Project: Ghana Emergency Medicine Collaborative

Document Title: Thyroid Storm

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Case of the Week

Pam Fry, MD

June 23, 2010

Objectives:

- Review an interesting case or 2 seen in the ER
- Discuss management of an acutely ill patient in the ER
- Discuss etiology of patient's illness
- Pimp an intern(s)

On a midnight shift…

- You just hang up the phone with the ME after a cardiac arrest in the ER when you hear…
- "…Code Blue 7 East…"
- …The charge nurse then comes running up to you stating "that's a nurse working on 7 East, our code team is responding and bringing the patient to you"…

15-20 minutes later…

- The code team arrives with OA:
  - 35 year-old AA woman
- Pt had a witnessed generalized tonic-clonic seizure
- Code team interventions:
  - Ativan 1mg IM
  - Started IV and gave ativan 1mg IV
  - Seizure aborted
  - Placed in full spine precautions
  - Ventilatory assistance with BVM
  - Lost IV in transit to ER

Now what?

ABC's & IV/O2/ Monitor

CT Scan

CXR

Differential Dx

DONT

EKG

HPI

Interventions*

Labs

Medications******

MRI

PMH*

Physical Exam

Ultrasound

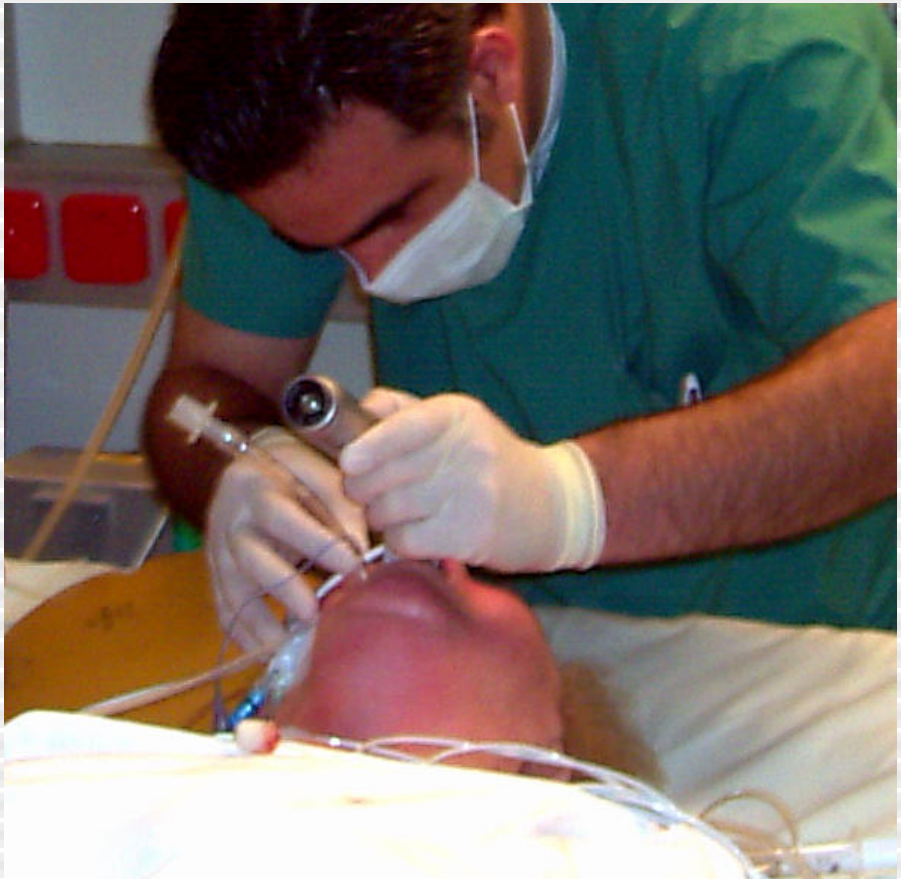
ABC's & IV/O2/Monitor

- Airway:
  - Spontaneous agonal breathing + BVM
  - RR 20
  - GCS 3
- Breathing:
  - Coarse breath sounds, equal bilaterally
- Circulation:
  - 2+ pulses throughout
- IV: being established
- O2: 100% with BVM providing FiO2 100%
- Monitor: HR 158 (sinus tach), BP 144/94

Do the DON’T!

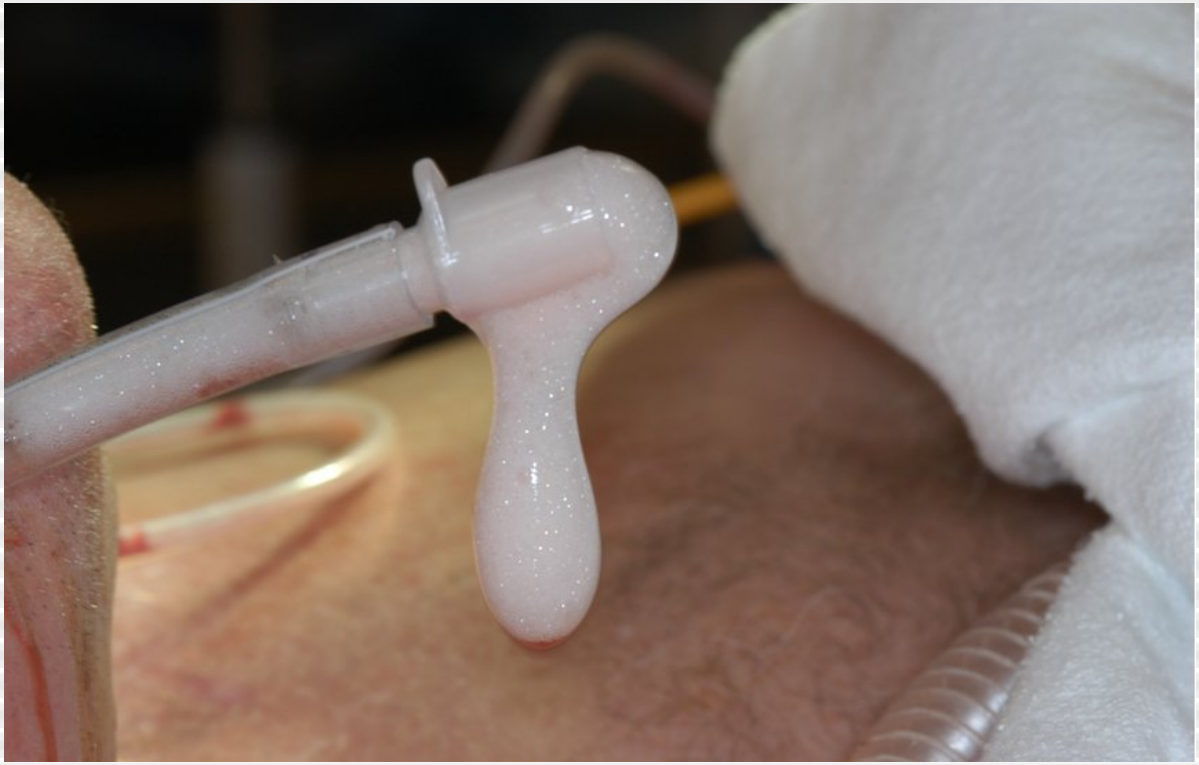
- Dextrose:
  - Accucheck: 213
- Oxygen:
  - BVM with 100% FiO2
- Nalaxone:
  - Not given
- Thiamine:
  - Not given

Intervention:



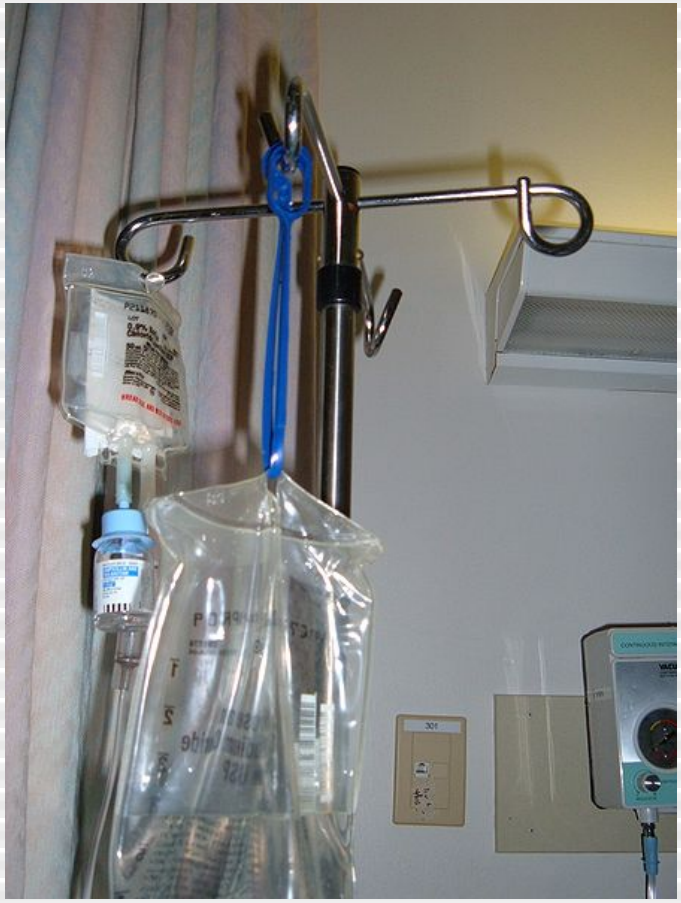
MrArifnajafov, Wikimedia Commons

Intubation Successful, But…



Source: Internet Scientific Publications

Nitroglycerin

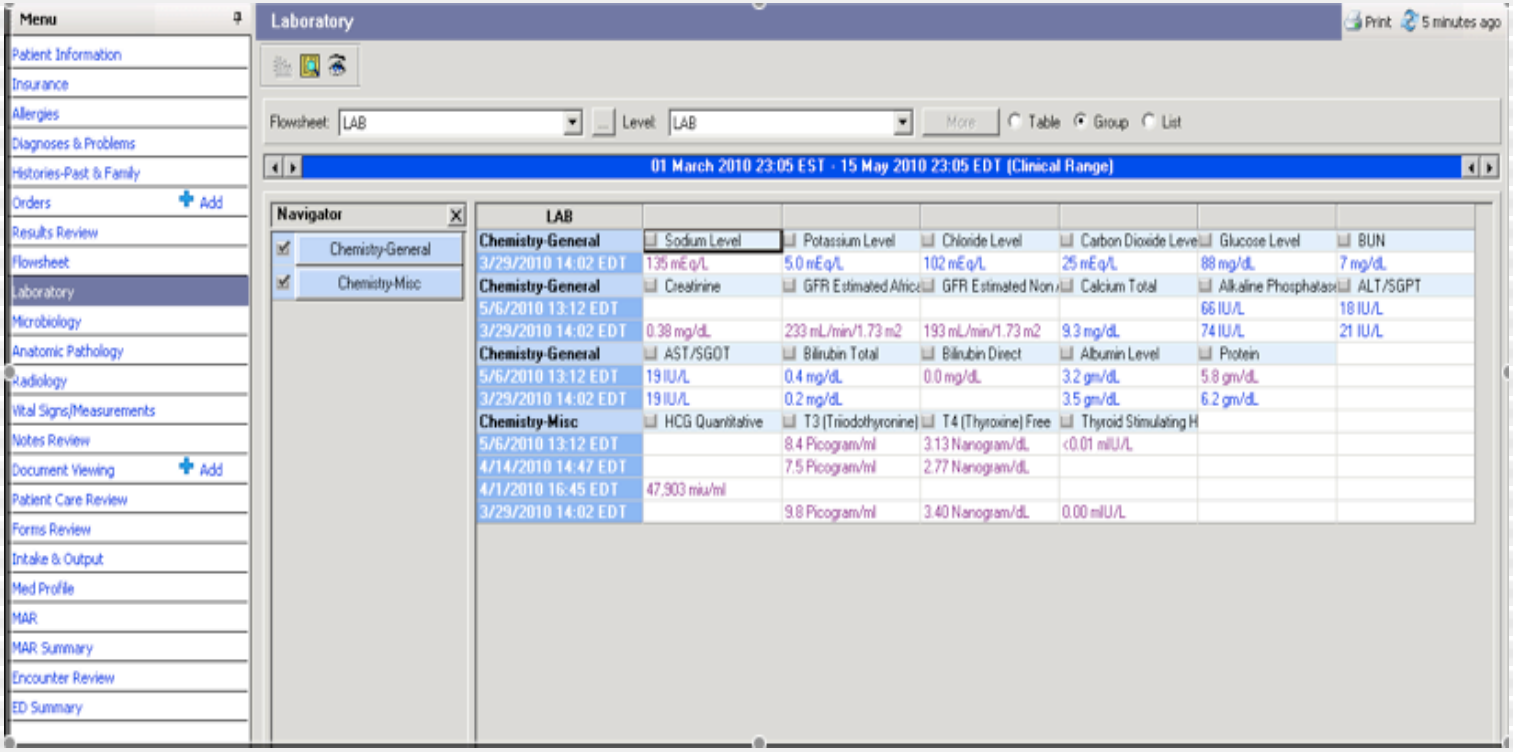


BrokenSphere, Wikimedia Commons

HPI:

- Pt came to work this evening and was feeling and acting normal.
- A fellow RN heard a scream “like a manic patient” and several thuds and turned to find the patient stumbling down the hall. The pt then fell and started seizing.
- Possible seizure in the past, unknown if pt is on any medications.

Past Medical History:



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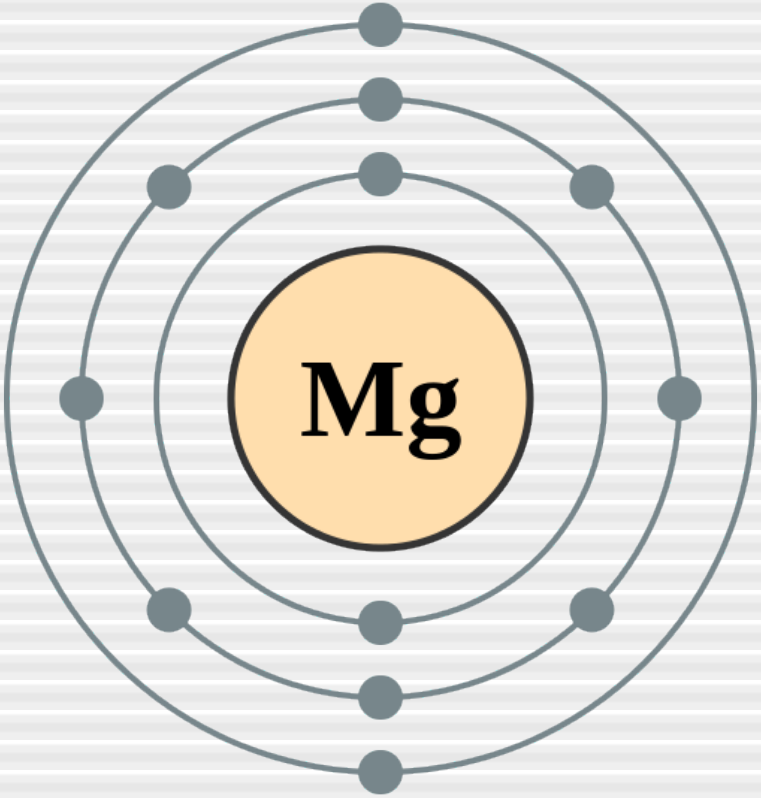
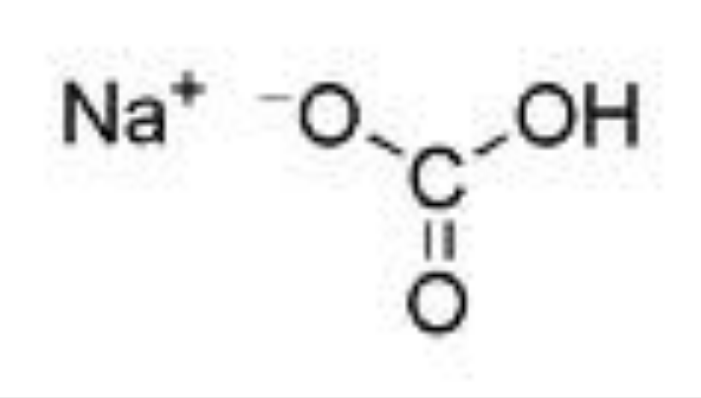
Magnesium



DePiep, Wikimedia Commons

Sodium Bicarbonate



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Lasix

Intropin, Wikimedia Commons

Ambernectar 13, Flickr

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PTU/Steroids

PD-GOV National Institutes of Health, Wikimedia Commons

PD-GOV United States Navy, Wikimedia Commons

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Calcium Gluconate

Benjah-bmm27, Wikimedia Commons

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Past Medical History:

- PMH:
  - Grave's Disease
  - Seizure 2009
  - G3P2, currently pregnant about 12 weeks
- PSH: None
- Allergies: NKDA
- Medications:
  - PTU 100 mg BID (recently changed from methimazole)
  - Vitamin C
  - Folic acid 0.4 mg Daily
- Social: No tobacco, ETOH, or drug use. Married with 2 children at home. RN at this hospital
- Family: No seizures or heart disease

