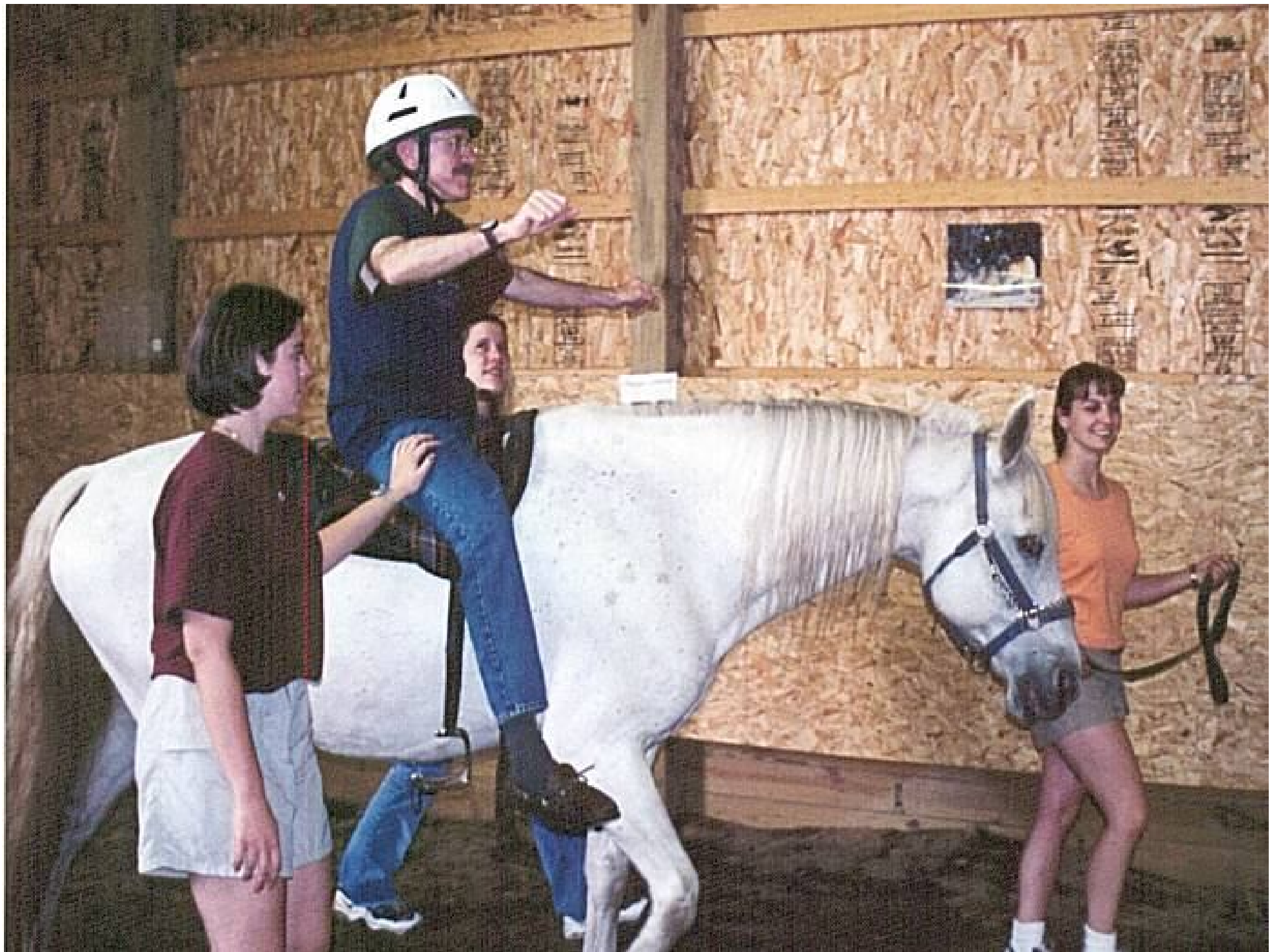


Chronic wound and stoma

Dr. S. Bradulskis

General surgery department , KMU





A diagram of a leaf cross-section. A horizontal line represents the upper epidermis, with a small grey rectangle on the right representing a guard cell. Below this line, the word "Stoma" is written in red. Further down, the word "Stoma" is written again in red. At the bottom, the word "Stoma" is written in red. A vertical olive-green bar is on the left side, and a small horizontal dark line is at the bottom left.

Stoma

Stoma

Stoma

Three basic types of diversions

- Tracheostomy or tracheostomy
- Urinary
- Fecal

History



- Tracheostomy is one of the oldest surgical procedures
- A tracheotomy was portrayed on Egyptian tablets dated back to 3600 BC.
- Asclepiades of Persia is credited as the first person to perform a tracheotomy in 100 BC.
- The first successful tracheostomy was performed by Brasovala in the 15th century.

Tracheostomy

History and indications

- 1932 prevent pulmonary infection in neurologically impair patients secondary to infections (poliomyelitis).
- 1943 remove bronchial secretions in cases of myasthenia gravis and tetanus.
- 1951 reduce the volume of dead space, use in COPD and severe pneumonia.
- 1950 positive pressure through tracheostomy for patients with poliomyelitis.
- 1955 obstruction secondary to infection: diphtheria, Ludwig's angina.
- 1961 Obstructions secondary to tumour, infectious disease and trauma.

ADVANTAGE OF TRACHEOSTOMY VS TRANSLARYNGEAL INTUBATION

- Increased patient mobility
- More secure airway
- Increased comfort
- Improved airway suctioning
- Early transfer of ventilator-dependent patients from the intensive care unit (ICU)
- Less direct endolaryngeal injury
- Enhanced oral nutrition
- Enhanced phonation and communication
- Decreased airway resistance for promoting weaning from mechanical ventilation
- Decreased risk for nosocomial pneumonia in patient subgroups

Tracheotomy

- operative procedure that creates an artificial opening in the trachea.

Tracheostomy

- Creation of permanent or semi permanent opening in trachea.

Tracheostomy

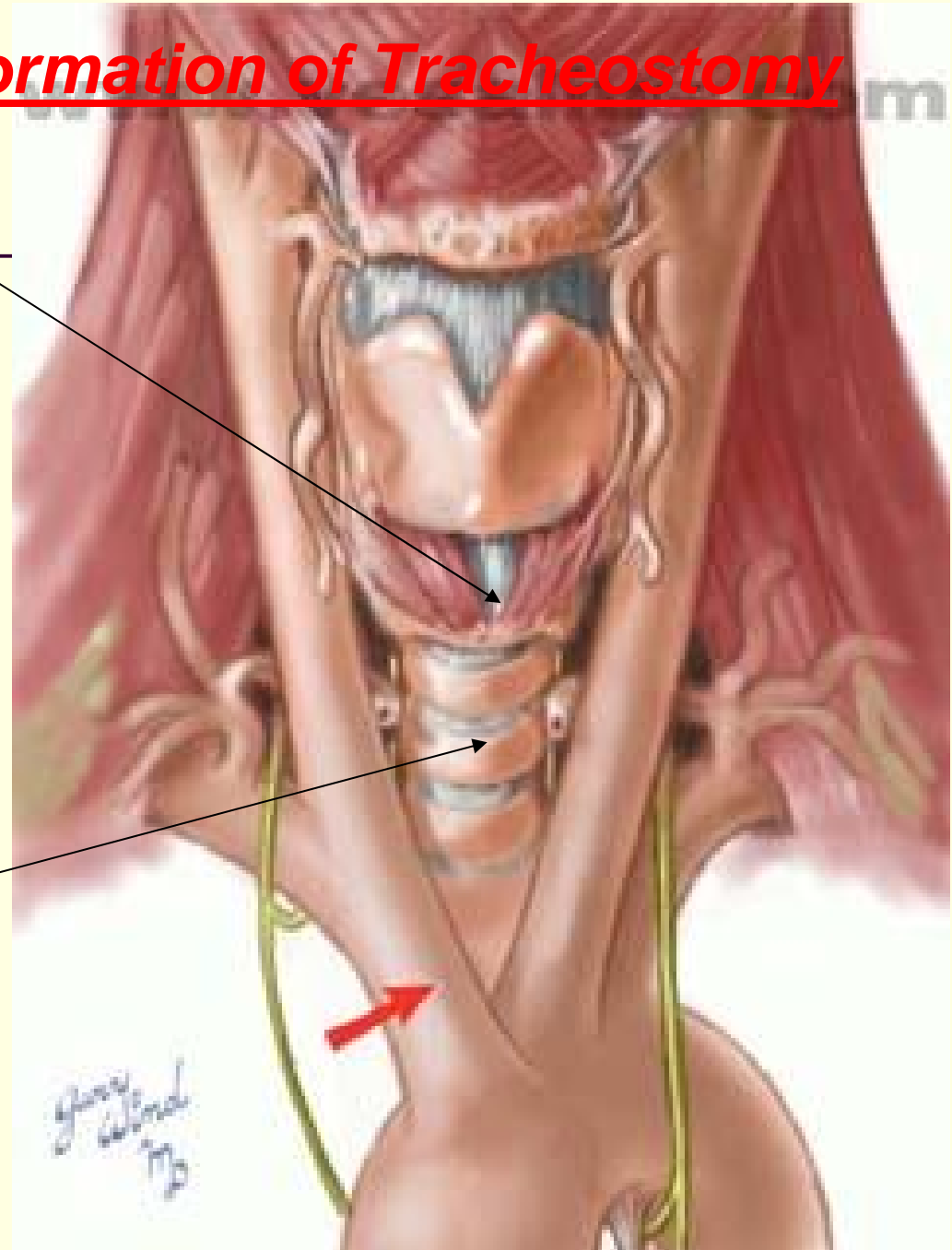
- Opening into the trachea, below the larynx
- Anatomically airway is intact (but may be deformed or obstructed)
- Usually temporary and reversible
- Must always wear tube
- Speech often possible with a valve

Formation of Tracheostomy

Cricothyroidotomy – usually an emergency procedure for immediate relief of acute obstruction

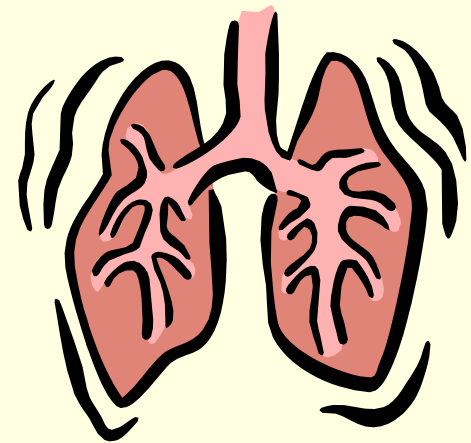
Percutaneous tracheostomy – usually done in ITU

Surgical tracheostomy, usually done under general anaesthetic, in surgical theatre



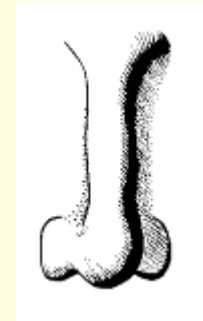
Indications

1. **Upper Airway Obstruction.**
2. **Pulmonary Ventilation.**
3. **Pulmonary Toilet.**
4. **Elective Procedure**



1. *Upper Airway Obstruction*

- a. Trauma
- b. Foreign body
- c. Infections
- d. Malignant lesions



2. *Pulmonary Ventilation*

- Tracheostomy should be performed in a patient still requiring ventilation through an endotracheal tube for more than a one week.



3. *Pulmonary Toilet*

- Those who cannot cough and clear their chest.
- Prevent aspiration by low pressure high volume cuff tracheostomy tube.

4. *Elective Procedures*

- For major head and neck operations.



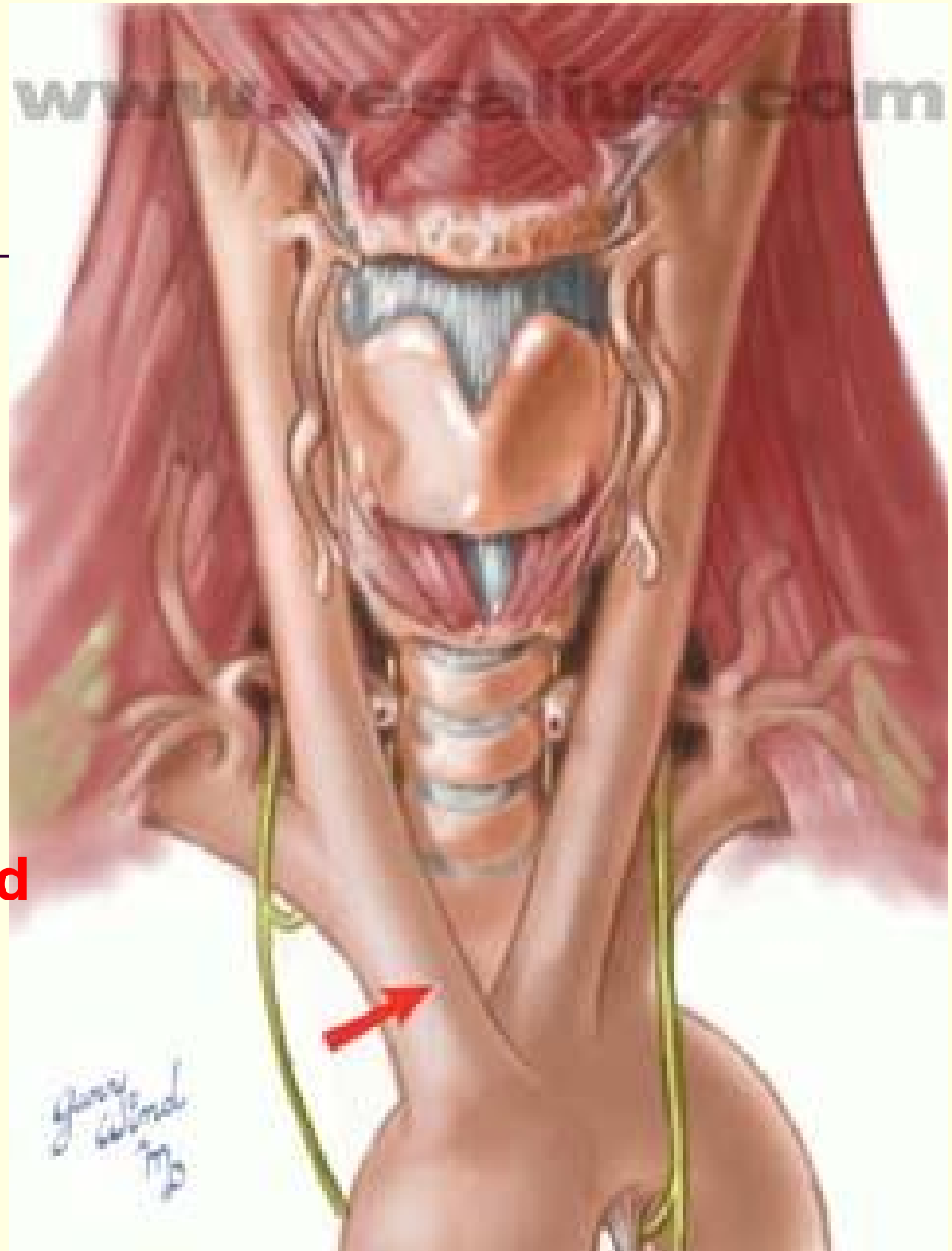
Anatomy

Trachea lies in midline of the neck extending from cricoid cartilage (C6) superiorly to the tracheal bifurcation at the level of sternal angle (T5).

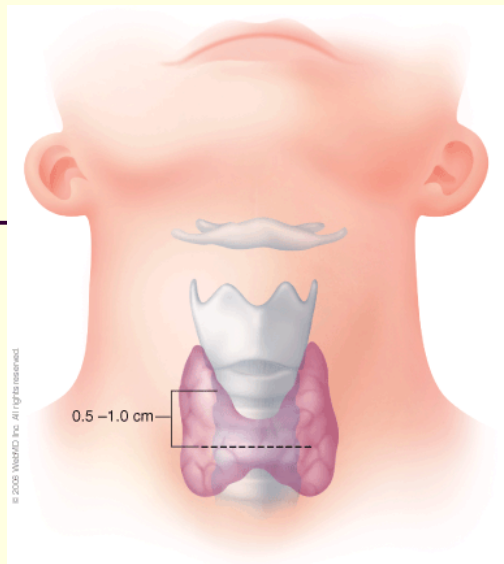
Comprises 16-20 C shaped cartilage rings.

Length 10-12cm.

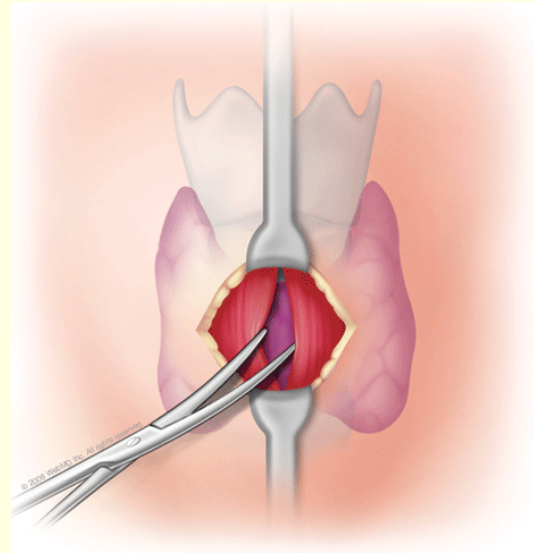
Diameter 15-20mm.



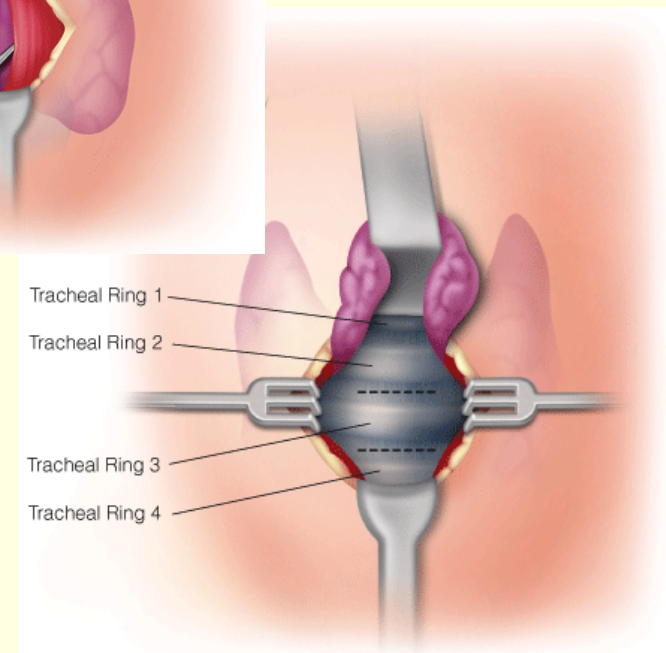




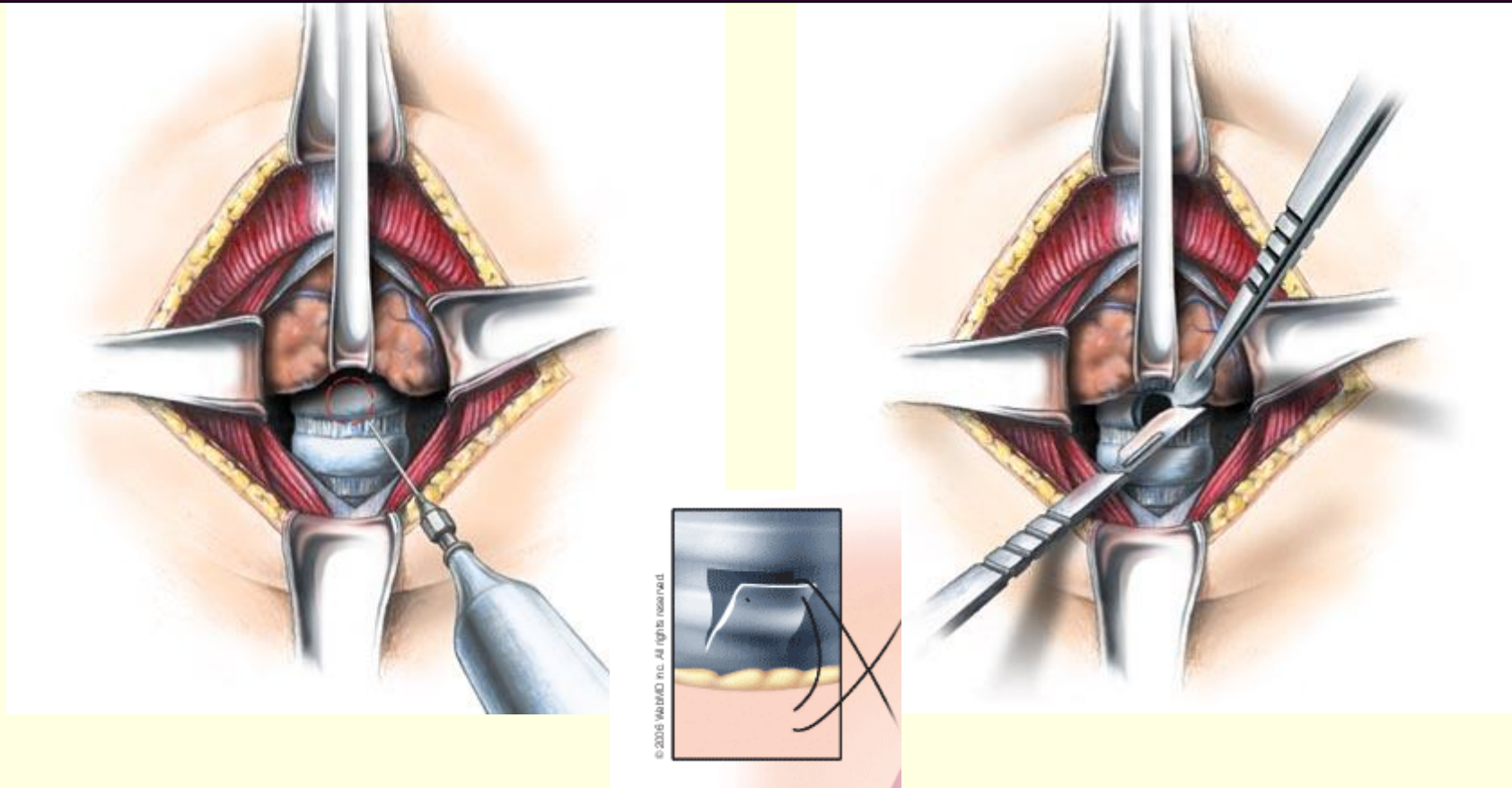
Incision 1 cm below the cricoid or halfway between the cricoid and the sternal notch.



