

# High Risk Complications associated with Orthopedic Surgery

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# Objectives

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- 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!

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# Complications

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

# Hemorrhage

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# Assessment-Clinical Manifestations

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



# More Signs and Symptoms

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



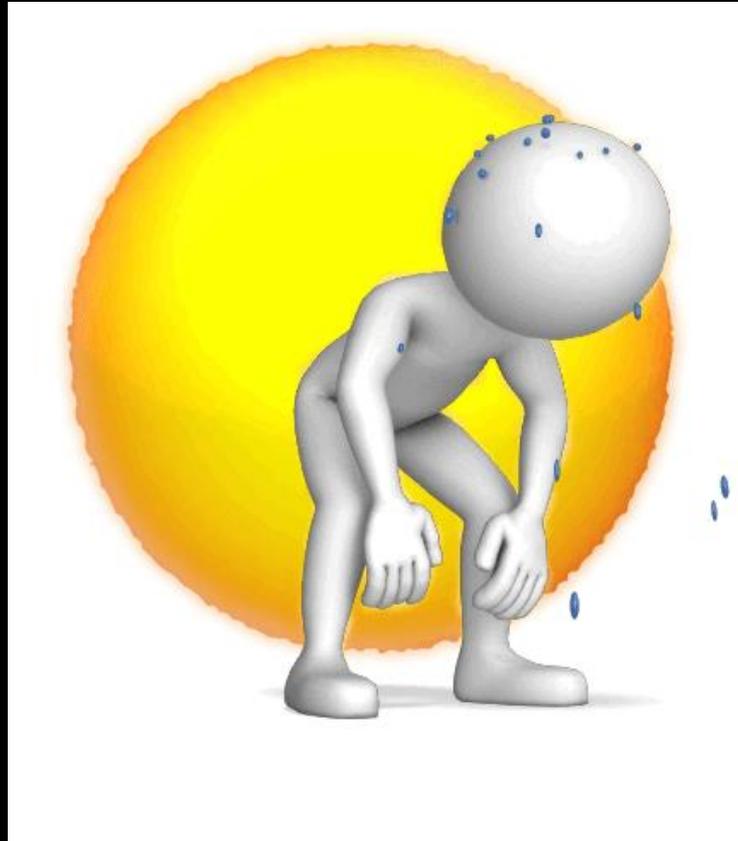
# Nursing Diagnoses

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- 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

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# Patient Risk Factors

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- 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

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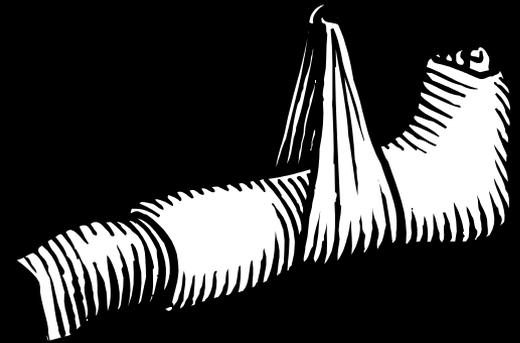
- Injury related:
  - fractured bone (pelvic)
  - foreign body
  - significant soft tissue damage
- **Trauma** surgery related
  - anatomic and technical aspects
  - skill and expertise of team



# Interventions and Treatments

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- 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

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- 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

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- 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)