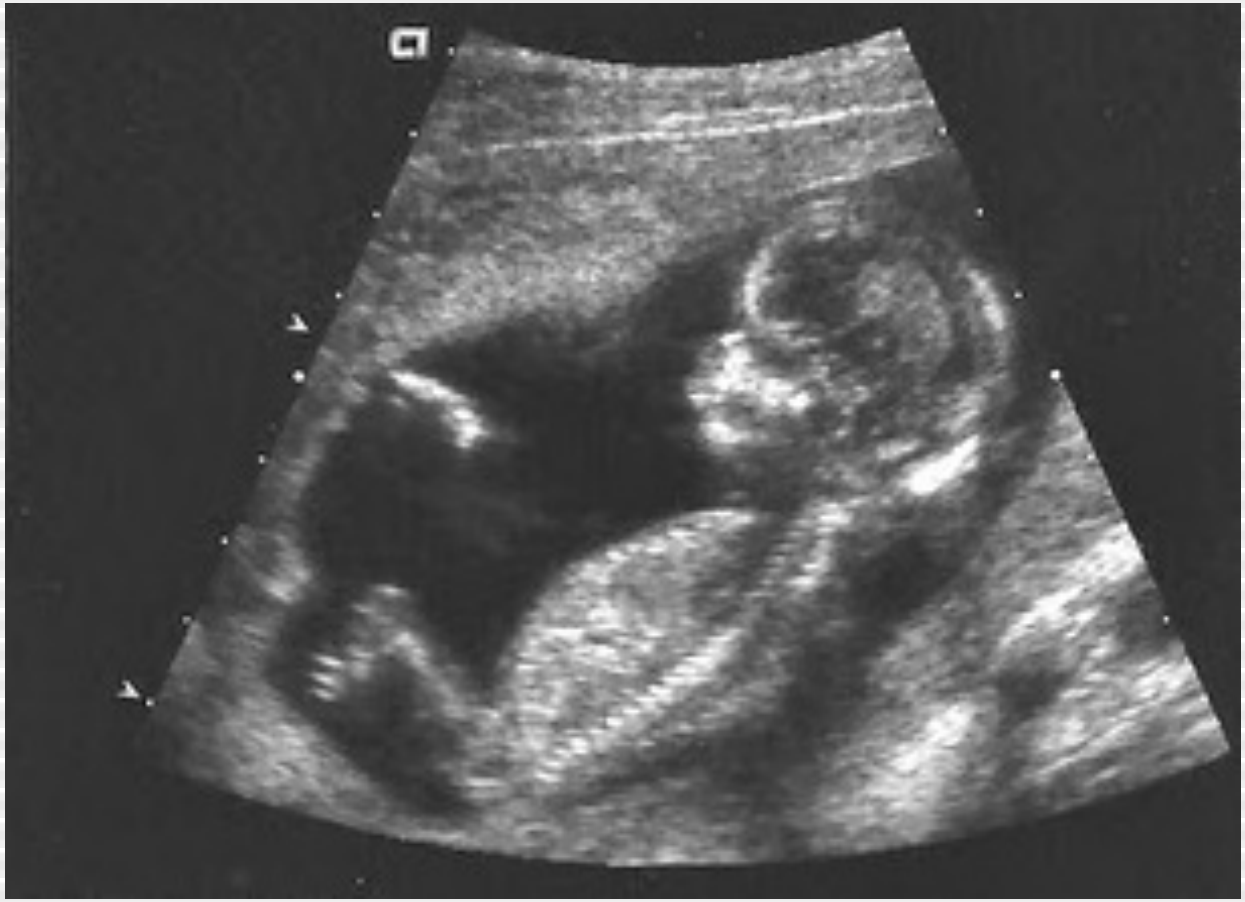
Physical Exam:

- VS: T 98.2, HR **158**, BP **159/97**, RR 20, O2 100% BVM
- General: Pt on backboard with c-collar in place receiving BVM ventilation support, unresponsive.
- HEENT: NC/AT, PERRL 4mm-2mm, **blood and frothy sputum present in nares**, no trauma noted in mouth
- Neck: C-collar in place, no thyromegaly
- Chest: **Agonal respirations**, **coarse breath sounds** present & equal bilaterally
- Heart: **Tachycardiac** rate, regular rhythm, no m/r/g
- Abdomen: Soft, **distention of BLQ**, NT, no masses or organomegaly
- Extremities: No deformities or edema noted
- Neuro: **Unresponsive, GCS 3**, no seizure movements

Labs:

- CBC: WBC **22**, Hgb 13.5, Plt 347
- Basic: Na **135**, K 4.6, Cl 102, CO2 **17**, BUN 10, Cr 0.74, glucose **217**, iCal **3.6**, Mag **2.6**, Phos **10.4;** LFT's: normal
- UA: protein **2+**, RBC 19, WBC 3, nitrite neg, LE neg; UDS: negative
- Coags: PTT **37.8**, INR 1.05
- ABG: **6.99/83/290/19/**99%
- BNP **177,** Myoglobin **189**, Troponin 0.05
- TSH **0.29**, Free T4 1.37
- Beta-hcg **32516**

Ultrasound:



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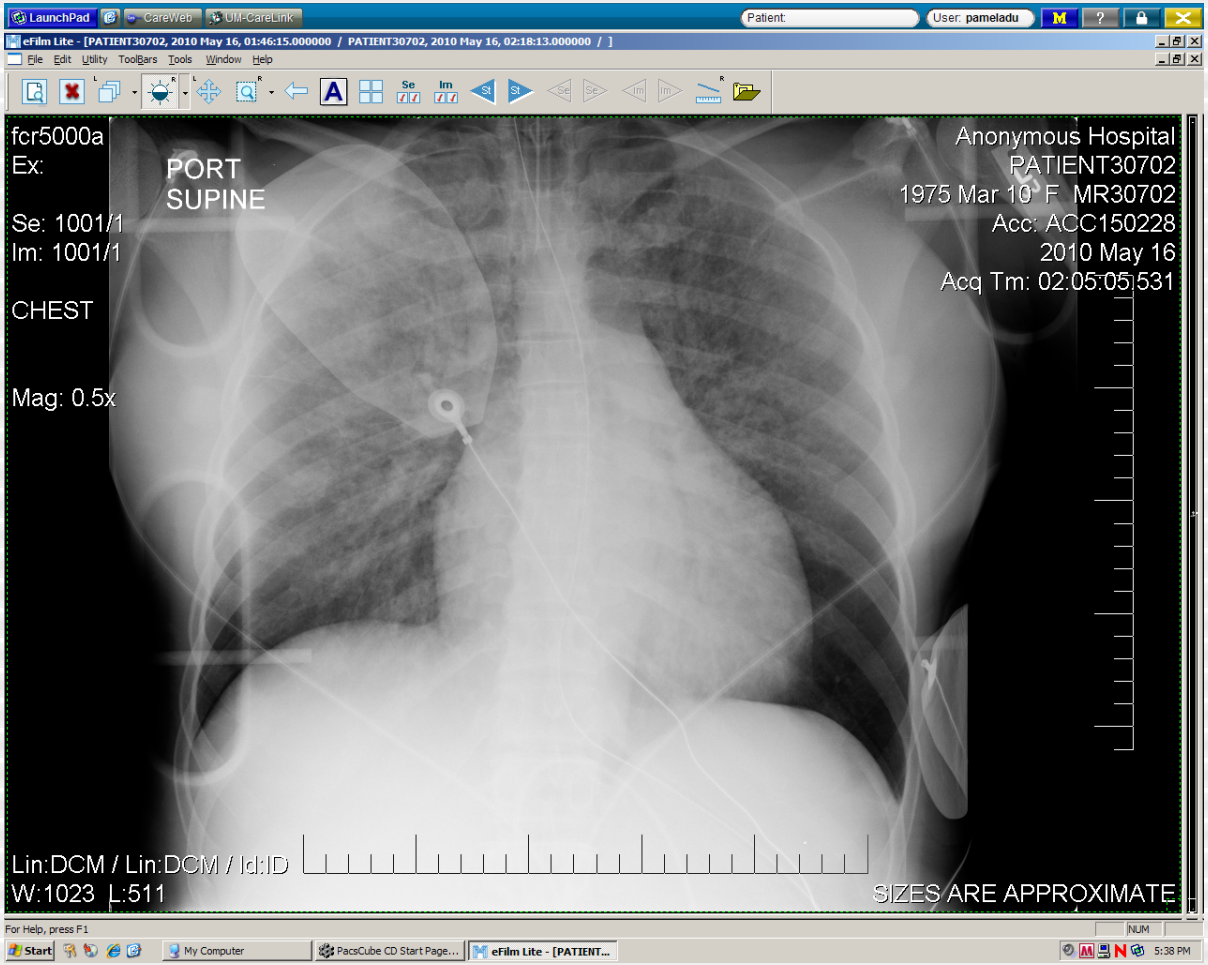
To Summarize

- 35 YO woman 12-14 weeks pregnant with a history of hyperthyroidism and ? prior seizure presents to the ER after screaming, stumbling, collapsing and seizing.
- GCS on arrival is 3 & pt intubated for airway protection & agonal respirations.
- Severe pulmonary edema present.
- Pt with hypertension and tachycardia.