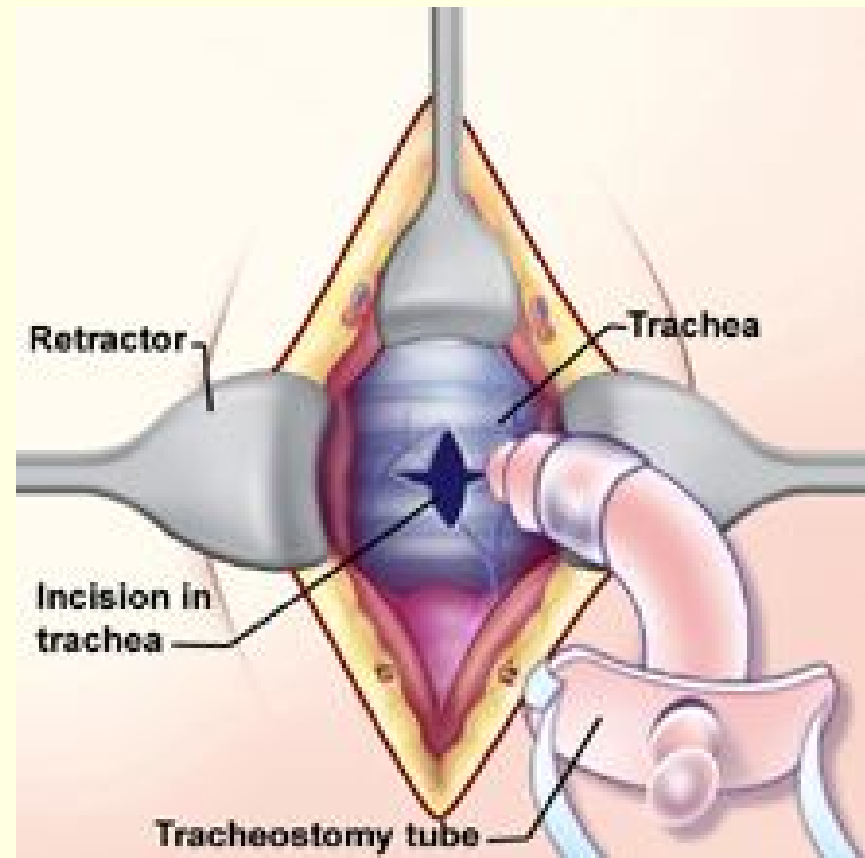
Retractors are placed, the skin is retracted, and the strap muscles are visualized in the midline. The muscles are divided along the raphe, then retracted laterally



The thyroid isthmus lies in the field of the dissection. Typically, the isthmus is 5 to 10 mm in its vertical dimension, mobilize it away from the trachea and retract it, then place the tracheal incision in the second or third tracheal interspace



- Shiley tracheostomy tube: #6
- Shiley tracheostomy tube: #8 for bronchoscopy.



Tracheostomy Tubes

- Plastic / silver
- Cuffed
- Plain, unfenestrated
- Plain, fenestrated
- Long, adjustable flange
- Soft cuff eg Fomecuff



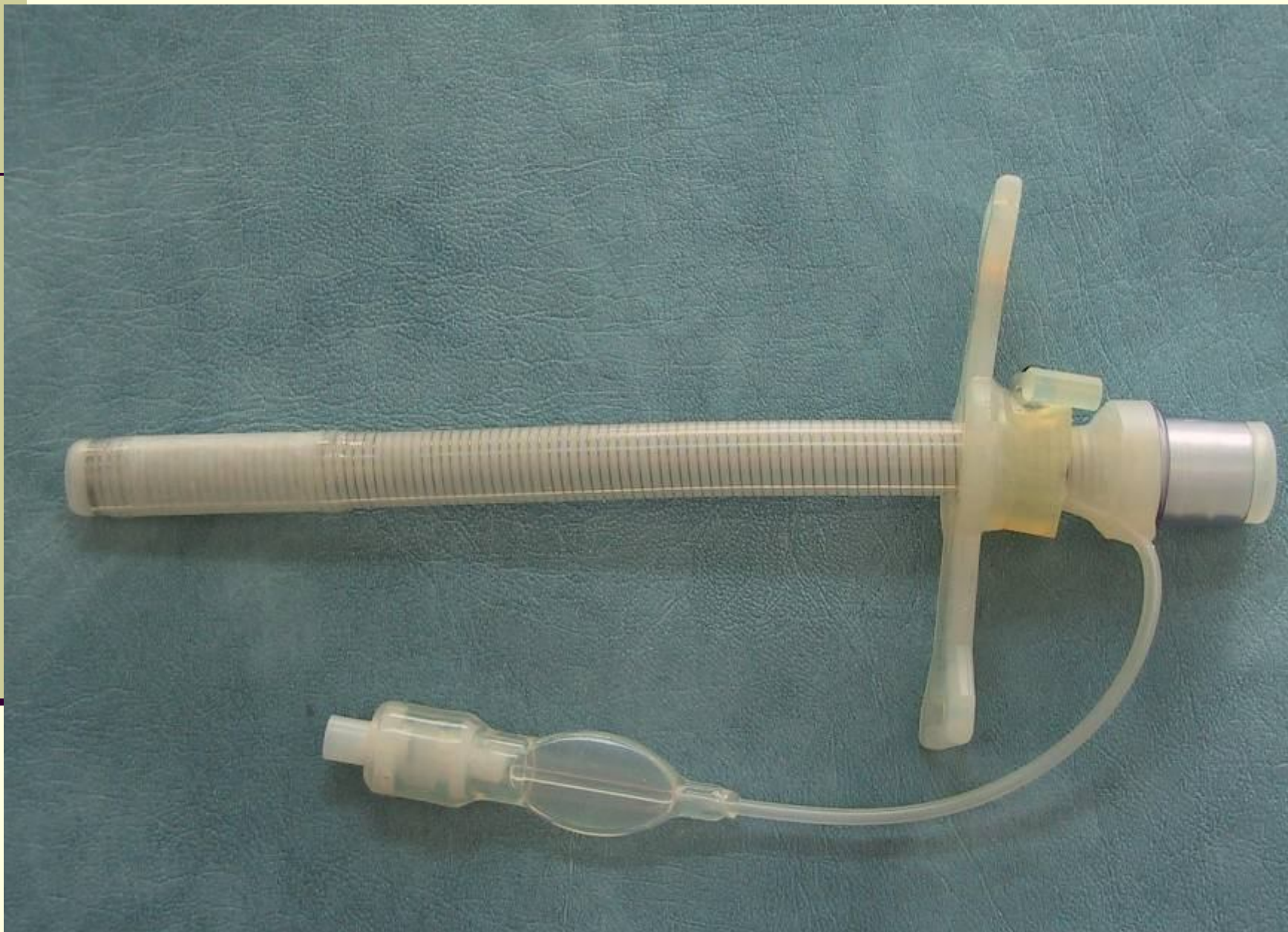






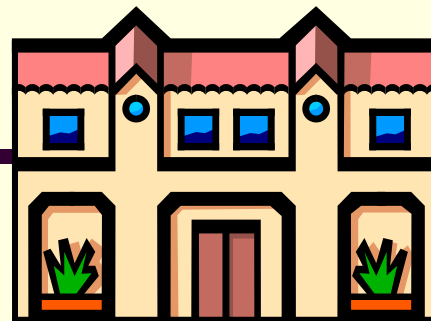






HOME CARE PLAN

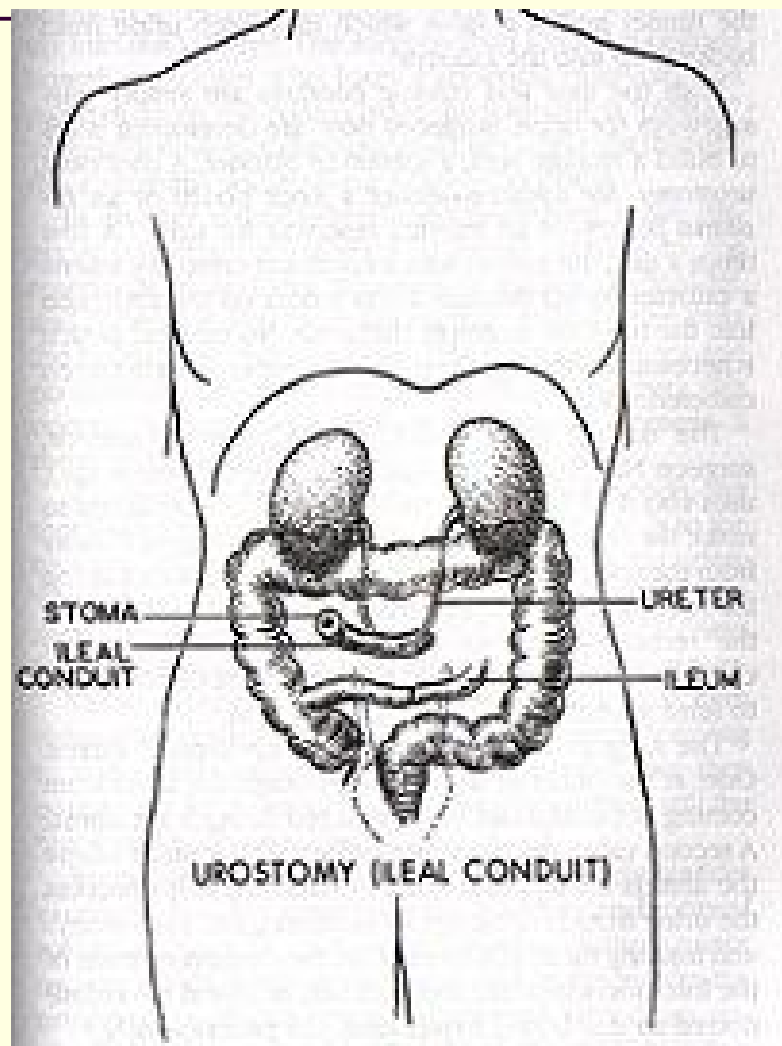
1. Education and training of the attendant.
2. Supply of dressing, suction catheters and suction machine.
3. When to come to the hospital.
4. Visit by community nurse.



Three basic types of diversions

- Tracheostomy or tracheotomy
- Urinary
- Fecal

Urinary Diversions



Reasons for diversions

- Removal of bladder from cancer
- Neurogenic bladder, congenital anomalies, strictures, trauma to the bladder, and chronic infections with deterioration of renal function

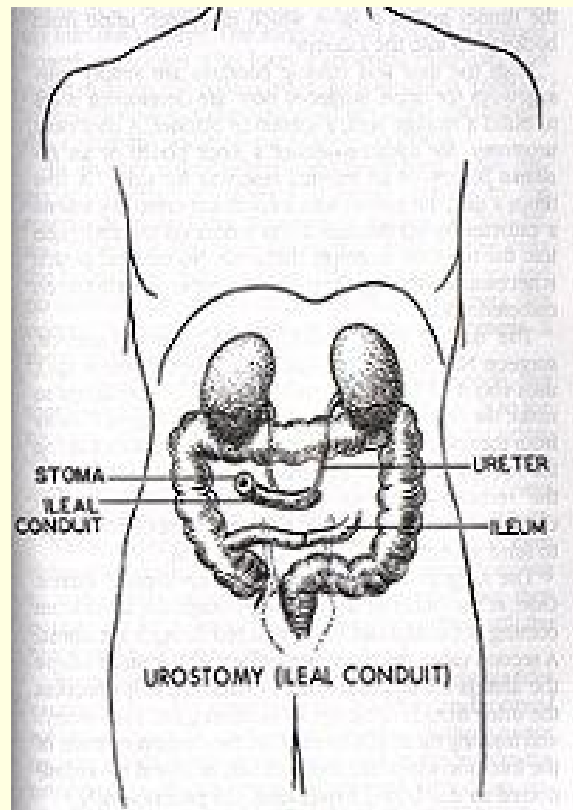
Types of diversions

- Incontinent
 - Ileal conduit
 - Cutaneous ureterostomy
 - Nephrostomy

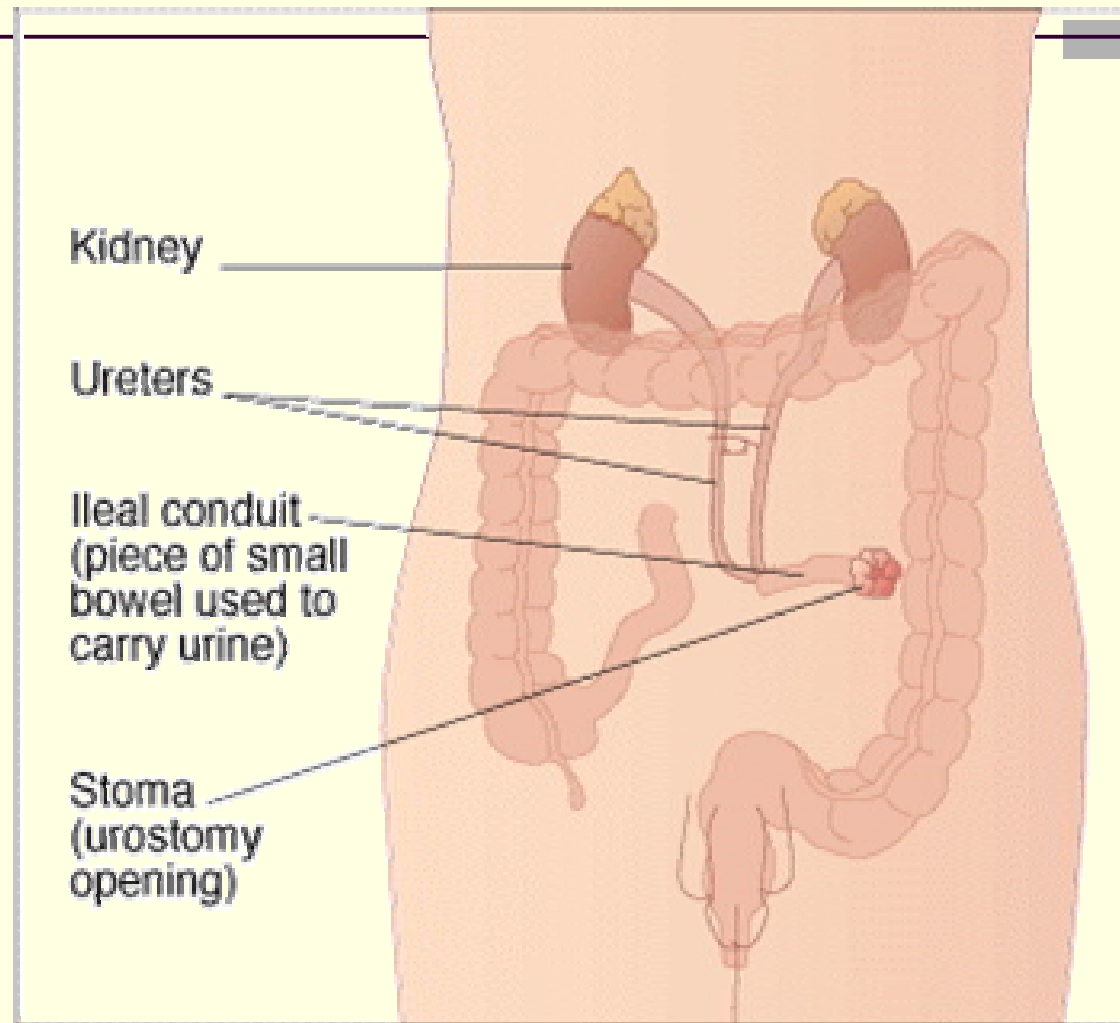
Ileal Conduit

- Most common type
- Ureters are implanted into a segment of the ileum that has been resected. Ureters are anastomosed into one end of the conduit and the other end is brought out through the abdominal wall to form a stoma.
- There is no valve or voluntary control.
- Advantages: good urine flow with few physiologic alterations.
- Disadvantages: surgical procedure is complex. Must wear an external collecting device. Must care for stoma and drainage bag.

Ileal conduit

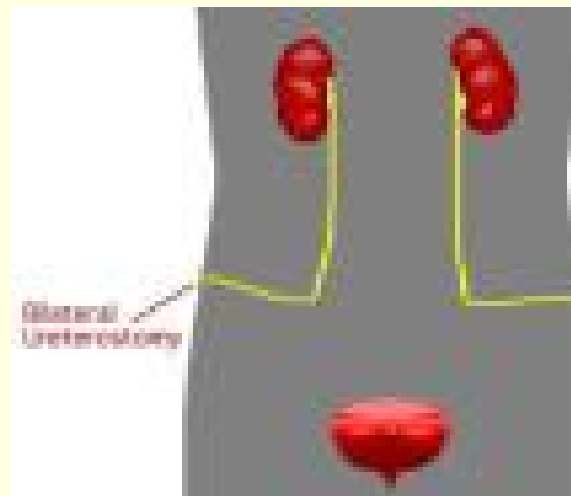


UROSTOMY



Cutaneous ureterostomy

- Ureters are excised from the bladder and brought through the abdominal wall to form stoma.
- Advantages: Not considered major surgery
- Disadvantages: External collecting device must be worn. Possibility of stricture or stenosis of small stoma.



Nephrostomy

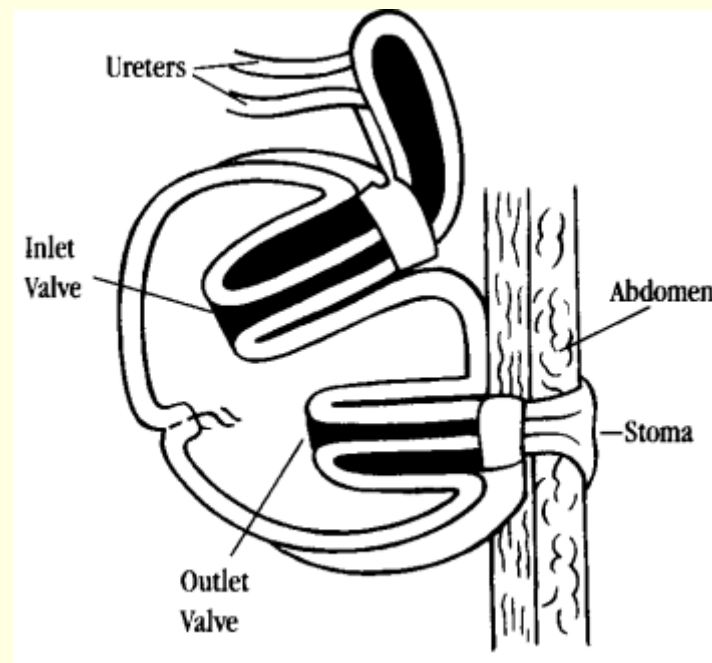
- Catheter is inserted into the pelvis of the kidney. May be done on one or both kidneys and may be temporary or permanent. Most frequently done in advanced disease as a palliative measure.
- Advantage: No need for major surgery
- Disadvantage: High risk of renal infection. Predisposition to calculus formation from catheter. May have to be changed every month. Catheter should not be clamped, should remain open.



Continent Diversions

- **Kock Pouch**-loops of intestine are anastomosed together and then connected to the abdomen via the stomal segment. Ureters are attached to the pouch above a valve, which prevents reflux of urine to the kidney. A second valve is placed in the intestinal segment leading to the stoma.

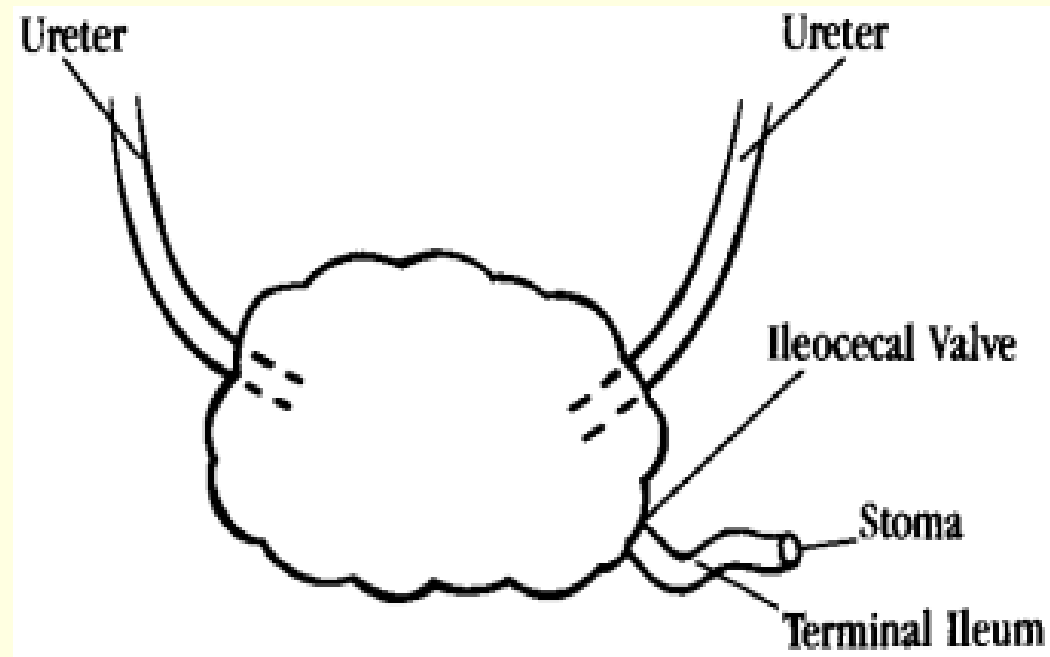
Kock Pouch



Indiana Pouch

- Ureters are anastomosed to the colon portion of the reservoir in a manner to prevent reflux. The ileocecal valve is used to provide continence and the section of ileum that extends from the intestinal reservoir to the skin is made narrower to prevent urine leakage.

Indiana Pouch



Continent urinary diversions

- The stoma is usually flush with the skin and placed lower on the abdomen than the ileal conduit stoma.
- Patient will need to self-catheterize every 4-6 hours and will need to irrigate the internal reservoir to remove mucus, but will not have to wear an external collection device.

Complications

- Breakdown of the anastomoses in the GI tract.
- Leakage from the ureteroileal or ureterosigmoid anastomosis
- Paralytic ileus
- Obstruction of ureters
- Wound infection
- Mucocutaneous separation
- Stomal necrosis

Wound infection



Mucocutaneous separation



Stomal necrosis



Three basic types of diversions

- Tracheostomy or tracheotomy
- Urinary
- Fecal

-
- Colostomy and ileostomy are surgically created openings of the intestines onto the abdominal wall, allowing the bowel motions to be emptied directly into a bag. Ileostomy refers to the creation of a stoma (from the ancient Greek for mouth) of the small intestine (the ileum), and colostomy to the large bowel (the colon).