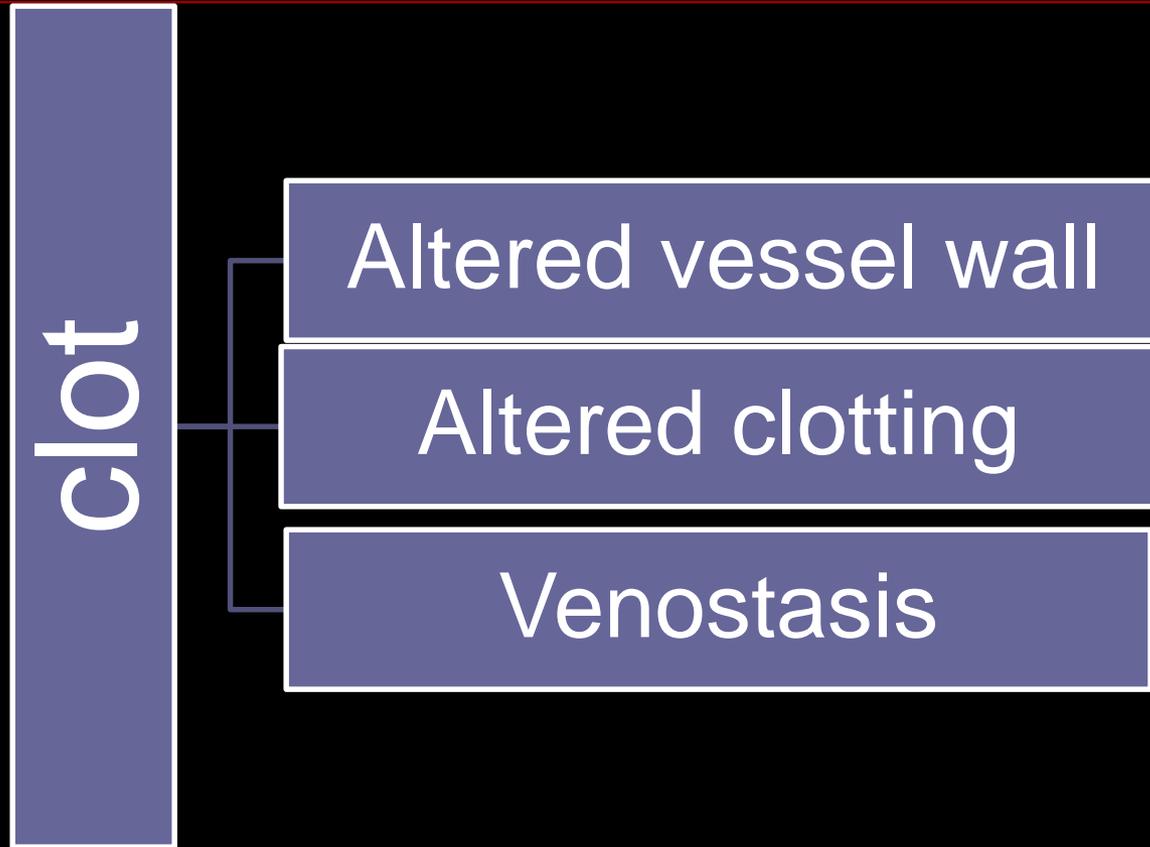
# DVT

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- 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

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# Assessment-Clinical Manifestations

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- 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

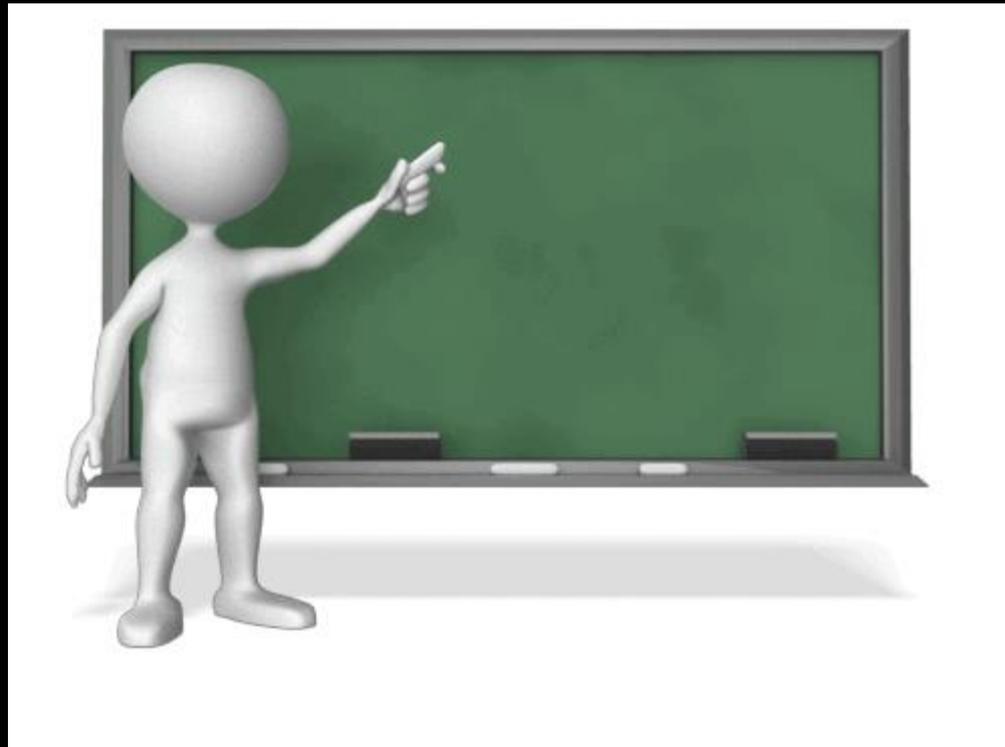
# Nursing Diagnoses

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- 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!

