

Redefining Adult Malnutrition - Where Are We Now?

Ainsley Malone, MS, RD, CNSC, LD
Nutrition Support Dietitian
Mt. Carmel West Hospital
Columbus, OH

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Objectives

- Outline historical and current issues related to hospital malnutrition
- Review current diagnostic approach to malnutrition
- Outline standardized malnutrition criteria – Patient case application
- Discuss strategies for implementation

Landmark Publication

The Skeleton in the Hospital Closet

An assessment of the role of nutrition in mortality from disease increases, physicians are becoming alerted by the frequency with which patients in our hospitals are being malnourished and even starved. One authority regards physician induced malnutrition as one of the most serious nutritional problems of our time.

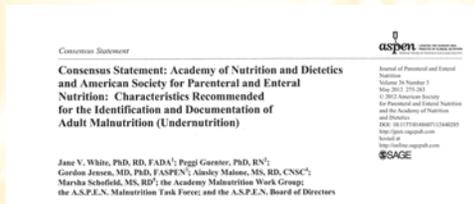
by CHARLES R. BUTTERWORTH, Jr., M.D.

In recent years there has been growing concern over the rapidly increasing rates of hospital malnutrition. In 1984, for example, there had been 100,000 hospital cases since 1970 (1,000,000 in a year) (1). In 1984, the total cost of hospital malnutrition was estimated to be \$1.5 billion (2). In 1984, the total cost of hospital malnutrition was estimated to be \$1.5 billion (2). In 1984, the total cost of hospital malnutrition was estimated to be \$1.5 billion (2).

"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."

Nutr Today 1979; 9:4-8

A New Approach to Defining Malnutrition



JPEN 2012; 36:275-283

Rationale for Developing Academy/A.S.P.E.N Characteristics to Identify Malnutrition:

- **No standardization**
 - Multiple Definitions
 - Multiple Diagnostic (ICD-9) Codes
 - Multiple characteristics used to Diagnose
 - Limited evidence base
- **Emerging role of inflammation**
 - Influence on Assessment Parameters
 - Influence on Response to Nutrition Intervention
 - Anti-inflammatory Interventions / Nutrition interventions outcomes divergence

Contributors to Malnutrition In Acute Care Settings

Personal

- Age
- Apathy/Depression
- Disease
- Inability to buy/prepare food
- Inability to chew/swallow
- Limited mobility
- Sensory loss
- 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
- Nutrition status low priority

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

Negative Outcomes Associated With Malnutrition

- Prospective evaluation of patients admitted to a tertiary care hospital in Singapore
 - 618 patients
- Subjective global assessment performed
 - Well nourished - 71%
 - Mod malnourished – 25%
 - Severely malnourished – 4%
 - Highest prevalence
 - Oncology – 71%
 - Endocrinology – 48%
 - Respiratory – 47%

Lim S, et al., Clin Nutr 2012;31:345

Negative Outcomes Associated With Malnutrition

Outcome Variable	Well Nourished (n=583)	Malnourished (n=235)	P Value
Hospital LOS (days)	4.6	6.9	0.001
Readmission within 90 days	133 (22%)	87 (37%)	0.01
Readmission within 6 months	187 (32.1%)	113 (48.1%)	0.035
1 year mortality	24 (4.1%)	80 (34%)	<0.001
2 year mortality	39 (6.7%)	100 (42.6%)	<0.001
Cost of hospitalization per patient (S\$)	3707	4606	0.085

Lim S, et al., Clin Nutr 2012;31:345

Malnutrition in the Surgical Patient

- Prospective observational evaluation
- Objective
 - To investigate the nutritional status of patients in a general surgery ward and
 - To define the correlation between malnutrition risk and clinical outcome
- n = 100 surgical patients
 - Able to complete nutrition screening
 - MST screening tool

Ben-Ishay O. Gastroenterol Res Pract 2011; 840512

Malnutrition in the Surgical Patient

TABLE 1: Patients characteristics, hospitalization, and outcome.

	High risk group	No risk group	P
Patients	32 (33.33%)	64 (66.67%)	
Median Age (y)	57 (24-94)	54 (19-90)	NS
Gender (male)	17 (53.12%)	35 (54.68%)	NS
Admission- emergency (versus elective)	22 (68.8%)	34 (53.1%)	.3
Malignancy (versus benign)	14 (43.72%)	12 (18.75%)	.02
Surgery performed	19 (59.37%)	38 (59.37%)	.8
LOS (d)*	18.8 ± 11.5	7 ± 5.3	.003
Nutritional therapy	15.6%	7.9%	.3
Mortality			
In hospital	3 (9.4%)	0 (0%)	.017
Cumulative 6 months	6 (18.8%)	1 (1.6%)	.006
Cumulative 12 months	7 (21.9%)	1 (1.6%)	.002