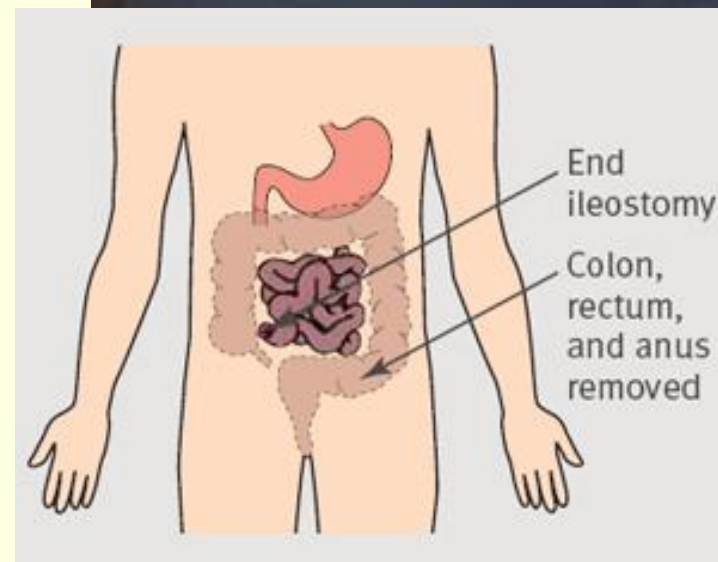
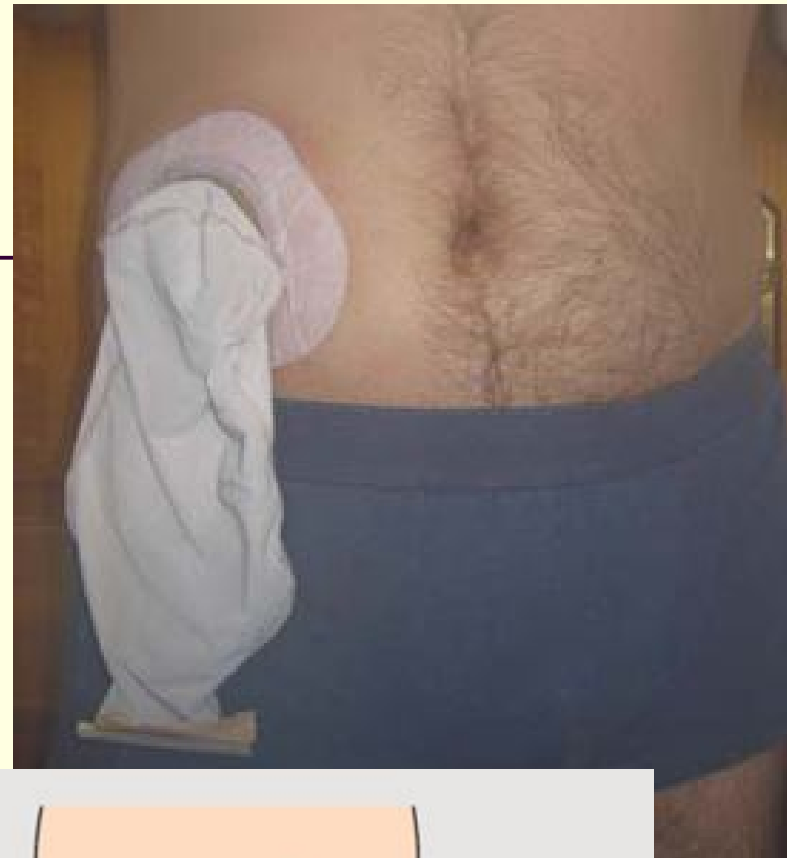
REASONS FOR STOMA FORMATION

- **Carcinoma** - Bowel or Bladder
- **Diverticulitis**
- **Inflammatory Diseases** - Ulcerative colitis / Crohn's Disease
- **Familial Polyposis**
- **Trauma** - e.g. Stab / Gunshot wounds
- **Neurological Damage** - e.g. Multiple Sclerosis
- **Incontinence**

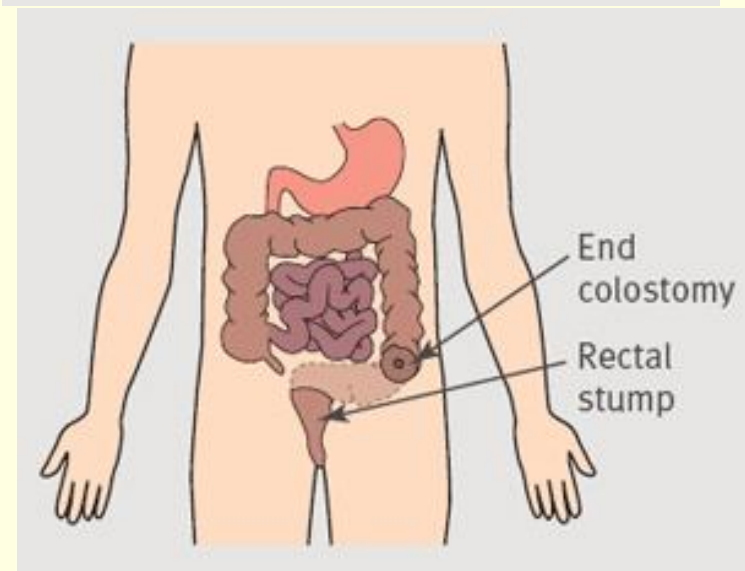
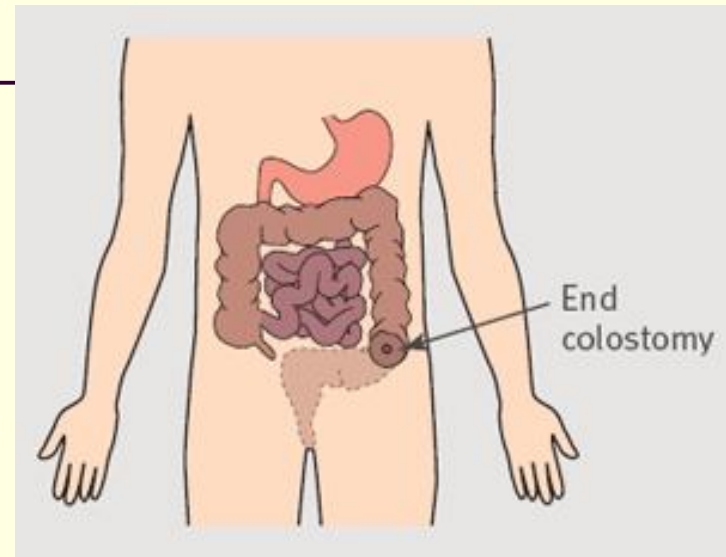
TYPES OF SURGERY RESULTING IN STOMA FORMATION

- Anterior Resection with Loop Ileostomy
- Abdomino Perineal Resection
- Hartmann's Procedure
- Double Barrelled Colostomy
- Pan-Proctocolectomy
- Sub-total colectomy with end ileostomy
- Ileo-anal Pouch
- Ileal Conduit
- Mitrofanoff appendicovesicostomy

ILEOSTOMY



END COLOSTOMY



LOOP COLOSTOMY







STOMA

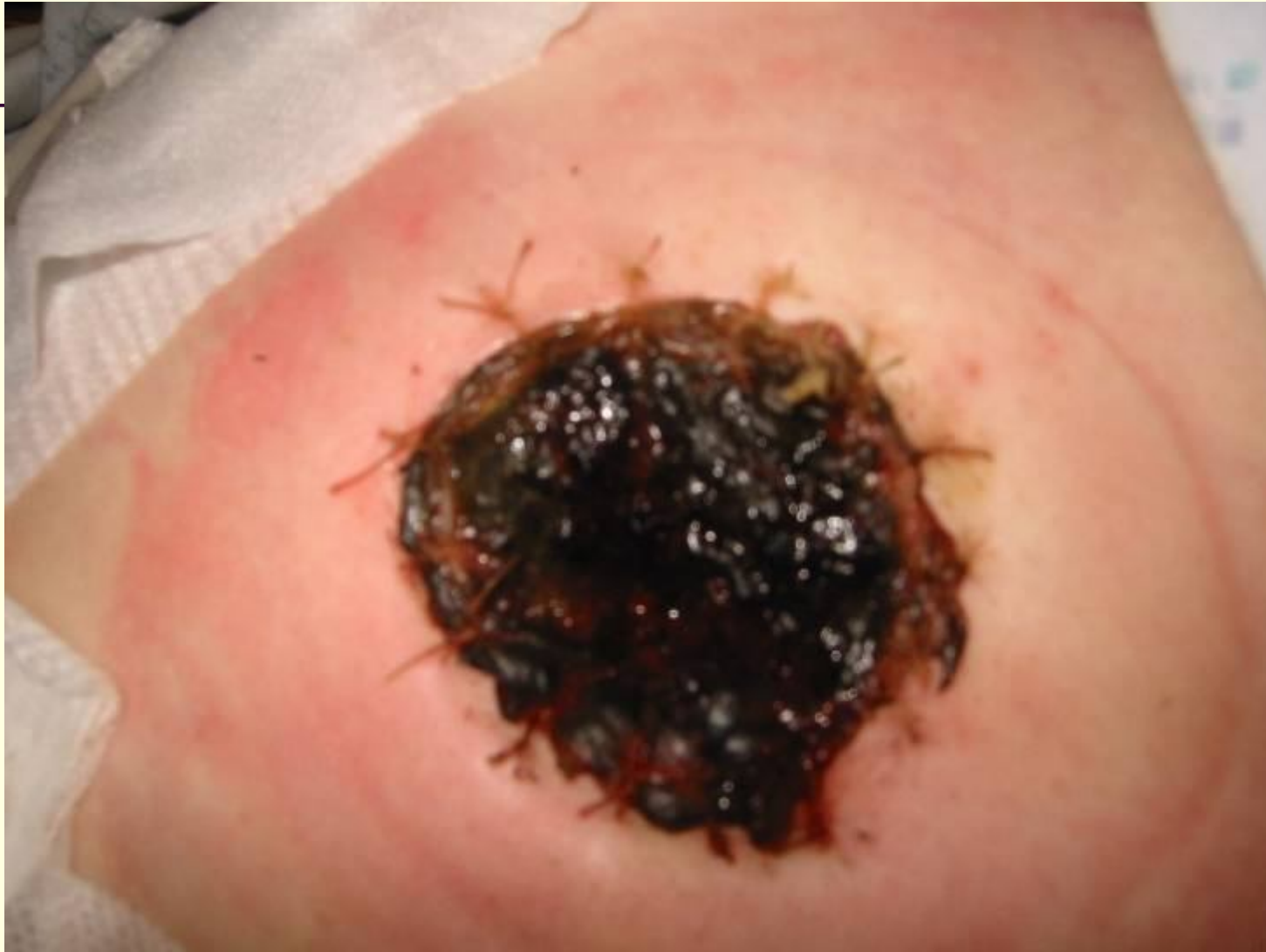
COMPLICATIONS



RETRACTION













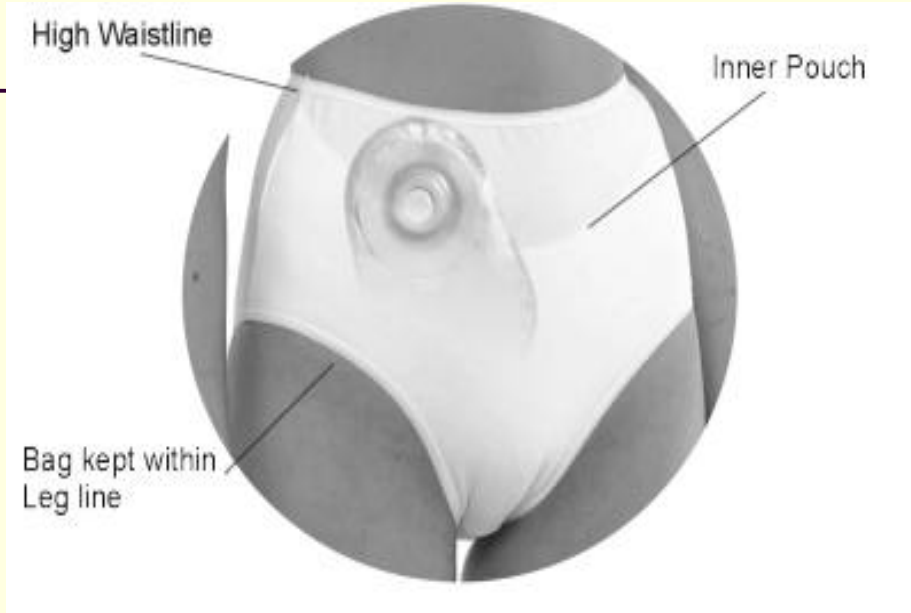
PROLAPSE

© Ostomy Forum



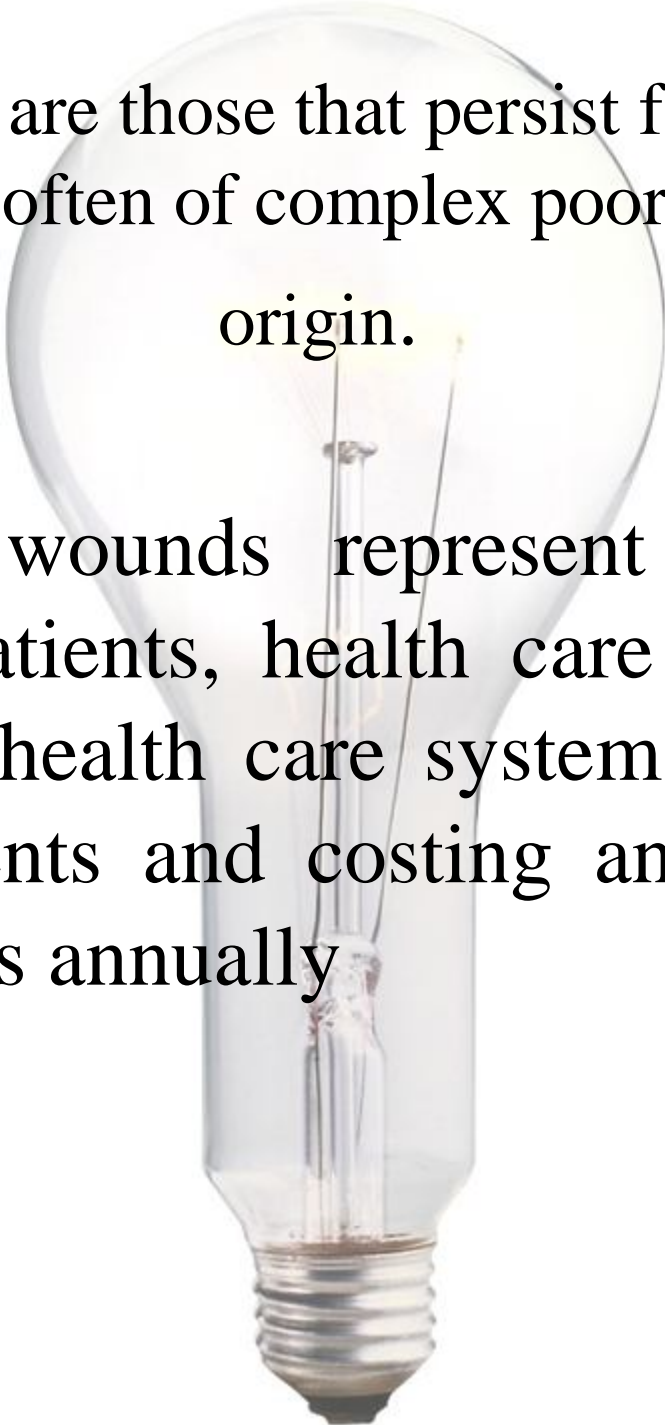
MUCO-CUTANEOUS SEPARATION





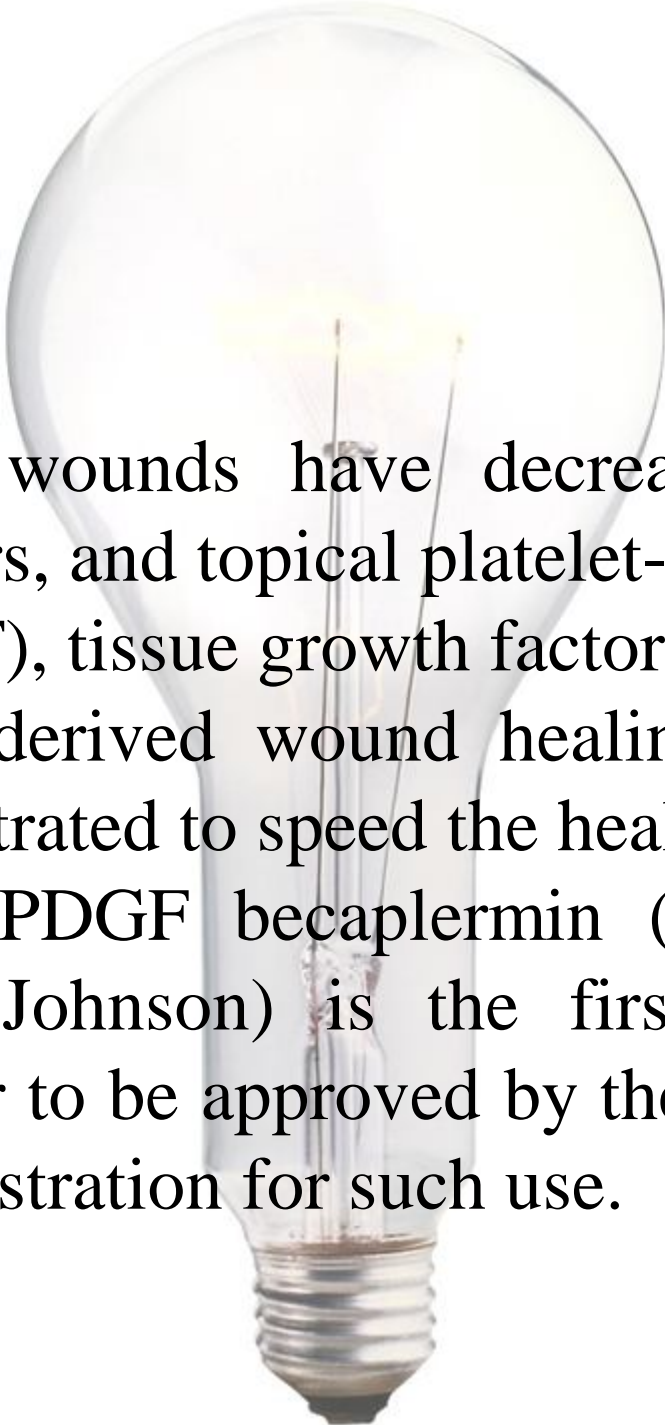
A glowing incandescent light bulb is centered in the frame. The bulb is illuminated, with a bright yellow light emanating from the filament. The text "Chronic wounds" is overlaid in a red, italicized serif font across the middle of the bulb.

Chronic wounds



Chronic wounds are those that persist for longer than 8 weeks and are often of complex poorly understood origin.

Chronic wounds represent a significant burden to patients, health care professionals, and the US health care system, affecting 5.7 million patients and costing an estimated 20 billion dollars annually

A glowing lightbulb is centered in the background. The text is overlaid on the lightbulb's glass. The text is in a black serif font and is arranged in a single paragraph.

Chronic wounds have decreased levels of growth factors, and topical platelet-derived growth factor (PDGF), tissue growth factor beta (TGF- β), and platelet-derived wound healing factor have been demonstrated to speed the healing of diabetic ulcers. The PDGF becaplermin (Regranex gel, Johnson & Johnson) is the first recombinant growth factor to be approved by the US Food and Drug Administration for such use.

A glowing lightbulb is positioned in the background, centered vertically and horizontally. The lightbulb is illuminated, with a warm yellow glow emanating from its filament. The glass of the bulb is clear, and the filament is visible. The base of the bulb is a standard screw-in type with visible threads.

Four Kinds of Chronic Wounds

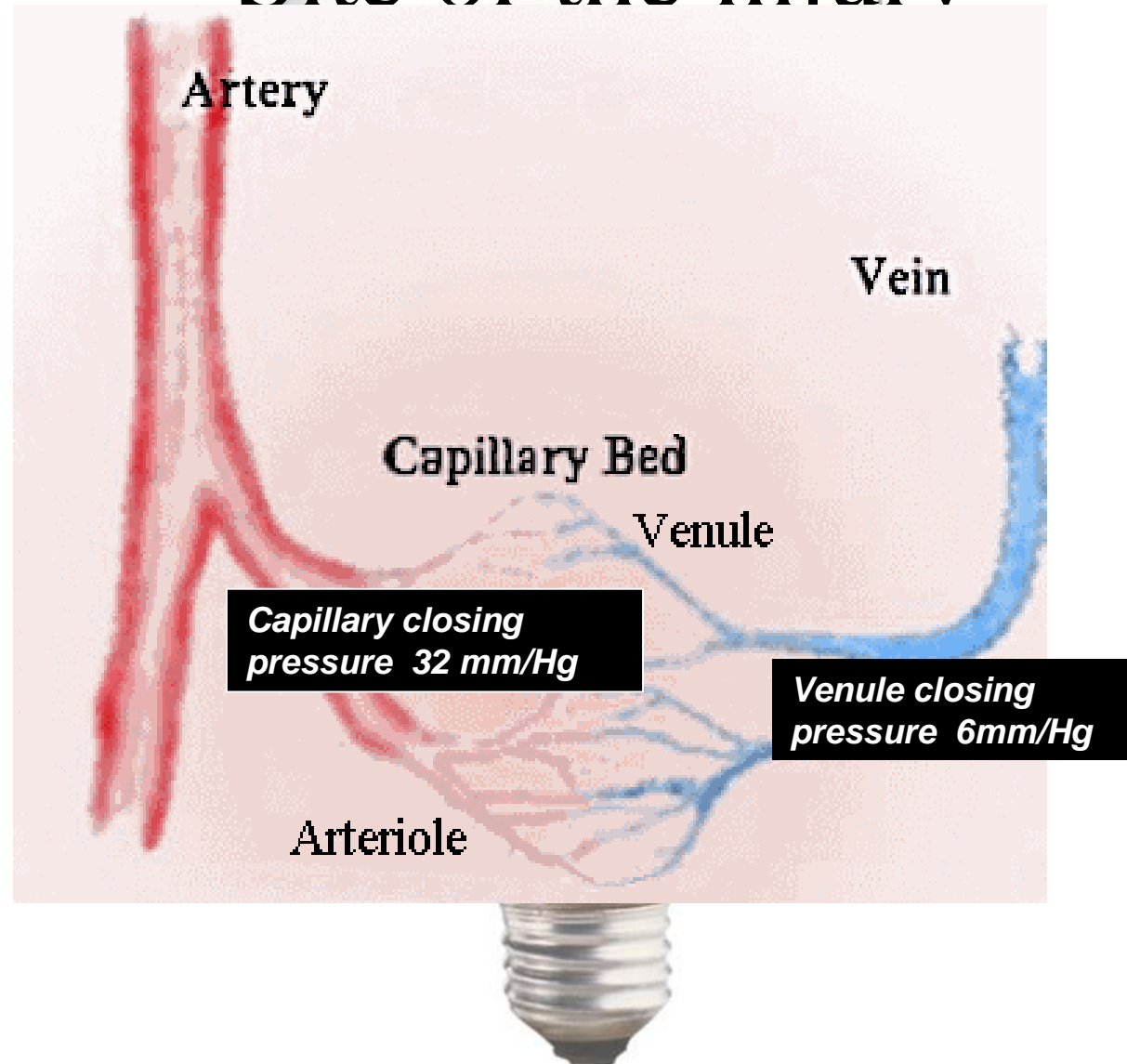
- Pressure Ulcer (**PU**)
- Diabetic Ulcer (**DU**)
- Venous Ulcer (**VU**)
- Arterial Ulcer (**AU**)

A glowing lightbulb is centered in the background. The bulb is lit, with a warm yellow light emanating from the filament. The glass of the bulb is clear, and the filament is visible. The base of the bulb is a standard screw-in base.

Chronic wounds Types

- Etiology is different
- Treatment is different
- Outcome is different

Site of the iniurv





Common pathway

- Extrinsic pressure >> Pressure (Decubitus) Ulcer
 - Capillary closing pressure <30mm/Hg x 15 min
- Stasis >> Ulceration or Dermatitis
 - Obstructed outflow (venous insufficiency)
 - Obstructed clearance of extracellular fluid and debris (lymphatic insufficiency, sclerosis)
- Arterial occlusive disease
 - Tissue hypoxia
 - Acute TE in small or terminal arterioles gangrene
 - Chronic PAD medium and large vessels ischemic ulcers.