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# Risk Factors

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- 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

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- 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

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- 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!

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# Medications and Surgical Intervention

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

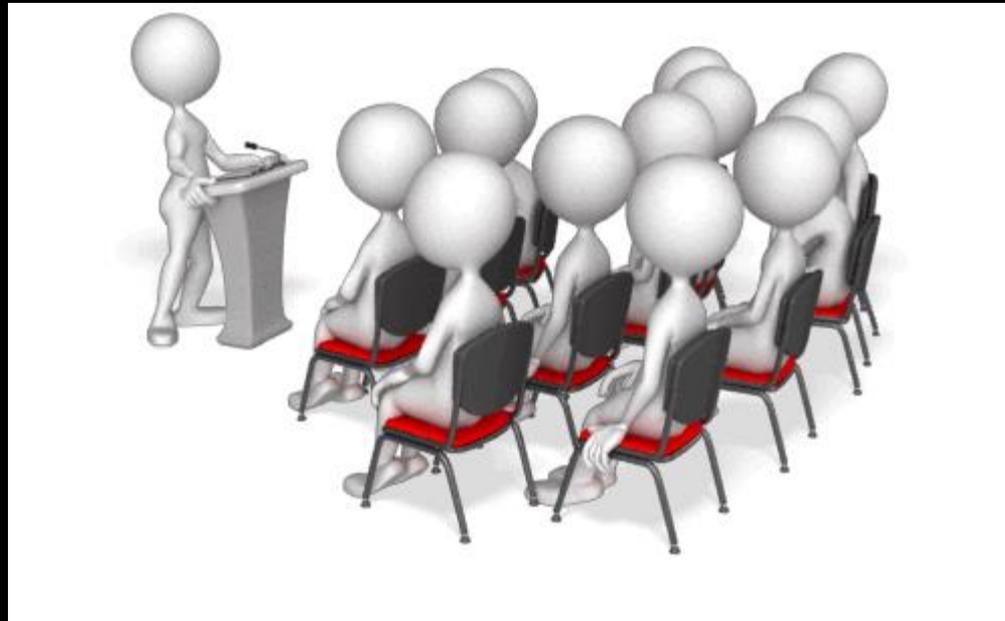
# Education Needs

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- 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

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# Fat Embolism

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- 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

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- 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!

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# Assessment-Clinical Manifestations

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- 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

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# Other Signs and Symptoms

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

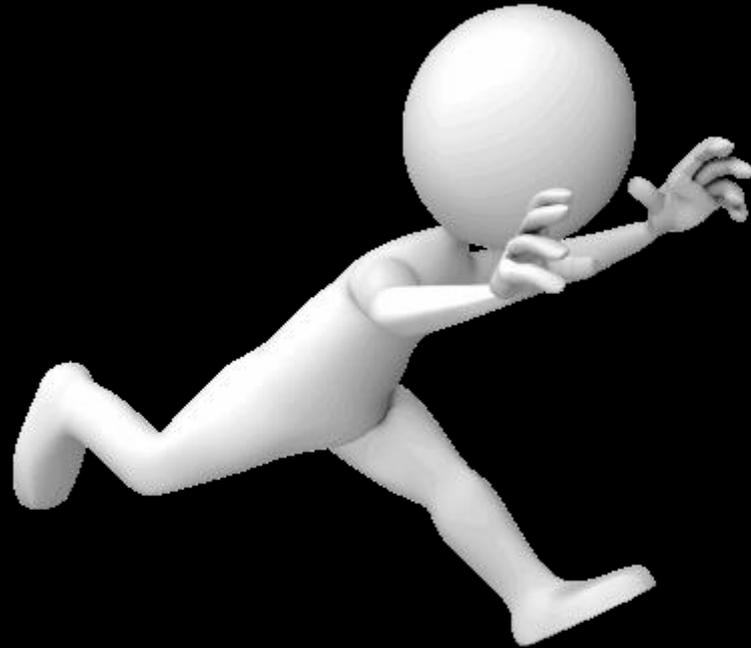
# Nursing Diagnoses

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- 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!

