Nutrition for the Hospitalized Patient

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Meet Our Patient

- 77 year old male
- s/p left hemicolectomy for colon cancer (stage II)
- 10 lb weight loss before surgery (156 from 166 lb usual body weight. Rehabbing at ECF.
- You admit him to your service on POD 21 for shortness of breath, suspected pneumonia, superficial surgical site infection
- Complains of fatigue, lack of appetite
- Weight now 142 lb (15% weight loss from usual)
- Eating 25-30% of regular trays at ECF

Objectives

- Identify factors that lead to malnutrition in the hospitalized patient
- Describe malnutrition in the hospitalized patient and effect on outcome.
- Determine reliable factors for nutrition assessment.
- Discuss common misconceptions in current practice that may contribute to nutrition problems.
- Describe appropriate options for nutrition interventions.

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"The Skeleton in the Hospital Closet" ..Malnutrition in our hospitals is not a new problem

- "I suspect, as a matter of fact, that one of the largest pockets of unrecognized malnutrition in America exists not in rural slums or urban ghettos, but in the private rooms and wards of big city hospitals."

  C.E. Butterworth, 1979

Weinsier RL et al. *Am J Clin Nutr.* 1979; 32: 418-26.

Contributors to Adult Malnutrition in Acute Care Settings

Personal
- Age
- Dementia/Depression
- Disease
- Overly restrictive therapeutic diet
- Inability to chew/swallow
- Limited mobility
- Sensory loss
- Multiple Medications
- Therapies: vents/drains/NPO, etc.

Organizational
- Lack of recognition
- Lack of screening/assessment
- Lack of nutrition education
- Confusion re: responsibility
- Ht/Wt not measured/recorded
- Failure to measure/record food intake
- Inadequate nutrients provided
- Lack of feeding assistance staff
- Lack of care coordination
- Nutrition status low priority

Int J Nurs Stud 2007;44(6):1036-54

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Presence of Malnutrition and Impact on Outcomes

Physiological Consequences:
- Muscle wasting
- Impaired cardiac function
- Immune hypofunction and dysfunction
- Multi-organ dysfunction
- Impaired wound healing

Detsky et al. *JAMA*. 1994. Reilly J et al. *JPEN.* 1988 Cederholm et al, *American Journal of Medicine* 1995.

Malnutrition in U.S. Hospitals

Data from 2010 Healthcare Cost and Utilization Project (>1000 hospitals)

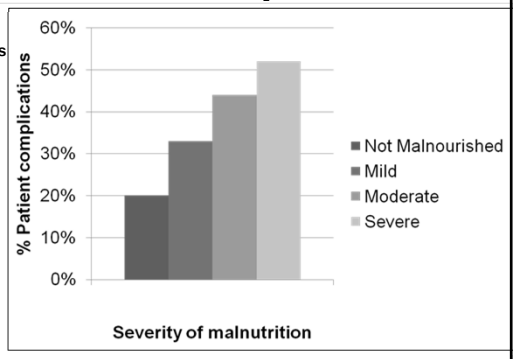
Malnutrition diagnosis from ICD 9 codes

⇨ **1.2 million discharges w/malnutrition dx**
Longer LOS: 12.6 vs 4.4 days (p<0.0001)
Higher costs: ~$27,000 vs ~$9,400 (p<0.0001)
Twice as many discharged with home care
Death 5 times more common

Corkins MR et al, JPEN 2014

More complications in malnourished patients

N = 100 patients

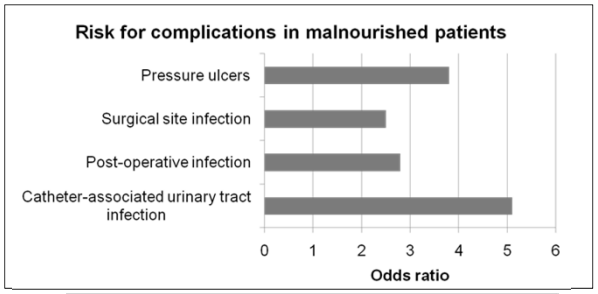


Sungurtekin H, *J Am Coll Nutr. 2004;23227-232.*

Impact on Outcomes

- **Impaired wound healing**
- **Increased morbidity/mortality**
- **Increased muscle/function loss**
- **Higher infection/complications**
- **Lower quality of life**
- **Increased length of stay**
- **Increased admissions/readmissions**
- **Higher healthcare costs**

Increased risk of post-surgical complications



Pre-existing malnutrition increases risk for post-surgical complications by 2- to 5-times.

