

High Risk Complications associated with Orthopedic Surgery

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Objectives

- Identify potential orthopedic trauma complications and clinical assessments
- Discuss nursing diagnoses associated with complications
- Describe nursing interventions and treatment for complications
- Explain education needs of patients and caregivers

Don't Forget Risk Factors!



Complications

- Hemorrhage
- Deep Vein Thrombosis
- Fat Embolus
- Compartment Syndrome
- Infection

Hemorrhage



Assessment-Clinical Manifestations

- Confusion
- Restlessness
- Anxiety
- Dizziness
- Weakness
- Tachycardia
- Irregular pulse



More Signs and Symptoms

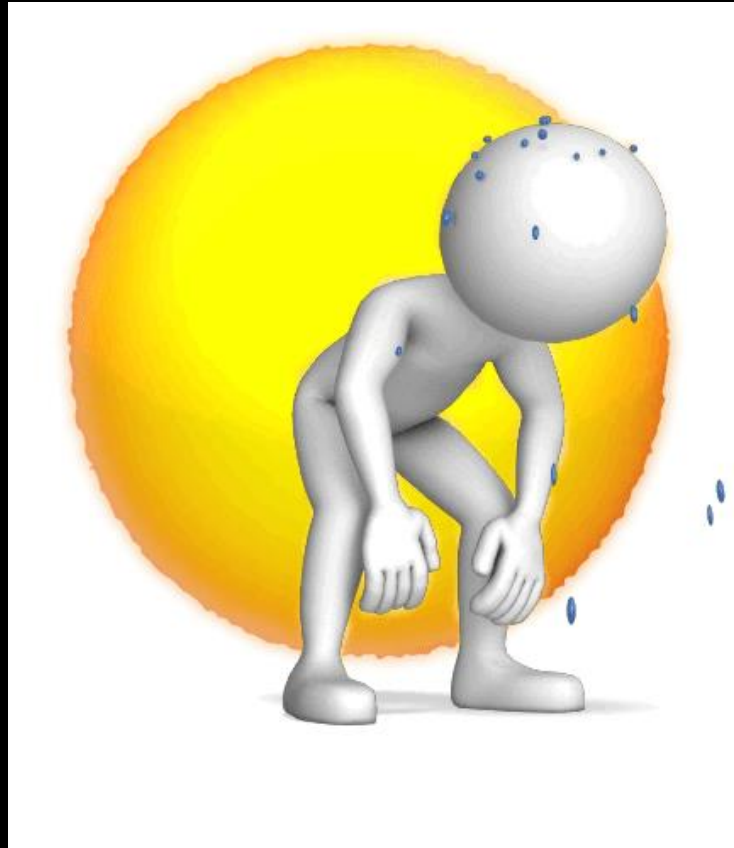
- Rapid, shallow respirations
- Hypotension
- Decreased urine output
- Cold, clammy skin
- Grayish pallor
- Abnormal drainage from wounds & drains
- May have swelling at site



Nursing Diagnoses

- Fatigue / Activity Intolerance: pace tasks
- Anxiety: fear viral transmission; calm/support
- Fluid Volume Deficit: monitor labs- HCT and Lytes, accurate I&O, assess for dehydration
- Potential Fluid Volume Excess: watch for rales, SOB, edema
- ✓ Ineffective tissue perfusion: CMS, edema
- Altered Nutrition: iron in diet, supplements

Fatigue and Dehydration



Patient Risk Factors

- Patient related:
 - coagulation disorder: hemophilia
 - infection
 - excessive anticoagulation
 - medication use: aspirin, NSAIDs
 - low platelet count: <150,000-400,000
 - hepatic disease, GI ulcers



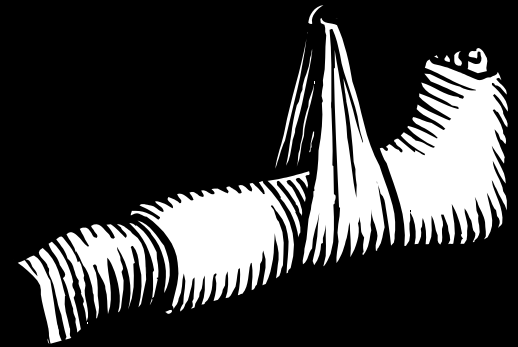
Other Risk Factors

- Injury related:
 - fractured bone (pelvic)
 - foreign body
 - significant soft tissue damage
- **Trauma** surgery related
 - anatomic and technical aspects
 - skill and expertise of team



