Hematology-Oncology Emergencies in the Hospital

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Hem/Onc Emergency Case #1

- 56 yo man with established metastatic prostate cancer to bone
- PSA 166 at diagnosis 18 mos prior to admission
- Prostate bx Gleason score 5+5
- Bone scan positive diffusely
- PSA fell to 2.2 with LHRH analog therapy
Hem/Onc Emergency Cases

- 14 mos after dx, PSA rising despite attempts at chemotherapy
- Multiple painful bony areas, even soft tissue masses
- Now presents with 5 days of gait difficulty, progressing to left foot drop and inability to walk
- Admitted to...you guessed it...hospitalist service
More History

- Mild foot drop progressed to complete inability to move leg in 36 hours (5 d ago)
- No new (back) pain, taking percocet q 4 hr for pains in multiple places
- No bowel movement x 4 days
- No problems with urination
- Right leg now starting to feel same as left – weak with some numbness and tingling radiating down the whole leg
Physical exam

- Thin but not cachectic
- Mass palpable on anterior chest wall
- Diffuse abd tenderness but no invol guarding
- No spinal tenderness
- 2/5 Left LE strength throughout 4/5 R LE hip flexor
  No LE reflexes but toes downgoing bilaterally
  Diminished pinprick bilaterally
- Diminished but present rectal tone, huge prostate
**Lab tests**

- Creatinine, lytes, calcium, lft’s nl
- CBC okay x mild anemia (hgb 11)
- PSA last 52 at outside facility, pending here

**Imaging**

- CXR obtained showing mets and chest wall mass
- Lumbar spine MRI done showing substantial mass at L5 compressing nerve root
L4 - Normal
L5 – Extensive Tumor
**Radiation Therapy Consult**

- Tell me when you’re ready to treat him
- Neurosurgery should have right of first refusal

**Neurosurgery consult**

- No thecal sac compression
- Nerve roots involved directly by tumor
- No role for surgical decompression without cord compression
- Recommend XRT and chemotherapy
Hem/Onc Consult

- Neurosurgery has right of first refusal
- We’ll call radiation oncology
- Chemotherapy change later

Empiric Meds

- Patient comes on decadron 4 mg PO q 6 hours
- Given morphine PCA for bony pains
Clinical Course

- Starts XRT urgently
- Day 1 is already feeling better
- Day 2 is even better
- Day 3 is getting weaker both subjectively and objectively
- Rad Onc says “it’s not OUR fault”
There’s no additional history
- There are no new labs
- Patient says yes to DNR/DNI, but still wants to be aggressive short of that
- Physical Exam:
  - 1/5 strength both lower extremities
  - Sensation gone on left
More imaging

- MRI SPINE SURVEY
- Multiple levels of metastases
- Significant cord compression at T4
Spine Survey
Empiric medications

- Casodex (bicalutamide) started
- Ketoconazole considered
- Decadron dose increased to 10 q 6 hrs

Outcome

- Patient taken to Anterior Corpectomy for acute cord decompression by Neurosurgical and CT surgery teams
- Slow recovery of sensation and motor function occurring
- Will eventually get radiation therapy
Hem/Onc Emergencies: What you always need to know

- Decision Maker: Patient, DPOA, Relative
- Tissue diagnosis: presumptive vs. biopsy-proven
- The time course of the decompensation
- Status of other disease beyond the currently involved site
Neurological Emergencies for Today

- Spinal Cord Compression
- CNS Metastases with symptoms
Neurological: Cord Compression I

- In most patients, presents as pain weeks in advance of motor symptoms/findings
- Autonomic dysfunction follows motor/sensory, so if you see it, it’s late!
- Usually occurs in diseases with vertebral body mets, not hematogenous dural mets
- Rapid deterioration (days) predicts worse outcome than longer (weeks)
The MRI view
Neurological: Cord Compression II

- You need to get:
  - A diagnosis - clear primary, or a new biopsy
  - Dexamethasone in the patient
  - Pain control: Opiates likely to be required along with bowel prophylaxis
  - MRI [or CT myelogram] of the WHOLE spine
  - Radiation Therapy IF multiple levels, poor KPS
  - Neurosurgery most other circumstances, especially no dx, or prior RT, or very rapid onset
  - A Medical Oncologist to remind you and help out
What is the right dose of dexamethasone?

