Medical Nutrition Therapy:

Acute Pancreatitis with Multiple Autoimmune Disorders

Corey Scarpero
University of Maryland
Dietetic Intern
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Executive Summary

An estimated 80,000 cases of acute pancreatitis occur each year in the United States, with biliary tract disease and alcoholism as the cause in 80% of these cases. The remaining 20% are attributed to drugs (e.g., azathioprine, corticosteroids, thiazide diuretics, and estrogens), hypertriglyceridemia, infection (eg, mumps), vascular disease, blunt trauma, structural abnormalities, hyperparathyroidism and hypercalcemia, or renal transplantation[1].

Individuals suffering from autoimmune diseases are often forced to choose between the symptoms of their condition and the side effects of chronic drug use to control those symptoms. In the case presented here, the patient was admitted for acute pancreatitis as a result of a combination of chronic corticosteroid use, which she requires for the control of her complex disease state, and a history of elevated lipids.

The standard of care for acute pancreatitis is bowel rest until the condition resolves, usually on its own, in an average of 5-7 days. TPN is warranted only in cases where the resolution of pancreatic enzymes is excessively prolonged, or when pancreatitis is accompanied by an overt hypermetabolic state (increased energy needs, proteolysis, and glucose production)[2]. In the case of an already malnourished individual, however, therapy must be tailored to meet these special needs, and TPN may be necessary earlier.

The following case study addresses a complex case of acute pancreatitis in an individual with several overlapping autoimmune diseases, including systemic lupus erythamatosis, Sjögren's Syndrome, and severe celiac sprue. The dietitian is challenged to meet the increased energy and nutrient needs of a patient with decreased absorption and many food intolerances, while providing the bowel rest needed for resolution of pancreatitis.

CASE REPORT

General Information

PK is a 57 year old Caucasian female who was admitted on March 24, 2004, after experiencing syncope, nausea, vomiting, and abdominal pain raditaing to her back. She had also had blood in her stools and had noted oil droplets in the toilet (suggesting **steatorrhea**). Admitting diagnoses for this patient included acute pancreatitis and lower leg cellulitis. PK was later discharged on April 1, 2004, but returned to AAMC on April 25, 2004, for reoccurence of lower leg cellulitis and a non-healing, infected foot ulcer requiring incision and debridement .

Social History

PK is a registered nurse, currently disabled due to multiple medical issues. She lives at home with her husband who has **polyarteritis nodosa** but is currently doing very well. PK has two adult children (one son, one daughter) and is well-supported by her family. She ambulates with a cane and was completely independent for all activities of daily living until recent onset of abdominal pain. PK has excellent knowledge of the gluten-free diet and practices strict adherence at home.

Medical / Surgical Data

Past Medical & Surgical History

PK has an extensive history of autoimmune disorders, including **systemic lupus erythematosus** (with chronic generalized weakness), **fibromyalgia**, **celiac sprue, endometriosis**, and **Sjrögen's syndrome**. Her medical history also includes

hypertension, **coronary artery disease** (status post two **stent** placements) with a **myocardial infarction** in 1998, chronic **venous stasis** and **cellulitis** of lower extremities with intermittent chronic foot ulcers, chronic **lymphedema**, uterine cysts, short term memory loss due to medications, chronic **oral candidiasis**, clinical depression (diagnosed five years ago), anemia of chronic disease, increased cholesterol, **pernicious anemia** (on B12 injections), **congenital pseudopapilledema**, chronic musculoskeletal pain syndrome following motor vehicle accident with severe trauma and multiple fractures, anxiety, and **osteoporosis**. PK has also undergone an appendectomy, a hysterectomy in 1998, and had a benign breast biopsy over ten years ago.

Family History

PK's paternal grandmother had uteran cancer, and her maternal grandfather had cirrhosis of the liver. Her father was a chronic alcohol abuser and had stomach ulcers. He died at age 67 in a motor vehicle accident. Her mother died at age 57 of heart disease.

Physical Data

Relevant portion of physical examination on March 24 admission to AAMC included:

Ear, nose, and throat:	Normal except mild dehydration, dry mouth
Abdomen:	Full, soft, tenderness generalized but maximally felt in epigastric area with some fullness, bowel sounds scanty
Lower extremities:	Bilateral edema, some redness on the left
Skin:	Some bruising around left jaw

Laboratory Results

Refer to Appendix I for table of PK's laboratory results.

Medications

Refer to Appendix II for table with medications, dosages, date of administration(s), medical function, and nutritional side effects of each drug.

