Medical Nutrition Therapy
Role of the RD in the HCT population

Transplant class
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Weight and HCT Outcome

Weight and Adult HCT Outcome

Weight history
<95% ideal weight: significantly poor prognosis;
<85% ideal weight: even poorer prognosis

Objectives

Identify RD nutrition assessment and monitoring parameters for adult and pediatric hematopoietic cell transplant (HCT) patients.

Understand the various types of weights and weight-based calculations. Understand the impact of pre-HCT weight/weight loss during treatment and outcomes.

Discuss appropriate nutrition support recommendations and possible implications in gut GVHD.

Describe nutrition interactions associated with immunosuppressive medications.

Weight and Weight-Based Definitions

Actual Weight: Weight taken on a scale.

Ideal Weight: SWOG/CTN Formula will be used to calculate ideal weights
- Males ≥ 90 kg (~3.2 lbs/ft)
- Females ≥ 87.5 kg (~2.4 lbs/ft)
- Patients > 5 feet tall: subtract 2.5 kg/ft

Adjusted Weight: For both Adult and Pediatric Patients, adjusted weight will be calculated as follows
Ideal weight – 0.25 (actual weight – ideal weight) x

Body Surface Area (BSA): \( \frac{Actual\ weight\ in\ kg \times height\ in\ cm}{60} \)

Body Mass Index (BMI): BMI = weight (kg)/[height(m)]²

What’s happening now with obesity on the rise?
Weight and Adult HCT Outcome

Fuji S. Bone Marrow Transplantation. 2014 Dec;49(12):1505-12 Impact of pretransplant body mass index on the clinical outcome after allogeneic hematopoietic SCT.

- Pretransplant BMI affected the risk of relapse and NRM after allogeneic HCT (n=>12,000).
- Obesity = risk factor for NRM.
- ↑ risk of NRM in overweight and obese vs. normal wt (HR 1.19 and HR 1.43, respectively).
- Underweight = risk factor for poor OS because of an ↑ risk of relapse.
- ↑ risk of relapse in the underweight group and ↓ in the overweight and obese groups vs normal wt (HR 1.16, 0.86, and 0.74, respectively).
- ↓ OS in underweight group vs. normal wt (HR 1.10, P=0.018).
- ↑ Risk of GVHD in overweight group vs. normal wt.

Weight and Adult HCT Outcome


- Obese pts = ↑ risk of NRM at 3 years vs. normal weight pts. (n=~900)
- BMI was not significantly associated with acute or chronic GVHD.
- Obese patients = ↓ relapse vs. normal weight pts.

Weight and Adult HCT Outcome


- Low initial BMI and more pronounced weight loss during HCT are strong prognostic indicators associated with lower survival and worse disease outcomes (n=156 AML pts).
- 10 year follow-up.
- Compared to patients with a baseline BMI (kg/m2) of 20-25, a low BMI <20 was associated with ↑ long-term mortality (70 vs. 49%, adjusted hazard ratio 1.97, 95% CI 1.04-3.71, p = 0.036).
- A more pronounced weight loss during HSCT (>7 vs. <2%) was associated with higher risk for bacterial infections (p = 0.059) and fungal infections (p = 0.032), and longer hospital stays (64 vs. 38 days, adjusted mean difference 25.6 days (15.7-35.5), p < 0.001).
- Intervention research is needed to investigate whether nutritional therapy can reverse these associations.

Role of the RD

SCCA HCT Medical Nutrition Therapy Model

Pre-HCT Nutrition Assessment Serial Reassessment Education Multi-disciplinary Rounds

- High BMI associated with worsened survival.
- Anthropometry
  - Retrospective review of 733 pediatric HCT patients
  - Arm circumference and triceps skinfold
  - Association between low muscle reserves, pre-transplant, and poorer survival
Clinical MNT Picture

↑ nutrient requirements due to:
- Metabolic complications
- Fever
- Infection
- Acute GVHD
- Preparative regimen
- Infection
- Metabolic complications

RD assesses:
- Nutrient Intake
- Intake vs Output
- Weight trend
- GI symptoms
- Lab Trends

Role of Registered Dietitian (RD)

- Assesses IVF/electrolyte needs
- Determines appropriate timing to initiate/discontinue nutrition support
- Initiates calorie counts to determine intake vs needs
- Educates patient regarding appropriate tolerable food sources pending regimen-related toxicity

Nutrient Goals

- Adjusted weight used for patients >120% ideal weight
- Calorie and protein requirements are significantly elevated during HCT:
  - Calorie needs = 30-35 kcal/kg
  - Protein needs = 1-1.5 g/kg
- Fluid requirements are significantly elevated due to:
  - Nephrotoxic conditioning regimens
  - Immunosuppressive agents
  - Antimicrobial agents
  - Fluid needs = 1,500 mL x Body Surface Area (BSA)

Serial nutrition assessment by RD important to address post-HCT complications that affect:
- Nutrient intake
- Absorption
- Utilization

Anthropometry

Oral intake vs Enteral vs Parenteral

How to feed the HCT patient?
**Immunosuppressed Pt Diet**

• Washed fruit/vegetables are allowed.

