

Nursing III Notebook: 2nd Half (After the Midterm) 10/18/2010

CVA

- 80% are preventable
- Strokes require emergency intervention
- can happen at any age.
- False- can continue throughout lifetime

CVA: sudden loss of brain function resulting from a disruption of the blood supply to a part of the brain.

1. Changes in level of consciousness
2. Pupil response, verbal response
3. Motor response
4. Complete assessment is done with emphasis on neurologic function
 - a. Begins with verbal response – level of alertness
 - b. Respiratory status, eye signs, reflexes
 - c. Babinski
 - i. Flexion of toes – normal except newborn
 - ii. Dorsiflexion of toes – contralateral pathology of corticospinal tract
 - d. Body temperature of an unconscious patient is taken rectally
 - e. Prevent urinary retention (indwelling catheter)
5. Glasgow Coma Scale

Non-Modifiable risk factors

Age, Race, Gender, Family history

Modifiable Risk Factors

- Hypertension
- Atrial fibrillation (take meds)
- Hyperlipidemia
- Diabetes Mellitus
- Smoking
- Asymptomatic Carotid Stenosis/Valvular heart disease
- Obesity
- Excessive alcohol consumption

Nursing Goals

1. Airway maintenance
2. Fluid balance
3. Skin integrity
4. Accurate perception of environment
5. Maintenance of intact family or support system
6. Maintains thermoregulation

TIA : reversible symptoms, could lead to a CVA

– usually occur ages 50's to 60's

- symptoms gone within 24hrs – could last only sec to min,
- 10% of time lead to stroke – 20% will have stroke within 3 yrs
- event of swift neurological onset producing focal neurological deficits
- s/s – dizziness, diplopia, dec speech, dec motor
- causes: cerebral ischemia, dec in blood flow below a critical level of O₂
- If flow not reestablished tia will lead to infarction
- carotid endarterectomy often done to prevent tia's from progressing to cvalf symptoms are not gone within 24 hours – reversible ischemic neurologic deficit

Carotid Endarterectomy P1902 – 1903 Brunner- Surgical removal of plaque

Done to manage a blockage in the artery

Post-Op Complications – watch for LOC changes

- a. Post-op BP elevation – highest in first 48 hours
 - b. Wound hematoma
 - i. Can lead to airway obstruction
 - c. Hyperperfusion : arteries are unable to constrict to regulate flow, can lead to damaged capillaries, edema, hemorrhage
 - i. Watch for headache
 - d. Hemorrhage – serious impairment, infrequent, but 60% fatal
 - i. Related to age, large stenosis, poor collateral flow, slow flow in the MCA region
2. Carotid artery angiography and stenting – safer – soon to be standard for those that cannot tolerate surgery.

Cardiac Surgery (CABG)

- Nursing interventions
- Education of the patients family
- Post Surgery
 - Monitor electrolytes
 - Potassium –
 - Low – dysrhythmias, PCVs, V-tach
 - High – ECG changes – Peaked T waves
 - Serum magnesium, sodium, and calcium
 - Hyperglycemia
 - Monitor Urine output every 30 minutes for 4 hours, then every 8 to 12 hours
- Elevated glucose is common post surgery complication

Causes of a CVA P1896 Brunner

1. Thrombus – most common (clot) (85%) : main presenting symptom: Numbness or weakness of the face, arm or leg, especially on one side. (hemiparesis) paralysis is hemiplegia
 - a. Causes ischemia in the brain, impedes blood flow
 - b. Usually plateaus in 6 months (functional recovery)
 - c. Subarachnoid hemorrhage
 - d. Cerebral aneurysm
 - e. Arteriovenous malformation
 - f. Slower, usually plateaus in 18 months
2. Cryptogenic stroke – cannot be classified in the other forms

1. common sites)

Time is Brain INR target is 2 – 3

If warfarin is contraindicated, than aspirin

1. **First three hours are critical** to salvage penumbra region (area around the clot)
 - a. tPA – onset 0.9 mg/kg Max dose 90mg 10% of dose in 1 minute, 90% over the next hour.
 - i. Binds to fibrin converting plasminogen to plasmin, which stimulates breakdown of the clot.
 - ii. Not given if BP is >180
 - iii. Not given if Age <18
 - iv. Not given if you had aspirin or heparin within 24 hours of stroke
 - v. Not given if you had an active seizure at time of the stroke
 - vi. Not given if you had major surgery within 14 days
 - vii. Not given if you had head trauma within 3 months

- viii. No NG tubes or Urinary Cath for the first 24 hours.
- ix. Side effects
 - 1. Bleeding (IV insertion site, nasogastric tube, urine, stool, emesis)
 - 2. Intracranial bleeding (6.4% of patients)
- b. Nursing intervention
 - i. Cardiac monitor
 - ii. BP control (<180/100)
 - iii. Monitor for Bleeding
- 2. Diagnostic Tests
 - a. CT Scan – blood for shift of the structures, areas of infarc, hemorrhage vs ischemia
 - b. MRI – better than CT scan for posterior brain areas and spinal cord
 - c. Skull X-ray – shift of structures

Neurologic Deficit	Manifestation	Nursing Implications/Patient Teaching Applications
Visual Field Deficits		
Homonymous hemianopsia (loss of half of the visual field)	<ul style="list-style-type: none"> • Unaware of persons or objects on side of visual loss • Neglect of one side of the body • Difficulty judging distances 	Place objects within intact field of vision. Approach the patient from side of intact field of vision. Instruct/remind the patient to turn head in the direction of visual loss to compensate for loss of visual field. Encourage the use of eyeglasses if available. When teaching the patient, do so within patient's intact visual field.
Loss of peripheral vision	<ul style="list-style-type: none"> • Difficulty seeing at night • Unaware of objects or the borders of objects 	Place objects in center of patient's intact visual field. Encourage the use of a cane or other object to identify objects in the periphery of the visual field. Driving ability will need to be evaluated.
Diplopia	<ul style="list-style-type: none"> • Double vision 	Explain to the patient the location of an object when placing it near the patient. Consistently place patient care items in the same location.
Motor Deficits		
Hemiparesis	<ul style="list-style-type: none"> • Weakness of the face, arm, and leg on the same side (due to a lesion in the opposite hemisphere) 	Place objects within the patient's reach on the nonaffected side. Instruct the patient to exercise and increase the strength on the unaffected side.
Hemiplegia	<ul style="list-style-type: none"> • Paralysis of the face, arm, and leg on the same side (due to a lesion in the opposite hemisphere) 	Encourage the patient to provide range-of-motion exercises to the affected side. Provide immobilization as needed to the affected side. Maintain body alignment in functional position. Exercise unaffected limb to increase mobility, strength, and use.
Ataxia	<ul style="list-style-type: none"> • Staggering, unsteady gait • Unable to keep feet together; needs a broad base to stand 	Support patient during the initial ambulation phase. Provide supportive device for ambulation (walker, cane). Instruct the patient not to walk without assistance or supportive device.
Dysarthria	<ul style="list-style-type: none"> • Difficulty in forming words 	Provide the patient with alternative methods of communicating. Allow the patient sufficient time to respond to verbal communication. Support patient and family to alleviate frustration

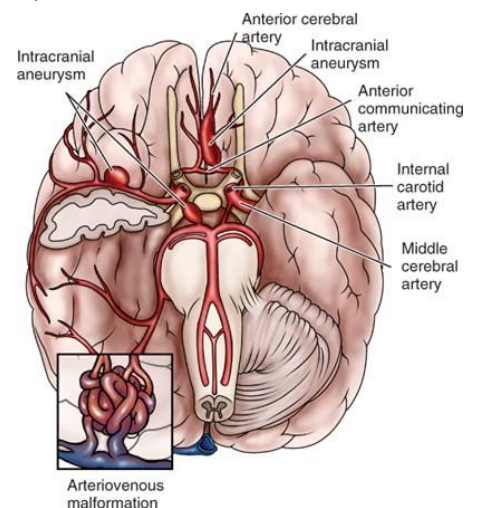
		related to difficulty in communicating.
Dysphagia	<ul style="list-style-type: none"> • Difficulty in swallowing 	<p>Test the patient's pharyngeal reflexes before offering food or fluids.</p> <p>Assist the patient with meals.</p> <p>Place food on the unaffected side of the mouth.</p> <p>Allow ample time to eat.</p>
Sensory Deficits		
Paresthesia (occurs on the side opposite the lesion)	<ul style="list-style-type: none"> • Numbness and tingling of extremity • Difficulty with proprioception 	<p>Instruct patient that sensation may be altered.</p> <p>Provide range of motion to affected areas and apply corrective devices as needed.</p>
Verbal Deficits		
Expressive aphasia	<ul style="list-style-type: none"> • Unable to form words that are understandable; may be able to speak in single-word responses 	<p>Encourage patient to repeat sounds of the alphabet.</p> <p>Explore the patient's ability to write as an alternative means of communication.</p>
Receptive aphasia	<ul style="list-style-type: none"> • Unable to comprehend the spoken word; can speak but may not make sense 	<p>Speak slowly and clearly to assist the patient in forming the sounds.</p> <p>Explore the patient's ability to read as an alternative means of communication.</p>
Global (mixed) aphasia	<ul style="list-style-type: none"> • Combination of both receptive and expressive aphasia 	<p>Speak clearly and in simple sentences; use gestures or pictures when able.</p> <p>Establish alternative means of communication.</p>
Cognitive Deficits		
	<ul style="list-style-type: none"> • Short- and long-term memory loss • Decreased attention span • Impaired ability to concentrate • Poor abstract reasoning • Altered judgment 	<p>Reorient patient to time, place, and situation frequently.</p> <p>Use verbal and auditory cues to orient patient.</p> <p>Provide familiar objects (family photographs, favorite objects).</p> <p>Use noncomplicated language.</p> <p>Match visual tasks with a verbal cue; holding a toothbrush, simulate brushing of teeth while saying, "I would like you to brush your teeth now."</p> <p>Minimize distracting noises and views when teaching the patient.</p> <p>Repeat and reinforce instructions frequently.</p>
Emotional Deficits		
	<ul style="list-style-type: none"> • Loss of self-control • Emotional lability • Decreased tolerance to stressful situations • Depression • Withdrawal • Fear, hostility, and anger • Feelings of isolation 	<p>Support patient during uncontrollable outbursts.</p> <p>Discuss with the patient and family that the outbursts are due to the disease process.</p> <p>Encourage patient to participate in group activity.</p> <p>Provide stimulation for the patient.</p> <p>Control stressful situations, if possible.</p> <p>Provide a safe environment.</p> <p>Encourage patient to express feelings and frustrations related to disease process.</p>



1. Acute phase 1-3 days
2. Complications
 - a. Deconditioning, swallowing difficulties, bowel and bladder dysfunction, inability to perform ADLs, and skin breakdown
3. Assessment
 - a. Changes in LOC
 - b. Presence or absence of voluntary and involuntary movements
 - c. Eye opening, pupil response
 - d. Quality and rate of heart and breathing
 - e. Ability to speak
 - f. I/Os
4. Diagnosis
 - a. Impaired physical mobility related to hemiparesis, loss of balance and coordination
 - b. Acute pain related to hemiplegia and disuse (especially shoulder)
 - c. Self care deficit
 - d. Disturbed sensory perception
 - e. Impaired swallowing
 - f. Risk for impaired skin integrity
 - g. Sexual dysfunction related to neurologic deficits or fear of failure
 - h. Interrupted family processes related to catastrophic illness and caregiving burden
5. Interventions
 - a. Improving mobility and preventing joint deformities
 - i. Preventing shoulder adduction
 - ii. Positioning of hand and fingers
 - iii. Changing positions
 - iv. Establishing an exercise program
 - v. Preparing for ambulation
 - b. Preventing shoulder pain (72% of stroke patients have shoulder pain)

Aneurysm: weakness of vessel (Hemorrhagic Stroke) -15% more deficits, longer recovery

- Circles of Willis P1834
- First clear manifestation : severe headache
 - Common sites: Internal carotid artery (ICA), anterior cerebral artery (ACA), anterior communicating artery (ACoA), posterior communicating artery (PCoA), posterior cerebral artery (PCA), and **middle cerebral artery (MCA)**
 - Arteriovenous Malformations (more common in young people)
 - A tangle of arteries and veins that lack a capillary bed. Leads to dilation of the arteries and veins and eventual rupture
 - Subarachnoid hemorrhage
 - Most common causes are leaking aneurysm in the area of the circle of willis and a congenital AVM of the brain.
- Increased intracranial pressure (normal ICP 7-15)
 - Almost always follows a subarachnoid hemorrhage
- Unequal pupils
- Change in LOC
- Repair
 - Brain surgery : if the diameter of the hematoma exceeds 3cm and the GCS scores decrease, than surgical evacuation is recommended.



- Assess for :
 - Rebleed – more apt if BP keeps rising
 - Suspect if the patient starts complaining of a headache, have nausea, begin vomiting
- Seizure activity : type of seizure, how long was it,
 - Drug of choice: Dilantin
- Vasospasm
 - Need calcium channel blockers and IV fluids (no dextrose)
- Hydrocephalus – blood in ventricles or subarachnoid space.
- Stroke in evolution
 - Assess for s/s of increases intracranial pressure (ICP)
 - changes in LOC
 - Restlessness
 - Pupil changes
 - Inequality; progressive dilation to fixed & dilated
 - Headache – constant and increasing
 - changes in VS (late) over time
 - decreased or erratic P & R; increased BP & T; Irregular R danger sign
 - widening pulse pressure (SBP- DBP) ie: 120-80 =40; 180-80 =100
- Aneurysm Precautions
 - Absolute bed rest
 - Elevate head of bed 30 degrees to promote venous drainage or keep bed flat to increase cerebral perfusion
 - Avoid all activity that may increase ICP or BP; Valsalva maneuver, acute flexion, and rotation of the neck and head.
 - Exhale through mouth when voiding or defecating to decrease strain.
 - Nurse provides all personal care and hygiene
- Altered cerebral perfusion
 - Patient is total care (no getting out of bed)
 - Keep head midline
 - Elevate head 0 – 60 degrees
 - Avoid Valsalva maneuver; no straining; use turning sheets
 - Stool softeners
 - Oxygen before suctioning
 - Osmotic diuretics: mannitol

Unconscious Patient

- ✓ Ineffective airway clearance related to loss of cough/swallowing reflexes
 - Intubation
 - Sidelying
 - Avoid placing affected arm over chest or abdomen
- ✓ High risk for altered skin condition

Sensory perception: alteration

Unconsciousness

Meaningful stimuli – music, touch, family

Talk to patients.