Diagnostic tests

An EKG on March 25 showed an ejection fraction of >70%, well preserved left ventricular function, and mild mitral and tricuspid regurgitation. A CT scan of the abdomen on this same date revealed no masses in the pancreas. A diagnosis of acute pancreatitis was based on laboratory values for PK.

Allergies

Gluten, sulfa drugs, keflex.

Nutritional History

Diet History

March 24:	NPO except medications
March 25:	Clear liquids
March 26:	Clear liquids
March 27:	Gluten free for breakfast and lunch NPO at dinner
March 28:	NPO TPN begun (100 cc/hr; 50 grams amino acids, 150 grams dextrose, 10% lipid at 10 ml/hr; non-protein kcal=660, total kcal = 860)
March 29:	Clear liquid breakfast TPN lowered to 70 cc/hr; (50 grams amino acids, 175 grams dextrose, 860 kcal non-protein kcal, 1060 total kcal) Low fat, gluten-free lunch, dinner

(Diet History Continued)

March 30: Low fat, gluten-free

March 31: Low fat, gluten-free, TPN discontinued

April 1: Low fat, gluten-free breakfast, patient discharged before lunch

Weight History

Height: 165 cm (5'5")
Weight upon admission: 52 kg (115 pounds)

Weight during January admission to AAMC: 60 kg (132 pounds)

Weight change in 2 months = ~8 kg (17 pounds) unintentional → High nutritional risk

Physical Activity Level

PK ambulates with a cane and does not participate in any physical activity beyond the activities of daily living.

Intake of Vitamins, Minerals, Supplements, Herbals

PK was taking vitamin B6, D, C, E, a multivitamin, and regular B12 injections prior to admission.

Medications Prior to Admission

Refer to Appendix III for table with medications and the medical function of each drug PK was taking before hospitalization

Past/Present Dietary Regimen / Nutritional Therapy

PK follows a gluten-free diet exceptionally at home and has access to many wheat-free foods through specialty stores and catalogs.

Hospital Course of Patient

Medical Treatment

PK was admitted to AAMC on March 24, 2004, after experiencing syncope, nausea, vomiting, and abdominal pain raditaing to her back. She had also had blood in her stools and had noted oil droplets in the toilet (suggesting steatorrhea).

The evaluation plan for PK included a CT scan of the abdomen to determine the cause of pain, an EKG to rule out any cardiac causes for syncope, and gentle hydration via IV fluids for dehydration. After performing these tests (see *Diagnostic Tests* section for results), a diagnosis of acute pancreatitis was made based on laboratory values (elevated serum lipase and amylase).

Based on this diagnosis, a plan of care was developed consisting of bowel rest for pancreas healing (with nutritional support if necessary), supplementation with pancreatic enzymes as necessary, and rehydration with IV fluids.

The standard treatment for acute pancreatitis includes the following objectives[1]:

- Withhold oral feeding
- IV fluids
- TPN in severe, prolonged cases

In comparing the treatment of PK to this standard, her care was quite appropriate and included all of these aspects.

Nutritional Treatment

Day 1	PK was experiencing extreme abdominal pain, nausea, and vomiting, and thus was NPO.
Day 2	Persistent nausea warranted issuing a clear liquid diet.
Day 4	PK's nausea had subsided enough to warrany a diet order of gluten-free for breakfast and lunch, with about 50% consumption of both. At this point, however, a diagnosis of pancreatitis was made and NPO was ordered for dinner in order to provide appropriate rest of the pancreas.
Day 5	NPO order persists for continued pancreas rest. TPN was also initiated due to the patient's weight loss and poor intake prior to admission. TPN was delivered at a rate of 100 cc/hr, containing 50 grams amino acids, 150 grams dextrose, 10% lipid at 10 ml/hr. This provided 775 non-protein kilocalories and 974 total kilocalories, providing about 54% of PK's energy needs, and 70% of her protein needs.
Day 6	On this day pancreatic improvement was demonstrated by a decrease in serum amylase and lipase, and consequently the diet was progressed to clear liquids. PPN was also lowered to a rate of 70 cc/hr to encourage appetite and p.o. intake. Later that day, PK's diet was advanced to low fat, gluten-free, and she was also given Pancrelipase to be taken with meals for increased digestion and absorption. A diet low in fat is important to reduce strain put on a healing pancreas.
Day 7-9	PK continued on the low fat, gluten-free diet, averaging about 50% intake, and TPN was discontinued one day before discharge.

