Clinical Case Report: Nutritional Management of Decubitus Ulcers and Wound Healing

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December 22, 2013
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Abstract

The relationship between nutrition and decubitus ulcer healing has been researched on many levels. Nutrition intervention has been commonly implemented by adequate energy and protein. However, more recent research has been done to determine micronutrients that promote wound healing as well. The dietitian that focuses intervention on adequate nutrition and current evidence based recommendations, will be able to promote optimal wound healing for patients with chronic wounds. This case study illustrates the use of the nutrition care process (NCP), outlining the components of the assessment, determination of nutrition diagnoses, and the application of evidence-based recommendations for nutritional management of decubitus ulcers and wound healing.

Disease Description

A decubitus ulcer is a wound that develops in the upper layers of the skin as the result of sustained, externally applied pressure. Without proper management, the ulcer eventually enlarges both radially and into the deeper tissue layers. Decubitus ulcers are usually accompanied by an inflammatory reaction, and often by local bacterial colonization or systemic infection.¹ They are a complicated illness that cause pain, suffering, increase morbidity, and can lead to serious further complications.² Since decubitus ulcers first arise in the upper layers of the skin, then extend outward and downward, their severity is classified according to the depth of extension.¹ Decubitus
Ulcers are classified by the depth of ulceration and by their site, extent, and wound condition.

A grading scale for decubitus ulcers of increasing severity is designated by grades I through IV and is based on the depth of the ulceration and the structures that are affected. The National Pressure Ulcer Advisory Panel’s stages classify the ulcers by the degree of tissue damage. A stage IV decubitus ulcer is described as full thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or, supporting structures.¹

Patients at high risk for decubitus ulcers include those who are immobilized by severe illness or who have multiple risk factors for the condition. Primary risk factors include unchanging position, externally applied pressure, variable intolerance of tissue ischemia, and peripheral arterial occlusion disease.² The most common cause of decubitus ulcers is externally applied pressure for an excessive period of time. Further damaging factors include friction at the skin surface, shearing forces, and moisture.²

Pressure ulcers are a serious complication of multimorbidity and are not always preventable. Impaired profusion, and any underlying disease, among other factors increase the risk for decubitus ulcers. This care report will describe a stage IV decubitus ulcer with a history that does not suggest a pressure ulcer but has developed from another mechanism. Pathology of the wound debridement shows squamous cell carcinoma. It is possible that the chronic wound later became squamous cell carcinoma, or that the advanced squamous cell carcinoma fistulized and then ultimately caused a chronic wound.
Malnutrition and Poor Wound Healing

Malnutrition can be simply defined as any nutrition imbalance. Adult malnutrition can occur over time with a consistent imbalance of intake and output. Adults who lack adequate calories, protein, or other essential nutrients needed for tissue maintenance and repair experience malnutrition. Inflammation is an important underlying factor that increases the risk for malnutrition and may contribute to suboptimal response to nutrition intervention. Nutrition risk can be identified by comprised intake or loss of body mass. Malnutrition can be defined in three ways: Starvation Related Malnutrition, Chronic Disease-Related Malnutrition, and Acute Disease or Injury-Related Malnutrition. The American Society of Parenteral and Enteral Nutrition (A.S.P.E.N.) developed six standardized characteristics that reflect nutrition status vs inflammation and a need to diagnose malnutrition. Markers included insufficient energy intake, weight loss, and diminished functional status as measured by hand-grip strength.

Malnutrition can have many negative effects on wound healing. Nutrient deficiencies affect wound healing by prolonging the inflammatory phase. Malnourished patients can develop pressure ulcers, infections, and delayed wound healing that results in chronic non-healing wounds. Metabolic rates are increased in the presence of a chronic wound, resulting in protein breakdown and loss of body water. Protein loss is also increased with the use of negative pressure wound therapy devices with continuous drainage of the wound bed. Malnutrition characterized by protein-calorie deficiency, vitamin deficiency, and dehydration are also major risk factors. Malnutrition impedes healing of chronic wounds. Therefore positive wound healing requires optimal nutrition.
Evidence-Based Nutrition Recommendations for Wound Healing

Energy is necessary for anabolism and healing. Estimated Needs are increased for patients with chronic inflammation and chronic wounds. Current nutrition therapies are aimed at treating nutrition deficiencies responsible for delayed wound healing. Clinical studies have shown that adequate nutrition can lead to enhanced wound healing and improvement of infectious complications. A.S.P.E.N. and the Wound Healing Society recommend 30 to 35 kcal/kg/d for optimal wound healing. Increased needs are recommended for patients who are underweight or have lost weight. The National Pressure Ulcer Advisory Panel (NPUAP) recommends that individuals who are underweight or losing weight increase their energy goals to 35 to 40 kcal/kg/d to optimize wound healing.