Left Brain hemisphere

1. Slow cautious actions
2. Aphasia: cannot get the right words out.
3. Right sided paralysis
4. Analytical skills

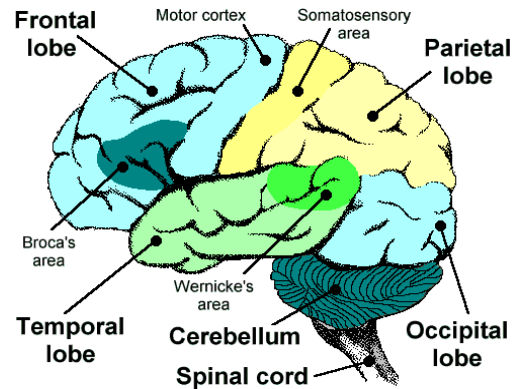
Right brain Hemisphere

1. Quick impulsive actions

2. Left side paralysis
3. One-sided neglect
4. Artistic and musical skills

Dominant hemisphere

- Broca's area – Muscle movement storage area for speech (expressive)
- Wernicke's area – Association area for speech (receptive)
- Major defect in both areas leaves the person unable to interpret verbal info (global)
- ✓ **Communication impaired verbal related to inability to comprehend or articulate speech properly**
 - Receptive Aphasia
 - Use visual cues
 - Simplify message when verbal
 - Use gestures, pictures, facial expression
 - Expressive Aphasia
 - Encourage speech, have pt repeat
 - Pt may be able to use gestures, writing
 - Global Aphasia
- ✓ Impaired physical mobility related to infarction in motor area
 - Assess for hemiplegia (weakness) vs. hemiparesis; flaccidity vs. spasticity
 - Assess for shoulder hand syndrome
 - Counteract typical hemiplegic position with anatomic positioning
 - Position chg Q 2h; ROM 4-5x daily
 - Transfer using help of unaffected side
 - Repeat activity



Optic Chiasm

- Homonymous hemianopsia
 - Visual field cuts on same side of field for both eyes
 - Often seen with one-sided neglect
 - teach patient scanning

Apraxia – inability to carry out a learned movement

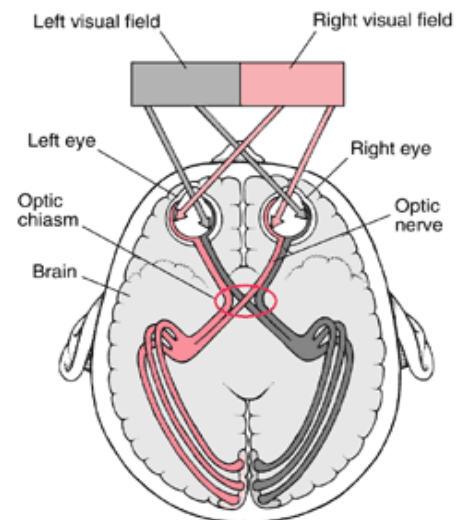
Agnosia – inability to interpret or recognize objects through the special senses

- Visual
- Auditory
- Tactile- can't recognize objects through touch

- ✓ Alteration in nutrition, less than body requirements related to inability or difficulty swallowing as evident by coughing, choking when eating.

- ✓ **Alt. in bowel & bladder function rt impairment of nerves to bladder &/or intestines aeb. urinary retention or incontinence or fecal constipation**

- Assess usual elimination patterns & positions
- Stimulate voiding as needed
- For incontinence : limit fluids after dinner; institute toileting schedule
- Encourage cranberry juice
- Intermittent catheterization
- For bowel elimination : increase roughage increase fluids to 2-3l/day, if appropriate; hot fluids, prune juice



- Stool softeners, suppository

Rehabilitation Phase

- Goals: promote independence, motivation and use patient's strengths to build upon
- Self care deficit
- Dressing techniques
- One handed devices
- Family involvement

Sexual Alteration

- Loss of self esteem
- OK to remain interested
- Suggest partners explore areas where sensation intact
- Verbal affection may enhance self worth
- Alternative positions: ie lying on affected side
- Referral to counseling for serious sexual problems

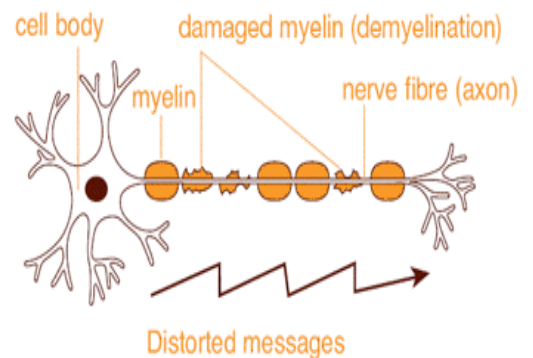
Autoimmune Processes

Degenerative neurological Disorders (Progressive)

Multiple Sclerosis

1. Demyelination disease
 - a. Results in impaired transmission of nerve impulses
 - b. Destructive removal of myelin (insulating and protective fatty protein that sheaths nerve cells)
2. Types and courses of MS
 - a. Relapsing Remitting (RR) (80%)
 - i. Complete recovery – residual deficits
 - b. Primary Progressive (PP) (10%)
 - c. Secondary Progressive (SP) (50%) – from RR to SP
 - d. Progressive Relapsing (RR) (5% or less)
3. Diagnostic Tests
 - a. MRI - Sclerotic plaques 3-4 mm diameter
 - b. CSF - Increased immunoglobulin G and Lymphocytes
4. Nursing Process
 - a. Assessment
 - i. Primary symptoms
 1. **Fatigue, depression, weakness, numbness, difficulty in coordination, loss of balance, pain, visual disturbance.**
 - ii. Secondary complications
 1. Spasticity, loss of abdominal reflexes, cognitive and psychosocial, Ataxia
 - iii. Address neurologic deficits, secondary complications and the impact of the disease
 - iv. Mobility and balance
 - v. Weakness, spasticity, visual impairment, incontinence
 - b. Diagnosis
 - i. Impaired bed and physical mobility related to weakness, muscle paresis, spasticity
 - ii. Risk for injury related to sensory and visual impairment
 - iii. Disturbed thought process
 - iv. Ineffective individual coping

Demyelination in MS



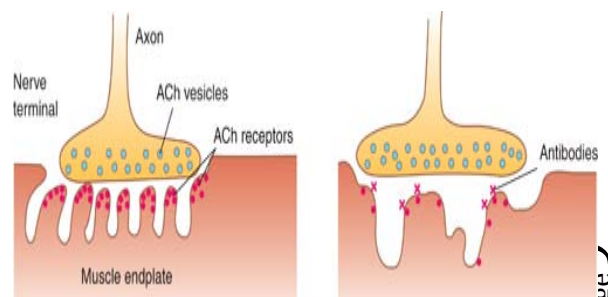
- c. Medical Management
 - i. Delay Progression of disease
 - ii. Manage chronic symptoms
 - 1. Spasticity – baclofen, given orally
 - a. Nerve blocks
 - 2. Fatigue – semetrol
 - 3. Ataxia – nerotin, beta blockers
 - 4. Bladder, Bowel – antispasmodic meds
 - a. Voiding routine
 - 5. Urinary tract infections
 - a. Vit C
 - iii. Treat acute exacerbations
 - 1. Stress, heat, cold, infection, pregnancy
 - iv. Pharmacologic Therapy : **Pt will develop flu like symptoms for 2-3 months**
 - 1. Disease modifying therapies (all are injections)
 - a. Interferon - Beta-1a (Rebif) SQ 3 times a week
 - b. Interferon - Beta-1b (Beta-Seron) SQ every other day
 - c. Interferon- Beta 1a (Avonex) IM weekly
 - d. Glatiramer Acetate (Copaxone) SQ daily
 - e. IV Methyl prednisone – to treat acute relapses, to shorten duration
- d. Planning and goals
 - i. Delay progression
 - 1. Fatigue is a big factor
 - ii. Manage chronic symptoms
 - 1. Warm packs for spasticity
 - iii. Promotion of physical mobility
 - 1. Teaching how to use assistive devices, walking with wide stance
 - iv. Prevent injury
 - v. Reduce factors that cause exacerbations
 - 1. Education : reduce stress, recognize sickness, avoid weather extremes
 - vi. Enhancing bladder and bowel control
 - vii. Teach self injection techniques
- e. Expected outcomes
 - i. Improves physical mobility
 - 1. Uses assistive devices correctly and safely
 - 2. Participates in gate training and rehabilitation program
 - ii. Is free of injury

Myasthenia Gravis

Affects the myoneural junctions: characterized by varying degrees of voluntary muscle weakness.

: females more than men (20 – 40) female , Men (50s)

1. Antibodies impair transmission of impulses across the myoneural junction at the acetylcholine receptor sites.
 - a. As a result, fewer receptors are available for stimulation: causes weakness that escalates with activity.
2. ONLY a MOTOR disorder, no effect on sensation and coordination.
3. Symptoms



- a. Ocular muscles (double vision)
 - b. Weakness of face and throat muscles
 - c. Generalized weakness
 - i. Affects all extremities and the intercostal muscles (respiratory)
4. Diagnosis
- a. Acetylcholinesterase Inhibitor Test
 - b. MRI
 - c. Electromyography (EMG)
5. Medical Management
- a. Improving function
 - b. Reducing and remove circulating antibodies
 - c. Pyridostigmine (Mestinon) - anticholinesterase
 - i. Inhibits the breakdown of acetylcholine
 - d. Immunosuppressive therapy
 - e. IV immune Globulin
 - f. Plasmapheresis
 - g. Surgical Management
 - i. Thymectomy - removal of the thymus gland - can take up to 3 years to benefit - T cells
6. Nursing Interventions
- a. Maintain a Patent airway
 - b. Avoid fatigue
 - c. Know drug interactions
 - d. Education
7. Complications
- a. Exacerbation of the disease process.
 - i. Severe muscle weakness
 - ii. Respiratory and bulbar weakness : intubation and ventilation may be needed
 - 1. Most common is from respiratory infection
 - 2. Medicine change
 - b. Cholinergic crisis caused by overmedication with cholinesterase inhibitors
 - i. Keep atropine on hand

Parkinson's Disease : Slow progressive neurologic movement disorder - leads to disability

- Associated with decreased dopamine
 - From destruction of pigmented neuronal cells in the basal ganglia region of the brain.
- Results in more excitatory neurotransmitters than inhibitory
- Symptoms do not appear until dopamine is down 80%
- **Idiopathic**
- **Secondary** – suspect causes (atherosclerosis, head trauma, etc.)

1. Clinical Manifestations

- a. Tremors at rest
- b. Rigidity
- c. Bradykinesia : abnormally slow movements
- d. Postural instability

2. Complications

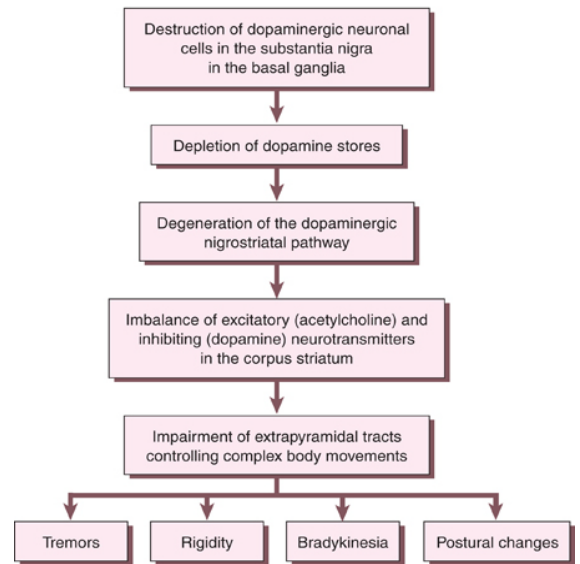
- a. Uncontrolled sweating
- b. Paroxysmal flushing
- c. Orthostatic hypotension
- d. Gastric and urinary retention
- e. Constipation
- f. Sexual dysfunction
- g. Depression
- h. Dementia (75% of patients)
- i. Delirium
- j. Hallucinations
- k. Dysphonia (soft, slurred, low pitched voice)
- l. Dysphagia

3. Assessment and diagnosis

- a. Diagnosed clinically from the patient's history and presence of two of the four cardinal manifestations:
 - i. Tremor, rigidity, bradykinesia and postural changes.

4. Treatment

- a. Control symptoms
- b. Maintaining functional independence
- c. Medications
 - i. Increasing striatal dopaminergic activity
 - ii. Reducing the excessive influence of excitatory cholinergic neurons
 - iii. Acting as a neurotransmitter pathways other than the dopaminergic pathway
 - iv. Antiparkinsonian
 1. Levodopa - most effective agent
 - a. Complication: neuroleptic malignant syndrome: severe rigidity, stupor and hyperthermia
 2. Carbidopa
 - v. Anticholinergic
 1. Trihexyphenidyl Hydrochloride (Apo-Trihex)
 2. Benztropine Mesylate (Cogentin)
 - vi. Antiviral
 1. Amantadine Hydrochloride (Symmetrel)
 - vii. Requip and mampax – dopamine agonist
 - viii. MAO inhibitors



- ix. Antidepressants : Elavil – two effects – anticholinergic and antidepressant
- d. Surgical Management
 - i. Surgical Procedures
 - 1. Thalamotomy (electrical destruction of the ventrolateral portion of the thalamus)
 - 2. Pallidotomy (electrical destruction of the ventral aspect of the medial globus pallidus)
 - 3. Patients eligible : those who have an inadequate response to medical therapy
 - a. Idiopathic Parkinson’s
 - b. Patients on the max dose of medications
 - c. Patients with dementia and atypical Parkinson’s are not eligible
 - ii. Neural Transplantation:
 - 1. Research into transplantation of porcine neuronal cells, fetal cells, and stem cells.
 - iii. Deep Brain Stimulation : pacemaker like brain implants
 - 1. Stimulation blocks the nerve pathways that cause tremors
- e. Nursing Intervention
 - i. Improve mobility
 - 1. Daily exercise, stretching, walking, ROM
 - 2. Taught to walk erect, swing arms
 - ii. Enhance self care ability
 - 1. Environmental modifications : assistive devices, hospital bed, overhead trapeze
 - iii. Maintain nutrition
 - 1. NG tube may be needed
 - 2. Semisolid diet with thick liquids
 - 3. Electric warming tray - keep foods hot during prolonged eating
 - iv. Optimize psychosocial wellbeing
 - 1. Taught to face the listener - (soft speech)
 - 2. Active participation in social events
 - 3. Promote self care
 - v. Education
 - 1. Home care
- f. Assessment:
 - i. Arm or leg stiffness?
 - ii. Irregular jerking of arms or legs?
 - iii. Frozen in one spot
 - iv. Mouth water excessively?, Grimace or make faces or chewing movements?
 - v. Specific activities you have difficulty doing?
- g. Diagnosis:
 - i. Impaired physical mobility related to muscle rigidity and motor weakness
 - ii. Self care deficits
 - iii. Constipation
 - iv. Imbalanced nutrition, less than body requirements related to tremor, slowness in eating

