pressure
- d. Toenail bed pressure

7. You're assessing a patient's Glasgow Coma Scale at the bedside. What is the patient's score based on these findings: when you arrive at the patient's bedside the patient is looking around, the patient tells you they are at a concert hall and the year is 1960 (it is 2022) but they state their correct name, and they are open to successfully open their mouth and stick out their tongue.

- a. GCS 14 (E4 V4 M6)
- b. GCS 11 (E3 V3 M5)
- c. GCS 15 (E4 V5 M6)
- d. GCS 13 (E4 V3 M6)

8. You're assessing a patient's Glasgow Coma Scale at the bedside. What is the patient's score based on these findings: when you arrive to the patient's bedside the patient's eyes are closed, but they open when you speak to the patient, the patient doesn't respond appropriately to questions asked and says words that don't make sense. In addition, the patient can't obey a motor command. Therefore, when you apply a central stimulus, the patient moves to locate and remove the stimulus.

- a. GCS 12 (E3 V4 M5)
- b. GCS 8 (E2 V4 M2)
- c. GCS 11 (E3 V3 M5)
- d. GCS 10 (E3 V3 M4)

9. You're assessing a patient's Glasgow Coma Scale at the bedside. What is the patient's score based on these findings: when you arrive to the patient's bedside the patient's eyes are closed but they open when you speak to the patient. The nurse cannot assess the best verbal response because the patient is intubated. In addition, the patient can't obey a motor command. Therefore, when you apply a central stimulus the patient flexes to withdraw from the stimulus.

- a. GCS 8 (E3 V1 M4)
- b. GCS 7T (E3 Vt M4)
- c. GCS 9 (E3 V1 M5)
- d. GCS 6T (E3 Vt M3)

10. You're assessing a patient's Glasgow Coma Scale at the bedside. What is the patient's score based on these findings: when you arrive at the patient's bedside the patient's eyes are closed and don't open when spoken to. The nurse applies a peripheral painful stimulus, and the patient's eyes open. When asked questions the patient groans and moans noises. In addition, the patient can't obey a motor command. Therefore, when you apply a central stimulus the patient flexes to withdraw from the stimulus.

- a. GCS 12 (E3 V4 M5)
- b. GCS 8 (E2 V4 M2)
- c. GCS 8 (E2 V2 M4)
- d. GCS 10 (E3 V3 M4)

Lecture 5: Meningitis

Meningitis is one of the infectious disorders of the nervous system.

Meningitis is an inflammation of the lining around the brain and spinal cord caused by bacteria or viruses. Bacterial meningitis is caused by bacteria.

Meningitis can be the primary reason a patient is hospitalized or can develop during hospitalization.

Pathophysiology

Meningeal infections generally originate in two ways: through the bloodstream or direct spread.

- **Transmission.** *N. meningitides* concentrates in the nasopharynx and is transmitted by secretion or aerosol contamination.
- **Entry.** One of the causative organisms enters the bloodstream, it crosses the blood-brain barrier and proliferates in the cerebrospinal fluid.
- **Stimulation.** The host immune system stimulates the release of cell wall fragments and lipopolysaccharides, facilitating inflammation of the subarachnoid and pia mater.
- **Increased ICP.** Because the cranial vault contains little room for expansion, the inflammation may cause increased intracranial pressure.
- **Circulation.** CSF circulates through the subarachnoid space, where inflammatory cellular materials from the affected meningeal tissue enter and accumulate.

Causes

Factors that may cause bacterial meningitis include:

- **Tobacco use.** Tobacco use predisposes the patient to meningitis.
- **Viral upper respiratory infection.** Viral upper respiratory infection increases the amount of droplet production.
- **Otitis media.** Otitis media increase the risk of bacterial meningitis because the bacteria can cross the epithelial membrane and enter the subarachnoid space.
- **Immune system deficiency.** People with immune system deficiencies are also at greater risk for the development of bacterial meningitis.
- **Bacteria.** The bacteria *Streptococcus pneumoniae* and *Neisseria meningitides* are responsible for 80% of cases of meningitis in adults, as well as *Haemophilus influenza* in children.

Clinical Manifestations

1. **Headache.** The headache is usually steady or throbbing and very severe as a result of meningeal irritation.
2. **Neck mobility.** A stiff and painful neck can be an early sign and any attempts at flexion of the head are difficult.
3. **Positive Kernig's sign.** When the patient is lying with the thigh flexed on the abdomen, the leg cannot be completely extended.
4. **Positive Brudzinski's sign.** When the patient's neck is flexed, flexion of the knees and hips is produced; when the lower extremity of one side is passively flexed, a similar movement is seen in the opposite extremity.
5. **Photophobia.** Extreme sensitivity to light is a common finding.
6. **Skin lesions.** Skin lesions develop, ranging from a petechial rash with purpuric lesions to large areas of ecchymosis.
7. **Cognitive impairment.** Disorientation and memory impairment are common early in the course of the illness.
8. **Seizures.** Seizures can occur and are the result of areas of irritability in the brain.

Prevention

The prevention of bacterial meningitis includes:

1. **Vaccine.** The Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention (CDC) recommends that the meningococcal conjugated vaccine be given to adolescents entering high school and to college freshmen living in dormitories.
2. **Health education.** Most states mandate education addressing meningococcal meningitis.
3. **Antimicrobial prophylaxis.** People in close contact with patients with meningococcal meningitis should be treated with antimicrobial chemoprophylaxis using rifampin, ciprofloxacin, or ceftriaxone sodium.

Complications

Complications of patients with bacterial meningitis include:

1. **Visual impairment.** Infection may spread towards the eyes if left untreated.
2. **Deafness.** Deafness may also occur when the bacteria reach the optic nerve.
3. **Seizures.** The bacteria irritate the meningeal layers and may lead to seizures.

Assessment and Diagnostic Findings

If the clinical presentation suggests meningitis, diagnostic testing is conducted to identify the causative organism.

Computed tomography (CT) scan or magnetic resonance imaging (MRI) scan

to detect a shift in brain contents (which may lead to herniation) prior to a lumbar puncture.

Key diagnostic tests: bacterial culture and Gram staining of CSF and blood.

Diagnosis is made by lumbar puncture. The CSF is cloudy. Gram stain of the CSF reveals organisms in 70% to 80% of all cases. When the organisms cannot be identified, bacterial antigens can be determined. H. influenzae is frequently detected with this technique. Clients with bacterial meningitis demonstrate the following:

- Moderately elevated CSF pressures
- Elevated CSF protein level (normal, 15 to 45 mg/dl)

- Decreased CSF glucose level (normal, 60 to 80 mg/dl, or two thirds of the serum glucose value)
- Elevated white blood cell count, usually increased (100 to 10, 000/cm³), with predominantly polymorphonuclear leukocytes.
- Medical diagnosis is made by assessment of clinical manifestations and is confirmed by isolating the causative organism from the CSF.

Medical Management

Bacterial meningitis constitutes a medical emergency. Prognosis varies according to the causative organism. The use of antibiotics has reduced the death rate to less than 5% for all types of bacterial meningitis. If untreated, it can be fatal within hours to days. Deaths most often occur in newborn infants and in older adults. Complications are rare but may include septic shock, vasomotor collapse, seizures, and increased ICP attributable to hydrocephalus, brain swelling, and fluid overload. Residual neurologic deficits are rare in adults.

A unique problem in treating CNS infection is that [highlight]an intact blood-brain barrier prevents complete penetration of the antibiotic[/highlight]. However, inflammation inhibits the blood-brain barrier, so for short time antibiotics penetrate the CNS. Antibiotics are given intravenously; the blood-brain barrier recovers as inflammation subsides, and high doses are required to reach the CSF.

- **Adequate fluid and electrolyte balance must be maintained.** Frequent assessment of the neurologic status is indicated to detect early manifestations of increasing ICP and seizures. Anticonvulsants may be prescribed for seizure prevention.
- **Antibiotic therapy.** Early administration of an antibiotic that crosses the blood brain barrier into the subarachnoid space in sufficient concentration to halt the multiplication of bacteria like Vancomycin administered intravenously.
- **Corticosteroids.** Dexamethasone has been shown to be beneficial as adjunct therapy in the treatment of bacterial meningitis if it is administered 15 to 20 minutes before the first dose of antibiotic and every 6 hours for the next 4 days.
- **Fluid volume expanders.** Dehydration and shock are treated with fluid volume expanders.

Nursing Management

The patient with meningitis is critically ill; therefore, many of the nursing interventions are collaborative with the physician, respiratory therapist, and other members of the healthcare team.

Nursing Assessment

Assessment of the patient with bacterial meningitis include.

- **Neurologic status.** Neurologic status and vital signs are continually assessed.
- **Pulse oximetry and arterial blood gas values.** These values are used to quickly identify the need for respiratory support.

Nursing Diagnosis

- Based on the assessment data, major nursing diagnoses include:
- Risk for Infection Transmission related to the contagious nature of the organism
- Acute Pain related to headache, fever, neck pain secondary to meningeal irritation
- Acute Pain related to nuchal rigidity, muscle aches, immobility and increased sensitivity to external stimuli secondary to infectious process

- Impaired Physical Mobility related to intravenous infusion, nuchal rigidity and restraining devices
- Activity Intolerance related to fatigue and malaise secondary to infection
- Risk for Impaired Skin Integrity related to immobility, dehydration, and diaphoresis
- Risk for Injury related to restlessness and disorientation secondary to meningeal irritation
- Interrupted Family Process related to critical nature of situation and uncertain prognosis
- Anxiety related to treatment and risk of death
- Risk for Ineffective Therapeutic Regimen Management

Nursing Care Planning & Goals

Goals for a patient with bacterial meningitis include:

1. Protection against injury.
2. Prevention of infection.
3. Restoring normal cognitive functions.
4. Prevention of complications.

Nursing Interventions

Important components of nursing care include the following measures:

- **Assess neurologic status and vital signs constantly.** Determine oxygenation from arterial blood gas values and pulse oximetry.
- **Insert cuffed endotracheal tube** (or tracheostomy), and position patient on mechanical ventilation as prescribed.
- **Assess blood pressure** (usually monitored using an arterial line) for incipient shock, which precedes cardiac or respiratory failure.
- **Rapid IV fluid replacement may be prescribed**, but take care not to overhydrate patient because of risk of cerebral edema.
- **Reduce high fever to decrease** load on heart and brain from oxygen demands.
- **Protect the patient from injury** secondary to seizure activity or altered level of consciousness (LOC).
- **Monitor daily body weight**; serum electrolytes; and urine volume, specific gravity, and osmolality, especially if syndrome of inappropriate antidiuretic hormone (SIADH) is suspected.
- **Prevent complications associated with immobility**, such as pressure ulcers and pneumonia.
- **Institute infection control precautions until 24 hours** after initiation of antibiotic therapy (oral and nasal discharge is considered infectious).
- **Inform family about patient's condition** and permit family to see patient at appropriate intervals.

Evaluation

Expected patient outcomes include:

- Avoidance of injury.
- Avoidance of infection.
- Restoration of normal cognitive functions.
- Prevention of complications.

Discharge and Home Care Guidelines

After hospitalization, the patient at home should:

- **Activities.** Alternate rest and activity to conserve energy.
- **Diet.** Consume safe, clean, and healthy foods.
- **Asepsis.** Promote simple infection control procedures at home.
- **Infectious process.** Identify signs and symptoms of an infectious process and report to the physician promptly.

Meningitis NCLEX practice questions.

1. Identify the bacteria not associated with the cause of bacterial meningitis:

- a. Cryptococcus neoformans.
- b. Haemophilus influenzae.
- c. Neisseria meningitidis.
- d. Streptococcus pneumoniae.

2. The most severe form of meningitis is considered to be:

- a. Bacterial.
- b. Aseptic.
- c. Septic.
- d. Viral.

3. Bacterial meningitis alters intracranial physiology, causing:

- a. Cerebral edema.
- b. Increased permeability of the blood-brain barrier.
- c. Raised intracranial pressure.
- d. All of the above changes.

4. During assessment, the nurse knows that well-recognized signs common to all types of meningitis include:

- a. Positive Kernig's sign.
- b. Positive Brudzinski's sign.
- c. Photophobia.
- d. Negative Kernig's sign.

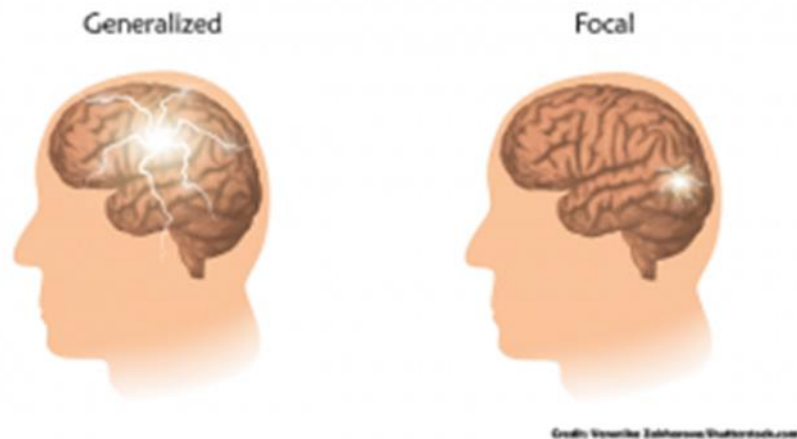
5. One of the recommended antibiotics for patients with bacterial meningitis that could cross the blood brain barrier is:

- a. Penicillin.
- b. Vancomycin.
- c. Ciprofloxacin.
- d. All of the above.

Lecture 6: Seizures

What are seizures? Seizures occur when **abnormal electrical signals** are being rapidly fired for neurons in the brain. This can happen throughout the brain affecting both sides (**generalized seizure**) or being in a specific area of the brain (**partial or focal seizure**).

Types of Seizures



Seizures can occur in anyone (children and adults) due to a severe acute condition, such as a high fever, illness (especially central nervous system types like bacterial meningitis), hypoglycemia, acid-base imbalances like acidosis, alcohol withdraw, brain tumor etc. Once the condition is corrected the seizures tend to stop.

However, some patients can experience **epilepsy**. Epilepsy is where the patient has frequent seizures due to a chronic condition of some type like congenital brain defect, **stroke**, traumatic brain injury, long-lasting effects of an infection etc.

Simplified Patho of Seizures

In the brain, our neurons are tasked with handling and transmitting information. There are two types of neurons I want to discuss. These **are excitatory and inhibitory neurons**.

Just like their name says, **excitatory neurons** produce “**an action**” or cause “**excitement**” by releasing a neurotransmitter called **glutamate** (this is an excitatory neurotransmitter).

Inhibitory neurons “**stop an action**” or cause inhibition by releasing an inhibitory neurotransmitter called **GABA**.

***For seizure activity not to occur in a healthy brain, there needs to be a **proper balance** between these two types of neurons. If there is an imbalance of excitatory neurons vs. inhibitory neurons seizures will occur. For example, if there is not enough GABA (remember this is the inhibitory neurotransmitter) being released, too much excitation will occur leading to seizure activity.

The reason I cover this is to help you understand how some of the anti-seizure drugs work to treat seizures. For instance, **barbiturates stimulate GABA receptors** which help control excitation and decreases seizure activity (more about medications below).

Types of Seizures

****remember these types for exams, especially their characteristics, expected duration, post ictus phase etc.**

Generalized: seizure is affecting both parts of the brain

- **Tonic-clonic (formerly called grand -mal):** most common type of generalized seizure
 - May experience AURA (**warning** a seizure is about to happen)
 - Loses consciousness (at risk for injury)
 - Will experience a tonic phase: body stiffens (may bite inside of the cheek or tongue.... may see blood leaving mouth with foaming of saliva), breathing stops followed by cyanosis)
 - Then a clonic phase: recurrent jerking (spasm and relaxation back-to-back) of extremities (patient may have incontinence of stool or/and urine)
 - Usually **lasts no more than 3 minutes....at risk for status epilepticus** with this type of seizure
 - ****if greater than 5 minutes or having multiple seizures in a row...activate emergency response team (will need immediate treatment to stop seizure (more on this in the nursing interventions)
 - Post ictus (duration: hours to days): this is the recovery period: patient will feel very tired, extremely sore from muscle stiffening and jerking, can't remember what happened.

Tonic seizure: (stiffening of the body.... risk for falling) or **Clonic seizure:** (jerking....can be symmetrical or asymmetrical)

Absence Seizure (formerly called petit-mal)

- Most common in **pediatric patients** and **Hallmark is a staring like state**
 - It will be like the child is just daydreaming but can't be snapped out of it.... can go unnoticed by others for a while because it short and the child won't remember it. The person will look confused and won't be able to talk during the event.
- Very short.... seconds
- Post Ictus: immediate...doesn't remember staring off

Atonic (drop attacks):

- “A” means **without** and when you put the word tonic after it the meaning is: **WITHOUT MUSCLE TONE**
 - The patient goes limp and falls if standing or slumps over if sitting...at risk for head injury (**may need helmet**)
- Usually not aware during event.... post ictus: immediate...regains consciousness

Myoclonic:

- Quick duration of jerking of the muscles
- Patient usually aware and conscious (this is what makes it different from a clonic seizure)
- Very short.... few seconds

Focal (also called partial): affects a specific part of the brain

Two types: know the main differences which is that with **focal onset aware (simple partial)** the patient is **AWARE** of their surroundings **but** with **focal impaired awareness (complex partial)** the patient is **NOT aware** of their surroundings AND will have **motor symptoms called automatisms**.

Focal Onset AWARE (simple partial): symptoms vary depending on where the seizure is located

- It tends to be a small area of a lobe...but patient is **AWARE**...example: occipital region the person may have vision changes
- Also sometimes called an aura too because it can happen right before focal impaired awareness (complex partial)

Focal Impaired AWARENESS (complex partial): alternation in awareness and has motor symptoms

- Temporal lobe most involved
- Focal onset aware (aura) can happen before it
- **Automatisms present:** this is where they are performing an action without knowing they are doing it like lip smacking, rubbing hands together, or grasping for something that isn't there

Stages of Experiencing a Seizure

We can divide how a person experiences a seizure into stages (it varies depending on the seizure type, so remember that)

Prodromal: when symptoms start to appear prior to the big event (hence seizure)

- **can start days before a seizure happens**
- mood changes (depression, anger, issues sleeping, anxiety, GI and urinary issues etc.)

Aura: doesn't happen with all types

- happens at the very beginning of the seizure (what type: **focal seizures** OR in a **tonic-clonic seizure**)
- **happens within seconds to minutes before a seizure**
- many times, it gives the patient time to prepare self for seizure. As the nurse (if you are present) help the patient lay down onto their side with a pillow under the head.

- Symptoms vary among patients but can include sudden weird smell or taste, déjà vu feeling, feeling anxious like something bad is about to happen, altered vision (lights or spots in vision) or hearing (hallucination type sounds or increased ability to hear sounds), dizzy (different for every person), inability to speak etc.

Ictus: (word means seizure) this is the actual seizure

- Usually lasts anywhere from 1 to 3 minutes
- **Time the seizure**
 - seizures greater than 5 minutes or if the patient starts having seizure back-to-back, the patient may be experiencing **status epilepticus** (will need medical care and medication to make the seizure stop...it will unlikely stop on its own)

Post Ictus: (after the seizure) brain is going to rest and recover from the seizure

- usually last hours to days (tonic clonic)for some patients it is immediate (absence)
- may feel extremely tired, sleepy, confused, headache etc.

Nursing Interventions for Seizures

Assess risk factors for seizure (remember any patient can experience this if any of the causes mentioned above are presenting...you want to be prepared. If risk factors present initiate seizure precautions:

- Seizure precautions may include:
 - at bedside have suction and oxygen ready
 - IV access (to given anti-seizure medication, if needed)
 - padded side rails
 - pillow under head (to protect head)
 - bed in the lowest position
 - remove objects that can cause injury (remove any restrictive clothing or items the patient may be wearing.... eyeglasses etc.)

Assess if your patient has a history of seizures in the past and if so what type of seizure, ask if the patient experiences prodromal signs and symptoms or an aura before the seizure, how long does the seizure last?

If patient is able to report prodromal or aura.... help patient prepare by getting the patient in a safe position by lying down on their side.

What to do when your patient has a seizure?

Protect patient if they are standing-up or sitting down by:

- gently lying the patient down and turning them onto their side. **WHY?** This helps prevent the tongue from covering the airway and helps saliva and blood drain from the mouth.
- **DO NOT** restrain patient or try to hold the patient down

- Protect their head and extremities (pillow and bed pads will help with this)
- **DO NOT** put anything in the patient's mouth
- Remove anything that can impede breathing or break (eye glasses, tight clothing etc.).