The following are the current recommendations for nutrition therapy for patients with pancreatitis[3]:

- Start NPO with IV feedings for 48 hours. Use TPN for excessively slow progression.
- Check glucose tolerance and progress to clear liquids. Eventually progress to amino acids and predigested fats. Progress to a diet given in six daily feedings, used with pancreatic enzymes for all meals and snacks.
- Alcoholic beverages are prohibited. In addition, caffeine, nicotine, and gastric stimulants should be prohibited
- Adequate calcium and fat-soluble vitamins supplementation should be provided. Magnesium may be needed.

- Diet should include adequate amounts of vitamin C, B-complex, and folate for water-soluble vitamin needs, as well as zinc. Thiamine is especially needed.
- Diet should be low in fat and provide adequate protein and increased energy requirements.

Nutrition therapy for PK closely resembles that of the current recommendations, with a few differences. First, the patient was not offered six small feedings, but was instead given the hospital's standard three meals. By offering six small meals, the patient may have increased kcal intake, an important factor for this malnourished individual. In addition, it is shown that frequent small feedings are often absorbed better in individuals with celiac disease, who suffer from flattened intestinal villi and infiltration of lymphocytes, leading to less surface area for absorption[4]. Refer to Appendix IV for an imaging demonstrating this phenomenon.

Secondly, PK was not given as many vitamin and mineral supplements as prescribed in the standards of care. Not only does she require these supplements, but would benefit from even more vitamins due to her state of malnutrition and chronic disease. She also has osteoporosis and should be provided with additional calcium and vitamin D[5].

Case Discussion

Medical Considerations

The pancreas plays a number of key roles in the digestive system. As chyme from the stomach enters the small intestine, the acidity of the material must be quickly and effectively neutralized. This is accomplished by the secretion of bicarbonate and water by the epithelial cells of the pancreatic ducts. The pancreas also performs the function of secreting the necessary enzymes for digestion of protein (trypsin and chymotrypsin), fat (lipase), and carbohydrate (amylase). Lastly, the pancreas is crucial for control of blood glucose. This glucose homeostasis is accomplished by the secretion of insulin (in times of high blood sugar), and glucagon (for low blood sugar)[6].

Pathophysiology of Pancreatitis

The mechanism that causes pancreatitis is not well known. It is thought that the enzymes normally secreted by the pancreas in an inactive form become activated inside the pancreas and begin to digest the pancreatic tissue (autodigestion). This causes swelling, hemorrhage, and damage to the blood vessels[7].

Symptoms

Symptoms of pancreatitis may include nausea, vomiting, abdominal pain that is greatest in the upper abdomen and may radiate to the back or below the left shoulder blade (may be worse after eating or drinking, especially foods with a high fat content), sweating, anxiety, fever, mild jaundice, swollen abdomen, clay-colored stools, steatorrhea, and hiccups.

Signs and Tests

Signs and tests for pancreatitis include elevated serum amylase, elevate urine amylase, elevated serum lipase, showing inflammation of the pancreas (viewed via abdominal CT, abdominal ultrasound, or abdominal MRI), a CBC showing elevated WBC count, elevated glucose, decreased serum calcium (due to formation of Ca "soaps" secondary to excess generation of free fatty acids). The condition may also alter trypsinogen, serum Mg, MDH, fecal fat, CEA, ionized Ca, AST, and serum bilirubin may increased because pancreatic edema compresses the common bile duct[1].

Ranson's Criteria (see Appendix V) are often used to diagnosis acute pancreatitis, as well as to predict the prognosis of an individual's disease state.

Treatment

Pancreatitis treatment is often aimed at supportive measures, such as IV fluid replacement, analgesics for pain, NPO to restrict pancreatic activity that makes symptoms worse, and nasogastric suctioning if there is persistent vomiting or paralytic ileus[1].

Prognosis

Most cases resolve in week, although life-threatening illness can develop. The death rate is high with hemorrhagic or necrotizing pancreatitis and complications such as liver, heart, or kidney impairment may occur.

Complications

Possible pancreatitis complications include low blood pressure, heart failure, kidney failure, ascites, and pancreatic cysts.

Implications of Findings to the Practice of Dietetics

While NPO status is crucial for pancreatitis recovery, it is also of high importance to feed the malnourished patient. Care must also be given to assess the nutrient requirements of the individual, and to provide proper supplementation of the necessary vitamins and minerals. Persistent documentation is often needed to fully accomplish this.