Vaccines

1. Live Vaccines
 - a. Gives the person some infectious agent: agent is attenuated (diminished virulence)
 - b. Measles, mumps, varicella, and hep A.
 - c. They are NEVER given to immunocompromised patients, or pregnant woman.
2. Killed Vaccines
 - a. Injecting organisms that are made inactive by heat or chemical means.
 - b. Totally incapable of causing disease, but elicit a lower level of immune response
 - c. Multiple doses are needed
 - d. Pertussis is an example of a killed bacterium
3. Toxoids
 - a. Bacterial toxins (like endotoxins or exotoxins)
 - b. Made inactive by heat or chemical means
 - c. Tetanus, and diphtheria are examples
4. Immune globulin
 - a. Administered if someone is exposed to a disease
 - b. Made from serum of someone who survived the disease
 - c. Temporary passive immunity
5. Antitoxins
 - a. Derived from serum of immunized animals.
 - b. Anti-toxins available for botulism, snakebite, spider bites.
 - c. People may be allergic to them.
6. Conjugated Vaccines
 - a. Attached to another
7. Recombinant:
 - a. Disease causing organism is genetically altered
 - b. HPV, pertussis, Hep B

General Contraindications

1. Moderate to severe
 - a. Diarrhea, illness, otitis media, vomiting, anaphylactic reactions

Immunization Schedule

- Infancy Immunizations
 - Hep B
 - Rotavirus
 - DTaP
 - Hib
 - PCV
 - IPV
- Early Childhood
 - Hib
 - PCV
 - MMR
 - Varicella
 - Hep A
- Adults
 - Td or Tdap
 - Pneumococcal
 - Zoster
- Yearly Influenza
 - Recommended for all over 6 months of age

RENAL SYSTEM

Physical Assessment of the Kidney : very vascular organ

1. Protected by spinal column, ribs in the back, musculature, covering over kidneys
2. Kidneys regulate blood pressure via specialized vessels called vasa recta. - This is part of the renin - angiotensin II - angiotensin I system
3. **Creatinine** - waste product of skeletal muscle that is filtered at the glomerulus and excreted in the urine. -**indicator of kidney function**
 - a. **GFR** glomerular filtration rate (125ml/min to 200ml/min)
 - b. $(\text{Volume of Urine} \times \text{Urine Creatinine}) / \text{Serum Creatinine}$
4. Regulation of sodium volume excreted depends on aldosterone.
 - a. Increased aldosterone - less sodium is excreted.
 - b. When the blood flow through the kidney is diminished, the kidney produces renin which controls angiotensin II.
5. Costovertebral angle
 - a. Location: lateral of the spinal column at about the 12th rib
 - i. Pain on palpation with a UTI
6. Auscultation of renal artery
 - a. Listen for a bruit during an abdominal exam
7. Bladder palpation
 - a. Kidney palpation requires special training
 - b. Percussion : empty bladder – tympanic, full – dull
8. Hypospadias : urethral defect where the opening is not at the end of the penis – below penis (Epispadias : opening above)
 - a. *harm later in life - toilet training, procreation, sexual intercourse*
 - b. *correction during the first year*
 - c. *diagnosis by inutero or inspection at birth*
 - d. *no genetic cause*
9. diagnosis
 - a. Specific gravity norm 1.010 to 1.025
 - b. Common renal function tests
 - i. GFR – danger if the GFR is reduced by 50%
 - ii. Renal concentration test
 1. Ability to contrite solutions in urine
 - iii. Creatinine clearance
 - iv. Serum creatinine : elevated creatinine and BUN – intrinsic renal disease
 1. End product of muscle metabolism
 2. 0.6 – 1.2 mg/dl
 - v. Urea nitrogen level (BUN)
 1. Index of renal function
 2. Urea is the end product of protein metabolism
 3. 7-18 mg/dl age>60 = 8-20
 4. BUN to CREATININE ratio : about 10:1
10. Nursing diagnosis
 - a. Anxiety
 - i. Toddler separation anxiety, preschooler – punishment, Parents-no direct genetic cause, discuss body image; discomfort, may need counseling



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- b. Alteration in skin integrity
 - i. Double diaper, Protect stent (don't straddle on hip), penis – small amount bloody drainage, home: alter activity.
 - ii. Stent stays in 3-7 days
- c. Altered patterns of urinary elimination
 - i. Check fist voiding straight stream
 - ii. Check catheter for kinks, sediment, amount of urine produced
 - iii. Obstruction
 - iv. Encourage fluid intake
 - v. Anticholinergics
 - vi. Check for fresh blood, purulent drainage

Renal Failure 25% - 90% mortality rate

1. Four phases of Renal Failure

- o Initiation period
 - Initial insult
 - Decrease blood flow to the kidney
 - Hypovolemia : hemorrhage, GI, GU, Skin, wound losses
 - Inadequate intake
 - Poor cardiac function : heart failure
 - Vasodilation (shock, infectious disease)
 - Intrarenal – Actual tissue damage to the kidney
 - Infectious processes
 - Acute tubular necrosis
 - Prolonged renal ischemia
 - Nephrotoxic agents : Contrast agents, aminoglycosides (gentamicin), NSAIDS
 - Prolonged renal ischemia ie: trauma, transfusion reaction
 - Postrenal obstruction of urinary collection system
 - Calculi, tumors, Prostate
- o Oliguria period
 - 7-10 days
 - Increase in substances normally secreted by the kidneys (creatinine, uric acid, urea, organic acids)
 - Hyperkalemia is the most immediate life-threatening imbalance
 - Urine output is below the minimum 500ml
 - Uremic symptoms first appear such as hyperkalemia
 - High risk for fluid volume excess related to poor excretion of body fluids
 - Adm. Diuretics as ordered, IE mannitol, Lasix
 - Monitor strict I/O, weight may determine pt's intake for the next day
 - Review signs and symptoms from Nsg II and CHF
- o Diuresis period (high output)
 - 2-6 weeks from onset
 - Gradual increase in urine output

- Recovery process starts
- Dehydration
- Glomerular filtration starts to recover
- Laboratory values stabilize and decrease
- Recovery period
 - Improvement of renal function, may take 3 to 12 months
 - Laboratory values return to the patient's norm
 - 1% - 3% reduction of GFR is common but not significant
- Chronic Renal Failure
 - NO magnesium based antacids

Prevention of Renal Failure

1. Adequate hydration during periods of illness, surgery
2. Monitor BP closely and hourly when critically ill
3. Careful history of exposure to nephrotoxic agents (monitor dose), if DM? control, if inc. BP ?control
4. Any known renal diseases
5. Recent surgery, trauma, transfusion
6. Prevent infection especially catheter

Common alterations in laboratory values

Serum Creatinine normal 0.5-1.3 mg/dl

- Creatinine = breakdown product of skeletal muscle metabolism
- Best indicator of renal function
- Contributes to signs and symptoms of uremic syndrome
- Consistently elevated in both ARF and CRF
- Values rise as high as 15-30 mg/dl
- 24hr urine for creatinine clearance used to evaluate renal function

BUN Blood Urea Nitrogen 5-15mg/dl

- BUN is the breakdown product of urea.
- Affected by changes in renal function, protein intake, fluid balance, liver function, usual ratio of BUN: Cr is 20:1, CR is 20:1, values rise as high as 100mg/dl
- 24 hour urine = best way to determine the functioning of the kidney
 - Start: bladder should be empty (first is discarded, last is kept)

Serum Sodium (NA 135-145mEq/l)

- Values are usually normal or low due to hemodilution
- Acidosis can cause shift of sodium into cells. A high sodium can result from excess salt intake or decreased urine output

Serum Potassium (3.5 – 5.5)

- Retention of potassium is the most life-threatening effects of renal failure due to cardiac change
- Kidneys normally excrete 80-90% of potassium
- K is the dominant intracellular cation.

Serum Phosphorus (2.5 – 4.0 mEq/l)

- P is a component of numerous metabolic processes. Dominant intracellular anion
- P and calcium have a reciprocal relationship
- Values rise in renal diseases
- If PxCa > 70, crystals may begin to lodge

Serum Calcium (8.0 – 10.5 mg/dl)

- Circulating Ca is involved in blood coagulation, impulses conduction, etc.
- Values are decreased in renal failure due to decreased intestinal absorption, increased P.
- Bone changes may occur

Serum Magnesium (1.5 – 2.5)

- Essential nutrient found in bone and muscle
- Values increase in renal failure
 - Can cause ekg changes.
- Avoid Mylanta, Maalox, milk of magnesia

Urine specific gravity: (1.010 – 1.030)

Urine osmolality: Check for urine/plasma osmolality which indicates poor concentration ability of kidneys

Arterial blood gasses: metabolic acidosis

Diagnostic Tests

1. Renal Biopsy : best test for confirming the actual cause or progression of renal disease
2. Pretest fast 6-8 hours, IV line, sedation, prone position
3. Posttest – pressure to puncture site, bedrest, frequent VS, check for bleeding
 - a. Internal – signs and symptoms of abdominal discomfort

Cryptorchidism (undescended testicle)

1. Def. failure of one or both testes to descend thru inguinal canal into the scrotal sac
2. Greater incidence in premature males
3. Diagnosed with palpation during physical exam; ultrasound to locate them
4. Tx. goals - 1. bring testes into position 2. promote spermatogenesis & fertility 3. enhance psychological well-being & physical appearance
5. Treatments (untreated can mean a higher chance of testicular cancer)
 - a. None
 - b. Human chorionic gonadotropin (HCG) – stimulates secretion of testosterone and promotes descent
 - c. Orchiopexy – placement and fixation of testes in scrotal sac : surgery – place a stitch on the testicle to the sac
 - i. Careful cleaning of urine and stool watch for infection
6. Nursing management
 - a. Careful cleaning of urine & stool - watch for infection
 - b. Bedrest , no vigorous play, no straddling
 - c. Apply ice
 - d. Analgesics

Wilm's Tumor or nephroblastoma

1. Most frequent intra abdominal tumor of childhood (cancer)
2. Diagnosis usually younger than age 5
3. ? arises from embryonic structures
4. Long encapsulation time
5. Diagnosis: abdominal swelling, ultrasound, ct scan
6. Major s/s : hematuria, anemia, elevated blood pressure, weight loss, fever



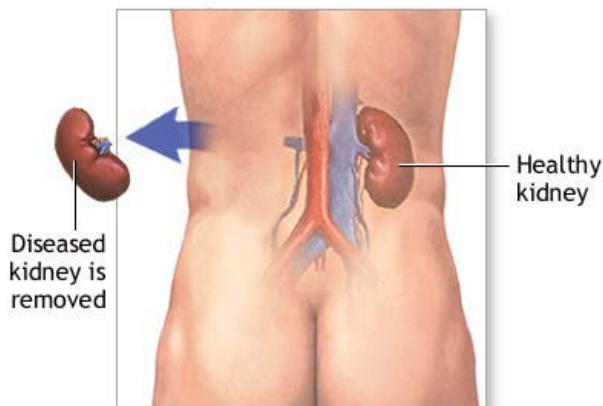
7. Check renal function tests (from lack of blood flow)
 - a. Kidneys produce renin to raise blood pressure: check for increased blood pressure

Wilm,s Tumor

8. Treatment
 - a. Diagnosis: Knowledge deficit
 - b. NO ABDOMINAL PALPATION – prevent tumor spread
 - c. Surgery asap (24-48hrs)
 - d. Extensive abdominal incision
 - e. Frequent BP monitoring
 - f. Postop
 - i. Nephrectomy
 - ii. Many potential complications
 - iii. Radiation / chemotherapy
 - g. Very good survival rate

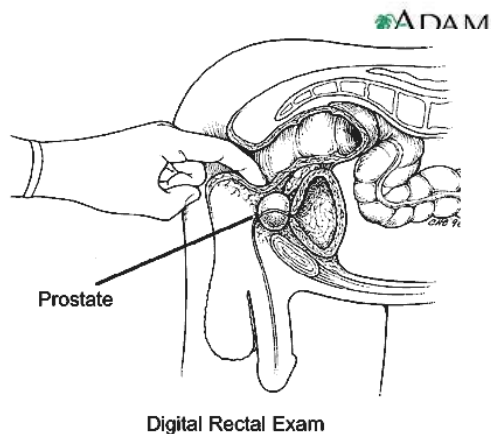
Nephrectomy (kidney removal)

1. Pre-op
 - a. Assess current renal function
 - b. Coagulation studies
 - c. Patient expression of feelings
2. Post-op
 - a. Hemorrhage and shock – chief complications
 - b. Abdominal distention, paralytic ileus
 - c. Infection
 - d. Keep all tubes patent



Benign Prostatic Hyperplasia (BPH)

1. Nonmalignant enlargement of prostate gland
2. Prostate enlargement narrows urethral channel and may extend upward into bladder
3. Age: male >40 years old.
4. Possible hormonal cause
5. Function of prostate : production of seminal fluid
6. Signs and symptoms for BPH
 - a. Increased urinary frequency, nocturia, urgency, decreased size and force of urine stream, hesitancy, terminal dribbling, dysuria, hematuria
 - b. Gradual hydroureter, hydronephrosis
 - c. Serious, acute urinary retention
7. Diagnostics include
 - a. BUN, creatinine
 - i. Prostatic specific antigen (PSA) if prostate cancer
 - ii. IVP
 1. Check the structure and function of the urinary tract (iodine based dye)
 2. Bladder emptying
 3. Post voiding urinary retention



