Nutrition Assessment & Monitoring

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Learning Objectives

- Identify the components of a nutrition assessment
- Discuss evidence-based recommendations for determining energy needs
- Evaluate clinical tools for monitoring nutrition interventions and outcomes

Nutrition Assessment

- In-depth evaluation of the patient’s nutritional status
- Intervention to correct nutritional problems
- Anticipated outcomes
- Monitor actual outcomes of interventions
- Re-assessment as patient’s condition changes or goals are not met
**Pieces of the Nutrition Assessment Puzzle**

- Medical condition
  - Diagnosis
  - Co-morbidities
- Nutrient intake
  - Diet history/current intake
  - Weight history
- Additional information
  - Functional status
  - Physical assessment
  - Medications
  - Laboratory results
- Education
  - Survival skills or in-depth
  - Previous nutrition counseling
  - Readiness to make lifestyle changes
- Discharge
  - Home environment
  - Willingness to comply
  - Reimbursement for therapies

**Medical Condition**

- How do medical diagnoses and co-morbidities impact nutritional status?
  - Chronic diseases
  - Fluid status
  - Pain
- Have previous/current surgeries affected digestion and absorption?
  - GI surgery
  - Fistula / ostomy
  - Bowel obstruction

**How are Nutrients Delivered?**

- **ORAL DIET**
  - Regular → Modified → Supplements
- **ENTERAL NUTRITION**
  - Gastric → Small Bowel
- **PARENTERAL NUTRITION**
Nutrient Intake

- Current intake
  - Calorie count
  - Food diary
- Retrospective intake
  - 24-hour recall
  - Food frequency
  - How long has appetite/intake been increased or decreased
    - Why?
  - Are specific food groups omitted or eaten exclusively?
  - Are digestion and absorption adequate?
    - Why not?

Weight & Height

- Weight
  - Ideal body weight
  - Actual body weight
  - Usual body weight
- Height
  - Measured
  - Estimated
    - arm span
    - summation of body parts
    - knee height
  - Guestimated

Investigate Weight Changes

- Unintentional weight loss/gain
  - ≥ 10% UBW within 6 months
  - ≥ 5% UBW within 1 month
- Body weight 20% over/under IBW result from and contribute to chronic diseases
- Waist-to-hip ratio associated with increased health risks of HTN, CVD, DM
  - ≥ 0.8 for women
  - ≥ 1.0 for men
Additional Information
- Laboratory data
  - Should confirm suspicions
  - If results unexpected, recheck
- Medications
  - Drug-nutrient interactions
  - Herbal/nutrient supplements
  - Polypharmacy
  - Route of ingestion
- Functional status
  - Self-care or dependence on others
  - Activity level

Laboratory Data
- Vitamin and mineral serum levels often do not correlate with stores or accurately measure toxicity or deficiency
  - If a patient demonstrates S&S of a micronutrient abnormality, treat accordingly and monitor for response
  - Many labs reflect degree of injury or illness and do not provide guidance for nutrition interventions

Hepatic Proteins Do Not....
- Reflect body stores of protein
- Define malnutrition
- Measure response to nutrition intervention
- Indicate how much protein to give
- Assess nutritional status

*Hepatic proteins reflect inflammation and are prognostic indicators*
Signs & Symptoms of Nutrient Deficiency

<table>
<thead>
<tr>
<th>Vision abnormalities</th>
<th>Anorexia</th>
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<tbody>
<tr>
<td>Skin abnormalities</td>
<td>Nausea/Vomiting</td>
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<tr>
<td>Neurological defects</td>
<td>Diarrhea</td>
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<tr>
<td>Hematologic disorders</td>
<td>Anemia</td>
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<tr>
<td>Impaired immunity</td>
<td>Weakness</td>
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<tr>
<td>Skeletal disorders</td>
<td>Weight loss</td>
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<tr>
<td>Tissue inflammation</td>
<td>Neuropathy</td>
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Modification of Standard Lytes, Vitamins & Minerals

- Organ failure
  - Cardiac
  - Renal
  - Hepatic
- Refeeding
- ETOH abuse
- GI losses
  - NG, stool, fistula
  - Medications
  - Inflammation
  - Long-term SNS

Subjective Global Assessment

- Nutrition-related history
  - Weight changes
  - Appetite / nutrient intake
  - GI symptoms
  - Metabolic stress
- Physical examination
  - Subcutaneous fat
  - Muscle mass
  - Fluid status – edema and ascites
- Functional capacity
**SGA Scoring**

- SGA is safe and inexpensive to perform.
- Accuracy depends on observer’s experience.
- It is better at identifying established malnutrition than nutritional risk.
- The continuum of malnutrition presents from inadequate nutrient intake to functional changes to anthropometric changes.

