

Shelby Koskela, RN, BSN, PHN, OCN
Patient Care Supervisor
Procedural Care, Interventional Radiology Nursing, and Wound Ostomy Nursing
Mercy Hospital, Part of Allina Health
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Objectives

- · Explain the pathophysiology, etiology, and common causes of Tumor Lysis Syndrome
- Define the common lab findings, symptoms, pre-treatment considerations, and treatment options of Tumor Lysis Syndrome
- Describe the pathophysiology and risk factors of Disseminated Intravascular Coagulation (DIC)
- Differentiate between Acute DIC and Chronic DIC
- Identify the symptoms, common lab findings, treatment options, and supportive care of Disseminated Intravascular Coagulation (DIC)
- Identify the cancer types that are at risk for Spinal Cord Compression
- · Differentiate between the symptoms of a cervical, thoracic, and lumbosacral spinal cord compression
- Explain how a spinal cord compression is diagnosed and the treatment options
- Define febrile neutropenia and the commonly seen symptoms
- Describe the assessment and management of febrile neutropenia as well as the consequences of delayed treatment and prevention tactics
- Understand the pathophysiology and risk factors of sepsis and septic shock
- · Differentiate between early symptoms of sepsis, severe sepsis symptoms, and septic shock symptoms
- · List the commonly seen lab results and treatment options of sepsis and septic shock

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Tumor Lysis Syndrome

- What is TLS?
 - A condition in which serious electrolyte imbalances occur in the body as a result of rapid cell death and necrosis of tumor tissue
- Pathophysiology
 - As tumor cells die, their normal intracellular components, such as potassium phosphate, get released into the bloodstream
 - This can cause high concentrations in the blood that the kidneys cannot eliminate quickly enough causing electrolyte and metabolic dysfunction
 - If not treated quickly, it can cause neurologic, GI, renal, and cardiac failure, and death
 - Most commonly occurs 48-72 hours after treatment

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- Etiology
 - Typically associated with:
 - · Leukemias with high white blood counts
 - Non-Hodgkin Lymphoma
 - Bulky, rapidly growing, treatment-responsive tumors
- Causes
 - Chemotherapy
 - Cisplatin, cytarabine, etoposide, paclitaxel, fludarabine, hydroxyurea, intrathecal methotrexate
 - Immunotherapy
 - Interferons, interleukins, rituximab, tumor necrosis factors
 - Hormonal Therapy
 - Tamoxifen
 - Corticosteroids
 - Surgery
 - Radiation

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Tumor Lysis Syndrome

- Laboratory Findings
 - Elevated:
 - Potassium >6 or an increase of 25% from baseline
 - Phosphorus >4.5 or increase of 25% from baseline
 - Uric Acid >8 or increase of 25% from baseline
 - Decreased
 - Calcium <7 or decrease of 25% from baseline

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- Signs and Symptoms
 - Initial
 - Nausea and vomiting
 - Abdominal pain or distension
 - Dypsnea
 - Dysrhythmias
 - Edema
 - Lethargy
 - Muscle or joint pain
 - Muscle twitching
 - Progressive
 - Increased GI symptoms
 - · Oliguria, hematuria, azotemia, progressing to anuria
 - CHF, hypertension, then tachycardia, then bradycardia, progressing to ventricular arrhythmias
 - Progressive muscle weakness, paresthesias, tetany, and seizures
 - Unrecognized
 - Acute kidney failure
 - Cardiac arrest
 - DIC
 - Death

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Tumor Lysis Syndrome

- Pre-Treatment Considerations & Assessment
 - Labs
 - Electrolytes
 - Renal function
 - Liver function
 - · Baseline weight
 - · Baseline electrocardiogram
 - · Diet considerations
 - Avoid foods high in potassium and phosphorus
 - Medication review
 - Avoid medications that may increase potassium (ACE Inhibitors, potassium sparing diuretics)

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- Treatment
 - Hydration
 - Aggressive hydration beginning 24-48 hours prior to the initiation of treatment and for 72 hours after treatment
 - Hydration supports renal blood flow, maintains urine output, decreased concentration of soluble acids in the urine
 - Ensure urine output is greater than 150-200mL/hour
 - Allopurinol
 - · Prohibits precursors of uric acid
 - · Given prophylactically, even to those with low risk
 - Begin medication 1-2 days prior to treatment and for 2-3 days post-treatment
 - Rasburicase
 - Converts circulating uric acid into water soluble metabolite, allowing plasma and urine uric acid levels to decrease rapidly