In addition, in conditions where small, frequent feedings are warranted, the dietitian must ensure adherence to this need by the dietary staff through proper training and communication, as it goes against the timing of meal service normally provided.

The registered dietitian's most important role in this case, as in many others, continues to be to serve as an advocate for the increased nutritional needs of the inpatient population.

Appendix I

Lab Values								
	Reference	3/24	3/25	3/26	3/27	3/28	3/29	3/30
RBC	*4.10-5.30*	**3.52**	**2.64**	**2.76**	**2.55**	**2.51**	**2.94**	**2.88**
Hgb	*12.0-16.0*	**10.9**	**8.4**	**8.6**	**8.1**	**7.8**	**9.2**	**8.9**
Hct	*37-47%*	**33.3**	**25.7**	**26.7**	**24.7**	**24.1**	**27.7**	**27.3**
WBC	*4.8 -10.8*			**3.7**				
Platelet Count	*150-350*	**375**	333	335	330	336	**387**	**370**
BUN	*5-25*	17	13	7	6	8	9	10
Na	*137-145*	**134**	140	138	140	138	141	**136**
K	*3.5-5.1*	4.4	**3.3**	**2.9**	**3.4**	4.2	4.0	3.5
Chlor	*98-107*	**96**	106	108	**114**	**112**	**115**	107
CO2	*22-30*	26.1	22.4	23.4	**19.3**	**19.0**	**17.3**	**19.1**
Gluc	*74-106*	88	93	99	75	82	84	96
Creat	*0.7-1.2*	**1.3**	1.0	0.8	0.8	0.8	0.7	**0.6**
Ca	*8.1-10.2*	8.8	**7.2**	**7.0**	**6.8**	**7.3**	**7.6**	**7.7**
Phosph	*2.5-4.5*	X	X	2.8	X	**1.8**	**1.8**	2.7
Alb	*3.5-5.0*	X	**2.8**	X	X	**3.0**	**2.8**	X
Amylase	*20-90*	185	143	154	182	202	166	117
Lipase	*7-60*	112	109	116	140	114	89	66
B12	*200-950*			253.6				
Uric Acid	*2.0-7.7*			4.2				
LDH	*20-300*			255				
AST	*10-40*			29				
ALT	*4-44*			13				
Total Bili	*0.3-1.3*			0.3				
Direct Bili	*0.0-0.5*			0.1				
Ionized Ca	*4.1-5.5*			4.2				
Cholesterol	*120-200*			208				
Mg	*1.0-2.3*			1.6				
Triglyceride	*20-190*			226				
Alk Phosph	*21-132*			53				