Interventions and Treatments

- Direct pressure: manual or dressings
- Electrocautery, resuturing
- Surgical intervention
- Monitor vital signs
- Supplemental oxygen
- Tourniquets, pneumatic anti-shock garments
- Position flat in bed, elevate affected extremity



More Interventions

- Volume replacement
 - Blood transfusion: FFP, PRBC, platelets, WB
 - IV fluids: crystalloids (LR/ NS)
 - Colloids: dextran, albumin, gelatin
- Vitamin K or clotting factor replacement
- Oral iron supplementation

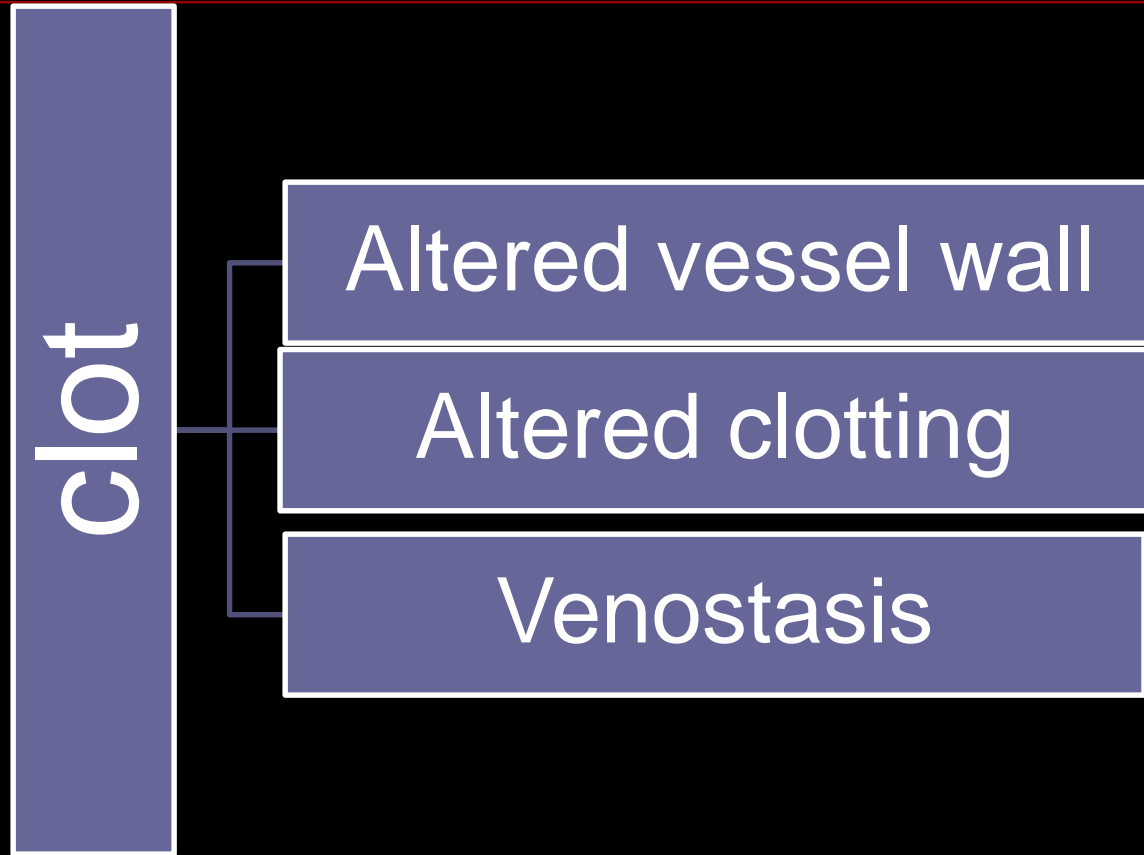
Education Needs

- Teach patient to:
 - continue iron supplementation as needed
 - maintain proper hydration
 - use coping strategies to manage anxiety
 - complete post-discharge lab studies
- Coordinate referrals relevant to care as appropriate:
 - visiting nurse, PCP (primary care provider)

