ONCOLOGIC EMERGENCIES

KRISTINE POWELL
MSN RN CEN NEA-BC FAEN
Learning Outcome(s):

- Describe 3 categories of oncologic emergencies
- Describe assessment and management of patients with tumor lysis syndrome, febrile neutropenia, and superior vena cava syndrome.
- Describe nursing implications for care of patients with tumor lysis syndrome, febrile neutropenia, superior vena cava syndrome, and spinal cord compression.

Conflicts of interest: None

Employer: Baylor Scott & White Health

Sponsorship / commercial support: None
<table>
<thead>
<tr>
<th>Rank</th>
<th>Cause of Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Heart Diseases</td>
</tr>
<tr>
<td>2</td>
<td>Cancer</td>
</tr>
<tr>
<td>3</td>
<td>Chronic lower respiratory diseases</td>
</tr>
<tr>
<td>4</td>
<td>Accidents (unintentional injuries)</td>
</tr>
<tr>
<td>5</td>
<td>Stroke (Cerebrovascular diseases)</td>
</tr>
<tr>
<td>6</td>
<td>Alzheimer disease</td>
</tr>
<tr>
<td>7</td>
<td>Diabetes</td>
</tr>
<tr>
<td>8</td>
<td>Influenza &amp; pneumonia</td>
</tr>
<tr>
<td>9</td>
<td>Renal disease</td>
</tr>
<tr>
<td>10</td>
<td>Intentional self-harm</td>
</tr>
</tbody>
</table>
## 2016 Estimated U.S. Cancer Deaths

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Source: American Cancer Society</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td>314,290</td>
<td>281,400</td>
<td></td>
</tr>
<tr>
<td><strong>Lung &amp; bronchus</strong></td>
<td>26%</td>
<td>26%</td>
<td>Lung &amp; bronchus</td>
</tr>
<tr>
<td><strong>Prostate</strong></td>
<td>8%</td>
<td>14%</td>
<td>Breast</td>
</tr>
<tr>
<td><strong>Colon &amp; rectum</strong></td>
<td>8%</td>
<td>8%</td>
<td>Colon &amp; rectum</td>
</tr>
<tr>
<td><strong>Pancreas</strong></td>
<td>7%</td>
<td>7%</td>
<td>Pancreas</td>
</tr>
<tr>
<td><strong>Leukemia</strong></td>
<td>6%</td>
<td>5%</td>
<td>Ovary</td>
</tr>
<tr>
<td><strong>Liver &amp; bile duct</strong></td>
<td>6%</td>
<td>4%</td>
<td>Uterine</td>
</tr>
<tr>
<td><strong>Esophagus</strong></td>
<td>4%</td>
<td>4%</td>
<td>Leukemia</td>
</tr>
<tr>
<td><strong>Non-Hodgkin lymphoma</strong></td>
<td>4%</td>
<td>3%</td>
<td>Liver &amp; bile duct</td>
</tr>
<tr>
<td><strong>Urinary bladder</strong></td>
<td>4%</td>
<td>2%</td>
<td>Non-Hodgkin lymphoma</td>
</tr>
<tr>
<td><strong>Brain/Nervous sys</strong></td>
<td>3%</td>
<td>2%</td>
<td>Brain/Nervous sys</td>
</tr>
<tr>
<td><strong>All other sites</strong></td>
<td>24%</td>
<td>25%</td>
<td>All other sites</td>
</tr>
<tr>
<td>Cancer Type</td>
<td>Men</td>
<td>Women</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>21%</td>
<td>29%</td>
<td></td>
</tr>
<tr>
<td>Lung &amp; bronchus</td>
<td>14%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Colon &amp; rectum</td>
<td>8%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>7%</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Melanoma of skin</td>
<td>6%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>5%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Kidney &amp; renal pelvis</td>
<td>5%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Leukemia</td>
<td>4%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Oral cavity</td>
<td>4%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Liver/Bile duct</td>
<td>3%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>All Other Sites</td>
<td>23%</td>
<td>18%</td>
<td></td>
</tr>
</tbody>
</table>

Breast                          | 13%          | 18%           |
Lung & bronchus                  | 8%           | 13%           |
Colon & rectum                   | 7%           | 8%            |
Uterine corpus                   | 6%           | 7%            |
Thyroid                          | 5%           | 6%            |
Non-Hodgkin lymphoma             | 3%           | 4%            |
Melanoma of skin                 | 3%           | 5%            |
Kidney & renal pelvis            | 3%           | 7%            |
Ovary                            | 3%           | 8%            |
Pancreas                         | 3%           | 9%            |
Leukemia                         | 3%           | 10%           |
All Other Sites                  | 23%          | 18%           |

