

Case Study Patient #2: Empyema

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Patient Profile

- ▶ 56 yo male
- ▶ ARU (1.20-2.7) → Surgery → ICU → Surgical Floor (2.8-2.21)
- ▶ Truck driver
- ▶ Not married
- ▶ Was independent
- ▶ Cooks/cleans with SO
- ▶ Complicated medical history
 - ▶ Subtotal colectomy
 - ▶ Weight loss



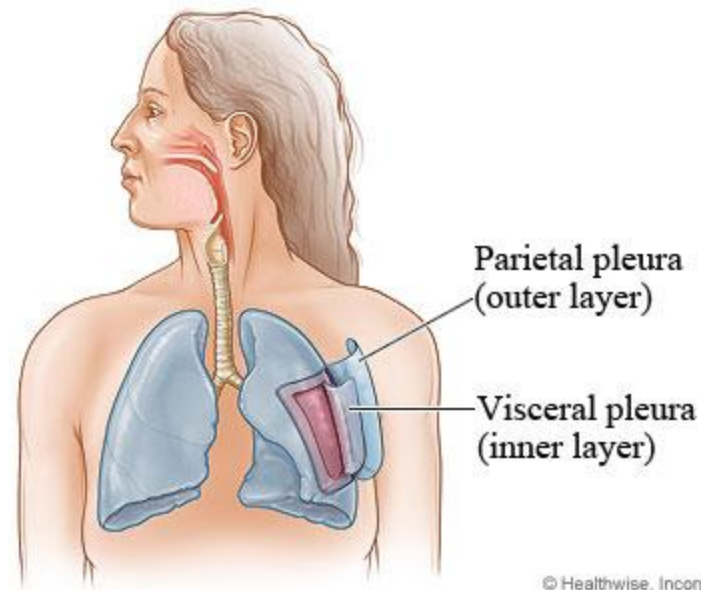
Diagnosis

- ▶ Empyema
- ▶ Small Bowel Obstruction (SBO)



Empyema

- ▶ Accumulation of pus in any body cavity; most common is thoracic empyema
- ▶ Type of pleural effusion (can be any fluid)
- ▶ Bacterial infection



A Few Causes

- ▶ Chest trauma
- ▶ Thoracic surgery
- ▶ Chronic drainage of malignant effusion
- ▶ Sepsis
- ▶ Respiratory infections



Transudate v. Exudate

- ▶ **Transudate**

- ▶ Develop from systemic influence that alter the pleural fluid, i.e. CHF, renal failure

- ▶ **Exudate**

- ▶ Develop from local factors, i.e. pneumonia, PE



The Three Stages of Empyema (when talking about a parapneumonic empyema)

▶ Serous, or exudative phase

- ▶ Pus is still sterile, meaning it is not positive for bacterial infection, pH is >7.2 , glucose is >40 ml/dL

▶ Fibropurulent phase

- ▶ Pus will become thicker and more opaque with positive bacterial cultures
- ▶ pH and glucose will drop
- ▶ Loculations will begin to form d/t fibrin being deposited
- ▶ Drainage is most likely indicated

▶ Organization phase

- ▶ Pleural peel formed, entrapping the lung; known as cortication
- ▶ Drainage is necessary