******Questions to be asking yourself during the seizure******

- **Note the time it started and time it stopped (VERY IMPORTANT:** if greater than 5 minutes or another seizure happens...**THINK:** status epilepticus and activate the emergency system response team. You will notify the MD of the seizure regardless because the seizure needs to be investigated....is the patient's drug level for anti-seizure medications too low?
- **When the seizure started what was the patient's behavior right before and during it?** (did they cry out, become confused, report an aura, become unconscious) and the characteristics of the body movements (if any) presented at the beginning and throughout the seizure.....stiffening of the whole body or just the extremities and then jerking or just jerking, was it on just one side or both sides of the body....be sure to be as detailed as possible...this helps the healthcare team determine what type of seizure this was and what treatment may be needed
- **Did the patient become incontinent of urine or stool?** Oxygen status (cyanosis present)

Your role during the Post Ictus stage:

Note the time the seizure stopped and how the patient is behaving afterwards:

- Are they tired (let them sleep and rest), confused, can't think or talk, have a headache (ask where it is located and pain rating), has any injuries (some patients may bite their tongue or cheek)
- Maintain airway (suction, administer oxygen)
- If a tonic-clonic seizure, the patient will be very sleepy, won't remember what happened.
- Assess vital signs and neuro status: pupils, reflexes, is patient confused or oriented
- Clean patient if incontinence was experienced.
- Document and report it to the physician... is this your patient's first seizure, are they on anything for seizures (is drug level not therapeutic.... may need to draw a drug level if ordered by MD)

EEG may be ordered:

What's an EEG?: assesses brain activity

- Painless
- Hold seizure medications or medications that are stimulants or depressants prior to EEG (these medications can prevent the proper assessment of abnormal brain waves associated with a seizure)

- No caffeine products (a stimulant) 8 hours before
- Can eat before
- Make sure patient's hair is clean (needs good attachment to scalp)
- Different types of EEGs: some patients will need to experience sleep deprivation before the test by not sleeping the night before the test or only part of the night.... always ask about this

Education to patient about factors that can trigger a seizure:



"Stop Seizure"

Stress

Trauma to the head

Overexertion

Period, pregnancy (hormones)

Sleep deprivation

Electrolyte and metabolic issues (hypoglycemia, dehydration, acidosis)

Illness (high fever)

Visualization disturbances (strobe lights, certain smells or sounds)

Under medicated with seizure med (remind patient importance of taking and coming to office visits to get drug levels drawn)

Recreational drugs

ETOH use

Medications/Treatments

Medications treat based on type of seizure:

Barbiturates: Phenobarbital (used tonic-clonic or focal seizures & status epilepticus)

- stimulates GABA receptors & this helps inhibitory neurotransmission
- side effects: drowsiness, uncoordinated movements (ataxia) etc.
- watch for: respiratory depression and hypotension

- drug level 15 to 40 mcg/mL

Hydantoins: Phenytoin (used in tonic-clonic or focal seizures)

- watch the gums: will enlarge and easily bleed (called **gingival hyperplasia**.... teach about good mouth care



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- may cause bone marrow suppression (watch platelets and WBCs)
- tell patient to watch for rash or Steven-Johnson's Syndrome and to REPORT it to their doctor immediately
- don't give with milk or antacids (interferes with absorption)
- 10 to 20 mcg/mL

Benzodiazepines: absence seizures, tonic clonic, focal

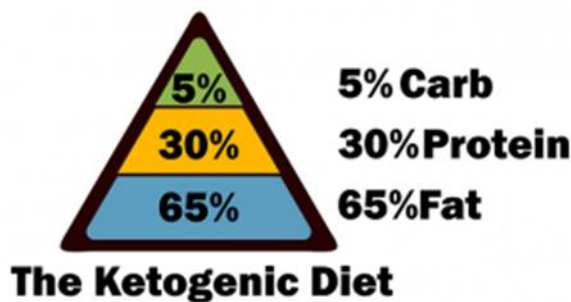
- Diazepam or Lorazepam: status epilepticus (fast acting)
- Very drowsy, **tolerance can develop where it isn't as effective**, impair liver (monitor liver studies)
- Reversal agent: Flumazenil (*used with extreme caution due to its risks)

Valproates: Valproic Acid

- all types.... monitor liver, WBC and platelets, GI issues

Other treatments:

- surgery: to remove an area of the brain that is causing the seizure....example: focal seizures that arise from temporal lobe (temporal lobectomy)
- Meds not working placement of a vagus nerve stimulator: an electrical device that sends electrical signals to the vagus nerve
- Ketogenic diet (used in pediatric patient who have epilepsy): high fat, low carb, diet.... used **when seizures not controlled by medication**



Credit:
Krisztian/Shutterstock.com

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Seizures NCLEX Questions

1. Neurons in the brain are tasked with handling and transmitting information. There are different types of neurons, such as excitatory and inhibitory. Excitatory neurons release the neurotransmitter _____, while inhibitory neurons release the neurotransmitter _____.

- a. GABA, glutamate
- b. Norepinephrine, GABA
- c. Glutamate, GABA
- d. Dopamine, glutamate

2. You're assessing your patient load for the patients who are at MOST risk for seizures. Select all the patients below that are at risk:

- a. A 32-year-old with a blood glucose of 20 mg/dL.
- b. A 63-year-old whose CT scan shows an ischemic stroke.
- c. A 72-year-old who is post op day 5 from open heart surgery.
- d. A 16-year-old with bacterial meningitis.
- e. A 58-year-old experiencing ETOH withdrawal.

3. A patient with a history of epilepsy is taking Phenytoin. The patient's morning labs are back, and the patient's Phenytoin level is 7 mcg/mL. Based on this finding, the nurse will?

- a. Assess the patient for a rash
- b. Initiate seizure precautions
- c. Hold the next dose of Phenytoin

- d. Continue to monitor the patient

4. You're educating a 25-year-old female about possible triggers for seizures. Which statement requires you to re-educate the patient about the triggers?

- a. "I'm at risk for seizure activity during my menstrual cycle."
- b. "I will limit my alcohol intake to 2 glasses of wine per day."
- c. "It's important I get plenty of sleep."
- d. "I will be sure to stay hydrated, especially during hot weather."

5. True or False: A patient who is experiencing a tonic-clonic seizure is experiencing a focal (partial) seizure.

6. A 7-year-old male patient is being evaluated for seizures. While in the child's room talking with the child's parents, you notice that the child appears to be daydreaming. You time this event to be 10 seconds. After 10 seconds, the child appropriately responds and doesn't recall the event. This is known as what type of seizure?

- a. Focal Impaired Awareness (complex partial)
- b. Atonic
- c. Tonic-clonic
- d. Absence

7. Your patient has a history of epilepsy. While helping the patient to the restroom, the patient reports having this feeling of déjà vu and seeing spots in their visual field. Your next nursing action is to?

- a. Continue assisting the patient to the restroom and let them sit down.
- b. Initiate the emergency response system.
- c. Lay the patient down on their side with a pillow underneath the head.
- d. Assess the patient's medication history.

8. Keeping the previous question in mind, the patient is now experiencing characteristics of a tonic-clonic seizure. The seizure started at 1402 and it is now 1408, and the patient is still experiencing a seizure. The nurse should?

- a. Continue to monitor the patient
- b. Suction the patient
- c. Initiate the emergency response system
- d. Restrain the patient to prevent further injury

9. Your patient has entered the post ictus stage for seizures. The patient's seizure presented with an aura followed by body stiffening and then recurrent jerking. The patient had incontinence and bleeding in the mouth from injury to the tongue. What is an expected finding in this stage based on the type of seizure this patient experienced?

- a. Crying and anxiety
- b. Immediate return to baseline behavior
- c. Sleepy, headache, and soreness
- d. Unconsciousness

10. You're developing discharge instructions to the parents of a child who experiences atonic seizures. What information below is important to include in the teaching?

- a. "This type of seizure is hard to detect because the child may appear like he or she is daydreaming."
- b. "Be sure your child wears a helmet daily."
- c. "It is common for the child to feel extremely tired after experiencing this type of seizure."
- d. "Avoid high fat and low carbohydrate diets."

11. You're assessing a patient who recently experienced a focal type seizure (partial seizure). As the nurse, you know that which statement by the patient indicates the patient may have experienced a focal impaired awareness (complex partial) seizure?

- a. "My friend reported that during the seizure I was staring off and rubbing my hands together, but I don't remember doing this."
- b. "I remember having vision changes, but it didn't last long."
- c. "I woke up on the floor with my mouth bleeding."
- d. "After the seizure I was very sleepy, and I had a headache for several hours."

12. You have a patient who has a brain tumor and is at risk for seizures. In the patient's plan of care, you incorporate seizure precautions. Select below all the proper steps to take in initiating seizure precautions:

- a. Oxygen and suction at bedside
- b. Bed in highest position
- c. Remove all pillows from the patient's head
- d. Have restraints on stand-by
- e. Padded bed rails
- f. Remove restrictive objects or clothing from patient's body
- g. IV access

13. Your patient is scheduled for an EEG (electroencephalogram). As the nurse you will:

- a. Keep the patient nothing by mouth.
- b. Hold seizure medications until after the test.
- c. Allow the patient to have coffee, milk, and juice only.
- d. Wash the patient's hair prior to the test.
- e. Administer a sedative prior to the test.

14. A patient is taking Phenytoin for treatment of seizures. Which statement by the patient requires you to re-educate the patient about this medication?

- a. "Every morning I take this medication with a full glass of milk with my breakfast."
- b. "I know it is important to have my drug levels checked regularly."
- c. "I will report a skin rash immediately to my doctor."
- d. "This medication can lower my body's ability to clot and fight infection."

15. The nurse is ordered to administer Lorazepam to a patient experiencing status epilepticus. As a precautionary measure, the nurse will also have what reversal agent on standby?

- a. Narcan
- b. Flumazenil
- c. Calcium Chloride
- d. Idarucizumab

16. A patient who is having a tonic-clonic seizure is prescribed Phenobarbital. During administration of this drug, it is important the nurse monitors for:

- a. Respiratory depression
- b. Hypertension
- c. Disseminated intravascular clotting
- d. Hypotension
- e. Fever

17. An 8-year-old child, who is not responding to anti-seizure medications, is prescribed to start a ketogenic diet. This diet will include:

- a. High carbohydrates and high fat
- b. Low fat, high salt, and high carbohydrates
- c. High fat and low carbohydrates
- d. High glucose, high fat, and low carbohydrates

Part 2: Nursing Management of Patients with Renal System Disorders

Lecture 1: Urinary Tract Infection

As a nursing student, you must be familiar with urinary tract infections and how to care for patients who are experiencing a UTI. You will learn the following from this lecture:

- Definition of urinary tract infection
- Causes of UTI
- Defense systems of the urinary tract
- How it is diagnosed
- Treatment
- Nursing Interventions

What is a urinary tract infection (UTI)? It is an infection found within the urinary tract that can be caused by a bacteria (most common), virus, or fungus.

Urinary tract infections can be found anywhere throughout the urinary system such as:

Lower Urinary System:

- Urethra (Urethritis)
- Bladder (Cystitis)

Upper Urinary System:

- Ureters (Urethritis)...usually associated with bladder or kidney infection
- Kidneys (Pyelonephritis)

*UTIs typically starts in the urethra and spread upward to the bladder and can be found in both the lower and upper tract. If the infection is not treated promptly and correctly, it can spread to the ureters and kidneys. Pyelonephritis is extremely dangerous because the infection can enter the bloodstream and lead to sepsis....

When an infection exists in the urinary tract it leads to inflammation of the structure involved which leads to pain, spasms, dark/cloudy urine, etc.

Who is most at risk for urinary tract infections.... women or men? Women!

Why? The female anatomy! The female urethra is shorter than the male which allows for easier migration of an infectious agent to the bladder **AND** the close proximity of the urethra and the rectum increases the chances of the bacteria in the GI tract infecting the urinary system (wiping incorrectly...back to front or wearing tight underwear or pants etc.).

Defense systems in place to help prevent Urinary Tract Infections

**If one of these defense systems becomes compromised, there is an increased risk of a UTI developing.*

- **Physiology of how urine flows downward:** This keeps urine flowing out of the system and prevents the retention or backflow of urine into the kidneys (hence bacteria can be easily flushed out). What structures help with this?
 - **Ureterovesical Valves:** these are one-way valves that connect at the ureters and bladder to prevent the backflow of urine into the ureters from the bladder...*in certain conditions like VUR (vesicoureteral reflux) these valves are defective.*
 - **Muscles of the Bladder:** these muscles help squeeze the urine out of the bladder and prevent residual urine...*sometimes these muscles become weak (diabetes, immobile patients who experience overextended bladder).*
 - **Pressure created by the urine in the bladder:** this keeps the urine traveling downward.

- **Urine itself:** it is normally sterile and possesses antiseptic qualities that can prevent bacteria from sticking to the lining of the bladder. In addition, the acidic conditions of the pH and amount of urea concentration can play a role in preventing a UTI.... *however, in some conditions, like uncontrolled diabetes mellitus where there are high amounts of glucose in the urine, the urine can act as a medium for bacteria growth.*
- **Lining of the urinary system** has immune cells that work to fight off infection... *a suppressed immune system decreases the cells effectiveness.*
- **Prostate gland (males):** it secretes a fluid that has antimicrobial properties to keep bacteria out... *in men with enlarged prostates the amount of fluid secreted is decreased.*
- **Normal flora in women:** present in and around the vagina are bacteria (lactobacilli) that keep the area around the urethra acidic which prevents bacteria from migrating, especially E.coli from the rectum.... *however, if a woman experiences a hormonal change (pregnancy, menopause, birth control usage) the flora can be destroyed.*

Causes of Urinary Tract Infection

“Hard to Void”

*The most common type of bacteria that causes a UTI is **E. coli**, which is usually from the GI system (rectum).

Hormone changes: pregnancy, menopause, birth control (changes the normal flora in the vagina that normally fights bad bacteria that can migrate into the urethra).

Antibiotics: changes the normal flora of the body

Renal Stones: cause blockage. Urine stays in the kidney and can't drain

Diabetes: compromised circulation...immune system not able to work as strong as it should to fight the infection, high glucose in the urine: breeding ground for bacteria to flourish, the bladder doesn't empty as it should (urinary retention from nerve damage)

Toiletries: excessive bubble baths, powders, perfumes, especially scented tampons, and sanitary napkins

Obstructive prostatic hypertrophy...seen in males with BPH: The urethra which is surrounded by the prostate gland becomes squeezed shut from the large prostate gland.... urine stays in the bladder because the patient can NOT empty it completely, and the prostate gland isn't able to properly secrete that fluid with antimicrobial properties.

Vesicoureteral reflux (VUR): most common in pediatric patients and is when urine from the bladder backflows into the kidneys. It is usually a congenital defect to the ureterovesical valves that are found between the bladder and ureters. They don't close properly and there is a backflow of urine into the ureters.

Overextended bladder: bladder is full for long periods of time and the bladder muscles become weak which leads to urinary retention. Patients who are immobile are at risk for this.

Indwelling catheters, invasive procedures, intercourse (especially with the usage of spermicides), incontinence of the bowel

Decreased immune system...can't fight germs (immunosuppressed) and majorly at risk for UTIs that are fungal and viral in origin.

How is a UTI Diagnosed?

Urinalysis (U/A): assesses for bacteria or WBCs in urine

- **Nurse's role:** properly collecting a urine sample and educating the patient on how to do this.... **WHY?** to prevent contamination of the specimen

- It is best to collect the urine when the bladder has been full for about 2-3 hours. It will be more concentrated.... don't want diluted urine.
 - First wipe with an antiseptic wipe
 - Void small amount into the toilet
 - Then collect the urine (midstream) and fill the cup halfway
 - Keep the cup a few inches away from the urethra
- How to collect out of a Foley catheter? Use the access port (found at the top of the tubing...never collect from the Foley collection bag) clean the access port with antiseptic and use the needless sterile syringe to withdraw urine.

Urine culture: to assess what bacteria is causing the UTI...so antibiotics can be ordered correctly

Cystoscopy: assesses the inside of the urethra and bladder (ordered for recurrent infections)

Signs and Symptoms of Urinary Tract Infection

- Pain when voiding (burning)
- Persistent need to void but not a lot is voided or can't void
- Strong odor to urine that is dark and cloudy (can have blood)
- Cramping in abdomen or pain at the costovertebral angle
 - **Costovertebral angle** is found under the 12th rib and between the spine (please watch video above for a demonstration). Lay non-dominate hand flat over the angle and make a fist with the dominant hand and firmly thump the first onto the flat hand....if the pain is experienced a kidney infection may be present (pyelonephritis).



- Spasms of the bladder or urethra
- Fever
- Increased WBC on U/A

NOTE: In the geriatric population, confusion, sudden increase in falling, and agitation are typically seen rather than the typical signs and symptoms above...they are less likely to have a fever or pain.

Nursing Interventions for Urinary Tract Infection

Assess for signs and symptoms of UTI (catch it before it becomes complicated.... many patients in the hospital setting are at risk for a UTI)

Maintain fluid status (intake and output) and monitor that urinary output is at least 30 cc/hr. Control pain with nonpharmacological and pharmacology methods:

- Warm sitz bath or heating pad
- paracetamol, NSAIDs, or Pyridium per MD orders
 - **Pyridium “Phenazopyridine”**: analgesic that will coat the bladder wall and urethra to decrease spasms and help with urinary frequency/burning. However, that patient will void **ORANGE-COLORED urine**...this is a normal side effect...educate the patient about this.

Monitor for complications (sepsis, renal failure)

Administer antibiotic medications per MD order... Sulfonamide “Bactrim” (educate the patient about **consuming 2.5 to 3 L of fluid/day to keep urine diluted due to crystalluria**)...give antibiotic at same time every day to keep blood level constant because a decrease in blood levels can decrease the effectiveness of the medication.

- If antibiotics are ordered for treatment along with urine culture...**COLLECT URINE CULTURE BEFORE starting the first dose of antibiotics**

Encourage the patient to take in 2.5 to 3L of fluid per day. **WHY?** This keeps the urine diluted and helps the system flush out the infection. In addition, if the urine becomes concentrated this increases the risk of crystalluria in patients taking sulfonamides like Bactrim.

Encourage frequent voiding at least every 2-3 hours.

Remove indwelling catheter if present per MD order (remember a major cause of UTI)

Patient Education for UTI:

- Take all the antibiotics
- Wipe front to back
- Urinate immediately after intercourse
- Avoid tight pants or underwear (wear cotton underwear that is loose fitting)
- Avoid bubble bath, powders, and perfumes in the genital area
- Change sanitary pads often and avoid tampons
- Avoid caffeine and alcohol...irritate bladder
- Every 2-3 hours void

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Urinary Tract Infection NCLEX Question

1. You’re assessing your patients during morning rounding. Which patient below is at the MOST risk for developing a urinary tract infection?

- a. A 25-year-old patient who finished a regime of antibiotics for strep throat 10 weeks ago.
- b. A 55-year-old female who is post-opt day 7 from hip surgery.
- c. A 68-year-old male who is experiencing nausea and vomiting.

- d. A 87-year-old female with Alzheimer's disease who is experiencing bowel incontinence.

2. A 36-year-old female, who is 29 weeks pregnant, reports she is experiencing burning when voiding. The physician orders a urinalysis. Which statement by the patient demonstrates she understands how to collect the specimen?

- a. "I'll hold the cup firmly against the urethra while collecting the sample."
- b. "I will cleanse back to front with the antiseptic wipe before peeing in the cup."
- c. "First, I will pee a small amount of urine in the toilet and then collect the rest in the cup."
- d. "I will be sure to drink a lot of fluids to keep the urine diluted before peeing into the cup."

3. During a head-to-toe assessment of a patient with a possible urinary tract infection, you perform costovertebral angle percussion. The costovertebral angle is found?

- a. between the bottom of the 12th rib and spine
- b. between the right upper quadrant and umbilicus
- c. between the sternal notch and the angle of Louis
- d. between the ischial spine and umbilicus

4. A 76-year-old female is admitted due to a recent fall. The patient is confused and agitated. The family members report that this is not normal behavior for the patient. They explain that the patient is very active in the community and cares for herself. Based on the information you have gathered about the patient, which physician's order takes priority?

- a. "Collect a urinalysis"
- b. "Collect a T3 and T4 level"
- c. "Insert a Foley Catheter"
- d. "Keep patient NPO"

5. The physician orders a urine culture on your patient in room 5505 with a urinary tract infection. In addition, the patient is ordered to start IV Bactrim (Sulfamethoxazole/Trimethoprim). How will you proceed with following this order?

- a. First, hang the antibiotic, and then collect the urine culture.
- b. First, hang the antibiotic and when the antibiotic is finished infusing collect the urine culture.
- c. First, collect the urine culture, and then hang the antibiotic.
- d. First, collect the urine culture and then hold the dose of the antibiotic until the urine culture is back from the lab.

6. A patient with a urinary tract infection is taking Bactrim (Sulfamethoxazole/Trimethoprim). As the nurse you know it is important that the patient consumes 2.5 to 3 L of fluid per day to prevent which of the following complications?

- a. Brown urine
- b. Crystalluria
- c. Renal Stenosis
- d. Renal Calculi

7. You're providing discharge teaching to a female patient on how to prevent urinary tract infections. Which statement is INCORRECT?

- a. "Void immediately after sexual intercourse."
- b. "Avoid wearing tight-fitting underwear."
- c. "Try to void every 2-3 hours"
- d. "Use scented sanitary napkins or tampons during menstruation."

8. A patient, who is having spasms and burning while urinating due to a UTI, is prescribed "Pyridium" (Phenazopyridine). Which option below is a normal side effect of this drug?

- a. Hematuria
- b. Crystalluria
- c. Urethra mucous
- d. Orange-colored urine

9. You're caring for a patient with an indwelling catheter. The patient complains of spasm-like pain at the catheter insertion site. Which of the following options below are other signs and symptoms the patient could experience or the nurse could observe if a urinary tract infection was present? SELECT-ALL-THAT-APPLY:

- a. Increased WBC
- b. Crystalluria
- c. Positive McBurney's Sign
- d. Feeling the need to void even though a catheter is present
- e. Dark and cloudy urine
- f. Cramping

10. On your nursing care plan for a patient with a urinary tract infection, which of the following would be appropriate nursing interventions? SELECT-ALL-THAT-APPLY:

- a. Encourage voiding every 2-3 hours while awake.
- b. Restrict fluid intake to 1-2 liters per day.
- c. Monitor intake and output daily.
- d. The patient verbalizes the importance of using vaginal sprays to decrease the reoccurrence of urinary tract infections prior to discharge home.

