Case Study: Chronic Pancreatitis, Transition from PN to EN

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**Introduction: DB**

DB is a 64 year old male who came to the ER with intractable nausea and vomiting for four days prior to admission, a fever, and lactic acidosis. At home he was on total parenteral nutrition (TPN) and had a port in place. With his fever and lactic acidosis and the presence of a port, he was taken to the intensive care unit (ICU) on sepsis protocol and cultures were sent to the lab to determine if he had sepsis. He was taken off the TPN on admission until the cultures could be tested.

DB had a history of chronic pancreatitis related to a pancreatic divisum. He also has severe gastroparesis, even though he has not had anything to eat in over a year. He was diagnosed with type I diabetes mellitus during early childhood. He also had a motor vehicle accident resulting in spinal fusion, and lung CA with a lobectomy in 2006. He lives at home with his wife, and has children who are grown and married. He never drinks alcohol.

During rounds in the ICU the first morning, it was found that he had a percutaneous endoscopic gastrostomy (PEG). Upon discussion with the patient and his wife, it was determined that it had been placed two weeks prior for stomach venting, and for an eventual trial of enteral feeding (TF or tube feed). The intensivist recommended he consider a jejunostomy tube be placed once he was stable and to begin enteral feeding through the jejunostomy. This recommendation was in part due to his persistent and severe gastroparesis, as well as his chronic pancreatitis.

A TPN consult was sent to both the dietitians and the pharmacy. His weight had been steady for over a year on his home TPN, and the decision was made to base the recommendations for TPN on his home formula. The dietitian’s recommendation to the
pharmacy was to have the TPN to run at 80 mLs/hr over 24 hours and consist of 225 mLs lipid/day, 160 g dextrose/L, 55 g AA/L. This would provide him with 24.5 kcals/kg, 1.3 g protein/kg, 2.6 mg/kg/min dextrose and 0.63 gms fat/kg. The pharmacy agreed and ordered the TPN to arrive that afternoon. That evening, the TPN was started after cultures from his port came back negative.

Two days later, the decision was made to place a jejunostomy tube. His fever had been reduced, and he was on medicine for the nausea and vomiting. The jejunostomy tube was placed on his sixth day in the hospital. It was surgically placed approximately 12 to 23 inches past the ligament of Treitz. A #16 French tube was placed. After 24 hours, a tube feed consult was ordered. The decision was made to start him on a peptide-based, elemental formula. The elemental formula in the hospital formulary is Vital. The order was made to start Vital 1.5 at 20 mLs/hr and watch for tolerance. The patient did not tolerate this formula and it was stopped after six hours. It was unknown if he did not tolerate it because of his pain medication, the fructooligosaccharides (FOS) in the formula, anxiety, or not having anything in his gastrointestinal (GI) tract for over a year. The patient and his wife still desired to try TF, and the next day, he was switched to Peptamen 1.5 at 10 mLs/hr and the TPN rate was decreased from 80 mLs/hr to 70 mLs/hr. If he tolerated the TF, the TF could be increased by 10 mLs/hr and TPN decreased by 10 mLs/hr every 8 hrs until a goal rate of 60 mLs/hr TF was reached. By 5 a.m. the next morning, he was tolerating the TF at 30 mLs/hr and by 2 p.m. his TPN was turned off and the TF was running at the goal of 60 mLs/hr. At discharge, his fever, nausea, and vomiting had resolved.

Education was given on TF, as well as the additional cost associated with an elemental formula. Counseling was given regarding how to monitor for tolerance, and additional TF care
and follow-up support was coordinated with his home health provider. Even though there was an increased cost associated with an elemental formula, the patient and his wife agreed that they wanted to continue with the formula to help him continue to tolerate the TF and hopefully keep him off TPN.

He continued to tolerate the TF, and was discharged on Peptamen 1.5 at 60 mLs/hr after 24 hrs. The home health company that had previously cared for his TPN took over management of his TF upon discharge. The summary of his stay can be found in the nutrition care process form at the end of this document (figure 2).