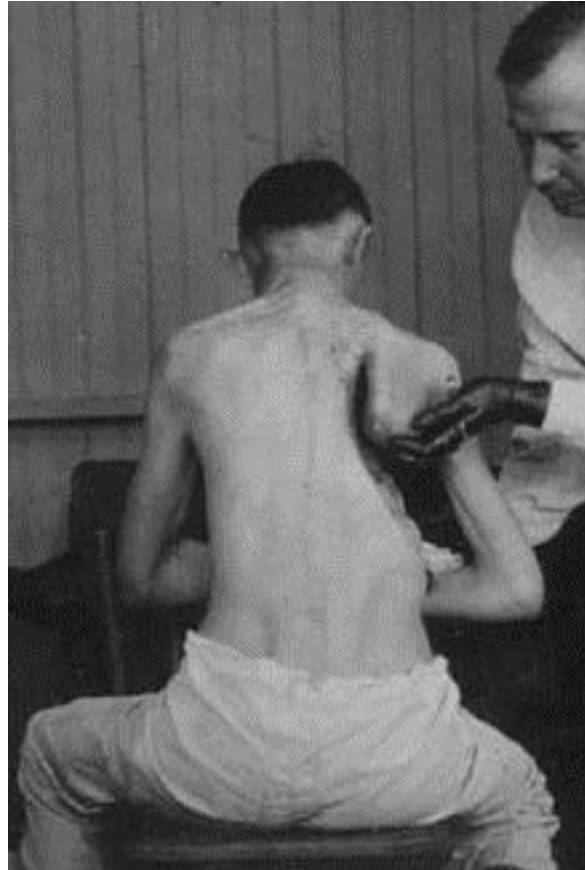


Symptoms

- ▶ Chest pain
- ▶ Dry cough
- ▶ Fever
- ▶ Malaise
- ▶ SOB
- ▶ Unintentional weight loss/poor appetite
- ▶ With a stethoscope, can hear muffled breathing and dull sounds when tapping the chest



We have come a long way...



Treatment for Empyemas

▶ Antibiotics

- ▶ 1st line of defense
- ▶ Often used in combination with other methods

▶ Drainage

- ▶ Thoracentesis (therapeutic and diagnostic)
- ▶ Chest tubes

▶ Fibrinolytics

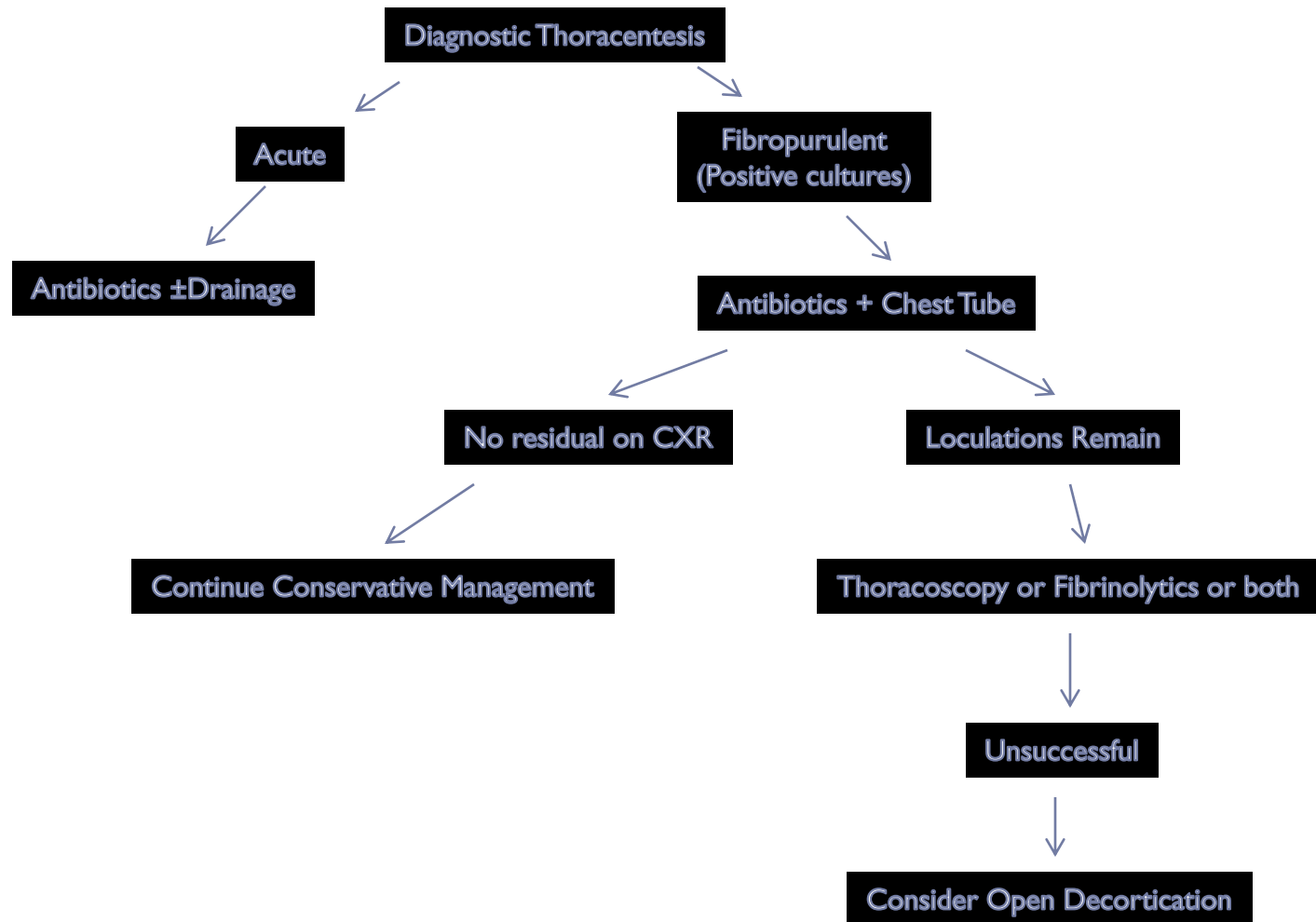
- ▶ “Clot busters”
- ▶ Components of clots: platelets, thrombin, fibrin
- ▶ Fibrin impairs drainage and promotes loculations