• Follows CDC guidelines for pregnant women.

• Start if neutropenic, with conditioning regimen and duration of IMM meds.

• 10-year study found 12/4069 (0.3%) developed foodborne illness within 1st year post-HCT.

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**Nutrition Support**

- Identify and prevent or correct protein-energy malnutrition and metabolic abnormalities.

- Preserve lean tissue.

- Promote growth and development in children.

- Maximize quality of life.

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**Refeeding Syndrome**

- Refeeding syndrome = fluid, micronutrient, electrolyte, and vitamin imbalances that occurs within the first few days after refeeding nutritionally compromised patients.

- Potentially life-threatening.

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**Benefits of Enteral Nutrition**

- Maintains mucosal integrity and gut barrier function

- Stimulates of mucosal repair

- ↓ incidence of hyperglycemia

- ↓ incidence of infection

- ↓ cost

- ↓ incidence of grade III-IV gut GVHD compared to PN use
Parenteral Nutrition

Indications for PN support during HCT:
- Myeloblastic conditioning regimen with severe GI toxicity
- Severe intestinal GVHD or high-volume diarrhea
- Suboptimal nutrition support from enteral route
- Anticipated length of poor oral intake > than 3 days

Parenteral Nutrition—Nonmyeloablative vs Ablative Regimens vs RIC

• 73 nonmyeloablative vs 73 myeloablative HCT.
• PN need minimal in nonmyeloablative due to ↓ mucositis and other severe GI toxicities.
• RIC vs myeloablative HCT:
  - ↓ mucositis (46% vs 93%, p=<0.0001)
  - ↓ need for TPN (21% vs 77%, p<0.001)
• PN not uniformly indicated for all patients.

Gut Microbiome


Intestinal microbiota helps to maintain the physical, functional, and immunologic barriers within the GI tract
- Diversity is important
- Intestinal microbiota is a modulator of GI immune homeostasis
- Growing evidence that the gut microbiota may contribute to the development of post-HCT complications, including GVHD
- Probiotics have the potential to change the gut flora to support the development and sustainability of a healthier microbiota

Parenteral Nutrition

Parenteral Nutrition—Nonmyeloablative vs Ablative Regimens vs RIC

• Provision of PN can be safely discontinued, without adverse effects during HCT, when:
  - Patients consume at least 30% energy needs
  - Patients are without evidence of malnutrition, malabsorption, or other significant GI toxicities
• Discontinuation of PN results in earlier resumption of oral intake post-transplant.
Probiotics
- Live microorganisms
- Most common species: *Lactobacillus, Bifidobacterium*
- May alter the composition of the intestinal microflora and improve the mucosal barrier
- Examples: yogurt, kefir, acidophilus milk

Prebiotics are also important!

Gastrointestinal GVHD: Gut Microbiota Manipulation

↑ bacterial diversity associated with ↓ GVHD mortality

Probiotics: Recommend pasteurized food sources (yogurt, kefir, acidophilus milk) rather than supplements during the immediate post-transplant course

More human studies needed in the HCT population before specific recommendations can be made

Medications

Impact on Nutrition/Diet

- MMF – Interaction with all calcium, not just "dairy"
  - Helpful to outline times pt can eat calcium
  - GI toxicity, consider myfortic
  - Consider coconut milk-based products
- Tac/CSP – Magnesium wasting
  - Also interactions with grapefruit + pomegranate juice/bitter orange/Earl Grey tea (bergamot)
- Sirolimus – Elevated TG levels

Prednisone

Bone health

- Basal vs premeal insulin

Medical Nutrition Therapy

Examples of interventions by RD

I didn’t want to eat the whole cake, Prednisone made me.
Diarrhea management

- Evaluate dietary fiber content
- Small, frequent meals
- Ensure pt is adequately hydrated
- Consider lactose-intolerance
- Consider oral magnesium supplementation
- Refer to RD for counseling/evaluation
- Late effects: pancreatic exocrine insufficiency

Hyponatremia

- Restrict free water
- Include sodium-containing fluids
- Do not tell patients to add salt to foods!
- Refer to RD for patient education

Metabolic Syndrome

- Metabolic syndrome appears early post-HCT
- 3:1 frequency of metabolic syndrome compared with NHANES data (n=86) in survivors >1 year post-transplant
- Statistically significant difference in the incidence of cardiometabolic traits in childhood survivors compared to controls

Metabolic Syndrome

- Increased risk of heart disease and DM
- Increased at day 80 and 1 year
- 1st tx is diet modification
- All calories are not created equal

Thank you!