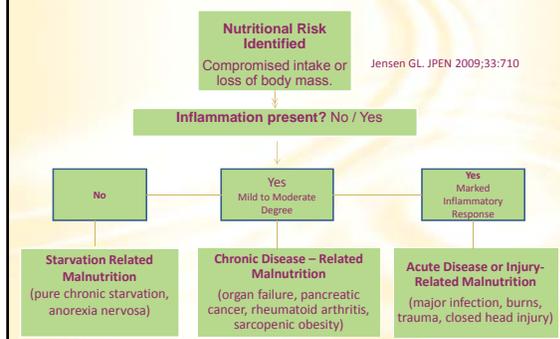
*Mean ± SD.

Ben-Ishay O. Gastroenterol Res Pract 2011; 840512

Development of a New Construct for Defining Malnutrition

- International Global Guidelines Group- 2009
 - Representatives from multiple international nutrition societies
- Define adult malnutrition syndromes in developed countries using an etiology-based approach that incorporates an appreciation of the continuum of inflammatory response
- Recognize the contributors to the development of malnutrition:
 - Semi starvation
 - Inability to assimilate nutrients consumed
 - Systemic inflammatory response

Etiology Based Malnutrition Definitions



Nutrition Risk Identification

- Nutrition Screening
 - A requirement by regulation agencies
 - Validated screening tools
 - Malnutrition Screening Tool (MST)
 - Mini Nutritional Assessment (MNA)
- Nutrition Assessment and Diagnosis
 - Three etiologic categories
 - Assess for presence of inflammation



“Practical” Indicators of Inflammation?

- Lab
 - Albumin, pre-albumin
 - C-reactive protein (CRP)
 - Cytokines - IL-6
 - Procalcitonin
- Clinical signs
 - Fever, leukocytosis, hyperglycemia

Jensen GL, et.al. JPEN
2012;36(3):267-274

The degree/duration of change in which of the above parameters that best reflects inflammation in which condition/disease state is unknown at this time.

A Vision for the Identification of Malnutrition in all Settings

Wouldn't it be amazing to have standardized definitions/characteristics and to know the prevalence of Adult Malnutrition in...

Our Health System



Our Country



Characteristics to Identify Adult Malnutrition

- **Attributes**
 - Basic parameters (hallmarks, few in total #)
 - Support diagnosis
 - Characterize severity
 - Increase/decrease as nutritional status changes
 - Evidence-based (when possible) / expert opinion
 - Will change over time as evidence of validity accrues

Any 2 or more characteristics must be used to identify Adult Malnutrition

Why not Serum Albumin/Visceral Proteins?

- Inflammatory disease / illness / injury elicit a cytokine-mediated acute phase response
 - Alters hormone secretion and target organ function
 - Favors a catabolic state that results in metabolic alterations
 - Over the short run the acute phase metabolic response with resulting catabolism is likely an appropriate adaptive response.
 - If the underlying stressor is severe, protracted or repeated, then adverse outcomes will result.
 - Results in down regulation of visceral protein synthesis

Inflammation can blunt favorable responses to nutrition intervention

Nutrition alone is ineffective in preventing muscle loss in inflammation

Academy Evidence Analysis: Albumin/Prealbumin

- Does serum albumin correlate with weight loss in four models of prolonged protein-energy restriction: anorexia nervosa, non-malabsorptive gastric partitioning bariatric surgery, calorie-restricted diets or starvation?
 - In the four models of prolonged protein-energy restriction, there was no correlation between serum albumin and weight loss.
 - Grade II
- Does serum prealbumin correlate with weight loss in four models of prolonged protein-energy restriction: Anorexia nervosa, non-malabsorptive gastric partitioning bariatric surgery, calorie-restricted diets or starvation?
 - In the four models of prolonged protein-energy restriction, there was no correlation between serum prealbumin and weight loss.
 - Grade III

Characteristics to Identify Severe Malnutrition

- Inability/unwillingness to eat
 - Compromised intake of varying degree and duration
- Evidence of *suboptimal intake*
 - ≥ 5 days with intake of $\leq 50\%$ of total estimated energy requirement (acute illness/injury category)
 - ≥ 1 month with intake of $< 75\%$ total estimated energy intake (chronic category)
 - ≥ 1 month with intake of $< 50\%$ total estimated energy intake (environmental/social circumstances category)

Characteristics to Identify Non-Severe (Moderate) Malnutrition

- Inability/unwillingness to eat
 - Compromised intake of varying degree and duration
- Evidence of *suboptimal intake*
 - > 7 days with a nutrient intake of $\leq 75\%$ of total estimated energy requirements (acute injury/illness category)
 - > 1 month days with a nutrient intake of $\leq 75\%$ of total estimated energy requirements (chronic illness/condition category)
 - > 3 months with a nutrient intake of $\leq 75\%$ of total estimated energy requirements (environmental/social circumstances categories)

