Optimizing Preoperative Nutrition

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Preop Under-Nutrition

- Impedes wound healing
- Increases risk of Superior Mesenteric Artery Syndrome
- Pre-op Goal = Weight gain and adequate stores of nutrients for wound healing
- < 3rd %ile absolute weight or < BMI
Preop **Over-Nutrition**

- Overweight does **not** mean properly nourished - risk remains
- Weight loss pre- and post-operatively can increase infection risk post-op
- High blood glucose levels impede wound healing
- Pre-op Goal = Stable weight and adequate stores of nutrients for wound healing
Preop Checklist

• Height - difficult to obtain accurate height in EOS patient
  • Arm span
  • Recumbent length
• Weight (BMI > 35 -> risk for SSI)
  • Goal weight for surgery
  • Typically 10% weight gain goal if underweight
• Visual assessment for bony prominences, skin breakdown, vulnerable areas (skin folds/creases related to deformity), scarring
• Skin fold measurements: Triceps skin fold ≥ 10%ile/age or serial increase (standards not determined)
Labs

- CBC (absolute lymphocyte count > 1500*)
- Iron profile (incl. transferrin > 200 mg/dL*)
- C-reactive protein
- Zinc (> 95 μg/dL*)
- Glucose (< 125 mg/dL*)
- Albumin (> 3.5 mg/dL*)
- Prealbumin (16-35 mg/dL*)
- 25-OH vitamin D
- B12
  * Cross et al, JAAOS 3/14
Medical

- Pulmonary - ↑RR impairs PO intake
- Dysphagia / aspiration - Video Ba swallow
- GERD
- 1º GI disease (short bowel, malabsorption, delayed gastric emptying)

✓ strong indication(s) for G-button / tube feeds/ trach
Golden triad/quartet

- Trach
- Port
- G button
- HGT
Nutrition Needs

- Energy needs - Dietary Reference Intake (DRI)
- Protein needs
  - 2 g/kg body weight
- Fluid needs
  - Prevent constipation (neuro patients !)
  - Very important in enterally fed patients
- Calcium intake
  - DRI for age
  - Supplement as needed
- Vitamin D intake
  - DRI for age
  - Supplement as needed
- Multivitamin with Iron
# Estimate Energy Needs (kcal/d)

## Equations to Estimate Energy Requirement: Ages 0-18 Years

### Infants and Young Children

Estimated Energy Requirement (kcal/day) = Total Energy Expenditure + Energy Deposition

<table>
<thead>
<tr>
<th>Age</th>
<th>Equation</th>
<th>Weight Unit</th>
<th>Height Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 months</td>
<td>$EER^* = (89 \times \text{weight [kg]} - 100) + 175$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-6 months</td>
<td>$EER = (89 \times \text{weight [kg]} - 100) + 56$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-12 months</td>
<td>$EER = (89 \times \text{weight [kg]} - 100) + 22$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-35 months</td>
<td>$EER = (89 \times \text{weight [kg]} - 100) + 20$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Children and Adolescents 3-18 years

Estimated Energy Requirement (kcal/day) = Total Energy Expenditure + Energy Deposition

<table>
<thead>
<tr>
<th>Age</th>
<th>Boys Equation</th>
<th>Girls Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-8 years</td>
<td>$EER = 88.5 - (61.9 \times \text{age [y]}) + \text{PA} \times [(26.7 \times \text{weight [kg]}) + (903 \times \text{height [m]})] + 20$</td>
<td>$EER = 135.3 - (30.8 \times \text{age [y]}) + \text{PA} \times [(10.0 \times \text{weight [kg]}) + (934 \times \text{height [m]})] + 20$</td>
</tr>
<tr>
<td>9-18 years</td>
<td>$EER = 88.5 - (61.9 \times \text{age [y]}) + \text{PA} \times [(26.7 \times \text{weight [kg]}) + (903 \times \text{height [m]})] + 25$</td>
<td>$EER = 135.3 - (30.8 \times \text{age [y]}) + \text{PA} \times [(10.0 \times \text{weight [kg]}) + (934 \times \text{height [m]})] + 25$</td>
</tr>
</tbody>
</table>

**Note:** These equations provide an estimate of energy requirement. Relative body weight (i.e., loss, stable, gain) is the preferred indicator of energy adequacy.

- $EER =$ Estimated Energy Requirement
- $\text{PA} =$ Physical Activity Coefficient

Source: This table is derived from the DRI report; see [http://nap.edu](http://nap.edu)
## Physical/Stress Modifiers

### Physical activity coefficients (PA), DRI (ages 3-18 years)

<table>
<thead>
<tr>
<th>GENDER</th>
<th>SEDENTARY</th>
<th>LOW ACTIVE†</th>
<th>ACTIVE‡</th>
<th>VERY ACTIVE†††</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>1.00</td>
<td>1.13</td>
<td>1.26</td>
<td>1.42</td>
</tr>
<tr>
<td>Girls</td>
<td>1.00</td>
<td>1.16</td>
<td>1.31</td>
<td>1.56</td>
</tr>
</tbody>
</table>

† (30-60 Mins. Daily moderate activity)
‡ (60 Mins. Daily moderate activity)
††† (120 Mins. Daily moderate activity, or 60 mins. Moderate + 60 mins. Vigorous activity)

### Activity Factors vs Stress Factors

<table>
<thead>
<tr>
<th>ACTIVITY FACTORS</th>
<th>STRESS FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paralyzed</td>
<td>Surgery 1.2-1.5</td>
</tr>
<tr>
<td></td>
<td>Burn 1.5-2.5</td>
</tr>
<tr>
<td>Confined to bed</td>
<td>Infection 1.2-1.6</td>
</tr>
<tr>
<td></td>
<td>Starvation 0.7</td>
</tr>
<tr>
<td>Ambulatory</td>
<td>Trauma 1.1-1.8</td>
</tr>
<tr>
<td></td>
<td>Growth Failure 1.5-2.0</td>
</tr>
</tbody>
</table>

Importance of Nutrition

• TIS patients have increased energy expenditure (work of breathing)
• Normal nutritional intake depleted by work of breathing -> no weight gain
• EOS pts < 5th %ile = “failure to thrive”
  -> 47% GRI pts (Myung)
  -> 79% Veprt pts (Skaggs)
Adequate Nutrition

- Wound healing
- Infection rate
- Serial surgical procedures - beware revisions
Nutrition - Insurance

- Any EOS patient -> suspicion
- Check labs
- Get your nutritionist on case, calculate EER
- Evaluate airway, swallow, GI function, respiratory status
- Trach
- Port
- G button
- HGT -> work on improved nutrition while gaining correction and pulmonary reserve