Lecture 2: Benign Prostatic Hyperplasia

Description

A very common condition in older men. Benign hyperplasia (enlargement) is thought to be under the hormonal influence (testosterone). The prostate extends upwards into the bladder gradually impeding and obstructing urine flow

Pathophysiology

Hyperplasia gradually obstructs urine flow from the bladder → acute retention (emergency) or partial retention of urine. Results in: A residual pool of urine in the bladder following urination. Ureteric reflux → hydro-ureter and hydronephrosis (a cause of renal failure). Stasis and infection (UTI): pyelonephritis. Reduced bladder tone and continence

Clinical Manifestations

Frequency of urination. Nocturia. Urgency. Hesitancy. Straining to void → occasional hematuria. Poor stream and dribbling of urine. Since that bladder not emptied. Abdominal/ suprapubic distension

Acute Retention of Urine

*Patients are often admitted in an emergency with total urinary obstruction

Acute Retention of Urine: Clinical Manifestations

Acute severe supra-pubic pain and distension. Inability to pass urine. Nausea (maybe vomiting). Neurogenic shock (related to pain). (Pyrexia and rigors if urinary tract infection and septicemia → septic shock)

Benign Prostatic Hyperplasia: Diagnosis

Rectal digital examination: a large soft rubbery non-tender prostate palpated (distinguish from hard, stone-like malignant prostate). Needle biopsy. Prostate Specific Antigen (PSA) Residual urine (and urine culture). Renal function tests. Creatinine clearance

Benign Prostatic Hyperplasia: Management

Medical/ mechanical management (mild) Emergency treatment (acute urinary retention). Surgery

Medical/ Mechanical Management

May be used in mild cases or if surgery is contra-indicated. Smooth muscle relaxant (Terazosin) affects the bladder neck. Dilatation with a balloon. Laser resection under ultrasound control. A permanent urinary catheter (urethral or supra-pubic) under antibiotic cover. Leg bag can be used

Acute Urinary Retention: Emergency Treatment

Analgesia: Morphine (partly given IV) to relieve pain and avoid shock. IV line/ antibiotics in case of shock. Immediate catheterization by an experienced urologist using a silastic firm catheter to avoid trauma to the urethra and maintain patency. Urine is released gradually to avoid shock. Urine sample for culture

Benign Prostatic Hyperplasia: Surgery

Surgery is the treatment of preference and is important in order to avoid: Renal damage from hydronephrosis. Pyelonephritis, septicemia, and renal damage from urinary stasis and infection

Benign Prostatic Hyperplasia: Surgical Procedures

Trans-urethral resection of the prostate gland (TURP): cutting via cystoscope. Supra-pubic resection: via abdominal incision and through the bladder. Retro-pubic resection: via abdominal incision behind the bladder (larger gland). More prone to infection in retropubic space. All hyperplastic tissue is removed leaving only the prostate capsule (which may re-grow)

Prostatectomy: Pre-operative Management

*Patients are mostly elderly. Often operations are performed under spinal anesthetic.

Thorough preparation: General health assessment. Chest physio. Anti-embolism stockings. Blood coagulation studies (the prostate gland is very vascular). CBC (Hb), blood group, and cross-match. Correct any dehydration. Promote nutrition

Prostatectomy: Post-operative Management

ICU/IVI and blood transfusion as required. A 3-way Foley catheter is used for continuous irrigation of the bladder with saline to flush away clots. IV antibiotics (including Gentamycin to prevent gram-negative shock) (also given when the catheter is removed). Physio Anti-embolism stockings/ leg exercises

Prostatectomy: Post-surgical Complications

Hemorrhage: prostate is very vascular. Clot retention: clots post-operatively may block the urinary catheter → obstruction: Risks neurogenic shock; also stretches the prostatic bed → further bleeding. DVT/ pulmonary embolism: (immobility and risk of ↑ blood viscosity). Pneumonia. Urinary infection → septicemia (shock)

Prostate Surgery: Post-op Nursing Responsibilities

ICU; IVI and blood transfusion as required. Careful monitoring of vital signs. Accurate intake/ output including irrigation. Monitor urine color (for ↑ hemorrhage). Monitor drainage: “milk” clots to encourage urine flow. Note supra-pubic distension, pain, and restlessness. Bladder washout if required (analgesia important in this case). Encourage ↑ oral fluids. Physio. Antibiotics

Lecture 3: Renal Calculi (Kidney Stones)

As a nursing student, you must be familiar with renal calculi and how to care for patients experiencing kidney stones. You will learn the following from this lecture:

- Definition of renal calculi
- Causes of kidney stones
- Types of renal stones
- How it is diagnosed
- Treatment
- Nursing Interventions

What are kidney stones? Hard insoluble crystallized minerals and salts have formed out of the filtrate produced by the nephron.

Remember the nephron is the functional unit of the kidney that filters the blood and reabsorbs/secretates minerals, water, and waste, which is urine.

Facts about Kidney Stones

Kidney stones can vary in size: they can be very small (like a fine grain of salt) or large (like a walnut.... very painful), and are composed of various materials. Hence, there are **different types of stones** (see the types below).

Most stones tend to form within the kidney, but they can form anywhere throughout the urinary system where there is a concentration of minerals (bladder, ureters).

They can migrate throughout the urinary system where they can further grow or cause blockage of urine.

Most stones can be passed (very painful) if they are less than 5 mm (*Diagnosis And Initial Management Of Kidney Stones* 8). If they are larger than this, they can become stuck within the urinary system.

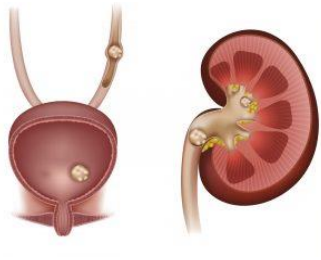


Photo Credit: Tefi/Shutterstock.com

Where can kidney stones be located?

- Inside the kidney
- Ureters (top, middle, or bottom of ureter before entering bladder)
- Bladder

Remember: For stones to form, there must be a concentration of minerals and salts in the filtrate, which will allow for the crystallization of the minerals. When a crystal forms it can grow over time and break off and travel through the urinary system. This can lead to the blockage of urine, infection, or other complications.

Types of Kidneys Stones

***Calcium Oxalate**: the most common type of kidney stone, and they tend to form in acidic urine. This type of stone is composed of calcium and oxalate, and forms when there is a high concentration of calcium or oxalate in the filtrate.

What can **increase the amount of calcium** in the filtrate?

- **Hypercalcemia/uria**: taking excessive amounts of calcium supplements, eating too much salt (increases the amount of calcium in the urine), renal tubule problems within the nephron, consuming too much animal protein (increases the amount of calcium in the urine)
- **Hyperparathyroidism**: the parathyroid is responsible for secreting PTH (parathyroid hormone) which causes the bones to release calcium into the blood...overactive parathyroid gland increases calcium levels.

What can **increase the amount of oxalate** in the filtrate?

- High intake of foods with oxalates (see nursing interventions to see the foods high in oxalate)
- GI disorders like ulcerative colitis and Crohn's disease due to malabsorption of fats. Normally, **calcium and oxalates bind together in the gut**, therefore, oxalate is excreted in the stool. However, when a GI disorder like ulcerative colitis is present there is a problem with digesting fats. So, **fats bind with calcium...leaving oxalates behind**. This leads to the build-up of oxalate in the urine.

Uric Acid: forms when there is **too much uric acid in the urine** (acidic urine)

What can cause **high amounts of uric acid in the urine**?

- Eating a diet high in purine or animal protein. These substances are broken down into uric acid and if too much of these products are consumed it can make the urine more acidic. Remember the glomerulus of the nephron is responsible for filtering the blood and removing uric acid.
- Dehydration: urine becomes acidic and the filtrate contains low amounts of water...allowing uric acid to crystallize.

- Gout: patients with Gout have a high amount of uric acid in the body
- Metabolic problems like diabetes, especially Type 2 Diabetes

Cystine: forms where there is **too much of the amino acid cysteine in the urine**. This is rare and tends to run in families.

- Remember amino acids are normally reabsorbed in the Proximal Convoluted Tubule (nearly 100%). However, the nephron fails to do this, so when there is too much cysteine in the urine it crystallizes.

Struvite: this type of stone is also rare and usually forms due to chronic urinary tract infections (UTIs).

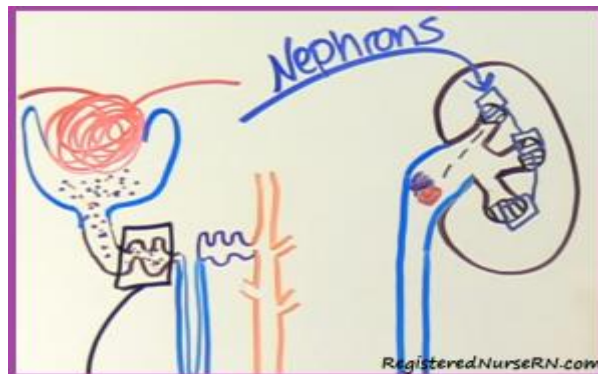
- **WHY?** Certain types of bacteria can cause the urine to become too alkaline and this allows magnesium, ammonium, and phosphate to crystallize, which is the composition of the struvite stone.... this stone is also known as staghorn stone and can be fairly large in size.

Calcium phosphate: forms in alkaline urine and can happen when renal tubule issues are present

*most common type of kidney stone

How does kidney stone formation happen?

Remember the nephron, specifically, the glomerulus filters the blood, and all minerals/water/waste are removed from the blood and leak down into Bowman's Capsule (these substances include nearly everything except proteins and blood cells).



In patients who are NOT susceptible to kidney stones, these substances will travel through the nephron and be reabsorbed or secreted at various points within the renal tubule. Then the excess will be secreted as urine by exiting the collecting tubule/duct to the renal papilla, minor, major calyx, renal pelvis, ureters, bladder, and urethra.

However, in patients with certain predisposing factors, there is an increase in the risk of these minerals coming together to form a crystal. The crystal can grow over time as debris sticks to the crystal and further crystallization happens. The crystal can travel out of the nephron and stay in the renal papilla, ducts, or other parts of the urinary system and grow. In addition, it can break off and travel through the system and get stuck.

Causes of Kidney Stones

Remember the word: “**Crystal**”

Consuming high amounts of oxalates, purine, animals' protein, and salt (eating too much salt keeps the body from reabsorbing calcium in the urine), and taking excessive amounts of calcium supplements with Vitamin D (*calcium oxalate, uric acids type stones*)

Recurrent UTIs (*struvite stones*)

hypocitraturia, hypercalcemia/uria, hyperparathyroidism

- **Hypocitraturia:** Citrate plays a role in stopping the formation of calcium salt crystals (specifically calcium oxalate and calcium phosphate binding). Therefore, citrate binds with calcium and stops it from binding with oxalate or phosphate. Furthermore, it keeps the urine alkaline and prevents it from becoming too acidic.... hence preventing uric acid or cystine stones to form since these stones form in acidic urine.

Structural blockage or stasis of the urine (prostate problems, strictures, deformities)

Too much uric acid (gout, dehydration, high diet in purine/animal proteins)

Absorption problems: gut doesn't absorb fats as with ulcerative colitis or Crohn's disease...fats bind with calcium and leave oxalates behind, **A**cquired (family history)

Low activity: immobile patients tend to have an increased amount of minerals and salts compared to people who are physically active and the urine stays stagnant in the kidney...hence increasing the risk of kidney stone formation.

Signs and Symptoms of Renal Calculi

Pain: characteristics of the pain depend on the location of the stone and it can change as the stone moves through the urinary system:

- **Renal colic:** stone in the renal pelvis...dull, deep aching in the flank or costovertebral area (see pic below)



- **Ureteral colic:** stone residing in the ureter and as it moves it can cause..... **intense, sharp, radiating, wavelike pain to the genitalia (scrotum, vaginal area)**
 - The patient may feel like they need to void but a small amount is voided.
 - Can have blood in the urine due to stone scraping the ureter (hematuria)

Nausea and vomiting (due to the intense pain)

Signs and symptoms of infection: fever, cloudy, odorous urine

Urinary retention: especially if the stone is stuck in the neck of the bladder...this makes it extremely hard to completely pass all the urine in the bladder... (note the location of the neck of the bladder)

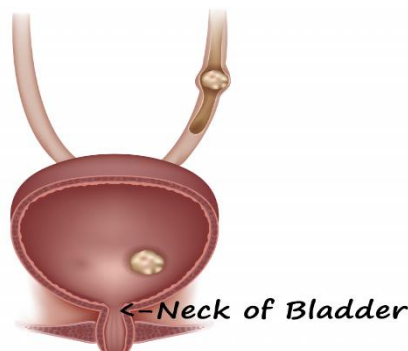
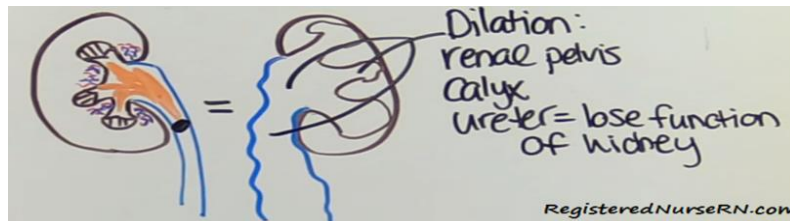


Photo Credit: Tefi/Shutterstock.com Additions: RegisteredNurseRN.com

Asymptomatic: until the stone moves within the kidneys and to the ureters

Complications of Renal Stone

- **Obstruction:** stones block the flow of urine. The urine can back up and causes hydrostatic pressure (hence increasing water pressure) within the kidney. This will increase pressure in Bowman's Capsule which will decrease the amount of blood the kidneys can filter.
- **Hydronephrosis or Hydroureteronephrosis:** due to the backup of urine which causes swelling and dilation in various parts of the kidneys (renal pelvis, minor/major calyx, and ureters) ...depending on where the stone is located. The end result is the loss of function to the kidney.



- **Damage to the nephrons...**hence renal failure
- **Infection**

How is Renal Calculi Diagnosed?

**as the nurse it is important to be familiar with tests the physician may order and your role as the nurse*

- KUB (x-ray of the kidneys, ureters, and bladder)
- IVP (intravenous pyelogram): a special dye, which is iodine-based, is given through the patient's IV. Then x-ray images will be taken to assess the kidneys, bladder, ureters, and urethra.
 - **Nurse's Role:**
 - Make sure the patient isn't allergic to iodine or shellfish, pregnant or might be, nursing a baby, impaired renal function or taking metformin/Glucophage.
- Ultrasound or CT scan
- Urine tests:
 - U/A assess for crystals, infection
 - 24-hour urine to measure the concentration of ions (calcium, sodium, etc.), waste products in urine (uric acid, creatinine), citrate, pH, kidney function
 - **Nurse's Role**
 - Keep the specimen cold by keeping it on ice for the whole 24 hours...if not kept cold this can alter the test results.

Nursing Interventions for Renal Calculi

****most patients will pass the stone and the nurse's job is to keep the patient's pain control, give fluids, strain urine, and monitor for complications.**
However, if the stone is large the patient needs other treatments (discussed below).

- Control pain (very, very painful) ...pain doesn't go away until it is passed or removed. The patient needs around-the-clock pain medications rather than PRN medications (which the patient has to request it). This will help keep pain medication blood levels constant and hopefully help control the pain. The physician may order

NSAIDs to help control the inflammation which can help the stone pass if it is stuck within inflamed areas.

- Maintain oral fluids (3-4 L per day) unless contraindicated:
 - **WHY?** It is very important in helping the stone pass. Fluid intake increases the pressure which can help move the kidney stone. In addition, it keeps the urine diluted because remember stones are more likely to form in concentrated urine. It also keeps flushing the kidneys to prevent stagnant urine within the urinary system...decreasing the risk of infection.
- Closely monitor I/Os (intake and output)
 - **WHY?** The patient will be consuming a lot of fluids and the nurse needs to make sure the kidneys are putting out enough fluid based on the intake. If the fluid output is low, renal function may be impaired, an obstruction may be present or other complications like hydronephrosis, etc.
- Monitor for signs and symptoms of UTI
- **Strain urine and ASSESS very closely for stones (VERY IMPORTANT):** Then notify the physician who will give you an order to send it to the lab. This is crucial so the physician can determine what type of stone is causing the problem and appropriate treatment can be ordered.
- Keep the patient as mobile as possible and try to avoid the supine position for long periods of time. Remember immobility is one of the causes of kidney stone formation...if the urine stays stagnant it can allow crystallization. Keeping the patient mobile helps the stone pass. If the patient is immobile, turn the patient more frequently.

Prevention Education (can reoccur):

Keep hydrated (prevents concentrated urine) 2L per day

Take medication as prescribed: MD may order the following as preventive measures in preventing kidney stone formation based on the type of stone the patient is susceptible to:

- **Allopurinol:** decreases uric acid levels (used in gout) ...uric acid stones
- **“HCTZ” hydrochlorothiazide:** decreases the amount of calcium in the urine...calcium type stones

Limiting calcium intake is **not recommended** due to osteoporosis risk unless the patient has metabolic problems or a problem with the nephrons of the kidney. Instead, limiting medication forms of calcium supplements and vitamin D.

Limiting animal proteins (high amount of protein increases the amount of calcium in the urine and increases uric acid levels)

Limit sodium to 2-3 g per day.... sodium decreases the reabsorption of calcium which will leave more calcium in the urine (watch hidden sodium foods like canned food, soda drinks, sandwich meats, and processed foods)

Avoid foods high in purine: organ meats, beer, pork, red meats, seafood (scallops, anchovies, sardines) (uric acid stones)

Avoid high oxalate foods: spinach, cabbage, rhubarb, tomatoes, beets, nuts, chocolate, wheat bran, strawberries, tea (calcium oxalate stones)

How to stain urine and why it is important and to keep stone so it can be analyzed

Treatments for Renal Stones

Extracorporeal shock wave lithotripsy (ESWL): NONINVASIVE: shockwaves are created to penetrate through the skin and body tissue. Shockwaves will hit the stone and break it down into grains of sand-like particles which can be passed out. Several treatments may be

required depending on stone size. Stent may be placed to facilitate the passage of the fragments...not for large stones

LITHOTRIPSY

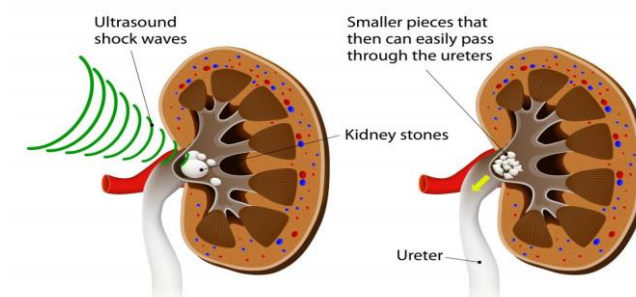


Photo Credit: Designua/Shutterstock.com

Nurse's Role

- Maintain fluid intake to facilitate stone fragment removal
- Keep the patient mobile
- Control pain
- May have bleeding in the urine
- Strain urine and send the stone to a lab

Percutaneous Nephrolithotomy: INVASIVE: used when the stone is large or can't use ESWL. The kidney stone is removed by a urologist and **doesn't have to be passed by the patient as with EWSL.**

An incision is made on the back where the kidney is and a nephroscope is used to remove the stone. Sometimes lithotripsy is used to break up the stone.

A nephrostomy tube may be placed to drain urine until healed (this is a catheter placed in the renal pelvis to drain urine)

Nurse's Role

- Maintain fluid intake of 3-4 liters
- Maintain nephrostomy: it drains kidney and stone fragments, empty the bag regularly, keep the site secure so the tube doesn't move and monitor for infection
- Strain urine and send stones to the lab

Ureteroscopy: no incision made...scope is inserted through the urinary system from the urethra to the kidneys...can remove the stone or break it up with a laser or lithotripsy...stent may be placed to allow fragments to pass

Nurse's Role

- Maintain fluid intake to facilitate stone fragment removal
- Keep the patient mobile
- Control pain
- May have bleeding in the urine
- Strain urine and send the stone to a lab

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Renal Calculi (Kidney Stones) NCLEX Question

1. You're providing an in-service to a group of nurses about the different types of kidney stones. You explain to the attendees that the most common type of kidney stone is made up of:

- a. Cholesterol
- b. Calcium and oxalate
- c. Calcium and phosphate
- d. Uric acid

2. Which patient below is at the MOST risk for developing uric acid-type kidney stones?

- a. A 53-year-old female with recurrent urinary tract infections.
- b. A 6-year-old male with cystinuria.
- c. A 63-year male with gout.
- d. A 25-year-old female that follows a vegan diet and reports eating high amounts of spinach and strawberries on a regular basis.

3. A patient is scheduled for an intravenous pyelogram (IVP) to assess for kidney stones. Which finding below requires the nurse to contact the physician?

- a. Patient reports flank pain that radiates downward
- b. Patient has hematuria
- c. Patient is allergic to shellfish
- d. Patient has cloudy urine

4. The physician orders a 24-hour urine collection on a patient with recurrent kidney stones. As the nurse, you know what the specimen should be?

- a. Kept at room temperature
- b. Kept on ice or refrigerated
- c. Sent to the lab every four hours
- d. Kept at a temperature between 98.6 'F to 99.3'F

5. You're providing care to a patient with a uric acid kidney stone that is 2 mm in size per diagnostic imaging. The patient is having severe pain and rates their pain 10 on 1-10 scale. The physician has ordered a treatment plan to assist the patient in passing the kidney stone. What nursing intervention is a PRIORITY for this patient based on the scenario?

- a. Administer pain medication
- b. Encourage fluid intake of 2-4 liters per day
- c. Massage the costovertebral area
- d. Implement a high-protein diet

6. A patient with a kidney stone explains that the pain he is experiencing is intense, sharp, and wavelike that radiates to the scrotum. In addition, he explains it feels like he

has to void but a small amount of urine is passed. Based on the patient's signs and symptoms, where may the kidney stone be located?

- a. Renal Calyx
- b. Renal Papilla
- c. Ureter
- d. Urethra

7. You're developing a nursing care plan for a patient with a kidney stone. Which of the following nursing interventions will you include in the patient's plan of care?