Fry DE, et al. *Arch Surg.* 2010;145:148-151.

Lean Body Mass Loss Correlates with Mortality

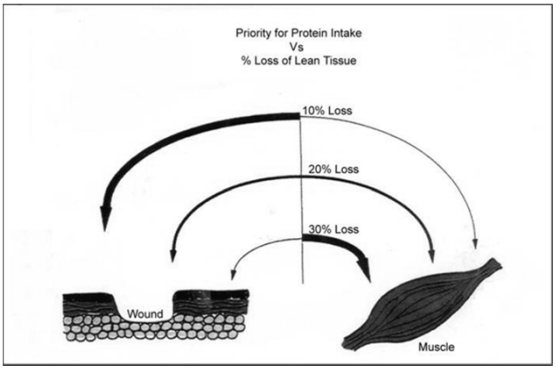
Complications relative to loss of lean body mass*

Lean body mass (% loss of total)*	Complications (related to lost lean mass)	Associated, mortality, %
10	Impaired immunity, increased infection	10
20	Decreased healing, weakness, infection, thinning of skin	30
30	Too weak to sit, pressure sores develop pneumonia, no healing	50
40	Death, usually from pneumonia	100

*Assuming no preexisting loss.

Demling RH. Nutrition, anabolism, and the wound healing process: an overview. ***Eplasty***. 2009;9:65-94.

Patients with lean body mass loss do not use ingested protein for healing



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How do we determine if our patient is at nutrition risk?

- **Nutrition assessment - Systematic steps to obtain, verify, and interpret data to identify nutrition related problems, their causes, and significance.**
- **Nutritional risk – attempt to predict potential nutritional problems based on the client's current health status**

SGA:
Subjective Global Assessment
NRS-2002:
Nutrition Risk Screening
MUST:
Malnutriton Universal Screening Tool
MNA:
Mini Nutritional Assessment (elderly)

Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.):
Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient.
(2009 – currently under revision)

- **"Traditional nutrition assessment tools (albumin, prealbumin, and anthropometry) are not validated in critical care.**
- **Before initiation of feedings, assessment should include evaluation of weight loss and previous nutrient intake prior to admission, level of disease severity, comorbid conditions, and function of the gastrointestinal (GI) tract."**

Ferrie & Allmann-Farinelli, 2013. Nutr Clin Prac 28: 463-483.

Plasma protein concentrations most likely are not useful indicators of nutritional status

- **Albumin**
- **Prealbumin**
- **Transferrin**
- **Retinol binding protein**
- **C-reactive protein**
- **Fibronectin**

Changes with inflammation

- **⇑ CRP, lactoferrin, ceruloplasmin**
- **⇓ albumin, prealbumin, transferrin**

Historical reliance on these indices continue to be used and appear to have no correlation with patient outcomes.

Nutrition Assessment for Mr. X

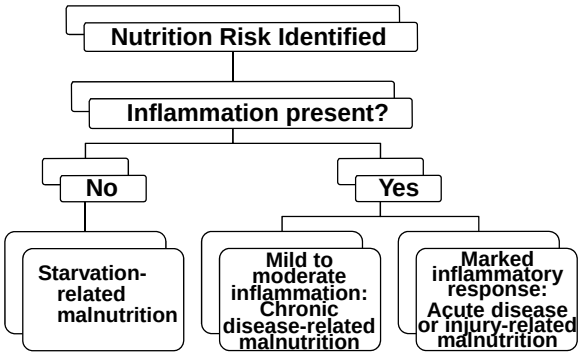
- **Ht. 5'7" Wt. 142#**
- **BMI 22.2 (Normal weight = 18.5–24.9)**
- **Usual Body Weight**
  - **Preillness - 166#**
  - **Weight prior to initial surgery – 156#**
  - **15% weight change**
  - **Classified as a severe weight loss**