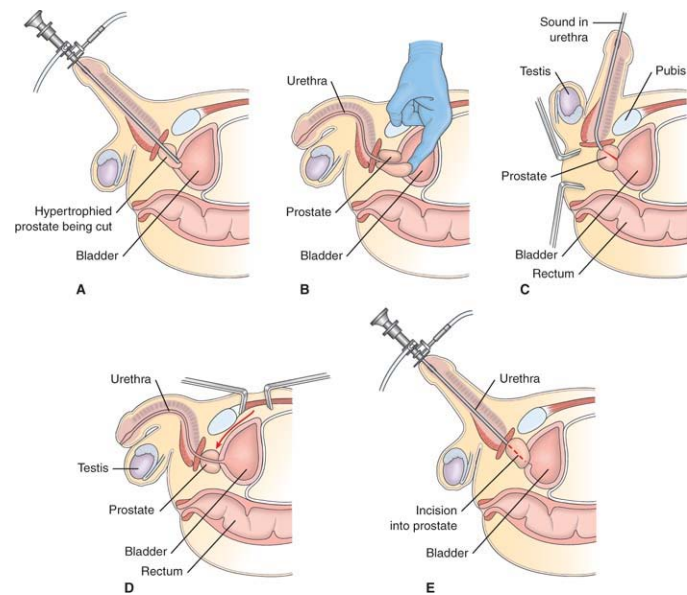
- b. Cystoscopy
 - c. Digital rectal exam (DRE)
 - d. Pre-op nursing diagnoses
 - i. Infection
 - ii. Pain
 - iii. Anxiety RT urinary obstruction
8. Nonsurgical treatment
- a. Proscar- Blocks DHT
 - b. anti adrenergic to decrease gland activity (decrease muscle tone in the neck of the bladder)
 - i. Hytrin
 - c. Lasers and ultrasound
 - d. Needle ablation
 - i. Catheter through penis – heated needle to destroy prostate tissue
 - e. Microwave therapy – via catheter
 - f. Saw Palmetto
 - g. Surgical tx : TURP Trans Urethral Resection of the Prostate (Benchmark)
 - i. TUIP Trans urethral incision of the prostate
 - ii. Removal of the inner portion of the prostate
 - iii. TUIP : transurethral electrovaporization, laser therapy, and open prostatectomy

Prostate Cancer

1. Incidence
 - a. 1:5 men
 - b. Increased incidence over age 50
 - c. Black men highest incidence in the world
 - d. Higher risk with relatives with disease and diet high in red meat and fat
2. Diagnosis
 - a. Signs and symptoms similar to BPG including hematuria, painful urination and late obstruction
 - b. Abnormalities of DRE
 - c. PSA elevated (over 30)
 - d. Transrectal ultrasound
 - e. Biopsy
3. Treatments
 - a. Radiation therapy (brachytherapy)
 - i. Early stage curative -seed implantation (1 year)
 - ii. Complications:
 1. Strain urine for possible seeds
 2. Must wear condom for first 2 weeks
 3. Stay away from infants and pregnant woman for 2 months
 - iii. Less likelihood of changes in their sexual potency
 - iv. Not much pain, but irritation to rectal area / occasional “flushing”
 - b. Hormone therapy (to increase estrogen)
 - i. Decrease tumor size
 - c. Cryosurgery

- d. Chemotherapy
- e. Surgery for BPH : Major Complication: urinary incontinence.

- i. All procedures remove hyperplastic tissue and leave prostatic capsule
- ii. TUR OR TURP - resectoscope thru urethra into bladder; no incision (most common) (A)
- iii. SUPRAPUBIC - removal of gland thru abd. incision that opens into bladder, suprapubic catheter post-op (B)
- iv. RETROPUBIC PROSTATECTOMY - low abd. incision, no bladder entry (D)
- v. PERINEAL (C)
 - 1. Perineal approach
 - 2. Increased chance of impotence
 - 3. Nerve – sparing approach
- vi. Transurethral TUIP (E)
- vii. RADICAL PROSTATECTOMY
 - 1. Radical removal of gland and surrounding structures
- viii. ROBOTIC PROSTATECTOMY
 - 1. Faster recovery
 - 2. 80% nerve sparing



f. Post Op Care

- i. Bladder spasms
 - 1. Painful often with feeling of fullness, bleeding around catheter
 - 2. Secure catheter
 - 3. Medication to relax smooth muscle
- ii. Assess for hemorrhage and shock
 - 1. Bedrest promotes hemostasis
 - 2. Immediate danger 1st 24 hours
 - a. Arterial “ketchupy” with clots
 - b. Venous “burgundy” less viscous
 - c. Usually urine bright red and light pink within 24 hours
 - d. Urinary catheter traction if needed (to stop bleeding if needed)
 - 3. Continuous bladder irrigation (CBI)-3 way foley
 - a. Maintain flow rate – often colorless or light pink return: no obstruction
 - b. Monitor output : monitor what goes in, what comes out, calculate the urine output.
- iii. Catheter placement vs obstruction vs bladder spasm
 - 1. Encourage fluid – IV then PO; accurate I&O
 - 2. If pt c/o pain, check tubing and if proper functioning
 - a. If s/s related to urgency and pressure, medicate for bladder spasms
- iv. Home care/teaching (general guidelines)
 - 1. Perineal exercises – gradual resolution of dribbling (p1820 brunner)

2. For 6-8 weeks avoid strenuous activities, sexual intercourse
3. Keep stool soft

Expected preoperative patient outcomes may include the following:

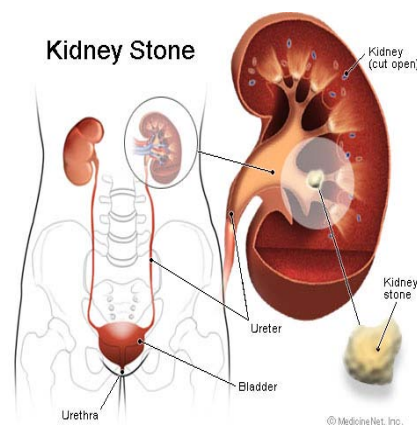
- Demonstrates reduced anxiety
- States that pain and discomfort are decreased
- Relates understanding of the surgical procedure and postoperative course and practices perineal muscle exercises and other techniques useful in facilitating bladder control

Expected postoperative patient outcomes may include the following:

- Reports relief of discomfort
- Exhibits fluid and electrolyte balance
 - Irrigation fluid and urinary output are within parameters determined by surgeon
 - Experiences no signs or symptoms of fluid retention
- Participates in self-care measures
 - Increases activity and ambulation daily
 - Produces urine output within normal ranges and consistent with intake
 - Performs perineal exercises and interrupts urinary stream to promote bladder control
 - Avoids straining and lifting heavy objects
- Is free of complications
 - Maintains vital signs within normal limits
 - Exhibits wound healing, without signs of inflammation or hemorrhage
 - Maintains acceptable level of urinary elimination
 - Maintains optimal drainage of catheter and other drainage tubes
 - Reports understanding of changes in sexual function

Urolithiasis /Renal Calculi / Kidney Stones

1. Def: supersaturation of filtrate (often calcium and oxalate) anywhere in the urinary tract that leads to stone formation.
2. Causes include increased calcium/oxalate (75%), uric acid, infection, urinary stasis, periods of immobility.
 - a. Diet, family history, immobility
3. Assessment for urolithiasis
 - a. Symptoms : PAIN – none to excruciating (Renal colic)
 - i. Acute pain – abdominal pain, diarrhea
 - ii. From urethral spasm of stone blocking ureter and flow of urine
 - iii. Flank pain – kidney
 - iv. Radiation to genitalia – ureters/bladder
 - b. Hematuria – smoky, rusty color
4. Intervention for urolithiasis
 - a. Encourage fluids
 - i. 3-4000 cc/day if not contraindicated
 - ii. Increase hydrostatic pressure
 - b. Medications
 - i. Opioids
 - ii. NSAIDS – block prostaglandin E



- iii. Antispasmodics – Ditropan, Pro-Banthine
 - c. Strain all urine
 - d. Procedures
 - i. Lithotripsy – shock waves pulverize stones (ultrasonic)
 - ii. Percutaneous nephrostomy
 - 1. Endoscope removes stones in kidney thru a small incision
 - 2. Nephrostomy tube – measure output on all tubes separately, if 2 tubes each separate
 - 3. Unobstructed drainage – no kinks, no clamps
 - 4. No irrigation unless specific MD's orders
- 5. Urolithiasis – nutrition
 - a. Good fluid intake
 - b. Diet depends on the composition of the stones
 - i. Calcium – restriction of protein (60gm) and sodium (3-4gm) in diet reduces calcium in urine
 - ii. Uric Acid – low purine diet
 - iii. Cystine – low protein diet (60gm)
 - iv. Oxalate – limit oxalate

Ileal Conduit / Ileal Loop

1. Urine is diverted by implanting the ureter in a 12 cm loop of ileum that is led out through the abdominal wall
 - a. Bladder is removed
 - b. Jackson-Pratt tube is placed in area that the bladder was in.
 - c. The ileal bag drains urine constantly
 - d. The ureter can also be implanted into the transverse colon or the proximal jejunum.
2. Surgery often done for cancer of bladder
3. Post op care
 - a. Check for stomal edema
 - b. Check stoma color, any bleeding?
 - c. Expect stomal edema for a time
 - d. Expect mucus shreds in urine
 - e. Encourage fluids; measure hourly output

Glomerular Disease

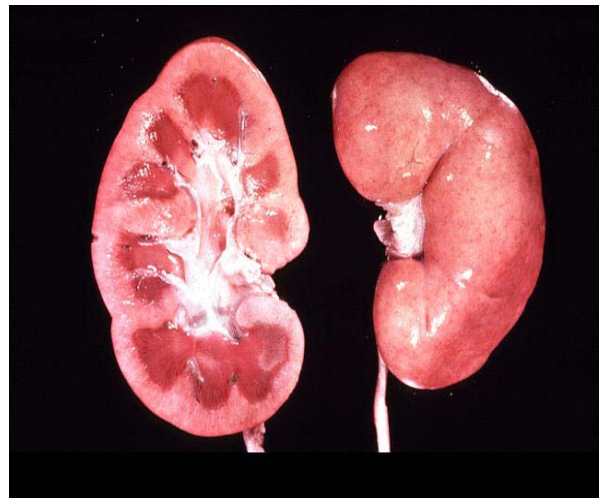
1. Acute nephritic syndrome
2. Streptococcal infection of the throat precedes glomerulonephritis by 2-3 weeks
3. Assessment
 - a. Enlarged kidneys
 - b. Elevated serum IgA
 - c. Brown cola-colored urine
4. Complications
 - a. Hypertension
 - i. Medical emergency
 - ii. Heart failure
 - iii. Pulmonary edema

5. Medical management
 - a. Treat the symptoms
 - i. Corticoid steroids
 - ii. Dietary protein restricted when BUN is elevated
6. Nursing management
 - a. Carbohydrates are given liberally
 - b. I&O carefully measured
 - c. Fluids are important
 - i. Insensible loss (300 – lungs, 600- skin)
 - d. Patient education about the disease process
 - i. Self care at home
 - ii. Notify physician if symptoms of renal failure occur
7. Nephrotic syndrome: major manifestation : EDEMA (soft and pitting, usually around the eyes, and dependant areas like the sacrum, ankles and hands)
 - a. Assessment
 - i. Proteinuria (predominantly albumin) exceeding 3.5 g/day is the hallmark of the Nephrosis
 - ii. Hypoalbuminemia
 - iii. hyperlipidemia.
 - b. Nursing management
 - i. Education about the importance of following medication regimes.
 - ii. Importance of communicating any changes to their physician

Chronic Renal Failure

Over 100 different causes

1. Hypertensive renal disease leading to nephrosclerosis (leading cause)
2. Diabetic nephropathy with changes in arterial system
3. Glomerulonephritis
 - a. 50% have cola colored blood
 - b. Some protein in urine
 - c. Complaint of flank pain
 - d. Casts in blood : cloudy – protein clumps
4. Inflammatory process involving usually both kidneys



Progressive phases of chronic renal failure (5 stages)

Normal GFR 90-125 (ml/min/1.63m²)

1. Early stages : kidneys able to compensate without symptoms
2. Disease progression: patient tries prevent complications (smoking, alcohol)
3. Stage 5
 - a. End stage renal disease (ESRD)
 - b. >70-80% of renal function lost
 - c. Stage 5 – GFR < 15 mL/min/1.73m²
 - d. GFR 5-10% of normal
 - e. Oliguria/ anuria develop - dialysis begins

Clinical manifestations: Fluid volume excess related to pt's inability to excrete urine

1. Assess for signs and symptoms of hypervolemia : decrease urinary output
2. Enforce fluid restriction (often 500-600ml more than previous day's output)
3. Administer diuretics if ordered
4. Edema, hypertension, heart failure
5. May have impaired gas exchange:
 - a. Blood loss
 - b. Anemia
 - c. Check for ecchymosis

Nutrition

- Dietary restrictions
- Altered taste sensations
 - Metallic tastes or uremic fetor (ammonia smell to breath)
- Anorexia
- Diet : 60 grams protein, 2 grams Na+, 2 grams K+
 - Complete proteins : Meat, eggs, fish, milk
 - Limit phosphorus
 - Calories 2000-2500 day, including fat or cholesterol as needed
 - Decrease fluid: thirst a problem, hard candy, mints, ice chips
 - Vitamin supplementation
- Check albumin levels

Irritation and depression of the CNS associated with uremia, uremic encephalopathy

- Check for early signs – headache, fatigue, dizziness, drowsiness, insomnia
- Check for late signs – Asterixis –(flapping dorsiflexed hand), confusion, coma

Alteration in skin integrity – buildup of metabolic waste products

- Check skin color - pale yellow, pallor, ecchymosis
- Check for pruritus – atrophy of sweat glands
- Apply oily skin lotion, use mild soap, no perfume
- ADM antihistamines for itchy skin

Dialysis

- Types
 - In center
 - Pd
 - Short daily home dialysis
 - Nocturnal Dialysis on Conventional machine
 - Nxstage Short Daily
 - Nxstage Nocturnal

Fistula : vein attached to an artery

- Buttonhole method – continually using the same hole at the same angle.
- Palindrome catheter = allows you to switch venous and arterial if necessary

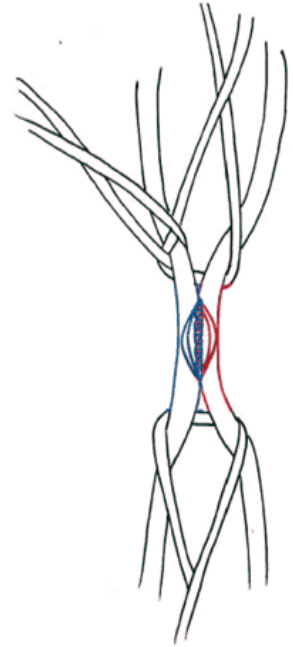
Dialysis def: Process used to remove fluid and waste products from the body when kidneys are able to do so.