▶ Surgery

- ▶ VATS (Video-Assisted Thoracoscopic Surgery)
 - ▶ Thoracotomy/Decortication
-



Suspected Empyema...



Empyema in Children: A 26-Year Review of the Montreal Children's Hospital Experience

- ▶ Reviewed 47 cases of empyema over a 26 year period
- ▶ Classification of the stage is important to know the treatment
- ▶ Looked at treatment methods
 - ▶ Acute: 8 (all) responded to antibiotics regardless of drainage
 - ▶ Fibropurulent: complete drainage was attained in seven of 39; loculations persisted in 25 of 39 after chest tube drainage
 - ▶ Chronic/organizational: 7 out of the 39 required formal decortications
- ▶ Conclusion: treatment is not “cut and dry,” especially in the second stage



Parapneumonic Effusions and Empyema

- ▶ Use fibrinolytics when the loculation would be hard to drain
- ▶ Streptokinase (not available in the US), urokinase, TPA
- ▶ “...the use of intrapleural fibrinolytics should be reserved for patients in centers without access to video-assisted thoracic surgery and for patients who are not surgical candidates.”
- ▶ Still being researched
- ▶ Therapeutic thoracentesis → Tube thoracostomy → Tube thoracostomy with intrapleural fibrinolytics → Thoracoscopy → Thoracotomy

Prognosis

- ▶ Usually very good
- ▶ Risk of complications increase as the severity increases
- ▶ Multiple comorbidities, especially malnutrition, can affect outcome or likelihood of developing an empyema
- ▶ Must have equipment, therapies, and personnel to have good prognosis--“Bacterial pneumonia can be severe and life-threatening, accounting for ~3 million pediatric deaths per year worldwide, primarily in resource-poor countries.”



Nutrition Intervention

- ▶ Level 2 acuity
- ▶ Correct weight loss, reduce anorexia, provide wound healing, and manage the appropriate diet
- ▶ Know their history



Malnutrition & the Respiratory System

- ▶ Correct malnutrition: “...pulmonary structure and function are also adversely affected by chronic malnutrition...One of the most striking effects of malnutrition on the respiratory system is that it reduces the capacity of patients to sustain adequate levels of ventilation.”
- ▶ Pay attention to weight loss: “A significant weight loss is the major sign of malnutrition. Recent loss of more than 10% of the usual body weight indicates severe malnutrition. It has been reported that 35% of patients have lost >10% of original body weight during hospitalization.”
- ▶ Check PAB and Albumin
- ▶ Send smaller, more frequent meals, send nutritional supplements, recommend an appetite stimulant, provide diet education, manage diet, recommend and/or manage EN or PN

Necessary Nutrients for Respiratory Health

- ▶ Vitamin C
- ▶ Antioxidants
- ▶ Omega-3
- ▶ “There is increased evidence correlating the role of dietary antioxidants such as vitamin C, vitamin E, β -carotene, and selenium with healthy lung functions. A variety of antioxidants are present in the extra cellular fluid and appear to play an important role in protecting the lungs from oxidant injury as the result of the inflammatory process caused by inhalation of cigarette smoke and other pollutants.”