1. 4 mg IV or PO q 6 hours
2. 6 mg IV or PO q 6 hours
3. 4 mg IV or PO q 4 hours
4. 6 mg IV or PO q 4 hours
5. 100 mg IV followed by 16 mg-24 mg a day in divided doses
6. Whatever you remember is fine
Surgery + XRT vs. XRT alone

- In patients with cord compression due to solid tumors:
  - Surgery + XRT preserves ability to walk [84%] versus XRT alone [57%]
  - Surgery + XRT patients walk longer [median 122 d] versus XRT alone [median 13 d]

Patchell et al, Lancet 2005; 366
Is Brain Different than Cord?

- Headache, seizures, altered mental status, or focal deficits
- Most commonly from lung or breast cancer if no prior known primary
- GI malignancies, sarcomas, prostate cancer are unusual etiologies – look for another 1°!
- If no dx, isolated to brain, consider lymphoma, HIV or not
- Surgery followed by Radiation therapy for isolated metastases improves survival vs XRT or surgery alone
Neurological: Brain Metastases

- **You need to get:**
  - A diagnosis if no known malignancy
  - Dexamethasone into the patient if there is edema, focal sx, shift (~16 mg/day, taper at end of XRT)
  - Phenytoin into the patient only if seizure witnessed/suspected
  - Good imaging of the whole brain: MRI if at all possible
  - Neurosurgery if no diagnosis, or clearly an isolated met
  - Radiation oncology will consider stereotactic radiosurgery for up to 3 or so isolated mets
Case #2

- 51 yo African American male without PMHx presents with:
  - Acute onset of both right-sided rib and back pain
  - Cough
  - Weight loss
  - Confusion
Baseline evaluation shows

- WBC 6.3, Hct 16.9, plts 340K
- Na 125, K 4.2, Cr 1.0, Ca 11, albumin 1.8, Phos 4.4
- Tender ribs, no fracture on CXR
- Blood smear with rouleaux
- Total serum protein 10.5 g/dL
- Dx: symptomatic hypercalcemia, likely from multiple myeloma
Treating Hypercalcemia: What is the first thing that you would do?

1. 80 mg IV furosemide
2. 2L Normal Saline
3. IV pamidronate
4. IV calcitonin
5. IV Solumedrol
6. Something else
Hypercalcemia manifestations

- “Stones”  
  [Renal: dehydration & nephrogenic DI; true stones rare]
- “Bones”  
  [Pain actually uncommon]
- “Abdominal Groans”  
  [Constipation, anorexia; less often nausea/vomiting]
- “Psychic Moans”  
  [Confusion, lethargy]

<table>
<thead>
<tr>
<th>Ca^{++} mg/dL</th>
<th>Ca^{i} mmol/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>1.4</td>
</tr>
<tr>
<td>12.0</td>
<td>2.0</td>
</tr>
<tr>
<td>14.0</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Mild
Moderate
Critical
Hypercalcemia of malignancy

- Usually gradual in onset
- Fatigue, constipation, anorexia, apathy, decreased LOC common manifestations
- Squamous cancers from multiple sites often make PTH-RP even without bony mets
- Breast, lung, myeloma mets common
- Prostate very rare despite bony disease
- Patients always volume depleted due to calcium-induced renal tubular defects
You need to:

- VOLUME REPLETE the patient
- Use furosemide ONLY to manage the patient’s volume status
- Administer an IV bisphosphonate. If CrCl > 30 ml/min, either pamidronate 90 mg over 3 hrs, or zoledronic acid 3-4 mg over 15 mins (800 x pamidronate potency)
- Know that calcitonin, steroids, gallium nitrate, mithramycin are not as effective (but calcitonin acts quickly)
- Know that except for myeloma, hypercalcemia predicts short survival ~5mo
How to treat hypercalcemia when CrCl <30?