Similarities between hemodialysis and peritoneal dialysis

- Semi permeable membrane thru which osmosis and diffusion occur
- Ultrafiltration (hemo only)
 - Special access
 - Appropriate dialysate – specific for patient

Hemodialysis

1. Semi permeable membrane – synthetic dialyzer
2. Dialysate – clear water and chemicals
 - a. Hold dialyzable meds and those that affect BP
 - b. Needle puncture for G & F with each dialysis for arterial and venous access
 - c. Anticoagulation with hemodialysis
 - d. Dialysis (heparin – half life 4 hours)
3. Access site – Graft, Fistula, Shunt
 - a. Check for adequate circulation – Bruit, Thrill
 - b. No BP's, IV's, Blood drawing on that arm
 - i. Absence could be blockage, clot or increased blood viscosity, check for infection.

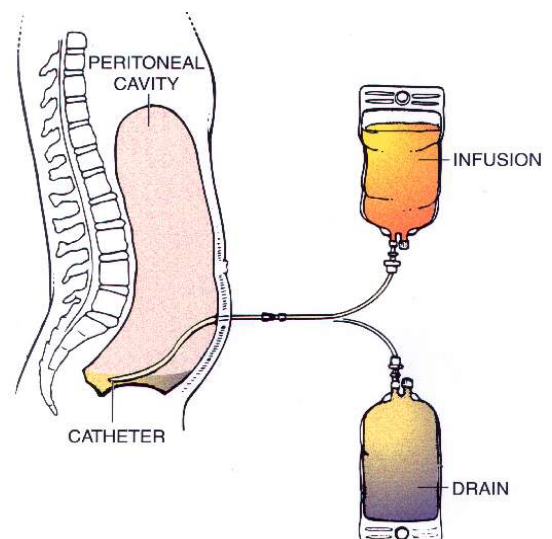


Disequilibrium Syndrome

1. Occurs during post dialysis
2. Signs and symptoms
 - a. Headache, restlessness, decreased LOC, fatigued
3. Check vital signs post dialysis
4. Question rapid decrease in BUN leading to cerebral edema

Peritoneal Dialysis

1. Semi permeable membrane surface of the perineum
2. Access – Tenckhoff Catheter
3. High risk for infection related to repeated use of Tenckhoff catheter
 - a. Frequent catheter dressing change using aseptic technique and mask
 - b. Document cloudy drainage of inflammation – send fluid specimen
 - c. Check for peritonitis – rebound abdominal tenderness, cloudy outflow
 - d. Administer antibiotics IV, PO or thru dialysis catheter
4. Process of Peritoneal Dialysis
 - a. Use sterile dialysate with ordered dextrose concentration 1.5%, 2.5%, or 4.25%



- b. 3 step process
 - i. Fill or inflow
 1. Usually 1-3000ml in 5-10 minutes
 - ii. Dwell time
 1. Osmosis and diffusion occur
 2. Ordered by a physician
 3. 10-20 min to overnight (usually about 4 hours, then overnight)
 - iii. Drain or outflow
 1. Releases unwanted fluid and waste over 10-30 minutes
 2. Solution should be clear, colorless or straw colored

Continuous Renal Replacement therapies

1. Hemofiltration – circulation of blood through a low flow resistance filter using the patient’s BP for pressure to remove fluid
2. Hemodialysis – Same as above but has concentration gradient for urea removal; no blood pump

Renal Transplant

1. Search for a Kidney
 - a. 2003: 56,000 waiting
 - b. 2010: 83,950 (US)
2. Qualifying a donor or recipe or recipient
 - a. Free of certain illness (cancer, some hypertension, HIV, IV drug user)
 - b. Sound psychological mind
3. Living Donor or Cadaver
 - a. Tissue match
 - b. Emotional status (patient and donor)
 - c. 96% survive 1 year, 10 years about 50%
4. Placement of transplant – iliac fossa
5. After the transplant
 - a. Post op
 - i. Usual post op care plus
 - ii. Administer osmotic loop diuretics
 - iii. Replace IV fluid based on 30-60 minute urine output
 - iv. Asses electrolytes
 - v. Check for catheter patency – clots may form, remove kinks
6. Graft rejection
 - a. Hyperacute
 - i. Develops intraoperatively or in several hours
 - ii. Irreversible, rare
 - b. Acute
 - i. Most common
 - ii. Days to several years
 - iii. Reversible with inclusions of immunosuppression
 - c. Chronic
 - i. Months to years
 - ii. Gradual decrease in kidney function

- iii. Irreversible
- iv. Assess for oliguria, edema, fever, including BP, increased weight, pain or swelling over graft site.
- d. High risk of infection related to immunosuppressants
 - i. Good handwashing
 - ii. Masks for upper respiratory infections
 - iii. Administer immunosuppressive (susceptible host)
 - iv. Assess signs and symptoms of infection
- e. Common immunosuppressives
 - i. **Cyclosporine** – prevents T-cells and macrophages from attacking graft
 - ii. **AZATHIOPURINE(IMURAN)** - INTERFERES WITH T - LYMPHOCYTES; TITRATED TO WBC COUNT NUMEROUS S/E: MAJOR ONE : BONE MARROW SUPPRESSION - MONITOR WBC & PLT. COUNT; CALL DR. IF WBC BELOW 1000
 - iii. **METHYLPREDNISOLONE(MEDROL, SOLU-MEDROL) or Prednisone** - CORTICOSTEROID; BLOCKS IMMUNE RESPONSE; GIVE PO DRUG WITH FOOD TO DEC. GI DISTRESS; NUMEROUS S/E
 - iv. May mask signs and symptoms of rejection or infection

TEST 2

Obstructive Disorders

- Cholelithiasis : stone formation in the Gallbladder
 - Most common problem in the biliary system
- Cholecystitis: inflammation of the gallbladder
- Choledocholithiasis: stone formation in the common bile duct

Etiology:

1. Two types of stones
 - a. Cholesterol stones – most common (can be 4cm)
 - b. Pigmented stones
2. Risk Factors
 - a. Female, Fat, Fertile, over 40, familial tendency, native Americans, rapid weight loss (5lbs per week), obesity, treatment with high doses of estrogen (soy based products),



Cholecystitis

1. Manifestations
 - a. Simple indigestion - severe pain – fever – jaundice
 - b. Right upper quadrant pain
 - c. Nausea, vomiting, restlessness, diaphoresis
 - d. Leukocytosis (increased white blood cells)
 - e. Fat intolerance, flatulence
 - f. Silent cholecystitis – no symptoms
 - g. Spasms that occur due to stone called biliary colic
 - h. Murphy's sign – temporary inspiratory arrest when palpating right upper side
2. When a stone lodges in the bile duct and blocks the bile
 - a. Stool will be a lighter color (brown feces is from bile)
 - b. Urine will be dark
 - c. Absorption of fat soluble vitamins is reduced (A,D,E,K) vitamins
 - d. Increase in direct bilirubin
 - i. Direct Bilirubin 0.0 to 0.3
 - ii. Indirect Bilirubin 0.1 – 1.0
 - iii. Total Bilirubin 0.1 – 1.2
 - e. Increase in cholesterol (should be under 150)
 - f. Steatorrhea (frothy, greasy stools)
 - g. Leukocytosis
 - h. Peritonitis
3. Prevention
 - a. Primary Prevention
 - i. Activity, healthy diet

- b. Secondary (attack in the past)
 - i. Modify diet, cholesterol control,
- 4. Diagnostic Tests
 - a. Ultrasound : 95-99 % accurate
 - b. ERCP - Endoscopic Retrograde Cholangiopancreatography
 - i. Direct visualization of the gallbladder, cystic duct, common duct
 - ii. NPO
 - iii. Sedation
 - iv. Video <http://www.youtube.com/watch?v=pKvEkLzZifM>
- 5. Medications
 - a. Analgesics (Dilaudid), Toradol
 - i. Anticholinergics
 - b. IV therapy
 - c. Broad spectrum antibiotic
 - d. Vitamin K when they have a prolonged prothrombin time
 - e. Ursodiol (Actigall) Chenodiol To prevent stone formation (may dissolve some stones)
 - f. MTBE –either administered into the gallbladder to dissolve the stones
- 6. Treatment
 - a. ESWL (Extracorporeal shock wave lithotripsy)
 - i. Made originally for kidney stones in the 1970s
 - ii. Need to have normal gallbladder function
 - iii. Mild symptoms
 - iv. Small stones (<20mm)
 - b. Diet
 - i. Low-fat diet
 - ii. Small meals to decrease symptoms
 - c. Surgery
 - i. Laparoscopic Cholecystectomy
 - ii. Open Cholecystectomy
 - 1. Medicate to perform breathing exercises
 - 2. T-tube insertion (Penrose drain put into a T)
 - a. Drains excessive bile
 - b. Comes out when there is minimal drainage
 - i. Clamp 1 hour before and 1 hour after a meal to test
 - 3. Jackson Pratt drain – taken out before discharge
 - iii. Post-op : pain control
 - 1. Turn cough and deep breathing
 - 2. No heavy lifting (10 lbs) for 4-6 weeks

Acute Pancreatitis : very sick – serious inflammation

- 1. Causes
 - a. Alcoholism
 - b. Theory : trypsin in the pancreas activates and begin to eat away at the pancreas and it becomes necrotic.
 - c. Trauma
 - d. Cancer

- e. Excessive use of thiazide diuretics
 - f. Excessive use of steroids, acetaminophen, oral birth control pills
2. Clinical manifestations
 - a. Severe abdominal pain with nausea and vomiting
 - i. Constant, incapacitating, mid epigastric to left upper quadrant radiating to the back
 - ii. More severe in the supine position (patient cannot lay down)
 - iii. Unrelieved by antacids
 - b. Abdominal distention
 - c. Low grade fever, sometimes shocky
 - d. Diminished bowel sounds
 - e. Tetany from low calcium (spasms in the hands and feet)
 - f. Jaundice
 - g. Trapped Trypsen releases kyan peptides which causes shock
 3. Prevention
 - a. Educate people at risk
 4. Medical Management
 - a. Serum amylase : 60 – 160 - pancreatitis can be upwards of 800
 - i. Amylase breaks down starch into sugar (produced by the pancreas)
 - b. NPO, NG with wall section to give the gut a rest
 - c. May need TPN
 - d. Surgical management : only if it necessary to remove the necrotic tissue (last resort)

Chronic Pancreatitis : similar to acute pancreatitis

1. **Administer pancreatic enzyme** – pills cannot be put with any kind of protein
 - a. Can ulcerate mucus membranes
 - b. Always given before or with meals, **NEVER after.**
2. Some patients need B12 injections.

Hepatic Disorders

Liver functions:

1. Glucose metabolism
2. Ammonia Conversion: converts into urea
3. Protein metabolism
 - a. Synthesizes almost all proteins **except for gamma-globulins**
4. Fat metabolism
 - a. Without bile production, you cannot break down fats
5. Vitamin A, B, Iron, and D storage
6. Bile Formation
 - a. Continually formed and stored in the gallbladder
 - b. Emulsify fats and bile salts
7. Bilirubin excretion
 - a. Pigment derived from the breakdown of hemoglobin
 - b. Concentration in the blood will increase in liver disease
8. Drug metabolism
 - a. Opioids, barbiturates, sedatives, amphetamines : binds them to be excreted in feces

Diagnostic tests: 70% of the liver may be damaged BEFORE liver functions tests are abnormal

1. Liver Function Tests
 - a. Serum enzyme activity
 - i. serum aminotransferases (AST), alkaline phosphatase, lactic dehydrogenase, Alanine aminotransferase (ALT)
 1. useful in detecting active liver disease such as hepatitis
 - b. Serum concentration of proteins
 - i. Albumin and globulins
 - c. Bilirubin, ammonia, clotting factors, prothrombin, and lipids
2. Liver biopsy – not as prevalent
 - a. Risk : bleeding – check hemoglobin, prothrombin, PTT, platelet count
 - b. After the biopsy – patient lays in their right side for a few hours (stop bleeding)
 - c. Monitor for chest pain
3. Ultrasound, CT, MRI
4. Exploratory laparotomy (can do the biopsy at the same time)

Assessment

1. Health history
 - a. Drug and alcohol abuse
 - i. Tylenol
 - b. Lifestyle behavior : exposure
 - i. Sexual practices
 - ii. Foreign travel
 - c. PHM

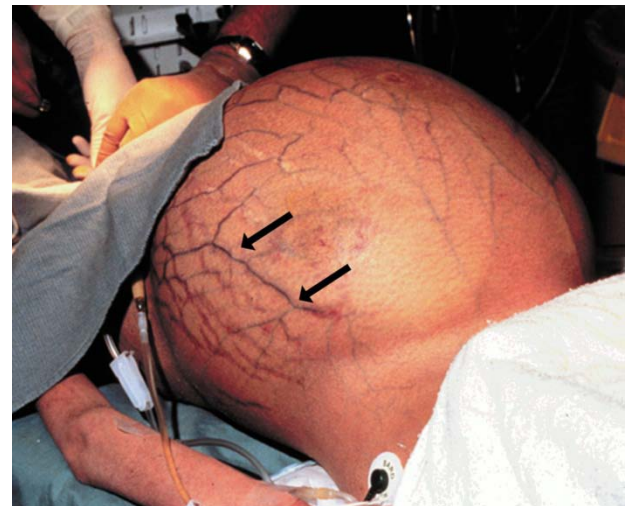
- i. Gallstones? : stones emptying into common bile duct, can backup bile into the liver and cause damage.
- d. Wilson's disease
- e. Black tarry stools
- f. Spider angiomas
- g. Male: enlarged breasts, testicular atrophy (hormonal changes)
- h. Asterix (flapping tremors)

Signs and symptoms of hepatic dysfunction

1. Can be from obstruction, damage, or cirrhosis (cirrhosis is not only from alcohol)
2. Jaundice: bilirubin is backed up into the liver. Blood re-absorbs the bilirubin
 - a. Hemolytic
 - i. Result in the increased destruction of RBCs
 - b. Hepatocellular
 - i. Caused by damaged liver cells, they can't clear normal amounts of bilirubin
 - c. Obstructive
 - i. Caused by occlusion of ducts from inflammatory response.
 1. Can be caused by a tumor on or pushing against the common bile duct
 - ii. Also called extra-hepatic (occurs outside the liver)

3. Portal hypertension

- a. Circulatory changes in the liver
- b. Liver cannot produce aldosterone which makes the kidney retain fluid and sodium
- c. Increased pressure in the portal venous system from obstruction or resistance in the liver
- d. Liver cannot produce albumen : fluid shifts from the intervascular area to the peritoneal space
- e. Produces ascites and varices
 - i. Ascites : albumen rich (protein) fluid in the peritoneal space
 - ii. Rapid weight gain, striations around umbilicus, distended belly, distended veins (caput medusae)