My Patient & His Treatments

- ▶ Full thoracotomy with left lung decortication; failed VATS
- ▶ Chest tubes
- ▶ Ileostomy
- ▶ TPN



Medications

Medication	Purpose	Interaction
Insulin (humalog and lantus)	Control/lower blood glucose	Hypoglycemia
Pantoprazole	Proton Pump Inhibitor	Low gastric secretions, increased gastric pH, diarrhea
Bisacodyl	Laxative	Increased laxative dependence, increased intestinal peristalsis
Reglan	Antiemetic	Increased gastric emptying, nausea, diarrhea, restlessness, drowsiness, fatigue, dizziness
Vancomycin (IV)	Antibiotic	“Red man syndrome”
Flagyl	Antibiotic	Anorexia, metallic taste, nausea, epigastric stress, diarrhea, dizziness

Patient Profile

- ▶ 5'11"
- ▶ 88 kg upon ICU admission
- ▶ 113% IBW
- ▶ 69% UBW (since October 2011)
- ▶ Pressure ulcer to left heel
- ▶ Had PEG, but did not use ARU; just flushed



Labs

Lab	2/9	2/10	2/11	2/12	2/13	2/14	2/15
Glucose	278	182	133	101	129	93	164
BUN	13	17	11	8	5	6	9
Sodium	128	131	133	129	135	134	136
Albumin					2.1		1.8

Lab	2/16	2/17	2/18	2/19	2/20	2/21
Glucose	164	127	158	126	114	160
BUN	9	9	8	8	9	9
Sodium	136	135	132	133	132	133
Albumin	1.9	2.1				

▶ Red is high; green is low

Macronutrient Needs

▶ In ICU:

- ▶ 2200-2550 kcal; 27-32 kcal/kg, *actual BW
- ▶ 96-112 g protein; 1.2-1.4 g pro/kg, *actual BW
- ▶ Per ml fluid

▶ Surgical Floor:

- ▶ 2025-2430 kcal; 25-30 kcal/kg, *adjBW
- ▶ 81-105 g protein; 1.0-1.3 g/kg, *adjBW
- ▶ At least 1 ml/kcal



Ileostomy Nutrition

- ▶ Decreases absorption of fat, bile acid, vitamin B12, fluid, potassium, sodium
 - ▶ Maintain fluid and electrolyte balance
- ▶ Avoid gas-forming foods, i.e. legumes and broccoli
- ▶ Suggest foods to reduce odor, i.e. yogurt, parsley, buttermilk
- ▶ Low fiber for a month after new placement; regular diet in 8 weeks
- ▶ For excessive diarrhea, avoid insoluble fiber, i.e. wheat bran, nuts and seeds, avocado & increase soluble, i.e. bananas, prunes, oatmeal



Diet Order

- ▶ NPO → Full liquid → DM → N/V = SBO → MD orders PICC, NPO...another MD orders CL → Back to NPO, TPN consult → Clinimix 4.25/25, Full liquid diet → CL, Clinimix 4.25/15, RD recs GI soft, 2200 cal DM → Soft select, 2200 DM, custom TPN → custom TPN, 1800 cal DM, RD recs to d/c TPN → off TPN, cardiac 1800 DM



Evaluation of Intake

▶ TPN alone

- ▶ Two days was Clinimix 4.25/25 @ 63 ml/hr for 65-70% of needs
- ▶ Two days custom TPN @ 83 ml/hr to provide 68% of kcal needs and lower end of 100% protein needs

▶ Diet alone

- ▶ <50% PO for 9 days, two of which were TPN days
- ▶ <50% up to 75% 1 day
- ▶ 50-75% up to 100% for every day after that



Nutritional Compromise

- ▶ Severe in ICU
- ▶ Moderate while on TPN
- ▶ Mild once TPN was d/c and began tolerating diet



Did this patient need TPN?