Time frame	Significant weight loss	Severe weight loss
1 week	1-2% UBW	>2 % UBW
1 month	5 % UBW	>5 % UBW
3 months	7.5 % UBW	>7.5 % UBW
6 months	10 % UBW	> 10 % UBW

Previous nutritional intake

Factors to consider	Mr. X
• Changes in appetite	• Prior to surgery, reported decrease in appetite.
• Changes in taste	• NPO after surgery x 3 days
• Presence of nausea, vomiting, diarrhea, constipation	• Clear Liquids x 2 days
• Ability to chew and swallow	• Discharged to ECF after one meal of regular diet
• Previous diets followed at home	• Admission from ECF, indicates 25-50% of meals consumed
• Factors that may impact quality of diet at home	

Proposed new definitions for malnutrition



White et al, JPEN 2012

Malnutrition criteria

- **1. Insufficient energy intake**
- **2. Weight loss**
- **3. Loss of muscle mass**
- **4. Loss of subcutaneous fat**
- **5. Localized or generalized fluid accumulation that may sometimes mask weight loss**
- **6. Diminished functional status as measured by handgrip strength or reduction in ADLs**

2 or more of six criteria needed to diagnose malnutrition

Insufficient energy intake

Type of malnutrition	Acute illness or injury-related	Chronic disease-related	Social or environmental cause
Moderate	<75% of est. energy requirement for >7 days	<75% of est. energy requirement for ≥1 month	<75% of est. energy requirement for ≥3 months
Severe	≤50% of est. energy requirement for ≥5 days	≤75% of est. energy requirement for ≥1 month	≤50% of est. energy requirement for ≥1 month

White et al, JPEN 2012

Weight loss

Type of malnutrition	Acute illness or injury-related		Chronic-disease related		Social or environmental cause	
Moderate	%	Time	%	Time	%	Time
	1–2 5 7.5	1 week 1 month 3 months	5 7.5 10 20	1 month 3 months 6 months 1 year	5 7.5 10 20	1 month 3 months 6 months 1 year
Severe	%	Time	%	Time	%	Time
	>2 >5 >7.5	1 week 1 month 3 months	>5 >7.5 >10 >20	1 month 3 months 6 months 1 year	>5 >7.5 >10 >20	1 month 3 months 6 months 1 year

White et al, JPEN 2012

Physical assessment…. One look is worth a thousand words

- Muscle wasting
- Fat wasting
- Fluid accumulation

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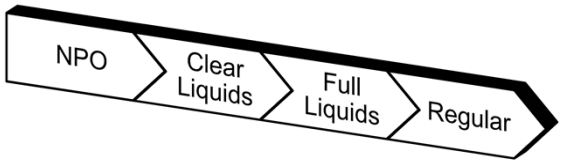
Nutrition Support

- Modification to prescribed oral diet
- Oral Supplements
- Enteral Nutrition (via feeding tubes)
- Parenteral Nutrition (TPN/PN)

Decision making – Nutrition support for the hospitalized patient

- Which patients need nutrition support?
  - Malnourished
  - Unable to maintain volitional intake (5-7 days for well-nourished, <24 hrs for malnourished)
  - Consider inflammatory state, disease severity, comorbid conditions, and function of the gastrointestinal (GI) tract.

The Old Paradigm



Author: Lišiak

Myth - clear liquid diets should be first

- **Randomized trials of patients on clear liquid vs. regular diet after open abdominal surgery—no difference in nausea and vomiting**
- **147 patients given tea, water, isotonic drink after removal of NGT - Patients were then fed based on their appetite and preferences. By POD 1, 27% were eating and tolerating solid foods. By POD 2, the number had risen to 81.3% and by POD 3, 97.1% were tolerating solid foods**

Kawamura, et al. Int J Colorectal Dis. 2009

Patients Know Best – Are "Fast Track" or ERAS* Protocols OK?