DVT

- Formation of fibrin leads to development of fibrin clot (thrombus) in lower extremity
- When thrombus is large enough to impede blood flow-clinical symptoms appear
- Virchow's Triad: 3 conditions causing clots
 - endothelial injury: altered vessel wall
 - altered clotting: hypercoagulable state
 - Venostasis: slowing of circulation-obstruction

DVT: Deep Vein Thrombosis



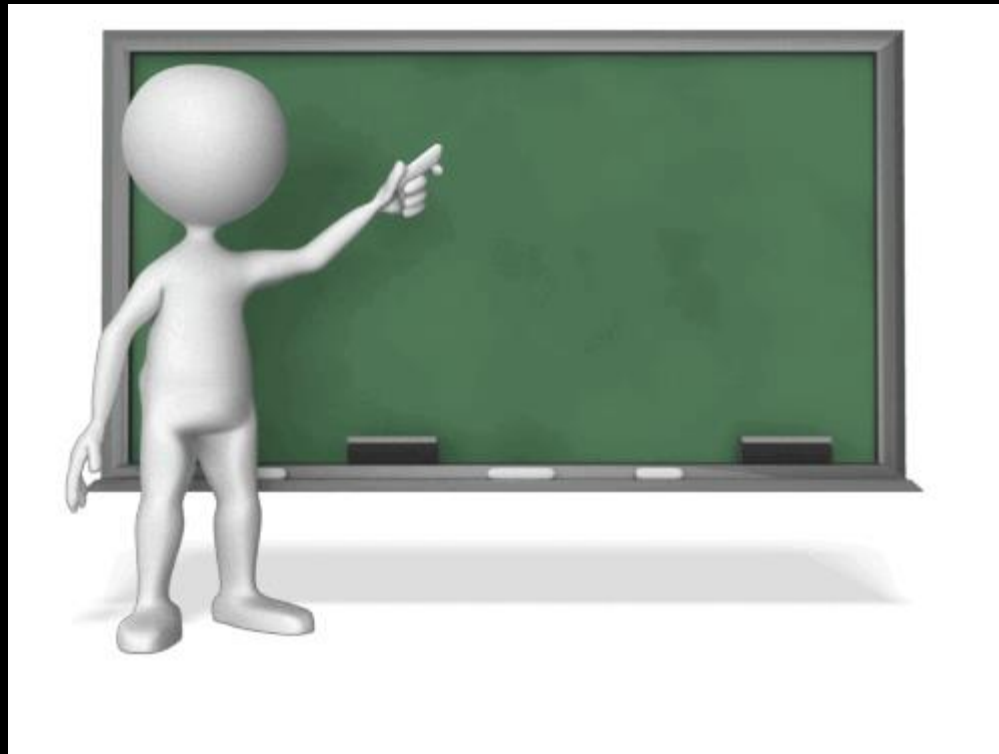
Assessment-Clinical Manifestations

- Unilateral swelling thigh, lower leg: due to inflammation and obstruction
- Localized redness, warmth, tenderness
- Palpation of calf: muscle firmness/tension
- Pain: cramping, sharp, aching, dull, severe, mild; intermittent or constant; increases with weight bearing and movement
- Doppler ultrasound, MRI

Nursing Diagnoses

- Alteration in comfort: pain management
 - use of analgesics, distraction techniques
- Alteration in tissue perfusion: bleeding precautions, monitor peripheral circulation, monitor labs, give anticoagulation therapy
- Knowledge deficit:
 - discuss activity level
 - explain treatments, medications

Utilize Your Teacher Role!



Risk Factors

- Patient related:

- **Trauma**

- previous thromboembolism, varicose veins
- immobilization, paraplegia, obesity
- CHF, MI, COPD, Sickle Cell, Polycythemia
- deficiencies in clotting cascade
- malignancy, pregnancy, estrogen intake
- increased age >60, dehydration, stroke

More Risk Factors

- Procedure related:
 - re-operation
 - surgery > 30 minutes
 - pelvis, hip, lower extremity surgeries
 - bilateral surgeries
 - postoperative infection
- Anesthesia related: General; use Epidural or Spinal



Non-Drug Interventions

- Elevate foot of bed
- Early ambulation
- Elastic stockings
- Ankle pumps
- Intermittent pneumatic compression devices
- Impulse technology: foot pump
- Deep breathing exercises

Get Your Patient Moving!