**Medical Concerns**

This patient came in with multiple medical concerns which affected the nutrition care plan during his admission. The main concerns were related to his chronic pancreatitis, caused by pancreatic divisum, and gastroparesis. Each condition presented a unique set of challenges, and combined with the status of his home TPN without oral intake for more than a year, each condition had to be considered while determining the nutrition care plan for this patient.

**Chronic Pancreatitis**

Chronic pancreatitis is the product of years of inflammation, leading to impairment of the pancreas.\(^1\)\(^-\)\(^3\) It often begins as acute pancreatitis, and can be caused by hereditary disorders, cystic fibrosis, hypercalcemia, hyperparathyroidism, hyperlipidemia, excessive alcohol consumption, or a lipase deficiency.\(^1\) 70% of chronic pancreatitis is caused by alcoholism.\(^1\) Chronic pancreatitis most often presents in people who are in their 30s or 40s because it usually takes years to develop.\(^1\)\(^,\)\(^2\) Signs of chronic pancreatitis or exacerbation of chronic pancreatitis are
severe abdominal pain, often accompanied by nausea, vomiting, and diarrhea.\textsuperscript{1-3} Eating can often exacerbate the pain.\textsuperscript{3}

Chronic pancreatitis causes damage, and eventually death, to the acinar cells, which secrete digestive enzymes. This can cause malabsorption of fat and decreased secretion of insulin.\textsuperscript{1-3} It is treated with a fat restricted diet, and often with pancreatic enzyme replacement therapy (PERT) to help an individual digest food.\textsuperscript{2,3} Patients with chronic pancreatitis have increased protein and calorie needs, especially during exacerbation periods.\textsuperscript{1-3} Fat malabsorption can occur as lipase levels decrease, and should be closely monitored.\textsuperscript{1} Fat soluble vitamins, as well as vitamin B\textsubscript{12}, often need to be replaced.\textsuperscript{2} Pain relievers as well as medicines to reduce gastric acid secretion are often prescribed, as well as nerve blockers.\textsuperscript{1} Surgeries, such as a pancreatectomy, are sometimes used but can cause other lifelong complications such as diabetes.\textsuperscript{1,2} Treatment generally focuses on pain relief, with surgery only indicated in severe cases.\textsuperscript{1}

**Pancreatic Divisum**

Pancreatic divisum is one of the main genetic causes of chronic pancreatitis.\textsuperscript{4} Pancreatic divisum is a birth defect. It is manifest when the two parts of the pancreas fail to fuse properly.\textsuperscript{4} This results in failure to create a common duct for excretion of enzymes and fluids.\textsuperscript{4} Because the two areas did not fuse, the pancreatic duct is not formed.\textsuperscript{4} Two different ducts are present, and enzymes and fluid drain through two different openings.\textsuperscript{4} This can be seen in figure 1 below. If one or both of these ducts become blocked, tissue damage may develop, leading to pancreatitis.
Gastroparesis

Gastroparesis is a delayed emptying or motility of stomach contents.\(^1,2\) It is common with patients who have diabetes, though other conditions can also cause it. Gastroparesis increases the time that food stays in the stomach before entering the small intestine. This delay can lead to a feeling of fullness or bloating, as well as nausea and vomiting.\(^2\) It can also lead to either diarrhea or constipation.\(^2\) The best way to treat it is to decrease meal volume and decrease the fat content of the diet.\(^1\) If gastroparesis is persistent and does not improve with these changes to diet, feeding through a jejunostomy tube may be required.\(^1\) This bypasses the stomach, allowing nutrition to be received without adding to the volume in the stomach.