- **145 patients who were allowed to eat within 24 hours after colorectal surgery**
- **POD 1, the most commonly preferred foods and beverages included: toast (80%), fruit juice (75%); broth (73%); fresh fruit (73%); potatoes (73%); egg (70%); coffee/tea (64%); ice cream (64%); crackers (64%); pudding, yogurt and sandwiches (61%). Most of these foods are not part of a clear or full liquid diet. On POD 2 similar foods and beverages as well as cooked vegetables; hot cereal; and casseroles were chosen.**

***Enhanced Recovery After Surgery (http://www.erassociety.org)**

Early postoperative feeding significantly reduces post-operative complications

Objective

- Evaluate surgical outcomes following early feeding (within 24 hours of surgery)[a] compared with traditional feeding[b]

Subjects

- 1,240 patients in 15 studies

Design

- Meta-analysis of randomized controlled trials of patients with GI tract resection

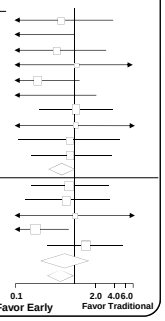
Study Outcomes

- Postoperative complication rates, mortality, tolerance of early feeding, resumption of bowel function, hospital length of stay

Osland E, et al. *JPEN J Parenter Enteral Nutr.* 2011;34:473-487.

Early Postoperative Feeding Significantly Reduces Postoperative Complications

	Study	Early	Traditional	OR	95% CI Lower	95% CI Upper
Pre-2000	Sagar	3 of 15	5 of 15	0.53	0.08	3.78
	Ryan	2 of 7	7 of 7	0.03	0	0.94
	Schroeder	4 of 16	7 of 16	0.46	0.07	2.91
	Binderow	0 of 32	0 of 32	1	0.02	61.41
	Beier-Holgersen	8 of 30	19 of 30	0.22	0.05	1.08
	Carr	0 of 14	4 of 14	0.08	0	2.06
	Ortiz	17 of 93	18 of 95	0.96	0.24	3.77
	Hartsell	1 of 29	1 of 29	1	0.07	13.42
	Nessim	3 of 27	4 of 27	0.75	0.11	5.01
	Stewart	10 of 40	12 of 40	0.78	0.17	3.56
	Subtotal	48 of 303	77 of 305	0.55	0.34	0.9
Post-2000	Han-Geurts	12 of 56	13 of 49	0.76	0.18	3.27
	Delaney	7 of 31	10 of 33	0.69	0.14	3.38
	Lucha	1 of 26	1 of 25	0.96	0.07	12.99
	Zhou	23 of 161	70 of 155	0.21	0.06	0.74
	Han-Geurts	22 of 46	20 of 50	1.37	0.33	5.61
	Subtotal	65 of 320	114 of 312	0.62	0.26	1.51
Pooled		113 of 623	191 of 617	0.55	0.35	0.87



Osland E, et al. *JPEN J Parenter Enteral Nutr.* 2011;34:473-487.

Myth - Bowel Sounds are Important

- Why do we listen to bowel sounds?
- No evidence supports the clinical importance of bowel sounds
  - Bowel sounds require air / fluid interface
- Bowel sounds should not guide therapy

Potential Factors Influencing Toleration of Diet and Enteral Feeding Post-op Setting

- Medications
  - Prokinetic agents
  - Narcotics
  - Sedative agents
  - Pressors
- Tube feeding

Factors influencing bowel sounds:

- Presence or absence of NG tube
- Visceral blood flow
- Ventilator
  - Ventilatory pressures
  - CPAP

Myth - Gastric Residuals Matter

Reignier 2011 Study [1]

	GRV Used (n=102)	No GRVs (103)
Intolerance	46.1%	26.2% *
Vol EN infused	1381 ml/d	1489 ml/d *
Vomiting	24.5%	26.2%
VAP pneumonia	19.6%	18.4%

Reignier 2013 Multicenter Study [2]

	GRV Used (n=215)	No GRVs (208)
Intolerance	64.2%	41.8% *
Calorie Deficit	518 kcal	314 kcal *
Vomiting	26.5%	41.8% *
VAP pneumonia	15.8%	16.7%

No change in clinically significant outcomes when you don't measure residuals

[1] Reignier (CC 2011) [2] Reignier (JAMA 2013)

A practical approach to GRVs:

- **Check residuals every 4-6 hours**
- **If the GRV is > 250 mL twice, a promotility agent (metoclopramide or erythromycin) should be considered**
- **Avoid automatic cessation for GRVs less than 500 mL in the absence of other signs of intolerance**

Gastric vs. Postpyloric Feeding?