Caput Medusae

iii. Management

1. Dietary control, bedrest, paracentesis, transjugular intrahepatic,
 - a. During paracentesis – albumen is given IV
 - b. Needle into the abdominal wall : patient should void first
 - c. Fowlers position
 - d. Constant blood pressure monitoring : watch for vascular collapse
 - e. After procedure: fluid measured and tested.
 - f. 15 minute vitals for 1-2 hours
 - g. Monitor electrolyte shifts.
2. Aldactone: potassium sparing, aldosterone blocking
3. Transjugular intrahepatic shunt (TIPS)
 - a. Method of treating ascites

- b. Canula threaded into portal vein, a stent between the hepatic vein and the portal vein
- 4. Esophageal varices: serious problem with cirrhosis patients
 - a. Pathophysiology
 - i. Blood backs up from the liver to the lower third of the esophagus, and the stomach.
 - ii. Varices occur in the esophagus, stomach, around the umbilicus, and rectal area.
 - b. Clinical manifestations
 - i. Dilated, tortuous veins from the blood flow resistance in the liver
 - ii. Vomiting blood
 - 1. Digested : black tarry stools
 - 2. Vomited: coffee grounds
 - c. Management
 - i. Endoscopy
 - ii. Portal vein pressure, Wedge pressure
 - iii. Laboratory tests (H&H)
 - iv. Manage signs and symptoms of shock
 - v. Drug therapy : vasopressin (Pitressin), Octreotide (Sandostatin) (vasodilation)
 - 1. Monitor for angina (keep nitro at bedside) (sometimes it is given with vasopressin)
 - 2. Inderal – reduces portal pressure
 - vi. Balloon Tamponade (**Sengstaken-Blakemore tube**)
 - 1. Puts pressure directly on the bleeding site
 - vii. Esophageal banding therapy

Hepatic encephalopathy and coma

- d. Ammonia can't be broken down into urea anymore and gets circulated into the brain
 - e. Liver cannot detoxify ammonia into urea
 - f. Ammonia causes central nervous system problems
 - i. Confusion, central nervous system problems, COMA
 - ii. Neuro and handwriting checks daily to check progression
 - g. High protein levels can cause ammonia levels to go up
 - h. Constructional apraxia : cannot draw simple figures
 - i. Fetor hepaticus : late sign of liver failure : fecal breath smell
 - j. Treatment
 - i. Monitor potassium levels (loss of potassium in stool)
 - ii. Deal with anything bleeding into the GI tract
 - iii. Use lactulose and low protein diet to get ammonia out. (monitor for potassium)
 - iv. Safety measures
 - 1. Bed, rails, observation
 - v. Labs for ammonia and electrolytes
 - k. Associated endocrine disorders
 - i. Liver metabolizes other hormones
 - ii. Damaged liver cannot inactivate estrogen
 - iii. Can get testicular hypertrophy
5. Generalized edema and bleeding
6. Vitamin deficiency

7. Metabolic abnormalities
8. Pruritus (itching)
9. Cirrhosis Assessment
 - a. Liver enlargement – then in end stage, smaller
 - b. Portal obstruction / ascites
 - i. Circulation backs up into the upper portion of the stomach (esophageal varices), the abdomen, and the rectum.
 - c. Infection and peritonitis
 - i. Spontaneous bacterial peritonitis (SBP)
 - ii. Peritoneal paracentesis to test fluid (ascites)
 - d. Gastrointestinal varices; low prothrombin levels (from lack of digestion of vitamin K (no bile))
 - e. Leg and presacral edema : late sign (due to a decrease in albumen) (hypoalbuminemia)
 - f. Vitamin deficiency / anemia
 - i. Inadequate breakdown, storage, and use of fat soluble vitamins
 - g. Mental deterioration :
 - i. Report when neurological status deteriorates.
 - h. Labs
 - i. INCREASES
 1. Enzymes **AST/ALT/GGT** (ALT enzyme most indicative of liver pathology)
 2. Bilirubin
 3. Prothrombin Time
 - ii. DECREASES
 1. albumin
 - iii. CHANGES IN LIVER SIZE/BLOOD FLOW
 1. (1) CT (2) MRI (3) Liver Scan (4) Ultrasound show enlarged liver
 - iv. DIAGNOSIS CONFIRMATION
 1. Liver Biopsy
 - i. Nursing Management
 - i. Rest and Protein/low salt diet with supplemental A, C, K & B vitamins
 - ii. Skin care : jaundice and edema = risk for skin breakdown
 - iii. Prevent injury: hepatic encephalopathy = agitation with risk of falls
 - iv. Prolonged PT time=risk of bleeding
 - v. Fluid volume excess (low albumin) = risk of increased cardiac output/workload on heart and pulmonary congestion. (daily weights)
 - vi. Promote consumption of high carbohydrate diet
10. Liver cancer : Primary liver cancer and liver metastases
 - a. Symptoms consistent with other liver pathology except for unique sx of RUQ abdominal pain
 - i. Weight loss, pain, jaundice, ascites,
 - b. Primary usually associated with liver disease
 - c. Diagnostic Tests: same for other liver pathology **EXCEPT: serum level of alpha-fetoprotein (AFP) elevated in 30-40%** patients with primary liver cancer (versus metastatic liver cancer)
 - d. Primary liver cancer is a good candidate for liver transplant
 - i. Cancer can travel, usually to the lungs (follows the lymph channels)
 - e. Medical and Nursing management
 - i. Radiation therapy

- ii. Chemotherapy
- iii. Percutaneous biliary drainage
- iv. Non-invasive treatments
- v. Surgical treatment : removal

Liver Transplant

- f. Pre-operative: Patient teaching about immunosuppressants, counseling to improve health habits, possible nutritional supplementation. Must be ESLF
- g. Post-operative: common transplant problems
 - i. Infection, bleeding, rejection
 - ii. Rejection is the leading cause of death
 - 1. Cyclosporin (anti rejection medication- toxic to kidneys)
 - iii. General post-op issues ; pts very prone to atelectasis (loss of lung volume) due to manipulation of diaphragm
 - iv. Rejection
 - v. Diet TPN and 10% glucose

h.

11. Liver Abscesses

- a. Pathophysiology
 - i. Infected area
- b. Clinical manifestations
- c. Diagnostic tests
 - i. Culture to match correct antibiotic
- d. Nursing care
 - i. Give IV antibiotics
 - ii. Monitor drain
 - iii. Watch white blood cell counts.

VIRAL Hepatitis Adams 917-922 (meds)

Hepatitis A: 20-25% of cases in the US

1. RNA Virus of the Enterovirus family
2. Fecal – Oral route
 - a. Hand to mouth
 - b. Poor hygiene
 - i. Infected food handler
 - ii. Consumption of water, shellfish from contaminated water
 - c. Close contact
 - i. Can be transmitted through sexual contact
3. Incubation 2 – 6 weeks
4. Illness 4 -8 weeks
 - a. Most recover
 - b. Rarely progresses to acute liver necrosis or fulminant hepatitis (resulting in cirrhosis of the liver or death)
5. Mortality rate is about 0.5% for those under age 40, 1-2% for older people
 - a. People with underlying chronic liver disease, mortality is higher
6. No carrier state or chronic state with Hepatitis exists.
7. Virus is only briefly present in serum
 - a. When there is jaundice, the patient is most likely to be non-infectious
8. Clinical Manifestations
 - a. Many are without jaundice (anicteric) and symptoms
 - b. Initially: flu like, upper respiratory symptoms
 - c. Anorexia – severe
 - i. From release of toxins by the liver
 - ii. indigestion
 - d. Jaundice and dark urine
 - e. May be milder in children
9. Assessment
 - a. Liver and spleen enlargement
 - b. Hep A antigen found in stool 7 to 10 days BEFORE illness and 2-3 weeks after
10. Prevention
 - a. Handwashing
 - b. HAV vaccines: Havrix and Vaqta
 - i. 2 dose to adults 18 and older
 - c. After contact : intramuscular administration of globulin during the incubation period
 - i. Provides 6 – 8 weeks of passive immunity
11. Medical Management
 - a. Bed rest during acute stage
 - b. During anorexia period: frequent small meals supplemented with IV fluids and glucose
12. Nursing Management revolves around teaching prevention, most medical management occurs in homes.

Hepatitis B

1. Transmitted primarily through blood.
 - a. Found in blood, saliva, semen, and vaginal secretions
 - b. Transmitted through mucus membranes and breaks in the skin
2. Long incubation period
 - a. Replicates in the liver: remains in serum for long periods allowing transmission
3. Most people (90%) develop antibodies and recover in 6 months on their own
 - a. Mortality rate reported as high as 10%
 - b. 10% progress to carrier state or develop chronic hepatitis with persistent infections and hepatocellular injury and inflammation.
 - c. Worldwide cause of cirrhosis and hepatocellular cancer
 - d. Elderly are at risk of severe liver necrosis or fulminant hepatic failure
4. Clinical manifestations : resembles Hepatitis A
 - a. Incubation period longer (1 to 6 months)
 - b. Fever and respiratory symptoms are rare, some will have arthralgias (joint pain) and rashes
 - c. Loss of appetite, dyspepsia, abdominal pain, generalized aching, malaise, and weakness.
 - d. If jaundice occurs, light colored stools and dark urine accompany it.
 - e. Liver may be tender and enlarged 12-14cm vertically.
 - f. Spleen is enlarged and palpable in a few patients
 - g. Subclinical episodes also occur frequently
5. Assessment
 - a. Serum for virus components
 - i. HBcAg – core antigen
 1. Antibody persists during the acute phase of the illness
 - ii. HBsAg – surface antigen
 1. Antibody detected during late convalescence, indicates recovery and development of immunity
 - iii. HBeAg – independent protein
 1. Antibody indicates significantly reduced infectivity
 - iv. HBxAg – gene product of X gene of HBV DNA
 1. Antibody may indicate ongoing replication of HBV
6. Prevention
 - a. Screening of blood donors for antigen presence
 - b. Use of disposable syringes, and lancets and introduction of needless IV sets
 - i. (helps health care workers as well)
 - c. Good personal hygiene, glove use
 - d. No eating or drinking in laboratory or patient areas
 - e. Patient education regarding nature of disease
 - f. Active immunizations
 - g. Passive immunization for exposure
7. Medical management: goal minimize infectivity, liver inflammation, decrease symptoms
 - a. Alpha-interferon offers the most promise
 - i. 5 million units daily or 10 million units three times a week for 16 to 24 weeks
 1. Resulted in the remission of the disease in 33% of the patients
 - ii. Prolonged course of treatment may have further benefits

- b. Antiviral agents (Epivir and Hepsera), oral nucleoside analogs for chronic hepatitis
 - c. Bedrest, activities restricted until hepatic enlargement and levels of serum bilirubin and liver enzymes are reduced.
 - d. Adequate nutrition.
 - i. Protein restrictions if symptoms indicate liver's ability to metabolize protein byproducts is impaired.
 - e. Antacids, and antiemetics to control symptoms
 - f. Fluid therapy if needed (IV)
8. Nursing management
- a. Encourage gradual resumption of physical activity
 - b. Identify psychosocial issues and concerns
 - i. Separation from family and friends. Planning to minimize isolation
 - ii. Fears of spreading the disease
 - c. Follow up to home care may be needed.

Hepatitis C

1. Spread of disease: Blood transfusions, sexual contact, and other parenteral means such as contaminated needles, unintentional needle sticks.
 - a. Most common chronic bloodborne infection nationally
 - b. People most at risk: IV or injection drug users, sexually active people with multiple partners, people who receive frequent transfusions, those who require large volumes of blood, and health care workers.
2. Incubation period: 15 to 160 days.
3. Clinical course is similar to HBV, but symptoms are usually milder
4. Chronic case state occurs frequently
5. Increased risk of chronic liver disease
 - a. Cirrhosis and liver cancer (hepatic cellular carcinoma)
 - b. Even small amounts of alcohol taken regularly appear to cause progression of the disease
 - c. There is no benefit from rest, diet or vitamin supplements
6. Management
 - a. Intron-A and Rebetol may have an effect on treatment and prevent relapse
 - b. Side effects – hemolytic anemia
 - c. Treatment for 6 to 12 months
 - d. Virus will clear in about half of the patients
7. Prevention
 - a. Blood screening has reduced the incidence.

Hepatitis D

1. Occurs in some cases of Hepatitis B
 - a. Common among IV or injection drug abusers, hemodialysis patients, and recipients of multiple blood transfusions
 - b. Incubation period is 30 – 150 days
2. Symptoms similar to Heb B
 - a. Patients are more likely to develop fulminant (sudden, intense, and lethal) hepatitis and progress to chronic active hepatitis and cirrhosis.