Current Guidelines and Recommendations: Chronic Pancreatitis

One of the most difficult challenges in deciding how to treat this DB was the lack of strong evidence for how to treat chronic pancreatitis. Many studies and guidelines look at acute pancreatitis or do not differentiate between treatments for chronic versus acute pancreatitis. Many nutrition guidelines are presented without being fully supported, or without having

Figure 1: Normal Pancreas vs Pancreatic Divisum \(^5\)
evidence that those guidelines are better than other options. In looking for research, it was determined that the most recent pertinent evidence spans the last ten years.

Two retrospective studies looked at how a jejunostomy feeding tube is tolerated in patients with chronic pancreatitis.\textsuperscript{6,7} Both found that jejunostomy feeding tubes improved prognosis, improved weight, decreased occurrence of sepsis, decreased pancreatic gland stimulation, and decreased pain.\textsuperscript{6,7} It was found that around 5\% of patients with chronic pancreatitis will need enteral feeding.\textsuperscript{6} Both studies were relatively small, with less than 100 participants. They also were retrospective, and therefore could not look at all factors determining ability for tolerance.

One of these retrospective studies looked at if a standard formula can be tolerated in patients with chronic pancreatitis.\textsuperscript{7} It was found that most people were able to tolerate the standard formula.\textsuperscript{7} Of the patients who did not tolerate the standard formula, 50\% also did not tolerate the elemental formula either and needed TPN.\textsuperscript{7} These findings were similar to findings in a study looking at semi-elemental or polymeric formulas in acute pancreatitis.\textsuperscript{8} The randomized study found that there was no difference in tolerance between formulas.\textsuperscript{8} However, it was found patients who had the semi-elemental formula had more favorable prognosis with less weight loss.\textsuperscript{8}

Looking at these and other studies, three review articles examined which method of feeding patients with pancreatitis is the best. One review study looked at chronic pancreatitis and cited one of the retrospective studies above, stating that only 5\% of patients with chronic pancreatitis need enteral nutrition.\textsuperscript{9} For anyone with chronic pancreatitis, it was found that they need around 1-1.5 g/kg protein and 30-40\% of calories should come from fat.\textsuperscript{9} Two review
articles looked at enteral versus parenteral nutrition. Both found that enteral nutrition is preferred over parenteral nutrition to help improve outcomes, with one stating it also has better outcomes in most patients in the ICU. \textsuperscript{10, 11} One review did admit that the studies on pancreatitis have such different data that solid recommendations for the preferred type of enteral feeding and exact location to place the feeding tube cannot be made until further research is conducted.\textsuperscript{11}

An additional review article supported the evidence that enteral nutrition may be necessary, and should be attempted before TPN.\textsuperscript{12} This review article also suggested PERT may be needed in patients with chronic pancreatitis to avoid malabsorption of fat and fat soluble vitamins.\textsuperscript{12} It also looked into research that suggests antioxidants may help reduce the pain associated with pancreatitis to help decrease inflammation, and recommended that patients with pancreatitis have antioxidant supplementation for better outcomes.\textsuperscript{12}

Combining the research with the reviews of research, ESPEN (European Society for Parenteral and Enteral Nutrition) and ASPEN (American Society for Parenteral and Enteral Nutrition) have developed nutrition guidelines for treating pancreatitis. ESPEN developed guidelines for the use of parenteral nutrition in pancreatitis. They recognized that enteral nutrition is the preferred form of nutrition, and parenteral nutrition should only be used when enteral nutrition was not tolerated.\textsuperscript{13} It was suggested that enteral nutrition improves outcomes in pancreatitis and is the preferred method.\textsuperscript{13} It was established that those with pancreatitis should be given 1.2-1.5 g/kg protein per day. ASPEN published similar guidelines, stating enteral nutrition is preferred over parenteral nutrition and should always be attempted first.\textsuperscript{14} They recommended continuous feeding over cyclic or bolus feeding, but recognized that not all studies support this suggestion. They also recommended peptide based formulas with medium chain
triglycerides (MCTs) be given to those patients with pancreatitis, but acknowledged that there are multiple contradictory studies and only weak evidence for that suggestion.\textsuperscript{14}