Source: American Cancer Society
Neoplasm = new & Abnormal formation of tissue (tumor)

- Benign tumor (NOT cancer)
- Malignant tumor (cancer)
- **Benign Tumors**
  - Structure typical of tissue of origin
  - Slow rate of growth
  - Mostly encapsulated
  - Slightly vascularized
  - Does not metastasize
  - Necrosis, ulceration unusual
  - Rarely recurs after removal
ONCOLOGY DEFINITIONS

- **Malignant Tumors**
  - Structure atypical of tissue of origin
  - Rapid rate of growth
  - Loosely or not encapsulated
  - Moderately to highly vascularized
  - Metastasizes
  - Necrosis, ulceration common
  - Frequently recurs after removal
<table>
<thead>
<tr>
<th>Tissue Type</th>
<th>Cancer Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epithelial tissues</td>
<td>Carcinoma</td>
</tr>
<tr>
<td>Melanocytes of skin</td>
<td>Melanomas</td>
</tr>
<tr>
<td>Connective tissues</td>
<td>Sarcomas</td>
</tr>
<tr>
<td>Lymphatic tissues</td>
<td>Lymphomas</td>
</tr>
<tr>
<td>Plasma cells</td>
<td>Multiple myeloma</td>
</tr>
<tr>
<td>Glial tissues of CNS</td>
<td>Neurogliomas</td>
</tr>
<tr>
<td>Granular leukocytes</td>
<td>Leukemias</td>
</tr>
</tbody>
</table>
TYPES OF TREATMENT

Chemotherapy
Radiation therapy
Surgery
Hormone therapy
Biological therapy (immunotherapy)
Alternative & complementary therapies
   (acupuncture & homeopathic therapies)
Symptom treatment
ONCOLOGIC EMERGENCIES

- **Metabolic**
  - Tumor lysis syndrome
  - Hypercalcemia of malignancy
  - Syndrome of inappropriate antidiuretic hormone

- **Hematologic**
  - Febrile neutropenia
  - Hyperviscosity syndrome

- **Structural**
  - Superior vena cava syndrome
  - Spinal cord compression
  - Pericardial effusion/tamponade

- **Other**
  - Infection, Pain, Nausea, vomiting, diarrhea, dehydration
  - Extravasations of chemotherapy agents

Oncologic emergencies may be due to the disease process or treatment.
ONCOLOGIC EMERGENCIES

• Metabolic
  • Tumor lysis syndrome
  • Hypercalcemia of malignancy
  • Syndrome of inappropriate antidiuretic hormone

• Hematologic
  • Febrile neutropenia
  • Hyperviscosity syndrome

• Structural
  • Superior vena cava syndrome
  • Spinal cord compression
  • Pericardial effusion/tamponade

• Other
  • Infection, Pain, Nausea, vomiting, diarrhea, dehydration
  • Extravasations of chemotherapy agents
ONCOLOGIC EMERGENCY CASE STUDY 1
CASE #1

- 53 year old
- c/o nausea, vomiting, diarrhea, general malaise and loss of energy
- Decreased urinary output
- History of abdominal mass
- Recently started on biotherapy
CASE #1

- Lab work
  - WBC
  - Potassium
  - Phosphate
  - Uric Acid
  - LDH

=> Tumor lysis syndrome
TUMOR LYSIS SYNDROME

- Death of cancer cells
- 2-10 days after therapy
  - May be delayed weeks for solid bulky tumors
  - May be spontaneous
- Most common with leukemias, lymphomas, and bulky solid tumors
- Electrolyte imbalances with metabolic triad of:
  - Hyperuricemia
  - Hyperkalemia
  - Hyperphosphatemia (with hypocalcemia)
<table>
<thead>
<tr>
<th>TUMOR LYSIS SYNDROME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>URIC ACID</strong></td>
</tr>
<tr>
<td><strong>POTASSIUM</strong></td>
</tr>
<tr>
<td><strong>PHOSPHOROUS</strong></td>
</tr>
<tr>
<td><strong>CALCIUM</strong></td>
</tr>
</tbody>
</table>
TUMOR LYSIS SYNDROME

Symptoms
- Subtle – fatigue, nausea, vomiting, diarrhea, lethargy, muscle cramps, joint discomfort
- Severe – Decreased urine output, edema, weight gain, hematuria, SOB, seizures, muscle tetany, heart palpitations, dysrhythmias, metabolic acidosis, altered mental status, acute renal failure
TUMOR LYSIS SYNDROME