Gastric Feeding

Relatively easy
Residuals are a problem
Aspiration risks higher
Can be done safely
Keep HOB > 30

Author: Mikael Häggström

Jejunal feeding

Shorter time to goal
Increased nutrient delivery
Decreased VAP
Access can be difficult

Author: Samir CC BY-SA 3.0

Author	Journal yr	Study pop N	Outcome
Strong	JPEN 1992	Gastric v Jejunal n=17	No difference in aspiration
Montecalvo	CCM 1992	Gastric v Jejunal	**Jejunal: Goal faster** Dec pneumonia
Kortbeek	J Trauma 1999	Gastic v Jejunal n=80	**Jejunal: Goal faster**
Kearns	CCM 2000	Gastric v Jejunal n=44	**Jejunal: Goal faster** no change VAP
Heyland	CCM 2001	Gastric v Jejunal n=33	**Gastric more aspiration**
Montejo	CCM 2002	MRPCT	**Jejunal: decrease complications**
Neumann	CCM 2002	Prospective descriptive n=60	Gastric: goal faster, No increase aspiration
Davies	CCM 2002	PRCT n=73	**Jejunal better tolerance decrease need for TPN**
Meert	Chest 2004	PRCT n=74 Pediatrics	**Jejunal greater goal** no change in aspiration
Methany	CCM 2006	Prospective descriptive n=360	**Gastric increases aspiration pneumonia**
Hsu CW	CCM 2009	PRCT N=120 Medical ICU	**Nasoduodenal goals earlier, less vomiting and less VAP**

But does my patient need enteral tube feeds? What about Oral Nutrition Supplements

Reduced 30-day readmission rates:
-8.4 percent reduction for patients with any diagnosis
-10.1 percent reduction for congestive heart failure pts
-12.0 percent reduction for acute myocardial infarction pts

Length of stay reduction: 1.65 days on average

Cost Savings: 15.8 percent or $3,079 in cost savings per hospitalization

Medicare administrative data

Philipson TJ, et. al. Impact of oral nutritional supplementation on hospital outcomes. Am J Manag Care. 2013 Feb;19(2):121-8.

But my patient can't eat and can't get a tube! When is Parenteral Nutrition (PN) Indicated?

2009 ASPEN / SCCM Guidelines (Currently Under Revision)

- **In the patient who was previously healthy prior to critical illness with no evidence of protein-calorie malnutrition, use of PN should be reserved and initiated only after the first 7 days of hospitalization (if EN is not available)**
- **If there is evidence of protein-calorie malnutrition on admission and EN is not feasible, it is appropriate to initiate PN as soon as possible following admission and adequate resuscitation.**
- **If patient malnourished preop, delay surgery, initiate PN 5 to 7 days pre-op, continue into post-op period.**
- **Initiate PN only if duration of therapy anticipated to be > 7 days (PN therapy for duration < 7 days should have no outcome benefit and may increase risk).**

Major Ongoing Questions in Critical Care Nutrition

Supplemental PN to "Top UP" patients unable to receive full enteral feeding

"Trophic" vs. Full EN in ICU patients
-trophic probably ok in non-surgical patients for first days of ICU stay

"Immunonutrition" – enteral formulations typically containing supplemental arginine, glutamine, omega-3 (fish oil), antioxidants

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RD evaluation and therapeutic nutrition options for our patient

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RD and MD/DO Team Collaboration

- **Nutrition Assessment**
- **Oral Recommendations**
- **Feeding Tube Placement**
- **Parenteral Nutrition?**

- **Discharge and follow-up plans?**