Preoperative nutrition

Patricia Leung

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SUNY Downstate - Department of Surgery
Case presentation

• 74 year old male
• PMH: multiple hospitalizations for SBO
• PSH: diverticulitis s/p Hartmann’s procedure 2010; ex-lap, takedown of enterocutaneous fistula, small bowel resection 2011
• No home meds
• NKDA
• Admitted 7/23 with complaints of abdominal pain, nausea/vomiting x1 day, one week of poor PO intake
• VS BP 111/85  HR 97  RR 18  T 98.7
• Gen: no apparent distress, thin cachectic man
• Abdomen: soft, mildly distended, minimally tender to palpation; ostomy bag with air + stool; enterocutaneous fistula with minimal drainage
Labs
WBC 7.7; Hct 47
Na 121  K 5.0  Cl 70  CO2 32  BUN/Cr 64/4.28  Gluc 103
PT 10  INR 0.9  PTT 25
Albumin 4.5

Imaging:
CT A/P – dilated small bowel loops with transition point in RLQ c/w SBO
• HOD#1 – NGT, NPO, IVF
• HOD#3 – PICC line placed, TPN started
• HOD#5 – advanced to clears; prealbumin 9
• HOD#6-30 – nutritional optimization; prealbumin 20.6 (8/26)
• HOD#31 (8/27) – exploratory laparotomy, takedown of enterocutaneous fistula with primary anastomosis of small bowel, oversewing of defect in Hartmann’s stump,
• POD#1-2 – ICU for close monitoring
• POD#3 – transferred to floor, ostomy working
• POD#4 – started on clears
• POD#6 – advanced to regular diet
• POD#10 – discharged home
Introduction

• 1859 – Crimean war
• 1930s – Studley observed direct relationship between preoperative weight loss and operative mortality rate, independent of factors such as age, impaired cardiorespiratory function, and type of surgery
How do we define malnutrition?

- “multifactorial syndrome characterized by severe body weight, fat and muscle loss and increased protein catabolism due to underlying disease as well as inadequate consumption of nutrients”

Develops as consequence of

- Deficiency in dietary intake
- Increased requirements associated with a disease state
- Complications of an underlying illness
- Combination
Skeleton in the hospital closet

- **1976** – *JAMA* – Bistrian et al surveyed medical wards of urban teaching hospitals finding prevalence of malnutrition at 44%
- **2002** – 20 Queensland public acute-care facilities with malnutrition rates 31-35%
- **2005** – Sydney hospital study – 42.3%
- **2006** – German hospital malnutrition study – 1 in every 4 patients was malnourished
Negative outcomes

- Higher infection and complication rates
- Increased muscle loss
- Decreased respiratory function
- Impaired wound healing
- Longer length of hospital stay
- Increased morbidity and mortality
What are our nutritional markers?

<table>
<thead>
<tr>
<th>Marker</th>
<th>Half-Life</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retinal binding protein</td>
<td>12 hours</td>
<td>$285</td>
</tr>
<tr>
<td>Prealbumin</td>
<td>2-3 days</td>
<td>$85</td>
</tr>
<tr>
<td>Transferrin</td>
<td>8-10 days</td>
<td>$25</td>
</tr>
<tr>
<td>Albumin</td>
<td>14-20 days</td>
<td>$12</td>
</tr>
</tbody>
</table>

Portable Chest XR $50
Other parameters

- Recent weight loss over 3 months of > 10% normal body weight.
- Nitrogen balance determination
- Indirect calorimetry
- Midarm muscle circumference
- Delayed hypersensitivity reactions to injected antigens
- Functional impairment of ventilatory effort or muscle response by electrical stimulation
- **History and physical examination**
# Subjective Global Assessment

**SUBJECTIVE GLOBAL ASSESSMENT RATING FORM**

<table>
<thead>
<tr>
<th>Patient Name:</th>
<th>ID #:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