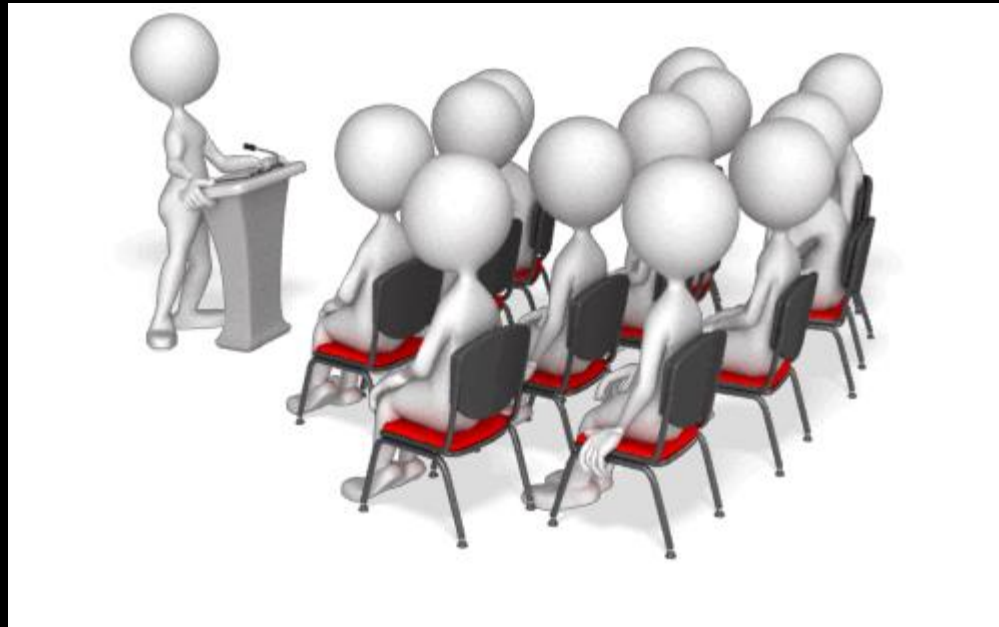
Medications and Surgical Intervention

- Aspirin
 - Unfractionated heparin
 - Low molecular weight heparin
 - Warfarin (Coumadin)
-
- Note: Inferior Vena Cava filters used in select, high risk patients only!

Education Needs

- Ensure knowledge of anticoagulation:
 - purpose, duration, monitoring of INR: 1-2
 - potential drug-food interactions (vitamin K)
 - potential drug-drug interactions
 - risk of bleeding, strategies to reduce risk
- Ensure understanding of follow up:
 - inform all health care providers about anticoagulants; wear Medical Alert bracelet

Inform Health Care Providers



Fat Embolism

- Mechanical Theory: injured adipose tissue and/or disruption of intramedullary (in bone or spinal cord) compartment releases fat into blood
- Biochemical Theory: fatty acids cause endothelial damage; fatty acids and fats lead to platelet aggregation and fat globule formation
- Early recognition to prevent morbidity and mortality!

Vital Statistics

- Embolic fat in the blood has been found in at least 90% of patients with major **trauma** to soft tissue or bone
- In a group of fatally injured blunt force **trauma** victims, 68% had pulmonary fat emboli present on autopsy
(Mudd,et al- 2000)
- Death: usually from respiratory problems

Fat Embolism: True Emergency!



Assessment-Clinical Manifestations

- Classic **triad** of symptoms
 - **hypoxemia:** and hypoxia, dyspnea, rales, tachypnea, rhonchi, accessory muscles
 - **neurologic abnormalities:** agitation, lethargy, confusion, anxiety, somnolence, retinal exudates and bleeding, LOC
 - **petechial rash:** skin(axillae, front side chest & neck, navel, conjunctivae), oral mucosa