1. Use 30 mg pamidronate instead of 90
2. Use calcitonin 4 units/kg SQ q 12 hr, hope renal function improves
3. If hypercalcemia severe, go ahead with full dose bisphosphonate
4. Use new osteoclast inhibitor denosumab, since common side effect is hypocalcemia
Case #3

- 77 year old woman with Chronic Lymphocytic Leukemia, intermittently receiving chemotherapy for the last 3 years for symptoms
- Admitted with dehydration, fatigue, mild renal insufficiency, anemia for fluids and transfusion (WBC = 18,000; hgb = 7.1; plts = 88,000; Cr = 2.7)
- On hospital day #2, lab calls with panic value neutrophil count of 400/mm$^3$ just as ward calls with patient temperature of 100.8F
Treating the Febrile Neutropenic Patient – First Steps?

1. Repeat labs to confirm, evaluate for a source, consider empiric antibiotics if looks ill

2. Obtain blood and urine cultures, CXR stat. Empiric cefipime + vancomycin within 60 minutes

3. As #2 but vancomycin only if has indwelling catheter, specific concern for skin infection

4. As #2 but also add filgrastim (G-CSF) 5 mcg/kg SQ daily
Neutropenic Fever I

- Almost always from chemotherapy effect (“day 10-15”), not underlying malignancy
- Duration of neutropenia predicts organisms
- Short-term = gram-negative > gram-positive
- Long-term (weeks) also fungal, viral, opportunistic
- Top of the “right now, this minute” list of common hem/onc emergencies (mortality rate 33% if antibiotics given later than 60 mins after presentation vs. 20% given sooner
Neutropenic Fever II

- You need to:
  - Fully evaluate the patient for a source
    - Blood, line cx, CXR, sputum, urine, skin, ?LP
  - If there’s a suspected source, treat it
  - If there’s NOT a suspected source (>75% of time), treat empirically for gut flora
    - Cefipime, imi/meropenem, moxifloxacin, pip/tazo, Aztreonam for pen allergy
  - Add vancomycin/linezolid if patient ill, concern for line infection (PICC>>implanted port)
  - Add coverage for lack of response (e.g. voriconazole after 3-4 days if still febrile)
  - Consider GCSF for ANC<100, sepsis, Age>65
Neutropenic Fever III – Are Hospitalists really going to see it?

- Modern Oncology Treatment continues to expand to more and more regimens for more and more cancers.
- Third, 4th, or 5th line therapy for relatively resistant cancers (lung, gastric, pancreatic, low-grade lymphomas) is now part of standard guidelines (so patients with less marrow reserve are treated more and more often).
- The timing of chemotherapy administration is less and less related to physician/clinic visits with the advent of oral chemotherapeutic regimens so it is not always obvious when “day 10” of chemotherapy is, when doing medication reconciliation.
Oral chemo causing neutropenia

- 6-mercaptopurine
- Altretamine
- Busulfan
- Capecitabine
- Carmustine
- Chlorambucil
- Crizotinib
- Cyclophosphamide
- Dasatinib
- Etoposide
- Everolimus
- Hydroxyurea
- Imatinib
- Lenalidomide
- Lomustine
- Melphalan
- Methotrexate
- Pazopanib
- Procarbazine
- Sorafenib
- Sunitinib
- Temozolomide
- Thalidomide
- Topotecan
- Vandetanib
- Vemurafenib
Case #4

- You have just received signout on a 51 year old female patient admitted for community-acquired pneumonia 2 days ago.
- Clinically she has yet to ‘turn the corner’ despite several days of antibiotics.
- Before she is seen, you get the stat page from the lab that her morning CBC shows a platelet count of 14,000 / mm$^3$. 
What do you want to know right now?