- Increased uric acid levels from breakdown of purines from tumor nuclei

- Symptoms:
  - 10-15 mg/dl: lethargy, nausea, vomiting, urate crystals in urine, renal colic, hematuria
  - >20 mg/dl: potential renal failure, mental status changes
TUMOR LYSIS SYNDROME

- Treatment of Hyperuricemia
  - Decrease production –
    - **Allopurinol** (decreases uric acid production and purine synthesis)
    - **Rasburicase** (converts uric acid to allantoin which is more soluble than uric acid and can reduce the chance of ARF.)
  - Urinary alkalinization to promote solubility (goal urine pH 7.0-7.5)
  - Hemodilute – volume expansion with IVF
TUMOR LYSIS SYNDROME

- Hyperkalemia arises from release of intracellular K from dying tumor cells
- Worsened by renal failure, acidosis, increased intake (ie. From PRBC transfusions and K-containing meds)
- Monitor for dysrhythmias
- Standard treatments (kayexalate, acute treatment with insulin/glucose, loop diuretics, inhaled beta-agonists (albuterol), sodium bicarb with severe acidosis, calcium gluconate.)
TUMOR LYSIS SYNDROME

- Hyperphosphatemia/hypocalcemia
  - Lymphoblasts have more PO$_4$ than normal lymphocytes
  - PO$_4$ eliminating through glomerular filtration only
  - Increased risk when Ca x PO$_4$ > 60 mg/dl
TUMOR LYSIS SYNDROME

- Tx of Hyperphosphatemia/Hypocalcemia
  - Hydration
  - Correct hyperphosphatemia with binders (aluminum hydroxide, aluminum carbonate, calcium acetate)
  - Correct hypocalcemia, if needed, with calcium gluconate
  - Treat hypomagnesemia
  - Avoid alkalosis (lowers iCa^{++})
TUMOR LYSIS SYNDROME

Additional management

- Frequent electrolyte monitoring
- Consider dialysis for
  - Potassium > 7
  - Uric Acid > 10
  - PO4 > 10
  - Hypertension/Volume overload
  - Other symptomatic electrolyte abnormalities
INITIAL APPROACH TO ACUTE TLS

- Monitoring, frequent neuro checks, and indwelling urinary catheter with monitoring of urinary output
- Fluid resuscitation - IVF D5 1/2NS +40 meq/L NaHCO₃ at 2x maintenance
- Adjust fluids to maintain urine pH 7.0-7.5
- Correct electrolyte imbalances
- Diuretics or dialysis for the usual indications
- Monitor for and treat complications
ONCOLOGIC EMERGENCY
CASE STUDY 2
CASE #2

- 36 year old
- c/o fever, joint and body aches, lack of energy
- History of breast cancer
- Recently started on chemotherapy
CASE #2

- Findings

  - Temperature – 102.3 F
  - Heart rate - 108
  - Respiratory rate – 28
  - Blood pressure – 108/72
  - Neutrophils on CBC

=> Febrile neutropenia
Fever and Neutropenia

- Neutropenia defined as ANC (Absolute Neutrophil Count) < 500
- Falling counts just as ominous
- Fever
  - $38^\circ C (101.0^\circ F)$ any route) or $\geq 38.0^\circ C (100.4^\circ F)$ measured one hour apart or twice in a 24-hr period.
- Ill-appearing
- Signs of infection are altered by neutropenia
- High risk of rapid deterioration and death from sepsis if due to an infection
FEVER AND NEUTROPENIA

- History:
  - Date and type of last chemotherapy (Nadir 5-10 days after last treatment)
  - Previous documented infections or obvious source of infection (50% of cases)
  - Presence of central line
  - Infectious exposures
  - History of splenectomy or dysfunctional spleen
  - Other comorbidities
FEVER AND NEUTROPENIA

- Symptoms:
  - Cough/dyspnea/cheest pain
  - Retrosternal pain
  - Sore throat/dysphagia
  - Abdominal pain
  - Pain with defecation
  - Vomiting and diarrhea

Find the source
FEVER AND NEUTROPENIA

- Good physical examination
  - Any areas of pain
  - Carefully note vital signs
    \[\hat{\text{HR}}, \downarrow \text{BP}, \uparrow \text{RR} \Rightarrow \text{sepsis}\]
  - Include peri-rectal area, oropharynx, sinuses
  - Central line site or IV sites
  - Sites of previous studies

- Diagnostic Studies
  - Pan-cultures / blood cultures / Urine culture (no cath)
  - CXR, other specific sites

Find the source!!
FEVER AND NEUTROPENIA

- Precautions:
  - Direct to treatment room (not negative pressure room).
  - Keep door closed. *Neutropenic Precautions* signage.
  - Mask on pt to transport.
  - Exemplary hand hygiene.
  - Caution with potential cross-contamination from MRSA, C-diff, VRE, pediatric pts, ill staff
  - Limit invasive procedures
FEVER AND NEUTROPENIA

- Don’t Delay!