The cause of the injury explains the chronicity of the injury



- Increased duration of extrinsic pressure:
 - Debilitated patients do not spontaneously adjust position: neuropathy, sedation, restraints, weakness
- Loss of dermal collagen and fat support of microcirculation
- Inflammation
 - Poor drainage inhibits clearance of bacteria, pro-inflammatory factors, necrotic tissue
- Tissue hypoxia
 - Poor perfusion and anemia limit delivery of



Differential Diagnosis

	LOCATION	CAUSE	APPEARS
PU DU	Bony Prom Callus	Pressure Neuropathy/trauma	Crater Borders distinct
VU AU	Calf/ankle Distal points	Venous Stasis Inadequate arterial flow	Irregular Gangrene



Diagnostic Approach

- Wound over bony prominence (**PU,DU**)
- DM with neuropathy, recurrent trauma, surrounding callus (**DU**)
- PAD, wet or dry gangrene (**AU**)
- Signs of venous stasis/calf or ankle (**VU**)
- Other causes possible, but rare



Pain in Chronic Ulcers

- **DU:** no or diminished pain, sensation
- **VU:** little pain, intact sensation
- **PU:** intermittent pain
- **AU:** constant pain



Diabetic Ulcers

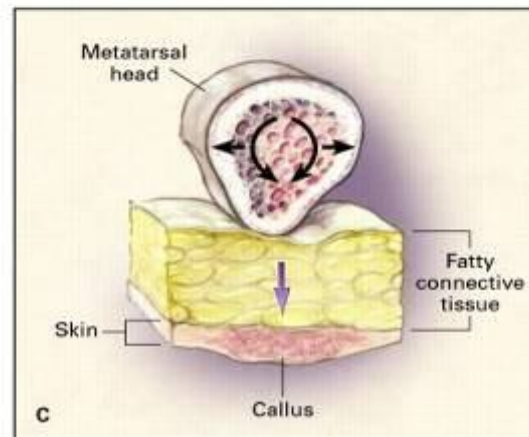
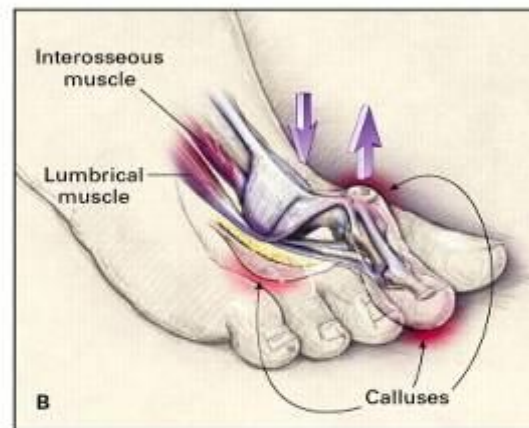
Burden of Diabetic Ulcers

- 15-25% of diabetics will have an ulcer
- Diabetes is leading cause of nontraumatic amputations (8 out of 10)
 - 50% could be prevented
- Annual cost
 - Avg cost over 2 yr period: \$ 28,000
- Morbidity and mortality
 - 8-22% ipsilateral reamputation, 26-44% contralateral
 - 13-40% mortality at 1 yr, 35-65% at 3 yrs, 39-80% at 5 yrs

Pathogenesis

- Impaired arterial supply
- Neuropathy
 - Loss of protective sensation, proprioception, vibration
 - Loss of motor innervation
 - Loss of autonomic function
- Metabolic
- Musculoskeletal deformities
 - Altered foot biomechanics, limited joint mobility, bony deformities

Biomechanics of Foot Ulcers



Screening to identify at risk patients

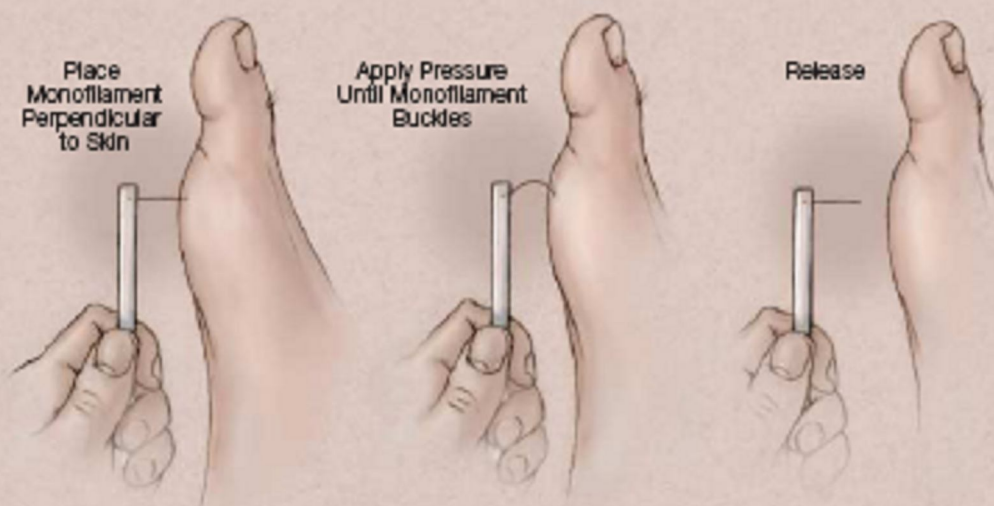
■ ASK about factors associated with foot ulceration:

- Previous foot ulcers
- Prior lower extremity amputation
- Long duration (> 10 yrs) of diabetes
- Poor glycemic control (HGA1C > 9%)
- Impaired vision

■ EXAMINE

- Footwear to ensure proper fit
- Sensation, plantar pressures, vascular disease

A Semmes-Weinstein Monofilament Test



B Testing Sites



Monofilament Foot Exam

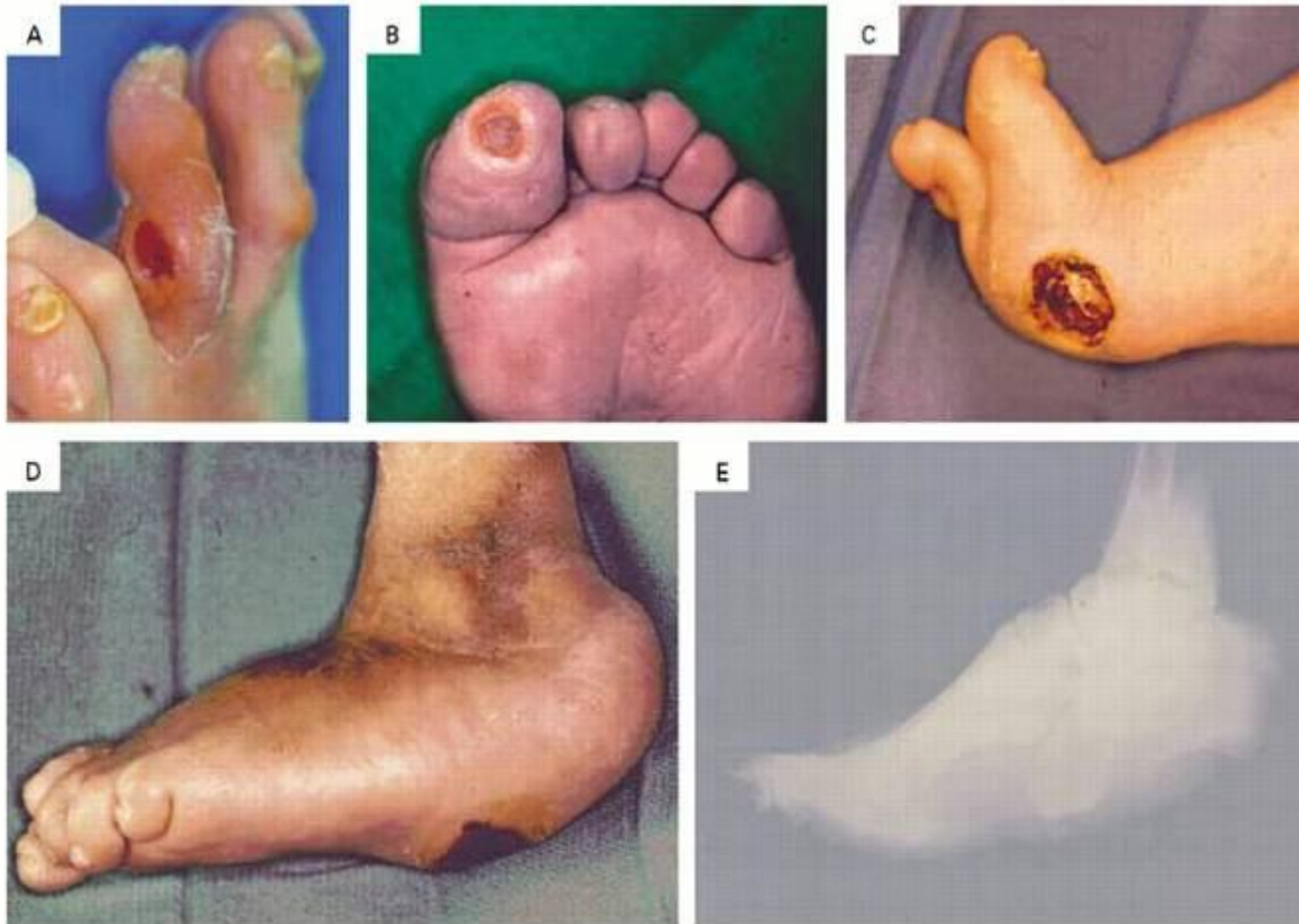
	Yes	No
Is there a foot ulcer now, or history of foot ulcer?	_____	_____
Is there toe deformity?	_____	_____
Is there abnormal shape?	_____	_____
Are toenails thick or ingrown?	_____	_____
Are pulses absent?	_____	_____
Can patient see bottom of his or her feet?	_____	_____
Is patient wearing improperly fitting shoes?	_____	_____



Key:

- ⊙ = Can feel the 10g nylon filament
- = Cannot feel the 10g nylon filament

Examples of Foot Lesions



Management of a Diabetic Foot Ulcer

1. Recognition and correction of underlying cause
2. Wound care
3. Prevention of recurrence

Infection in diabetic ulcers

All diabetic wounds are colonized?

TRUE

All diabetic foot ulcers are infected?

FALSE!

Defining Presence of Infection

- Noninfected
 - Healthy granulation tissue
 - No surrounding cellulitis
 - No symptoms or signs of inflammation
- Infected
 - Surrounding cellulitis
 - Inflamed wound and/or drainage

Classifying Severity of Infection

- Mild
 - No systemic signs/symptoms
 - <2 cm of surrounding cellulitis
- Moderate/Severe
 - >2 cm of surrounding cellulitis
 - Significant drainage
 - Deep tracts (to bone?)
 - Systemic signs/symptoms of infection
 - Laboratory changes

P
E
D
I
S



Wound Culturing Technique

- Culture only if it is *clinically infected*
- Avoid superficial swab cultures
 - Contain both colonizers and pathogens
 - Insensitive, especially for anaerobes
- Best methods
 - Curettage
 - Deep tissue culture/biopsy
 - Aspirate of pus, cellulitis

Microbiology of Lower Extremity Infections in Patients With Diabetes

- Monomicrobial
 - Almost always *Staphylococcus aureus* or β -hemolytic streptococci
- Polymicrobial
 - Gram-positive, gram-negative aerobic and anaerobic organisms¹

1. Gerding DN. Foot infections in diabetic patients: the role of anaerobes. *Clin Infect Dis*. 1995;20 (suppl 2):S283–S288.



Methods to Detect Osteomyelitis

	Sensitivity	Specificity	LR+
■ Plain films ¹	62%	64%	
■ Nuclear scanning ¹	86%	45%	
■ MRI ¹	99%	81%	
■ Probing	66%	85%	

1. Eckman et al. JAMA 1995;273:712-20

2. Grayson et al. JAMA 1995;273:721-23

Non-Antimicrobial Treatment of Wound Infections

- Debridement
 - Surgical
 - Autolytic and enzymatic
 - Biosurgical (fly maggots)
- Pressure reduction
- Vacuum-assisted wound closure
- Infection control

Diabetic Ulcers

- Typically on the ball of the foot or other weight-bearing pressure point.
- Characteristic hard keratinized margin with a small deep open center.
- Small vessel disease, neuropathy
- Debridement superficial only for comfort.
- Probe for bone.
- Infection is more likely, empiric ABX warranted .

Diabetic foot ulcer



Surgical Treatment of Lower Extremity Infections in Patients With Diabetes

- Incise and drain abscesses, enclosed pus
- Remove dead tissue
- Consider revascularization, bone resection
- Fulminant soft tissue infections require urgent debridement

Drainage, removal of dead tissue, revascularization, or other procedures (pressure redistribution) permit antibiotics and normal host defenses to arrest infection and heal ulceration.

Antibiotic Treatment of Lower Extremity Infections in Patients With Diabetes

- Route of administration
 - Intravenous (IV) therapy for severe infection or poor gastrointestinal (GI) absorption
 - Oral antibiotics for mild to moderate infections when appropriate
 - Other routes (topical, local intravascular, antibiotic impregnated materials) occasionally used

Antibiotic Treatment of Lower Extremity Infections in Patients With Diabetes: Duration of Therapy

- Duration of therapy (not experimentally defined)
 - Soft tissues: 1–3 weeks (depending on size and severity)
 - Osteomyelitis: 4 weeks–6 months of antibiotic therapy

Lipsky BA et al. *Diabetes Metab Res Rev*. 2000;16(suppl 1):S42–S46.

Ulcer Characteristics

■ Diabetic ulcers

- Small, round, smooth margins
- Not associated with pain
- May be shallow or deep & have tunneling

■ Arterial ulcers

- Small, round, shallow
- Pale base, poor granulation
- Smooth margins
- More likely to be associated with pain

Ulcer Characteristics

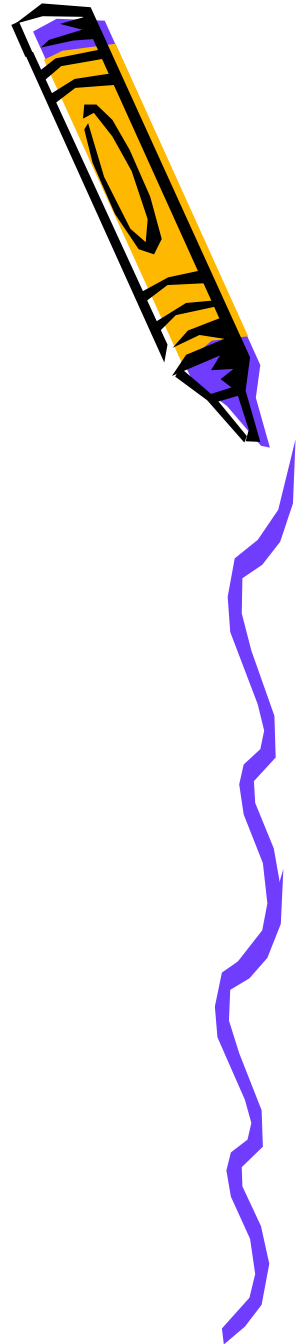
- Venous stasis ulcers

- Typically shallow, irregular borders, variable size
- Associated with large amount drainage
- Often associated with increased pigmentation of skin

- Miscellaneous ulcers

- Associated with surgical incision or scar
- Associated with trauma

- **PRESSURE ULCER**



PRESSURE ULCER: DEFINITION

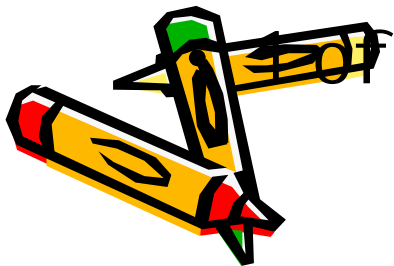
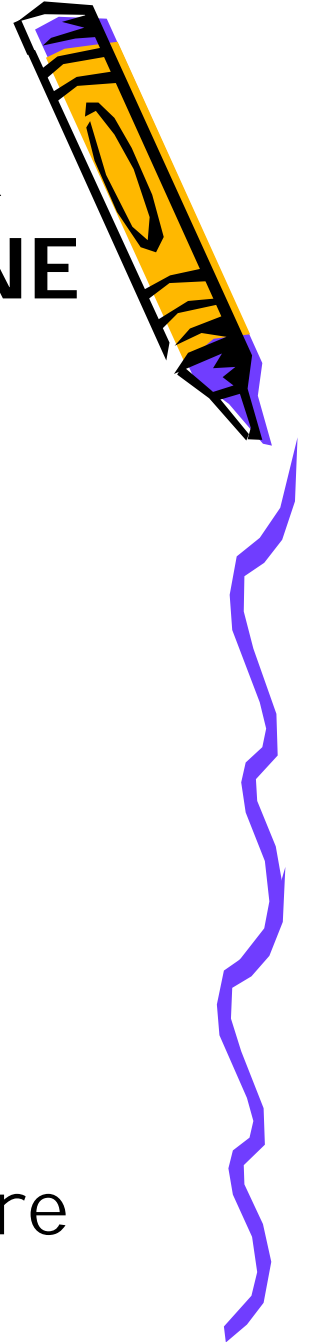
- Definition (2007 National Pressure Ulcer Advisory Panel): an injury caused by unrelieved pressure on a specific region of skin and muscle in bed or chair bound patients
- The time for pressure ulcer development is variable due to severity of illness and a number of comorbid conditions



PRESSURE ULCERS: A MAJOR ISSUE IN GERIATRIC MEDICINE

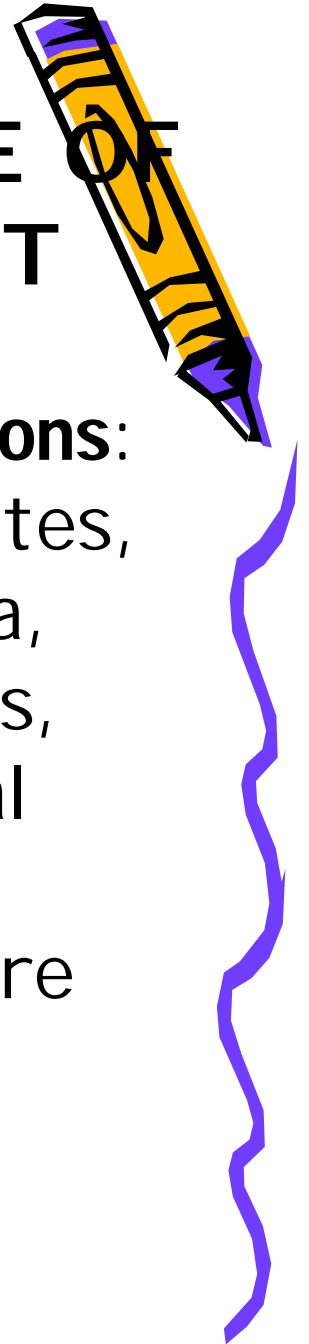
- Affects 1 million adults annually
- Higher risk in older persons because:
 - Local blood supply to skin decreases
 - Epithelial layers flatten and thin
 - Subcutaneous fat decreases
 - Collagen fibers lose elasticity
 - Tolerance to hypoxia decreases

1 of 3 sentinel events for long-term care



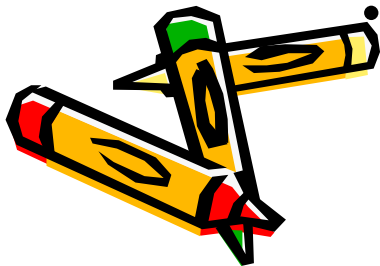
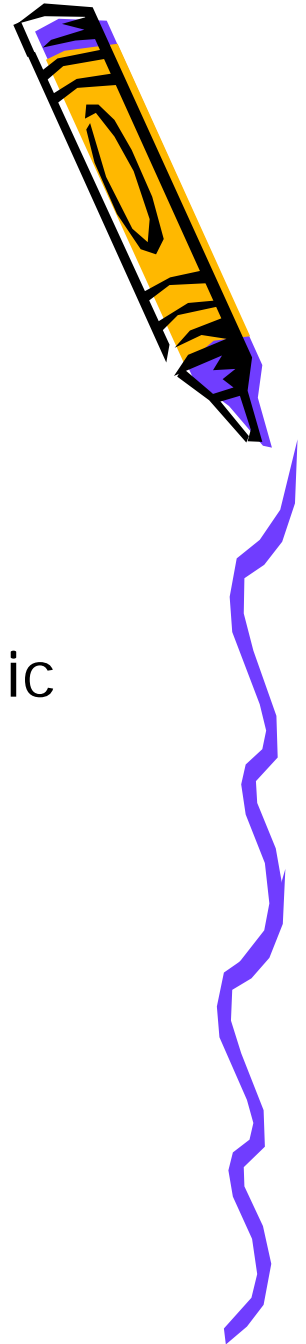
INTRINSIC FACTORS PREDICTIVE OF PRESSURE ULCER DEVELOPMENT

- **Age 70+**
- **Impaired mobility**
- Current smoking
- **Low BMI**
- **Confusion**
- **Urinary and fecal incontinence**
- **Malnutrition**
- **Restraints**
- **Comorbid conditions:** malignancy, diabetes, stroke, pneumonia, CHF, fever, sepsis, hypotension, renal failure, dry skin, history of pressure ulcers, anemia, lymphopenia, hypoalbuminemia



EXTRINSIC FACTORS PREDICTIVE OF PRESSURE ULCER DEVELOPMENT

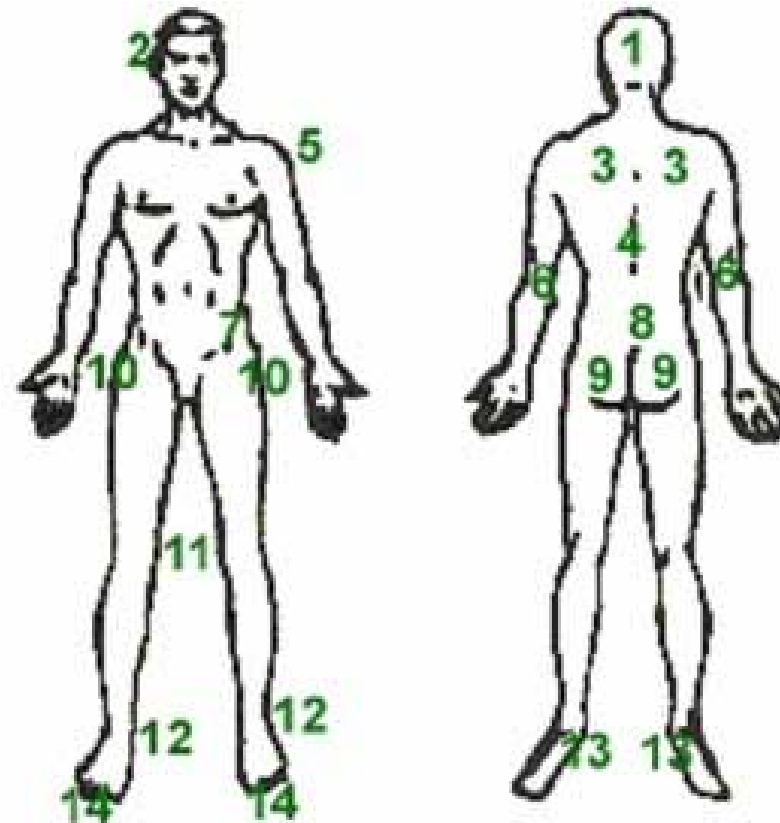
- Alcohol/drug abuse,
- **Friction/shear/pressure**
- **Inadequate current wound care**
- Immunosuppressive and chemotherapeutic agents
- **Nutritional deficiency**
- **Uncontrolled excess local pressure**
- Adverse reactions to skin care products
- Smoking
- Fecal and urinary incontinence



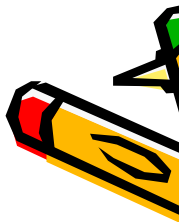
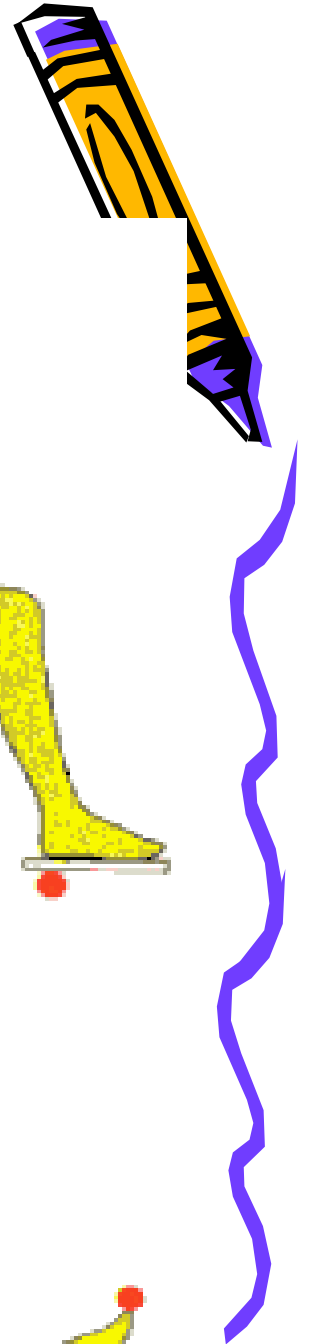
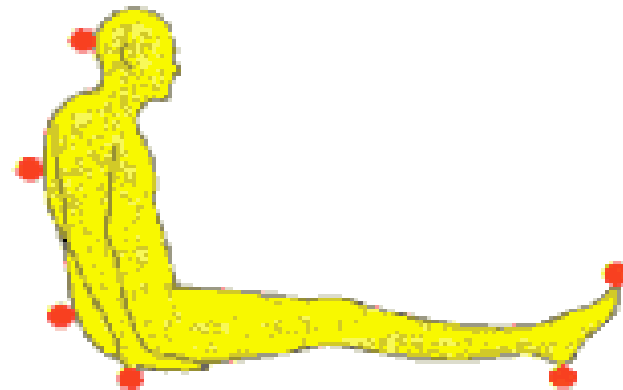
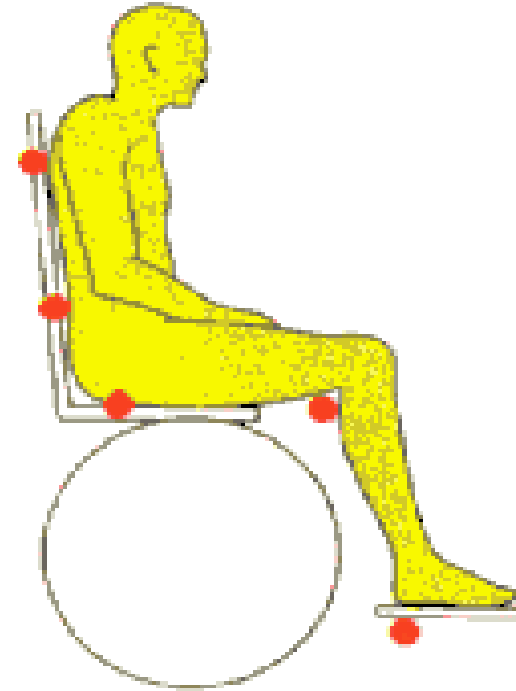
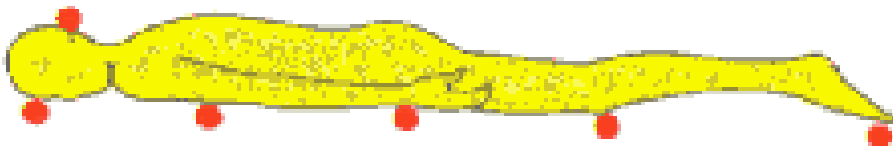
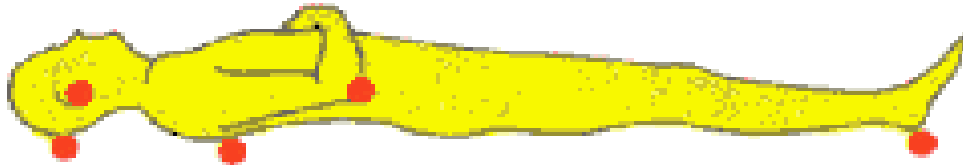
Usual pressure ulcer locations

- Over Bony Prominences

1. Occiput
2. Ears
3. Scapula
4. Spinous Processes
5. Shoulder
6. Elbow
7. Iliac Crest
8. Sacrum/Coccyx
9. Ischial Tuberosity
10. Trochanter
11. Knee
12. Malleolus
13. Heel
14. Toes



Pressure Points



Other locations...

