It’s a Tumor!
Oncologic Emergencies: What a Hospitalist Needs to Know

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No conflicts of interests

Learning Objectives
• Recognize common oncologic emergencies
• Identify strategies to manage oncologic emergencies
Road Map

- Case presentations
- Solid Tumor related oncologic emergencies
  - Infectious emergencies
  - Neurologic emergencies
  - Structural emergencies
  - Metabolic emergencies

Oncologic Emergencies: Case presentation

- 48 yo W with PMHx significant for HTN receiving chemotherapy for sarcoma presents with c/o
  - nausea, vomiting
  - extreme fatigue
  - temperature 100.5 at home.
  - No other complaints

- PMHx: HTN, Sarcoma
- SHx: nonsmoker, non-drinker
- Meds: ondansetron, Ativan

Oncologic Emergencies: Case presentation

- VS: T=100.6  HR 100  110/60  RR 18
- NAD but appears fatigued, non-toxic
- PERRL, OP clear, no mucositis
- PICC left arm without erythema/induration/drainage
- Total body exam normal except diminished breath sounds bilateral bases and slightly enlarged R thigh in comparison to L thigh from known sarcoma in the pelvis

- Do you need to know anything else?
Oncologic Emergencies: Case presentation

- Last chemo one week ago
- What do you do next?

Oncologic Emergencies: Neutropenic Fever

- Fever
  - Single oral temperature > 38.3°C (101.3°F)
  - Sustained temperature > 38°C (100.4°F) for >1 hour
- Neutropenia
  - Absolute neutrophil count <1000
- Severe neutropenia
  - Absolute neutrophil count <500

Oncologic Emergencies: Neutropenic Fever

- Most commonly seen after chemotherapy
- Risk of infection depends on
  - Depth of neutropenia
  - Duration of neutropenia
  - Comorbid conditions
- Nadir is usually 5-10 days after last chemotherapy dose
Oncologic Emergencies: Neutropenic Fever

• Presentation
  • Fever usually only symptom
  • Fever → Severe sepsis
  • Neutropenia often leads to atypical presentations of common infections
    • Pneumonia often without infiltrate on CXR
    • UTI often without pyuria

• Careful Examination is crucial
  • Particular attention: Skin, oral cavity, sites of indwelling catheters, perianal area
  • DRE discouraged

Oncologic Emergencies: Neutropenic Fever - Patient Evaluation

• Work-up:
  • Targeted history and Physical
  • Labs: BMP, CBC with differential, UA
  • BCx x2: If CVC present then one from each catheter and one from periphery
  • Respiratory symptoms: CXR, sputum Cx
    • Consider CT chest (50% of CT chest with pneumonia not seen on CXR)
  • Consider respiratory viral panel depending on season
  • Diarrhea: C difficile PCR
  • Other targeted work up depending on symptoms:
    • CT sinuses, CT A/P etc

Oncologic Emergencies: Neutropenic Fever - Microbiology

<table>
<thead>
<tr>
<th>Common Bacterial Pathogens in Neutropenic Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common gram-positive pathogens</td>
</tr>
<tr>
<td>Common gram-negative pathogens</td>
</tr>
<tr>
<td>Staphylococcus aureus, including methicillin-resistant strains</td>
</tr>
<tr>
<td>Enterococcus species, including vancomycin-resistant strains</td>
</tr>
<tr>
<td>Vibrio group strain</td>
</tr>
<tr>
<td>Streptococcus pneumonia</td>
</tr>
<tr>
<td>Streptococcus pyogenes</td>
</tr>
<tr>
<td>Common gram-negative pathogens</td>
</tr>
<tr>
<td>Escherichia coli</td>
</tr>
<tr>
<td>Klebsiella species</td>
</tr>
<tr>
<td>Enterobacter species</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
</tr>
<tr>
<td>Citrobacter species</td>
</tr>
<tr>
<td>Achromobacter species</td>
</tr>
<tr>
<td>Acinetobacter species</td>
</tr>
<tr>
<td>Stenotrophomonas maltophilia</td>
</tr>
</tbody>
</table>
Oncologic Emergencies: Neutropenic Fever

High Risk Assessment
• Profound neutropenia, ANC < 100
• Significant medical comorbidities
• MASCC score < 21
• Presence of severe mucositis or diarrhea, hypotension, new onset abdominal pain, pneumonia, neurologic changes

Low Risk Assessment
• No high risk factors
• Clinical criteria:
  • Anticipated neutropenia ≤ 7 days
  • No or few co-morbidities
  • Stable and adequate hepatic and renal function
  • More often in solid tumors