From these recommendations and studies, all agree that enteral formula leads to better outcomes in pancreatitis and should be attempted first.\textsuperscript{1, 2, 10-14} Use of a peptide based or semi-elemental formula is recommended.\textsuperscript{6, 8, 14} Multiple studies have suggested that patients may tolerate standard formula, though more studies should be conducted to support this.\textsuperscript{7, 8} Protein should be estimated at 1.2-1.5 g/kg for patients with pancreatitis.\textsuperscript{8, 9, 13} Jejunostomy tubes appear to promote the best tolerance in those with pancreatitis by decreasing pancreatic gland stimulation, and improving outcomes.\textsuperscript{6, 7}

**Discussion**

This patient was admitted with a history of being on home TPN for over a year. His previous doctor had not begun with enteral nutrition as is suggested. However, the medical team at the hospital recognized this, and from day one decided to try for enteral feedings. Once his cultures came back negative, he was started back on the TPN to give him time to stabilize while still receiving nutrition. Surgery was then performed to insert the jejunostomy tube for nutrition, which is the recommended location for a feeding tube to be placed in those with pancreatitis. He previously had no stimulation of the GI tract, so he was not started on PERT. This may be something that will need to be considered if he begins to have steatorrhea.

While some studies suggest that a standard formula may be used, the decision was made to initially start this patient with a peptide-based, elemental formula. This is the recommendation from ASPEN. Also, the patient did not have anything in his GI tract for over a year, and there was concern about tolerance. He initially was placed on the Vital formula, but did not tolerate it.
However, when we switched to Peptamen, he was able to tolerate the TF at goal. The intolerance may have been to the FOS in the Vital as a patient without anything in his GI tract, though this is only a hypothesis. Both TF formulas provided him over 100% of the recommended intake for vitamins and minerals, including vitamins C and E which are considered to be antioxidants and may help in pain reduction.

Throughout his hospitalization he received 1.3-1.4 g/kg protein. Initially he was only receiving 24.5 kcals/kg, which is lower than the recommended amount. However, he had no GI stimulation, which decreased his estimated needs by about 10%. The initial calorie level was also based on the calorie level he needed to maintain his weight. When advanced to enteral feeding, he received 29 kcals/kg, which is close to the recommended level for patients with pancreatitis and accounted for the increased needs that come with GI stimulation.

While the recommendations and research still have room for improvement, they were followed as closely as possible for this patient. It took some consideration of his individual needs to determine which recommendations and studies would be most appropriate to use with this patient. In the future, it may be best to start with the Peptamen. However, this was not on the hospital formulary, and intolerance needed to be proven to justify the cost in ordering a non-formulary product in a patient who was expected to be in the hospital for multiple weeks. This patient was unique in that he had nothing in his GI tract for a year. Other patients may tolerate a standard formula, though it would still be beneficial to test for tolerance using an elemental formula prior to trying a standard formula.
Conclusion

Chronic pancreatitis is a disease state that still has room for research to be conducted on the best nutrition care plan. While he was admitted for other symptoms, DB was able to have doctors recognize the benefits of enteral feeding, and had a jejunostomy tube placed within a week of his admission to the hospital. DB was able to tolerate an elemental enteral formula by the end of his stay, and was able to be discharged without the use of TPN. This will hopefully promote better outcomes and fewer hospitalizations. With a team who was aware of recent research and willing to look up current recommendations, he was able to receive excellent care.