1. PT/PTT/fibrinogen to rule out DIC
2. Yesterday’s platelet count to see how far it’s fallen
3. Is the patient bleeding?
4. Has this patient received heparin in any form in the last week?
5. LDH to rule out TTP
Thrombocytopenic bleeding

- Petechiae and mucosal bleeding (the image below) are common but by themselves don’t require systemic treatment
- **Active bleeding with a platelet count under 50,000/mm³ requires platelet transfusion regardless of etiology**
# Acute Thrombocytopenia in Inpatients

<table>
<thead>
<tr>
<th>Cause</th>
<th>Severity</th>
<th>Treatment Keys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disseminated Intravascular Coagulation (DIC)</td>
<td>Variable, can be severe (&lt;20Kplts/mm³)</td>
<td>Treat the underlying disorder; Support with platelets and factors</td>
</tr>
<tr>
<td>Heparin-induced (HIT)</td>
<td>Moderate (typically 50-120K)</td>
<td>Stop all heparin products; Anticoagulate with direct thrombin inhibitor</td>
</tr>
<tr>
<td>Other drug-induced</td>
<td>Moderate</td>
<td>Stop offending drug/drug class</td>
</tr>
<tr>
<td>Thrombotic Thrombocytopenic Purpura (TTP)</td>
<td>Moderate, rarely severe</td>
<td>Plasma exchange required +/- corticosteroids</td>
</tr>
<tr>
<td>HELLP (in Pregnancy)</td>
<td>Variable, can be severe</td>
<td>Delivery</td>
</tr>
<tr>
<td>Immune (ITP)</td>
<td>Variable, can be severe</td>
<td>Diagnosis of exclusion, very unlikely to develop in inpatient</td>
</tr>
</tbody>
</table>
# Acute Thrombocytopenia in Inpatients – the Big Three

<table>
<thead>
<tr>
<th>Cause</th>
<th>Bleeding vs Clotting</th>
<th>Companion features</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIC</td>
<td>Bleeding more common</td>
<td>Elevated PT, aPTT, D-dimers, Low fibrinogen, Patient usually quite ill</td>
</tr>
<tr>
<td>HIT</td>
<td>Clotting more common (venous/arterial)</td>
<td>PT, fibrinogen should be normal, Heparin exposure 4-10 days prior to &gt;50% fall in platelet count</td>
</tr>
<tr>
<td>TTP</td>
<td>Clotting more common (arterial)</td>
<td>Normal LDH excludes diagnosis, Hemolytic anemia usually modest, Schistocytes on smear eventually prominent, At least one systemic sign or symptom should be present (mental status changes, renal insufficiency, fever)</td>
</tr>
</tbody>
</table>
If HIT is the leading diagnosis

- A negative ELISA (Anti-PF4 Ab) is reassuring, a positive test is not diagnostic
- Serotonin-release assay (SRA) is the gold standard and should be sent at the same time as the ELISA
- A direct thrombin inhibitor (must adjust bivalirudin in renal insufficiency; adjust argatroban in hepatic insufficiency) must be given while tests are pending
- Platelet count improves within days
- DVT should be looked for if not already known
How long should patients with likely HIT be anticoagulated with warfarin after their platelet counts are normal?

1. If no clot, stop; If clot, 3 months
2. If no clot, 3-4 weeks; If clot, 3 months
3. If no clot, 3-4 weeks; If clot, indefinite (at least 6 months)
If TTP is the leading diagnosis

- Patient needs Quinton or equivalent high-volume central catheter placed
- Plasma exchange is generally done daily (1 to 1.5 plasma volume exchange/day)
- Addition of daily 1 mg/kg prednisone appears to have superior outcome
- Platelet count, LDH, clinical improvement followed and usually stabilize within 5 d
- Plasma exchange usually continued every other or every third day after full platelet recovery 2-4 more times, steroids tapered
**Back to our Patient: DIC, not bleeding**

INR 1.7, aPTT 1.5 x ULN  
Fibrinogen normal, D-dimers up

- **For patients in DIC, you need to:**
  - Check PT, PTT, Fibrinogen, D-dimers BID
  - Give FFP 10-15 ml/kg for INR > 1.5 to 2
  - Give 10U cryoprecipitate for fibrinogen <150
  - Give platelets to keep > 40,000
  - Give vitamin K 10 mg SQ (patients are depleting liver-dependent factors)
  - If use heparin, adjust dose to normalize PT and fibrinogen but NOT elevate PTT (no bolus, usually 800-1000 units/hr IV)
In DIC, when should heparin be considered?