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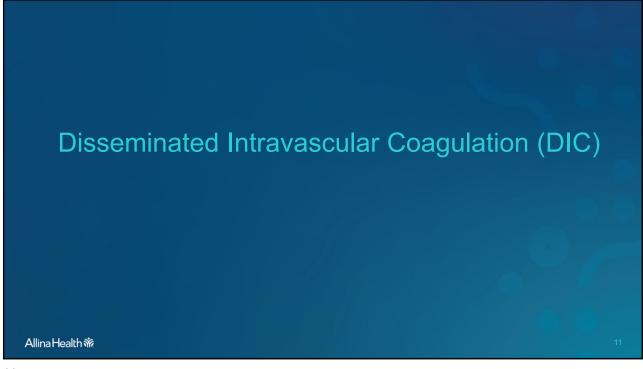
Tumor Lysis Syndrome

- · Treatment Cont.
 - Loop Diuretics
 - · May help prevent fluid overload and maintain urine output
 - Oral Phosphate-Binding drugs (Albumin)
 - · Treatment for hyperkalemia and hyperphosphatemia
 - Dialysis
 - · If renal failure occurs

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DIC

- DIC is a complex system disorder that involves the activation of coagulation pathways, leading to thrombotic and hemorrhagic events
- Pathophysiology
 - DIC causes hypercoagulation, triggering the coagulation pathways to be initiated inappropriately
 - The cascade begins with the release of tissue factor, causing the release of thrombin
 - This release then causes plasminogen to convert to plasmin, causing fibrinolysis (the breakdown of fibrin within clots)
 - This then causes excessive fibrin degradation products (FDPs), which causes bleeding
 - The final result is a situation of simultaneous hemorrhage and clot formation and is a lifethreatening event
 - · Blood supply to vital organs is compromised

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DIC

- DIC is always associated with an underlying disorder
- Risk Factors
 - Sepsis
 - · Some solid and hematologic cancers
 - · Trauma, especially neurotrauma
 - · Severe transfusion reaction
 - Organ destruction
 - Toxic reactions
 - · Heat stroke / hyperthermia
 - · Rheumatologic disorders
 - · Some obstetric complications

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DIC

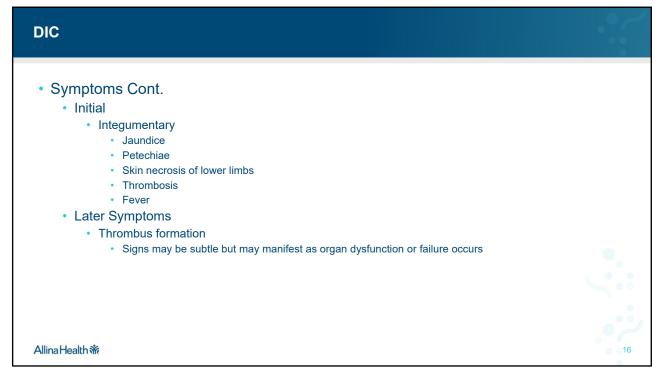
- Acute DIC
 - Causes
 - · Infection is the most common underlying cause of acute DIC
 - Infection may produce a systemic inflammatory response, activating the cytokine system that begins the hypercoagulation cascade
 - · Oncological Conditions
 - · Acute promyelocytic leukemia (APL) is most often associated with acute DIC (85% of patients)
 - In APL, tissue factor is released directly from the promyelocyte blast cells into the blood stream, beginning the coagulation pathway of events
 - Symptoms
 - Bleeding that occurs simultaneously form at least 3 unrelated sites is a hallmark sign of acute DIC
- Chronic DIC
 - Causes
 - Solid metastatic mucinous adenocarcinomas and tumors of the prostate, breast, stomach, lung, and pancreas
 - Symptoms
 - Associated with minimal bleeding and diffuse thrombosis

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DIC Symptoms Initial Bleeding · Anywhere from occult/oozing to frank hemorrhage Renal Acidosis Hematuria Oliguria Uterine hemorrhage Pulmonary Dypspnea Hemoptysis Cough Tachypnea · Diminished breath sounds · Pleural friction rub Allina Health %