- a. Restrict calcium intake
- b. Strain urine with every void
- c. Keep the patient in the supine position to alleviate pain
- d. Maintain fluid restriction of 1-2 Liter per day

8. You're providing discharge teaching to a patient who was hospitalized for the treatment of a kidney stone. The type of kidney stone the patient experienced was a uric acid type stone. What type of foods will you educate the patient to avoid?

- a. Cabbage, spinach, tomatoes, strawberries
- b. Ice cream, milk, pork, cheese
- c. Beans, potatoes, corn, peas
- d. Liver, scallops, anchovies, sardines, pork

9. Your patient arrives back to their room after having extracorporeal shock wave lithotripsy (ESWL) for treatment of a kidney stone. What will be included in the patient's plan of care? SELECT-ALL-THAT-APPLY:

- a. Keep the patient in bed
- b. Encourage fluid intake of 3-4 liters per day
- c. Maintain nephrostomy tube
- d. Strain urine
- e. Keep dressing dry and intact

10. You are providing pre-op teaching to a patient scheduled for percutaneous nephrolithotomy. Which statement by the patient demonstrates the patient understood the pre-op teaching?

- a. "During the procedure the surgeon will move the stone down the ureter, so I can pass the stone in the urine."
- b. "I may have a nephrostomy tube after the procedure."
- c. "A scope is inserted through the urinary system from the urethra to the kidneys to assess the kidney stone."
- d. "This procedure is noninvasive and no incision is required."

Lecture 4: Chronic Kidney Disease

As a nursing student, you must be familiar with chronic kidney disease along with how to care for patients who are experiencing this condition. You will learn the following from this lecture:

- Definition of chronic kidney disease
- Causes
- Pathophysiology

- Stages of CKD
- Signs and Symptoms
- Nursing Interventions
- Treatment

Chronic Kidney Disease (CKD)

What is CKD? It is a **significant decline in kidney function** that happens over a long period of time that leads to the *buildup of waste, water, and electrolyte imbalances in the body*. CKD is **irreversible**.

Role of the Kidneys:

The kidneys receive fresh blood from the heart and filter the blood via the **nephrons** (glomerulus), which creates a filtrate/urine that will progress through the rest of the nephron (renal tubule). The renal tubule will fine-tune the filtrate by pulling out water and ions. Then the substances left over will be excreted in the urine.

Remember the glomerulus does NOT normally filter blood cells or proteins (just water, urea, creatinine, ions). In addition, creatinine is the only substance filtered by the glomerulus that is solely filtered from the bloodstream that is NOT reabsorbed within the renal tubule. Therefore, measuring creatinine levels in the urine/blood help us to determine the functionality of the kidneys, specifically the nephron.

The creatinine level along with the patient's gender, race, weight, and age can help the physician determine the patient's glomerular filtration rate (GFR).

In CKD, the filtering structure of the nephron (GLOMERULUS) is unable to filter properly. Therefore, the patient's glomerular filtration rate (GFR) is decreased.

There are various stages of CKD. A **normal GFR is 90 mL/min or higher**. This is the rate the glomerulus filters waste, ions, and water.

Stages of Chronic Kidney Disease

Be familiar with the GFR for each stage, especially stage 5, which represents ESRD (end-stage renal disease).

Stage 1: Kidney damage with normal renal function *GFR >90 ml/min* but with proteinuria (3 months or more)

Stage 2: Kidney damage with mild loss of renal function *GFR 60-89 ml/min* with proteinuria (3 months or more)

Stage 3: Mild-to-severe loss of renal function *GFR 30-59 mL/min*

Stage 4: Severe loss of renal function *GFR 15-29 mL/min*

Stage 5: end-stage renal disease *GFR less 15 mL/min*

**Source: "Kidney Disease Statistics For The United States | NIDDK"*

When GFR decreases dramatically it leads to many problems (in the early stages the patient may be asymptomatic):

- Increased waste in the body: Uremia (Increased BUN and Creatinine levels, neuro changes, itching, metabolic acidosis)
- Hypervolemia (edema, HTN, pulmonary and cardiac problems)

- Electrolyte Imbalances: hyperkalemia, hypocalcemia, hyperphosphatemia (high phosphate levels cause low calcium levels, which stimulates the parathyroid gland to produce PTH. This causes calcium to leak out of the bones...hence bone problems), hypermagnesemia
- Oliguria (*less than 400 ml/day*) or Anuria (*less than 100 mL/day*)
- Proteinuria and Hematuria: glomerulus is damaged so it is allowing blood cells and proteins to leak through. The patient may have lower albumin levels (more swelling) and further anemia.

Kidneys also produce hormones:

EPO (erythropoietin): helps create RBCs in the bone marrow. In CKD, the EPO decreases, which leads to *anemia*.

Renin: plays a role in increasing blood pressure. In CKD the glomerulus is filtering less water and the kidneys think the blood pressure is low, so it releases renin, which in turn *increases blood pressure* even more.

Kidneys activate Vitamin D

Vitamin D: plays a role in helping the body reabsorb calcium from the food we eat. In CKD, the activation of vitamin D is diminished and this leads to lower calcium levels (*hypocalcemia*).

Causes of CKD

- *High blood pressure (hypertension): constant high pressure on the artery wall that supplies the kidneys causes damage. Therefore, less blood reaches the kidneys and the nephrons can't function properly.
- *Diabetes Mellitus: uncontrolled hyperglycemia causes glucose to stick to arteries walls, which damages the blood supply to the kidneys.
- Acute kidney injury
- Polycystic kidney disease: the genetic condition where cysts grow in the kidneys
- Infection
- Nephrotoxic drugs: NSAIDs, aminoglycosides, chemotherapy drugs, contrast dyes for testing procedures

*most common causes of chronic renal failure

Treatment for Chronic Kidney Disease:

Early stages with normal GFR:

- Controlling blood pressure and glucose level
- Medications for hypertension that help protect the kidneys, such as ACE inhibitors "pril" or ARBs "sartan"
- Monitoring GFR and blood pressure regularly

Advanced stages where GFR is abnormal:

- Dialysis
- Kidney transplant
- Diet changes

Nursing Interventions for Chronic Kidney Disease

What is going on with this patient? Remember waste build up (uremia and metabolic acidosis), anemia, electrolyte imbalances, low urinary output, and fluid overload.

Uremia (buildup of waste in the blood)

- Safety: patient may be confused, assess neuro status
- Itching: due to deposits of urea crystals on the skin via the sweat glands. It looks like frost on the skin and is called “uremic frost”



- Low protein diet: urea is a waste product of protein breakdown (patient doesn't need any more urea). However, the patient needs some protein to prevent muscle wasting.
- Assess for kussmaul breathing which is deep/rapid breaths from the acid building up in the blood (metabolic acidosis). This type of breathing is a compensatory mechanism by the respiratory system to increase the blood's pH.

Anemia: low red blood cells in the blood. RBCs help transport oxygen throughout the body so it can function.

- Why is anemia presenting? Due to low amounts of EPO being produced by the kidneys and possible deficiency in other minerals that help with hemoglobin production (which acts as a transporter for RBCs). These minerals include *iron, folic acid, and vitamin B12*
- Patient signs and symptoms: pale, extremely tired, dyspnea, confused
- Treatment: Supplements of Iron (IV forms if the patient on dialysis rather than PO), Erythropoietin (subq injections), or blood transfusions per MD orders

Electrolyte Imbalances:

Hyperkalemia (>5.1 mEq/L): (normal level 3.5 – 5.1 mEq/L) at risk for the significant cardiac event due to the nephrons decreased ability to excrete potassium.

- Nursing Role:
 - restrict potassium-rich foods (potatoes, avocados, strawberries, tomatoes, spinach, oranges, bananas), monitor EKG for changes (tall peaked T-waves, Wide QRS and prolonged PR interval)
 - monitor lab values
 - may be ordered to give Kayexalate orally or rectally to remove extra potassium from the blood
 - place on a cardiac monitor to watch the rhythm

Hyperphosphatemia (>4.5 mg/dL): normal level 2.7-4.5 mg/dL

Hypocalcemia (<8.6 mg/dL): normal level 8.6-10 mg/dL

- Phosphate builds up in the blood because it cannot be excreted out of the kidney due to a damaged nephron, which leads to the decrease of calcium “hypocalcemia”.

WHY? Because phosphate binds to calcium and when there are high amounts of phosphate in the blood it depletes calcium from the blood due to this binding. In addition, calcium levels decrease due to the inactivation of vitamin d by the kidneys.

- In addition, high phosphate levels stimulate the parathyroid gland to release PTH (parathyroid hormone), which causes the bones to leak calcium in the blood stream to increase the level. This can cause bone problems.
- Nursing Role:
 - Administer phosphate binders, such as calcium carbonate or “PhosLo (calcium acetate)” to decrease phosphate levels. These medications work by excreting phosphate in the stool found in food. Give with meals or immediately after eating.
 - Diet low in phosphate: Restrict foods high in phosphate: poultry, fish, dairy, nuts, sodas, and oatmeal.
 - Safety due to weak bones.

Hypermagnesemia (>2.6 mg/dL): normal 1.6-2.6 mg/dL

- Patient is at risk for EKG changes, tendon reflexes diminished or absent, lethargy.
- Nursing role:
 - Avoid administering magnesium-based antacids or laxatives
 - Low magnesium foods
 - MD may order IV calcium to help decrease level

LOW UOP and Fluid Overload:

- Monitor intake and output (strict)
- Daily weights
- Assess swelling and lung sounds “crackles”
- Monitor blood pressure
- Low sodium diet

References:

1. “Kidney Disease Statistics For The United States | NIDDK.” *National Institute of Diabetes and Digestive and Kidney Diseases*. N.p., 2017. Web. 17 July 2017.
2. “What Is Chronic Kidney Disease? | NIDDK.” *National Institute of Diabetes and Digestive and Kidney Diseases*. N.p., 2017. Web. 17 July 2017.

Chronic Kidney Disease (End Stage Renal Failure) NCLEX Questions

1. A 55-year-old male patient is diagnosed with chronic kidney disease. The patient’s recent GFR was 25 mL/min. What stage of chronic kidney disease is this known as?

- a. Stage 1
- b. Stage 3
- c. Stage 4
- d. Stage 5

2. A patient with CKD has a low erythropoietin (EPO) level. The patient is at risk for?

- a. Hypercalcemia
- b. Anemia

- c. Blood clots
- d. Hyperkalemia

3. A 65-year-old male patient has a glomerular filtration rate of 55 mL/min. The patient has a history of uncontrolled hypertension and coronary artery disease. You're assessing the new medication orders received for this patient. Which medication ordered by the physician will help treat the patient's hypertension along with providing a protective mechanism to the kidneys?

- a. Lisinopril
- b. Metoprolol
- c. Amlodipine
- d. Verapamil

4. Which patient below is NOT at risk for developing chronic kidney disease?

- a. A 58-year-old female with uncontrolled hypertension.
- b. A 69-year-old male with diabetes mellitus.
- c. A 45-year-old female with polycystic ovarian disease.
- d. A 78-year-old female with an intrarenal injury.

5. A patient with Stage 5 CKD is experiencing extreme pruritus and has several areas of crystallized white deposits on the skin. As the nurse, you know this is due to excessive amounts of what substance found in the blood?

- a. Calcium
- b. Urea
- c. Phosphate
- d. Erythropoietin

6. Your patient with chronic kidney disease is scheduled for dialysis in the morning. While examining the patient's telemetry strip, you note tall peaked T-waves. You notify the physician who orders a STAT basic metabolic panel (BMP). What result from the BMP confirms the EKG abnormality?

- a. Phosphate 3.2 mg/dL
- b. Calcium 9.3 mg/dL
- c. Magnesium 2.2 mg/dL
- d. Potassium 7.1 mEq/L

7. You are providing education to a patient with CKD about calcium acetate. Which statement by the patient demonstrates they understood your teaching about this medication? Select-all-that-apply:

- a. "This medication will help keep my calcium level normal."
- b. "I will take this medication with meals or immediately after."
- c. "It is important I consume high amounts of oatmeal, poultry, fish, and dairy products while taking this medication."
- d. "This medication will help prevent my phosphate level from increasing."

8. While assessing morning labs on your patient with CKD. You note the patient's phosphate level is 6.2 mg/dL. As the nurse, you expect to find the calcium level to be?

- a. Elevated
- b. Low

- c. Normal
- d. Same as the phosphate level

9. A patient with stage 4 chronic kidney disease asks what type of diet they should follow. You explain the patient should follow a:

- a. Low protein, low sodium, low potassium, low phosphate diet
- b. High protein, low sodium, low potassium, high phosphate diet
- c. Low protein, high sodium, high potassium, high phosphate diet
- d. Low protein, low sodium, low potassium, high phosphate diet

10. The kidneys are responsible for performing all the following functions EXCEPT?

- a. Activating Vitamin D
- b. Secreting Renin
- c. Secreting Erythropoietin
- d. Maintaining cortisol production

Part 3; Nursing management of patients with Musculoskeletal disorders

Lecture 1: Bone Fractures

As a nursing student, you must be familiar with bone fractures, along with how to care for a patient experiencing one. You will learn the following from this lecture:

- Definition of bone fractures
- Types
- Signs and Symptoms
- Complications
- Nursing Interventions
- Treatment

What is a bone fracture? It's a break or crack in a bone.

Causes of Bone Fractures: happens because the bone can NOT withstand the force

- Trauma (fall, car accident, etc.)
- Twisting (sports injury, abuse, etc.)
- Diseases (bone cancer or osteoporosis)

Children tend to heal faster than adults from bone fractures because the periosteum (the dense fibrous membrane covering the bones) is stronger, more flexible, and thicker than adults.

It can take anywhere from 3 to 12 weeks to heal from a bone fracture, depending on the person's age and health status.

Complications of a bone fracture include:

- Infection (osteomyelitis)
- Compartment syndrome
- Fat embolism

Signs and Symptoms of a Bone Fracture

“BROKEN”

Bruising over the site (discolored with swelling) and pain

Reduced movement of extremity or muscle

Odd appearance (looks abnormal)

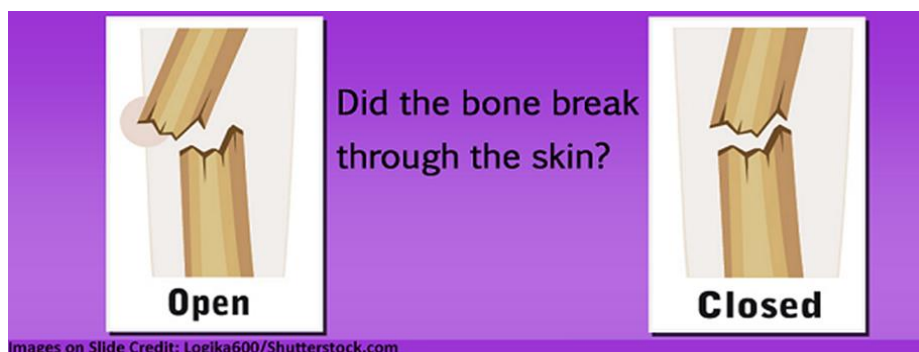
Krackling sounds due to bone fragments rubbing together (crepitus)

Edema and erythema at the site

Neurovascular impairment...6 P's (ischemia: pain, pallor, paralysis, paresthesia, pulselessness (late sign), poikilothermia)

Types of Bones Fractures:

****Remember these types!!**



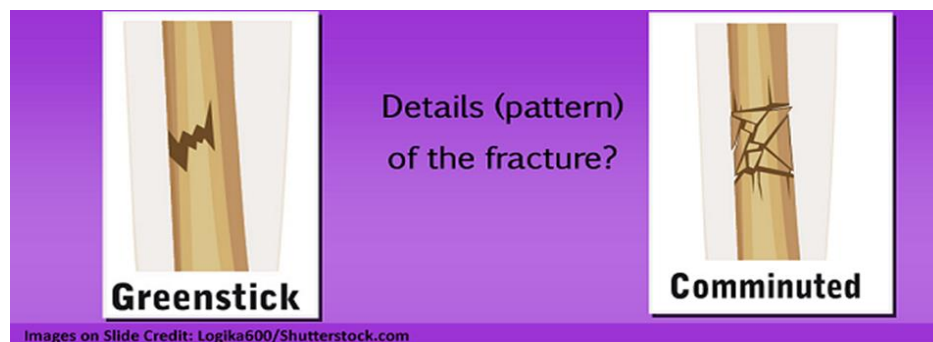
- Did it break through the skin? Open or closed

Open Fracture (“Compound”): a fractured bone that breaks through the skin

Closed Fracture (“Simple”): a fractured bone that does NOT penetrate through the skin (skin remains intact)



- *Is the bone completely broken or part of it?* Complete or incomplete
- Complete Fracture:** the fracture completely separates the bone in two
- Incomplete Fracture:** the fracture does NOT break the bone all the way through

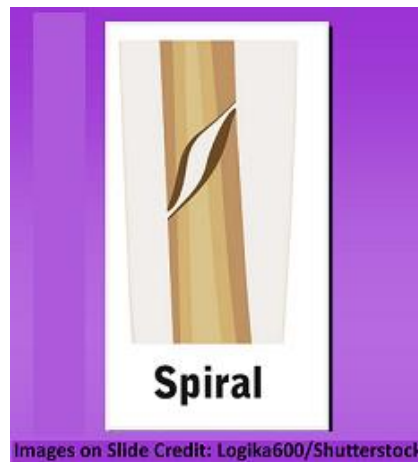


- *What is the pattern or details or the fracture?* Straight across, up and down, at an angle, crushed in fragments
- Greenstick:** one side of the bone is bent while the other is broken...*incomplete type of fracture* (is **most common in pediatric patients because their bones are more flexible than in adults**)
- Comminuted:** the bone is broken into many fragments (3 or more)

Transverse: the fracture is straight across the bone shaft

Oblique: the fracture is slanted across the bone shaft





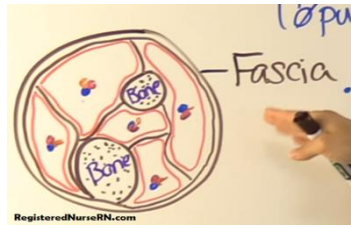
Spiral: the fracture twists around the bone shaft (from a twisting injury)

Nursing Interventions for Fractures

- After a fracture confirm the patient is safe (out of harm's way) and stable then.....
 - **Immobilize the fracture by using a device to splint it:** (it keeps the patient from using the affected extremity)
 - *WHY is this important to do?* The goal is to help a bone fracture heal properly by putting it back in its original state (if it moves this can cause improper healing). In addition, it prevents more surrounding tissue damage, bleeding, and pain.
 - Stop bleeding, if present, by applying pressure with a clean cloth (be sure you know if your patient takes blood thinners, and if possible, what their PT/INR (Coumadin) and PTT (Heparin) values are.
 - If the fracture is an opened "compound" fracture, cover it with a **sterile dressing!**
 - Elevate extremity to decrease swelling.
 - Apply ice wrapped in a towel to the injury to decrease swelling (want to prevent excessive swelling due to the risk of compartment syndrome).
 - Keep NPO (nothing by mouth) until evaluated by surgeon...may need surgery.
 - X-ray will be ordered to diagnose a possible fracture and what type.
 - Pain management with prescribed medications: document and closely monitor how the medication is relieving the pain...very important!! Watch out for compartment syndrome (pain is not relieved with medication and it hurts with passive movement like stretching or elevating the extremity).
 - Monitor for fat embolism, especially if this is a long bone fracture: Assess mental status and respiratory system: confusion, restlessness, increased respiration, difficulty breathing
 - **Assess neurovascular status!** Assess the 6 P's: this assesses the function of the nerves and blood flow for possible compartment syndrome (if not caught early this will lead to IRREVERSIBLE nerve, muscle, damage, and tissue death)

What is Compartment Syndrome?

Compartment syndrome occurs when too much pressure is exerted within the muscle compartments found within the fascia.



This can occur when there is hemorrhaging (bleeding) or swelling present after an injury, like with a bone fracture (or with external factors like a cast being too tight or traction). All this can increase the pressure within the compartments. As the pressure builds, this will cut off the blood supply and nerve function to this muscle. If not corrected within 6 hours, the damage is permanent.

Remember from anatomy and physiology that in the leg and arm there are individual compartments grouped together (but separated from one another) that contain bone, muscle, nerves, and vessels. Each compartment usually has its own muscle, nerve, and vessel supply. Fascia is what keeps all these structures in place and separated.

The important thing to remember about fascia when talking about compartment syndrome is that it does NOT expand when pressure increases within a compartment (so there will be no relief within the compartment from the fascia).

Instead, the pressure stays within the compartment and causes blood vessel and nerve function to become compromised (diminished). So, ischemia is going to occur to the muscle and distal extremity to the fracture.

Assess the **6 Ps**:

1. **P**ain (early sign)
2. **P**aresthesia (can be an early sign too)
3. **P**allor
4. **P**aralysis
5. **P**oikilothermia
6. **P**ulselessness (late sign)

Pain: worst with **passive** touch or movement, elevating the limb, or any pressure, stretching increases the pain. Pain medication is not relieving it.

Paresthesia: patient may report it feels like the extremity distal to the fracture feels like it is falling asleep or a “pin and needle” sensation. Can they feel you touch their extremity? *ALWAYS CHECK THE UNAFFECTED EXTREMITY TO COMPARE!*

Pallor: Extremity should be pink and have normal capillary refill less than 2 seconds. In CS, it may appear pale or dusky and have a capillary refill greater than 2 seconds. *ALWAYS CHECK THE UNAFFECTED EXTREMITY TO COMPARE!*

Paralysis: can the patient move the distal extremity from the fracture or has the movement decreased...this is a bad sign! *ALWAYS CHECK THE UNAFFECTED EXTREMITY TO COMPARE!*

Poikilothermia: This occurs when the affected extremity distal from the fracture feels cooler to the touch compared to the unaffected extremity. The extremity can NOT regulate its temperature.