1. Once FFP, cryo and platelets given, give heparin to prevent further rise in PT/INR
2. When there is definite evidence of thromboembolism
3. When factor/platelet replacement are ongoing but DIC labs are still abnormal
4. When factor/platelet replacement are ongoing, DIC labs are abnormal, but only if patient having clotting/bleeding
SUMMARY

- In general, hematologic and oncologic emergencies occur with already-known diagnoses
- You need to know the diagnosis before instituting empiric therapy
- Steroids are almost never wrong
- Neutropenic fever is as urgent as cord compression and airway obstruction
- When in doubt, call Heme/Onc!
Suggested Real-Time References

- Internet Free:
  - Emedicine.medscape.com (reference section)
  - www.merckmedicus.com (includes Harrison’s online & Hospital Medicine online)

- Internet Cost:
  - UpToDate (www.utdol.com)
  - MDConsult (www.mdconsult.com)

- Mobile Device Applications (Free):
  - Medscape (Diseases & Conditions)
  - Clinical Care Options Oncology inPractice (Freter & Haddadin Oncologic Emergencies section)
Types of Emergencies: Systems Approach

- **Neurological**
  - Cord Compression, CNS metastases, Carcinomatous Meningitis, Hyperviscosity/TTP/Leukostasis

- **Cardiopulmonary**
  - Airway obstruction, Cardiac Tamponade, SVC syndrome

- **Metabolic**
  - Tumor lysis, Hypercalcemia

- **Hematological**
  - DIC, TTP, Neutropenic Fever, Severe Thrombocytopenia, sickle cell crises
Types of Emergencies: Urgency Approach

- **Right Now This Minute**
  - Airway obstruction, neutropenic fever, tamponade, cord compression, CNS metastases with symptoms

- **Today**
  - Coagulopathies, tumor lysis, DIC, leukostasis, TTP, hyperviscosity, severe thrombocytopenia, sickle cell complications

- **If Not Today, Tomorrow**
  - SVC syndrome, most hypercalcemia, most CNS mets without edema
Case #5

- Previously healthy 64 yo man with fatigue, confusion SOB, easy bruising for 5 days
- ER assessment:
  - Pale, in some distress, bruising and some gum bleeding, cardiac/lung/abd exam pretty benign
  - WBC 128,000, hgb 6.8, platelets 22K
  - Creatinine 3.4, K 5.6, Ca 7.8, LFTs 2 x ULN
  - T 100.2F, BP 100/50, HR 110, RR 26 02 sat 86% RA → 92% on 4L NC
- ECG: sinus tach, CXR: mild increased interstitium
Peripheral Blood Smear

Dx: Acute Leukemia NOS, 70% blasts
What do you want to do first?

1) Evaluate for DIC / Transfuse platelets
2) Check tumor lysis labs and start allopurinol
3) Give antibiotics for functional neutropenic fever & sepsis
4) Call Renal to initiate dialysis for hyperkalemia
5) Call IR for central catheter for leukapheresis
6) Give chemotherapy to reduce WBC count
Leukostasis

- Mostly in AML with WBC > 100,000
  - Fxn of cell number *and* size and deformability
  - Can occur at lower WBCs, this is a clinical dx
  - CLL, CML uncommon even with WBC >300,000
- Altered mental status, coma common, but other organs also involved
- Hypoxia, renal insufficiency concerning
- May worsen with induction chemo
- High one-week mortality left untreated
You need to get:

- The patient HYDRATED
- Quinton access (Interventional Radiology or Renal Fellow) and arrange for possible leukapheresis, diagnosis and chemotherapy
- The urge NOT to transfuse an anemic, hypoxic patient – total viscosity would increase
- Consider LP for cytology to rule in / out CNS leukemia if altered mental status
- Steroids may help demarginate WBCs
**Leukostasis**

- **Additional issues in high WBC leukemia:**
  - Plan for Tumor Lysis – it will happen with therapy or possibly on its own
  - Monitor platelet counts carefully (automated machine counts inaccurate with high WBC, and DIC is also likely, so check PT/PTT/fibrinogen)
  - Leukapheresis only useful short-term in combination with some cytoreductive chemo, indications still controversial
  - Critical that Hem/Onc involved to decide chemotherapy regimen vs count stabilization +/- apheresis
Tumor Lysis Syndrome

“A syndrome resulting from cytotoxic therapy, occurring generally in aggressive, rapidly proliferating lymphoproliferative disorders.” It is characterized by combinations of:

- Hyperuricemia
- Lactic acidosis
- Hyperkalemia
- Hyperphosphatemia
- Hypocalcemia
- Acute renal failure
Tumor Lysis Syndrome I

- Occurs in tumors with high body burden and high chemosensitivity
- Usually high-grade lymphomas or leukemias
- Small cell, germ cell less common
- Usually due to therapy, so you know the diagnosis already
- May occur at onset of therapy, or after a day or two
Tumor Lysis Syndrome II

- **Pre-treatment, you need to:**
  - Fix conditions that will make effects worse:
    - Dehydration, renal obstruction, avoid IV contrast
  - Get baseline labs: K, Ca, Phos, Uric Acid, LDH, Cr
  - Alkaline diuresis: D5•1/2NS with 2 or even 3 amps NaHCO₃/l at 200+ cc/hr, keep urine pH > 7, urine output high; ? lasix, mannitol
  - Allopurinol 600 mg load, then 300 QD to keep uric acid down
  - Rasburicase? [recombinant urate oxidase $2500/d]
  - Especially high risk patients: call renal before starting therapy
**Tumor Lysis Syndrome III**

- During treatment, you need to:
  - Keep alkaline urine output high
  - Check BID lytes, phos, UA, Ca, LDH, Cr
  - Try to keep phosphate < 7, Ca > 6, K<6
  - If Ca low, remember to give Mg, too
  - Give back Ca slowly if phosphate high
Tumor Lysis Syndrome IV

- If phosphate >7, switch NaHCO$_3$ to NS to prevent Ca-PO$_4$ deposits in kidney (urate nephropathy now less of a concern)
- Oral phosphate binders (Amphogel) help
- Acute K Rx is always good, but insulin/D-50 preferred over IV Calcium if Ca-P product high. Kayexalate fine
- May need dialysis
Neurological Emergencies

- Spinal Cord Compression (already covered)
- CNS Metastases with symptoms (already covered)
- Carcinomatous Meningitis
- Vascular Events:
  - Hyperviscosity
  - Leukostasis (already covered)
  - TTP (already covered)
Neurological: Carcinomatous Meningitis I

- Focal cranial/peripheral neuropathy, seizures common
- Unlikely to occur without other obvious systemic disease
- Hematogenous disease, lymphoma, leukemia
- CT/MRI may be negative; need CSF cytology
Neurological: Carcinomatous Meningitis II

- You need to get:
  - CSF cytology for the diagnosis
  - If high suspicion, intrathecal chemotherapy at same LP
    - Methotrexate or Ara-C ONLY!!
  - Radiation therapy to whole cranium
  - Neurosurgery if Ommaya reservoir needed for multiple courses
Neurological: Vascular Events