Don't Discount the Rash



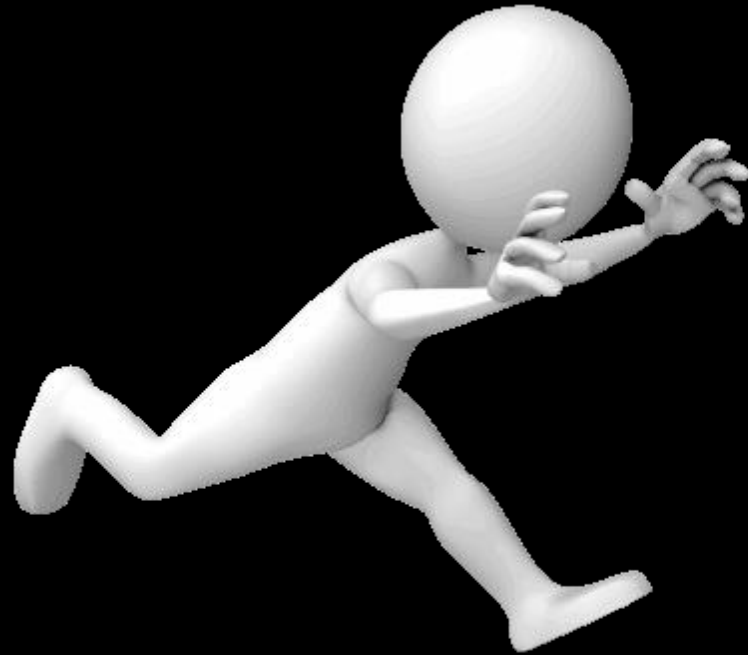
Other Signs and Symptoms

- Cardiac system: tachycardia
- Genitourinary system: proteinuria, oliguria, hematuria
- Hematologic system: altered clotting profile, decrease in HCT, HGB, unexplained anemia
- Other: fever, jaundice

Nursing Diagnoses

- Impaired gas exchange: need to maintain adequate gas exchange
- Ineffective breathing: need to maintain effective respiratory effort without respiratory compromise
- Ineffective tissue perfusion: maintain normal ABGs & vital signs uncompromised
- Anxiety: calmly provide information

Control Anxiety!



Risk Factors

- **Multiple Trauma**
- Hypovolemic shock following **traumatic** injury
- Fracture of long bone: fibula, femur, ribs
- Prolonged time between **traumatic** injury and stabilization
- Sepsis
- DIC: disseminated intravascular coagulation (bleed out)

Interventions: Airway & Breathing

- Airway management : position for maximum ventilation with HOB up, intubate as needed
- Maximize breathing: encourage slow, deep breathing and coughing, use of incentive spirometer, oxygen therapy
- Monitor respiratory patterns, O₂ saturations and ABGs

Other Interventions

- Provide fluid volume replacement: monitor HGB /HCT, blood transfusions if needed
- Monitor vital signs; keep patient quiet
- Minimize movement of long bone fractures, complete splinting/immobilization quickly
- Steroids -controversial: methylprednisolone
- Intensive care unit approach: pulmonary artery catheter, low dose Dopamine

Education Needs

- Teach patient:
 - coping strategies to manage anxiety
 - recognition and acceptance of temporary support
 - respiratory toileting (cough/deep breathing)
- Coordinate referrals as appropriate

Compartment Syndrome

- Compartments involved:
 - lower leg (4): most affected
 - forearm (3): most affected
 - upper arm: fairly common
 - hand, buttock, thigh, abdomen: less common
- Muscle swelling, reduction capillary blood perfusion
- Metabolic demands unmet= ischemia results

Causes: Internal Forces

- Hemorrhage, edema build up
- Severe **trauma**, crush injuries, bruised muscles, burns
- Fractures (proximal tibia, distal humerus)
- Anabolic steroid use
- Infection
- Venomous snake bites
- Frostbite