## HISTORY

<table>
<thead>
<tr>
<th>WEIGHT/WEIGHT CHANGE: (Included in K/D001 SGA)</th>
<th>Rate 1-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Baseline Wt: (Dry weight from 6 months ago)</td>
<td></td>
</tr>
<tr>
<td>Current Wt: (Dry weight today)</td>
<td></td>
</tr>
<tr>
<td>Actual Wt less/past 6 mo: % loss: (actual loss from baseline or last SGA)</td>
<td></td>
</tr>
<tr>
<td>2. Weight change over past two weeks: No change Increase Decrease</td>
<td></td>
</tr>
</tbody>
</table>

## DIETARY INTAKE

<table>
<thead>
<tr>
<th>No Change (Adequate)</th>
<th>No Change (Inadequate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Change: Sub optimal Intake: Protein Kcal Duration</td>
<td></td>
</tr>
<tr>
<td>Full Liquid: Hypocaloric Liquid Starvation</td>
<td></td>
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</tbody>
</table>

## GASTROINTESTINAL SYMPTOMS (Included in K/D001 SGA-anorexia or causes of anorexia)

<table>
<thead>
<tr>
<th>Symptom:</th>
<th>Frequency:</th>
<th>Duration:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anorexia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diarrhea</td>
<td></td>
<td></td>
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<tr>
<td>Never, daily, 2-3 times/wk, 1-2 times/wk &gt; 2 weeks, &lt; 2 weeks</td>
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</tbody>
</table>

## FUNCTIONAL CAPACITY

<table>
<thead>
<tr>
<th>Description</th>
<th>Duration:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Dysfunction</td>
<td></td>
</tr>
<tr>
<td>Change in function</td>
<td></td>
</tr>
<tr>
<td>Difficulty with ambulation</td>
<td></td>
</tr>
<tr>
<td>Difficulty with activity (Patient specific “normal”)</td>
<td></td>
</tr>
<tr>
<td>Light activity</td>
<td></td>
</tr>
<tr>
<td>Bed/Chair ridden with little or no activity</td>
<td></td>
</tr>
<tr>
<td>Improvement in function</td>
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</tbody>
</table>

## DISEASE STATE/COMORBIDITIES AS RELATED TO NUTRITIONAL NEEDS

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>Comorbidities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal requirements</td>
<td>Increased requirements</td>
</tr>
<tr>
<td>Acute Metabolic Stress: None Low Moderate High</td>
<td></td>
</tr>
</tbody>
</table>

## PHYSICAL EXAM

| Loss of subcutaneous fat (Below eye, triceps, biceps, chest) (Included in K/D001 SGA) |
| Muscle wasting (Temple, clavicle, scapula, ribs, quadriceps, calf, knee, interosseous) (Included in K/D001 SGA) |
| Edema (Related to undernutrition/insufficient fluid intake) |

## OVERALL SGA RATING

Very mild risk to well-nourished: 0 or 1 or 2 or 3 or 4 or 5 or 6 or 7 categories or greater.
Mild-moderate: 2 or 3 or 4 or 5 categories. No clear sign of normal status or severe malnutrition.
Severely Malnourished: 1 or 2 or 3 or 4 or 5 or 6 or 7 categories/significant physical signs of malnutrition.
Nutrition Risk Index

Screening tool to assess risk of complications

• Useful in patients undergoing noncardiac, abdominal surgery.
• \( \text{NRI} = (1.519 \times \text{albumin}) + (41.7 \times \text{present wgt/usual wgt}) \)

- NRI >100   normal
- NRI 97.5-100 mild malnutrition
- NRI 83.5-97.5 moderate
- NRI <83.5   severe

Our patient
“If the gut works, use it”

- Patients who can’t eat
- Patients who won’t eat
- Patients who shouldn’t eat
- Patients who don’t eat enough