Protein is also necessary for the synthesis of enzymes involved in wound healing. All stages of wound healing require protein and positive nitrogen balance. Increased protein intake has been associated with enhanced wound healing. Research has shown that increasing protein intakes above the DRI enhances healing of chronic wounds. The recommended ranges include 1.25 to 1.5 g/kg/d for adults with chronic wounds. With severe stage III and IV ulcers may require 1.5 to 2.0 g/kg/d. Protein is essential to all the stages of wound healing and adequate calories must be provided to prevent protein from being used as an energy fuel. Amino acids arginine and glutamine have been studied for their role in wound healing. Researchers such as Steiber and Desneves et al have found that arginine supplementation can enhance wound tensile strength. Glutamine is essential for gluconeogenesis and providing fuel for wound healing.
healing. The suggested dose of supplementation of glutamine for wound healing is 0.57 g/kg/d.⁶

Desneves et al found in a randomized controlled trial that supplementary arginine, vitamin C, and zinc significantly improved the rate of wound healing.⁸ The trial was performed on sixteen inpatients with stage 2, 3, or 4 pressure ulcers. The supplementation group received a standard diet plus high-protein energy supplements containing additional arginine (9g), vitamin C (500mg), and zinc (30mg). Only the patients receiving additional arginine, zinc, and vitamin C demonstrated clinically significant improvement in wound healing (P< 0.01). This study was performed on a small set of patients and although results showed significant improved healing rate with supplementation, the results need to be confirmed on a larger study group.

Adequate nutrition has been shown to play a major role in the healing of decubitus ulcers. The NUPAP and A.S.P.E.N. include nutrition as one of the key systemic factors that influence healing.¹³ Current research has proved that adequate energy, protein, vitamin C, and zinc are the basis of nutrition interventions to heal pressure ulcers.⁹

**Nutrition Support and Wound Healing**

The first goal of nutrition support is to meet energy needs. Adequate energy is essential for optimal wound healing. Nutrition therapy is one of several interventions that contribute to improved clinical outcomes for pressure ulcer patients. Brasseur and Liske performed a case study to explain how a long-term, acute care facility specializing in wound care was successful in improving the healing outcomes of an elderly patient.
with severe chronic pressure ulcers. The patient was provided nutrition support with a peptide-based, critical care enteral formula. Results of this case study found that a high-protein, peptide-based enteral formula provided more of the nutrients necessary to improve nutritional status and healing outcomes than a intact protein formula.

Case Presentation

JM, a 66 year old male, presented with a stage IV decubitus ulcer on his buttocks. JM had not been seeking medical care for the previous ten years. Six months before admission, JM discovered 6 small holes on his buttocks that would intermittently flare up. JM became very ill and stated he stayed in bed for several years trying to tough it out. Eventually he became too weak to stand and decided to visit a primary care physician. With concern a wound care specialist was consulted and JM was sent to a local community hospital. Debridement and cultures were done that showed Squamous Cell Carcinoma and Staphylococcus aureus. There was also concern of osteomyelitis. JM was then sent to St. Mary’s Hospital and Medical center due to concern for osteomyelitis and further treatment of the stage IV decubitus ulcer.

Full assessment suggested that the stage IV ulcer was not a pressure ulcer but had developed from another mechanism. Due to the pathology of the debridement, the chronic wound may have developed squamous cell carcinoma, or JM had anal squamous cell carcinoma that fistulized and then ultimately caused the wound.