Table 1: The Multinational Association for Supportive Care in Cancer Risk Index Score

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial sepsis, septic shock and/or multiorgan failure</td>
<td>8</td>
</tr>
<tr>
<td>No hyperthermia without infection or fever &gt; 38°C</td>
<td>6</td>
</tr>
<tr>
<td>No primary or secondary malignant disease</td>
<td>4</td>
</tr>
<tr>
<td>Sepsis or neutropenic sepsis with mucositis and/or fever &gt; 38°C</td>
<td>2</td>
</tr>
<tr>
<td>Diabetes requiring insulin with moderate symptoms</td>
<td>1</td>
</tr>
<tr>
<td>Other cancer</td>
<td>3</td>
</tr>
<tr>
<td>Age &gt; 65 years</td>
<td>-</td>
</tr>
</tbody>
</table>

Max score: 26 points

MASCC score < 21 = high risk
Start vancomycin if any of the following apply:
- Presence of severe mucositis
- Skin/soft tissue infection
- Presence of pneumonia radiographically
- Concern for line infection
- Severe sepsis, hemodynamic instability
Oncologic Emergencies: Neutropenic Fever

- Outpatient Treatment per IDSA guidelines:
- Suggested Antibiotic regimen:
  - Ciprofloxacin 500mg PO q8h PLUS Amoxicillin/Clavulanate 500mg PO q8
  - PCN Allergy: Clindamycin

- Early recognition and prompt treatment are paramount
- Febrile neutropenia is defined as fever ≥ 38.3°C AND ANC<500 or impending ANC<500
- Blood cultures from peripheral vein and if present, from any CVC
- Prompt administration of IV broad spectrum abx is mandatory
- Very select few patients can be managed as outpatient otherwise Admit

Oncologic Emergencies Case Presentation

- 58 yo W with PMHx significant for breast cancer 5 years ago with negative surveillance on follow up presents to PCP's office with mid- and low back pain after pulling her grandchildren in a wagon. Pain improved with ibuprofen. No other complaints.
- PMHx: HTN, HLD
- Exam: VSS, TTP lower thoracic and lumbar spine paravertebral areas and only mild TTP midline same areas
- Tx: ibuprofen and home
Oncologic emergencies: Case Presentation

- Patient presents to the ED with worsening pain 3 days later
  - same pain
  - still no other complaints
  - Similar exam with no neurologic deficits
- Again sent home with NSAIDS and oxycodone
- 6 days later...

Oncologic Emergencies Case Presentation

- Called EMS after unable to get up from chair
- New urinary retention
- Significantly worse back pain
- Exam:
  - VSS
  - No rectal tone
  - 2/5 strength bilateral lower extremities and decreased sensation

Oncologic Emergencies Case Presentation

- What tests do you order now?
  - CT Spine
  - MRI Spine
  - PET/CT
  - CT Myelogram
  - Xray Spine
Oncologic Emergencies: Malignant Spinal Cord Compressions

Vertebral bone metastasis grows into the epidural space and compresses the spinal cord.

Para spinal mass grows through the neural foramina.

Metastasis in the vertebral body causes its collapse and bone fragments are displaced in the epidural space.

<table>
<thead>
<tr>
<th>Patients</th>
<th>Pain (%)</th>
<th>Weakness (%)</th>
<th>Sensory deficit (%)</th>
<th>Autonomic dysfunction (%)</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>398</td>
<td>83</td>
<td>67</td>
<td>90</td>
<td>48</td>
<td>3</td>
</tr>
<tr>
<td>153</td>
<td>88</td>
<td>61</td>
<td>78</td>
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<td>139</td>
<td>96</td>
<td>76</td>
<td>53</td>
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<td>79</td>
<td>70</td>
<td>91</td>
<td>46</td>
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<tr>
<td>77</td>
<td>94</td>
<td>85</td>
<td>57</td>
<td>57</td>
<td>35</td>
</tr>
</tbody>
</table>

Table: Clinical presentation of malignant spinal-cord compression
Oncologic Emergencies: MSCC - Diagnosis

- **MRI**
  - Gold Standard
  - Sensitivity: 93%
  - Specificity: 97%
  - Image entire spine!