Differential Diagnosis:

- SAH
- Venous Sinus Thrombosis
- Brain Tumor
- Eclampsia
- Electrolyte abnormalities
- Thyrotoxicosis
- PE
- Cardiomyopathy
- Pheochromocytoma
- Infection
  - Meningitis
  - UTI
  - Pneumonia
- Status Epilepticus
- Stroke
- MI
- DKA
- Hypoglycemia
- Toxins

CXR



PD-INEL

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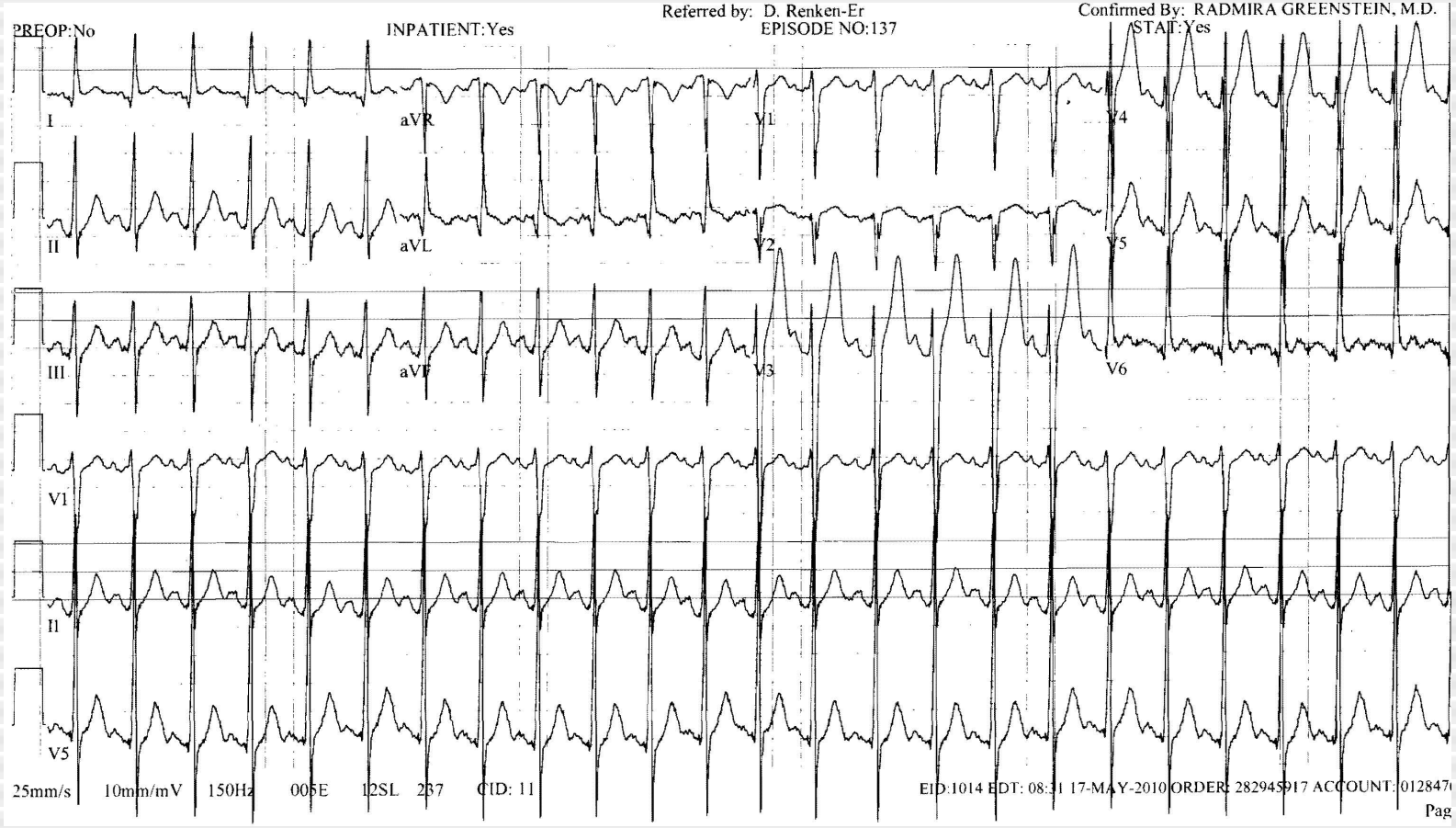
EKG



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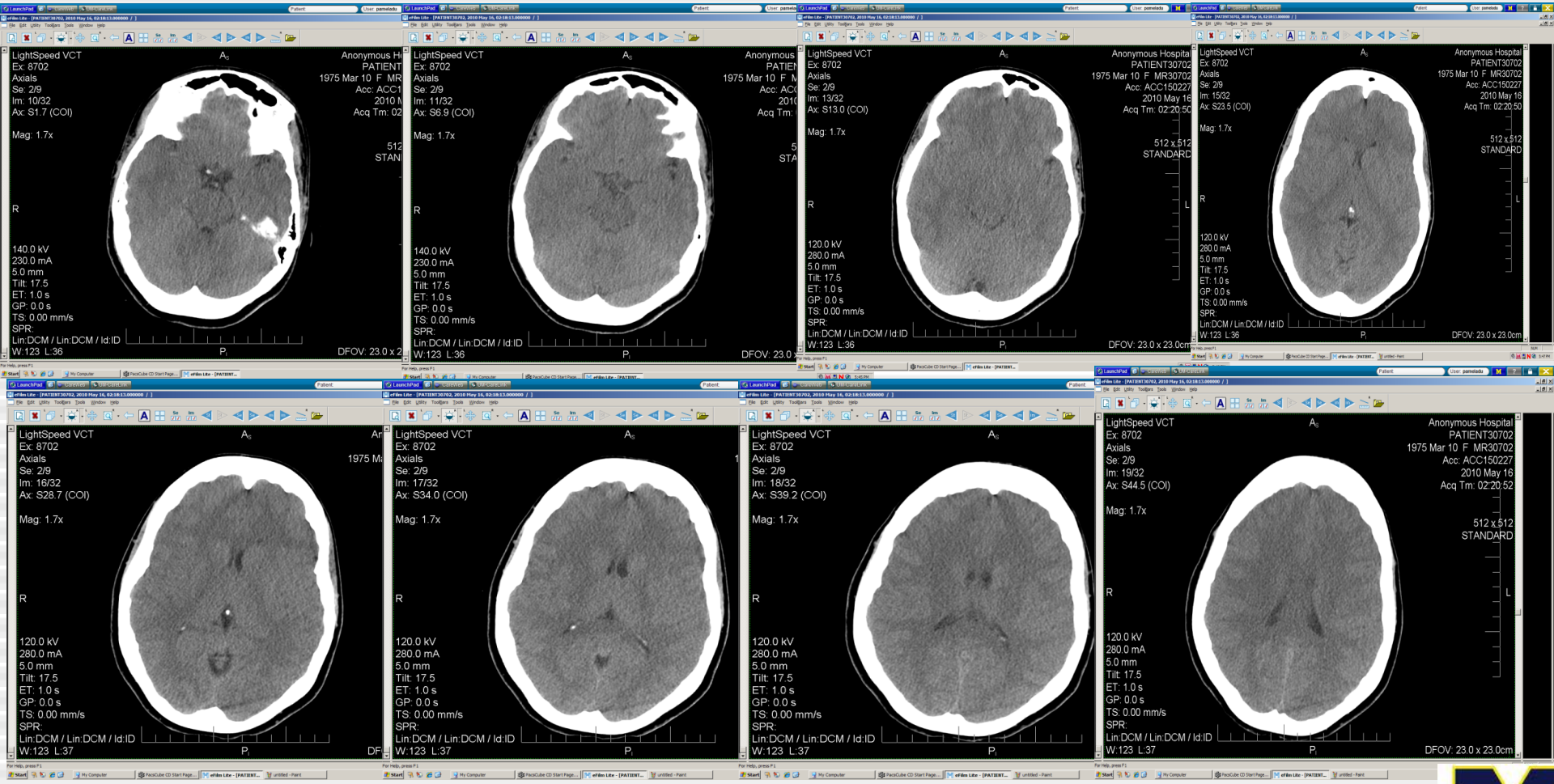
CT



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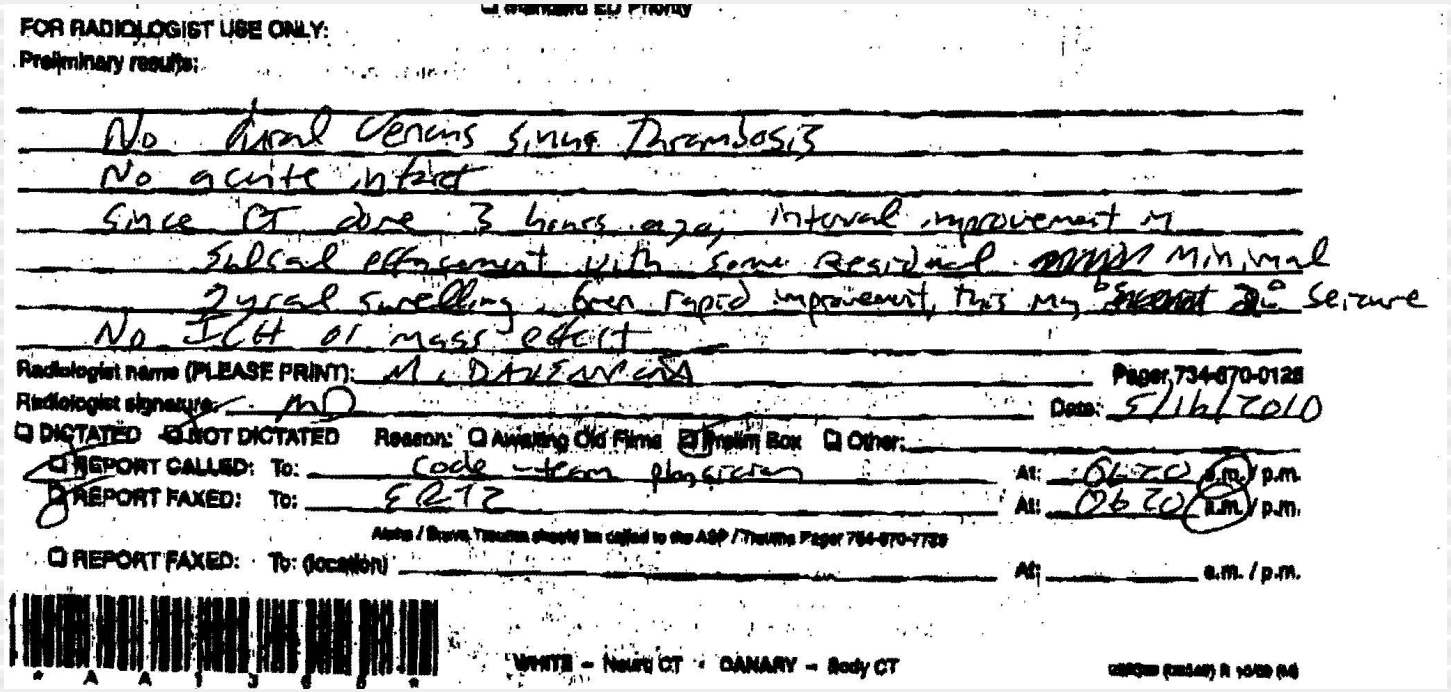
MRI