Management required multiple services and plastic and general surgery were consulted to perform and diverting ostomy. JM was kept NPO due to the fistula and placed on Total Parenteral Nutrition.
Nutrition Care Process: Assessment

Client History

The patient is a pleasant 66 year old man who came into the hospital with decubitus ulcer, weakness, and falls. The patient had not been seeking medical care over the previous ten years and reports an ulcer on his buttocks ten years ago. JM is divorced and lives alone. He stated the ulcer began after he developed a dental infection and cataracts. The ulcer resolved and then JM discovered an irritating rash on his buttocks that intermittently worsened. Approximately six months ago, JM noticed six small holes had developed and would intermittently flare up. JM was sent to a wound care specialist. Cultures were done that grew staph with concerns of osteomyelitis and stage IV decubitus ulcer.

Food/Nutrition Related History

JM reported having a big appetite prior to admission. He stated he would purchase his meats from a local butcher. JM also reported hunting and fishing prior to getting sick. He recalled having a big garden each year and harvesting produce most of the year round. Three weeks prior to admission JM’s appetite decreased significantly due to severe pain. JM reported being too weak to prepare meals which resulted in him skipping many meals.

Nutrition-Focused Physical Findings

JM reported having abdominal pain in his left lower quadrant starting in August of 2001. He reported he initially thought it was constipation and used Miralax and Dulcalax
with resolution of constipation after about 2 weeks. The pain still persisted. He denied diarrhea, melena, n/v, or hematochezia. Debridement of the large decubitus ulcer suggested the wound was not a pressure ulcer but had developed from another mechanism.

**Anthropometric Measurements**

JM is 6’1” and weighs 78.84kg, with a BMI of 21.8. The ideal body weight of a man this height is 83.6 kg. JM is 89% of ideal body weight. JM reported a loss of ~10 pounds within three weeks, almost 12% of his body weight. (App.5)

**Biochemical Data, Medical Tests, and Procedures**

Labs and imaging: MRI of the pelvis showed decubitus ulceration with fistula or sinus tract extending into the rectum-anal junction. Abnormal signal involving the sacrococcygeal junction, osteomyelitis may be present. Edema involving the psoas muscles, concerning for infection. The MRI also showed degenerative disk disease in L5 to S1. CT of the abdomen showed stage IV decubitus ulcer. Medical tests also showed mild diverticulosis, question small hiatal hernia calcifications in the liver renal cysts, and emphysema.

Prealbumin was mildly depleted at 12.6. Due to the severity of the condition and the need to perform a diverting colostomy, many nutrition related biochemical labs were not performed. For the initial nutrition assessment, the dietitian only had the prealbumin lab. This lab is an important indicator when using ARAMARK’s nutrition care priority points to screen the patient.
**Nutrient Needs**

Nutritional requirements were estimated at 30 to 35 kcals/kg, 1.5 to 2.0 g protein/kg, and 30 ml fluid/kg. The dietitian developed recommendations for Total Parenteral Nutrition (TPN) based on JM’s nutrient needs. Recommendations included a goal rate of 83 ml/hr to provide 100g Amino Acid and 300g Dextrose. This would provide 1420 kcals/day. Due to the recent weight loss and poor intake the TPN was initiated at 45ml/hr to prevent refeeding syndrome.

**ARAMARK Nutritional Status Classification**

JM was screened and classified as severe nutrition compromise 2’ NPO, TPN, weight loss, BMI, and diagnosis. ARAMARK Nutrition Care Priority points indicated status 4 severe nutrition compromise with a total of 17 points. JM was scheduled to be reassessed with follow-up care within 2 days. (Table 4)

**Malnutrition Identification**

Calorie-Protein malnutrition and Chronic Disease-Related Malnutrition was identified. Nutrition risk was identified due to comprised intake and loss of body mass. (Figure 2)

**Nutrition Care Process: Diagnoses**

1. Increased Nutrient Needs (NI-5.1) due to Increased Demand for nutrients (wound healing, cancer, infection) as evidence by low percent body fat and muscle mass, stage IV decubitus ulcer, staph, and squamous carcinoma.
2. Unintended weight loss (NC-3.2) due to increased demand for nutrients and decreased ability to consume sufficient energy as evidence by 10 pound weight loss in three weeks, weakness, fever, and poor intake.

3. Malnutrition (NI-5.2) due to chronic wound healing and cancer increasing nutrient needs as evidence by >5% weight loss in 3 weeks, underweight per BMI >65 years old, muscle loss, and weakness.