Hyperviscosity/ Leukostasis / TTP

- Hyperviscosity mostly with Waldenstrom’s, less common myeloma or Polycythemia Vera, or Essential Thrombocythemia
- Nonspecific sx: somnolence, headache, blurry vision, dizziness
- Serum viscosity usually > 3
- In PV, Hgb usually > 18
- In ET, platelets well over $10^6$
Neurological: Hyperviscosity

- **You need to get:**
  - The patient HYDRATED
  - Apheresis for IgM, plus chemotherapy. You will need the Hem/Onc Fellow for chemo and the Renal Fellow for a Quinton catheter!
  - Phlebotomy for PV: replace units with NS, want Hgb ~ 15
  - Hydroxyurea and aspirin for ET
Cardiopulmonary Emergencies

- Airway obstruction
- Cardiac Tamponade
- SVC syndrome
**Pulmonary: Airway Obstruction I**

- Most respiratory failure from cancer due to lymphangitic spread, chemotherapy toxicity, radiation, malignant effusions
- Also need to consider cardiac failure from chemotherapy (doxorubicin, cyclophosphamide), radiation, cardiac tamponade
- As with all airway emergencies, intubation, cricothyrotomy, Heliox may be necessary
Pulmonary: Airway Obstruction II

You need to get:

- Airway protection, corticosteroids for edema
- A diagnosis (small cell lung cancer Rx would be chemotherapy)
- Pulmonary, ENT, and CT surgery consults for stenting or laser curettage
- Medical Oncology to evaluate for XRT vs. chemotherapy or both
Cardiac: Tamponade I

- Malignant effusions are common, just not commonly symptomatic
- Presents with left or right sided failure, paradoxus, big heart on CXR
- May be vague: hiccoughs, persistent cough
- Lung, breast cancer most common primaries
- Mortality probably will be from other aspects of patient’s disease
Cardiac: Tamponade II

- You need to get:
  - An Echo and cytology from pericardiocentesis
  - Catheter drainage of the pericardial space (so leave it in at pericardiocentesis!)
  - Oncology input re: chemotherapy
  - CT surgery input re: subxiphoid pericardial window or balloon pericardiotomy, especially for recurrent effusions in patients with good performance status
Cardiopulmonary: SVC Syndrome I

- Usually from lung cancer; lymphoma, breast cancer, mediastinal tumors also possible
- Facial, symmetric or asymmetric upper extremity edema common
- Shortness of breath common but patients not hypoxic
- Only a relative emergency, even with CNS symptoms; usually collaterals working
Cardiopulmonary: SVC Syndrome II

- **You need to get:**
  - A chest CT to outline the mass that will need therapy
  - A diagnosis hopefully from another site (to avoid biopsy-induced bleeding)
  - Oncology involved; chemotherapy for small cell, lymphoma, germ cell
  - Radiation oncology for almost everything else
  - No *a priori* need for heparin or steroids
  - Call IR? New area of interest: stenting
SVC stenting for symptoms – before & after
Metabolic Emergencies

- Tumor Lysis Syndrome (already covered)
- Hypercalcemia (already covered)
Hematologic Emergencies

- Neutropenic Fever (already covered)
- DIC (already covered)
- Severe thrombocytopenia (already covered)
- Sickle cell crises (covered by Brad Lewis)
- Overanticoagulation (covered by Tracy Minichiello)
# Platelet vs. Factor Bleeding

<table>
<thead>
<tr>
<th>CLINICAL CHARACTERISTIC</th>
<th>PLATELET DEFECT</th>
<th>CLOTTING FACTOR DEFICIENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site of bleeding</td>
<td>Skin, mucous membranes</td>
<td>Deep in soft tissue</td>
</tr>
<tr>
<td>Bleeding after minor cuts</td>
<td>Yes</td>
<td>Not usually</td>
</tr>
<tr>
<td>Petechiae</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>Ecchymoses</td>
<td>Small, superficial</td>
<td>Large, palpable</td>
</tr>
<tr>
<td>Hemarthrosis, muscle hematomas</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Bleeding after Surgery</td>
<td>Immediate, mild</td>
<td>Delayed, severe</td>
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