→ TPN
Indications for TPN

- Enterocutaneous fistula
- Bowel obstruction
- Inflammatory bowel disease
- Acute radiation enteritis
- Short gut syndrome
- Major trauma/burns
- Severe pancreatitis
- Patients who can’t tolerate enteral feeds
- Nutritional optimization prior to surgery?
• Prospective, randomized controlled trial
• 395 malnourished patients
• Malnourished if score <100 on Nutrition Risk Index or if a) current weight 95% of ideal weight or less, or b) serum albumin 3.9 g/dL or less, or c) prealbumin of 18.6 mg/dL or less
• Required laparotomy or non-cardiac thoracotomy
• Receive either TPN for 7-15 days before surgery and 3 days afterward vs. no TPN
• Outcomes: Rate of complications and mortality within first 90 days after surgery
Results

- Hyperglycemia 38 vs 3%
- Post-operative infection 14 vs 6.4% (p=0.01)
- Mortality 13.4% (31/231) vs 10.5% (24/228) at 90 days [p, 7.3% vs 4.9 % within 30 days
- No significant reduction in morbidity or mortality with TPN
- For mildly malnourished patients, risk of major infectious complications 14.4 vs 3.7% (p 0.004)
- Severely malnourished patients - risk of major non-infectious complications 5.3 vs 42.9% (p=0.03)
Recent literature

• **1997** – Klein et al - meta-analysis of 13 RCTs with 1,250 patients
  - 7-10 days of preoperative TPN led to 10% reduction in post-operative complications with no effect on mortality

• **2001** – Koretz et al – meta-analysis of 61 RCTs of perioperative TPN
  - TPN failed to improve outcomes, did not cause harm

• **2001** – Heyland et al – meta-analysis of 27 RCTs with 2,907 patients
  - Lower rate of post-operative complications but no difference in mortality

• Enterocutaneous fistulas, Crohn’s disease, cancer patients, patients who can’t tolerate enteral nutrition
SCCM/ASPEN Guidelines

- Severe stress or malnutrition NPO >4-5 days
- Moderate stress or malnutrition NPO > 5-7 days
- Non-stressed/normal nutrition NPO >7-10 days
Preoperative Serum Albumin Level as a Predictor of Operative Mortality and Morbidity

JAMA Surgery

Gibbs, J; Cull, W; Henderson, W; Daley, J; Hur, Kwan; Shukri, F

• Prospective observational study
• 44 tertiary care VA medical centers
• 54,215 major noncardiac surgery cases
• Outcome: 30 day operative mortality and morbidity
Patient demographics:

- 97.1% male
- Mean age 61 years
- 76% white, 18% black, 6% other
Results:
• Mean preoperative serum albumin level 3.8 g/dL
• 23% had albumin < 3.5 g/dL

Univariate analysis
• Mortality rate increases from <1% for albumin levels 4.6 g/dL or higher to 28% for albumin levels below 2.1 g/dL

• Morbidity increases from 10% to 65% at albumin 4.6 g/dL vs 2.1 g/dL

Multivariate analysis
• Decrease in albumin level of 1 g/dL is associated with more than 2-fold increase in odds of dying and odds of a complication
Subgroup:

Patients who were

• <70 years old
• ASA 1 or 2
• Independent functional status
• No reported weight loss >10% within last 6 months prior to surgery
• Women (n=1,575)

• 15,555 patients
• Negative association (p<0.001) between serum albumin level and mortality
Malnutrition is very prevalent
Enteral nutrition is preferred
No clear evidence to support preoperative TPN
TPN may be indicated in subgroup of patients
Albumin can be used as a predictor of operative morbidity and mortality
References

• Robertson and Smaill: Nutrition in Surgery, Canad. M. A.J; Jan 1947


• Gibbs, J; Cull, W; Henderson, W; Daley, J; Hur, Kwan; Shukri, F; Preoperative Serum Albumin Level as a Predictor of Operative Mortality and Morbidity JAMA Surgery

• Perioperative TPN in surgical patients NEJM 1991