Appendix II - Medications

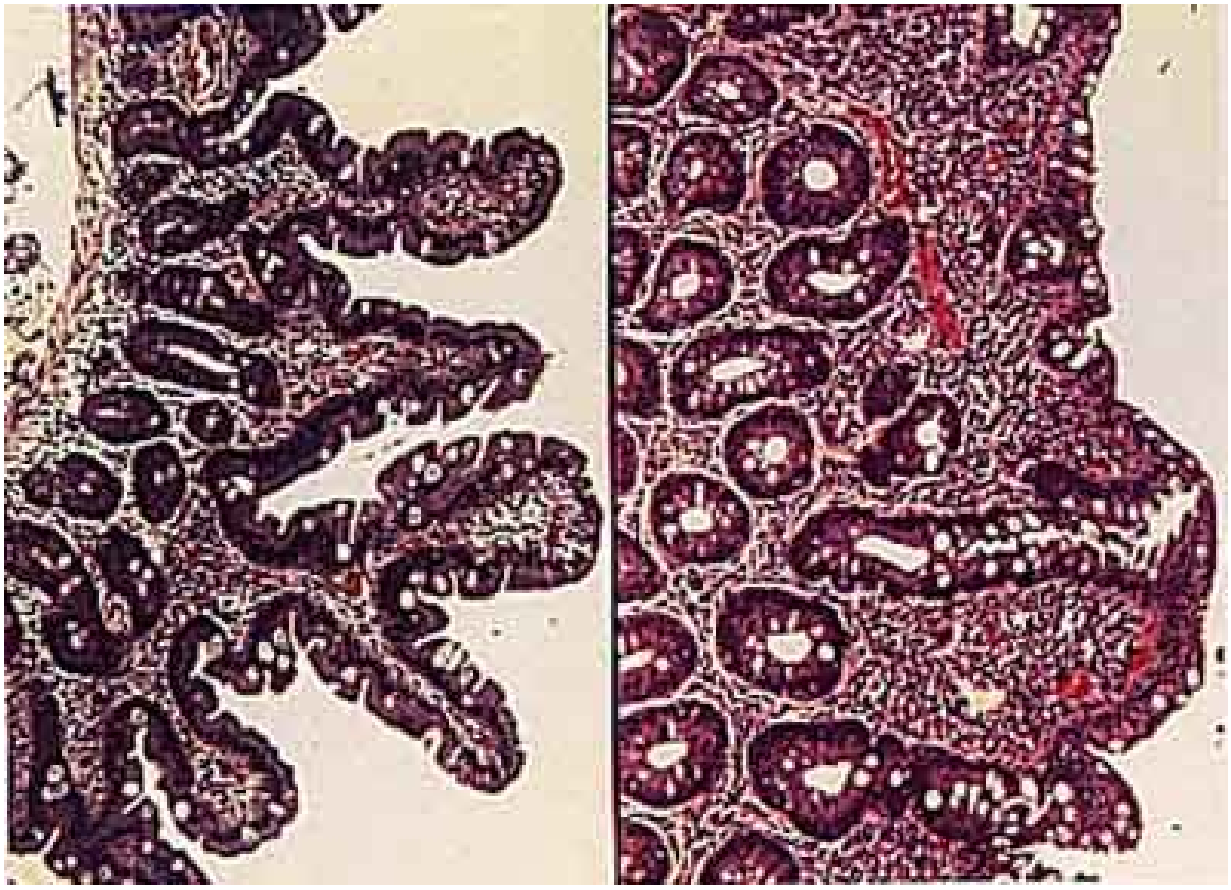
Medication	Route	Start	Stop	Function	Nutritional Implications
Clonazepam	PO	3/30	4/1	CNS depressant; used to treat anxiety	Limit caffeine. May cause anorexia, increased thirst, dry/sore mouth, dysphagia.
Pantoprazole	PO	3/29	4/1	Proton pump inhibitor used to treat GERD	Should be taken 30-60 minutes before meal. May dec. absorption of Fe and B12.
Prednisone	PO	3/29	4/1	Corticosteroid- used as anti-inflammatory, immunosupressant	Decrease Na, inc Ca, vit D, protein. Often causes increased appetite and weight gain.
Pancrelipase	PO	3/29	4/1	Pancreatic enzymes for the digestion of proteins, starches, and fats.	
Becalblermin gel	topical	3/29	4/1	Human platelet-derived growth factor used to treat ulcers of the foot, ankle, or leg	
Erythropoeitin	SC	3/27	4/1	Antianemia, stimulates RBC production	May need Fe, folate, or B12 supp. May cause N/V or GI bleeding.
Naloxone	IV	3/27	4/1		
Cyanocobalamin	IM	3/26	4/1	Vitamin B12	Caution with folate supp as may mask pernicious anemia and result in progression of neurologic damage.
Ondansetron injection	IV	3/25	4/1	Antiemetic	May cause dry mouth, constipation, diarrhea
Zolpidem tarrate	PO	3/25	4/1	Sleep aid	Do not take immediately after a meal, decreases abs. and delays action. May cause dry mouth, constipation, diarrhea.
Metoprolol	PO	3/25	4/1	Beta-adrenergic blocker; for hypertension	
Nitroglycerin	Patch	3/24	4/1	Nitroglycerin skin patches are used to prevent chest pain (angina). They work by relaxing the blood vessels to the heart, so the blood flow and oxygen supply to the heart is increased.	Take with food. Decrease Na. Avoid natural licorice.
Oxycodone	PO	3/29	4/1	Analgesic	May cause nausea, vomiting, constipation, anorexia. Avoid alcohol.
Ranitidine inj	IV	3/28	3/30	Histamine H_2-receptor antagonists; anti-ulcer	Dec. B12 and Fe abs. Bland diet may be recommended.
Hyperalimentation solution	IV	3/28	3/30		
Lorazapem	*PYX	3/30	3/30	Antianxiety	Limit caffeine. May cause dry mouth, nausea, constipation.
Morphine	IV	3/27	3/29	Narcotic analgesic that acts in the central nervous system to relieve pain	