Based on his outcomes, similar approaches should be used in a future patient with chronic pancreatitis. Enteral nutrition should be the first attempt at providing nutrition, preferably a jejunostomy tube. An elemental formula may be better tolerated, and would be the first formula that should be started. Once tolerance is established, an attempt may be made to change to a standard formula to help decrease cost upon discharge. If patients have steatorrhea, PERT should be initiated and continued for life. Signs of high blood sugar and developing diabetes should be monitored in any patient who does not have a history of diabetes. Care should be taken to look at other conflicting diagnoses and plans should be individualized for each patient.
References

1. Escott-Stump S. Nutrition and Diagnosis-Related Care, 7 ed. Baltimore, Md: Lippincott Williams & Wilkins; 2012.
Figure 2: NCP Form

<table>
<thead>
<tr>
<th>Patient: DB</th>
<th>Referred for: chronic pancreatitis - TPN and TF consults</th>
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**NUTRITION ASSESSMENT**

**Food and Nutrition Related History:** pt has been on home TPN for over 1 year, with NPO. TPN runs 18 hrs/day and provides 25 kcals/kg, 1.1-1.3 g protein.

**Anthropometric Measurements**

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<th>Gender: M</th>
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**Usual Wt:** usual wt 71 kg
1/22: 75.7 kg via unknown method with +5L fluid balance
1/24: 81.3 kg via bedsacle with +fluid balance
1/29: 69.8 kg via standing scale (decrease related to fluid balance, scale variance)
Wt Hx: stable
Feeding wt:
1/22-1/29: 71 kg (usual wt)
1/29 on: 70 kg (rounded from standing wt)

**BMI:**

- usual BMI 21.9
- 1/22: BMI 23.4
- 1/24: BMI 25
- 1/29: BMI 21.5

**Biomedical Data, Medical Tests & Procedures**

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**Medical Diagnosis/PMH/Relevant Conditions:**
Admit hx: intractable N/V x 4 days, fever, dehydration and lactic acidosis. On admit, pt suspected of sepsis. Hospital sepsis protocol activated, and patient placed in ICU. During stay, cultures found to not have growth, indicating no sepsis. During admit, decision was made to try for J-tube placement to begin enteral feeds and hopefully d/c TPN. 6 days into admit, pt had J-tube placed 12-23” past ligament of treitz (#16 FR).

PMH: chronic pancreatitis, pancreatic divisum, Gastroparesis. G-tube present for venting (inserted 1 month prior to admit). Type 1 DM since childhood, and lung CA with lobectomy in 2006.

**Family hx:**

**Pertinent Medications:**

- 1/22: Lantus, reglan, NS at 50 mls/hr, empiric abx until culture results available
- 1/24: Lantus, raglan, zofran, phenergan, electrolyte protocol, Humalog, TPN
- 1/29: Lantus, zofran, Humalog, NS at 70 mLs/hr

**Skin status:**

- X Intact
- □ Pressure Ulcer/Non-healing wound; Comments: BSS 19 throughout stay

**Physical Assessment:**

- upon admit, pt had dark circles under eyes and appeared frail. As admit continued, pt regained color to his face, and began to appear more alert and active.

**Estimated Nutritional Needs Based on Comparative Standards:**

- pt needs based on home TPN regimen as pt had stable wt while on TPN. If TF is tolerated, will need to increase calorie needs by 10%.

**Calories:**

- 1/22 using 71 kg feeding wt: 1775 kcals (25 kcals/kg) – per home regimen
- 1/29 using 70 kg feeding wt: 1950-2100 kcals (29-30 kcals/kg) – increased from previous to account for SDA of food with TF start

**Protein:**

- 78-92 g (1.1-1.3 g/kg) – per home regimen
- 77-98 g (1.1-1.4 g/kg) – higher end initially and lower end once medical issues stabilize

**Fluid:**

- +1775 mLs or per MD
- 2200+ mLs (depending on PEG output and higher if diarrhea occurs)

**Diet Order**

- NPO – do not run TPN until sepsis r/o

**Feeding Ability**

- □ Independent
- □ Limited Assistance
- □ Extensive/Total Assistance
- X N/A

**Oral Problems**

- □ Chewing Problem
- □ Swallowing Problem
- □ Mouth Pain
- X None of the Above

**Intake**

- □ Good (> 75%)
- □ Fair (approx. 50%)
- □ Poor (<50%)
- □ Minimal – (<25%)
- X NPO

- 13
□ No Nutritional Diagnosis at this time  X Proceed to Nutrition Diagnosis Below

### NUTRITION DIAGNOSIS

#### On Admit:
- **P (problem)** inadequate parenteral nutrition infusion related to:
- **E (Etiology)** possibility of sepsis needs to be ruled out before restarting TPN as evidenced by:
- **S (Signs & Symptoms)** no TPN running at admit and consult not planned until after results are finalized.