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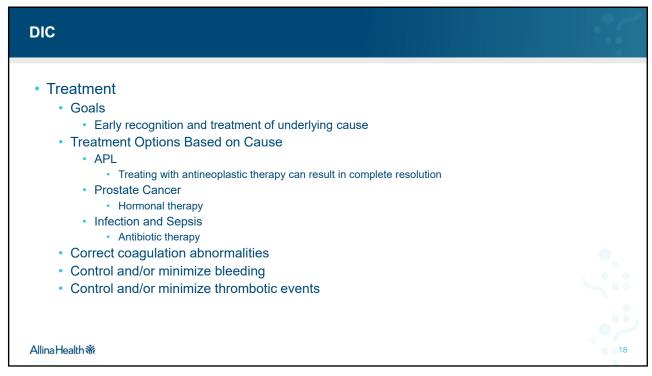
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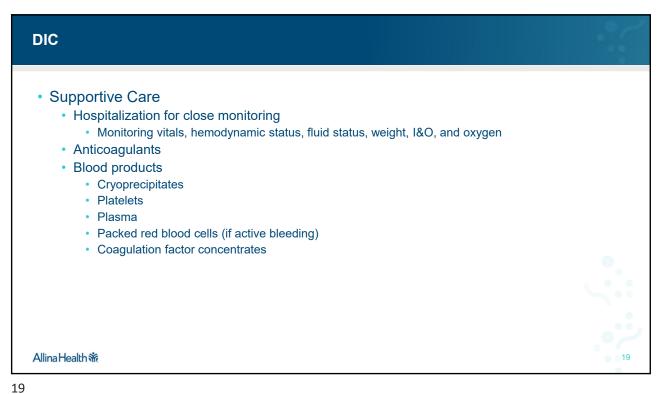
DIC Laboratory Findings Decreased Platelets • Fibrinogen level (severe cases, decreases slowly) Antithrombin III Plasminogen Alpha-2 antiplasmin level Protein C Elevated Fibrin degrading products (FDPs) D-Dimer Thrombin time Firbinopeptide A level Prolonged Results Prothrombin time · Partial thromboplasmin time International normalized ratio (INR)

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Spinal Cord Compression

Cancer Types

- Tumors commonly metastasizing to the spinal cord
 - Lymphomas, neuroblastomas, seminomas
- Tumors commonly associated with bone metastasis that can result in SCC
 - Breast, prostate, lung, renal, myeloma, Non-Hodgkin lymphoma, Hodgkin Lymphoma
- Tumors that are primary spinal cord tumors
 - Ependymoma, glioma, astrocytoma

Location on the Spine

- Thoracic Spine 70%
- Cervical Spine 10%
- Lumbosacral Spine 20%



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Spinal Cord Compression

- Cervical Symptoms
 - Early
 - · Occipital headache, radiating to neck/shoulder, neck stiffness
 - Neurogenic shock (hypotension, bradycardia)
 - Paresthesia
 - Lhermitte sign (tingling sensation on back and extremities when neck is flexed or extended)
 - Hyperactive deep tendon reflexes
 - Late
 - Quadriplegia
 - · Bladder, bowel, and sexual dysfunction
 - · Autonomic hyperreflexia
 - · Lesion above C4, may have diaphragmatic dysfunction



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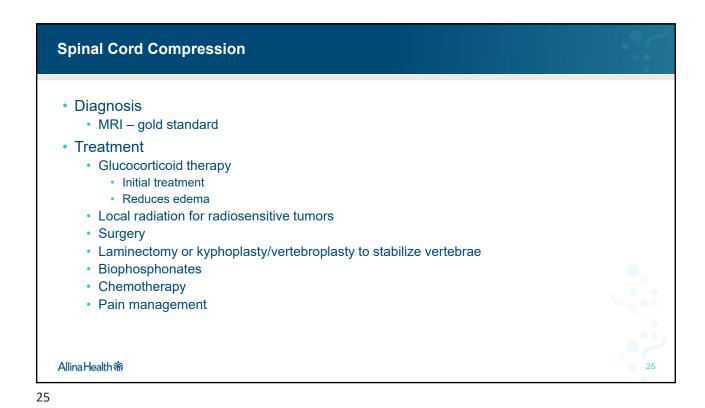
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Spinal Cord Compression • Thoracic Symptoms • Early • Pain, local or radicular, or both • Abdominal muscle weakness • Lower extremity weakness • Paresthesia around the abdomen • Decreased sensation below the site of the lesion • Increased deep tendon reflexes distal to the lesion • Late • Lower extremity paralysis • Bladder, bowel, sexual dysfunction • Risk of autonomic hyperreflexia AllinaHealth AllinaHealth AllinaHealth 23

