Nutrition and the HSCT Patient

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I have no disclosures

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Objectives

- Review risk factors and current literature regarding nutrition and HSCT
- Discuss current nutrition assessment tools
- Review Pilot Diet Study completed at Duke

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Overview

- Malnutrition occurs in approximately two-thirds of patients with malignant disease
- Inversely correlated with length of survival and implies a poor prognosis
- Changes in carbohydrate, lipid, and protein metabolism that can contribute to fluid imbalance, acid-base balance, and changes in the concentration of electrolytes, vitamins, and/or minerals

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Cancer Cachexia

- A specific form of malnutrition
  - loss of lean body mass
  - muscle wasting
  - impaired immune, physical and mental function.
- Associated with
  - poor response to therapy
  - increased susceptibility to treatment-related adverse events
  - poor outcome and quality of life
- Multifactorial syndrome thought to result from
  - the actions of both host- and tumor-derived factors, including cytokines involved in a systemic inflammatory response to the tumor.

Argiles J. European Journal of Oncology Nursing, Vol 9, supp 2, 2005

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Risk Factors for Malnutrition During HSCT

- We all know these….
  - Dry mouth
  - Taste aversion
  - Early satiety
  - Nausea
  - Anticipatory nausea
  - Anorexia
  - Depression
  - Highly emetogenic chemotherapy agents
  - Mucositis

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Changing Demographics

- Prior to effective cancer screening
  - Diagnosis in late disease stage
  - Weight loss and cachexia common
  - Significant untreated nausea and vomiting
- Now with better screening
  - Patients already obese or overweight
  - Weigh gain is complication of many treatments
  - Perception "Bone Marrow Diet"
- Is this better or worse?

CA: A Cancer Journal for Clinicians 2012

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Changing Demographics

- High technology home care
- Growth factors
- Improved antibiotics
- Better patient education
- Better symptom management
- More outpatient care

Oncology Nursing Forum volume 33, no 2, 2006

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Current Nutrition Data

Study	Study Type	N	Results in favor of unrestricted diet	Other
Gardner et al CJO, 2008	Prospective Randomized	153	NSD	
Trifilio et al BBMT, 2012	Retrospective Review	726	NSD SD increase post neutropenia in ND	Increased incidence of C. diff and VRE in ND
Moody et al J of Ped Hemat/ Onco 2006	Prospective Randomized	19	NSD	
DeMille et al ONF, 2006	Descriptive Pilot	28	NSD	Outpatient difficult adherence
Study	**Study Type**	**N**	**Assess nutritional status prior to transplant**	**Other**
Hadjibabaie et al BMT 2008	Cross-sectional survey	50	BMI vs NB	Difficult adherence

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Nitrogen Balance = Nitrogen intake - Nitrogen loss
Nitrogen intake = Protein intake (g/day) / 6.25
Urinary Urea Nitrogen (UUN) determined with 24hr urine collection
Nitrogen loss = UUN (g/day) + 4g (to account for random nitrogen loss)

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Everyone's favorite!

- Serum protein levels (albumin, prealbumin) frequently used in nutrition assessment are often inaccurate in the hospitalized patient and DO NOT reflect nutritional status.
- In an unstressed state, levels may remain normal despite significant malnutrition. However, during illness, albumin levels are often low regardless of nutritional status and will likely not increase until the acute stress has passed
- In summary, DO NOT let these numbers be your nutrition assessment

Banh L. Serum Proteins as Marks of Nutrition: What are we treating? Practical Gastroenterology 2006; XXX(10):46-64.

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Albumin

Increased in	Decreased in
Dehydration	Overhydration/ascites
Blood transfusions	Hepatic failure
	Inflammation/infection/metabolic stress
	Protein losing states cachexia
	Trauma/post-op
	Bed rest
	CANCER
	Corticosteriod use

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Prealbumin

Increased	Decreased
Severe renal failure	Acute catabolic state
Corticosteroid use	Post-surgery
Oral contraceptives	Liver disease/hepatitis
	Infection/stress/inflammation
	Dialysis
	Hyperthyroidism
	Significant hyperglycemia

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Transferrin

Increased	Decreased
Iron deficiency	Pernicious anemia (B12)
Dehydration	Anemia of chronic disease
Oral contraception/estrogens	Overhydration
Chronic blood loss	Chronic infection
Hepatitis	Iron overload/iron dextran therapy
Hypoxia	Uremia
Chronic renal failure	Nephrotic syndrome
	Severe liver disease/hepatic congestion
	Cancer
	Age
	Corticosteroids

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Clinical Nutrition Assessment

- Anthropometrics (serial weights, fluid status, pre-illness weight)
- Physical exam (muscle wasting, sarcopenia, edema, dry skin, dentition)
- Recent nutrition intake and nutrition intake history
- Medical/surgical history
- Labs (with caution)
- Medications, supplements, herbs, protein powders
- Step back and look (wounds healing, making gains with PT?)