Pulselessness: Always mark the pulses with a black marker and have a Doppler available to monitor the sound of the pulse. **(this is a late sign in compartment syndrome)**

Nursing interventions for Compartment Syndrome:

- keep the extremity AT HEART level (NOT below.... remember you want to maintain arterial pressure and elevating it above heart level will cause more ischemia)
- loosen and remove restrictive items
- notify the physician
- perform neurovascular checks (6 Ps)
- prepare the patient for possible bivalvement of the cast, reduction of weight in the traction, or in **severe cases fasciotomy**.

Various treatments for a Bone Fracture:

Bone reduction: putting the fractured bone back in its original state.

Closed reduction: done manually.... nonsurgical with general anesthesia

- **Cast** (plaster or fiberglass) placed to keep the broken bone in place to allow it to heal

Things to remember about casts:

- Monitor for compartment syndrome: 6 P's
- Monitor for infection: hotspots in the cast, severe pain, fever
- Keep the cast and extremity elevated **above** the heart level (decreases swelling)
- Apply ice packs to the cast for the first 2 days to decrease swelling
- Even drying for new cast by turning every 2 hours
- Use palms of the hand to handle (not fingertips) with a new wet plaster cast.
 - WHY? Prevents dent formation in the cast by handling with the palms of the hand, which can cause skin breakdown over time.
- Maintain skin integrity: petal the cast.... use soft tape called moleskin around the edge to prevent skin breakdown
- Keep the cast dry and never stick anything inside to scratch an itch

Open reduction: done surgically to put the fractured bone back in its original state and a fixation device used:

- Internal: attached to the bone inside the skin (pins, rods, plates, screws, or external)
- External: fixture attached to the outside of the skin that helps with bone healing (can be adjusted...metal braces, screws)
- **Traction:** aligns the bone with a constant steady pulling action.
- Make sure the weights are hanging freely and not on the floor
- Never remove weights with a MD order
- Pin care and monitor for infection (odorous draining, redness, pain)
- Neurovascular status: 6 P's
- Overhead trapeze bar to move around in bed

References:

1. *Assessment & Initial Management of the Trauma Patient*. (2006). *Emergency.cdc.gov*. Retrieved 3 October 2017, from https://emergency.cdc.gov/masscasualties/word/blast_curriculum_3H.doc
2. *Cast Care | HealthReach*. *HealthReach*. Retrieved 4 October 2017, from <https://healthreach.nlm.nih.gov/document/546/Cast-Care>

Fractures NCLEX Questions

1. Figure 1 represents what type of bone fracture: This is a fracture that is slanted across the bone shaft.

- a. Transverse Fracture
- b. Spiral Fracture
- c. Oblique Fracture
- d. Compound Fracture

2. Figure 2 represents what type of bone fracture: The fractured bone is broken into many fragments (3 or more).

- a. Open Fracture
- b. Greenstick Fracture
- c. Oblique Fracture
- d. Comminuted Fracture

3. Figure 3 represents what type of bone fracture: This a fractured bone that breaks through the skin.

- a. Closed Fracture
- b. Compound Fracture
- c. Greenstick Fracture
- d. Transverse Fracture

4. You're caring for a patient who has experienced a fracture to the right arm that is represented in Figure 3. What nursing intervention will you take with this type of fracture?

- a. Cover the fracture with a sterile dressing
- b. Place the arm below the heart level.
- c. Attempt bone reduction by manually readjusting the bone.
- d. Place a tight compression bandage over the fracture.

5. A 85-year-old patient has an accidental fall while going to the bathroom without assistance. It appears the patient has sustained a bone fracture to the left leg. The leg's shape is deformed and the patient is unable to move it. The patient is alert and oriented but in pain. What will you do FIRST after confirming the patient is safe and stable?

- a. Apply an ice pack covered with a towel to the site.
- b. Immobilize the fracture with a splint.
- c. Administer pain medication.
- d. Elevate the extremity above heart level.

6. Which statement by a patient, who just received a cast on the right arm for a fracture, requires you to notify the physician immediately?

- a. "It is really itchy inside my cast!"
- b. "My pain is so severe that it hurts to stretch or elevate my arm."
- c. "I can feel my fingers and move them."
- d. "I've been using ice packs to reduce swelling."

7. What is a late sign of compartment syndrome?

- a. Paralysis
- b. Pain
- c. Paresthesia
- d. Pulselessness

8. Select all the signs and symptoms that will present in compartment syndrome?

- a. Capillary refill less than 2 seconds
- b. Pallor
- c. Pain relief with medication
- d. Feeling of tingling in the extremity
- e. Affected extremity feels cooler to the touch than the unaffected extremity

9. Your patient is 2 hours post-op from a cast placement on the right leg. The patient has family in the room. Which action by the significant other requires you to re-educate the patient and family about cast care?

- a. Gently move the cast with the fingertips of the hands every 2 hours to help with drying.
- b. Positioning the cast at the heart level with pillows.
- c. Checking the color and temperature of the right foot.
- d. Using a hair dryer on the cool setting to help with drying.

10. A patient sustained a fracture to the femur. The patient has suddenly become confused, and restless, and has a respiratory rate of 30 breaths per minute. Based on the location of the fracture and the presenting symptoms, this patient may be experiencing what type of complication?

- a. Compartment Syndrome
- b. Osteomyelitis
- c. Fat embolism
- d. Hypovolemia

11. Which assessment finding found while assessing a patient with a fracture who has traction requires immediate intervention?

- a. The weights are freely hanging on the floor.
- b. Pin sites are free from drainage.
- c. Patient uses the overhead trapeze bar to move around in the bed.
- d. Patient's extremities have a capillary refill of less than 2 seconds.

12. A 5-year-old has a fracture of the right upper arm. The x-ray showed that one side of the bone is bent while the other is broken. Is this known as a _____ fracture?

- a. Spiral
- b. Greenstick
- c. Oblique
- d. Transverse

NCLEX Cast Care Question

This is an **NCLEX cast care question**. This question provides a scenario about a patient with a cast, and you must decide which action performed by the patient's significant other requires you to re-educate the patient and family about cast care.

Your patient is 2 hours post-op from a cast placement on the right leg. The patient has family in the room. Which action by the significant other requires you to re-educate the patient and family about cast care?

- a. Checking the color and temperature of the right foot.
- b. Elevating the cast above heart level with pillows.
- c. Gently use the fingertips of the hands to move the cast every 2 hours to help with drying.

- d. Using a hair dryer on the cool setting to help with drying and itching.

To answer this question correctly, you have to pull from your nursing knowledge about cast care.

What's a cast? It is a device used to immobilize a fractured bone, which will allow the bone to heal naturally. They are often placed after a closed bone reduction (a fancy way of saying the bone was manually placed back in its original state) and can be made of plaster or fiberglass.



Credit: logika600/Shutterstock.com

Nursing Interventions for Cast Care:

- Monitor for **compartment syndrome: 6 P's**
- Monitor for **infection**: hotspots in the cast, severe pain, fever
- Keep the cast and extremity **elevated above the heart level** (decreases swelling)
- Apply ice packs to the cast for the first 2 days to decrease swelling
- Evenly dry the cast by turning it every 2 hours
- Use **palms of the hand to handle (not fingertips)** when wet:
 - **WHY?** Prevents dent formation in cast by handling with the palms of the hand, which can cause skin breakdown overtime
 - Maintain skin integrity: petal the cast and use soft tape called moleskin around the edges to prevent skin breakdown
- Keep the cast dry and never stick anything inside it to scratch an itch

Now let's eliminate options (we want to eliminate options that are correct actions performed by the patient's significant other....so we are looking for something the person performed wrong):

A. Checking the color and temperature of the right foot. ELIMINATED! This is a good thing! We want the patient and the patient's family to check the 6 P's to help catch compartment syndrome early if it develops.

B. Elevating the cast above heart level with pillows. ELIMINATED! Another good thing! This helps decrease swelling, which is what we want because excessive swelling can lead to compartment syndrome.

C. Gently using the fingertips of the hands to move the cast every 2 hours to help with drying. CORRECT! This is an alarming finding and the significant other should be re-educated on how to handle the wet cast properly. The family member should use the PALMS of the hands....not fingertips. **WHY?** The fingertips will cause dent formation, which can lead to skin ulcer formation overtime.

D. Using a hair dryer on the cool setting to help with drying and itching.

ELIMINATED! This can be done to help the cast dry faster and help with itching. The hair dryer should never be on a warm or hot setting due to the risk of burns.

The answer is C.

References:

1. *Assessment & Initial Management of the Trauma Patient*. (2006). *Emergency.cdc.gov*. Retrieved 3 October 2017, from https://emergency.cdc.gov/masscasualties/word/blast_curriculum_3H.doc
2. *Cast Care* | *HealthReach*. *HealthReach*. Retrieved 4 October 2017, from <https://healthreach.nlm.nih.gov/document/546/Cast-Care>

Lecture 2: Rheumatoid Arthritis

As a nursing student, you must be familiar with rheumatoid arthritis along with how to care for patients who are experiencing this condition. You will learn the following from this lecture:

- Definition of rheumatoid arthritis
- Overview
- Signs and Symptoms
- Nursing Interventions
- Treatment

What is rheumatoid arthritis? An autoimmune condition that causes inflammation in the joints. This inflammation specifically affects the membrane lining of the joint called the **synovium**. Rheumatoid arthritis can eventually lead to bone fusion.

What is a joint? It is where two bones meet together.

Rheumatoid Arthritis Stages:

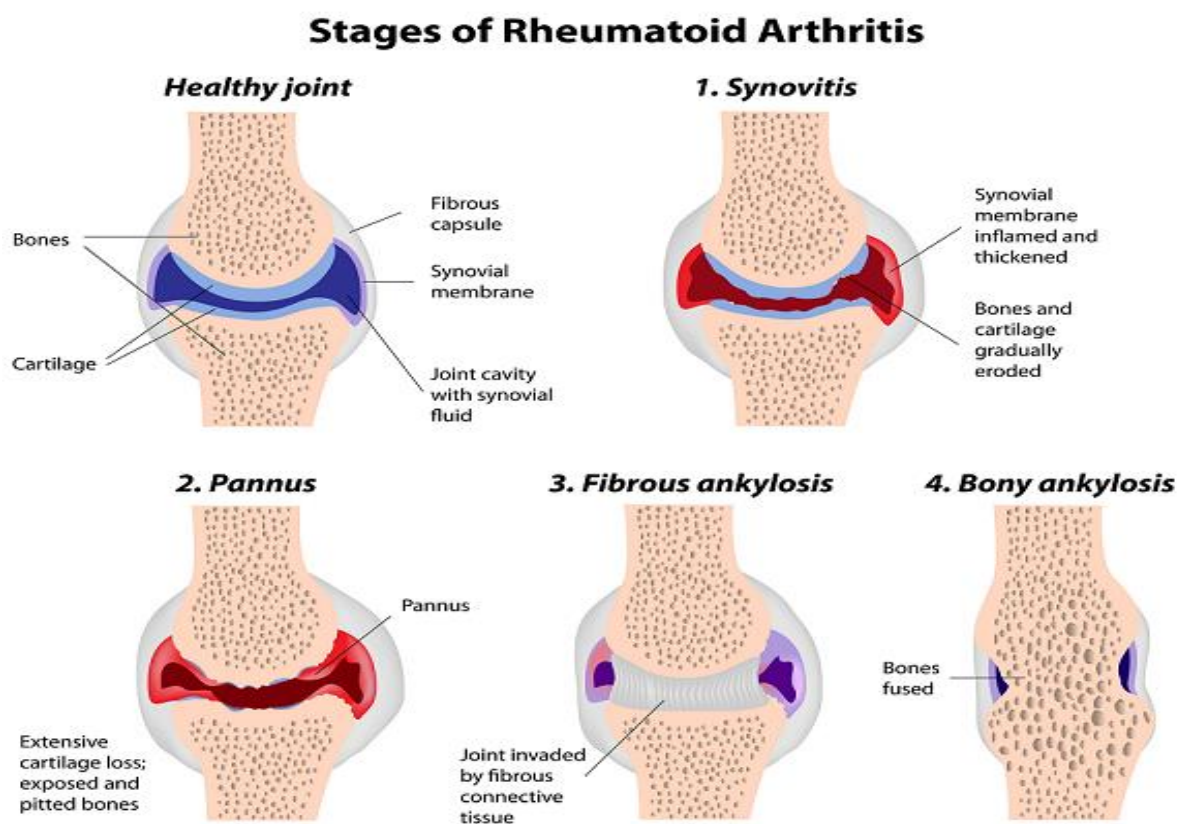


Photo Credit: Alila Medical Media/Shutterstock.com

Synovitis: inflammation of the synovium

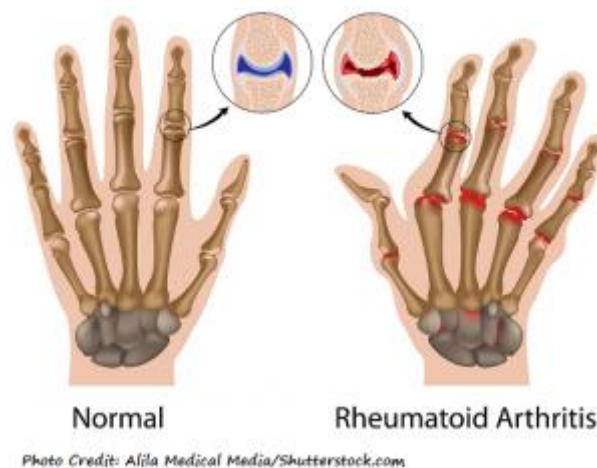
WBCs invade the synovium, which causes it to become inflamed. This inflammation leads to thickening, and the formation of a pannus.

Formation of a Pannus:

A pannus is a layer of vascular fibrous tissue. The pannus will grow so large it will damage the bone and cartilage within the joint. The space in between the joints will disappear and ankylosis will develop.

Ankylosis:

This is the fusion of the bones. The patient will have major stiffness and immobility of the joint.

**Overview of Rheumatoid Arthritis**

The patient will have soft, tender, warm, and swollen joints. They will feel very tired (this leads them to be inactive) and have a fever.

****Hallmark signs: RA affects the same joint bilaterally. Stiffness and pain will be worst in the mornings (>30 minutes of stiffness) or after long periods of inactivity and all types of joints can be affected.**

In the late stages bone deformity occurs (**note the image below how the fingers are curved at the tops and it is symmetrical**):



Rheumatoid arthritis **most commonly affects the fingers and wrist**. It can also affect the neck, shoulders, elbows, ankles, knee, and feet. However, it just doesn't affect the joints but can extend to the heart, skin, eyes, mouth, lungs, and cause anemia.

Can happen at any age...most commonly 20-60 years old....not just in older adults as in osteoarthritis.

Cases vary: some patient have severe chronic cases that last for life time. While others may have for a short time and it goes into remission. RA can come on suddenly or gradually over years.

There is no cure for RA.

This key is to catch it early to prevent the progression of joint damage. Treatment includes:

- Medications: NSAIDs, corticosteroids, and DMARDs
- Surgery (replacing the joint with an artificial one, removal of the synovium “synovectomy”, “arthrodesis” (joint fusion) where the joint is removed and the bones are fused together with a bone graft.

It leads to the destruction of the joint within 2 years of the development of the disease, so it happens fast.

Management with:

- Lifestyle changes (developing plans for rest and exercise)
- Joint support: splints, using assistive device
- Stay healthy and low stress (cause flare-up)

Cause not clear (genetic, environmental, or hormonal factors)...tends to affect women more than men

Hard to diagnosis because symptoms may be associated with other diseases...tests typically ordered:

- Positive rheumatoid factor, elevated erythrocyte sedimentation, C-reactive protein (inflammation is present the body...higher in people with RA), x-ray shows joint deterioration

Signs and Symptoms of Rheumatoid Arthritis

Seven S's

Sunrise Stiffness (severe pain)

Soft feeling in the joints

Swelling in the joint (warm)

Symmetrical

Synovium (affected and inflamed)

Systemic (affects not only the joints...patient will feel achy, tired, and it can affect the lungs, heart, anemia etc)

Stages (synovitis, pannus, anklyosis)

Nursing Interventions for Rheumatoid Arthritis

Nursing focus:

- Pain (need to know how to treat the pain)
- Preserving the joints (improving function and mobility, using assistive devices)
- Education (medications and nonpharmacological treatment, the disease itself)
- Mental status (dealing with depression and improving self-esteem, pain, alters life, no cure)

Joint assessment

Ask patient questions to help determine early on if this is RA: does it affect the symmetrical joints, when is the stiffness the worst?

Educate patient about the disease (no cure but can be managed) and assess patient's understanding about RA because management (exercise, medications) help improve quality of life and prevent further joint deterioration.

Taking care of joints and decreasing fatigue:

During flare-ups rest the joints that are inflamed (no exercise on the joint)...splints help with this along heat and cold treatments:

- heat (best for stiffness)...heating pad or hot showers
- cold (best for pain...helps reduce inflammation)

Patient needs to maintain physical exercise as tolerated. This improves the fatigue and prevents a decrease in muscle strength. In addition, it prevents contractions by keeping the joints in motion.

Patient needs to schedule times for rest and to never overexert themselves.

Monitor for signs and symptoms of anemia (pale, fatigue, short of breath on exertion, palpitations)...may be ordered supplements to promote RBCs production **like iron, folic acid, vitamin b 12**...at risk for GI bleeding due to medications NSAIDs....watch for dark, tarry stools

Multidisciplinary approach: Physical therapy and occupational therapy will be part of the patient's care to help assist with treatment plans.

Patient needs to perform routinely ROM (range of motion) exercises and low impact aerobic exercise (stationary bike, walking, water aerobics)

Use assistive devices (make sure the patient is using them correctly to promote safety...at risk for injury). These devices help alleviate stress on the joints. These devices include raised toilet seat, tools to help grab items, tools to help button or zip shirts, shower chair, cane, walkers etc.

Medications for Rheumatoid Arthritis: combination of therapy may be used depending on the patient's case

NSAIDs: decreases inflammation and helps with pain

- "Ibuprofen": may cause GI distress...needs to be taken with food

Corticosteroids: decreases inflammation

- Dexamethasone (Decadron)
- Methylprednisolone (Medrol)
- Prednisone
 - Can be given by mouth, topical, IV, injection into the joint or IM
 - Skin become thin and fragile, bruises and tears easily....meticulous skin care
 - Watch for hyperglycemia, especially in diabetic patients
 - At risk for infection

DMARDs (disease-modifying antirheumatic drugs): suppresses immune system from attacking the joint along with helping slow down the destruction of the disease on the joints and bones.

- Hydroxychloroquine (Plaquenil) (**monitor for vision changes...retinal damage**)
- Leflunomide (arava)
- Methotrexate (Trexall)
- Sulfasalazine (Azulfidine)

DMARDs (biologic response modifiers): These drugs are still part of the DMARDs drug category but are **genetically engineered and used in very severe cases.**

- Abatacept
- Adalimumab
- No live vaccines, avoid infection (handwashing, avoid crowds and sick people), keeping appointments to measure blood levels (wbcs), injection site will be sore...common to have site reaction

NCLEX Practice Questions On Rheumatoid Arthritis

1. During a routine health check-up visit a patient states, “I’ve been experiencing severe pain and stiffness in my joints lately.” As the nurse, you will ask the patient what questions to assess for other possible signs and symptoms of rheumatoid arthritis?

Select-all-that-apply:

- a. “Does the pain and stiffness tend to be the worst before bedtime?”
- b. “Are you experiencing fatigue and fever as well?”
- c. “Is your pain and stiffness symmetrical on the body?”
- d. “Is your pain and stiffness aggravated by extreme temperature changes?”

2. True or False: Rheumatoid arthritis tends to affect women more than men and people who are over the age of 60.

3. Identify the correct sequence in how rheumatoid arthritis develops:

- a. Development of pannus, synovitis, ankylosis
- b. Ankylosis, development of pannus, synovitis
- c. Synovitis, development of pannus, ankylosis
- d. Synovitis, ankylosis, development of pannus

4. A patient with severe rheumatoid arthritis is scheduled for a procedure called an arthrodesis. The nursing student you are precepting asks what type of procedure this is.

Your response is:

- a. “It is a procedure where the affected joint is removed and each end of the bones found within that joint are fused together.”
- b. “It is a procedure that involves replacing the joint with an artificial one.”
- c. “It is a procedure where the surgeon goes in with a scope and cleans out the affected joint.”
- d. “It is a procedure where the synovium is completely removed within the joint, which helps decrease inflammation of the joint.”

5. A 58 year old female is experiencing a flare-up with rheumatoid arthritis. While assisting the patient with her morning routine, the patient verbalizes a pain rating of 7

on 1-10 scale in the right and left wrist along with severe stiffness. You note the wrist joints to be red, warm, and swollen. What nonpharmacological nursing interventions can you provide to this patient to help alleviate pain and stiffness? Select-all-that-apply:

- a. Exercise the affected joints
- b. Assist the patient with a warm shower or bath
- c. Perform deep massage therapy to the wrist joints
- d. Assist the patient with applying wrist splints

6. You are providing education to a patient, who was recently diagnosed with rheumatoid arthritis, about physical exercise. Which statement made by the patient is correct?

- a. "It is best I try to incorporate a moderate level of high impact exercises weekly into my routine, such as running and aerobics."
- b. "I will be sure to rest joints that are experiencing a flare-up, but I will try to maintain a weekly regime of range of motion exercises along with walking and riding a stationary bike."
- c. "It is important I perform range of motion exercises during joint flare-ups and incorporate low-impact exercises into my daily routine."
- d. "Physical exercise should be limited to only range of motion exercises to prevent further joint damage."