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• Lumbosacral Symptoms • Early • Pain, local, or radicular, or both, in groin and down legs (sciatica) • Pain while raising legs straight • Weakness in pelvic muscles & lower extremities • Ataxia gait • Paresthesia and numbness • Decreased reflexes • Late • Autonomic effects • Bowel, bladder, sexual dysfunctions Allina Health Allina Health Allina Health Allina Health Allina Health • Lumbosacral Symptoms • Sexual dysfunctions • Autonomic effects • Bowel, bladder, sexual dysfunctions

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Febrile Neutropenia

- Definition
 - A disorder characterized by an ANC < 1.0 and fever > 101.0 or a sustained temperature >100.4 for more than one hour
- Considered a medical emergency
- Prompt intervention is critical to avoid morbidity and mortality
- Symptoms
 - Hypotension (SBP <90)
 - Tachypnea (RR >24)
 - Serum Albumin less than 3.3
 - Serum bicarbonate level less than 21
 - Cross-reactive protein level (CRP) greater than 20
 - High procalcitonin level greater than 2.0



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Febrile Neutropenia

- Assessments & Management
 - · Prompt intervention is essential
 - · Blood and urine cultures
 - Chest X-ray
 - VRE swabs (if indicated)
 - · Prompt administration of IV antibiotics
 - · Cefepime is the most common first-line treatment
- Consequences of Delayed Treatment
 - · Circulatory collapse
 - · Acute respiratory failure
 - · Sepsis and septic shock
 - Death

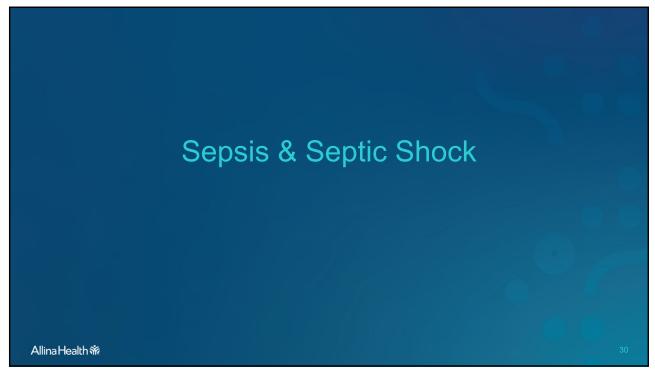
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Prevention Educating patient and caregiver on infection prevention measures Prophylactic use of colony-stimulating factors for those at high risk Filgrastim and Pegfilgrastim Prophylactic antibiotics, antivirals, and antifungals for patients with hematologic malignancies at high risk Allina Health Allina Health 29

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Sepsis & Septic Shock

- Pathophysiology
 - Gram-negative bacteremia is found in the majority of patients
 - Gram-positive bacteremia has been increasing due to the increased use of central vascular access devices and the use of cytotoxic agents
 - Endotoxins (released from gram-negative bacteremia) and exotoxins (released from gram-positive bacteremia) enter the blood stream
 - The endotoxins/exotoxins cause a release of histamine, interleukins, tumor necrosis factoralpha, and vasoactive mediators, which in turn causes vasodilation
 - This process activates a coagulation cascade with fibrin/platelet aggregate formation resulting in microthrombin, seen in sepsis
 - The release of cytokines and increased thrombin formation continue to affect each other, leading to capillary leak syndrome, further vasodilation, increased fibrin formation, decreased blood flow, and decreased tissue perfusion

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Sepsis and Septic Shock

- Risk Factors
 - Granulocytopenia
 - Most common risk factor
 - · Increased duration and severity increases the risk
 - Extreme age (>1 or <65)
 - Long intensive care hospitalizations
 - Loss of skin or mucosal injury
 - Malignancy-related immunosuppression
 - · Humoral immunity modifications
 - Multiple myeloma
 - · Chronic lymphocytic leukemia
 - Diabetes
 - Comorbid organ dysfunction
 - · Presence of a vascular access device