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# Risk Factors

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- **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

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- 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, O<sub>2</sub> saturations and ABGs

# Other Interventions

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- 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

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

# Compartment Syndrome

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- 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

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- 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

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

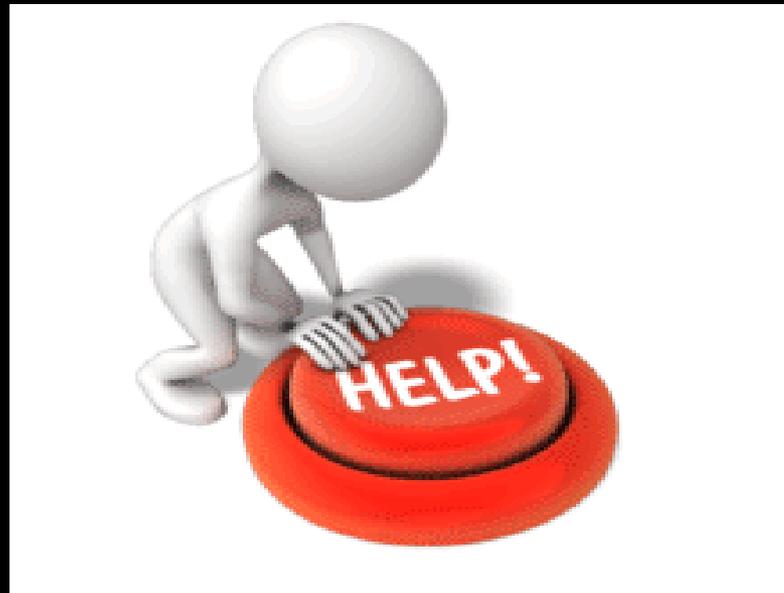
# Be Alert, Stay Alert!

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- 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!

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# Assessment: Clinical Manifestations

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- 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

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- **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

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- 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

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- 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

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- 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.....

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- 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

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- 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

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- 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

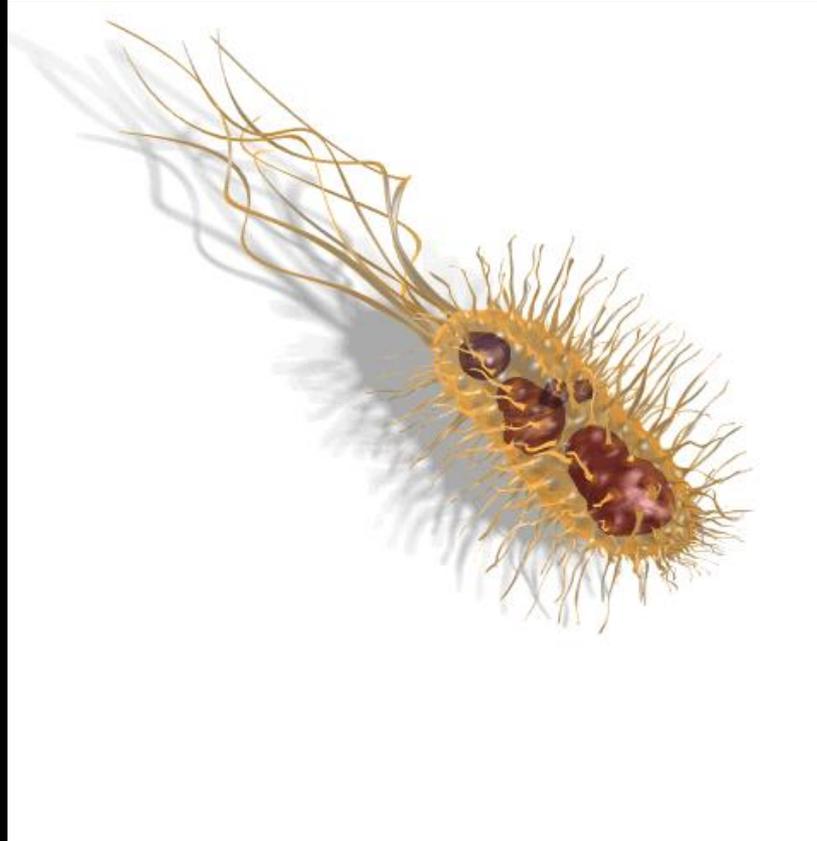
# Complications

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- 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

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# SSI: Surgical Site Infection

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- 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

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- 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

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- 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

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# Risk Factors

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- 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

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- 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

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

# Inter-operative Interventions

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- 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

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- 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!

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# More Interventions

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- 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

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- 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

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# Our Target: Decrease Complications!

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