Characteristics to Identify Severe Malnutrition

- Unintended weight change
 - Interpretation of Percent Weight Loss**

Percentage Weight Loss	Time Period
> 2	1 week
> 5	1 month
> 7.5	3 months
> 10	6 months
> 20	1 year

**Height, weight and usual weight need to be obtained in order to determine the percentage and interpret the significance of weight loss

Acute = 1 week, 1 month or 3 months
Chronic = 1 month, 3-12 months

Characteristics to Identify Non-Severe (Moderate) Malnutrition

- Unintended weight change
 - Interpretation of Percent Weight Loss**

Percentage Weight Loss	Time Period
1-2	1 week
5	1 month
7.5	3 months
10	6 months
20	1 year

**Height, weight and usual weight need to be obtained in order to determine the percentage and interpret the significance of weight loss

Acute = 1 week, 1 month or 3 months
Chronic = 1 month, 3-12 months

Characteristics to Identify Malnutrition

- Changes in Body Composition

- Loss of Subcutaneous Fat
 - › Orbital, triceps, fat overlying the ribs
 - › Mild to severe



- Muscle Loss

- › Temples (temporalis muscle)
- › Clavicles (pectoralis & deltoids)
- › Shoulders (deltoids)
- › Interosseous muscles
- › Scapula (latissimus dorsi, trapezius, deltoids)
- › Thigh (quadriceps) and calf (gastrocnemius).



Loss Of Subcutaneous Fat



Loss of Muscle Mass



Physical Assessment – Fat Loss

Exam Area	Tips	Severe Malnutrition	Non-Severe Malnutrition	Normally Nourished
Below the Eye	Touch above the cheekbone	Hollow look, depressions, dark circles, loose skin	Slightly dark circles, somewhat hollow look	Slightly bulged fat pads.
Neck	View patient from front and side	Individ muscles (sternomastoid, trapezius and clavicles well visualized)	Individ muscle anatomy less apparent. Clavicles less protuberant	Subcutaneous fat present; muscles not easily visualized
Ribs •Lower back •Mid axillary line	Have patient press hard against a solid object	Depression between ribs very apparent	Ribs apparent, depressions between them less pronounced	Chest is full; ribs do not show
Triceps/Biceps	Arm bent, roll skin between finger	Very little space betw folds, fingers touch	Some depth to pinch but not ample	Ample fat tissue obvious between folds of skin

Physical Assessment – Muscle Loss

Exam Area	Tips	Severe Malnutrition	Non-Severe Malnutrition	Normally Nourished
Temple	Ask patient to turn head side to side	Hollowing, scooping, depression	Slight depression	Can see/feel well defined muscle
Neck	View patient from front and side	Individ neck muscles (sternomastoid, trapezius) notibly reduced	Muscle mass moderately decreased. Clavicles less protuberant	Approp muscle mass present
Shoulder	Patient arms at side: observe shape	Shoulder to arm joint looks square, bones prominent. Acromion protrusion very prominent	Acromion process may slightly protude	Rounded, curves at arm/shoulder/ neck
Clavicle	Make sure patient isn't hunched over	Protruding, prominent bone	Visible in male, some protrusion in female	Not visible in male, but not prominent in female

Physical Assessment – Muscle Loss

Exam Area	Tips	Severe Malnutrition	Non-Severe Malnutrition	Normally Nourished
Interosseous Muscle	Look at thumb side of hand; look at pads of thumb when tip of forefinger touching tip of thumb	Depressed area between thumb-forefinger	Slight depression	Muscle bulges, could be flat in some well nourished people
Knee	Ask patient to sit with leg propped up bent at knee	Bones prominent, little sign of muscle around knee	Knee cap less prominent, more rounded	Muscles protrude, bones not prominent
Quadriceps (front thigh)	Ask patient to sit; grasp quads to differentiate muscle	Depression/line on thigh, obviously thin	Mild depression on inner thigh	Well rounded, well developed

Characteristics to Identify Malnutrition

- Changes in Body Composition
 - **Fluid accumulation##**
 - » Localized (hand, lower extremity or scrotal edema)
 - » Generalized fluid accumulation - clinically evident edema on examination
 - » Extremity edema (hand/arm, ankle/leg)
 - » Vulvar/Scrotal edema
 - » Generalized edema
 - » Anasarca

##May mask weight loss, might be reflected as weight gain

Assessing Edema

1+	2 mm depression, barely detectable. Immediate rebound
2+	4 mm deep pit A few seconds to rebound
3+	6 mm deep pit 10-12 seconds to rebound
4+	8 mm: very deep pit >20 seconds to rebound