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Sepsis & Septic Shock

Early Sepsis Symptoms

- High cardiac output with normal or slightly elevated blood pressure
- Capillary leak (edema develops)
- Subsequent hypotension
- Nausea

Severe Sepsis Symptoms

- Hypotension, causing hypoperfusion of organs
- · Normal or elevated temperature
- · Warm, flushed skin
- Bounding pulse
- Tachypnea
- Tachycardia
- Decreased gastrointestinal motility (nausea & vomiting)
- Abnormal hematologic status
- Hyperglycemia
- Lactic acidosis
- Oliguria
- Mental status changes



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Sepsis & Septic Shock

- Septic Shock Symptoms
 - Cold, clammy skin
 - · Lethargy, progressing to coma
 - Hypotension
 - Tachycardia
 - Weak pulse
 - Tachypnea
 - Decreased breath sounds with pulmonary edema/rales
 - Renal failure
 - · Persistent hematologic abnormalities
 - Hyperglycemia
 - Lactic acidosis
 - Hyponatremia
 - Hypokalemia
 - Hypocalcemia
 - Hypomagnesemia
 - Hypophosphatemia
 - Decreased albumin

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Sepsis & Septic Shock

- Lab Findings
 - · Complete Blood Count
 - Increased or decreased white blood cells
 - Decreased hemoglobin
 - Decreased platelets
 - Metabolic panel
 - Glucose increased with sepsis and septic shock, decreased with prolonged septic shock
 - Increased
 - BUN
 - Creatinine
 - Decreased
 - Sodium
 - Potassium
 - Calcium
 - Albumin
 - Magnesium
 - Phosphate
 - Prolonged Prothrombin time / partial prothrombin time
 - Elevated lactate
 - · Elevated biochemical markers

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Sepsis & Septic Shock

Sepsis Treatment

- · Fluid resuscitation
- Respiratory support
- DVT prophylaxis
- Antibiotics
- Antifungals
- Blood products
- · Electrolyte replacement
- Nutritional support
- Insulin support
- Vasopressors and inotropic drugs
- Activated protein C replacement

Septic Shock Treatment

- ICU monitoring for aggressive and continuous monitoring
 - · Central venous pressure monitoring
 - · Oxygen support & pulse oximetry
- Aggressive fluid resuscitation
- Intubation and ventilation due to pulmonary edema, encephalopathy, and/or coma
- Supportive treatments
 - Prophylaxis for stress ulcers
 - DVT prophylaxis
 - Nutritional support
 - Assessment/intervention for delirium
 - Psychosocial support and education

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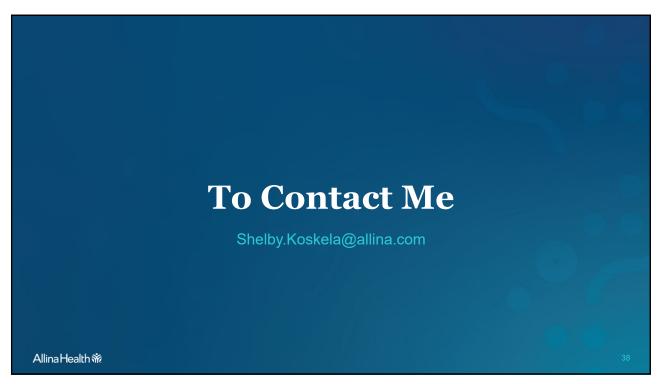
Works Cited

- Cancer Quest. (2018). Cancer Biology. Retrieved from https://www.cancerquest.org/index/php/cancer-biology
- National Cancer Institute. (2018). Cancer as a Disease. Retrieved from https://training/seer.cancer.gov/disease/
- National Cancer Institute. (2018, April). *Understanding Cancer*. Retrieved from https://www.cancer.gov/about-cancer/understanding/what-is-cancer#-cell-differences
- Oncology Nursing Society. (2016). Core Curriculum for Oncology Nursing (5th Edition ed.). St. Louis, MI: Oncology Nursing Society
- Oncology Nursing Society. (2016). Putting Evidence into Practice. Retrieved from https://www.ons.org/practice-resources/pep
- Oncology Nursing Society. (2016). Study Guide for the Core Curriculum for Oncology Nursing. (5th Edition). (P.A.-C. ilers, M. R. Langhorne, & R. P. Fink, Eds.) St. Louis, MI: Oncology Nursing Society

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