**Nutrition Care Process: Intervention**

The dietitian identified nutritional goals for the patient:

**Short-Term Goals:**

1. Continue NPO for surgery
2. Initiate TPN at 45 ml/hr to provide 55 g Amino Acid, 160 g Dextrose, and 765 kcals.
3. Advance TPN as tolerated to a goal rate of 83 ml/hr to provide 100 g AA, 300 g Dextrose, and 1420 kcals.

**Long-Term Goals:**

4. Monitor the ability to transition to PO, wean down TPN
5. Support wound healing
6. Replete visceral protein levels
7. Promote weight gain
Nutrition Care Process: Monitoring and Evaluation

The purpose of nutrition monitoring is to quantify progress made by the client in meeting the nutrition care goals. JM was admitted 9/19 with large decubitus ulcer, s/p debridement in Delta Hospital. The history and findings do not suggest a pressure ulcer but had developed from another mechanism. Pathology shows squamous cell from the debridement. This is a chronic wound. It is possible that the patient has a chronic wound that then became squamous cell carcinoma, or that he had squamous cell carcinoma the fistulized and then ultimately caused this wound. Pt NPO, initiate TPN slowly with a rate of 43 ml/hr to provide 55 g AA and 160 g Dextrose. Advance TPN rate as tolerated. Monitor ability to transition to PO. JM is classified as severe nutrition compromise.

Monitor:

1. TPN Rate tolerance-Refeeding syndrome
2. Nutrient related labs-Na, K, Mg, Phos
3. Weight, prevent further weight loss
4. Input/output
5. Ability to transfer to PO and wean off TPN

Conclusion

JM received TPN 9/19 and 9/20 for colostomy and was then transitioned to a regular diet. He continued to eat well and consume commercial beverage Ensure plus daily. Juven, a wound healing modular containing additional protein and evidence based nutrients was ordered. In October the patient experienced extreme nausea and emesis which resulted in an esophageal perforation. JM underwent a thoracotomy with
decortication and esophagostomy. G and J tubes were placed and Tube Feeding was initiated. Trickle Feeds of TF Vital was started. The patient was given an elemental formula due to the jejunostomy and colostomy to promote maximal absorption. Currently, JM has advanced to a level 1 dysphagia pureed diet and nocturnal tube feeds. Commercial beverage Ensure clear and a Juven is consumed daily. Two packets of a protein modular, beneprotein is added to the TF three times a night. The patient continues to progress nutritionally as well as with wound healing.
References


Appendix

Table 1: The Pathophysiology of Decubitus Ulcers

<table>
<thead>
<tr>
<th>Extrinsic</th>
<th>Immobility</th>
<th>Intrinsic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate promotion of movement</td>
<td>↓</td>
<td>Motor Disease</td>
</tr>
<tr>
<td>Trauma</td>
<td></td>
<td>Neurological Disease</td>
</tr>
<tr>
<td>Amputation</td>
<td>Pressure</td>
<td>Sensory Disturbances</td>
</tr>
<tr>
<td>Sedation, physical restraints</td>
<td></td>
<td>Malnutrition, dehydration</td>
</tr>
<tr>
<td>Lack of attention to positioning, erroneous</td>
<td></td>
<td>Mental Illness</td>
</tr>
<tr>
<td>Moisture, Shearing forces</td>
<td></td>
<td>Hypoperfusion</td>
</tr>
<tr>
<td>Decubitus Ulcers</td>
<td></td>
<td>Trophic Disturbance</td>
</tr>
</tbody>
</table>
### Table 2: Malnutrition: A.S.P.E.N.