7. Disease-modifying antirheumatic drugs (DMARDs) are used to treat rheumatoid arthritis. Select-all-the drugs below that are DMARDs:

- a. Dexamethasone (Decadron)
- b. Hydroxychloroquine (Plaquenil)
- c. Teriparatide (Forteo)
- d. Calcitonin
- e. Leflunomide (Arava)
- f. Methotrexate (Trexall)

8. A patient with rheumatoid arthritis is experiencing sudden vision changes. Which medication found in the patient's medication list can cause retinal damage?

- a. Hydroxychloroquine (Plaquenil)
- b. Leflunomide (Arava)
- c. Sulfasalazine (Azulfidine)
- d. Methylprednisolone (Medrol)

9. You're providing care to a patient with severe rheumatoid arthritis. While performing the head-to-toe nursing assessment, you note the patient's overall skin color to be pale and the patient looks exhausted. You ask the patient how she is feeling, and she says "I'm so tired. I can't even get out of this bed without getting short of breath." Which finding on the patient's morning lab work may confirm a complication that can be experienced with rheumatoid arthritis?

- a. Potassium 3.2 mEq/L
- b. Hemoglobin 7 g/dL
- c. Sodium 135 mEq/L
- d. WBC count 6,500

10. A physician suspects a patient may have rheumatoid arthritis due to the patient's presenting symptoms. What diagnostic testing can be ordered to help a physician diagnose rheumatoid arthritis? Select all that apply:

- a. Rheumatoid factor
- b. Uric acid level
- c. Erythrocyte sedimentation
- d. Dexa-Scan
- e. X-ray imaging

Lecture 3: Amputation

Description

Amputation is the removal of a body part usually part or whole of an extremity (limb)

Amputation Causes

- Progressive peripheral vascular disease (often a complication of Diabetes Mellitus: "Diabetic foot")
- Trauma: crush injury, burn injury including electrical, frostbite
- Chronic osteomyelitis
- Gas gangrene
- Malignant tumor
- Congenital deformity

Aim of Amputation

- To save life where gangrene (inadequate circulation) infection or malignancy will spread
- To preserve as much viable healthy limb as possible
- To relieve symptoms
- To improve function
- To improve quality of life

Levels of Amputation

- Aim to conserve as much limb as possible and to preserve joints
- Surgery at the most distal point of limb which will heal successfully
- Depends on: Circulatory status of extremity
- Appropriate level for fitting prosthesis

Pre-operative Assessment

Age of patient and general health. Current medications psychological impact of proposed surgery. Circulatory status of affected limb: Doppler flowmetry. Segmental BP
Transcutaneous partial pressure O₂ (PaO₂). Related muscle and joint function

Amputation Complications

1. Hemorrhage
2. Infection

3. Skin breakdown/ delayed healing
4. Phantom limb pain (tingling pain as if limb still present) Joint contracture
5. Severe depression and grief over permanent loss of limb, altered body image and modification of lifestyle

Amputation: Post-operative Nursing Care

Adequate hydration/ nutritional status. Aseptic technique. Monitor wound healing, presence of oedema/ infection/ skin breakdown. Monitor for onset of complications. Tourniquet available in case of severe hemorrhage. Assess mood

Amputation: Care of Limb

Reduce oedema (delays healing): Elevate limb (avoid placing lower limb on pillow. Risks flexion contracture of hip joint. Rather raise foot of bed). Constant pressure bandage: (molds stump for prosthesis). Range of motion exercises/ change of position: Strengthens and molds muscles of stump. Prevents flexion contracture of joint

Amputation Phantom Pains

Monitor for phantom pains Address by:

Massage of stump to mold for prosthesis and desensitization with:

- Transcutaneous electrical nerve stimulation (TENS)
- Local anaesthetic β -blocker medication

Amputation Rehabilitation

Multi-disciplinary rehabilitation team (patient, physician, nurse, physiotherapist, psychologist, occupational therapist)

- Early application of prosthesis as soon as stump formed.
- Early usage/ ambulation ($\uparrow$ muscle tone)
- Counselling, encouragement, support for grieving process, lifestyle changes

Lecture 4: Osteomyelitis Nursing Management

Definition

- Osteomyelitis is a pyogenic bone infection.

Risk Factors

- Trauma or secondary infection (most commonly *Staphylococcus aureus*).
- Blood-borne (hematogenic) osteomyelitis is more common in children after a throat infection.
- Resulting from orthopedic surgical procedures is more common in older persons.

Pathophysiology

- Circulation of infectious microbes through the bloodstream to susceptible bone leads to inflammation, increased vascularity and edema.
- The organisms grow, pus forms within the bone, and abscess may form. This deprives the bone of its blood supply, eventually leading to necrosis.



image by : nlm.nih.gov

Assessment/Clinical Manifestations/Signs And Symptoms

- Localized bone pain
- Tenderness, heat and edema in the affected area
- Guarding of the affected area
- Restricted movement in affected area
- Purulent drainage from a skin abscess

Systemic symptoms

- High fever and chills in acute osteomyelitis
- Low-grade fever and generalized weakness in chronic osteomyelitis

Laboratory and diagnostic study findings

- White blood cell count reveals leukocytosis
- Erythrocyte sedimentation rate is elevated
- Blood culture identifies the causative organisms.
- Radiographs and bone scan demonstrate bone involvement in advanced disease.

Medical Management

- Initial goal is to control and arrest the infective process.
- Affected area is immobilized; warm saline soaks are provided for 20 minutes several times a day
- Blood and wound cultures are performed to identify organisms and select the antibiotic
- Intravenous antibiotic therapy is given around-the-clock.
- Antibiotic medication is administered orally (on empty stomach) when infection appears to be controlled; the medication regimen is continued for up to 3 months
- Surgical debridement of bone is performed with irrigation; adjunctive antibiotic therapy is maintained.

Nursing Diagnosis

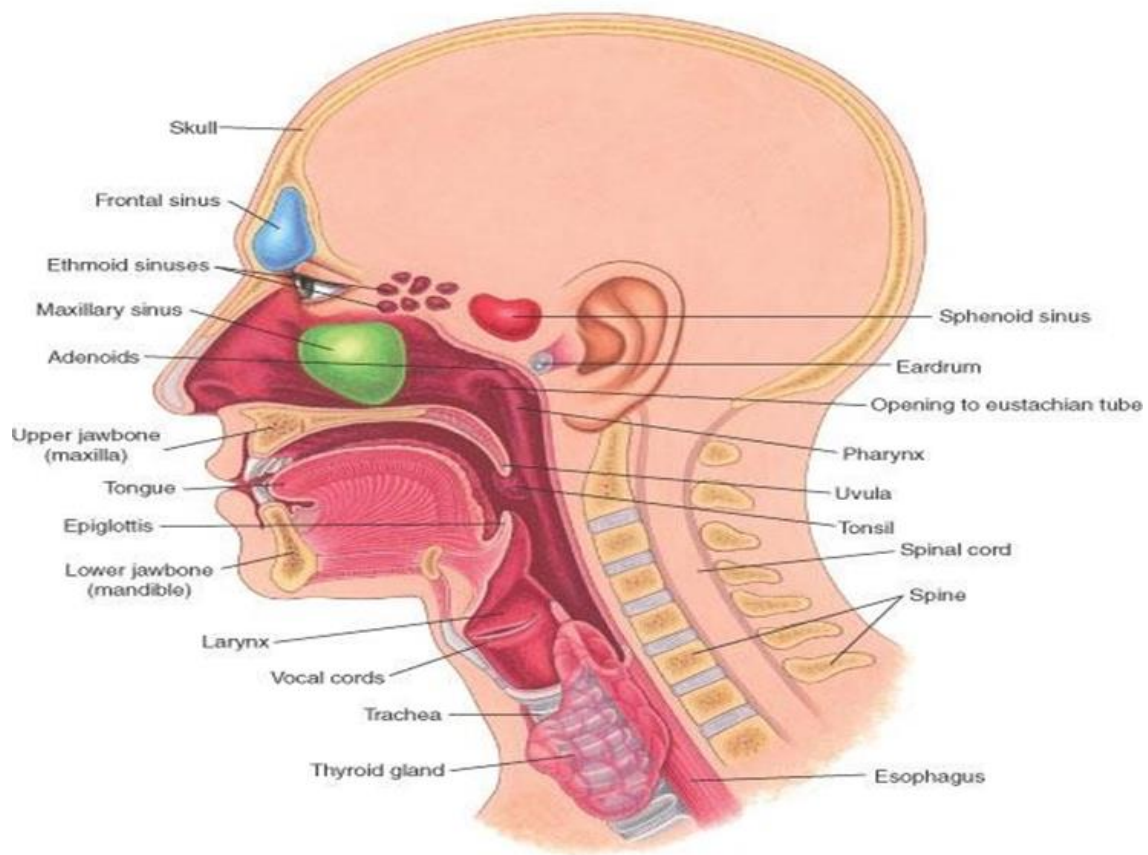
- Pain related to inflammation and swelling
- Impaired physical mobility associated with pain, immobilization devices, and weight-bearing limitations

- Risk for extension of infection: bone abscess formation
- Deficient knowledge about treatment regimen

Nursing Management

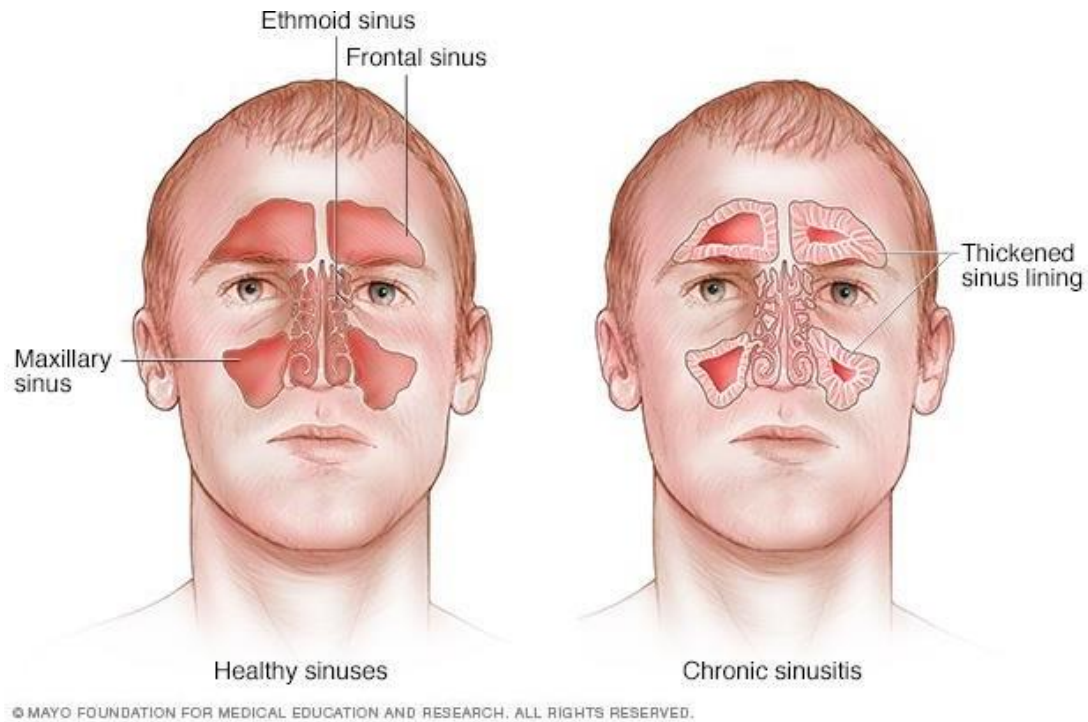
1. Protect the affected extremity from further injury and pain by supporting the limb above and below the affected area.
2. Prepare the client for surgical treatment, such as debridement, bone grafting or amputation, as appropriate.
3. Administer prescribed medications, which may include opioid and non-opioid analgesics and antibiotics.
4. Promote healing and tissue growth.
 - Provide local treatments as prescribed (e.g. warm saline soaks, wet to dry dressings)
 - Provide a diet high in protein and vitamins C and D.

Part 5: Nursing Management of Patients With Ear, Nose, And Throat (ENT) Disorders



Lecture 1: Sinusitis

Sinusitis is an inflammation, or swelling, of the tissue lining the sinuses. Normally, sinuses are filled with air, but when sinuses become blocked and filled with fluid, germs (bacteria, viruses, and fungi) can grow and cause an infection.



Types of sinusitis

1. **Acute sinusitis:** A sudden onset of cold-like symptoms such as runny, stuffy nose and facial pain that does not go away after 10 to 14 days. Acute sinusitis typically lasts 4 weeks or less.
2. **Subacute sinusitis:** An inflammation lasting 4 to 8 weeks.
3. **Chronic sinusitis:** A condition characterized by sinus inflammation symptoms lasting 8 weeks or longer.
4. **Recurrent sinusitis:** Several attacks within a year.

Causes

- Common cold,
- Allergic rhinitis (swelling of the lining of the nose),
- Nasal polyps (small growths in the lining of the nose)
- A deviated septum (a shift in the nasal cavity).
- In children, common environmental factors that contribute to sinusitis include allergies, illness from other children at daycare or school, pacifiers, bottle drinking while lying on one's back, and smoke in the environment.
- In adults, the contributing factors are most frequent infections and smoking.

Signs and Symptoms of Acute Sinusitis

1. Facial pain/pressure.
2. Nasal stuffiness.
3. Nasal discharge.
4. Loss of smell.
5. Cough/congestion

Additional symptoms may include:

- Fever.
- Bad breath.
- Fatigue.
- Dental pain

Diagnostic Procedures

1. Physical examination.

The exam may include feeling and pressing the sinuses for tenderness.

2. Mucus culture.
3. Nasal endoscopy (see below).
4. X-rays.
5. Allergy testing.
6. CT scan of the sinuses
7. Blood test.

Treatment

- **Acute sinusitis.**

1. decongestants like Sudafed and steam inhalations alone.
2. If antibiotics are given, they are usually given for 10 to 14 days.

- **Chronic sinusitis.**

- a. Warm moist air may alleviate sinus congestion.
- b. A vaporizer or inhaling steam from a pan of boiling water (removed from heat) may also help.
- c. Warm compresses are useful to relieve pain in the nose and sinuses.
- d. Saline nose drops are also safe for home use.
- e. Antibiotics or oral steroids may also be prescribed.
- f. For chronic or recurring sinusitis, referral to an otolaryngologist may be indicated

Complications

1. Meningitis
2. Brain abscess
3. Infection of the bone.

Nursing Diagnosis and Interventions for Sinusitis

- **Acute Pain:** in head, throat, sinus related to inflammation of the nose

Interventions:

1. Assess the client's level of pain
2. Explain the causes and effects of pain on the client and family
3. Teach relaxation techniques and distractions
4. Observation of vital signs and client complaints.

- **Anxiety:** related to lack of client knowledge about diseases and medical procedures

Interventions:

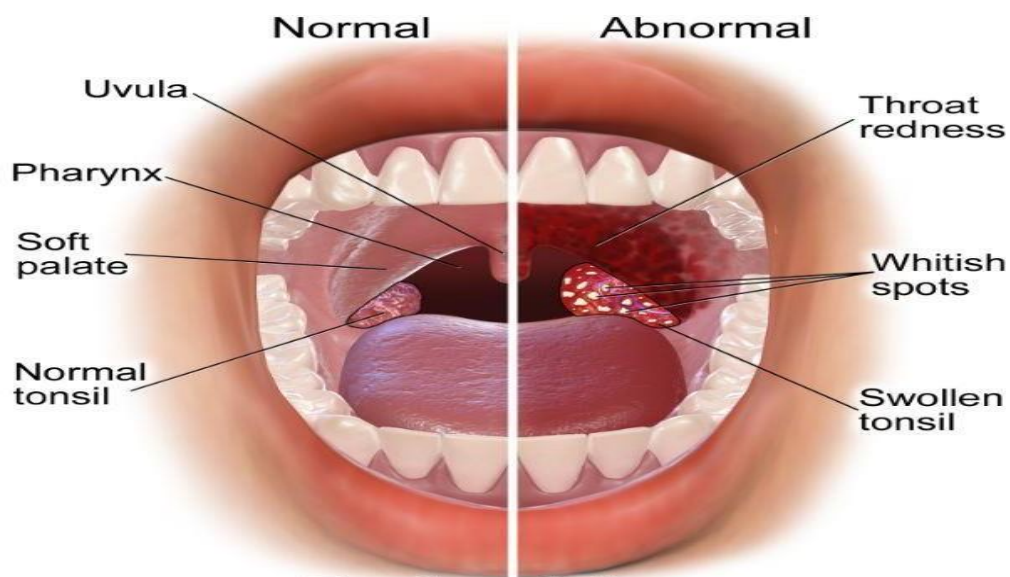
1. Assess client's level of anxiety
 2. Show empathy (it comes with a touch client)
 3. Give an explanation to clients about the illness slowly, quietly and use of clear sentences, short easy to understand
 4. Get rid of excessive stimulation such as:
 - Place the room quieter client
 - Limit contact with others / other clients are likely to experience anxiety
- **Ineffective Airway Clearance** related to the obstruction (nasal secret buildup) secondary to inflammation of the sinuses

Interventions:

1. Assess the existing build-secret
2. Observation of vital signs
3. Collaboration with the medical team for cleaning discharge

Lecture 2: Tonsillitis

- At the back of throat, two masses of tissue called tonsils. The tonsils are large lymphoid tissues which act as filters, trapping germs that could otherwise enter airways and cause infection. They also produce antibodies to fight infection. But sometimes the tonsils themselves become infected. Overwhelmed by bacteria or viruses, they swell and become inflamed, a condition known as tonsillitis.
- Tonsillitis is contagious. Tonsillitis is spread mainly by droplets from direct contact or airborne droplets (cough).
- Viral caused tonsillitis is often contagious for about 7–10 days while untreated bacterial caused disease may be contagious for about 2 weeks. However, bacterial-caused tonsillitis can be treated with antibiotics and the patient usually is not contagious 24–48 hours after starting antibiotics.



Causes

1. Whether viral or bacterial, tonsillitis is transmitted most commonly from one person to another by social contact such as droplets in the air from sneezing.
2. Most of the time, tonsillitis is caused by a viral infection.
3. Bacterial tonsillitis can be caused by *Streptococcus pyogenes*, the organism that causes strep throat.
4. Only about 30% of tonsillitis in children is caused by strep throat.
5. Only 10% of tonsillitis in adults is caused by strep throat.

Symptoms

- Sore throat.
- Difficulty feeding (in babies).
- Pain with swallowing.
- Fever
- Headache.
- Abdominal pain.
- Nausea and vomiting.
- Cough, Hoarseness.
- Runny nose.
- Redness of the tonsils and throat, white patches on the tonsils
- Tenderness in the glands of the neck (swollen lymph glands).
- Ear pain (caused by nerves that go to the back of the throat also go to the ear)

Diagnosis

1. Physical examination.
2. A swab specimen from the back of the throat.

Treatment

1. Throat pain and fever may be improved with over-the-counter pain relievers such as ibuprofen.
2. Ease sore throat pain by gargling frequently with warm salt water
3. Drink plenty of fluids to avoid dehydration.
4. Because most sore throats are caused by viruses, antibiotics are not routinely needed. However, penicillin is the most commonly prescribed class of antibiotics.
5. People who are allergic to penicillin may be treated with erythromycin. Treatment with oral antibiotics may be provided for 10-14 days.
6. If there are abscesses not cured, they should be drained either by the removal of fluid with a needle and syringe (needle aspiration) or tonsillectomy (remove tonsils).

Nursing Diagnosis for Tonsillitis

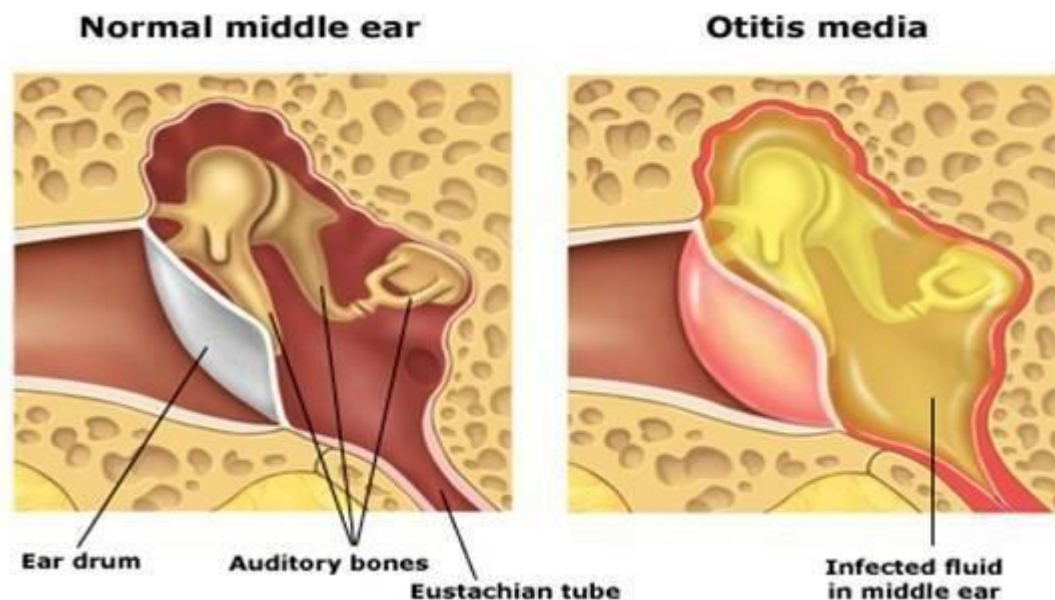
- **Ineffective Airway Clearance** related to obstruction of breath due to excess production secret.
- **Acute Pain** related to swelling of tissues; surgical incision.
- **Imbalanced Nutrition Less Than Body Requirements** related to the anorexia; difficulty swallowing.
- **Knowledge deficit** related to lack of understanding.
- **Risk for Fluid Volume Deficit** related to the risk of bleeding due to operative action.