Appendix III - Medications Prior to Admission

Medication	Function
Lasix	Diuretic
Metoprolol	Beta-adrenergic blocker; for hypertension
Aspirin	Analgesic, to prevent MI or CVA
Coumadin	Anticoagulant
Lipitor	Antihyperlipidemia
Prednisone	Corticosteroid- used as anti-inflammatory, immunosupressant
Vitamin B12	Supplementation, antianemic
Metoclopramide	Antiemetic, antiGERD
Prevacid	Antiulcer
Oxycontin	Analgesic
Skelaxin	Skeletal muscle relaxant
Augmentin	Antibiotic
Premarin	Hormone
Multivitamin	
Vitamins B6, D, C, E	
Nitrostat	Anti-CHF
Somata	Sleep aid
Zofran	Antiemetic

** *Route of administration, frequency, and dose information not available* **

Appendix IV – Stained Cross Section of Intestinal Villi[4]



Normal **Celiac Disease**

Appendix V – Ranson's Criteria for Diagnosis of Pancreatitis[9]

At Admission	During Initial 48 Hours
Age > 55 yrs	Hematocrit falls by > 10 mg/dl
WBC > 16,000/cc	BUN increases by > 5 mg/dl
Glucose > 200 mg/dl	Calcium < 8 mg/dl
LDH > 350 IU/L	PaO2 < 60 mmHg
AST > 250IU/L	Base deficit > 4 mg/dl
Fluid sequestration > 6 L	

Mortality increases with number of positive signs:

Less than 3: mortality rate = < 5%

3-4 positive: mortality rate = 15-20%.

Glossary[8]

Celiac Sprue – Celiac disease is an inherited, autoimmune disease. The lining of the small intestine is damaged in response to ingestion of gluten and other proteins found in wheat, barley, rye, possibly oats, and their derivatives.

Cellulitis – A diffuse, acute infection of the skin and subcutaneous tissue characterized most commonly by local heat, redness, pain, and swelling, and occasionally by fever, malaise, chills, and headache.

Congenital Pseudopapilledema – Papilledema is disc edema secondary to increased intracranial pressure. Pseudopapilledema is apparent optic disc swelling that simulates papilledema but is usually secondary to an underlying benign process

Coronary Artery Disease – An abnormal condition that may affect the heart's arteries and produce various pathologic effects, especially the reduced flow of oxygen and nutrients to the myocardium.

Endometriosis – Endometriosis is a condition in which the tissue that normally lines the uterus (endometrium) grows in other areas of the body, causing pain, irregular bleeding, and frequently infertility.

Fibromyalgia – Fibromyalgia is a common condition characterized by widespread pain in joints, muscles, tendons, and other soft tissues. Some other problems commonly linked with fibromyalgia include fatigue, morning stiffness, sleep problems, headaches, numbness in hands and feet, depression, and anxiety.

Fibromyalgia can develop on its own, or secondary to other musculoskeletal conditions, such as rheumatoid arthritis, or systemic lupus.

Gluten – The insoluble protein constituent of wheat and other grains.

Hypertension – Elevated blood pressure

Lymphedema – A condition characterized by the accumulation of lymph in soft tissue and the resultant swelling caused by inflammation, obstruction, or removal of lymph channels.

Myocardial Infarction – Necrosis of a portion of cardiac muscle cause by an obstruction in a coronary artery through either atherosclerosis, a thrombus, or a spasm. Also called heart attack.

Oral Candidiasis – An infection of the oral cavity caused by a species of *Candida*; often caused by immunosupression.

Osteoporosis – A reduction in the amount of bone mass, leading to fractures after minimal trauma.

Pernicious Anemia – A progressive megaloblastic macrocytic anemia that results from a lack of intrinsic factor essential for the absorption of cyanocobalamin (B12).

Polyarteritis Nodosa - Polyarteritis nodosa is a serious blood vessel disease in which small and medium-sized arteries become swollen and damaged when they are attacked by rogue immune cells.

Sjrogen's Syndrome – Sjogren syndrome is a systemic inflammatory disorder characterized by dry mouth, decreased tearing, and other dry mucous membranes. It is often associated with autoimmune rheumatic disorders.

Steatorrhea – Greater than normal amounts of of fat in the feces, characerized by frothy, foul-smelling fecal matter that floats.

Stent - An intraluminal coronary artery stent is a small, self expanding, stainless steel mesh tube that is placed within a coronary artery to keep the vessel open. It may be used during a coronary artery bypass graft surgery to keep the grafted vessel open, after balloon angioplasty to prevent reclosure of the blood vessel, or during other heart surgeries.

Systemic Lupus Erythamatosus – Chronic inflammatory disease affecting many systems of the body. Includes severe vasculitis, lesions of the skin and nervous system, and sometimes renal involvement

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