- **CT**
  - If contraindications or lack of availability of MRI

- Radionuclide bone scans and PET-CT can detect MSCC but not as accurate as MRI

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Oncologic Emergencies: MSCC – Treatment

- **Corticosteroids**
  - Sorenson et al 1994
    - Single-blind RCT of high dose (96mg) dexamethasone vs. no steroids
    - Ambulatory after treatment: 81% vs. 68%
    - Ambulatory 6 months later: 59% vs. 33%
    - Life table analysis showed better ambulation course with steroids (p<0.05)

- Little agreement on dose
  - Vecht et al 1989
    - No differences in pain, ambulation or bladder function between low and high dose steroids
    - High dose may be associated with increased toxicity
Oncologic Emergencies: MSCC - Treatment

• Surgery vs. RT vs. Combination:
  • Prospective trial:
    • Patchell, 2005
      • Surgery + XRT vs. XRT alone

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Oncologic Emergencies: MSCC - Patchell, 2005

<table>
<thead>
<tr>
<th></th>
<th>Surgery + RT</th>
<th>RT alone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of patients able to walk after treatment (p=0.081)</td>
<td>84%</td>
<td>57%</td>
</tr>
<tr>
<td>Time patients retained ambulation from treatment (p=0.003)</td>
<td>122 days</td>
<td>13 days</td>
</tr>
<tr>
<td>Regained ambulation (p=0.01)</td>
<td>62%</td>
<td>19%</td>
</tr>
</tbody>
</table>

• surgery group also required less pain meds and steroids

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Learning Points: MSCC

• MSCC may be the presenting feature of cancer in up to 20% of patients
• Hx of worsening back pain in patients with cancer warrants urgent investigation
• MRI whole spine is imaging modality of choice
• Dexamethasone administration if any concern while awaiting imaging
• Decompressive surgery followed by XRT is superior to XRT alone
• Failure of immediate diagnosis and treatment is associated with significant morbidity and compromised quality of life
Oncologic Emergencies: Case presentation

• 72 yo M with NSCLC presents with confusion and fatigue. No other complaints
• PMHx: NSCLC with bone mets (Femur), HTN, CAD
• SHx: Current smoker, social drinker

Oncologic Emergencies: Case presentation

• VS: AF  HR 92  BP 122/68  94% RA
• Thin, comfortable appearing
• Non-focal exam except difficulty remembering 3 items at 5 minutes
• Labs: Hgb 9.8, otherwise wnl
• Next Study...
Oncologic Emergencies: Brain Metastases

- Most common form of malignant CNS involvement
  - Up to 200,000 cases/year in the US

- Most common sites:
  - Lung
  - Breast
  - Melanoma
  - Leukemia/Lymphoma

- Usually present in hemispheres due to higher blood flow

- Causes symptoms via:
  - Direct compressive effects
  - Vasogenic edema

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Oncologic Emergencies: Brain Metastases

- Signs/Symptoms depends on location of metastases
  - Common:
    - Headaches
    - Seizures
    - Focal deficits (e.g., Weakness)

- Work up includes
  - Physical Exam: delineate neurological deficits
  - CT head
  - MRI Brain
    - Can show lesions too small for CT
    - Better tissue contrast

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Oncologic Emergencies: Brain Metastases - Treatment

- Symptomatic Treatment
  - Dexamethasone
    - For vasogenic edema
  - Anticonvulsants
    - Non-enzyme inducing anticonvulsants are preferred
    - Phenobarbital
    - Levetiracetam
    - Gabapentin
    - Securapty is still performed but no evidence
      - Definitely for hemorrhagic metastasis as more likely to cause seizures

- Definitive treatment → Surgery and RT
  - Limited role for chemotherapy
Oncologic Emergencies: Brain Mets-Prognostic Groups

- **Class I** → Median survival 7.1 months
  - Age <65
  - Karnofsky score <70
  - No extracranial disease
  - Primary tumor not progressive

- **Class II** → Median survival 4.2 months
  - Anyone NOT in class I or III

- **Class III** → Median survival 2.3 months
  - Karnofsky score <70

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Oncologic Emergencies: Case presentation

- 80 yo M with colon cancer presents with shortness of breath.
- Gradual over 2-3 weeks, unable to sleep flat, unable to walk across the room
- PMHx: colon, cancer, DJD, HTN
- SHx: 20 pk/yr smoking, quit 20 years ago

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Oncologic Emergencies: Case Presentation

- VS: AF  HR 120  100/90  26  94% 3L
- Neck veins distended
- RRR without murmurs, 2+ pitting edema
- Lungs CTAB, tachypneic
- Rest of the exam normal
What study do you get next?