Nursing Interventions

1. Keep the patient in a comfortable position to remove secretions and maintain respiratory function
2. Perform suctioning if necessary.
3. Assess the respiratory system function.
4. Assess the patient's ability to cough and release secretions.
5. Observation for vital signs and signs of respiratory distress
6. Collaboration with the therapists in the provision of physiotherapy.
7. Assess the level or degree of pain felt by the patient using the scale and help the patients in finding the factors that precipitation on pain in feel.
8. Create a peaceful environment.

Lecture 3: Otitis media

A middle ear infection, also called otitis media, occurs when a virus or bacteria causes the area behind the eardrum to become inflamed. Otitis media (OM) is the second most common disease of childhood, after upperrespiratory infection (URI).



Types of Otitis media

There are two types of middle ear infections: acute otitis media (AOM) and otitis media with effusion (OME).

- **Acute otitis media**

This type of ear infection comes on quickly and is accompanied by swelling and redness in the ear behind and around the ear drum. Fever, ear pain, and hearing impairment often occur as a result of trapped fluid and/or mucous in the middle ear.

- **Otitis media with effusion**

After an infection goes away, sometimes mucous and fluid will continue to build up in the middle ear. This can cause the feeling of the ear being “full” and affect ability to hear clearly.

Pathophysiology

Allergy, infection, ear trauma, swelling of the adenoids



Obstruction of Eustachian tube



Prevent drainage of normal secretion from the middle ear



Tube becomes partially opened



Organism enter middle ear & multiply



Infection process (fever, sever pain, swelling)



Reddening & bulking & depressed tympanic membrane

Causes

Middle Ear infections happen when the Eustachian tubes are blocked. Blockages can be caused by:

- A respiratory infection, such as cold or flu
- Allergies
- Exposure to cigarette smoke
- a sinus infection
- Infected or overgrown adenoids (tonsils)
- For infants, being fed lying down (drinking a bottle while lying on the back)

Symptoms of acute OM

- Otagia
- Fever
- Otorrhea
- Recent onset of anorexia
- Irritability
- Vomiting
- Diarrhea

These symptoms are accompanied by abnormal otoscopic findings of the tympanic membrane (TM), which may include the following:

- Opacity
- Bulging
- Erythema

- Middle ear effusion (MEE)
- Decreased mobility

Diagnosis

1. Use an otoscope to look inside the ear. If infected, there may be areas of dullness or redness or there may be air bubbles or fluid behind the eardrum. The fluid may be bloody or filled with pus.
2. Tympanometry, which uses a small handheld instrument to measure changes in air pressure in the ear. It can indicate if the eardrum is ruptured.
3. Reflectometry, in which a small instrument is placed near the ear and makes a sound. It allows seeing if fluid is present behind the eardrum.
4. A hearing test may be recommended if child has had persistent ear infections.
5. Cultures of drainage; show the type of bacteria
6. Mastoid X rays or CT scan; show spreading of the bacteria beyond the middle ear.

Treatment

The goals for treating ear infections include:

1. Curing the infection.
2. Relieving pain and other symptoms
3. Preventing future ear infections.
4. If a bacterial infection is present, the doctor may prescribe antibiotics

Medications

- **Antibiotics** -- If antibiotics use, be sure to give the all the doses. The antibiotic most often prescribed for an ear infection is amoxicillin, Children who are treated with antibiotics are more likely to develop vomiting, diarrhea, or a rash.
- **Analgesics**-- Analgesics are recommended for symptoms of ear pain, fever, and irritability such as; ibuprofen or acetaminophen. Children under 19 should not take aspirin, due to the risk of developing a rare but serious illness called Reye's syndrome

Surgical management

1. **Tympanoplasty**: it is designed to close a perforation in the tympanic membrane)
2. **Ossiculoplasty**: Surgical reconstruction of the middle ear bones to restore hearing)
3. **Mastoidectomy**: surgery to remove cholesteatoma.

Complications

1. Temporary hearing loss during and right after an ear infection. Permanent hearing loss is very rare.
2. Other potential complications include:
 - Ruptured or perforated eardrum, which usually heals on its own.
 - Chronic, recurrent ear infections.
 - Enlarged adenoids or tonsils.
 - Mastoiditis, an infection of the bones around the skull.
 - Speech or language delay in a child who suffers lasting hearing loss from multiple, recurrent ear infections; very rare.
3. Cholesteatoma (middle ear cyst)
4. Epidural abscess (inflammation around the brain).

5. Facial paralysis.

Nursing care plan;

A: Assessment

1. Assess the presence of pain behaviors: verbal and non-verbal.
2. Assess the increase in temperature (an indication of the infection process).
3. Assess the presence of enlarged lymph nodes in the neck area.
4. Assess nutritional status and adequacy of fluid intake of calories.
5. Assess the possibility of deafness.

B: Nursing Diagnosis

- Anxiety R/T surgical procedure, potential loss of hearing.
- Disturbance auditory sensory perception R/T ear disorder, complication of surgery
- High Risk for infection R/T complication of surgery.
- Acute Pain related to inflammation of the middle ear tissue.

C: Planning and goals

- Reduce the pain.
- Reduce the anxiety.
- Improving hearing & communication.
- Prevent infection.

D: Nursing Intervention

1. Assess the level of intensity of the client and client's coping mechanisms.
2. Give analgesics as indicated.
3. Distract the patient by using relaxation techniques, distraction etc.
4. Reduce noise in the client environment.
5. Using good communications to build trust between patient and health team
6. If there is need the client can use hearing aids.

E: Evaluation

- Patient verbalizes acceptance of the results of surgery & exhibits less stress, tension & irritability.

The patient free from signs of infections.

Part 6: Nursing Management of Patients with Ophthalmic disorders

Lecture 1: Cataracts

Cataracts are a type of eye disorder that can cause blindness. This lecture will cover the following:

- What are Cataracts?
- Pathophysiology of Cataracts
- Signs and Symptoms of Cataracts
- Causes of Cataracts
- Treatment
- Nursing Interventions for Cataracts

What are cataracts? It's an eye disorder that occurs when the lens of the eye loses its transparency. As a result, the transmission of light to the retina is affected, which leads to vision impairment. This impairment is described as cloudy, murky visual perception.

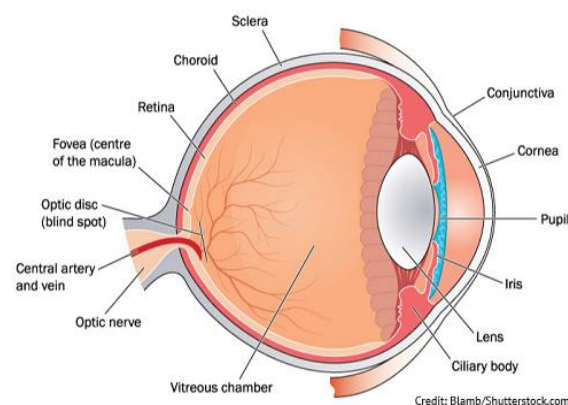
This is an example of the type of vision experienced by someone with cataracts:



Cataracts are a common eye disorder, especially in older adults.

Pathophysiology of Cataracts

How do our eyes actually see images and how does the lens of the eye play a role in this?



There are many structures in the eye that work together to allow us to see and process images. It all starts with light. When we open our eyes light is detected and enters through the cornea, which is the outer most part of the eye. If you look at the side of someone's eye, many times you can see this small clear outward bulge that envelops the middle of the eye. The cornea helps process the light received through the eye by bending it so it can get to its proper destination.

Now, under the cornea is the iris (the colored part of the eye and there are various shades of eye colors which make us unique). Within the middle of the iris, is the pupil (which is simply a hole). The iris is made up of smooth muscle that will contract and relax depending on the amount of light detected by the eye. The goal of the iris is to be a gatekeeper so just the right amount of light enters the eye, and it does this by increasing or decreasing the diameter of the pupil.

For example, if a lot of light is detected by the eye, the iris will cause the pupil to constrict and this helps prevent too much light from entering the eye. Then, on the flip side, if more light is needed to process images, the pupil will cause the pupil to dilate. This is an automatic feature we can't control.

Once the light passes through the pupil it hits the **lens**. The lens has special muscles attached to it called ciliary muscles. These muscles will help bend the lens so you can focus on objects depending on their distance. Therefore, these muscles are responsible for accommodation.

Also, the lens should be transparent (very clear) due to being made up of clear proteins called crystallin. Crystallin gives the eye lens its clarity and helps the light focus onto the retina.

The retina has very special receptors that are sensitive to light called photoreceptors (specifically cones and rods). These neat receptors turn the light received by the eye into electrical signals and transmits them through the optic nerve and into the brain. Once there we are able to see the most vibrant, clearest image possible.

What happens in conditions like cataracts?

In most cases of cataracts (due to the aging process that causes senile cataracts) the lens starts to become cloudy. This is because crystalline proteins start to stick together and this clouds the lens.

Think of it like a dirty window....when a window is dirty; the light coming in through the window scatters and visual perception of the room is poor. However, if the light comes in through a clean window, the light beams through the room creating excellent visual perception.

Therefore, with a cloudy non-transparent lens, the light breaks up or scatters which causes the light not to reach the photoreceptors properly. This causes the images to be visualized as cloudy and blurry at any distance. Eventually, as the lens continues to become more cloudy the retina will receive less light and the lens can actually turn brownish in color and vision will diminish more overtime along with color perception until blindness occurs (blindness is reversible with surgery, however).

Causes of Cataracts:

- Aging (senile cataracts)
 - over time the lens starts to lose its transparency and proteins start to stick together on the lens and over time the lens becomes cloudy.
- Congenital
 - born with a cataract
 - example: mom had a rubella infection during 1st trimester
- Trauma to the eye
- Disease processes: diabetes (uncontrolled diabetes)
- Unprotected eye exposure to sunlight
- Medications: corticosteroids
- Lifestyle: smokers, alcohol consumption, family history

Signs and Symptoms of Cataracts

Not painful and happens gradually

CATS (remember the picture of the cat above)

Cloudy/blurry vision (can also have double vision in the affected eye)

Acquiring frequent eyeglass prescriptions to help vision

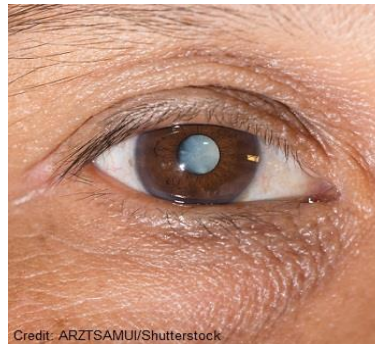
Toned-down colors (washed out and faded)

Sensitivity to glare and light

- Lights seem too bright (glare) and halos around lights (tends to be worst at night...many patients notice this when they drive at night)

Tools Used to Diagnose Cataracts

If a cataract is severe enough, it can be easily visualized in the eye like the photo below:



Ophthalmologist will perform a thorough eye exam such as:

- Visual Acuity test with Snellen Chart
- Slit-lamp: helps enlarge the front areas of the eye to allow the doctor to see the structures of the eye for evaluation like the cornea, lens, iris etc.
- Dilation of the pupils to assess the optic nerve with an ophthalmoscope

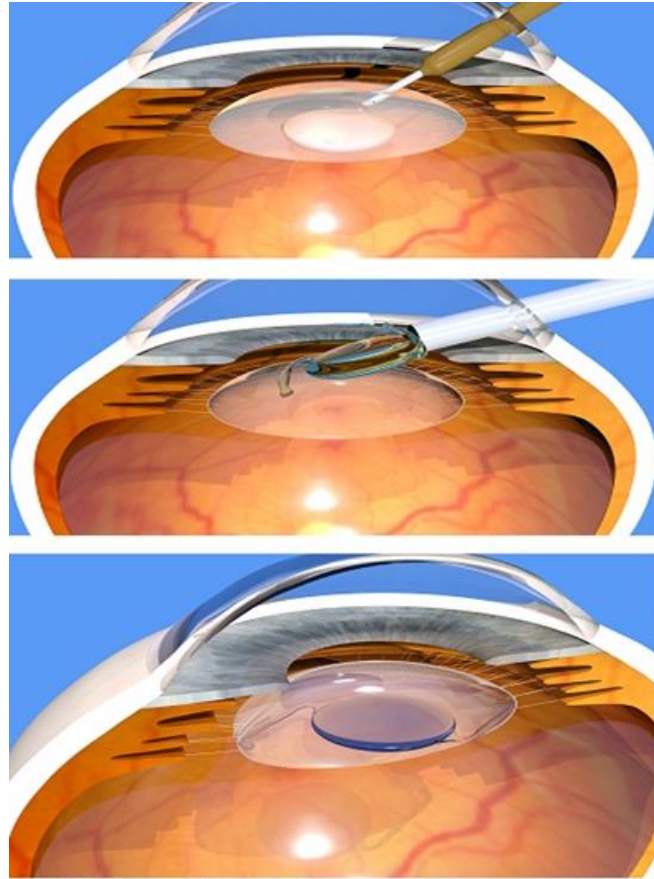
Cataracts Treatment

Monitoring the cataract until it progresses to a point where the patient cannot perform normal activities (first option)

- Regular eye checkups and changing eye glass prescriptions
- Anti-glare glasses
- Education: Protecting eyes from sunrays, magnifying items for better views, and adding more light

Surgery: remove the cloudy lens and replace it with an intraocular len (IOL)

Phacoemulsification: type of extracapsular extraction that is performed to remove the cloudy lens by breaking it up with sound waves. The old lens is removed and a new lens called an intraocular lens (IOL) is placed in the eye. This lens will stay in the eye permanently and is the eye's new lens.



Credit: Belus/Shutterstock.com

Nursing Interventions for Cataracts

Educate about Prevention

- Identify patients who are at risk and remember many patients develop cataracts when older...so the goal is to start early with preventive measures

LENS

Layers of protection: sunglasses that have UVA and UVB protection and large brim hats

Eat fruits and vegetables in diet

- They provide nutrients like vitamin C, E, lutein, zeaxanthin, which are all important for eye health. If diabetic educate about managing blood glucose levels.

No smoking (reduce alcohol consumption)

Schedule regular eye exams to monitor the health of the eyes

Surgery Interventions:

Before: Outpatient procedure and the procedure itself is quick (less than 15-20 minutes) and then patient is monitored in recovery and then goes home. One eye is treated at a time and the other eye will be treated at another time.

- NPO
- Driver to go home
- Eye drops before the surgery (some surgeons require the patient start instilling the eye drops 3 days before the procedure)
 - Anti-inflammatory and Antibiotics
 - Key education points for the patient:

- instill in the eye that is having surgery
- educate about waiting 3-5 minutes before instilling the other type of eye drop medication so it gives the eye enough time to absorb the first medication
- eye drop sequence typically does not matter
- demonstrate how to instill the eye drops in the conjunctival sac of the eye
- how to perform **punctal occlusion** to prevent the medication from absorbing in the systemic circulation
- Examples of eye medications used:
 - Difluprednate (corticosteroid)
 - Nepafenac (NSAID)
 - Moxifloxacin (Antibiotic)
- Pre-op dilation of pupil needed right before surgery which the nurse may administer
 - Why? The pupil must be dilated so the surgeon can obtain the best view of the eye when replacing the lens.
 - Things to Remember:
 - Patients with darker eye colors (like dark brown) may need higher doses of dilation medications to achieve the same effects compared to someone with blue, green eyes (these eye colors will dilate faster than people with dark brown eyes).
 - Why? Dark brown eyes have more pigment (melanin) in them and the pigment binds or bounds the drops so people with a lot of pigment in the eyes need high doses (takes long to dilate).
 - Lower the lights (makes eyes more sensitive to light) and blurry vision (will need assistance in getting up and moving around)
 - **Assess if taking Tamsulosin (Flomax) or other types of alpha blockers**
 - These medications relax smooth muscle and can affect the iris and make it “floppy” (alters pupil dilation...remember the pupil needs to dilate for a successful surgery)
 - Can lead to a condition called: intraoperative floppy iris syndrome...eye doctor must be aware prior to surgery
 - Tamsulosin is used in men to treat an enlarged prostate.
 - Examples of Pupil Dilation Medications:
 - **Mydriatics** (Phenylephrine): works on the alpha adrenergic receptors of the eye and causes the iris dilator muscle to contract and when this occurs the pupil increases in size.
 - **Cycloplegics**: paralyzes the ciliary muscle of the eye which results in the loss of accommodation.

After Surgery:

- Position on the non-surgical side.
- Eye shield is worn after surgery (per surgeon recommendations and when removed wear glasses throughout the day)
 - while sleeping or napping wear the eye shield to protect the eye from rubbing or trauma

- Eye drops needed (antibiotics, anti-inflammatory)...use clean hands
- Restricting activities that could increase eye pressure (heavy lifting, running, coughing, bending, swimming)...can watch TV as desired.
- Pain should be minimal (Acetaminophen if needed)
- Normal: itching (don't rub) and blurriness normal for few day
- ABNORMAL: notify if severe pain or further decrease in vision, light flashes or floaters (could indicate retinal detachment), purulent drainage, excessive redness, or fever
- Keep appointments, will check eye healing (may need new glass prescription once healing process is over)

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Cataracts NCLEX Questions

1. In your patient's health history you read that the patient has a cataract in the right eye. You know that this eye disorder can be best described by which statement below?

- This eye disorder is caused by increased intraocular pressure that results in damage to the optic nerve.
- Cataracts occur in the eye when the macula of the retina becomes damaged and impairs central vision.
- The development of a cataract occurs when the lens of the eye loses its transparency.
- This eye disorder occurs from uncontrolled high blood glucose levels which lead to retinal damage.

2. What is the most common cause of cataracts?

- Congenital
- Aging
- Trauma
- Uncontrolled blood glucose levels

3. In the development of cataracts, light is scattered and cannot travel properly to the retina's _____, and this leads to visual impairment.

- crystalline proteins
- amacrine cells
- ganglion cells
- cones and rods

4. Which patient finding below is associated with the development of cataracts?

- Loss of central vision
- Loss of peripheral vision
- Cloudy, hazy vision
- Black spots in vision

5. A patient is being evaluated for cataracts. The doctor uses a slit-lamp to assess the patient's eyes. As a nurse, you know that this device will?

- a. help test the patient's visual acuity.
- b. test the strength of the ciliary muscles.
- c. enlarge the front area of the eye (cornea, iris, lens etc.).
- d. help for visualization of the fundus.

6. Your patient is having phacoemulsification for the treatment of a cataract. You're providing education to the patient about the procedure. Which statement by the patient demonstrates he understood the educational material provided about this procedure?

- a. "The cloudy lens in my eye will be broken up with sound waves and removed. Then a new permanent lens, called an intraocular lens, will be placed in my eye."
- b. "A small air bubble is injected into the eye to help push the retina back into position to help the lens refract light."
- c. "An incision is made to remove the trabecular meshwork and this will help drain fluid out of the cloudy lens."
- d. "The surgeon will remove parts of the iris and lens."

7. TRUE OR FALSE: If a patient has bilateral cataracts and needs surgery, both eyes can be surgically treated at the same time.

8. A patient has a cataract in the left eye and has decided to prolong having surgery as long as possible until her activities of daily living are affected. What are some measures the patient can take to help manage the cataract at this time? Select all that apply:

- a. Wearing sunglasses with UVA protection.
- b. Enlarging text or visual images with a magnifier.
- c. Adding more light when reading.
- d. Wearing anti-glare glasses.

9. Your patient has several risk factors that increase his risk for developing cataracts. What preventive measures can you educate the patient about? Select all that apply:

- a. Wearing large brim hats while in the sun
- b. Eating a diet rich in vegetables and fruits
- c. Quit smoking
- d. Reducing alcohol consumption
- e. Managing blood glucose levels
- f. Scheduling regular eye exams

10. A patient will be having outpatient cataract surgery in 3 days. The surgeon ordered the patient to begin instilling two types of eye drop medications 3 days prior to the surgery. You have demonstrated and educated the patient on how to do this properly. Which action by the patient is incorrect and requires re-education about how to instill the eye drops?

- a. The patient instills the eye drops onto the conjunctival sac.
- b. The patient instilled the anti-inflammatory eye drops before the antibiotic eye drops.
- c. The patient waited 30 seconds before instilling the second eye drop medication into the eye.
- d. After instilling each type of eye drop medication, the patient kept the eye closed and took her index finger and placed it at the side of the bridge of the nose for 2 minutes.

11. The nurse is preparing to instill eye dilation drops to a patient prior to cataract surgery. The nurse confirms that the operative eye is the right eye. On assessment, the nurse notes the patient has dark brown eyes and that a cataract is present in the right eye. Which of the following nursing actions is incorrect prior to instillation of the eye drops?

- a. The nurse will lower the lights in the room prior to administration.
- b. The nurse prepares the patient for blurry vision.
- c. The nurse is aware that pupil dilation effects will occur quickly in this patient and should be administered at a time that correlates with the actual time of the surgery.
- d. The nurse places the call light within reach of the patient.

12. A 68-year-old male patient is considering cataract surgery. You're collecting the patient's health and medication history. Which medication below on the patient's home medication list should the nurse notify the doctor about?

- a. Tamsulosin
- b. Levothyroxine
- c. Atorvastatin
- d. Omeprazole

13. Prior to cataract surgery, the nurse is ordered to administer an eye medication that paralyzes the ciliary muscle of the eye which results in the loss of accommodation. Which medication group below has this type of mechanism of action?

- a. Rho Kinase Inhibitors
- b. Mydriatics
- c. Cycloplegics
- d. Carbonic Anhydrase Inhibitors

14. A patient has arrived for a post-op visit to the clinic after cataract surgery in the left eye. Which statement by the patient causes concern and requires further investigation?