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What can we do?

- Cereal and juice are not the answer
- "If eating ½ serving of Rice Krispies and 4 oz of apple juice is not ok for your 6-year-old or your elderly parents, it's not ok for our patients."

- Early intervention by registered dietician
- Shift eating patterns to coincide with appetite
- Small frequent meals
- Room temperature foods
- Encourage high calorie/small volume foods
  - Protein supplement shakes and smoothies

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Theoretical Basis for Neutropenic Diet

- Approx. 75% of leukemic and 50% of solid tumor deaths are related to infections 2° to neutropenia
- Developed to reduce the introduction of bacteria into GI system of immunocompromised patients
- Food is the ideal medium for supporting the growth of microorganisms due to soil, water, and air exposure
- Organisms found on food that commonly cause infection:
  - *Escherichia coli*
  - *Pseudomonas aeruginosa*
  - *Klebsiella pneumoniae*

Restau, J.; Clark, A. (2008). The Neutropenic Diet: Does the Evidence Support This Intervention? *Clinical Nurse Specialist, 22(5)*: 208-211.

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Transplant center practice

- Varied
- Multiple variations of neutropenic or low bacterial diet
- Food safety emphasis

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Updated Guidelines

"Concern arising from the detection of potential pathogens in food has not been supported by documented evidence of such organisms as the source of opportunistic infections in immunocompromised persons. The potential benefit of food safety recommendations directed specifically toward HCT recipients must be weighed against the uncertain value of such recommendations and their potential to adversely affect patients' nutritional intake and/or quality of life."

BBMT, October 2009

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Why Do This?

- I wanted a BMT registered dietician
- I wanted better food options for our patients
- I got interested in graduate school
- I thought it would be "pretty easy"

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Purpose of Neutropenic Diet Study

- PRIMARY OBJECTIVE: To compare the incidence of bacteremia as defined by grade 3 infections of gram negative or fungal pathogens in patients undergoing myeloablative allogeneic stem cell transplant when receiving a neutropenic diet or a non-neutropenic diet
- SECONDARY OBJECTIVE: To assess the nutritional status of patients undergoing myeloablative allogeneic stem cell transplant in those receiving a neutropenic diet as compared to those receiving a non-neutropenic diet using the Scored Patient-Generated Subjective Global Assessment (PG-SGA)

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Eligibility Criteria

- Scheduled to undergo a myeloablative allogeneic stem cell transplant for any cancer or non-cancer illness from any related or unrelated donor source including bone marrow, peripheral blood progenitor cell, or umbilical cord blood
- Age 20-70 years of age
- Karnofsky Performance Scale KPS> 80
- Ability to read and write English
- These are standard inclusion criteria for the subjects undergoing myeloablative stem cell transplant
- No evidence of active infection

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Assessment and Data Collection

- Baseline and weekly until ANC>500 x 3 days
  - Blood counts, hepatic panel, prealbumin, transferrin
  - PG-SGA survey
  - Weekly food diary
  - Weight

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- The scored PG-SGA is a concept that incorporates a numerical score as well as providing a global rating of well-nourished, moderately or suspected of being malnourished or severely malnourished.

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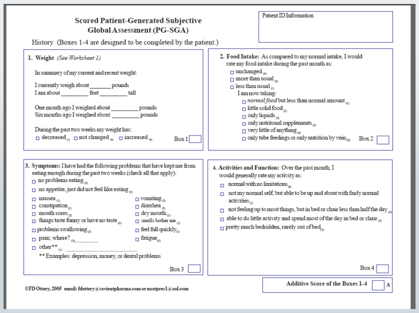
PG-SGA Survey



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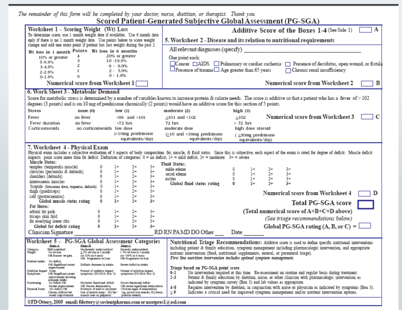
PG-SGA Survey



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3. Symptoms: I have had the following problems that have kept me from eating enough during the past two weeks (check all that apply):

- ☐ no problems eating (0)
- ☐ no appetite, just did not feel like eating (3)
- ☐ nausea (1)
- ☐ vomiting (3)
- ☐ constipation (1)
- ☐ diarrhea (3)
- ☐ mouth sores (2)
- ☐ dry mouth (1)
- ☐ things taste funny or have no taste (1)
- ☐ smells bother me (1)
- ☐ problems swallowing (2)
- ☐ feel full quickly (1)
- ☐ pain; where? (3) __________
- ☐ other** (1) __________

** Examples: depression, money, or dental problems

Box 3 ☐

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PG-SGA

Scoring

Nutritional Triage Recommendations: Additive score is used to define specific nutritional interventions including patient & family education, symptom management including pharmacologic intervention, and appropriate nutrient intervention (food, nutritional supplements, enteral, or parenteral triage). First line nutrition intervention includes optimal symptom management.