FOR RADIOLOGIST USE ONLY:

Preliminary results:

No dural venous sinus thrombosis
No acute infarct
Since CT done 3 hours ago, interval improvement in
subcal effacement with some residual minimal
hyperdensity, been rapid improvement, this may be recent 2° seizure
No ICH or mass effect

Radiologist name (PLEASE PRINT): M. DALEMAN
Pager 734-670-0128
Radiologist signature: MD
Date: 5/14/2010

☐ DICTATED ☒ NOT DICTATED Reason: ☐ Awaiting Old Films ☒ Prelim Rpt ☐ Other:

☒ REPORT CALLED: To: code stroke pager/crew At: 0620 a.m. / p.m.

☒ REPORT FAXED: To: ER TZ At: 0620 a.m. / p.m.

Alerts / Brain Trauma should be called to the ASP / Trauma Pager 764-670-7788

☐ REPORT FAXED: To: (location) At: a.m. / p.m.

WHITE – Neuro CT • CANARY – Body CT

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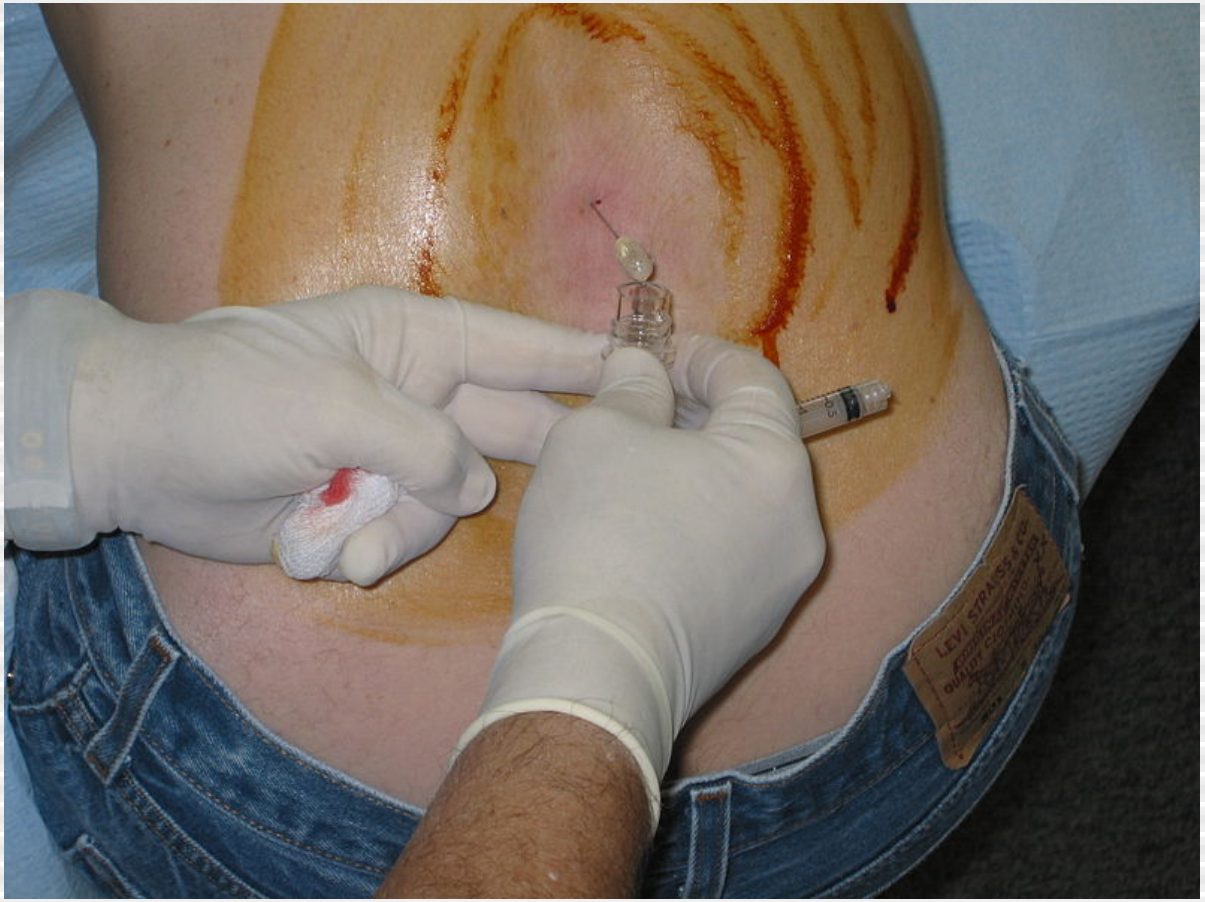
LP



Brainhell, Wikimedia Commons

Beta-blocker

Parhamr, Wikimedia Commons

Hospital Day 1

- Pt admitted to MICU: HR 110, BP 110/75
- Neurology: s/p tonic-clonic seizure, CT/MR -
  - LP performed given ?bleed on flair MR images
  - Neurogenic pulmonary edema from seizure
  - Neurology: Recommended EEG and anti-epileptics, husband refused anti-epileptics given pregnancy
- Cardiology: Pt developed hypotension, remained tachycardiac
  - Troponin elevated 4.66
  - TTE: Severe global LV hypokinesis, mild MR, moderate TR, moderated pulmonary hypertension, EF 20-25%
  - Cardiology: Tachycardia secondary to pump failure, TTE most c/w Tako-Tsubo syndrome

Hospital Day 1 Continued…

- Given cardiogenic shock with WMA on TTE pt taken emergently to cath lab
  - Clean coronary arteries
  - Intra-aortic balloon pump placed
  - Swan-Ganz catheter placed
  - Pt transferred to CCU
- Repeat thyroid studies: TSH <0.01 (0.29), FT4 2.22 (1.37), FT3 7.8
  - Endocrine consulted: PTU and Hydrocortisone started
- Formal fetal USN: Normal limited fetal survery, EGA 14 5/7 weeks

Hospital Day 2

- Endocrine: HR and BP improved with PTU and hydrocortisone tx
  - FT4 2.55 (2.22, 1.37)
- Neuro: Pt alert, following simple/complex commands, no recurrent seizures
  - EEG: normal
- Cardiology: Pt continues on IABP
  - TTE: slight improvement to no change from previous TTE; EF 30%
- Respiratory: Improved FiO2, Tachypnea with spont trials
  - Keep intubated until IABP removed

Hospital Day 3

- Endocrine: Pt continues on PTU & Hydrocortisone
  - FT4 2.39 (2.55, 2.22, 1.37) FT3 3.9 (7.8)
- Neuro: Still refusing anti-epileptics, no recurrent seizures
- Cardiology: IABP removed without incident
- Respiratory: Pt extubated after removal of IABP

Hospital Days 4 & 5

- Day 4:
  - PO Metoprolol started given HTN
  - PTU and Hydrocortisone continued
  - Pt declined anti-convulsants, will reconsider at end of 2nd trimester
- Day 5:
  - PO Metoprolol dose increased given HTN
  - FT4 2.59 (2.39), FT3 5.5 (3.9)

Hospital Day 6

- TTE: Severe Apical Hypokinesis, EF 33%
- Pt discharged home!
  - Discharge Diagnosis:
    - Graves Disease with thyrotoxic storm
    - Grand Mal Seizure
    - Cardiomyopathy
    - Acute Respiratory Failure
  - Discharge Medications:
    - Metoprolol 25 mg PO BID
    - PTU 200 mg PO QID
  - Outpatient follow-up