- a. "My left eye has experienced some itchiness."
- b. "The vision in my left eye was blurry for a few days."
- c. "I have been experiencing flashes of light in my left eye."
- d. "I had pain in my left eye after surgery and took Acetaminophen."

15. Which activity below is allowed after cataract surgery?

- a. Bending
- b. Running
- c. Watching TV
- d. Swimming

16. A patient is 2 hours post-op from cataract surgery in the right eye. You're collecting vital signs and assessing the patient. Which finding in your patient after cataract surgery requires you re-educate the patient?

- a. The patient is asleep on their right side.
- b. The patient is wearing the eye shield while asleep.
- c. The patient fell asleep watching TV.
- d. The patient is not wearing his glasses.

Lecture 2: Glaucoma

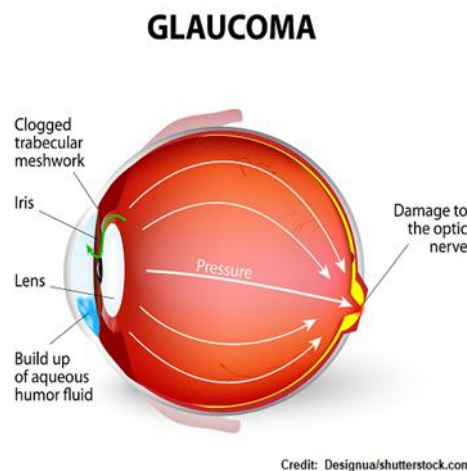
Glaucoma is a set of eye diseases that is caused by **increased intraocular pressure (IOP)** which damages the optic nerve.

The optic nerve transmits the visual surroundings we see from our eyes to the brain. If this nerve becomes damaged it results in vision loss and eventually blindness that will be permanent.

Key Points about Glaucoma:

- No cure but there are treatments to help prevent damage to the optic nerve by lowering the IOP, hence preventing blindness.
- There are different types of glaucoma. We will talk about the two main types in this lecture called: **open-angle** and **angle-closure**
 - Most common type is called open-angle, and the symptoms are very subtle with many people being unaware they have glaucoma until the disease has advanced.
 - Angle-closure (also sometimes referred to as narrow-angle or closed-angle) is rare but develops suddenly and requires immediate intervention.
- Early detection is vital with glaucoma, which can be done with an eye exam to monitor intraocular pressure.

Pathophysiology of Glaucoma



The key players for understanding the patho of glaucoma are **intraocular pressure** and **aqueous humour**.

What's intraocular pressure?

Intra means *within* and ocular means *eye*...so intraocular pressure is the fluid pressure within the eye, and the fluid we're talking about is called **aqueous humour**. IOP is calculated by the production and drainage rate of aqueous humour in the eye. The production and drainage rate should be equal or increased intraocular pressure will occur.

A **tonometer** is used to measure the intraocular pressure. A normal intraocular pressure is about 10-21 mmHg.



Credit: ARZT SAMUI/shutterstock.com

What's Aqueous Humour?

It's the fluid within the eye that has many roles, but it plays a significant role with maintaining intraocular pressure.

How aqueous humour is produced and flows through the eye helps us understand glaucoma. Therefore, first let's discuss the normal flow of aqueous humour in the eye without glaucoma presenting:

Aqueous Humour Flow Path

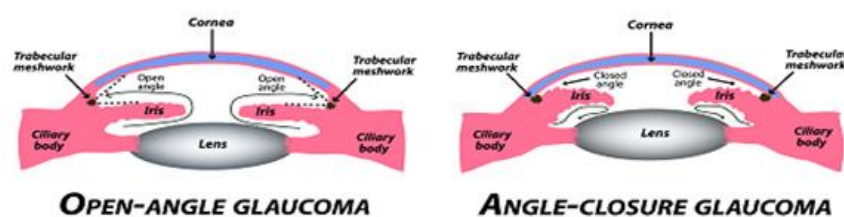
Ciliary body produces aqueous humour-> the aqueous humour first goes through the **posterior chamber of the eye** which is found between the lens and iris-> then it goes through the pupil's opening and makes its way to the **anterior chamber**, which is found between the iris and cornea -> then it drains out via the **drainage angle** into the **trabecular meshwork** (which is permeable and like a strainer) -> then into **Schlemm's canal** and eventually into the **episcleral veins** of the eyes.

****An important area I want to talk about is the **drainage angle**.** This area is where an angle is formed at the front of the eyes between the iris (the colored part of the eye) and cornea....hence this area forms an angle.

This angle is where aqueous humour drains out into the trabecular meshwork. ***It's the angle we are talking about when we refer to either open or closed angle glaucoma.*** An ophthalmologist can check the patient's drainage angle with a *gonioscope*.

Types of Glaucoma

TYPES OF GLAUCOMA



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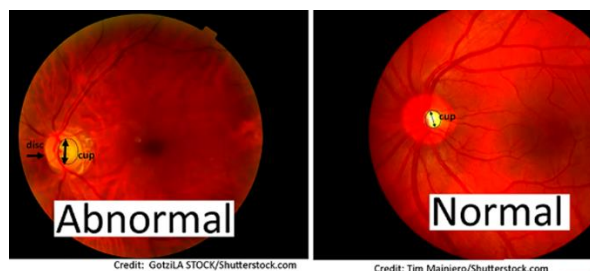
Open-angle glaucoma:

In open angle glaucoma, the drainage angle is **opened** (so the angle between the cornea and iris is wide/opened like it should be) **but** the trabecular meshwork is clogged.

Why does it become clogged? As we get older the meshwork doesn't work as well to drain aqueous humour and becomes thick and less permeable. Therefore, aqueous humour does not drain out but stays in the eye and increased intraocular pressure occurs. This pressure will compress the optic nerve, which overtime will cause vision loss.

Signs and Symptoms of Open-angle Glaucoma

- Silent: asymptomatic in early stages...you may have heard it referred to as a “thief of sight”
 - It happens gradually and when the patient notices the s/s the disease has advanced to permanent vision loss.
- No pain
- Increased intraocular pressure (patient needs to have various readings at different times)
- Optic disc cupping: found when assessing the fundus of the eye with an ophthalmoscopy...looks at the **optic disc to cup ratio**.
 - The optic disc is found on the fundus and in the middle of the disc is the optic cup. In chronic open-angle glaucoma the cup will enlarge and change the disc-cup ratio.
 - Below is a picture of a normal optic nerve on the right...note the cup (bright part in the middle) is smaller than the disc but on the left the optic cup is a lot larger.



- Loss of peripheral vision: this is side vision (not really noticeable to the patient until they develop tunnel vision)....example here:



Angle-closure glaucoma:

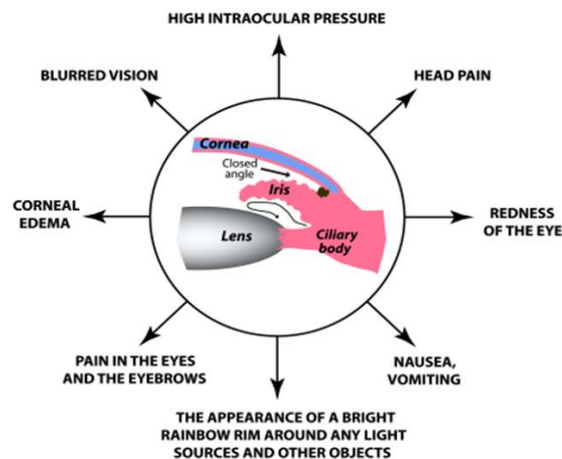
In angle-closure glaucoma the drainage angle becomes very narrow, hence closed (the drainage angle between the cornea and iris is closed/narrow). Therefore, aqueous humour can't drain down into trabecular meshwork (which is functioning and NOT clogged). This type is rare but if it happens it is requiring emergency treatment.

How the drainage angle becomes closed? Example: The iris or lens can become pushed forward which closes off the angle. This can happen with anatomical defect where the angles are already narrow, trauma to the eye, or pupil dilation through medications:

Anticholinergics: dilate the pupils...found in many medications like allergy, copd, depression medication etc.

Signs and Symptoms of Angle-closure glaucoma:

Symptoms of Angle-Closure Glaucoma



Credit: Timonina/shutterstock.com

- Severe eye pain
- Nausea and vomiting
- Vision changes: blurred/seeing halos around lights
- Red eyes
- Edema of the cornea
- Increase intraocular pressure



Nursing Interventions Glaucoma

To help us remember key concepts about treatment, medications, and education let's remember the word:

“Thief”

The treatment goal is to reduce intraocular eye pressure to prevent damage to the optic nerve

- Medication first-line treatment (eye drops or oral meds) if don't work may need
- Surgical (laser procedure or general traditional eye surgery)

Selective Laser Trabeculoplasty (SLT): quick procedure that is completed in minutes. It lowers IOP by using lasers to target certain parts of the drainage angle tissue which causes changes to the tissue, and these tissue changes allow extra fluid to drain out of the eye. IOP will be lowered over a couple of months.

- Not permanent treatment...results last for several years.

Trabeculectomy (one common type): decreases IOP pressure in the eyes (used when eye drops or other procedures are not working)

- Some of the trabecular meshwork is removed and an opening is created to allow aqueous humour to collect in an area of the conjunctiva and this fluid will be reabsorbed and decrease eye pressure. The patient will have what's called a bleb (pictured below) usually under the upper eyelid where the fluid has collected.



- Vision lost already will not come back...helps control pressure for several years not permanent.

General post-op education points after glaucoma surgery (patient education):

- Keep post-op appts. (very important because eye pressure is monitored along with other important post-op assessments)
- No driving until cleared by doctor.

- Protective sunglasses when in the direct sunlight.
- Instill eye drops exactly as prescribed (antibiotics/anti-inflammatory) and use clean hands.
- Don't rub eyes, use contact lenses, and avoid activities that increase eye pressure: bending, straining activities like reading or straining during bowel movement (may need stool softeners), or lifting heavy objects
- Wear eye shield as prescribed.
- Blurred vision, eyes tear up more frequently, and eyes feeling itchy (stitches) are normal after procedure but will decrease overtime....report any sudden vision loss or severe pain....some pain is common.
- Monitor for signs of infection: discharge, fever, extreme eye redness and vision changes

Helpful to remember the **3 Ss of open-angle glaucoma** (know the different signs and symptoms between open and closed-angle glaucoma):

- **Silent Sight Stopper**
 - **Silent (open-angle):** asymptomatic until it's too late because the irreversible damage has been done to the optic nerve when the patient notices loss of peripheral vision or tunnel vision.
 - **Sight:** vision lost can't be brought back and once blindness occurs it's permanent...why it occurs? Increase intraocular pressure damages the optic nerve.
 - **Stopper:** the development of permanent vision loss/blindness is stoppable (hence avoidable) if glaucoma is identified early through an exam eye that checks for eye pressure (help prevent the loss of vision through medications or procedures to keep IOP low)...know the risk factors for glaucoma...discussed below.

Immediate treatment for angle-closure glaucoma (emergency): remember this type is **NOT** silent with its symptoms (patient will report symptoms as noted above)

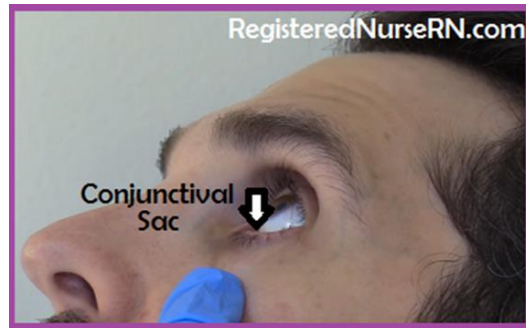
- Mediations: eye drops and oral medication to drop eye pressure **along with**
- Surgical procedure:
 - **laser iridotomy:** small hole created in the iris with a laser to drain the increased aqueous humour
 - **Iridectomy:** removes part of the iris
 - may be performed in both eyes because of the risk of the other eye developing angle-closure as well.

Eye gtts (drops)

General guidelines for **administering eye drops**

- Stress to the patient the importance of using eye drops exactly as ordered (don't skip days or abruptly stop)....these medications can help stop the progression of blindness associated with glaucoma
- Use clean hands
- Administering more than **1 type** of eye drop medication?
 - Space out giving the medications: administer about 3-5 minutes apart so that the first medication can be used by the eye and not washed out by the second medication (very important)

- Eye ointment or eye drops first? **Drops then ointment**
- Drops are placed into the lower sac of the eye (conjunctival sac)...**NOT** directly on the eye via the cornea (observe the patient using the drops and re-educate if using incorrectly)



- After instilling each eye drop medication have the patient refrain from blinking but keep the eye closed and perform “**punctal occlusion**”.



- Use the index finger and gently place pressure at the side of the bridge of the nose (over the tear duct) for about 2-3 minutes.
- WHY? Prevents the medication from draining down into the nasolacrimal duct and being absorbed by the bloodstream, and it allows more medication to stay in the eye to work. This can happen with beta blockers, cholinergics, and other eye drop medications.

Eye medications: help lower intraocular pressure (decrease production of aqueous humour and/or increase drainage of aqueous humour from the eye)

To help us remember 4 groups of glaucoma meds, let's remember the **ABCC's**:

Alpha agonists “idine”: Brimonidine: works with alpha receptors by activating them....decreases aqueous humour production (constriction to the ciliary body) and helps increase the drainage of aqueous out of the eye and this lowers IOP.

- Systemic effects: punctal occlusion very important
- Risk of feeling very drowsy

Beta blockers “lol”: Timolol: decrease aqueous humour production

- Systemic effects, cardioselective & noncardioselective types

- not for patients with bradycardia, asthma, or COPD
- assess breathing and heart rate before administration

Carbonic anhydrase Inhibitors (CAIs): “zolamide” (oral or drops): “Acetazolamide”

- Decrease aqueous humour production...diuretic that inhibits carbonic acid production
- Assess for a sulfonamide allergy

Cholinergic (miotics): “Pilocarpine” eye drops: helps lower intraocular pressure especially in angle-closure glaucoma

- How? They constrict the pupil which will help increase drainage of aqueous humour out through the trabecular meshwork.
- Antidote is atropine.
- Cholinergic effects: sweating, increase salivation, bronchospasms, decreased heart rate etc. increase eye sensitivity to light (problems with vision in dim light especially)
- Punctal occlusion during administration

Prostaglandin analogs: “prost”: Bimatoprost

- increase the drainage of aqueous humour out of the eye...doesn’t cause as many systemic effects as the other medications but can lead to ***longer and thicker eyelashes and change color of iris to brown.***

Rho kinase inhibitors (newer type of medications for glaucoma): Netarsudil:

- increase drainage of aqueous humour by inhibiting the ROCK pathway which is found in the trabecular meshwork so it will drain better and help decrease IOP .
- causes dilation: common side effect is conjunctival hyperemia (extremely red eyes)

*these drugs can be combined...example: beta blocker w/ alpha agonist etc.

Factors that increase the development of glaucoma: **SAVE your eyesight!**

- Sixty or older (especially w/ family history)
- African American, Hispanic, and Asian Community
- Vascular Problems (diabetes, hypertension etc.)
- Elevated intraocular pressure (generally normal IOP 10-21 mmHg)

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Glaucoma | National Eye Institute. (2020). Retrieved 19 November 2020, from <https://www.nei.nih.gov/learn-about-eye-health/eye-conditions-and-diseases/glaucoma>
 Glaucoma Awareness Month. (2020). Retrieved 19 November 2020, from <https://www.cdc.gov/features/glaucoma-awareness/index.html>

Glaucoma (Open-angle and Closed-Angle) NCLEX Questions

1. Which statement below is CORRECT about glaucoma?

- “The vision loss that occurs with glaucoma is reversible with eye drop medications.”

- b. "Glaucoma occurs due to decreased intraocular pressure, which damages the optic nerve."
- c. "Surgery can cure glaucoma."
- d. "A normal intraocular pressure is about 10-21 mmHg and is elevated in most patients with glaucoma."

2. A patient asks you to explain how the intraocular pressure is measured to help detect glaucoma. You state that IOP (intraocular pressure) is measured by what instrument below?

- a. Gonioscope
- b. Tonometry
- c. Ophthalmoscope
- d. Phoropter

3. The production and drainage rate of aqueous humor is not equal in patients with glaucoma. Select below the correct sequence for how aqueous humor should flow through the eye:

- a. The ciliary body produces aqueous humor -> then it flows through the anterior chamber (area of the eye between the iris and cornea) -> pupil opening -> posterior chamber (area of the eye between lens and iris) -> drainage angle -> trabecular meshwork -> schlemm's canal -> episcleral veins
- b. The lens produces aqueous humor -> then it flows through the pupil opening -> the anterior chamber (area of the eye between the iris and cornea) -> posterior chamber (area of the eye between lens and iris) -> drainage angle -> trabecular meshwork -> schlemm's canal -> episcleral veins
- c. The ciliary body produces aqueous humor -> then it flows through the posterior chamber (area of the eye between the lens and iris) -> pupil opening -> anterior chamber (area of the eye between iris and cornea) -> drainage angle -> trabecular meshwork -> schlemm's canal -> episcleral veins
- d. The lens produces aqueous humor -> then it flows through the posterior chamber (area of the eye between the iris and cornea) -> pupil opening -> anterior chamber (area of the eye between lens and iris) -> drainage angle -> trabecular meshwork -> schlemm's canal -> episcleral veins

4. You're providing an educational seminar to a group of senior citizens about glaucoma. You explain to the participants about the differences between open-angle and angle-closure glaucoma in relation to the drainage angle of the eye. A participant asks what type of examination can be performed to assess the drainage angle of the eye. Your response is?

- a. Tonometry
- b. Ophthalmoscopy
- c. Retinoscopy
- d. Gonioscopy

5. What signs and symptoms are present with angle-closure glaucoma? Select all that apply:

- a. Patients are mainly asymptomatic
- b. Gradual loss of peripheral vision
- c. Sudden vision changes (halos around lights or blurred vision)
- d. Severe eye pain

- e. Corneal edema
- f. Nausea and vomiting
- g. Red eyes
- h. No pain
- i. IOP <10 mmHg

6. Your patient is being treated for open-angle glaucoma. What assessment finding is NOT typically present with this type of glaucoma?

- a. Tunnel vision
- b. Cloudy vision
- c. Optic disc cupping
- d. High intraocular pressure

7. Your patient has a history of angle-closure glaucoma. What type of medications should this patient avoid?

- a. Anticholinergics
- b. Cholinergics
- c. Beta blockers
- d. Alpha-agonists

8. Your patient, who has open-angle glaucoma, is scheduled for a procedure that will remove some of the trabecular meshwork and create an opening to allow aqueous humor to collect in an area of the conjunctiva. This procedure will allow aqueous humor to be reabsorbed and help decrease IOP. As the nurse you know that you will need to provide pre-op and post-op patient education about what procedure below?

- a. Iridectomy
- b. Selective Laser Trabeculoplasty (SLT)
- c. Laser iridotomy
- d. Trabeculectomy

9. You're providing care to a patient who just had glaucoma surgery. The patient is alert and oriented. Vital signs are: heart rate 82 bpm, blood pressure 110/80, oxygen saturation 97% on room air, respiratory rate 18, and pain rating of 2 on 1-10 scale. Which patient finding below requires you to notify the physician?

- a. The patient reports blurred vision.
- b. The patient is having difficulty passing stool and reports constipation.
- c. The patient reports that the eyes feel itchy.
- d. The patient's eyes are frequently tearing up.

10. A patient is experiencing a severe case of acute angle-closure glaucoma. The patient is not a candidate for laser intervention. The nurse would anticipate the physician would order the nurse to prep the patient for what procedure?

- a. Trabeculoplasty
- b. Trabeculectomy
- c. Iridectomy
- d. Blepharoplasty

11. You're observing a patient self-administer eye drops for the treatment of glaucoma. Which finding below requires you to re-educate the patient on how to administer eye drops correctly?

- a. The patient refrains from blinking after instilling the eye drops.
- b. The patient washes hands before and after administering the eye drops.
- c. The patient uses a tissue to catch any medication that drips out of the eye after administration of the drops.
- d. The patient places the drops of medication directly on the eye via the cornea.

12. A patient is scheduled to take Brimonidine and Latanoprost eye drops for management of glaucoma at 1000. What correct action below will the nurse take when administering these eye drops?

- a. The nurse assists the patient with using the index finger to gently place pressure at the side of the nose bridge for about 30 seconds after administering each eye drop medication.
- b. The nurse waits at least 3-5 minutes before administering the second eye drop medication.
- c. The nurse administers each eye drop directly on the eye via the cornea.
- d. The nurse encourages the patient to blink after each eye drop administration.

13. A patient with glaucoma is ordered eye medication for the right eye in the form of an ointment and eye drop. The nurse will administer which type of medication first?

- a. Ointment and then the eye drops
- b. Eye drops and then the ointment

14. A patient with open-angle glaucoma has developed thicker and longer eyelashes and reports a darkening of their eye color. You assess the patient's medication list. What glaucoma medication on the patient's medication list can cause this side effect?

- a. Bimatoprost
- b. Pilocarpine
- c. Acetazolamide
- d. Timolol

15. The patient is ordered to take Timolol for the treatment of glaucoma. Before administration the nurse will educate the patient about this new medication. Which of the following information is the MOST pertinent the nurse to include?

- a. Measuring the heart rate because this medication can cause tachycardia
- b. Performing punctual occlusion after instilling the eye drops
- c. Avoid taking this medication with any other glaucoma medications.
- d. Always administer this medication 1 minute before another type of glaucoma medication.

16. Your patient is ordered to take Acetazolamide for treatment of glaucoma. What in the patient's history would require you to hold the medication and obtain an order clarification from the physician?

- a. The patient has open-angle glaucoma.
- b. The patient is allergic to sulfonamides.
- c. The patient reports tunnel vision.
- d. The patient's IOP is 25 mmHg.