- Antibiotics - Start asap and within 60 minutes of arrival. Follow CPG for antibiotic use in neutropenic patients with cancer (Infectious Diseases Society of America)

- Anti-fungal or anti-viral, if indicated

- Symptom management (anti-pyretics, analgesics)

- Monitor for and treat sepsis
FEVER AND NEUTROPENIA

- Duration of Therapy
  - Afebrile
  - Well-appearing
  - No source => ANC > 200 and rising
  - Known source => Standard duration for that source & ANC > 500 and rising
- Optimize nutrition and hydration
- Avoid exposure to illness (bacterial, viral)
  - Females: Avoid tampons, douches
- Be knowledgeable about the risks and the early signs of infection especially if higher risk patients (e.g. indwelling catheter or use of in & out catheters, implanted port or central line)
ONCOLOGIC EMERGENCY CASE STUDY 3
CASE #3

- 58 year old
- c/o swelling to face and upper body, cough, and SOB
- progressive and worse for 2 days
- History of lung cancer

=> Superior vena cava syndrome
Occlusion of SVC causing impaired venous return
- External: Tumors, lymph nodes
- Internal: Central line clot formation

Higher incidence with breast, lung, and esophageal cancers, lymphomas, and metastasis

50% will present prior to diagnosis of cancer
**SVC SYNDROME**

- **Symptoms**
  - Cough, hoarseness, dyspnea, orthopnea, chest pain, ruddy face/chest
  - Headache, visual changes, nausea, lethargy

- **Signs**
  - Swelling face/neck/chest/upper arms, engorged conjunctiva, distended neck and chest wall veins, collateral veins-chest, diaphoresis, wheezing, stridor, cyanosis of face/neck, airway compromise
  - LATE – decreased cardiac output from decreased venous return
SVC SYNDROME

- Diagnosis:
  - CXR, CT chest, MRI
  - Selective venography to localize
  - Tissue diagnosis – thoracentesis
  - Lymph node biopsy
SVC SYNDROME

- Treatment:
  - Emergency airway management, as needed
  - Chemotherapy, radiation, surgery
  - Stent placement
  - Steroids, diuretics
  - HOB 45°
  - Cardio-respiratory support as indicated
ONCOLOGIC EMERGENCY
CASE STUDY 4
CASE #4

- 74 year old male
- c/o back pain-worse when lying down, constipation, and unable to urinate
- History of prostate cancer

=> Spinal cord compression
SPINAL CORD COMPRESSION

- Local or metastatic tumor invades epidural space causing cord compression
- Permanent paralysis may occur
- Higher incidence with myeloma, lymphoma, breast, lung, prostate, or renal cancer
- Most common sites – thoracic spine (60%), lumbosacral (30%), cervical (10%). Metastasis in multiple levels of spine (50%)
SPINAL CORD COMPRESSION

Presentation:
- Back pain (90% of cases) – site specific
- Referred pain (varies based on location of compression)
- Motor deficits (70%)
- Sensory deficits (30%)
- Bowel/bladder dysfunction
- Hydrocephalus – high cervical tumors
- Respiratory compromise – high SCC
SPINAL CORD COMPRESSION

- High Index of Suspicion for any cancer patient with c/o back pain
- Plain films abnormal 2/3 of cases
- CT, bone scans, myelograms
- MRI – gold standard
SPINAL CORD COMPRESSION

- Treatment - decompression
  - Don’t delay
  - Steroids
  - Chemotherapy, radiation, or surgery
  - Resolve severe constipation and urinary retention (prevention of autonomic dysfunction)

- Outcome
  - Depends on duration of symptoms
  - ½ who are non-ambulatory never recover!
OTHER ONCOLOGIC EMERGENCIES

- Hypercalcemia & other electrolyte imbalances
- Syndrome of inappropriate antidiuretic hormone (SIADH)
- Increased ICP / Herniation
- Obstruction – Airway, urinary, vascular, etc.
- Anaphylaxis from chemotherapy treatment
- Hemorrhage, severe anemia, DIC, other hematologic
- Hyperviscosity syndrome
- Pericardial effusion/tamponade
- Pain
- Chemotherapy-related nephrotoxicity or enterotoxicity
- Nausea, vomiting, diarrhea, dehydration
- Extravasations of chemotherapy agents
REFERENCES


Kristine Powell
MSN RN CEN NEA-BC FAEN
Kristine.Powell@BSWHealth.org