3. Treatment is similar to other forms of hepatitis

Hepatitis E

1. Believed to be transmitted by fecal-oral route, principally through contaminated water in areas with poor sanitation.
2. Incubation period 15 to 65 days
3. Resembles hepatitis A
 - a. Jaundice is almost ALWAYS present (not in A)
4. Self limiting course with abrupt onset
5. No chronic form

Hepatitis G and GB –C

1. Blood transfusion with an infection occurring 14 – 145 days (too long for B or C)
 - a. When the other forms of hepatitis are ruled out
 - b. Autoantibodies are absent
2. Clinical significance is uncertain

NON VIRAL Hepatitis

- Chemical can have a toxic effect on the liver
 - Can cause acute liver cell necrosis and toxic hepatitis
 - Most common truly hepatotoxic:
 - Carbon tetrachloride
 - Phosphorus
 - Chloroform
 - Gold compounds
 - Medications that are hepatotoxic
 - Nydrazid (anti tuberculosis)
 - Fluothane (inhaled anesthetic)
 - Aldomet (antihypertensive)
 - Certain antibiotics, antimetabolites, and anesthetic agents

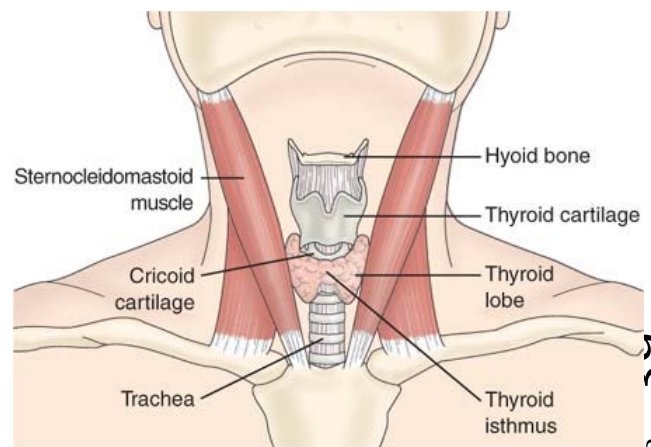
Metabolic or Endocrine function loss

Thyroid Disorders Iodine is critical

Thyroid gland: butterfly shaped organ located in the lower neck, anterior to the trachea. It consists of two lateral lobes connected by the isthmus. Regulates BMR

Function of thyroid hormone

1. Primary function: control cellular metabolism activity
 - a. T_4 maintains body metabolism in a steady state.
 - b. T_3 is about 5 times as potent as T_4 and has a

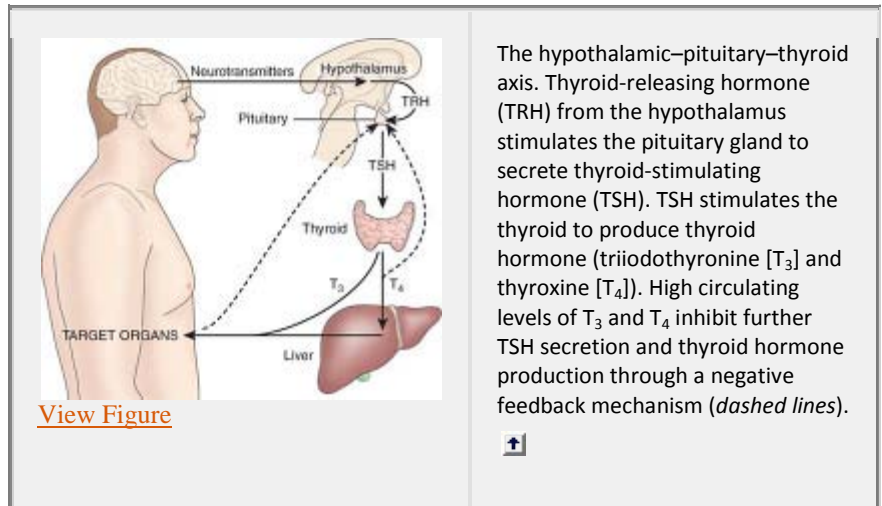


more rapid metabolic action.

- c. These hormones accelerate metabolic processes by increasing specific enzyme levels that contribute to oxygen consumption and altering responsiveness of tissues to other hormones.
- d. The process influences cell reproduction and are important in brain development. It is necessary for normal growth. They influence EVERY major organ system.

2. Calcitonin (thyrocalcitonin)

- a. Also secreted by the thyroid.
- b. In response to high levels of serum calcium and it causes a reduction in the level of serum calcium by increasing its deposition in the bone.



Pathophysiology

- 1. Hypothyroid (inadequate secretion of thyroid hormone)
 - a. During development results in stunted physical and mental growth (cretinism).
 - b. In adults it manifests as lethargy, slow mentation and generalized slowing of body functions.
- 2. Hyperthyroidism
 - a. Greatly increased metabolic rate.
 - i. Some characteristics of hyperthyroidism are caused from increased circulating catecholamines (epinephrine and norepinephrine)
 - b. Associated with enlarged thyroid gland (goiter)
 - i. Goiter also commonly occurs with iodine deficiency
 - 1. the lack of iodine results in low levels of circulating thyroid hormones which causes increased release of TSH. Elevated TSH causes overproduction of thyroglobulin (a precursor to T₃ and T₄) and hypertrophy of the thyroid gland.

Assessment and diagnostic findings

- 1. Physical exam
 - a. Inspection and palpation of the thyroid gland
 - i. Instruct patient to extend the neck slightly and swallow
 - ii. The thyroid rises normally with swallowing
 - iii. Palpate for size, shape, consistency and symmetry along with tenderness
 - iv. Examine anterior or posterior (posterior encircle the neck, thumbs on nape of neck while fingers palpate isthmus and anterior surfaces and later lobes.
 - v. The isthmus should have as firm and of a rubber band consistency.
 - vi. With the patient flexing neck slightly forward and to the left or right, the thyroid cartilage is displaced and the lobes can be palpated in the posterior area of the sternocleidomastoid muscles. Swallowing can assist palpation.
 - vii. Auscultation : if a localized audible vibration of a bruit is heard, it is indicative of increased blood-flow through the thyroid which is associated with hyperthyroidism.

- viii. Soft texture may indicate Graves' disease, firmness may indicate Hashimoto's, thyroiditis or malignancy, and tenderness may indicate thyroiditis.
- 2. Laboratory and Diagnostic Studies
 - a. Serum immunoassay for TSH and free T4
 - i. TSH measurement has a sensitivity of 98% and a specificity greater than 92%
 - ii. **Free T4 levels correlate with metabolic status**
 - 1. **Elevated in Hyperthyroidism**
 - 2. **Decreased in Hypothyroidism**
 - b. Ultrasound, CT and MRI are used to clarify or confirm the other diagnostic tests.
 - c. Fine needle biopsy
 - d. Thyroid scan : gamma camera (uses radioactive iodine)
 - e. Tg (thyroid globulin) detect cancer
- 3. Nursing implications
 - a. Some medicines contain iodine, multivitamins with iodine
 - b. Some medications affect the tests, aspirin, corticosteroids.
- 4. Specific Disorders
 - a. **Hypothyroidism**
 - i. Can range from subclinical to myxedema, an advanced form
 - 1. Husky voice, weight gain, alterations in skin integument (thickened), intolerance to cold, slowed mental process, elevated cholesterol, subnormal temperature
 - 2. **Myxedema**: accumulation of mucopolysaccharides in subcutaneous and other interstitial tissue. Used to describe severe symptoms of hypothyroidism.
 - a. Myxedema coma: depression – diminished cognitive status – lethargy – and somnolence – stupor – depressed respiratory – alveolar hypoventilation – narcosis – COMA (exclusively in patients over age 50)
 - ii. 95% of patients have primary, or thyroidal hypothyroidism; dysfunction of the thyroid gland itself.
 - 1. If caused by the pituitary, then it is pituitary or secondary hypothyroidism
 - iii. **Hashimoto's disease** is autoimmune originating hypothyroidism
 - iv. **Cretinism** lack of thyroid function at birth
 - v. Clinical manifestations
 - 1. Extreme fatigue, coarse hair with hair loss, brittle nails, dry skin and numbness are common, numbness and tingling of the hands can also occur.
 - 2. Affects women five times more than men
 - 3. Occurs most often between 40 and 70 years old.
 - 4. Severe hypothyroidism:
 - a. Subnormal body temperature and pulse rate
 - b. Weight gain without increased food intake
 - c. Skin becomes thickened, can become constipated
 - d. Hair thins and falls out, face becomes expressionless and masklike
 - e. Patient complains of cold, even in warm environment
 - f. May become irritable, complain of fatigue, and as it progresses mental responses are dulled.
 - g. Cognitive changes similar to dementia
 - vi. Laboratory other changes

1. Elevated cholesterol, atherosclerosis, CAD, poor left ventricle function
2. Elevated TSH levels
3. High sensitivity to sedatives, opioids, and anesthetics
4. Increased risk of intraoperative hypotension, heart failure, altered mental stat.

vii. Management

1. Objective is to replace the missing hormone and restore normality
 - a. Administer synthetic levothyroxine (Synthroid or Levothroid)
 - i. Synthetic version of thyroxine (T4)
 - ii. Watch for overdose: **tachycardia**, angina, tremors, nervousness, insomnia, heat intolerance
 - b. WATCH BLOOD GLUCOSE – meds can affect level
 - c. Increases the affect of digitalis, anticoagulants, and Indocin
 - d. Tricyclics and Dilantin may increase the effectiveness of thyroid hormones.
2. **Avoid application of heat**
3. Administer fluids cautiously

viii. Nursing management

1. Teaching self care : medication administration and side effects
2. Nutrition to promote weight loss
3. Screening of TSH levels in elderly recommended after age 50
4. Diagnosis's
 - a. Activity intolerance related to fatigue
 - b. Risk for imbalanced body temperature
 - c. Constipation related to depressed gastrointestinal function
 - d. Deficient knowledge about therapeutic regimen
 - e. Disturbed thought process
5. Promote comfort (cold – reduced metabolic rate)
6. Poor self image (weight gain)

b. Hyperthyroidism

- i. Second most prevalent endocrine disorder after diabetes
- ii. Associated with goiter
- iii. **Grave's disease**: most common type of hyperthyroidism
 1. Excessive output of thyroid hormones caused by abnormal stimulation of thyroid gland by circulating immunoglobulins.
- iv. Affects women 8 times more than men.
- v. May appear after emotional shock, stress or infection
- vi. Emotional effects (thyrotoxicosis)
 1. Nervousness (common)
 2. Hyperexcitable, irritable, and apprehensive
 3. Cannot sit quietly, have palpitations
- vii. Clinical effects
 1. Tolerate heat poorly, perspire freely
 2. Flushed, salmon colored skin
 3. May report dry skin, diffuse pruritus
 4. Fine tremor of the hands may be present

5. May have ophthalmopathy such as **exophthalmos** (bulging eyes)
6. May have increased appetite, progressive weight loss, abnormal muscle fatigability, amenorrhea, changes in bowel function.
 - a. Should eat 6 small meals per day
7. Pulse changes constantly between 90 and 160
- viii. Diagnostic and laboratory tests
 1. Enlarged thyroid gland, it is soft and a thrill can often be felt and auscultated.
 2. Decreased serum TSH, increased free T₄, and increased radioactive iodine uptake
 3. TSH, free t₄, t₃ and t₄, t₃ resin uptake, thyroid antibodies
 4. T₄ is commonly used to diagnose abnormal TSH
- ix. Management
 1. Drugs and radiation
 - a. Antithyroid agents
 - i. PTU : blocks synthesis of hormones – conversion of T₃ to T₄
 - b. Use of radioactive iodine (I131) (most common) (treats Grave's disease)
 - i. Results in inevitable hypothyroidism
 - ii. Watch for Thyroid Storm**
 - c. Beta adrenergic blocking agents
 - d. Antithyroid medications : PTU (contraindicated in pregnancy)
 - e. SSKI (potassium iodide) – reduces vascularity of thyroid
 2. Surgical removal
 - a. Anti coagulants should be stopped 2 weeks prior to surgery
 - b. PTU administered to normalize thyroid hormone levels
 - c. Watch for Iodine toxicity after surgery
 3. Thyroid Storm
 - a. Could happen after surgery or after use of radioactive iodine.
 - b. Can occur from stress, injury, untreated hyperthyroidism
 - c. High fever, rapid pulse, altered mental status
 - d. Critically ill – like extreme hyperthyroid
 - e. Treatment
 - i. Hyperthermia blankets
 - ii. Tylenol
 - iii. Humidified oxygen (monitor blood gasses)
 - iv. PTU poly thyroid Uracel (blocks thyroid hormone)
 - v. Hydrocortisone for shock
 - vi. Iodine to slow T₃ and T₄ hormones

5. Thyroiditis

- a. Acute (rare) : happens and is treated and goes away
- b. Subacute : inflammatory process, difficult to swallow – treat with Inderal
- c. Hypothyroid: Chronic thyroiditis (Hashimoto's Disease)
 - i. In contrast to acute thyroiditis, chronic thyroiditis is not accompanied by pain, pressure symptoms, or fever.
 - ii. Thyroid activity is usually normal or low
 - iii. Diagnosis is based on history of inflamed thyroid gland

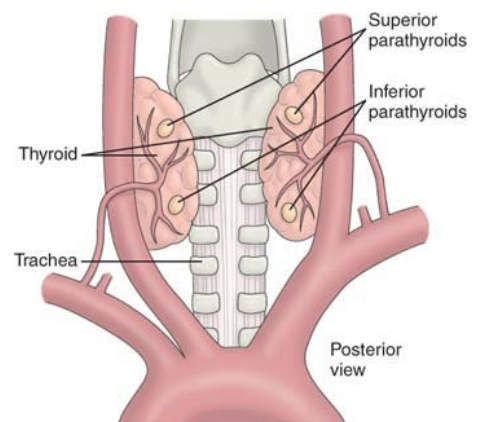
- iv. 60 to 80 times more likely to get thyroid lymphoma
- v. If untreated it runs a slow progressive course ending in hypothyroidism
- vi. Treatment
 1. Thyroid hormone therapy to reduce the work of the thyroid
 2. Surgery may be required if it persists.

6. Thyroid tumors

- a. Endemic Goiter (iodine deficient) (most common)
 - i. Areas of the world or country where natural supply of iodine is deficient
 1. In the US, the great lakes area.
 - ii. Compensation by the thyroid gland caused by stimulation by the pituitary gland
 - iii. The pituitary produces thyrotropin (TSH), the hormone that controls the release of thyroid hormones from the thyroid gland
 - iv. When there is low iodine, the thyroid slows hormone release, therefore the pituitary releases TSH to stimulate the thyroid. This causes the thyroid to swell.
 - v. May result in tracheal compression
 - vi. Suppress function before surgery
- b. Nodular Goiter
 - i. Hyperplasia – no symptoms – just enlargement- can lead to cancer
- c. Thyroid cancer
- d. Treatment : surgery
 - i. Pre-op : education on what to expect
 - ii. Post-op: routine
 - iii. Possible complications
 1. Airway obstruction, bleeding, tetany (Trousseau’s sign & Chvostek’s sign)
 - a. Positive **Trousseau’s sign** : carpopedal spasm is induced by occluding the blood flow to the arm for 3 minutes with a blood pressure cuff.
 - b. Positive **Chvostek’s sign** : when a sharp tapping over the facial nerve just in front of the parotid gland and anterior to the ear causes spasm or twitching of the mouth, nose and eyes.
 2. Trach kit at bedside & Calcium Gluconate

7. Parathyroid Glands

- a. Four glands embedded in the posterior aspect of the thyroid gland
- b. Protein hormone (parathormone) **regulates calcium and phosphorus metabolism.**
- c. Increased secretions = increased calcium absorption from the kidneys, intestine, and bones which **raises serum calcium levels**
- d. Lowers blood phosphorus levels
- e. Serum level of ionized serum calcium regulates the output of parathormone.
- f. Hyperparathyroidism : overproduction of parathyroid hormone
 - i. May have no symptoms, or may have symptoms related to the high calcium levels in the blood.
 - ii. Formation of kidney stones from increased excretion of calcium and phosphorus