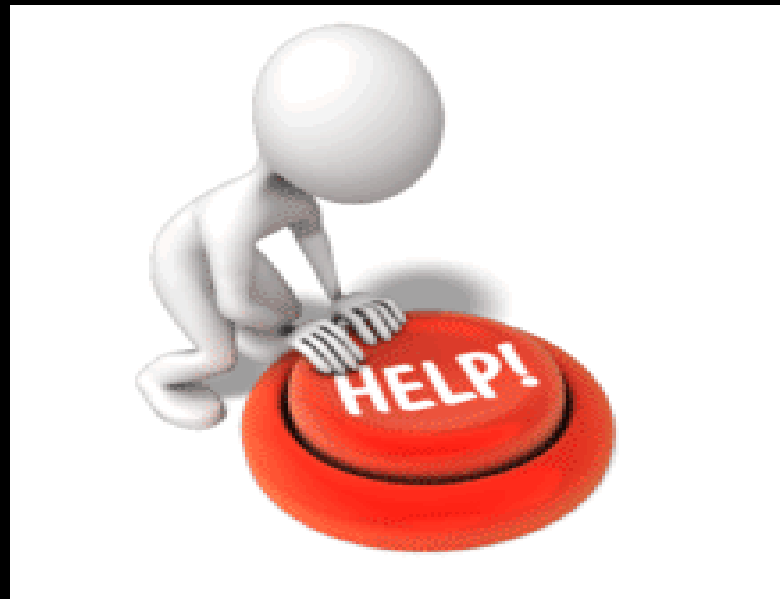
External Causes

- Tight cast, splint, dressing, brace, air trousers
- Trapped under heavy object with prolonged pressure
- Traction
- Prolonged limb compression during period of unconsciousness

Be Alert, Stay Alert!

- Symptoms :can occur as early as 30 minutes or as late as one week
- Muscle damage: irreversible after 4-6 hours of ischemia
- Nerve damage irreversible after 12-24 hours
- Can be exacerbated by hypovolemia: sequestered fluids, frank hemorrhage
- Aggressive Rx: prevent organ failure, death

Acute: Can be Limb Threatening!



Assessment: Clinical Manifestations

- Increasing **Pain**; pain out of proportion to injury; “severe pain with passive stretching”, electricity-like limb pain
- Tight or burning feeling in the skin
- Tight or full feeling in the muscle
- Swelling, bruising
- **Paresthesias**: early loss of vibratory sensation (numbness, tingling)

More Signs and Symptoms

- **Pallor:** rarely associated with syndrome
 - Intracompartmental pressure > systolic pressure = pulse absent, capillary refill delay
- **Pulses:** absent- late sign of circulatory collapse
- **Paralysis:** loss of motor function
 - last sign in very late stages; indicates permanent tissue damage

Diagnosis

- Physical exam: inspection, assessment
- If syndrome suspected: compartment measurement test: needle inserted in muscle
 - after reading, patient performs activity to recreate symptoms
 - pressures retested; 30-45 mmHG a concern-tissue necrosis
 - New hypothesis: high false positive rate may exist with this test

Nursing Diagnoses

- Risk for neurovascular dysfunction
- Risk for uncontrolled pain
- Risk for infection
- Risk for impaired skin integrity
- Risk for impaired physical mobility
- Risk for delayed surgical recovery
- Risk for knowledge deficit

Interventions

- Relieve pressure source: remove splint, bivalve cast, release/decrease traction, loosen/remove constrictive bandage, remove CPM
- Extremity: at heart level- not above=causes decrease in local arterial perfusion, **NO** ice
- Hydrate: maintain mean arterial pressure
- Effective pain management, oxygenation

Interventions Continued.....

- Perform frequent neurovascular assessment
- When checking extremity pulse (dorsalis pedis), occlude other major artery (post.tibial)
- Compare pulses to opposite non-injured side:
r/o vascular injury
- Monitor urine output
- Monitor serum levels of CPK. LDH, SGOT:
muscle damage indicated by elevated values
and myoglobin in urine

Surgical Treatment

- Fasciotomy:
 - Decompression of compartment
 - Pressure remains high: ischemia is a threat
 - No tourniquets used
 - Passive ROM daily post-op
 - 3-5 days post-op: examine/debride wound
 - Skin graft if necessary: close wound
 - Amputation possible