**Estimated Energy Expenditure**

**Healthy Individuals**
- Calories per kilogram
- Harris-Benedict
- Mifflin-St Jeor
- Owen
- WHO Equation
- Bernstein
- Robertson & Reid

**Critically Ill**
- Swinamer
- Ireton-Jones
- Frankenfield
- Penn State

**Best Predictive Accuracy for Non-Obese Critically Ill**

- Penn State (2003) - 79% (III)
  \[ RMR = 0.85(BMR) + 33(V_3) + 175(T_{max}) - 6433 \]

- Swinamer - 55% (III)
  \[ EE = 945(\text{BSA}) + 6.4(a) + 108(T_{max}) + 24.2(\text{rr}) + 81.7(\text{vt}) - 4349 \]

- Ireton-Jones (1992) - 52% (II)
  \[ EE = 1925-10(a) + 5(w) + 281(s) + 292(t) + 851(b) \]
  \[ EE = 629 - 11(a) + 25(w) - 609(o) \]

Recommendation: Fair, Conditional
**Do Not Use These Equations for Non-Obese Critically Ill**

- Harris-Benedict with/without stress factors
- Ireton-Jones (1997)
- Fick
- Mifflin-St Jeor

**Best Predictive Accuracy for Obese Ventilated Critically Ill**

- Ireton-Jones (1992) – 72% (II)
  
  \[
  EE = 1925 - 10(a) + 5(w) + 281(s) + 292(t) + 851(b)
  \]

- Penn State (1998) – 61% (II)
  
  \[
  RMR = 1.1(BMR) + 32(V_e) + 140(T_{max}) - 5340
  \]

Recommendation: Fair, Conditional

Key: BMR=HBE; \(V_e\)=minute ventilation (L/min); \(T_{max}\)=maximum temperature; BSA=body surface area; \(a\)=age in years; \(rr\)=respiratory rate (breaths/minute); \(vt\)=tidal volume (L/min); \(w\)=actual weight in kg; \(s\)=sex (1=male, 0=female); \(t\)=trauma (1=yes, 0=no); \(b\)=burns (1=yes, 0=no); \(o\)=obesity, >130% IBW (1=yes, 0=no)

**Assessment of Protein Needs**

- Estimated protein requirements
  - RDA: 0.8 gm/kg
  - Critical illness: 1.0-2.0 gm/kg
  - Renal/Hepatic failure: 0.6-1.0 gm/kg
  - Home EN & PN: 1-1.5 gm/kg
  - Nitrogen accretion maximized at 1.5gm/kg
- 10-20% total kcal
Non-PN Energy and Protein Sources

- Dextrose
  - Intravenous fluids
  - Medications
  - Dialysates
- Protein
  - Blood products
- Fat
  - Propofol

Canadian Guidelines, 2007

Recommended

- PN
  - Avoid hyperglycemia
  - Do not start PN and EN simultaneously
  - Do not start PN until all strategies to optimize EN tolerance have been tried
  - Glutamine with PN
- EN
  - Early EN (24-48 h after ICU admission)
  - Do not supplement arginine in critically ill
  - Fish oil, borage oil and antioxidants in ARDS patients
  - Polymeric (whole protein)
  - Routine use of small bowel feedings
  - Elevate HOB 45°

Canadian Guidelines, 2007

Should be Considered

- PN
  - Withholding lipids
  - Low dose
  - Intensive insulin therapy
  - Supplemental vitamins and trace elements
  - Selenium with/without other antioxidants
- EN
  - Glutamine for burn & trauma pts
  - Prokinetics with GRV
  - Optimize delivery in head injured patients
Canadian Guidelines, 2007
Insufficient Data for Recommendation
- Indirect calorimetry versus predicted equations
- Parenteral nutrition
  - BCAA
  - Lipids
  - Zinc
  - Low dose feeding
  - When to start