▶ Indications for PN:

- ▶ Acute exacerbation of Crohn's
- ▶ Severe acute necrotizing pancreatitis
- ▶ Peritonitis
- ▶ Intestinal hemorrhage
- ▶ Intestinal obstruction
- ▶ Intractable vomiting
- ▶ Paralytic ileus
- ▶ High output fistula
- ▶ SBS
- ▶ >1 L/d of stool
- ▶ Bone marrow recipients having N/V and severe mucositis >3 d



Did this patient need TPN?

- ▶ Indications for TPN
 - ▶ ABSOLUTE
 - ▶ Inaccessible GI tract
 - ▶ SBS
 - ▶ Nonoperative mechanical bowel obstruction
 - ▶ Multiple enterocutaneous fistulas or high-output fistulas distal to site of feeding tube tip placement
 - ▶ Paralytic ileus
 - ▶ RELATIVE
 - ▶ Severe radiation enteritis
 - ▶ Necrotizing pancreatitis
 - ▶ Diarrhea refractory to medical interventions
 - ▶ Intestinal pseudo-obstruction and intolerant to enteral feedings
 - ▶ Intractable vomiting refractor to medical interventions
 - ▶ High-output fistulas proximal to site of feeding tube tip placement
 - ▶ Gut ischemia
 - ▶ Profound serum electrolyte, glucose, and mineral abnormalities

Did this patient need TPN?

- ▶ Evaluate this criteria:
 - ▶ More than 10% involuntary weight loss in 2-3 months
 - ▶ <75% of IBW or UBW
 - ▶ PAB <10, transferrin <100
 - ▶ Inadequate oral intake >7 days
 - ▶ GI function (gut failure, mesenteric ischemia, hemodynamic stability, gut rest)

- ▶ “ASPEN guidelines define a patient who has lost at least 10% of pre-illness weight and has taken nothing by mouth for 5-7 days as nutritional risk.”

Risks of TPN

▶ Mechanical

- ▶ Improper central venous line placement
- ▶ Sepsis/infection
- ▶ Venous thrombosis

▶ Infection

- ▶ Not changing the dressing or line often enough
- ▶ Not using sterile methods
- ▶ Not inspecting the site often enough for sign of infection

▶ Metabolic

- ▶ Fluid and electrolyte imbalances
 - ▶ Hyperglycemia
 - ▶ Refeeding syndrome
 - ▶ Vitamin deficiencies
-



Nutrition Diagnoses w/Interventions

- ▶ Involuntary weight loss related to a history of poor nutrition with colitis as evidenced by his %UBW
 - ▶ Advance as tolerated to 2200 cal DM diet
 - ▶ Add Glucerna and propass applesauce BID
- ▶ Inadequate protein energy intake related to altered GI function as evidenced by CL x 1 day
 - ▶ Advance as tolerated to 2200 cal DM diet
 - ▶ Add supplements when diet allows
 - ▶ Communication form to MD
- ▶ Inadequate protein energy intake related to altered GI function as evidenced by CL x 2 days, <50% PO, & TPN providing 65-70% of estimated needs
 - ▶ Maintain current TPN for some nutrition while patient is working towards tolerating PO diet, but to discontinue TPN when the patient tolerates at least 50% PO
 - ▶ Continue current diet order of GI soft, 2200 DM
 - ▶ Add Glucerna once a day



Nutrition Diagnoses w/Interventions

- ▶ Inadequate protein energy intake related to altered GI function as evidenced by patient eating about 50% PO
 - ▶ Taper TPN as patient begins to tolerate >50% PO
 - ▶ Send Glucerna BID once patient is off TPN due to high blood sugars
- ▶ Excessive PN nutrition related to current condition as evidenced by patient tolerating PO diet and beginning to eat approximately 75% of meals consistently.
 - ▶ Discontinue TPN as there is not indication at this time
 - ▶ Continue with current diet order
 - ▶ Send Glucerna BID when TPN d/c
- ▶ Increased nutrient needs related to metabolic stressors as evidenced by surgical incisions/pressure ulcer
 - ▶ Encourage PO
 - ▶ Patient select menu
 - ▶ Send double meat portions
 - ▶ Glucerna BID



Monitor and Evaluation

- ▶ >75% estimated energy and protein needs met with PO
- ▶ Maintain LBM
- ▶ Promote skin integrity
- ▶ Patient able to better select appropriate foods based on educations



Personal Impressions