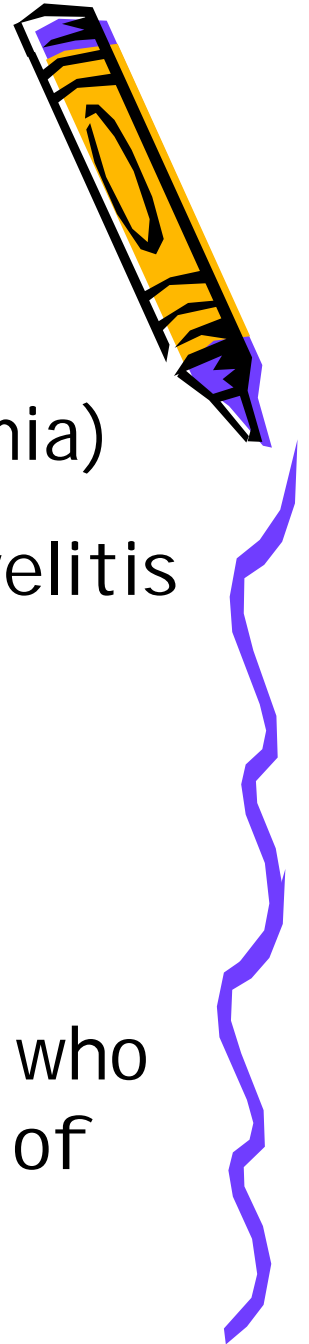
- Any skin surface subject to excess pressure
- Examples include skin surfaces under:
 - Oxygen tubing
 - Urinary catheter drainage tubing
 - Casts
 - Cervical collars



POSSIBLE COMPLICATIONS

- Sepsis (aerobic or anaerobic bacteremia)
- Localized infection, cellulitis, osteomyelitis
- Pain
- Depression

Mortality rate = 60% in older persons who develop a pressure ulcer within 1 year of hospital discharge



STAGING OF PRESSURE ULCERS

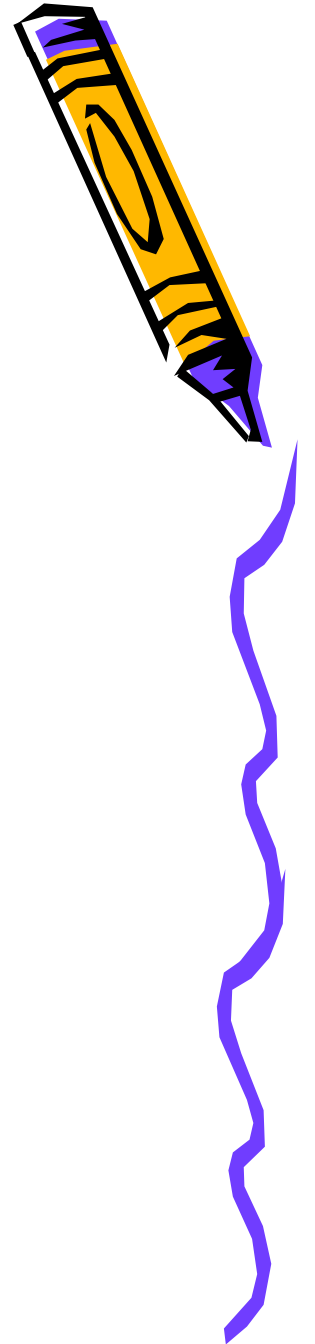
Stage I: Persistent nonblanchable erythema of intact skin. In darker skin tones, ulcer may appear with persistent red, blue, or purple tones. Most common of all pressure ulcers. "At risk" person.



Used with permission EPUAP

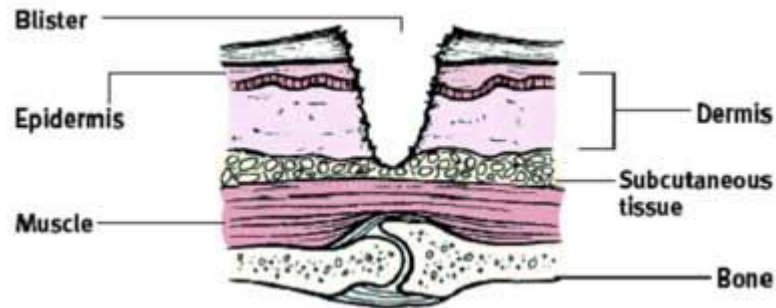


Stage 1

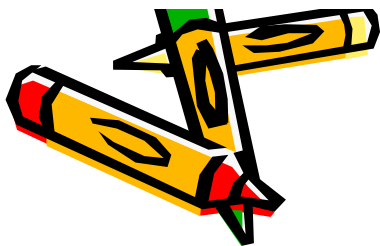


STAGING OF PRESSURE ULCERS

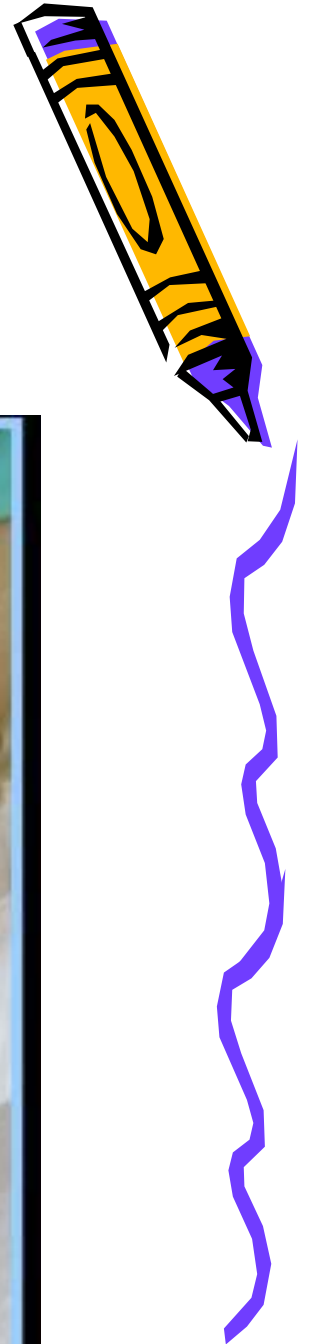
- **Stage II:** Partial-thickness skin loss involving epidermis, dermis, or both. Ulcer is superficial and presents as an abrasion, blister, or shallow crater.



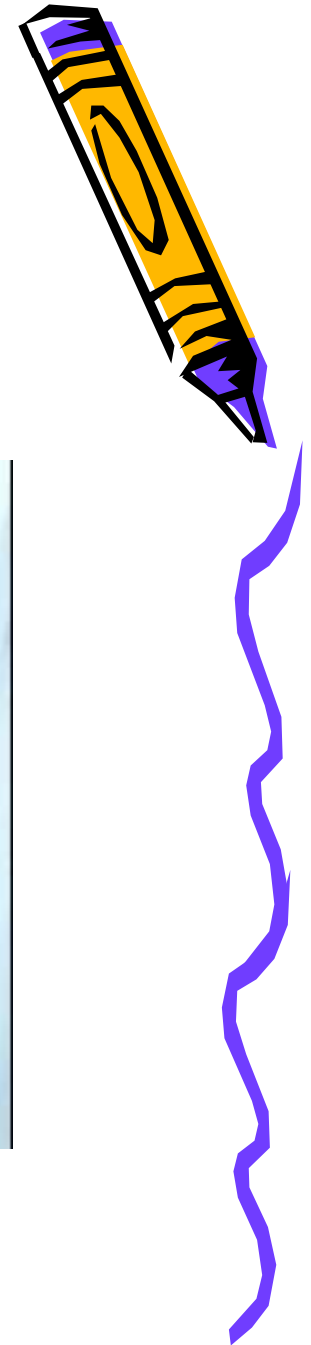
Pressure ulcer over the left ischial tuberosity is shallow with loss of dermis.



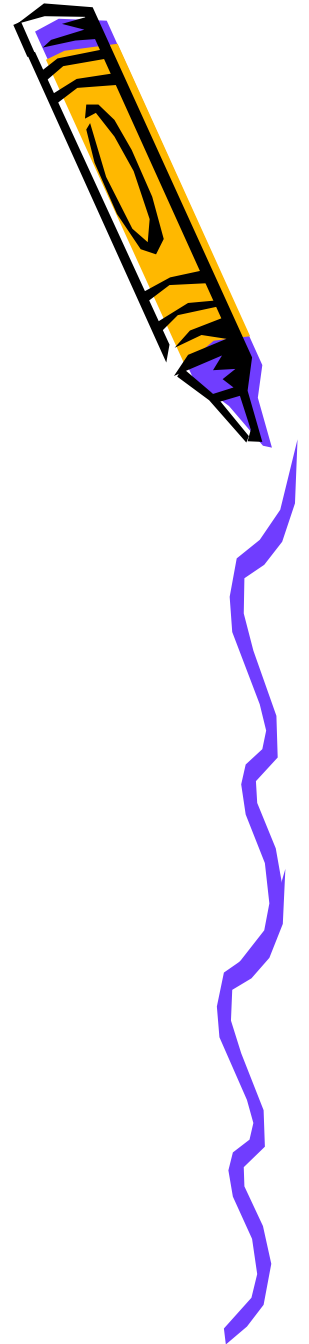
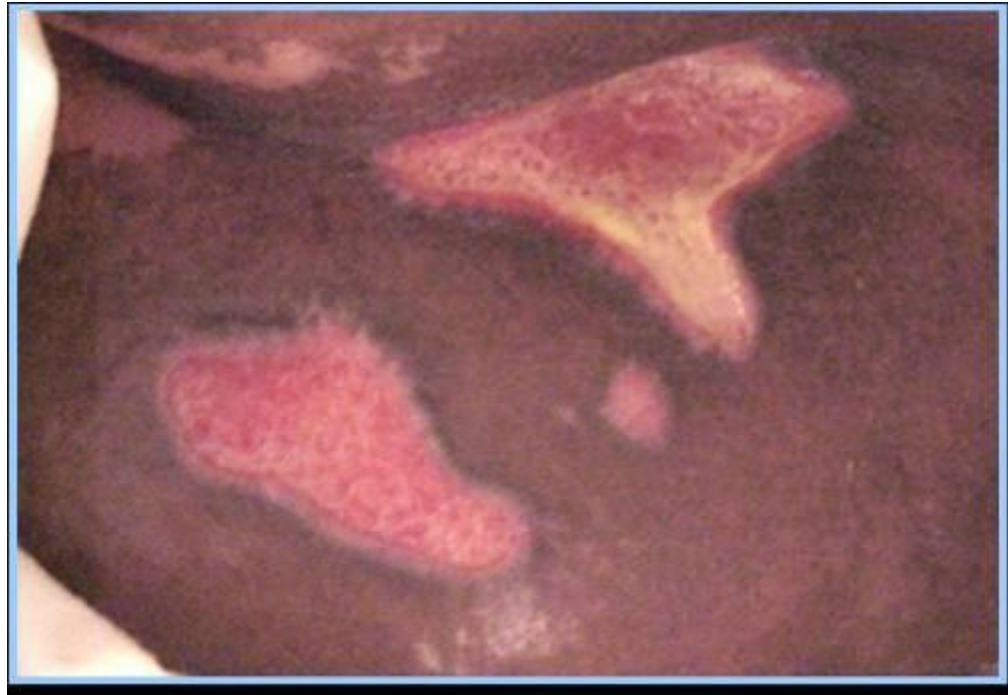
Stage II Pressure Ulcers



Stage II Pressure Ulcers

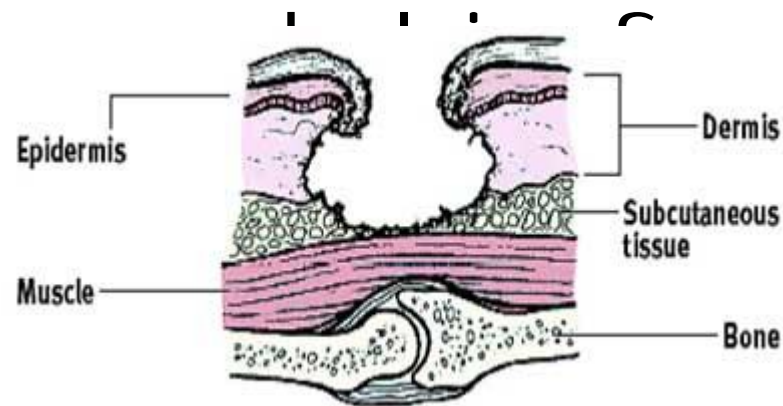


Stage II Pressure Ulcers



STAGING OF PRESSURE ULCERS

Stage III: Full-thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through,



The right sacral ulcer extends into subcutaneous tissue. No muscle, bone, or tendon is visible.



Used with permission LWW

Stage III Pressure Ulcer



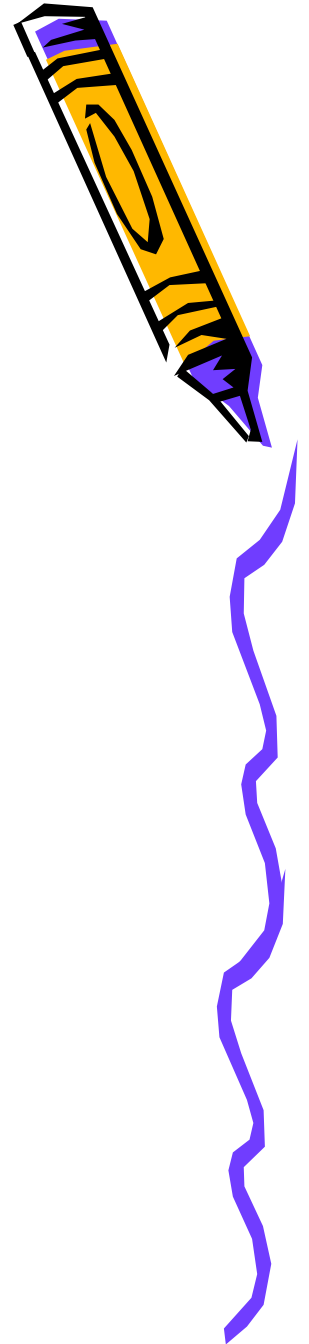
STAGING OF PRESSURE ULCERS

- **Stage IV:** Full-thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (e.g. tendon, joint capsule). Undermining and sinus tracts may also be present.



Used with permission LWW

Stage I V Pressure Ulcer

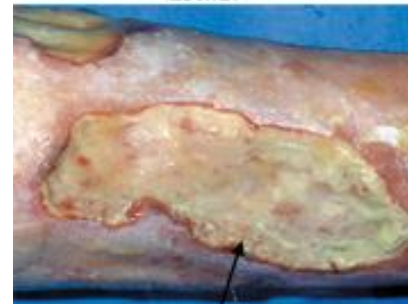


STAGING OF PRESSURE ULCERS

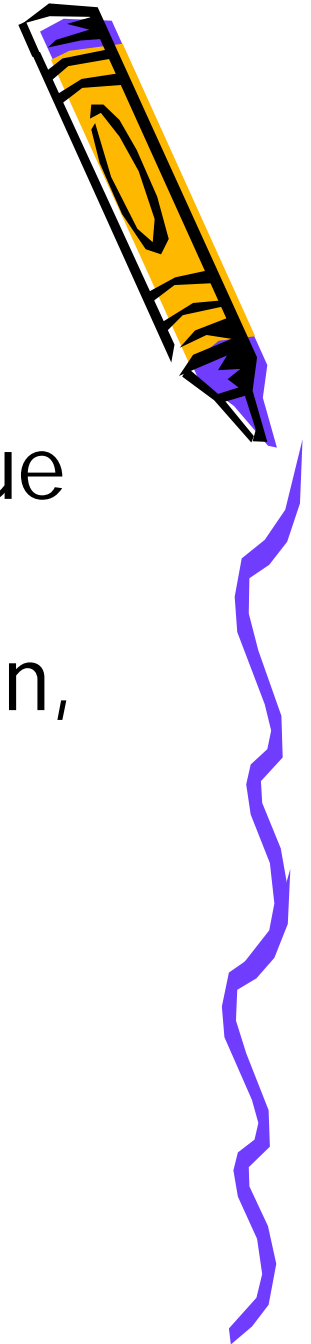
- **Unstageable:** Full thickness tissue loss in which slough (yellow, tan, gray, green or brown), eschar (tan, brown or black), or both in the wound bed cover the bottom of the ulcer.



Eschar

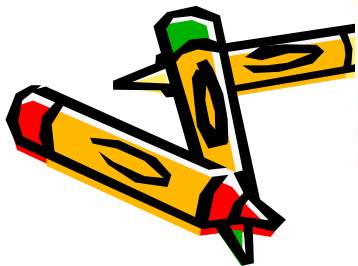


Slough

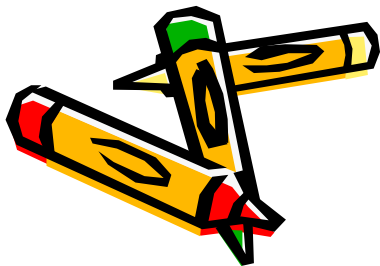
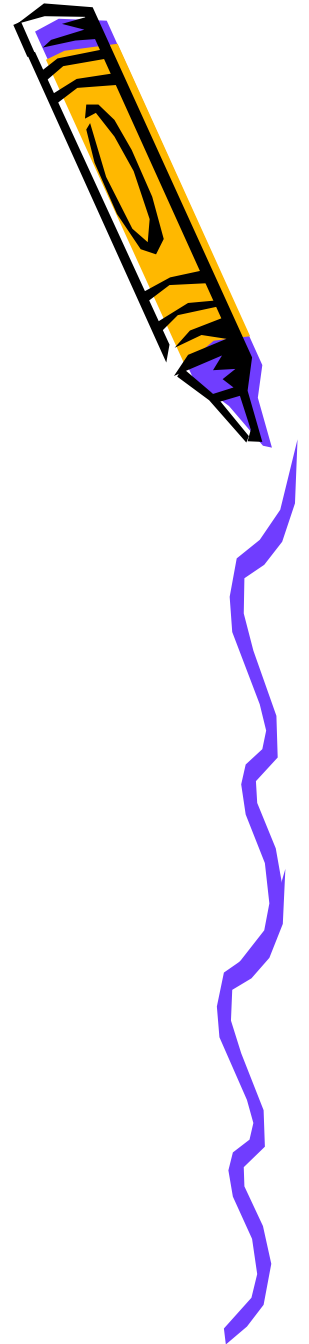


Pictures - Royal College of Surgeons of Edinburgh

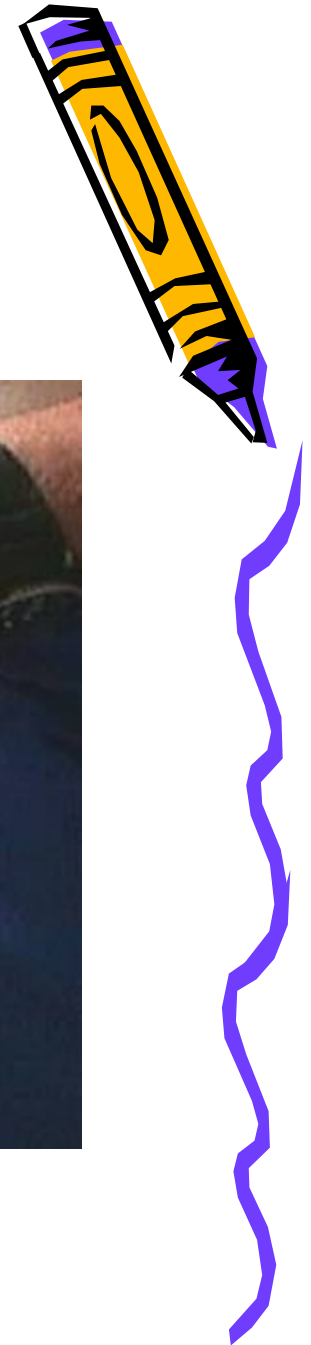
Unstageable Pressure Ulcer



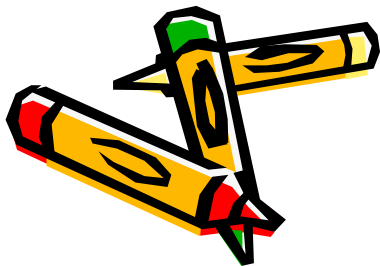
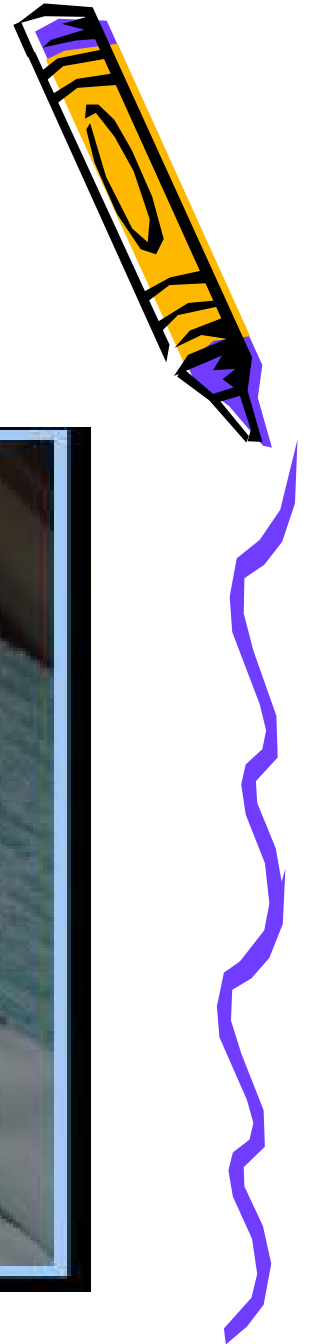
Unstageable Pressure Ulcer