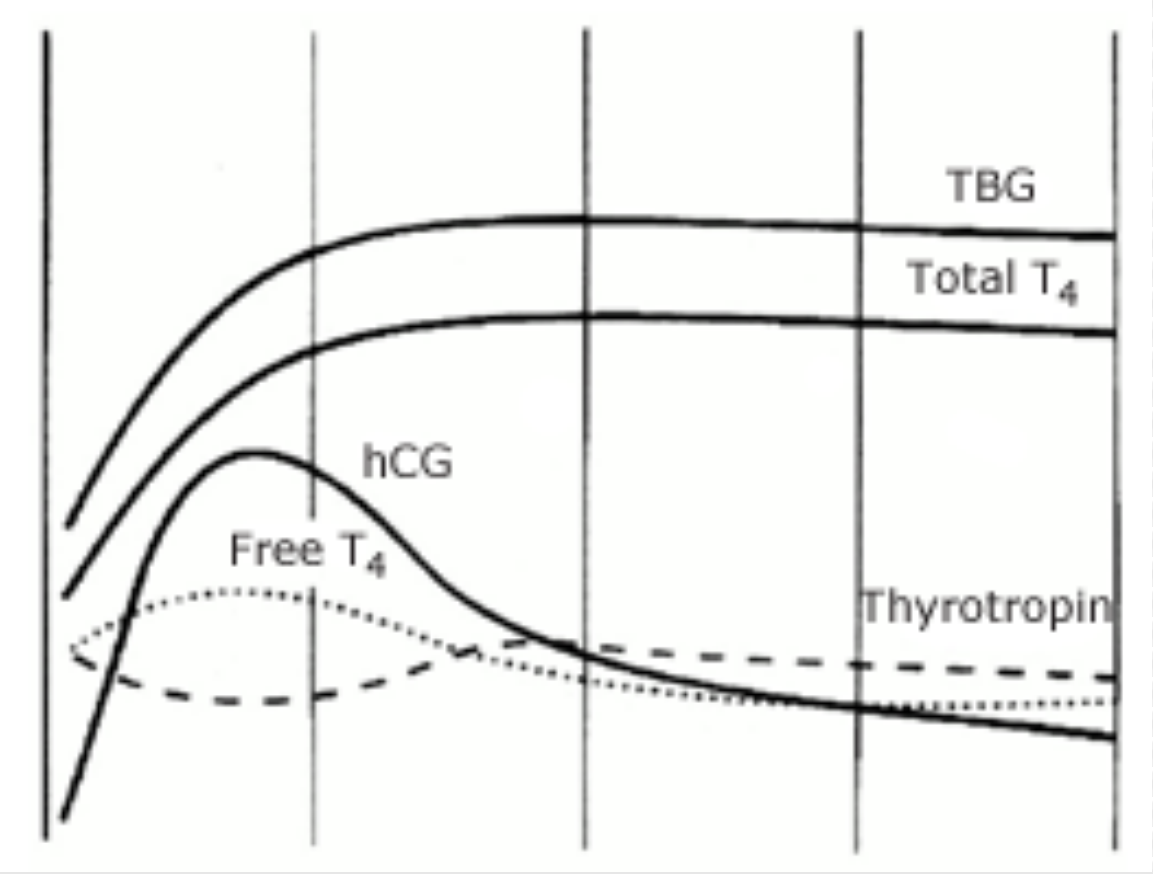
HA & Collapse in Pregnancy

- Eclampsia
  - Dx: HTN, seizure, edema, proteinuria, +/- elevated LFT's & thrombocytopenia
  - Tx: Magnesium + OB
- SAH
  - Dx: CT + LP
  - Tx: BP control + Neurosurgery
- Venous Sinus Thrombosis
  - Dx: MR
  - Tx: Anticoagulation + Neurosurgery

Thyroid Function in Pregnancy

- Increase in thyroxine-binding globulin
  - Increase in total T4 & T3
- hCG stimulates the TSH receptor
  - Decrease in TSH levels
  - Increase in free T4 & T3
- Hyperthyroidism in pregnancy:
  - TSH <0.01 mU/L +
  - High free T4 level

Changes in maternal thyroid function during pregnancy:



Thyroid Storm

Temperature	
99-99.9	5
100-100.9	10
101-101.9	15
102-102.9	20
103-103.9	25
≥104	30

Precipitant	
No	0
Yes	10

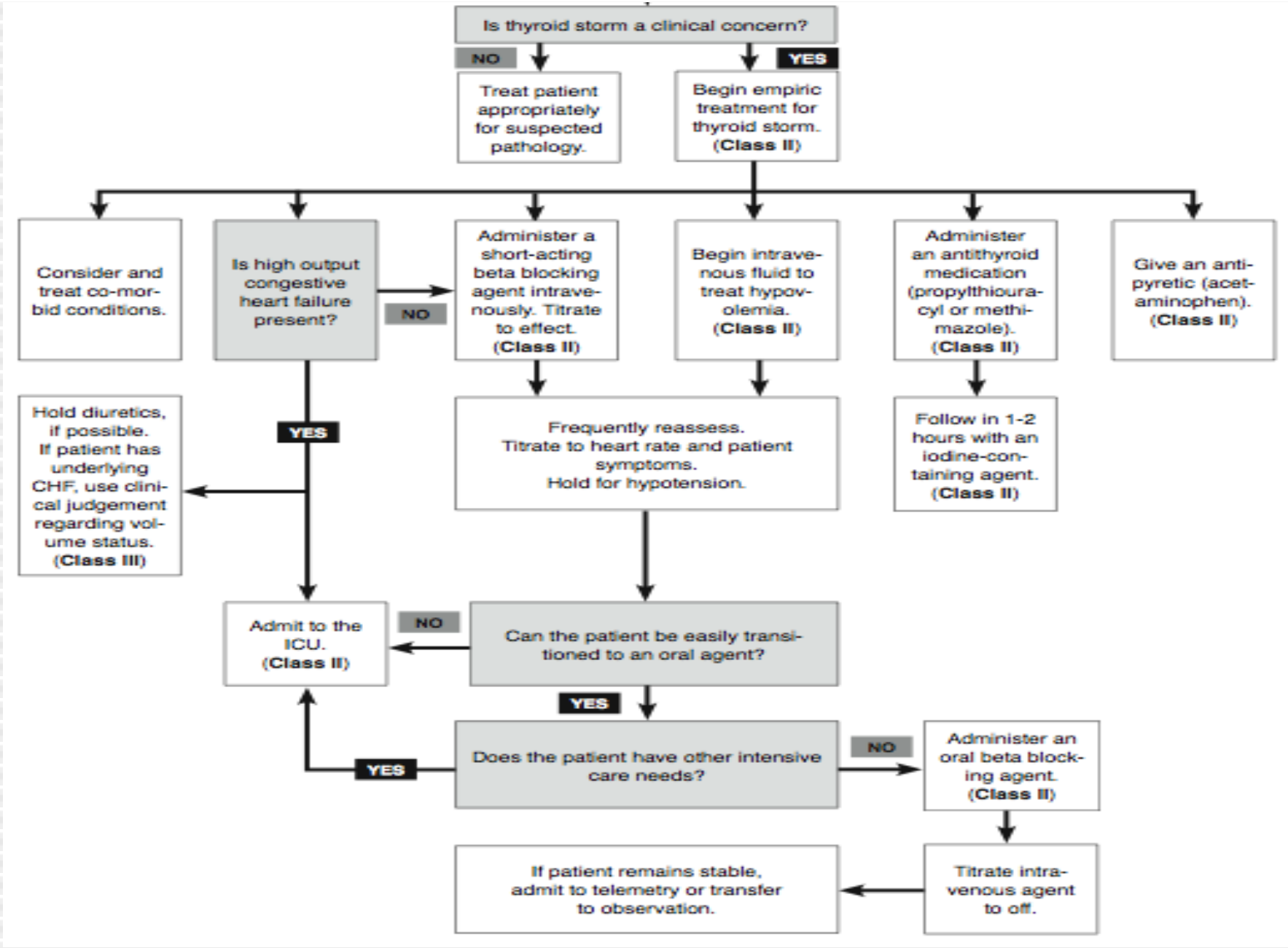
CNS Effects	
Agitation	10
Delirium, psychosis, extreme lethargy	20
Seizure, coma	**30**