Hogan, M (2007) Medical-Surgical Nursing (2nd ed.). Salt Lake City: Prentice Hall

Characteristics to Identify Malnutrition

• Measures of Physical Function/Performance

• Hand Grip Strength *

- Dynamometer
- Standards (excellent, good, average, fair, poor) for dominant hand by gender and age
- Maximum reading (kg) from 3 attempts, allow 1 minute rest between attempts

• 4-meter/other walk tests ^

• Stair climbing/chair rising/balance ^

- Fair results - Moderate Malnutrition
- Poor results - Severe malnutrition
- Peak Expiratory Flow/Lung Function being explored



*Strongest correlation to date with muscle mass and nutritional status

^ Elderly populations

Severe Malnutrition in Adults

J Acad Nutr Diet. 2012;112(5): 730-738

For Example: ICD-9 Code 262*	Acute Illness/Injury	Chronic Illness	Social/Environmental
Weight Loss	>2%/1 week >5%/1 month >7.5%/3 months	>5%/1 month >7.5%/3 months >10%/6 months >20%/1 year	>5%/1 month >7.5%/3 months >10%/6 months >20%/1 year
Energy Intake	≤ 50% for ≥ 5 days	≤ 75% for ≥ 1 month	≤ 50% for ≥ 1 month
Body Fat	Moderate Depletion	Severe Depletion	Severe Depletion
Muscle Mass	Moderate Depletion	Severe Depletion	Severe Depletion
Fluid Accumulation	Moderate → Severe	Severe	Severe
Grip Strength	Not Recommended in ICU	Reduced for Age/Gender	Reduced for Age/Gender

* 2012 ICD-9-CM Physician Volumes 1 and 2. American Medical Association

Non-Severe Malnutrition in Adults

J Acad Nutr Diet. 2012;112(5): 730-738

For Example: ICD-9 Code 263.0 *	Acute Illness/Injury	Chronic Illness	Social/Environmental
Weight Loss	1-2%/1 week 5%/1 month 7.5%/3 months	5%/1 month 7.5%/3 months 10%/6 months 20%/1 year	5%/1 month 7.5%/3 months 10%/6 months 20%/1 year
Energy Intake	< 75% for > 7 days	< 75% for ≥ 1 month	< 75% for ≥ 3 months
Body Fat	Mild Depletion	Mild Depletion	Mild Depletion
Muscle Mass	Mild Depletion	Mild Depletion	Mild Depletion
Fluid Accumulation	Mild	Mild	Mild
Grip Strength	Not Applicable	Not Applicable	Not Applicable

* 2012 ICD-9-CM Physician Volumes 1 and 2. American Medical Association

Patient Case Application

Case 1

- DD is a 81 year old male transferred from his skilled facility d/t urinary tract infection and altered mental status
 - Significant PMH for CAD with CABG X 3, cardiomyopathy, IDDM, CKD, s/p total knee replacement
- Height: 6'2", Adm Weight: 177# BMI: 24
- Nutrition history
 - 195# 3 months PTA
 - No record of meal consumption or tolerance PTA
- Hospital course
 - Liberal DM diet with PO supplements HD #1-8
 - Consuming 25% to 50% most meals; others refused
 - HD#9, DD c/o diffuse abdominal pain, NV

Case 1

- HD#10 – Diet changed to NPO
- Abdominal film HD#9 – fecal impaction and ileus
- NST c/s to begin PN – HD#10
- Physical Exam
 - Mild bilateral ankle edema
 - No evidence of fat or muscle loss
- Clinical Parameters
 - WBC: 12.6 K, afebrile, Albumin: 1.6 g/dL; Prealbumin: 5.6 mg/dL

Malnutrition Process Work Flow

- Nutrition Screening by Patient Care Services upon admission
 - MST – score of ≥ 2 generates referral
- RD assess patient
- RD reviews malnutrition findings with MD
 - Collaborates on documentation and plan of care
- Upon discharge, coders review medical record and assign ICD-9 malnutrition code

Future Malnutrition Activities

- Feasibility and Validity Study
 - Acute care hospitals
- Expand criteria development for other populations
 - Ambulatory care setting
- A.S.P.E.N. Nutrition Care Registry
 - Sustain©
 - Currently focused on home parenteral nutrition
 - Next focus will be on malnutrition in hospital setting

Characteristics Summary

- Reduced food/caloric intake
- Unintended/non-volitional weight loss
- Loss of muscle
- Loss of subcutaneous fat
- Evidence of fluid accumulation
- Diminished hand grip strength

Any 2 or more characteristics should be used to identify Adult Malnutrition

Thank You!!

“Obstacles don’t have to stop you. If you run into a wall, don’t turn around and give up. Figure out how to climb it, go through it, or work around it.”
~Michael Jordan~