1. Occurs in 55% of patient with primary hyperparathyroidism
- iii. Demineralization of bone, bone tumors, skeletal pain (back and joints), increased risk of bone fracture
- iv. Diagnosed by persistent elevation of serum calcium levels and elevated concentration of parathormone.
- v. Double antibody parathyroid hormone test used to identify primary or secondary
- vi. Ultrasound, MR, thallium scan and fine needle biopsy are used to evaluate function
- vii. Treatment
 1. Primary treatment is surgical removal of abnormal parathyroid
 2. **Daily intake of 2000ml of water or more is encouraged – due to risk of kidney involvement. (prevent kidney stones)**
 3. Exercise to minimize bone loss
- viii. Hypercalcemic crisis: extreme elevation of serum calcium levels (>15mg/dl)
 1. Neurologic, cardiovascular, and renal symptoms (life threatening)
 2. Severe thirst, polyuria, muscle weakness, abdominal cramps, constipation
 3. **Treatment: rehydration with large amounts of IV fluids**, diuretic agents to promote renal excretion of excess calcium, and phosphate therapy to correct hypophosphatemia.
 4. Cytotoxic agents , calcitonin and dialysis can be used in an emergency
- g. Hypoparathyroidism
 - i. Most common cause:
 1. Inadequate secretion of parathormone after interruption of the blood supply or surgical removal of the parathyroid gland.
 - a. They are very small and can be removed by accident during thyroid surgery.
 2. Atrophy from unknown cause is less common
 - ii. Results in increased blood phosphate, and decreased blood calcium
 - iii. Manifestations
 1. Irritability of the neuromuscular system : chief symptom
 - a. Tetany: general muscle hypertonia with tremors and spasmodic contractions. (serum calcium levels of 5 -6 mg/dl)
 - i. Late tetany: numbness, tingling, cramps, stiffness in hands and feet
 - ii. Overt tetany: bronchospasm, laryngeal spasm, carpopedal spasm (flexion of the elbow and wrist and extension of the carpophalangeal joints and dorsiflexion of the feet), lockjaw
 2. Positive **Trousseau's sign** : carpopedal spasm is induced by occluding the blood flow to the arm for 3 minutes with a blood pressure cuff.
 3. Positive **Chvostek's sign** : when a sharp tapping over the facial nerve just in front of the parotid gland and anterior to the ear causes spasm or twitching of the mouth, nose and eyes.
 - iv. Medical management
 1. IV calcium gluconate.
 2. Seizure activity: sedative agents such as pentobarbital
 3. Parenteral parathormone given to treat acute hypoparathyroidism with tetany

- a. high incidence of allergic reactions
4. patient should be in an area free of noise, drafts, bright lights, and sudden movements
5. Diet: high calcium and low phosphorus.
 - a. Milk products, eggs are high in calcium but also contain high levels of phosphate. (they are restricted)
 - b. Aluminum hydroxide gel (Gelusil, Amphojel) administered to bind phosphate.
 - c. Vitamin D required to enhance calcium absorption in GI tract

Breast discussion

Teaching self exam: lump – more dangerous: hard, poorly delineated, non-painful (monthly 5-7 days after menses)

- Painful cysts are usually fluid filled
- Diagnostic tests – mammograms, ultrasound, needle biopsy, genetic testing,
- Risk factors – family history (1st degree – pre-menopausal breast cancer (3sx)), early menarche (before age 12), no births, First baby after age 30, late menopause
- Surgical procedures : how to care for patients with mastectomy or reconstructive surgery
 - Body image : very disfiguring
 - Head of bed up
 - No BP on affected arm, elevated on a pillow, never above the shoulder.
 - ROM exercises 3 times a day for 20 minutes

Paget's disease of the breast : crusting around the nipple, redness, tingling, itching, burning or pain

Modified radical mastectomy: removal of the entire breast tissue and part of the *axillary lymph node dissection (ALND)*

Total mastectomy: same as modified but without the ALND

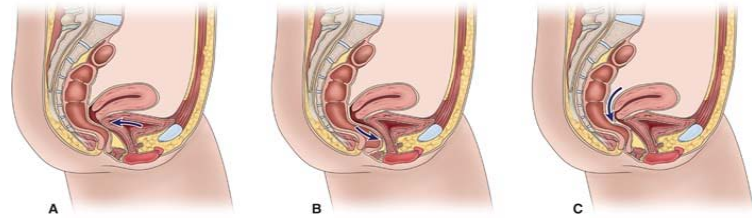
Breast conversion treatment: partial or segmental mastectomy, quadrantectomy. -excise the tumor completely and obtain clear margin.

Galactography: injection of radiopaque material through the ductal opening of the areola followed by a mammogram.

Contraception

1. Oral contraceptives:
 - a. Side effects: dizziness, headache, lightheadedness, bloating, nausea, potential for PE, especially if you smoke.
 - b. Avoid prolonged sun exposure
 - c. Increased risk for stroke, blood clots, HTN, gallbladder disease, vision problems
2. IUD : uterus is about 2"x4" when not pregnant. IUD creates a hostile environment so nothing can be implanted.
3. Diaphragm/cervical cap – fitted, spermicidal jelly
4. Vaginal ring – emits small amount of estrogen
5. Condoms male/female: break, come off, taken off wrong.
6. Coitus Interruptus : withdrawal method (does not work due to pre-ejaculate)
7. Cystocele: fallen bladder
 - a. Usually results from injury during childbirth

- b. sense of pelvic pressure, incontinence, frequency, urgency
- c. Management: Kegal exercises, pessary, surgery.



A. Cystocele B. rectocele C. enterocele

8. Rectocele: upward pouching of rectum - pushes wall of vagina forward.
9. Enterocele - protrusion of intestinal wall into vagina: prolapse results from weakened of support of uterus itself. Cervix drops and may protrude from the vagina.
10. Uterine prolapse
 - a. Management: surgery and pessaries are the two options.

Fertility awareness – find out when they can get pregnant

- Morning after pill : high level of progesterone
- Implanon – implanted in the subcutaneous tissue in one arm, lasts for three years. Can be used with lactating women
- Depo Provera – IM lasts for three months
 - Appropriate for people – developmentally challenged, people who cannot remember to take a pill every day.
- Surgical sterilization : tubal ligation, vasectomy
 - Ectopic pregnancy
 - Possible after tubal ligation
 - Pregnancy outside the uterus

Cystocele : bladder falls back through the anterior wall, into the vagina

- Usually caused by weak musculature (multiple babies)
- Stress incontinence
- Dyspareunia – painful intercourse
- Treated with anterior colporrhaphy : repair of herniation
 - Post op: Foley, Peri-Care, no standing for long periods of time

Rectal prolapse : treated with posterior colporrhaphy

Soft diet, stool softeners and cold packs

Prolapsed uterus

Total hysterectomy

Urine in Foley is pinked tinge – they nicked the bladder : without the foley, is normal (bloody drainage)

Premenstrual Syndrome (pre menstrual dysphoric disorder)

1. 10% of all women – severe enough to interfere with life.
 - a. Criteria
 - i. Signs and symptoms must be cyclic, in the luteal phase (just after ovulation)
 - ii. Need to be symptom free before ovulation
 - iii. Must have an impact on activities of daily living
 - iv. Can only be diagnosed by journaling
 - b. Hormone dependant
 - c. Clinical manifestations

- i. Moody, cramping, cravings, headaches, fatigue, changes in sleep & appetite, decreased sexual interest, depressed, anxious, poor concentration, accident prone, irritable, mood instability, angry.
2. Treatment : exercise, relaxation exercise, stay away from salty food, refined sugar, chocolate
 - a. Eat high carb foods, calcium, magnesium, vitamin E and b, primrose oil

Dysmenorrhea (painful menstruation)

1. Heavy crampy sensation, headaches, nausea, vomiting, diarrhea, fatigue, breast tenderness
2. Diagnostic tests : pap smear, ultrasound to check for fibroids, endometriosis, hormone levels
3. Treated with NSAID's – take before cramps start, low dose oral contraceptives, rest and exercise, heating pads
- Abnormal uterine bleeding
 - Amenorrhea : no period -primary – never had one, secondary – stopped
 - Ovarian tumors,
 - Oligomenorrhea: scant bleeding
 - Menorrhagia : excessive bleeding (saturate more than 1 pad per hour)
 - Metrorrhagia : bleeding between periods
 - Post menopausal bleeding : NEVER ignore this (cancer indication)
 - Treatment: H&H, CBC – iron
 - Surgery : therapeutic D&C (dilatation and curettage)
 - Post op D&C – no tampons or intercourse for 2 weeks, no heavy lifting
 - Endometrial ablation – burn away the endometrial layers

Menopause

1. Definition: permanent cessation of menses (50-55)
 - a. No period for 1 year (can take 3-5 years to complete)
2. Signs and symptoms
 - a. Hot flashes, moody, vaginal mucosa dries up and atrophies, vaginal pH rises (bacterial infections), psychological (insomnia).
3. Treatment
 - a. Check hormones
 - b. Hormone therapy - breast cancer
 - i. Contraindications
 1. People who smoke
 2. Undiagnosed vaginal bleeding
 3. Estrogen dependant cancers : in first line family
 4. Thrombo-embolic problems
 - c. Exercise, calcium rich diet, weight bearing exercise, vitamin E, KY jelly, water (weight/2 = ounces per day)

Uterine fibroids (**Leiomyoma**)

1. Solid benign tumors, more common in black women
 - a. Can affect pregnancy (interfere with implantation)
2. Diagnosis : ultrasound
3. Treatment:
 - a. Lupron – many side effects
 - b. Surgical removal : myomectomy

Endometriosis: overgrown of the endometrium

1. Can grow out of the uterus, into the pelvic cavity
2. At risk if you have no babies, Caucasian, 1st line family history
3. Heavy throbbing pain going into your back, bleeding, fertility issues
4. Diagnosis: laparoscopy, ultrasound
5. Treatment:
 - a. NSAIDs
 - b. Oral contraceptives
 - c. Surgical repair.

Cervical Cancer : cervical, endometrium, ovarian

1. Cervical is most curable: squamous cell – slow to metastasize, slow to grow
 - a. Risk factors: HPV, Multiple sexual partners, multiple pregnancies, early sexual experience, smoking, genital herpes
 - b. Diagnosis: pap smear :
 - c. Treatment: cryosurgery : freeze the margins (early 100% curable)
2. Endometrial cancer :ages 50-70
 - a. Risk factors: early menarche, late menopause
 - b. Diagnosis: endometrial biopsy, ultrasound
 - c. Treatment: hysterectomy
 - i. Radiation (rods) – bedrest
3. Ovarian Cancer: 70% of woman are diagnosed at stage 4
 - a. Risk factors, over 50, white, asymptomatic, 1st degree relatives with ovarian, breast or colon cancer.
 - i. Serous carcinomas – metastasize
 - b. Diagnostic tests: laperscopy
 - i. CA125 marker
 - c. Treatment: total abdominal hysterectomy
 - i. 6 months to a year later, take a second look surgery

Vaginal Infections

1. Risk Factors
 - a. Multiple sexual partners
 - b. Diabetes
 - c. Unprotected sex
 - d. Tight undergarments, poor personal hygiene
2. Pathophysiology
 - a. Simple vaginitis
 - b. Trichomonas – most common STD in the world
 - i. Strawberry spots high in the canal and on the cervix
 - ii. Frothy yellow or white discharge, malodorous
 - iii. Treated with Flagyl

Pelvic Inflammatory disease

1. Nausea, meles, difficulty in urination,
2. Culture, hospitalized, IV antibiotics
 - a. Education

Genital Herpes

1. Incubation period is 3 to 7 days, a-symptomatic, permanent
2. 50 million have it.
3. Prodromal symptoms: itching, burning, contagious before blisters.
4. Acyclovir cream on blisters (keep clean and dry)
5. Anti-viral medications.

Cystic Fibrosis

1. Pathophysiology: Autosomal genetic defect (mucus producing glands)
 - a. Caused by mutations or dysfunction in the cystic fibrosis trans membrane conductance regulator.
 - b. Characterized by thick, viscous secretions in the lungs, pancreas, liver, intestine, and reproductive tract.
 - c. Increased salt content in the sweat.
 - d. **Hallmark: bronchial mucus plugging, inflammation, and eventual bronchiectasis (usually begins in the upper lobes). Progressive loss of lung function 1-4% per year**
 - e. **Foul smelling stools**
2. Nursing responsibilities: Collect sputum for culture, Spirometer test
3. Newborn screening is done using dried blood samples looking for immunoreactive trypsinogen.
 - a. Sweat chloride test used with classic symptoms or positive family history. (test result of 60 mEq/L is diagnostic with other signs.
4. Nutrition: 120-150% of RDA recommended calories, twice the normal protein and moderate fat
5. Respiratory care: Chest PT before meals, respiratory aerosol treatment, and antibiotics
6. Medications:
 - a. Aerosol bronchodilators
 - b. Aerosol DNase
 - c. Corticosteroids, & NSAIDs (ibuprofen)
 - d. Antibiotics
 - e. Pancreatic enzyme supplements (aids in digestion)
 - f. Vitamins E, A, D, and K when deficient. (cystic fibrosis interferes with vitamin production)
 - g. Ursodeoxycholate : may slow progression of hepatic disease in CF
 - h. Lactulose: may abort early distal intestinal obstruction syndrome

Anemias and Leukemias

Erythrocytes – RBC

- Leukocytes – WBC
- Thrombocyte – platelets

CBC Complete Blood Count

1. RBC erythrocyte Count
 - a. Men 4.6 – 6.2 uL
 - b. Women 4.2 – 5.4 uL
 - c. Increased: thrombocytopenia, dehydration
 - d. Decreased: hemorrhage
2. WBC – Leukocyte Count

- a. 4,500 – 11,000 cu mm
 - i. Increased: infections, surgery, trauma, leukemia, malignant disease
 - ii. Decreased: immunocompromised
3. Hemoglobin
 - a. Men 13-18 gm/dl
 - b. Women 12-16 gm/dl
 - c. Increased:
 - d. Decreased
4. Hematocrit
5. Mean Corpuscular volume (MCV)
 - a. Average size of RBC
6. Mean Corpuscular hemoglobin (MCH)
 - a. Hemoglobin content of average RBC
7. Mean Corpuscular hemoglobin concentration (MCHC)
 - a. Volume of hemoglobin in 100ml of packed cells

Anemia

1. Condition in which the hemoglobin concentration is lower than normal
 - a. Fewer than normal erythrocytes within circulation
 - b. Amount of oxygen delivered to body tissue is also diminished
2. Hemolytic anemia – destruction of RBC from autoimmune problem (sickle cell)
3. Clinical manifestations
 - a. Several factors influence the development of anemia-associated symptoms
4. Iron Deficiency Anemia – MOST COMMON
 - a.