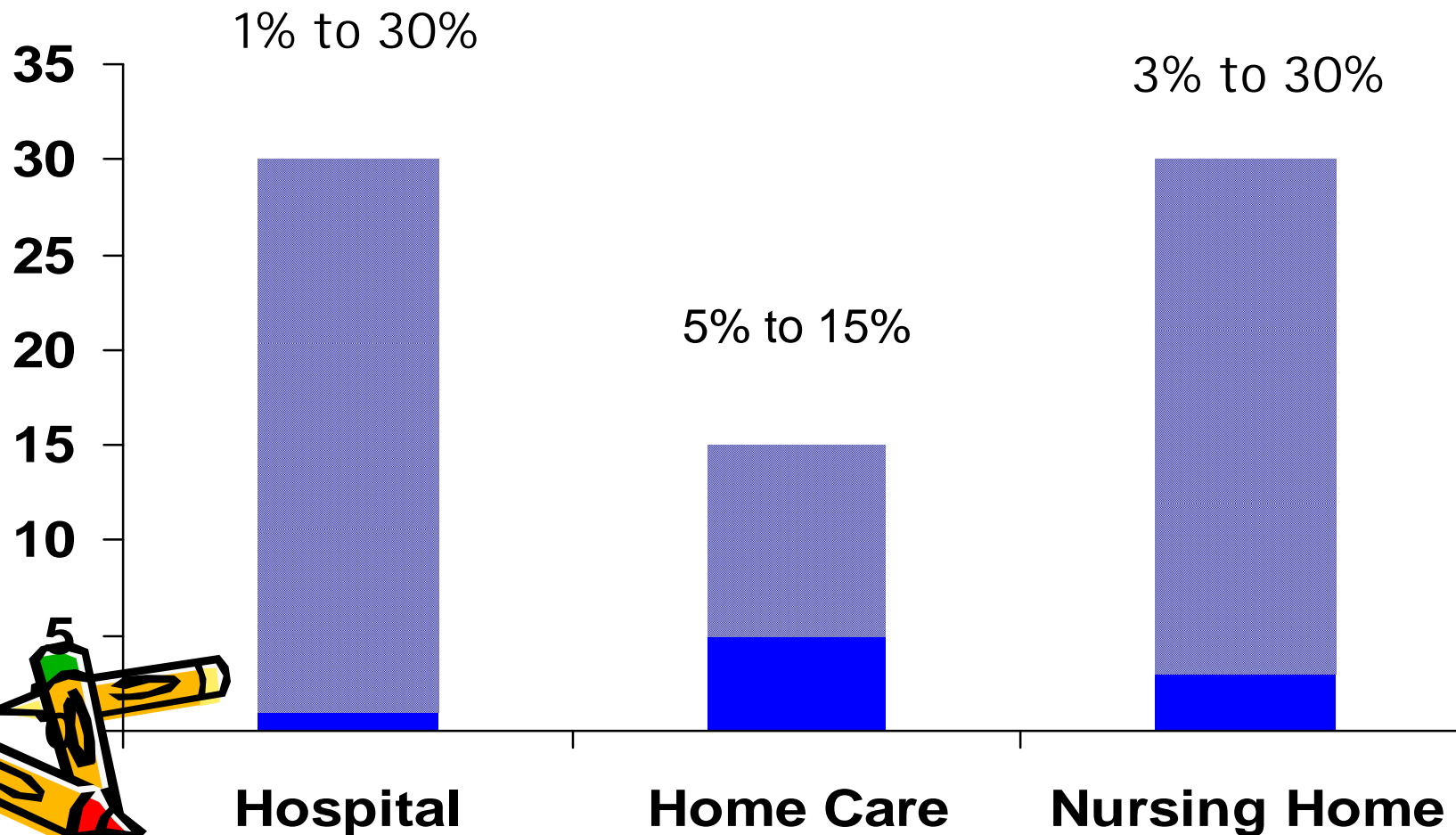
Unstageable Pressure Ulcer



Suspected Deep Tissue Injury



PREVALENCE OF PRESSURE ULCERS VARIES BY SETTING

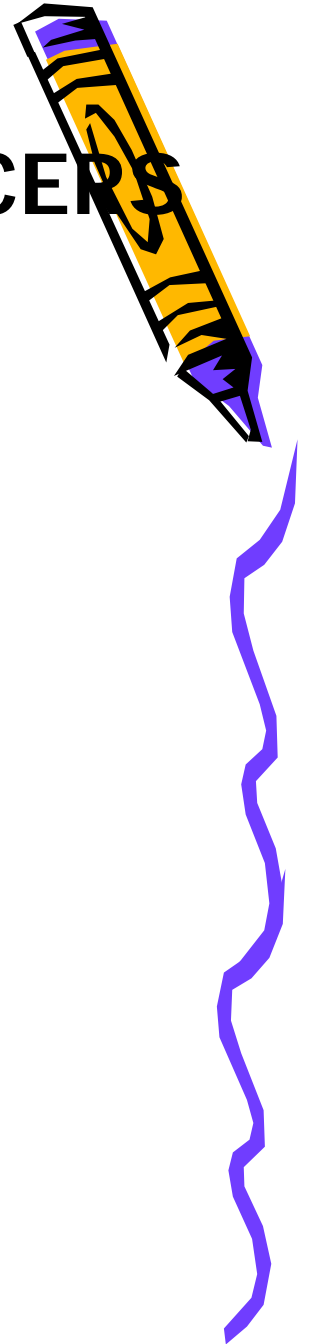
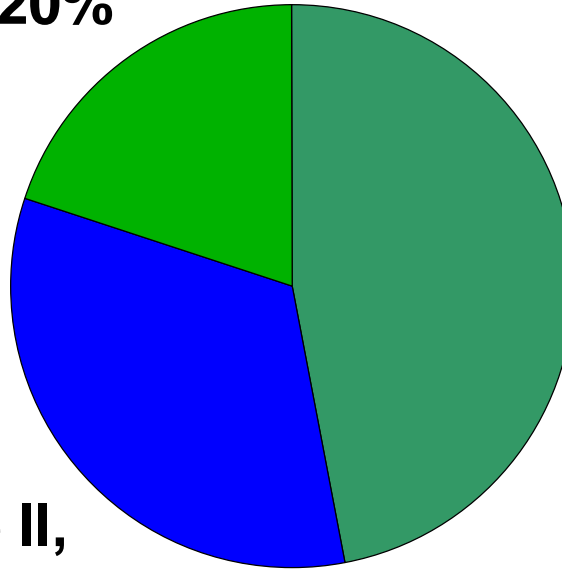


PREVALENCE OF PRESSURE ULCERS VARIES BY STAGE

Stages III
& IV, 20%

Stage II,
33%

Stage I,
47%



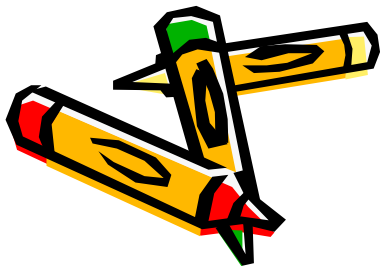
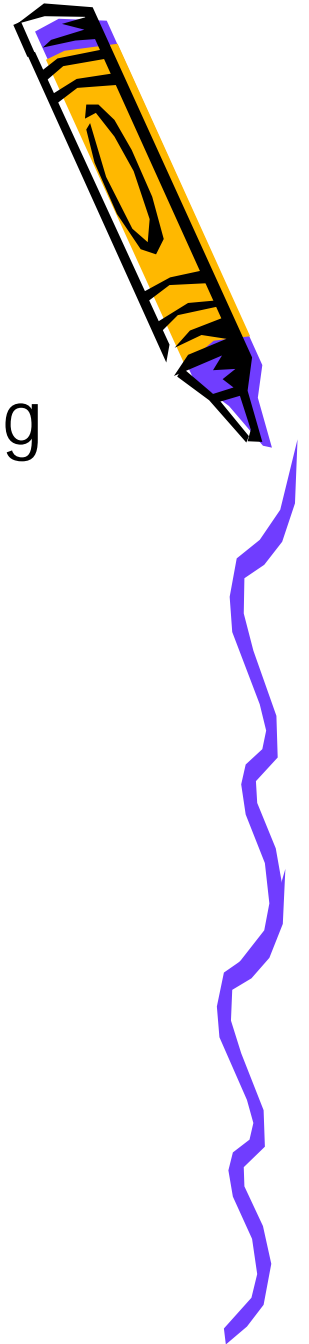
PREVENTION

An evidence-based approach to preventing pressure ulcers focuses on:

Skin care

Mechanical loading

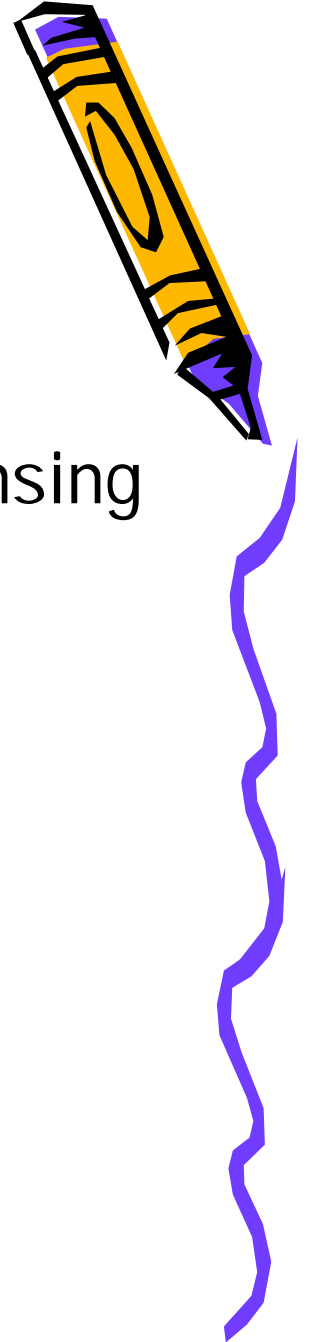
Support surfaces



PREVENTION: SKIN CARE

- Daily systematic skin inspection and cleansing
- ↓ factors that promote dryness
- Avoid massaging over bony prominences
- ↓ moisture (incontinence, perspiration, drainage)

Minimize friction and shear



PREVENTION: MECHANICAL LOADING

- Reposition at least every 2 hours (may use pillows, foam wedges)
- Keep head of bed at lowest elevation possible
- Use lifting devices to decrease friction and shear
- Remind patients in chairs to shift weight every 15 min

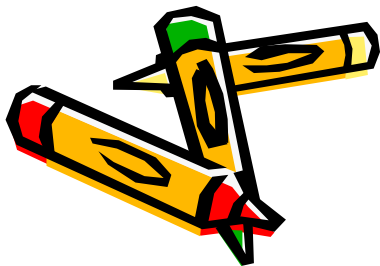
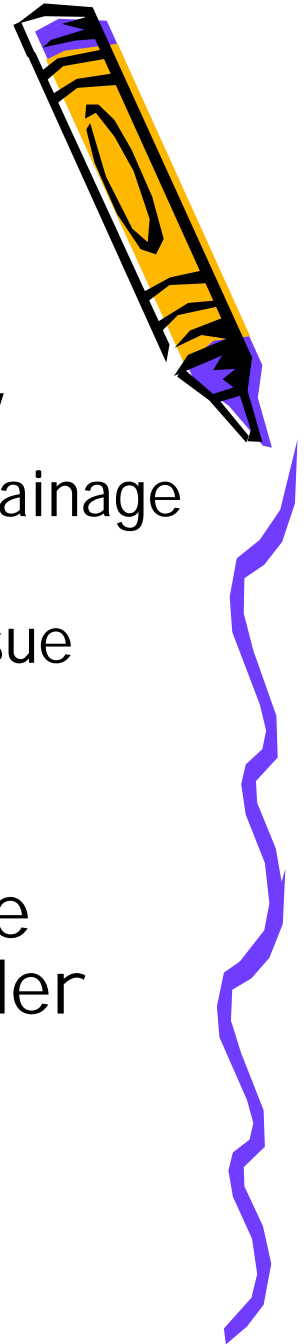
"Doughnut" seat cushions are contraindicated, may cause pressure ulcers

- Pay special attention to heels (heel ulcers account for 20% of all pressure ulcers)



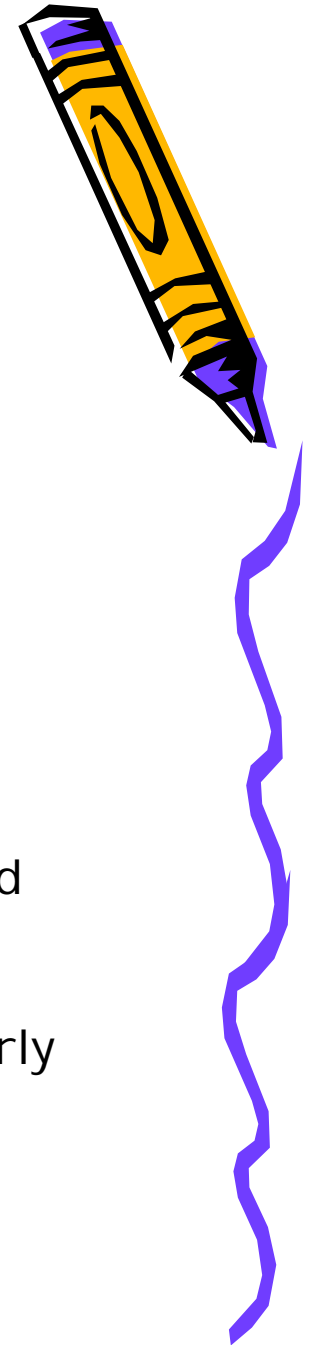
MANAGEMENT: CONTROL OF INFECTIONS

- Wound cleansing and dressing are the key
 - ↑ frequency when purulent or foul-smelling drainage is first observed
 - Avoid topical antiseptics because of their tissue toxicity
- With failure to heal or persistent exudate after 2 weeks of optimal cleansing, consider trial of topical antibiotics



MANAGEMENT: CONTROL OF INFECTIONS

- If still no healing, consider presence of:
 - Cellulitis--
 - Biopsy for culture of underlying tissue, bone
 - May need systemic antibiotics
 - or Osteomyelitis—
 - Staphylococcus aureus is by far the most commonly involved
 - X-Ray—Soft tissue swelling, bone destruction (10-21 d after infection)
 - CT—Medullary and cortical destruction
 - MRI —Better for soft tissue assessment, good for early bony edema
 - Remember, the white-blood-cell count is not a reliable indicator and can be normal even when infection is present.



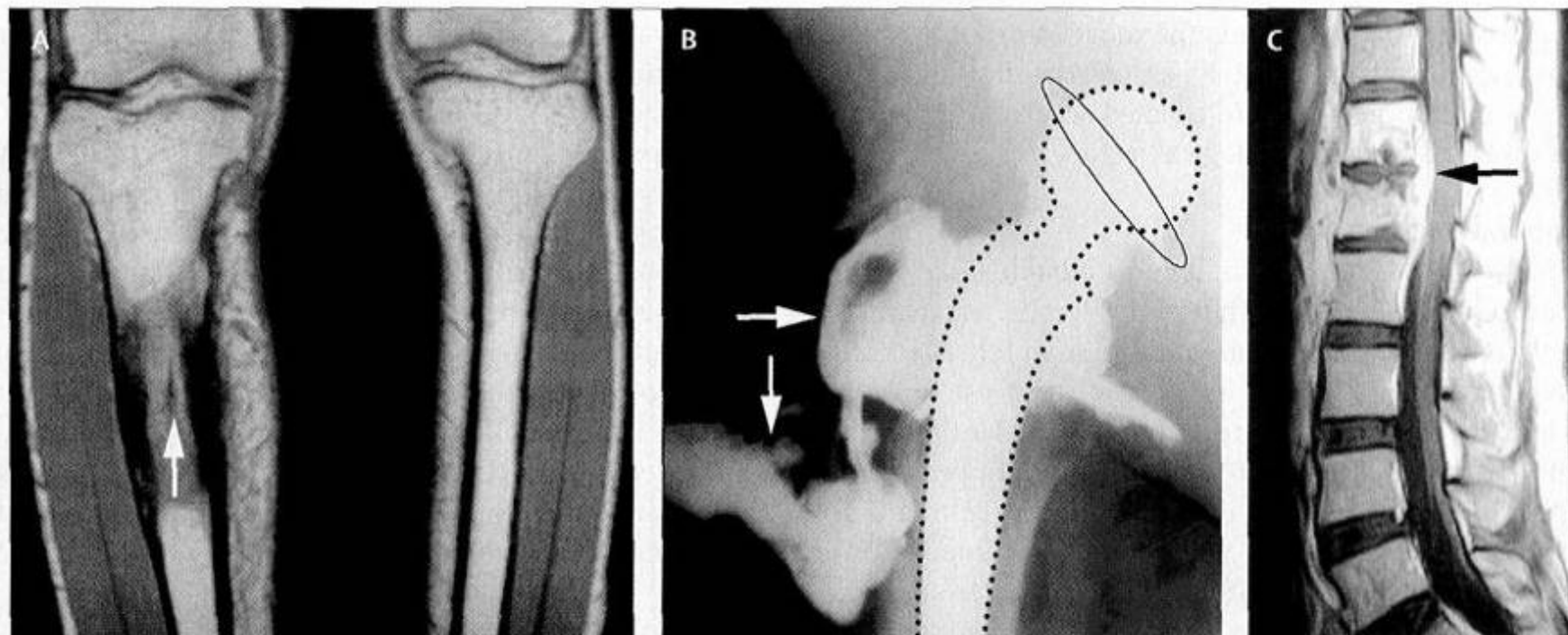


Figure 3: Imaging procedures in osteomyelitis

A: Chronic osteomyelitis—SE T1-weighted MRI, coronal view of both legs (for comparison) after intravenous injection of gadolinium-DPTA, shows cortical thickening, bone-marrow oedema, and a sequestrum (arrow) on the right tibia. B: Infected total hip prosthesis—in cases of suspected prosthetic infection, articular fluid is aspirated before surgery for bacterial culture; this is followed by dye injection for better visualisation of the articular space and possible fistula. In this case, arthrography shows a large periprosthetic abscess filled by contrast medium (arrows). The hip prosthesis is delineated. C: Vertebral osteomyelitis—MRI, sagittal view on SE T1-weighted after intravenous injection of gadolinium-DPTA, shows on vertebrae Th12–L1 high-signal intensity of the bone marrow and an epidural phlegmon (arrow). Images were provided by Prof Jean Garcia, Department of Radiology, University of Geneva Hospitals.

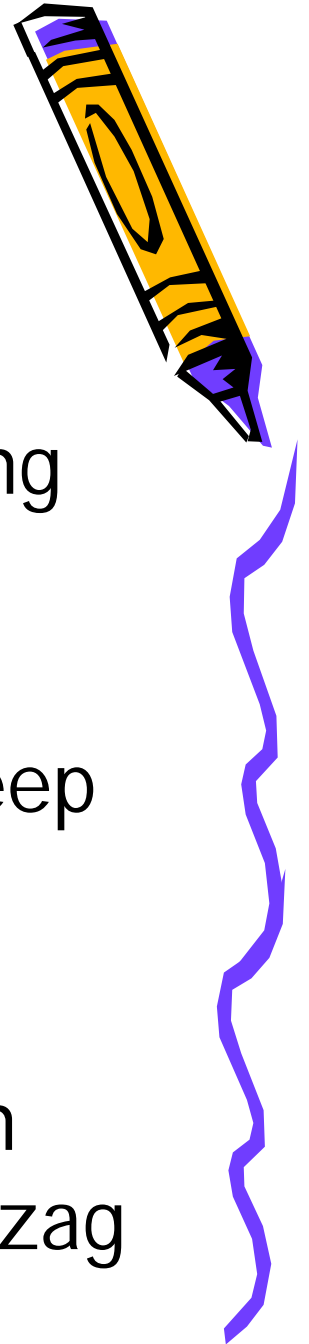


MRI views of osteomyelitis

Courtesy: [Lancet 2004 Jul 24;364\(9431\):369](#)

Bacterial Culture Collection

- Bacterial culture: I F have nonhealing wounds, increased discharge or develop a new odor
- Done selectively only I F suspect deep tissue infection
- Take from cleaned wound margin
- Swab healthy-appearing granulation tissue by rotating the swab in a zigzag pattern

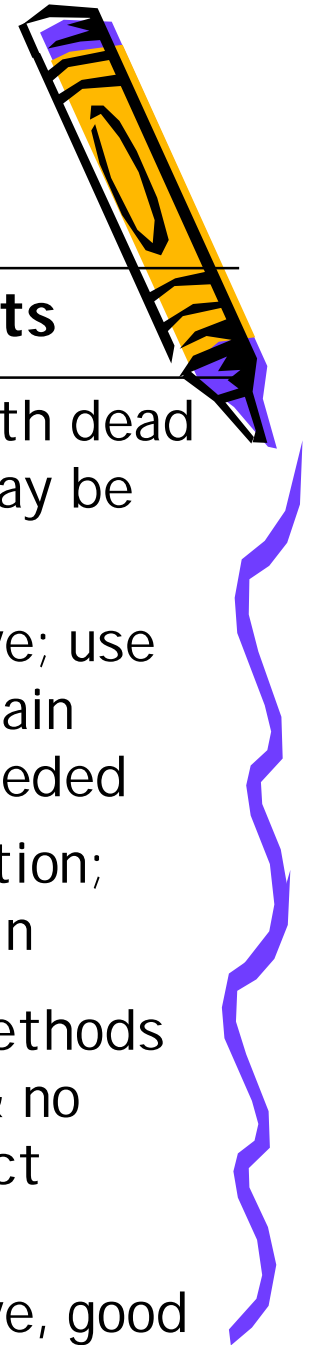


General Principles of Treatment

- Keep wound bed clean & moist, surrounding tissue dry
- Stage 1 – Barrier creams or transparent dressings
- Stage 2 – Hydrogel and hydrocolloid
- Stage 3 & 4 – Hydrogel and hydrocolloid
 - Alginates to absorb moisture/fill space
 - Silver to reduce bacterial burden if needed
 - Debride if eschar or slough



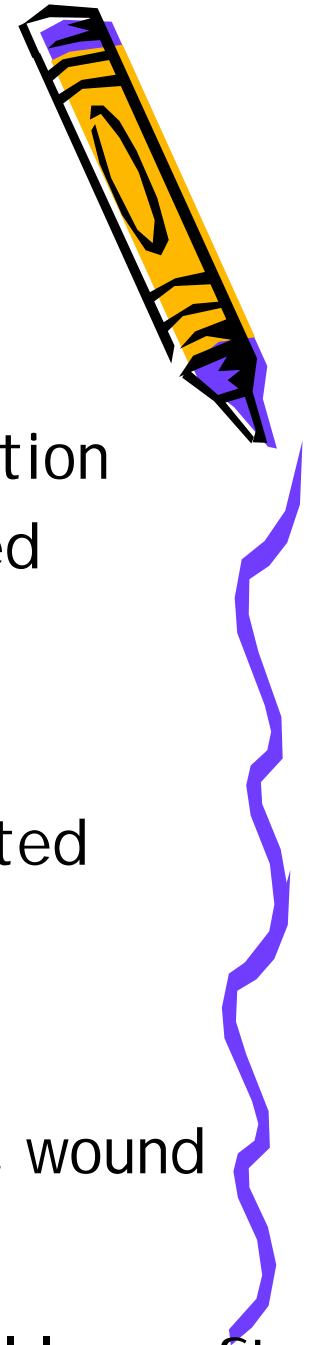
MANAGEMENT: METHODS OF DEBRIDEMENT



Type	Methods	Comments
Mechanical	Wet-to-dry irrigation, hydrotherapy	May remove both dead & live tissue; may be painful
Surgical, sharp	Scalpel, scissor to remove dead tissue; laser debridement	Quick, effective; use for infection; pain management needed
Enzymatic (Accuzyme)	Topical agent to dissolve dead tissue	Use if no infection; may damage skin
Autolytic (Duoderm)	Allows dead tissue to self-digest	Use if other methods not tolerated & no infection; effect delayed
Biosurgery	Larvae to digest dead tissue	Quick, effective, good if surgical debridement