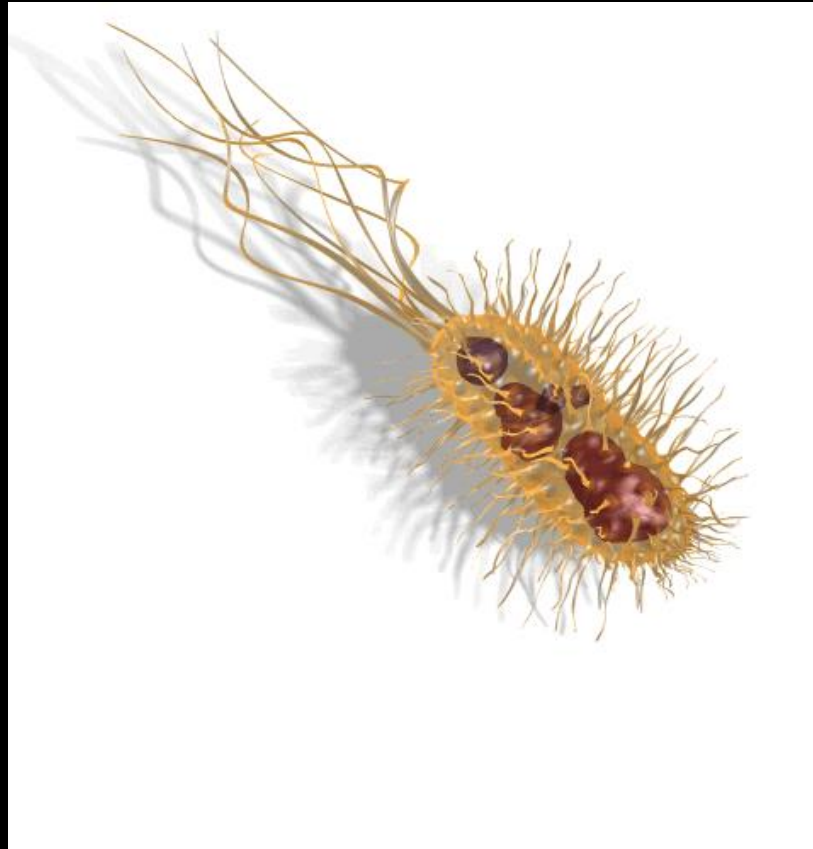
Educational Needs

- Who to call and when to call for guidance; importance of post-discharge follow up
- Teach patient/caregiver about pain and comfort plan (pharmacological and other)
- Teach patient/caregiver signs and symptoms of infection, proper wound care
- Ensure accommodation in the home if patient has activity restrictions

Complications

- Objective sensory and motor deficit
- Volkmann's contracture
- Infection
- Muscle necrosis, destruction
- Permanent nerve injury
- Amputation
- Limb deformity, contracture
- Acute renal failure

Infection- Need I Say More



SSI: Surgical Site Infection

- Superficial incision, deep incision, or organ/space surgical site infections that occur within 30 days after operative procedure
- Most frequent pathogens: Staph Aureus, Staph Epidermis, Streptococcus species
- MRSA: increasingly important cause of infections