CHF	
Pedal edema	5
Bibasilar rales or a-fib	10
Pulmonary edema	**15**

GI symptoms	
Diarrhea, n/v, abdo pain	10
Unexplained jaundice	20

Tachycardia	
99-109	5
110-119	10
120-129	15
130-139	20
≥140	**25**

Score Total	
>25	**Storm**
<25	**No Storm**

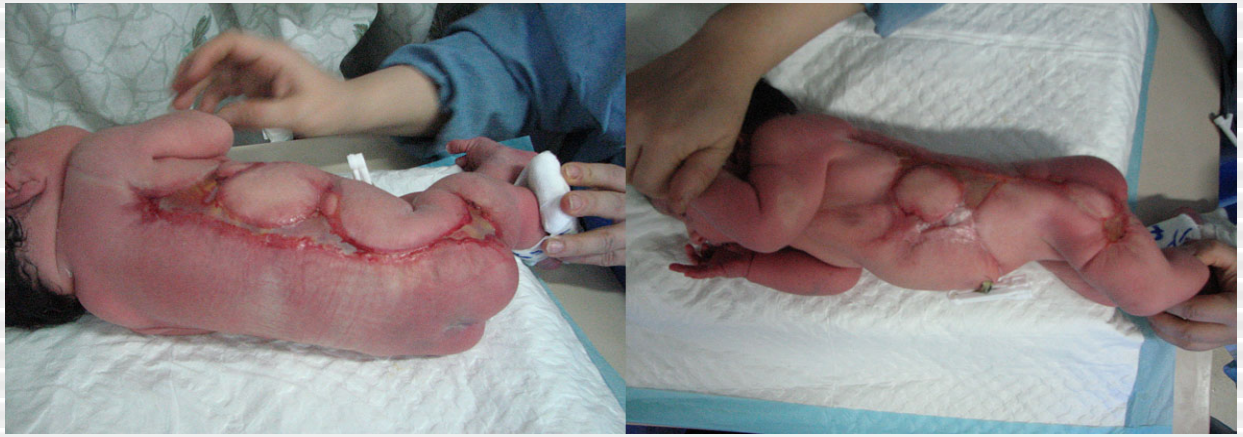


Source Undetermined

Treatment of Thyroid Storm:

- Step 1: Block peripheral effect of thyroid hormone
  - IV beta-blocker
- Step 2: Stop the production of thyroid hormone
  - PTU or methimazole
  - Dexamethasone or hydrocortisone
- Step 3: Inhibit hormone release
  - Iodine 1-2 hours after antithyroid medication

Methimazole embryopathy:



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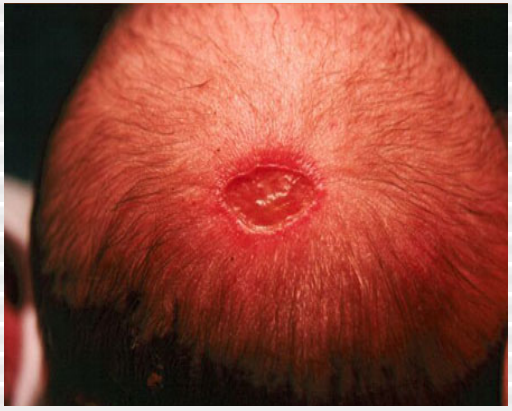

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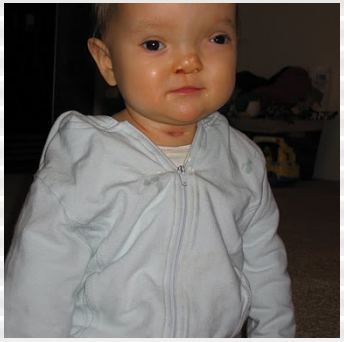

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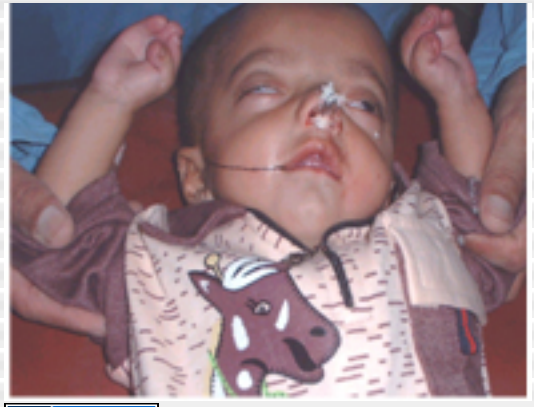

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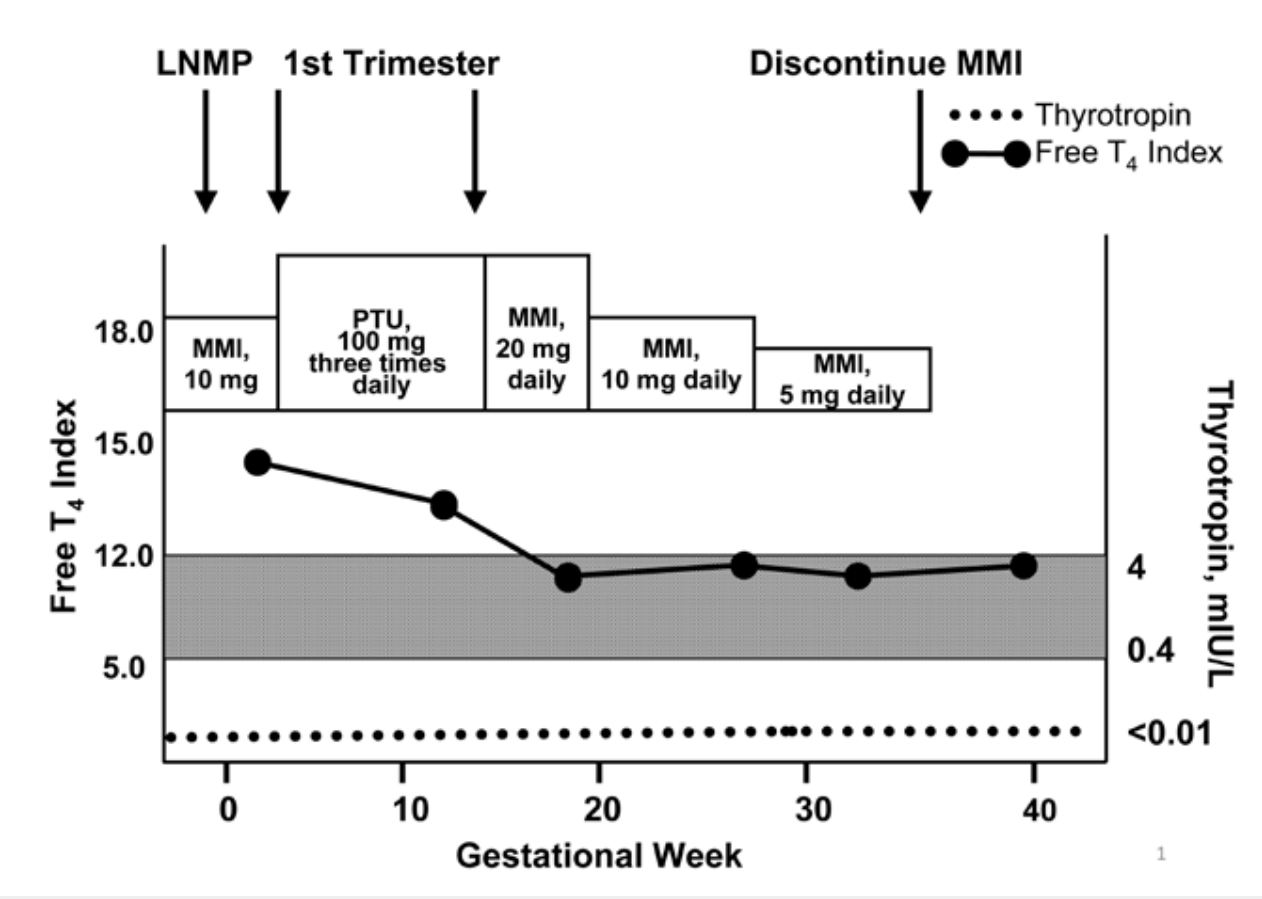
Management of Hyperthyroidism in Pregnancy:



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Stress-Induced (Takotsubo) CM

- Mayo Clinic Diagnostic Criteria:
  1. Transient hypokinesis, akinesis, or dyskinesis of LV mid segments +/- apical involvement
  2. Absence of obstructive coronary disease
  3. New EKG changes OR modest elevation in cardiac troponin
  4. Absence of pheochromocytoma, neuropathology, or myocarditis

Treatment of HF in Pregnancy

- Afterload Reduction:
  - Hydralazine
  - Amlodipine
  - Nitroglycerin
  - Lasix
- Iontropes:
  - Dobutamine
  - Dopamine
  - Digoxin
- Vasopressors:
  - Dopamine
- Stable HF:
  - Beta-blockers
- Edema:
  - Loop Diuretics
- Mild-Moderate HF:
  - Hydralazine
  - Digoxin
- Decompensated HF + normal BP:
  - Nitroglycerine
- Decompensated HF + hypotension:
  - Dopamine

Take home points

- ABC's & IV/O2/Monitor every patient
- Thyroid storm is a clinical diagnosis
- Hyperthyroidism & storm more common in 1st trimester secondary to pregnancy related hormone changes
- Treat thyroid storm in pregnancy with beta-blockers (careful if in decompensated CHF), PTU +/- steroids in the ER
- Treat decompensated HF in pregnancy in the ER as you would any pt
  - Pressor of choice = dopamine