MANAGEMENT: DRESSINGS



- **Transparent film:** stage I, protects from friction
Contraindicated: skin tears, draining, suspected infection

- **Foam island:** stages II, III
Contraindicated: excessive exudate; dry, crusted wound

- **Hydrocolloid:** stages II, III
Contraindicated: poor skin integrity, infection, wound needs packing



- **Petroleum-based nonadherent:** stages II, III, graft sites

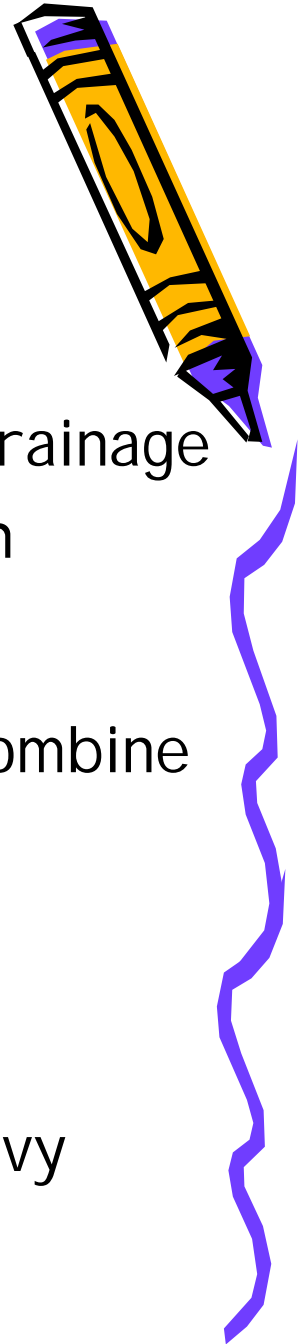
MANAGEMENT: DRESSINGS





- **Calcium Alginate:** stages II, III, IV, excessive drainage
Contraindicated: dry or superficial wound with maceration

- **Hydrogel, amorphous:** stages II, III, IV; must combine with gauze dressing
Contraindicated: maceration, excess exudate

- **Hydrogel, sheet:** stage II, skin tears
Contraindicated: maceration, moderate to heavy exudate

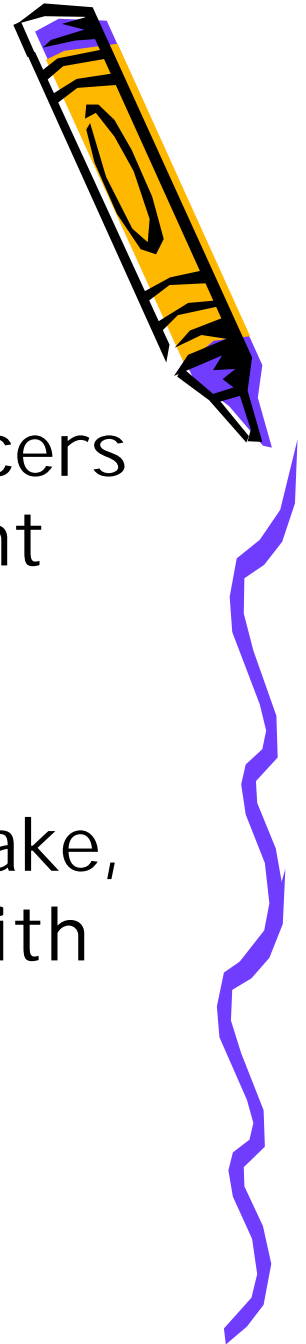
- **Gauze packing:** stages III, IV, deep wounds



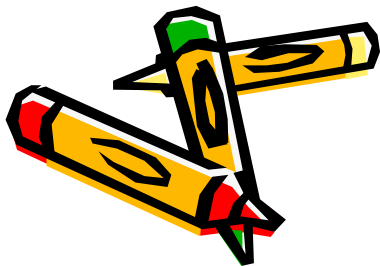
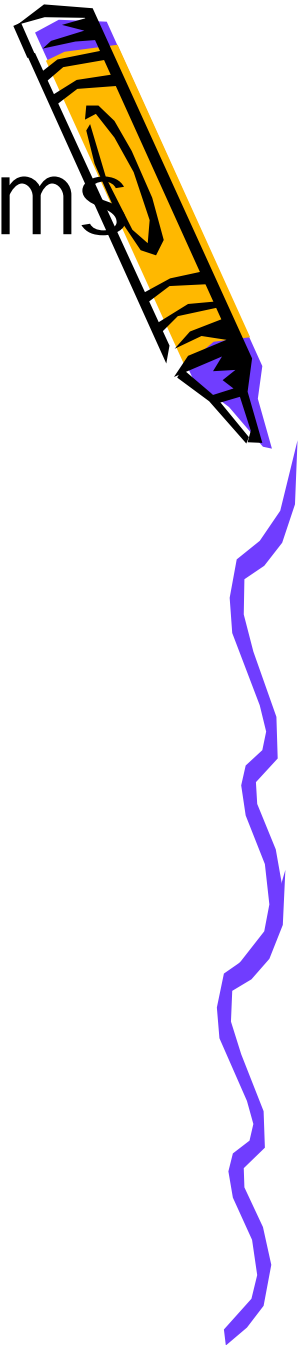
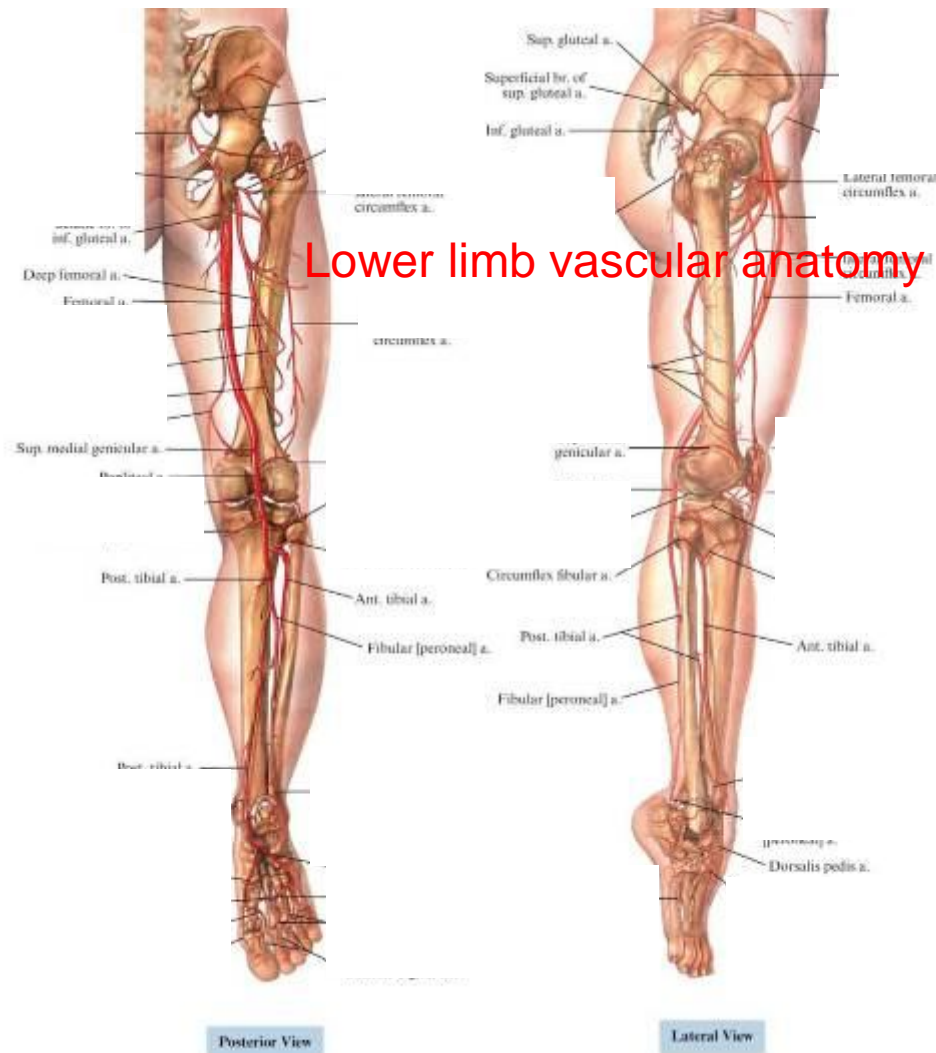
Wound Type	Stage I - Pressure Ulcer	Stage II - Pressure Ulcer or Partial Thickness Wound		Stage III or IV Pressure Ulcer or Full Thickness Wound		Wounds with Necrosis
						
Definitions	Stage I - An area where the epidermis is intact and the erythema (reddened skin) does not resolve within 30 minutes of pressure relief.	Stage 2 - An area of partial thickness loss of skin layers involving the epidermis and possibly penetrating into but not through the dermis		Stage 3 - Full thickness skin loss extending through the dermis to involve subcutaneous tissue	Stage 4 - Deep tissue destruction extending through subcutaneous tissue to fascia and may include muscle, tendon, joints, or bone	Stage 4 - The base of the wound cannot be visualized - i.e. obscured by necrosis or yellow slough
Exudate	PREVENTION	Dry to Light Exudate	Moderate Exudate	Dry to Light Exudate	Heavy Exudate	Wounds with Necrosis
Dressings and Change Frequency	Prevention Guidelines Pressure relief to area Turn or reposition q2hr in bed; q1hr in chair Pillow under calf to float heels, cushion heels if in WC/GC Monitor skin q 8 hours Protective Barrier if skin denuded, Wet, & Weepy Hydrocolloid Drsg if friction involved	Cleanse: NS If Dry: apply Wound gel to Hydrate Cover: Telfa type or Hydrocolloid Dressing Change: q3 days or when exudate reaches 1 inch from the edge	Cleanse: NS Fill If Needed: Calcium Alginate absorb exudate Cover: Gauze or hydrocolloid dressing Change: q3 days or when exudate reaches 1 inch from the edge	Cleanse: NS If Dry: apply Wound gel to hydrate Fill If Needed: Calcium alginate to absorb exudate Cover: Hydrocolloid dressing Change: q3 days or when exudate is 1 inch from edge	Cleanse: NS Fill: Calcium Alginate to absorb exudate or to fill dead space Cover: Gauze or hydrocolloid dressing Change: q3 days or when exudate is 1 inch from edge	Cleanse: NS Necrotic Wounds: To facilitate autolytic debridement - apply 1/4 inch Wound-Gel on necrotic area covered by Hydrocolloid dressing OR Enzymatic can be used OR If gel & exudate create too much moisture use Calcium Alginate to absorb or Hydrocolloid Drsg alone to continue autolytic debridement

MANAGEMENT: NUTRITION

- If an older adult at risk for pressure ulcers has malnutrition, a nutritional assessment must be done
- Markers of poor dietary and protein intake, low albumin and weight are associated with pressure ulcer development and healing



Vascular Disorders and Peripheral Circulation Problems



Peripheral Vascular Disease

Includes disorders that alter the natural flow of blood thorough the arteries and veins of the peripheral circulation. Lower extremities affected more often than upper.

- Peripheral Arterial Disease (PAD)
 - Most common

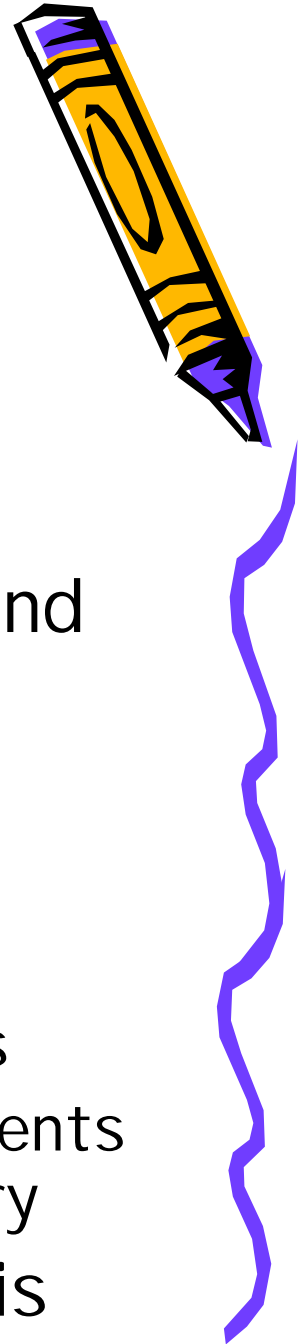


• Peripheral Venous Disease



Peripheral Arterial Disease

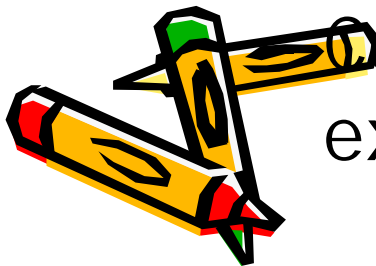
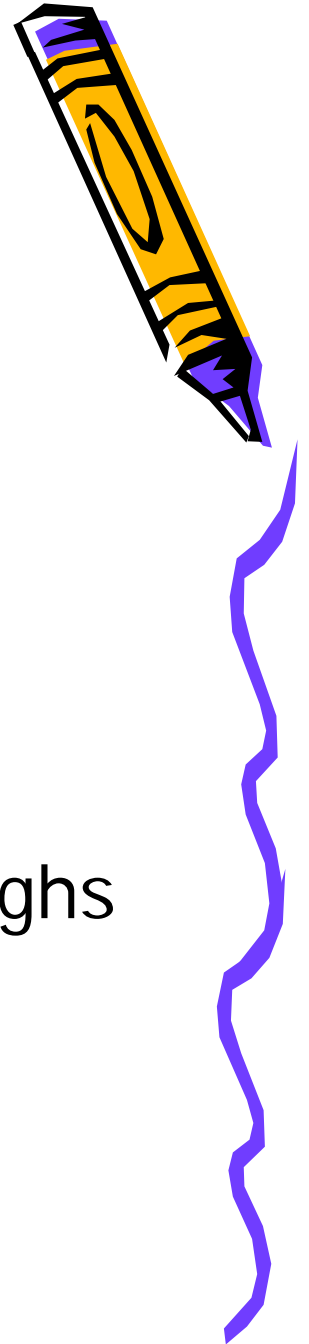
- Chronic with partial to total arterial occlusion
 - Deprives lower extremities of oxygen and nutrients
 - Atherosclerosis is most common cause
 - Classified as:
 - Inflow: involve distal end of aorta and the common, internal and external iliac arteries
 - Outflow: involve infrainguinal arterial segments and are below the superficial femoral artery
- Risk factors same as for atherosclerosis



Peripheral Arterial Disease

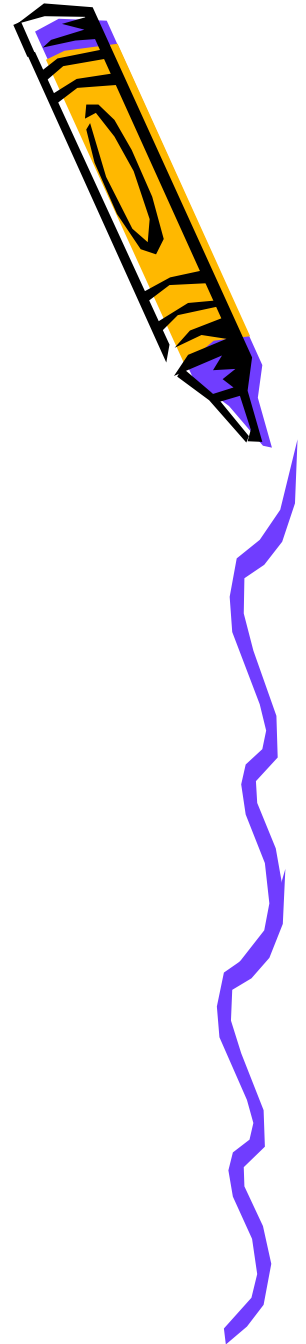
Assessment

- Pain
 - Intermittent claudication
 - Rest pain
 - Discomfort lower back, buttocks, thighs
 - Burning or cramping in the calves, ankles, feet, and toes
- Cold or numb sensation in the extremities



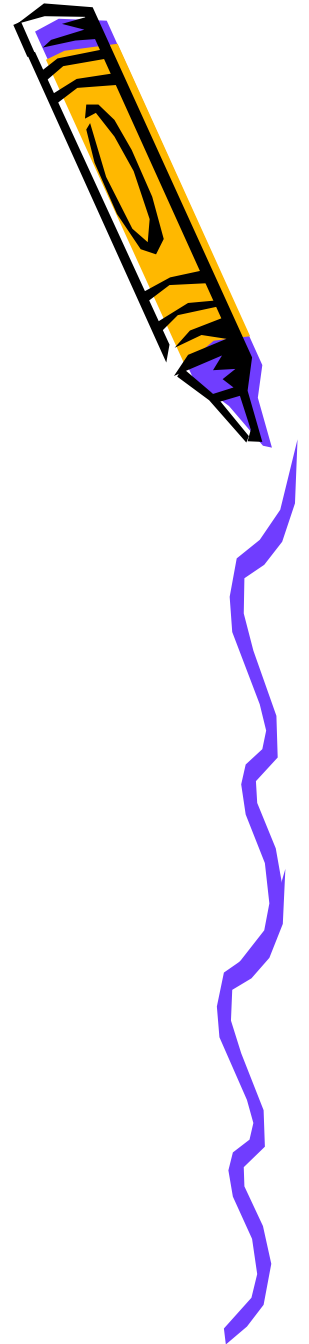
Peripheral Arterial Disease

- Clinical Manifestations
 - Loss of hair lower calf, ankle, foot
 - Dry, scaly, dusky, pale or mottled skin
 - Thickened toenails
 - Cold, cyanotic or darkened extremity
 - Pallor when extremity ↑, rubor when ↓
 - Diminished/absent peripheral pulses
 - Arterial/Venous stasis ulcers
 - Diabetic ulcers





Gangrene



Arterial Ulcers

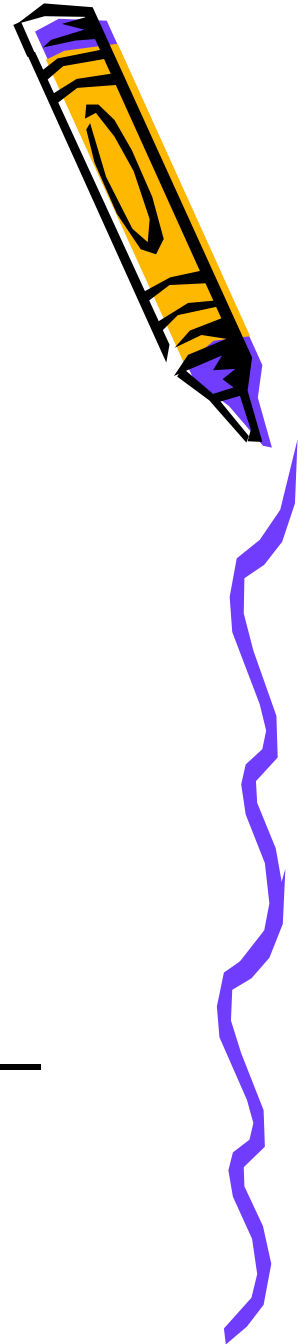


Risk factors for atherosclerosis

- Male > female
- Smoking
- Diabetes
- Hypertension
- Hyperlipidaemia
- Family history

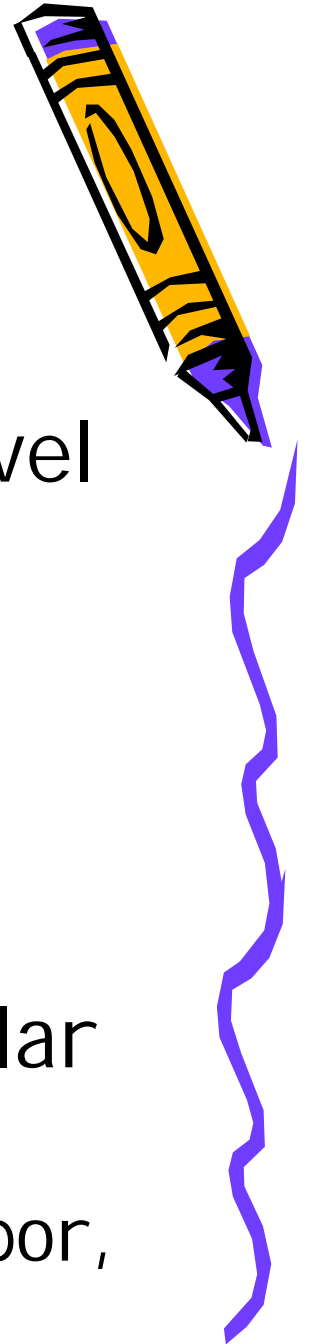
Arterial Ulcers-- AU

- Tend to occur on distal areas
- Diminished/absent pulses
- Punched-out appearance, or gangrene
- Requires either salvage revascularization, or amputation—usually the latter



Diagnosis add levels

- All patients with ulcers should be assessed for arterial disease. (Level I)
 - Pedal pulses
 - Ankle brachial index
- Patients with absent or reduced pulses or $ABI \leq 0.9$ should be considered for referral to a vascular specialist. (Level I)
 - Assess capillary refill, dependent rubor, foot temperature as confirmatory measure



Ankle Brachial Pressure Index

- Measure the systolic BP in the arm as normal
- Place cuff above ankle
- Place Doppler US over dorsalis pedis
- Inflate cuff above arm systolic and release slowly until pulse comes back (I.e. you first hear it using Doppler)

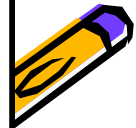
$$\text{ABPI} = \frac{\text{Systolic BP leg}}{\text{Systolic BP arm}}$$





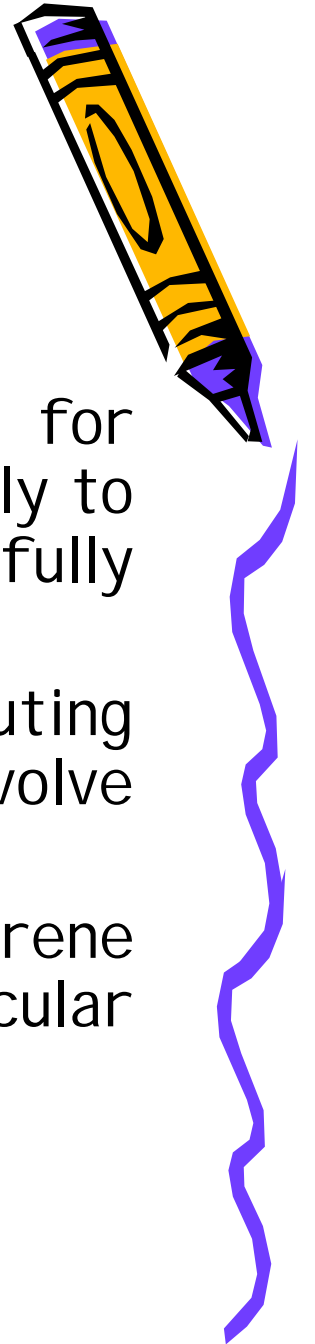
Ankle Brachial Pressure Index

ABPI value	Interpretation	Action	Ulcers?
> 1.3	Abnormal vessel hardening	Routine ref	Venous ulcers - use full compression bandaging
1.0 - 1.3	Normal range	None	
0.9 - 1.0	Acceptable	None	
0.8 - 0.9	Minor arterial disease	Manage RF	
0.5 - 0.8	Moderate arterial disease	Routine ref	Mixed ulcers use reduced compression
< 0.5	Severe arterial disease	Urgent ref	Arterial ulcers - no compression



Diagnosis

- Patients presenting with risk factors for atherosclerosis who have ulcers are more likely to have arterial ulcers and should be carefully evaluated.
- In ischemic appearing ulcers, look for contributing factors other than atherosclerosis that involve the arterial system.
- Patients with an ulcer and rest pain or gangrene should be promptly referred to a vascular specialist.