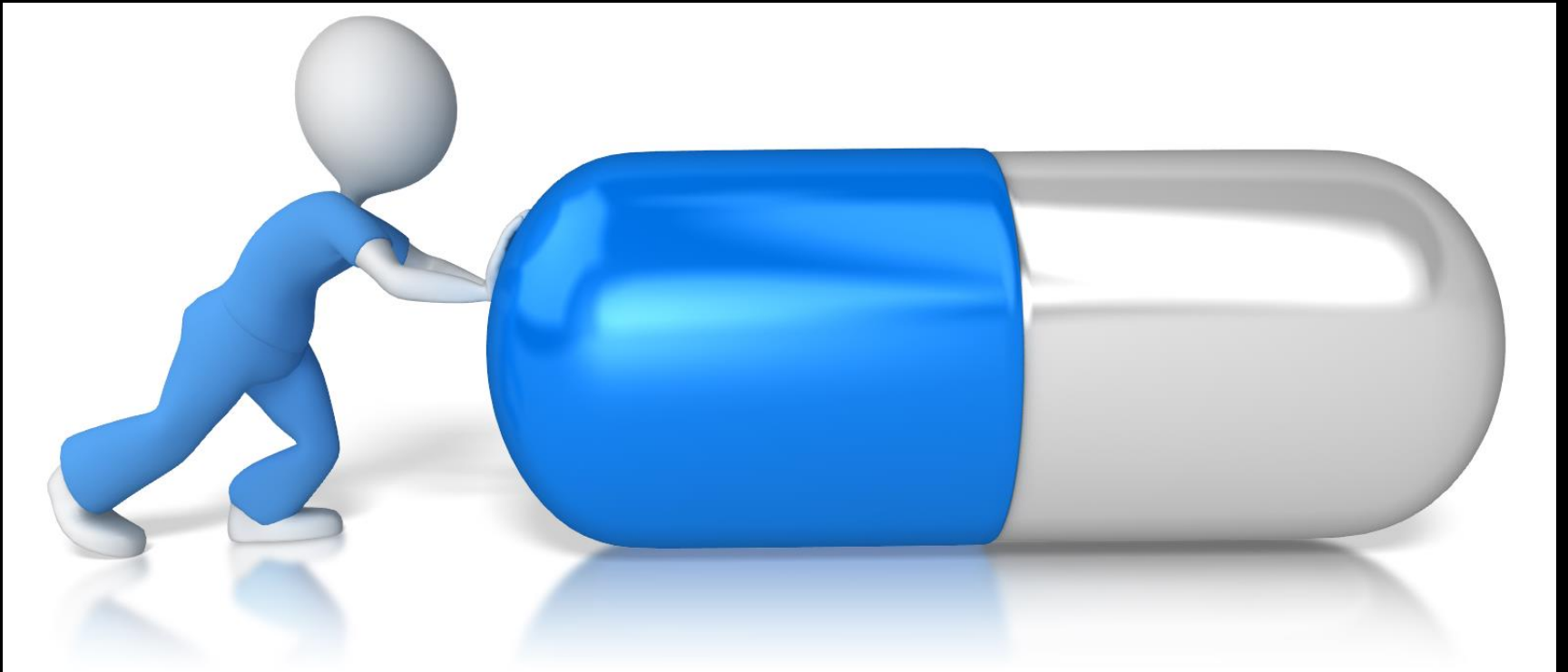
Assessment-Clinical Manifestations

- Redness /edema around incision/wound
- Purulent discharge from wound/incision
- Malodor from wound/incision
- Increased temperature around incision/wound; increased pain
- Poor wound healing
- Elevated body temperature
- Elevated WBC, C-reactive protein (10mg/L), ESR= erythrocyte sedimentation rate

Nursing Diagnoses

- Delayed surgical recovery: teach patient & caregiver signs / symptoms of infection, wound care and medications
- Pain: control environment to enhance patient's response to discomfort; initiate drug therapy as well as non pharmacological pain management techniques

Don't forget to Medicate



Risk Factors

- Patient characteristics:
 - Immuno-compromised, another infection
 - diabetes, obesity, malnutrition
 - substance abuse (including tobacco)
- Injury characteristics: wound class
 - extent of tissue **trauma**, foreign bodies
 - multiple bone fractures, bone displaced
 - vascular injury, periosteal (bone membrane) stripping

Pre-op and Intra-op Risk Factors

- Pre-op factors: length of pre-op stay
 - inadequate immobilization
 - prolonged time from injury to stabilization
- Intra-op factors:
 - + wound cultures, use of drains & packings
 - surgery length and type, surgeon expertise
 - inappropriate use antibiotics; hair removal
 - contamination: glove punctures, drapes

Postoperative Risk Factors

- Inadequate analgesia
- Inadequate aseptic technique
- Insufficient fluid replacement
- Compromised blood perfusion
- Low oxygenation
- Cold ambient temperature
- Hypertension
- Elevated glucose levels

Inter-operative Interventions

- Antimicrobial prophylaxis
- Adhere to strict aseptic technique: thorough surgical scrub, adequate sterilization
- Gentle handling of soft tissues
- Stable fixation of fractures
- Meticulous tissue debridement
- Close wound without excessive tension
- Active warming: avoid vasoconstriction

Postoperative Strategies

- Thorough hand washing
- Adequate analgesia
- Maintain adequate hydration and oxygenation
- Aseptic technique for wound care and dressing changes
- Supplemental oxygen as needed
- Active warming measures
- Keep BP& Serum Glucose in normal range

Warm The Environment!



More Interventions

- Systemic/oral antibiotics:
 - distinguish between invasive infection and surface colonization
 - check results of microbiologic culture first
- Optimal nutritional intake:
 - High protein, sufficient calories: prevent decline in lean muscle
 - Vitamins A,C,E and iron/zinc: increase wound healing and decrease infection risk

Education Needs

- Teach patient/caregiver:
 - value of frequent, thorough hand washing
 - wound care and disposal of dressings
 - signs and symptoms of infection; how to take temperature
 - adequate protein diet; vitamins A,C and E
- Develop strategies to enhance compliance with prescribed medication regimen

Answer Questions; Explain WHY



Our Target: Decrease Complications!