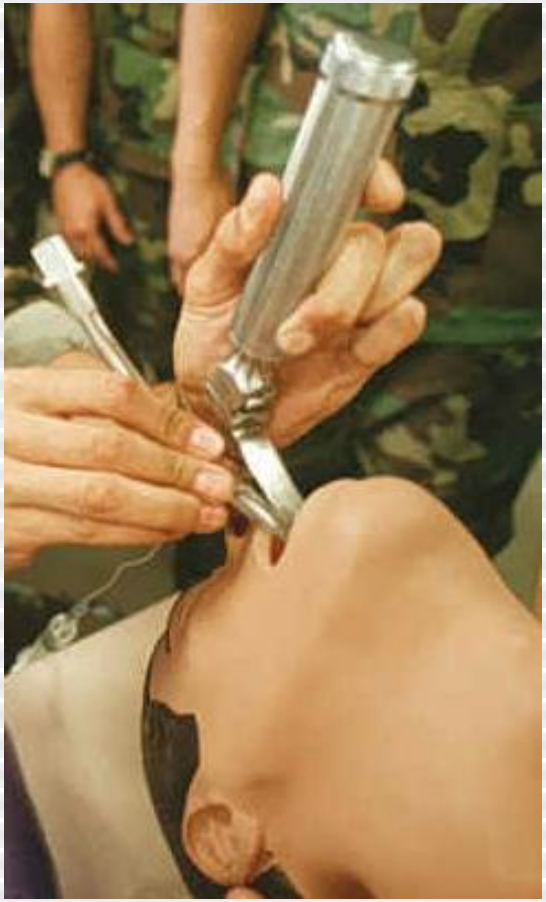
Quick case:

- CF 25 YO man arrives via EMS in respiratory extremis
- History of asthma with increasing SOB over past few days
- Last night pt was partying and smoked MJ and cigarettes
- Awoke at 5 AM with severe respiratory distress
- Used albuterol inhaler 5 times with no improvement and called EMS
- EMS interventions: IV established, Oxygen via NRB, PO prednisone, duoneb NMT's, and epinephrine 0.3 mg IM

CF

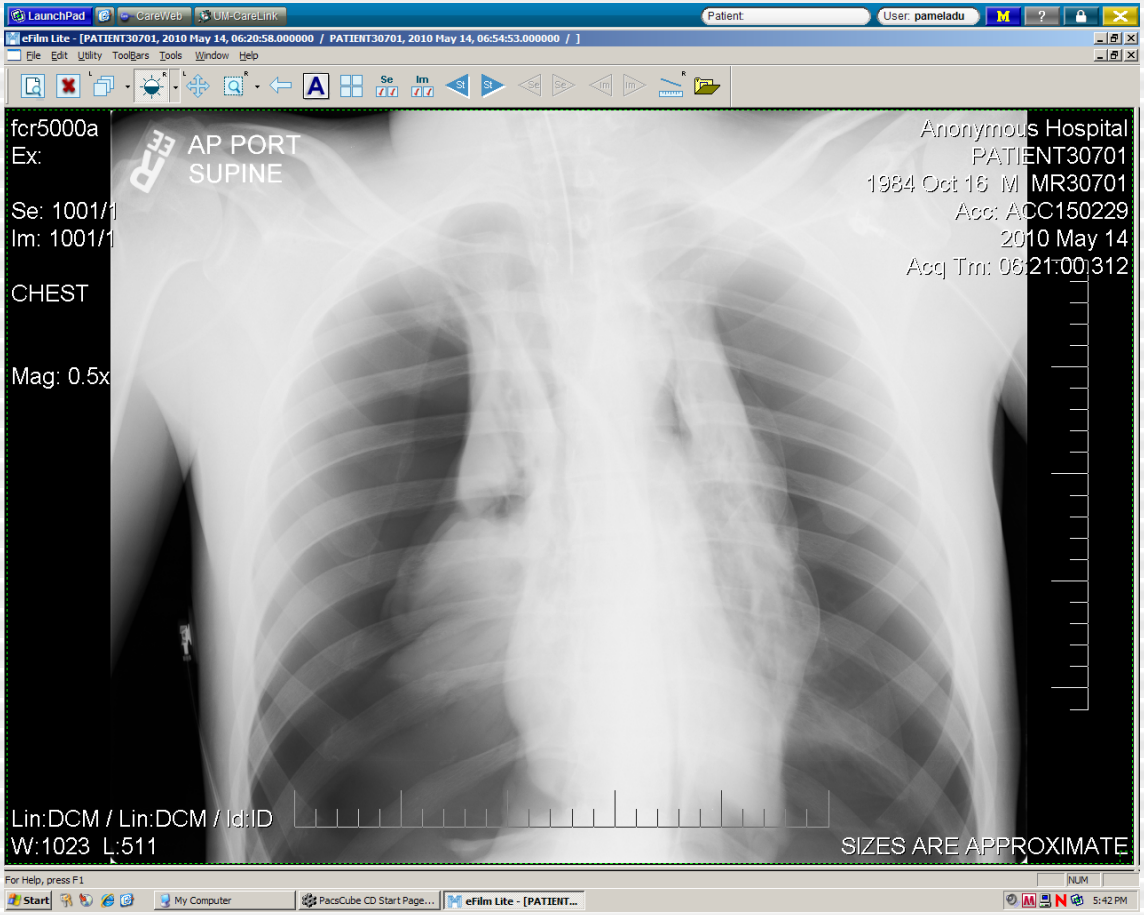
- Vitals: P 117, BP 225/129, RR 38, O2 sat 64%
- General: Pt in respiratory extremis, tripod position, panicking, extremely diaphoretic, pulled out IV, won't keep oxygen mask on, stating "help me," bilateral prominent JVD
- Respiratory: In extremis, very faint breath sounds with slight end-expiratory wheezes bilaterally. Extremely diminished breath sounds

Intubate!



United States Marine Corps, Wikimedia Commons

CXR



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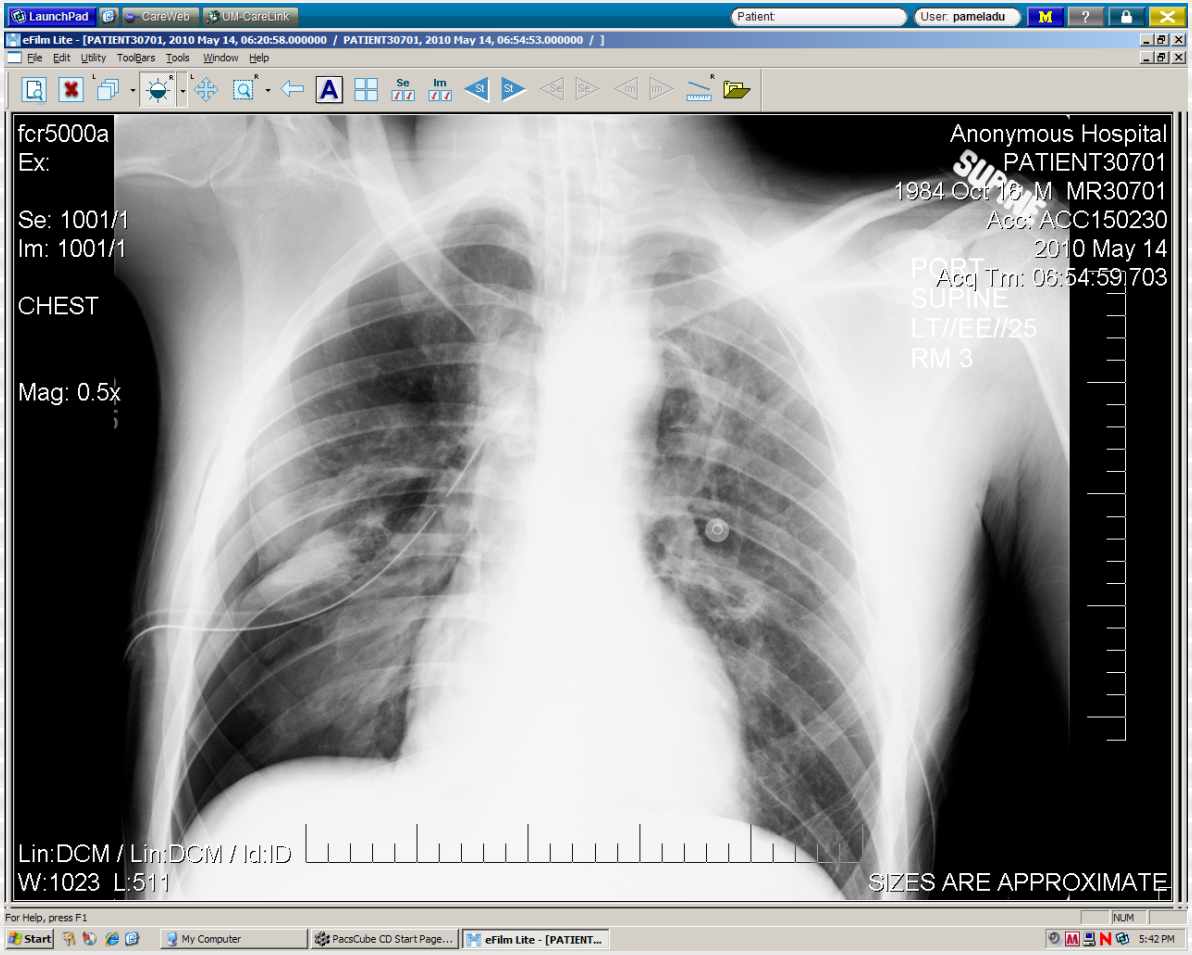
Needle Decompression/CT

Source Undetermined

CXR



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