Classification of CLI

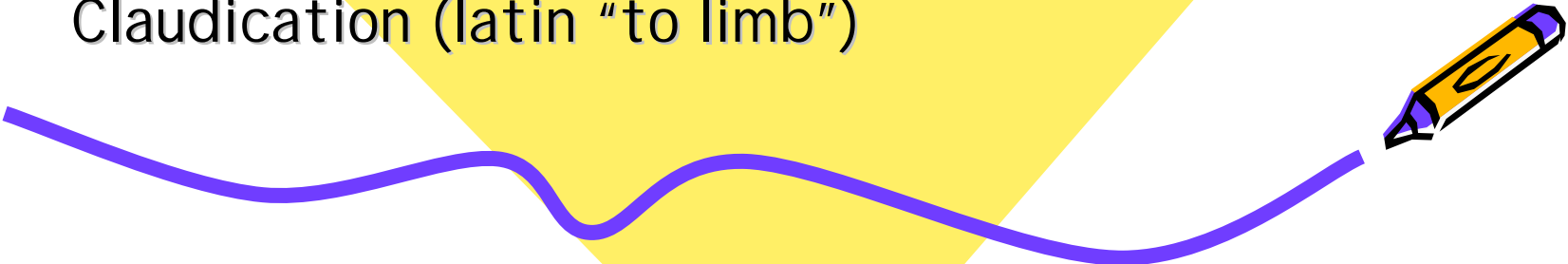
Fontaine Classification

Stage I	Asymptomatic
Stage II	Intermittent claudication (limits lifestyle)
Stage III	Rest pain
Stage IV	Ulceration/ gangrene

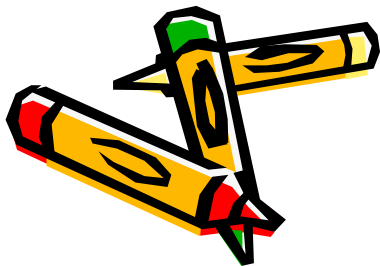
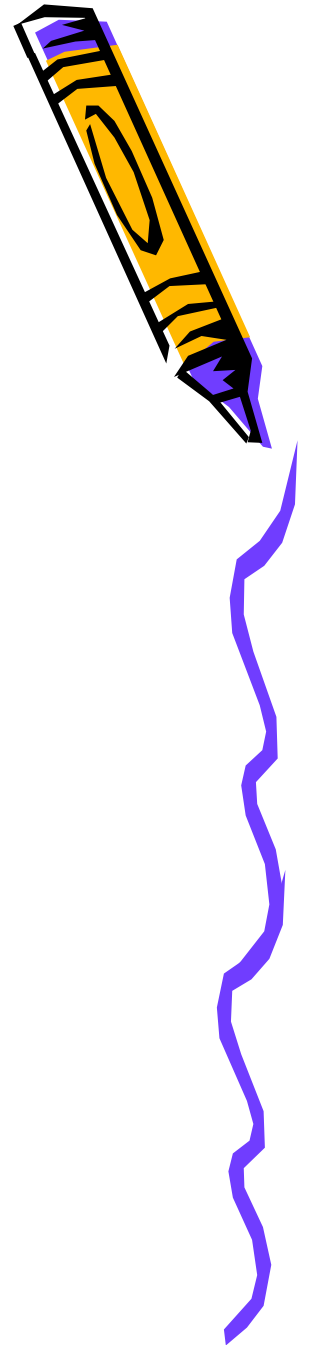
Stages III & IV signify critical ischaemia



Syndromes

- Leriche's syndrome - triad of claudication of buttocks, atrophy of legs and impotence
 - Buerger's sign - foot becomes pale w/ elevation, red (hyperaemic) when placed on floor, assoc'd w/ Buerger's angle
 - Buerger's disease - thromboangiitis obliterans. Non atherosclerotic inflammatory disease associated with tobacco use
 - Claudication (latin "to limb")
- 

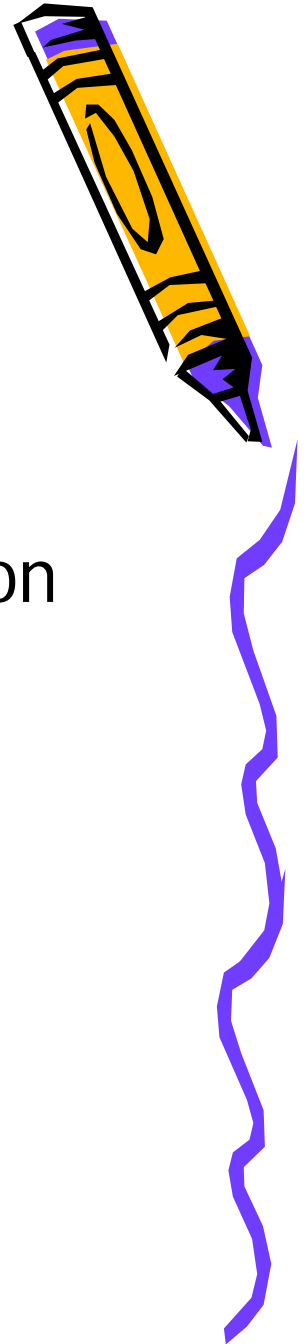
Non-healing ischemic ulcer



Physical Diagnosis

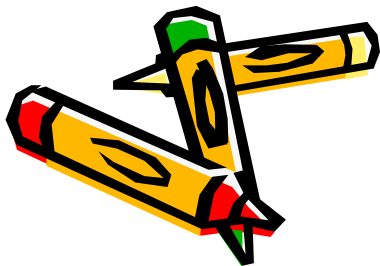
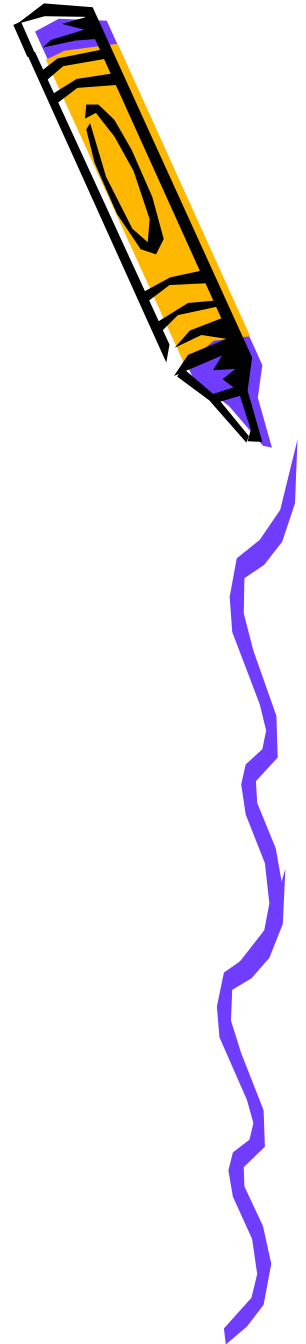
- End arterial location, typically feet
- Non-healing lower leg trauma.
- Clean (more or less), dry, no granulation tissue, edge may be heaped up.
- Signs of chronic ischemia
 - Muscle wasting
 - Cool extremities
 - Dopplers ABI 's
 - Blanching or incr pain on elevation

Arterial ischemic ulcer



Medical Treatment of AU

- Control glucose level and HT
- Moderate exercise
- Smoking cessation
- Dry dressings (dry gangrene preferable)
- ?Gingko biloba



Your patients need water



Avoid bad habits...



What Works: AU

- Amputation/revascularization/hospitalization if $ABI < 0.4$
- Do not compress if $ABI < 0.7$



Types of bypass

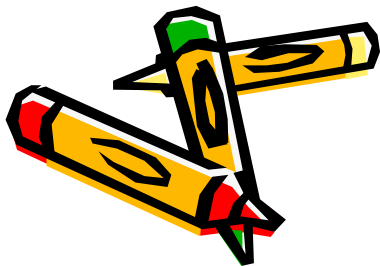
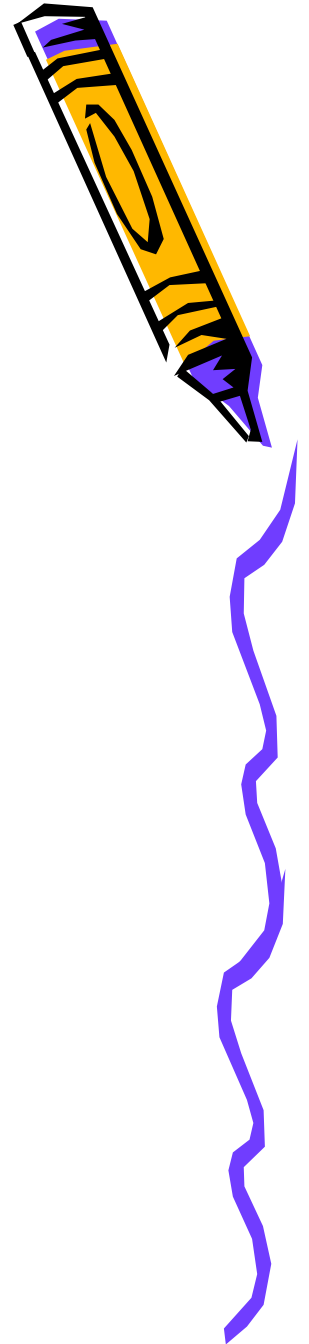
- Femoro-popliteal (Fem Pop)
 - To bypass SFA occlusion. Femoral -> popliteal
- Femoro-distal (Fem Distal)
 - To bypass more distal occlusions. Femoral -> e.g. ant. tibial, peroneal
- Axillo-femoral
 - Used if original graft fails. Axillary femoral
- Femoro-femoral
 - Used w/ axillo-femoral

Types of graft

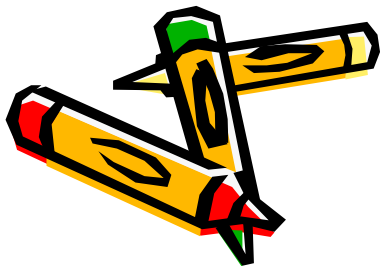
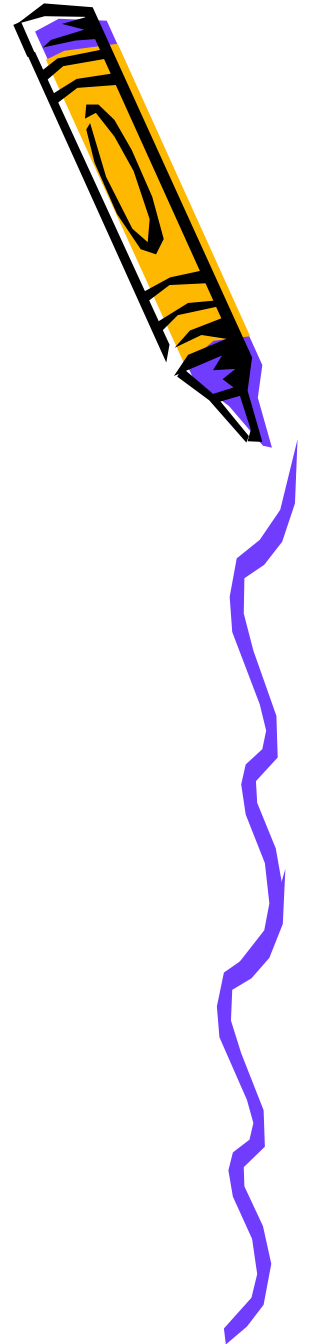
- Autologous
 - Usually long saphenous vein harvested
 - Reverse vein graft
 - In situ graft (valves destroyed w/ valvulotome)
- Synthetic
 - Dacron or PTFE

Venous Ulcers

- Due to venous insufficiency
- Medial Aspect of the leg
- Beefy Red
- Jagged
- Painless
- Treat with compression



Venous Ulcer

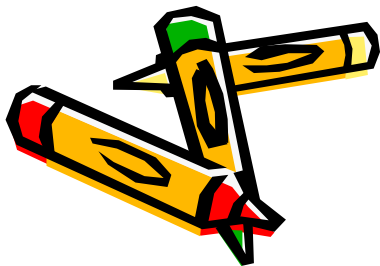
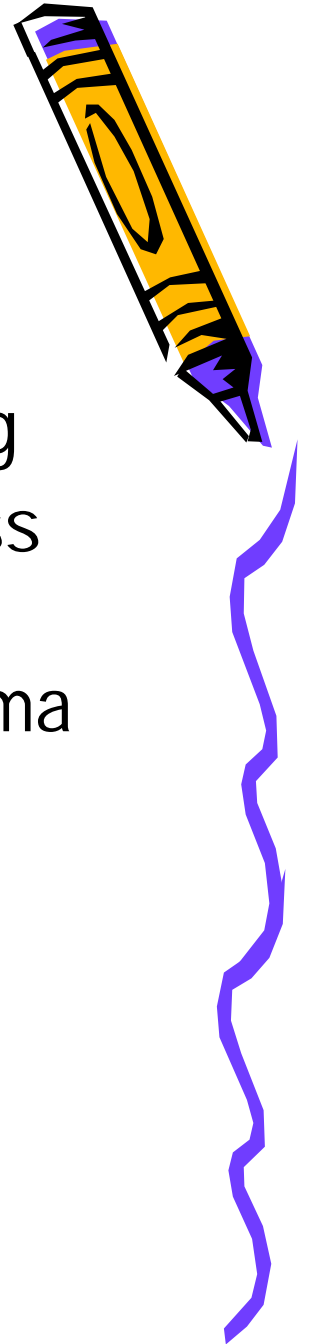




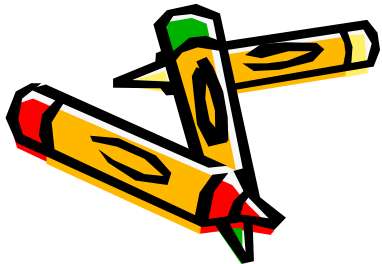
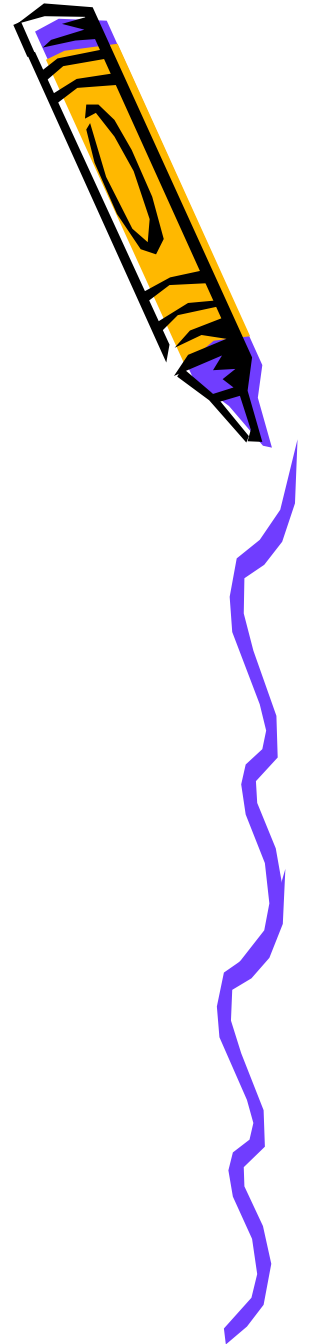
Venous Ulcers



- Medial lower leg
- Champagne Glass leg
- Dependent edema
- Hemosiderin staining
- Weeping wound with irregular borders

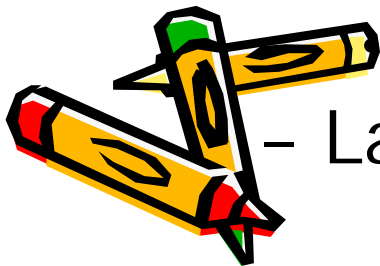
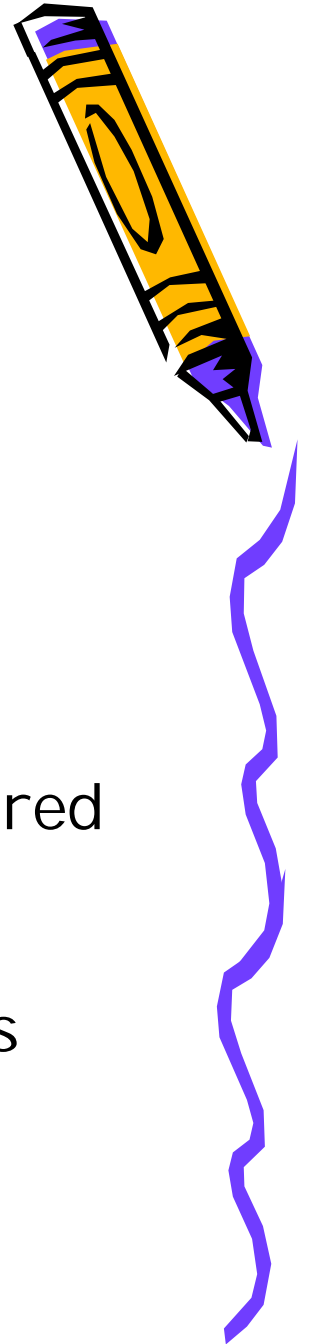


Venous Ulcers



Peripheral Venous Disease

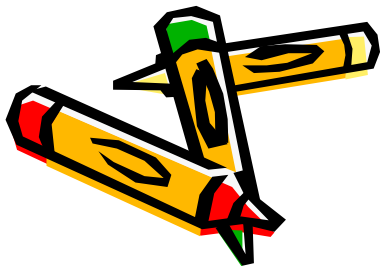
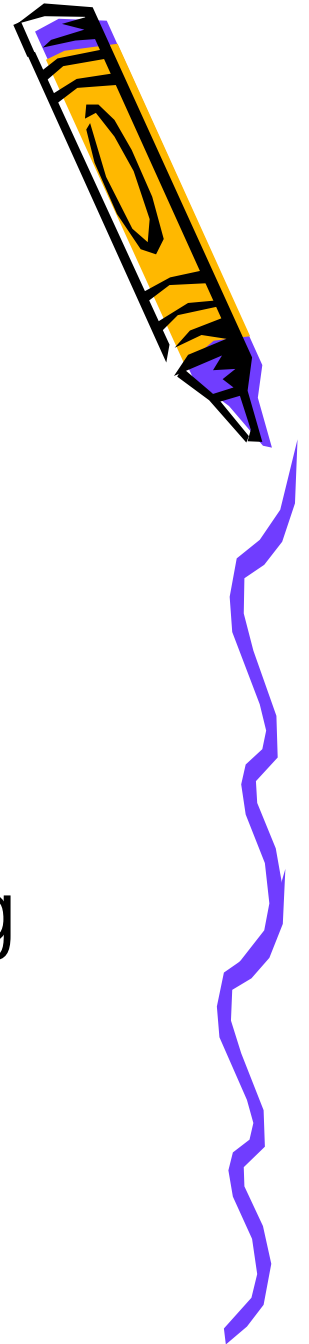
- Alteration of blood flow in veins
 - Thrombus formation (venous thrombosis)
 - Defective valves:
 - Blood clot develops, Virchow's triad: injured endothelium, venous stasis, hypercoagulability
 - Associated with an inflammatory process
 - Thrombophlebitis
 - Deep venous thrombophlebitis (DVT)
 - Lack of skeletal muscle contractility



Peripheral Venous Disease

Assessment

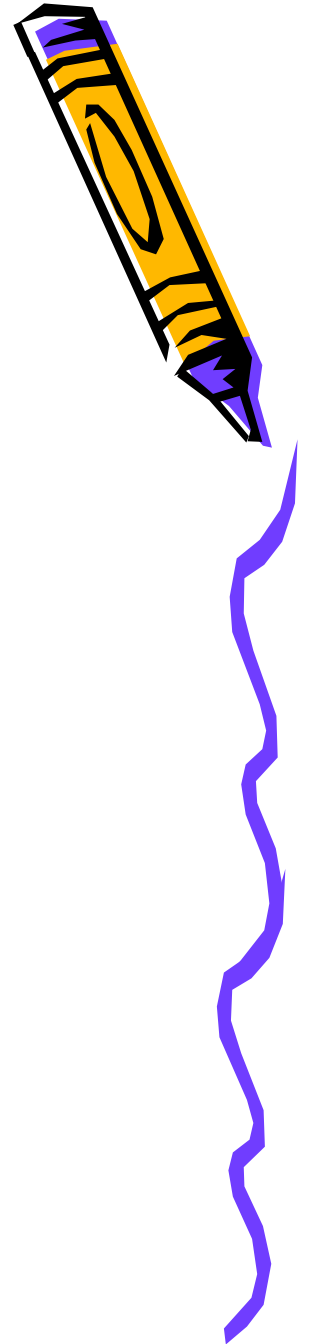
- May be asymptomatic
- Classic s/s: DVT: calf or groin tenderness or pain
- Sudden onset of unilateral swelling



Peripheral Venous Disease

Interventions

- Non-surgical management
 - Rest
 - Elevation of extremity
 - Moist soaks
 - Monitor for s/s of pulmonary embolus
 - Compression stockings
 - Drug therapy
 - Heparin
 - Coumadin
 - Thrombolytic therapy



Peripheral Vvenous Disease: Drug Therapy

Low-Molecular Weight Heparin

- Action is consistent
 - Longer half-life and more predictable response
- Approved for prevention and treatment of DVT



Peripheral Venous Disease: Drug Therapy

Warfarin (Coumadin)

- Works in liver to inhibit synthesis of vitamin K dependent clotting factors
- Takes 3-4 days to reach therapeutic levels
- Regulated by PT and/or I NR
- I NR should be between 2.0 and 3.0
- Long term therapy (3-6 months post DVT or longer)

Vitamin K is antidote



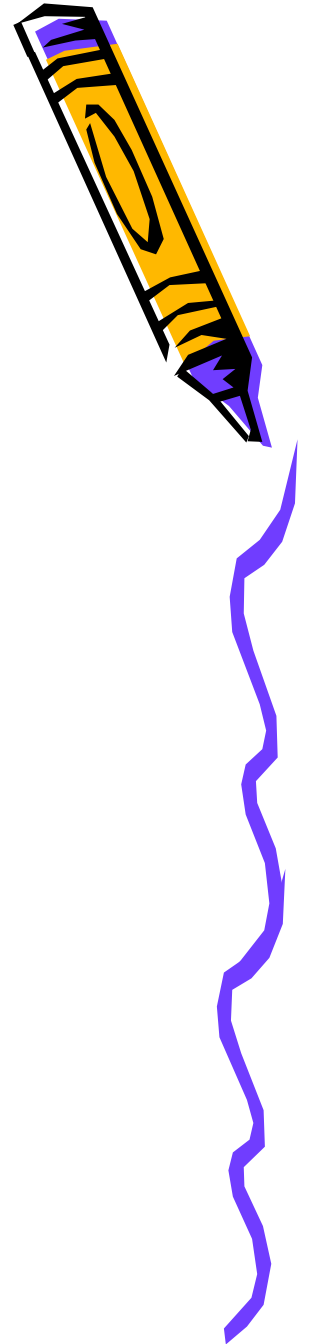
Peripheral Venous Disease: Drug Therapy

Thrombolytic therapy:

- Systemic thrombolytics can successfully dissolve clots
- Can prevent valvular damage and consequential venous insufficiency
- Contraindicated post-op, post trauma, post-partum, post cva or spinal injuries

Streptokinase

Must observe closely for signs of bleeding





Thank YOU!
QUESTIONS?



Peripheral Venous Disease

- Surgical management
 - Thrombectomy
 - Inferiour vena caval interruption
 - Ligation or external clips