0-1	No intervention required at this time. Re-assessment on routine and regular basis during treatment.
2-3	Patient & family education by dietitian, nurse, or other clinician with pharmacologic intervention as indicated by symptom survey (Box 3) and laboratory values as appropriate.
4-8	Requires intervention by dietitian, in conjunction with nurse or physician as indicated by symptoms survey (Box 3).
≥ 9	Indicates a critical need for improved symptom management and/or nutrient intervention options.

FD Ottery, 2001

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Study Screening

- 90 subjects screened
  - 47 enrolled
  - Not as easy as it sounded
    - Risk aversion
    - "another study"
    - Community practices
    - Only wanted "real food"
    - Timing of consenting
  - One subject not evaluated
    - Progressive disease during TBI
    - 46 evaluable

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Characteristics	Mean		Range
Age	43.5		23-62
Characteristics		N	%
Gender			
Male		24	52
Female		22	48
Diagnosis			
AML		22	48
ALL		8	17
Lymphoma		6	13
**Other		10	22
Preparatory Regimen			
TBI/Chemotherapy		21	57
Chemotherapy alone		16	43
Donor Source			
Matched Related Donor		15	33
Matched Unrelated Donor		19	41
Matched Related Donor-BM		1	2
Dual Umbilical Cord Blood		11	24

**Other: Myeloma, MDS, CLL, AEL, Myelofibrosis, CML

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The final accrual is 46 patients. Twenty-five were randomized the experimental while 21 were randomized to the control group

Arm	Frequency	Percent	Cumulative Frequency	Cumulative Percent
control	21	45.65	21	45.65
experimental	25	54.35	46	100.00

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Table of Positive Blood Cultures by Arm

	Arm		
Frequency	Neutropenic Diet	Regular Diet	Total
no	15 70.00	18 72.00	33
yes	6 30.00	7 28.00	13
Total	21	25	46

Six of twenty-one (30%) control patients and seven of twenty-five (28%) in the experimental group had positive blood cultures, the chi-square test for comparing these proportions is 0.9; therefore, these proportions are not statistically significantly different.

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Results

- No significant difference in PG-SGA scores
  - Mucositis
    - High scores during neutropenia
    - Rebounded when discharged close to baseline
- No difference in days of TPN
- No difference in any lab values

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Limitations

- Small sample size
- Broad inclusion criteria
- Accrual difficulty
- Food diary
  - Most incomplete
  - Not enough data to evaluate
- Objectives
  - GvHD
  - Gut flora
  - Overall outcomes

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Implications and Questions

- Does a drastic diet change, modify the gut flora?
- Assessment and teaching
  - Baseline assessment
  - Risk factors
  - Safe food preparation guidelines
- Community education
- Consistent practices
  - Remove the specific food limits
  - Follow FDA safe handling guidelines
  - Evidenced based guidelines
- Bigger study

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[CANCER RESEARCH 47, 3309–3316, June 15, 1987]

Nutritional Support of Bone Marrow Transplant Recipients: A Prospective, Randomized Clinical Trial Comparing Total Parenteral Nutrition to an Enteral Feeding Program[1]

Debra J. Szeluga, Robert K. Stuart,[2] Ron Brookmeyer, Virginia Utermohlen, and George W. Santos

Divisions of Experimental Hematology [R. K. S.] and Bone Marrow Transplantation [G. W. S.], The Johns Hopkins Oncology Center, Baltimore, Maryland; Department of Biostatistics [R. B.], The Johns Hopkins School of Hygiene and Public Health, Baltimore, Maryland; and Division of Nutritional Sciences [D. J. S.], Cornell University, Ithaca, New York

- Compared to the enteral feeding program:
- TPN was associated with more days of diuretic use
- More frequent hyperglycemia
- More frequent catheter removal (prompted by catheter-related complications)
- Less frequent hypomagnesemia
- There were no significant differences in the rate of hematopoietic recovery
- Length of hospitalization or survival
- Nutrition-related costs were 2.3 times greater in the TPN group.

"We conclude that TPN is not clearly superior to individualized enteral feeding and recommend that TPN be reserved for BMT patients who demonstrate intolerance to enteral feeding."

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In Summary

- More research is needed…….
- "Clinical trial organizations such as the Blood and Marrow Transplant Clinical Trials Network could be platforms to conduct such trials and funding agencies should make it a priority to fund research of the biologic effects of diet on outcomes in transplantation recipients and patients with cancer."

Boeckh M. BBMT Vol 18, issue 9, Sept 2012

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