• ECHO

Oncologic Emergencies: Malignant Pericardial Effusion

• Development:
  • Direct extension
  • Common in lung, breast and mediastinal lymphoma
  • Mets to the epicardium
  • Non-contiguous cancers
  • Primary
    • Exceedingly rare, usually mesothelioma
  • Poor prognosis
    • Especially if >350mL
    • High mortality within the year
Oncologic Emergencies: Malignant Pericardial Effusion

**Presentation:**
- Symptoms depend on rapidity of onset
- Common:
  - Dyspnea, chest pain, cough, dysphagia, hiccups, hoarseness
- Physical exam:
  - Tachycardia, distant heart sounds, JVD, UE and LE edema, pulsus paradoxus
  - Beck’s triad: elevated JVP, hypotension, muffled pericardium (rare)
  - Tamponade: hypotension, shock with tachycardia and JVD

**Management:**
- Drainage of fluid
  - Pericardiocentesis
  - Pericardial window
  - Pericardial drain catheter placement
- Systemic control of underlying malignancy with chemotherapy
- Decompression can produce paradoxical hemodynamic instability
- Often portends poor prognosis

**Symptoms dependent on rapidity of accumulation**

**Needs drainage once develops tamponade features**

**Systemic control of disease necessary**

**Portends a poor prognosis**
Oncologic Emergencies: Case Presentation

- 45 yo M with 45pk/yr tobacco abuse presents with worsening shortness of breath worse with exertion and worse when supine, pain between his shoulder blades, cough and new rash in a band like pattern over his chest
- PMHx: none
- SHx: 45pk/yr tobacco abuse, social drinker

Oncologic Emergencies: Case Presentation

- VS: AF HR 98 110/56 RR 20 96% RA
- Pertinent physical exam findings:
  - Facial swelling
  - Increased respiratory effort when supine
  - Telangiectasias on chest wall
  - Dilated veins on the neck and chest wall

Oncologic Emergencies: Superior Vena Cava Obstruction

- Gradual compression of the superior vena cava
  - Leads to edema and retrograde flow
- 15,000 cases/year in the US
  - Associated with advanced disease
  - <10% survive >30 months after treatment
- Average symptoms last ~45 days
  - 90% note duration of symptoms < 8 weeks
- Symptoms may improve spontaneously due to dilation of collateral circulation
Malignant causes of SVC Obstruction

<table>
<thead>
<tr>
<th></th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-small cell lung carcinoma</td>
<td>50</td>
</tr>
<tr>
<td>Small cell lung carcinoma</td>
<td>22</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>12</td>
</tr>
<tr>
<td>Metastatic carcinoma</td>
<td>9</td>
</tr>
<tr>
<td>Germ cell carcinoma</td>
<td>3</td>
</tr>
<tr>
<td>Others (thymoma, mesothelioma)</td>
<td>4</td>
</tr>
</tbody>
</table>

Oncologic Emergencies: SVC Syndrome – Clinical Presentation

**Symptoms of SVC Syndrome**

- Facial Swelling
- Dyspnea
- Cough
- Arm swelling
- Orthopnea
- Pain
- Dysphagia
- Syncope
- Headache
- Stridor

**Signs of SVC Syndrome**

- Dilated neck veins 70.1%
- Facial Swelling 68.1%
- Superficial chest veins 60.1%
- Arm swelling 46%
- Edema 30.5%
- Cyanosis 22.7%
- Vocal cord paralysis 4.7%
- Obtundation 1%

Oncologic Emergencies: SVC syndrome – Work up

- Usually diagnosed clinically BUT imaging often obtained for confirmation
  - CT Chest with contrast
Oncologic Emergencies: SVC Syndrome - Treatment

- Definitive management
  - Chemotherapy
  - Radiation based on tumor type causing obstruction
- Stenting (IR)
  - Increasingly common
  - Seems to be safe and effective
  - No randomized trials yet of chemoRT vs. stenting
- Rowell, 2002:
  - Systematic review
  - SVCO relief:
    - 95% stent vs. 77% chemoRT
  - SVCO relapse:
    - 11% stent vs. 17% chemoRT

Learning Points: SVC Syndrome

- Malignancy accounts for more than 90% of cases of SVCO.
- SVCO is often not immediately life threatening; thus, an attempt should be made to establish the etiology which dictates management.
- Initiation of high dose steroids often results in symptomatic relief.
- Insertion of an intravascular stent often results in symptomatic relief within 24–48 h.
- Radiotherapy provides good palliation in the majority of patients.