Canadian Guidelines, 2007
Insufficient Data for EN
- Glutamine
- Prebiotics/probiotics/symbiotics
- Continuous vs intermittent feedings
- Gastrostomy vs nasogastric feedings
- Ornithine ketoglutarate (OKG)
- Low fat
- High protein
- Low pH feedings
- Fiber
- Feeding protocol (but if used, provide prokinetics and allow GRV >250 mL)
- Closed vs. open system

ESPEN Guidelines for EN
Clin Nutr 2006;25:210-223
- Grade A
  - Provide glutamine to EN for burn and trauma patients
  - IEF for trauma & elective upper GI surgery patients
  - Supplement Cu, Se, Zn in burned patients
  - Avoid PN in patients who tolerate EN
- Grade B
  - Consider IEF with mild sepsis; avoid with severe sepsis
  - ARDS provide omega-3 fatty acids and antioxidants
  - ICU pts with severe illness tolerating <700 mL EN/d should not receive IEF containing arginine, nucleotides, and omega-3 fatty acids
Start EN in patients unable to start oral diet within 3 days
Despite no data on improved outcomes, start EN within 24 h of hemodynamic stability
During acute/initial phase of illness provide 20-25 kcal/kg increase to 25-30 kcal/kg during anabolic phase.
Provide 25-30 kcal/kg/d for malnourished patients and consider PN supplementation
No difference between jejunal and gastric feeds
Peptide formulas not shown to be more beneficial than whole protein

Do not add blue dye to EN
Elevate HOB 45°
Single RMR measurement adequate in ventilated patients achieving steady state
Indirect calorimetry is standard for determining RMR
Do not use HBE, I-J 1997, Fick or St Jeor to estimate needs
Maintain serum glucose < 140 mg/dL
RD should promote strict glycemic control (80-100 mg/dL) in ventilated critically ill ICU patients

EN preferred over PN
Initiate EN 24-48 h post-injury/ICU admission
Provide promotility agent with ↑ GRV
Repeat IC with RQ <0.7 or >1.0

Do not use immunonutrition routinely in ICU
EN should provide at least 60-70% of estimated needs during the first week
**Fair, Conditional**
- Gastric feeds acceptable for most ICU patients
- Small bowel feeds for supine or heavily sedated patients or those with GRV >250mL x 2
- Do not change energy source for 24 h before or during RMR measurement

**Weak, Imperative**
- Air leaks with IC impair results
- Room temp 68-77 °F for IC

**Weak, Conditional**
- Intermittent EN >400 kcal/feeding: hold feeds at least 5 h before IC (if not feasible or <400 kcal – hold 4 h)

**Consensus, Imperative**
- GRV > 250mL for 2 or more consecutive times
- Allow patient to rest 30 minutes prior to IC
- Ensure room is quiet and comfortable for IC

**Consensus, Conditional**
- Allow 30 minute rest after activity or procedures prior to IC
- Non-steady state can be chronic and measures may reflect actual energy expenditure

**Insufficient Evidence, Imperative**
- More studies needed comparing IC devices
- Ensure patient is physically comfortable prior to IC
### Nutrition Education

- What does the patient need or want to know about nutrition?
  - How many times has the patient heard this before?
  - What has changed since the last diet instruction?
- Adapt teaching to patient’s educational need and learning capability
- Is it appropriate to refer for out-patient counseling?
- Who will follow-up with patient?

### Can the Patient Go Home on Nutrition Support?

- Clinically and medically stable
- Appropriate access device
- Carepartner available
- Safe & appropriate home environment
- Patient willing and able to comply with regimen
- Reimbursement
- Who will write orders and monitor after D/C?

### Nutrition Care Process

- Step 1: Nutrition assessment
- Step 2: Nutrition diagnosis
  - Problem – diagnostic label
  - Etiology – cause/contributing risk factors
  - Signs/Symptoms – defining characteristics
- Step 3: Nutrition intervention
- Step 4: Nutrition monitoring and evaluation
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<td>- Focus on nutrition-related issues and their root causes</td>
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<td>- Conservative goals – start low and go slow</td>
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<td>- Document and communicate goals of interventions</td>
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<td>- Monitor responses to nutrition interventions</td>
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<td>- Monitor changes in patient’s clinical status</td>
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<td>- Reassess and adapt care plan if actual outcomes are not consistent with anticipated outcomes</td>
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