#### While on TPN:
- **P (problem)** inadequate trace element intake related to:
- **E (Etiology)** national component shortage as evidenced by:
- **S (Signs & Symptoms)** decreased amount of trace elements added to TPN.

#### On TF/Discharge:
- **P (problem)** increased calorie needs related to:
- **E (Etiology)** reintroduction of nutrition through the gut accounting for about 10% increase in intake needs as evidenced by:
- **S (Signs & Symptoms)** pt tolerating TF, and need to increase calculations to greater than 25 kcals/kg for wt maintenance.

### INTERVENTION

#### Nutrition Prescription:
1/22: TPN consult received after sepsis was r/o. Recommend 80 mLs/hr x 24 hrs/day: 225 mLs lipid/day, 160 g dextrose/L, 55 g AA/L. This will provide 24.5 kcals/kg, 1.3 g protein/kg, 2.6 mg/kg/min dextrose, and 0.63 g/kg fat. Also, add insulin to TPN bag as this is what pt does at home.  
1/27: J-tube successfully placed 12-23” past ligament of treitz (#16 FR).  
1/29: TF consult received. Begin TF: FS Vital 1.5 at 20 mLs/hr, and decrease TPN by 20 mLs/hr. Combination will provide: 29 kcals/kg, 1.4 g protein, 284 g carbohydrates, 33% calories from fat.

#### Food or Nutrient Delivery:
1/21-1/22: NPO and no TPN until sepsis r/o  
1/22-1/29: TPN  
1/29-1/31: TPN and TF via J-tube  
1/31-2/1: TF via J-tube

#### Nutrition education:
1/21: Educate pt on need for j-tube. Pt stated hope for TF, but that currently PEG was only for venting. Discussed inability to feed through PEG, and discussed difference between PEG and j-tube.  
1/29: Discussed with pt j-tube placement, and plan for elemental formula. Discussed possible signs of intolerance.  
1/30: Discussed with pt change in formula, and that the new formula would likely be better tolerated. Discussed increased cost associated with enteral formula. Wife and pt agreeable to cost if tolerated until pt could switch to other formula.

#### Nutrition Counseling:
1/21: Discussed current regimen and desire to begin TF if possible.  
1/29: Provide encouragement, and let him know we would be watching tolerance.  
1/30: Discussed with pt and wife change in formula for better tolerance.  
1/31: followed-up with pt – no further questions or concerns

#### Coordination of Care (refer to):
2/1: Referred to home health agency (previously established with Walgreens Home Health) for further monitoring and adjustment of TF following discharge from hospital.

#### Goal(s):
1/22: Pt to receive 1920 mLs TPN daily (+/-5%) – **goal met**  
1/29: Pt to begin TF within 12 hrs, and tolerate 20 mLs/hr. – **goal not met**  
1/20: Pt to tolerate 10 mLs/hr. Pt to advance to 60 mLs/hr TF and 0 mLs/hr TPN within 3 days – **goal met**  
1/31: Pt to go home on TF and no TPN. Wt to remain stable, and pt to continue to tolerate TF.

### MONITORING & EVALUATION

#### Indicators:
- Feeding Method  
- Wt  
- Intake (mLs)  
- TF tolerance  

#### Criteria:
- TPN, then TF  
- Wt remain stable (+/- 2 kg)  
- TPN at 1920 mLs; TF 20 mLs/hr then 10 mLs/hr with final goal of 60 mLs/hr  
- Monitor amount of stools/day, GI distress