Oncologic Emergencies: Case presentation

- 72 yo M with NSCLC presents with confusion and fatigue. No other complaints
- PMHx: NSCLC with bone mets (Femur), HTN, CAD
- SHx: Current smoker, social drinker
Oncologic Emergencies: Case presentation

- VS: AF HR 92 BP 122/68 94% RA
- Thin, comfortable appearing
- Non-focal exam except difficulty remembering 3 items at 5 minutes
- CT Head Negative
- Labs: Calcium 15.4, Hgb 9.8, Creatinine of 1.7

Calcium Regulation

Oncologic Emergencies: Hypercalcemia

PTHrP
- Most common mechanism ~80%
Bone Metts
- with paracrine effects
- bone destruction
Vit D analogue production
- mostly heme malignancies
Ectopic PTH production
- rare, usually lung cancer
Sources of Hypercalcemia

Oncologic Emergencies: Hypercalcemia

- Management:
  - Hydration with NS
  - Once hydrated:
    - IV bisphosphonate
      - Pamidronate superior to most other bisphosphonates
        - Fatemi, 1992
        - Vinhilois, 1997
        - Zoledronic acid shown to be superior to pamidronate
        - Major, 2001
      - Bisphosphonates are superior to hydration alone
        - Ralston, 2004
    - Use with caution in patients with renal impairment

Learning Points: Hypercalcemia

- Malignancy accounts for two thirds of patients requiring admission for treatment of hypercalcemia
- Hypercalcemia is defined as a corrected serum Ca\(^{2+}\) concentration greater than 2.6 mmol/l.
- Severe hypercalcemia can cause life threatening complications such as acute pancreatitis, acute renal failure, and coma
- Initial management includes appropriately aggressive fluid replacement followed by a bisphosphonate.
- Bisphosphonates should be used with caution in patients with renal impairment.
Oncologic Emergencies: SIADH

- Diseases originating in or involving:
  - Lungs
  - 45% of patients with SCLC
  - Pleura
  - Thymus
  - Brain
- Iatrogenic:
  - Chemotherapy
- Pain
- Lung involvement
- Infections, effusions

Oncologic Emergencies: SIADH - Management

- Rule out:
  - Adrenal insufficiency
  - Hypothyroidism
  - Medication culprits
- Treatment:
  - Severe – hypertonic saline
  - Fluid restriction
  - Lasix
  - Demeclocycline: causes nephrogenic DI
  - Profound polyuria, hepatotoxicity
  - Vaptans
# Tumor Lysis Syndrome

- **Definition:**
  - Uric acid: ↑
  - K⁺: ↑
  - PO₄: ↓
  - Ca²⁺: ↑

- **Risk Factors for TLS:**
  - Bulky disease
  - Very sensitive to chemotherapy
  - LDH/uric acid: ↑
  - Hypovolemia
  - Poor urine output

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**Cairo-Bishop Lab Definition:** Either a 25% change or level above or below normal for any two or more serum values of the following within 3 days before or 7 days after initiation of chemotherapy.

<table>
<thead>
<tr>
<th>Characterized by</th>
<th>Risk Factors for TLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ Uric acid</td>
<td>Bulky disease</td>
</tr>
<tr>
<td>↑ K⁺</td>
<td>Rapid cellular turnover</td>
</tr>
<tr>
<td>↑ PO₄</td>
<td>Very sensitive to chemotherapy</td>
</tr>
<tr>
<td>↓ Ca²⁺</td>
<td>↑ ↑ LDH/uric acid</td>
</tr>
<tr>
<td></td>
<td>Hypovolemia</td>
</tr>
<tr>
<td></td>
<td>Poor urine output</td>
</tr>
</tbody>
</table>
### Tumor Lysis Syndrome – Definition, Clinical

- Cairo-Bishop clinical definition of TLS:
  - Creatinine 1.5 x ULN
  - Cardiac arrhythmia
  - Seizure

### Tumor Lysis Syndrome – Treatment

- Prevention is Key
  - IVFs
  - Allopurinol
    - Slow onset of action
  - Rasburicase
    - Rapid onset of action
    - Inhibits uric acid production and uropathy

### Oncologic Emergencies: TLS – Clinical Presentation

- Variable
  - GI: nausea, vomiting
  - Fluid imbalances: overload, edema, low UOP
  - Cardiac: CHF, arrhythmias
  - MSK: lethargy, cramps, tetany
  - Neuro: syncope, seizures, sudden death
  - GU: hematuria
The End.....Finally!

Questions?

• Thank you!