<table>
<thead>
<tr>
<th>Nutrition Risk Identified</th>
<th>Inflammation present?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Compromised intake or loss of body mass</td>
<td>NO/YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>Mild to Moderate Degree</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>Marked Inflammatory Response</td>
</tr>
<tr>
<td>Starvation-Related Malnutrition</td>
<td></td>
<td>pure chronic starvation, anorexia nervosa</td>
</tr>
<tr>
<td>Chronic Disease-Related Malnutrition</td>
<td></td>
<td>Organ failure, pancreatic cancer, rheumatoid arthritis, sarcopenic obesity</td>
</tr>
<tr>
<td>Acute Disease or Injury-Related Malnutrition</td>
<td></td>
<td>Major infection, burns, trauma, closed head injury</td>
</tr>
<tr>
<td>Medication</td>
<td>Rationale</td>
<td>Side Effects</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>Heparin</td>
<td>Anticoagulant; deep venous thrombosis</td>
<td>Skin and subcutaneous necrosis, osteoporosis, bone and mm. pain</td>
</tr>
<tr>
<td>Zosyn</td>
<td>Antibiotic</td>
<td>Dry mouth, diarrhea, flatulence</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>Antibiotic-oral form indicated to treat Staph</td>
<td>Nausea</td>
</tr>
<tr>
<td>D5-1/5 NS IVF</td>
<td>Hypovolemia</td>
<td></td>
</tr>
<tr>
<td>Potassium Chloride</td>
<td>Hypokalemia</td>
<td>n/v, abdominal pain, diarrhea</td>
</tr>
<tr>
<td>TPN (5% AA, 15% Dex)</td>
<td>Fistula, Central TPN</td>
<td>Refeeding Syndrome</td>
</tr>
<tr>
<td>Nutrition Care Indicator Category</td>
<td>Priority Points 4</td>
<td>Priority Points 3</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Nutrition History or anticipated</td>
<td>Poor Appetite (50% needs for &gt;2 weeks)</td>
<td></td>
</tr>
<tr>
<td>Feeding Modality or anticipated</td>
<td>TPN</td>
<td></td>
</tr>
<tr>
<td>Unintentional Weight Loss</td>
<td>5% in 1 mo</td>
<td>12% 3 wks</td>
</tr>
<tr>
<td>Weight Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serum albumin/Prealbumin (mg/dL)</td>
<td>Prealbumin 12.6</td>
<td></td>
</tr>
<tr>
<td>Dx/Condition</td>
<td>Stage 4 ulcer Malnutrition</td>
<td></td>
</tr>
</tbody>
</table>
Calculations:

% Body Weight: (10# wt loss in 3 weeks)

\[ \text{% weight loss: } \left( \frac{\text{UBW} - \text{ABW}}{\text{UBW}} \right) \times 100 \]

\[ (85 - 75/85) \times 100 = 12\% \]

\[ \text{IBW: } 106 + 6(13) = 184\# / 2.2\text{kg/#} = 83.6 \text{ kg} \]

\[ \text{% IBW= } 74.84 \text{ kg/ 83.6 kg} = 89\% \]

TPN Calculations:

66 year old man with Stage IV ulcer, SCC, and Staph infection

Admit weight 74 kg; BMI=21

Energy Requirements: 30 - 35 kcals/kg= 2200-2500 kcals/d; will use 2000 due to pt severe malnutrition, and to avoid refeeding syndrome.

Protein Requirements: 1.5 g/kg= 115 g/d= 460 kcals/d

Fat Requirements: DO not exceed 59 grams per day; due to lipid shortage pt will receive 250ml 20% 2x/week (~143 g/d) to prevent EFAD.

Total Kcals 2000-460(pro kcals) = 1540 kcals

1540-143=1397 kcals

1397/3.4= 410 grams dextrose

GIF: ((410gx1000mg/g)/74 kg)/1440 min/d= 3.8

Final TPN: 100g AA/300G Dex at 83ml/hr to provide 1420 kcals and 100g protein.
<table>
<thead>
<tr>
<th>Problem or Nutrition Diagnosis Label</th>
<th>Etiology</th>
<th>Signs and/or Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>#1 NI-5.1 Increased Nutrient needs</strong></td>
<td>increased demand for nutrients (cancer, wound healing, infection)</td>
<td>low percent body fat and muscle mass, stage IV decubitus ulcer, staph, and squamous carcinoma.</td>
</tr>
<tr>
<td><strong>#2 NC-3.2 Unintended weight loss</strong></td>
<td>due to increased demand for nutrients and decreased ability to consume sufficient energy</td>
<td>10 pound weight loss in three weeks, weakness, fever, and poor intake</td>
</tr>
<tr>
<td><strong>#3 NI-5.2 Malnutrition</strong></td>
<td>chronic wound healing and cancer increasing nutrient needs</td>
<td>&gt;5% weight loss in 3 weeks, underweight per BMI &gt;65 years old, muscle loss, and weakness</td>
</tr>
</tbody>
</table>