Nutrition in Hospitalized Children

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Objectives

• Define malnutrition and understand its scope in hospitalized children
• Examine the role of pediatric hospitalists in optimizing the nutritional status of hospitalized children
• Practice skills needed to assess and optimize nutrition in hospitalized children
• Brainstorm a system improvement strategy that standardizes the evaluation and management of hospitalized children with a common nutritional concern
• Insert ARS questions:

1. Malnutrition occurs in up to ____ of hospitalized pediatric patients. (1) 5%, (2) 10%, (3) 25%, (4) 50%, (5) 75%, (6) >75%

2. Protein energy malnutrition occurs in up to ____ of hospitalized pediatric patients. (1) 5%, (2) 10%, (3) 25%, (4) 50%, (5) 75%, (6) >75%

3. T/F A complete definition of malnutrition should include under- and overnutrition.

4. T/F Undernutrition in the United States is most commonly observed in hospitalized patients.
Malnutrition (undernutrition)

• Imbalance between nutrient requirement and intake resulting in cumulative deficits of energy, protein or micronutrients that may negatively affect growth, development, or other relevant outcomes
  – Although malnutrition is commonly used as an alternative to undernutrition, it technically also encompasses overnutrition, making obesity a form of malnutrition (UNICEF)

• Unlike undernutrition typical in developing countries (marasmus and/or kwashiorkor), undernutrition in the U.S. generally occurs in the setting of acute or chronic illness
  – Most frequently observed in hospitalized acute and/or chronically ill children and in children with special healthcare needs
    ▪ Frequently exacerbated by the acute illness and hospitalization itself (nutrient loss, altered nutrient utilization, decreased nutrient intake)
  – Leads to more complicated hospitalizations due to:
    ▪ Progression of underlying disease or condition
    ▪ Poor wound healing
    ▪ Slow return to previous level of activity
    ▪ Complications that significantly increase LOS and cost of hospitalization
Figure 1. Defining malnutrition in hospitalized children: Key concepts. CDC, Centers for Disease Control and Prevention; MGRS, Multicenter Growth Reference Study; WHO, World Health Organization.
“I suspect 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 our big city hospitals...many undesirable practices concerning the nutritional care of hospitalized patients have their roots in long-standing neglect of nutrition in medical education and in health care delivery systems.”

Charles E. Butterworth, MD, Nutrition Today, 1974
Dr. Butterworth’s List in 1974... and 40 Years Later

- Failure to record accurate height and weight
- Frequent staff rotation
- Diffusion of patient care responsibility
- Prolonged use of IV glucose/saline
- Withholding meals due to tests
- Inadequate tube feeding, unsanitary and uncertain composition
- Ignorance of composition of vitamin mixtures and other nutritional products
- Failure to recognize increased nutrition needs for illness/injury

- Surgical procedures without first optimizing nutrition, failure to give nutrition after surgery
- Failure to appreciate role of nutrition in infection/antibiotic overuse
- Lack of communication and interaction between MD and RD
- Lack of RD concern about every patient in hospital
- Delay of nutrition until advanced state of depletion
- Limited availability of laboratory tests to assess nutrition status, failure to use those tests that are available
Pediatric hospitalists should...

• Be experts in making objective nutritional assessments
• Lead, coordinate, or participate in multidisciplinary efforts to:
  • Screen for malnutrition
  • Improve the nutritional status of hospitalized pediatric patients
• Insert ARS questions:

1. I am an expert in making objective nutritional assessments (Likert scale)

2. With regard to multidisciplinary efforts to improve the nutritional status of hospitalized pediatric patients, most often I am a (1) leader, (2) coordinator, (3) participant, or (4) none of the above (i.e., I don’t think much about nutrition in my hospitalized patients)
1. Who or what is ASPEN?
   (1) A lovely tree that recently replaced the Colorado Blue Spruce as Utah’s State tree
   (2) A scientific society whose members are health care professionals—physicians, dietitians, nurses, pharmacists and researchers dedicated to assuring that every patient receives optimal nutrition care
   (3) A ski resort in Colorado attracting celebrities...but remember Utah has the greatest snow on earth!
Case 1 – 41 day old male with fever to 103 and vomiting

• Initial presentation to ED on DOI #1
  – Afebrile, full sepsis evaluation reassuring
  – Only kept down 2 ounces in 24 hours prior to evaluation
  – Current weight 3.55 Kg, birth weight 3.14 Kg
  – Tolerated PO in ED and discharged home

• Returned to ED on DOI #3
  – Report of continued fever and vomiting, weight 3.58 Kg
  – Admitted to observation unit for 2 days
    ▪ Afebrile, all cultures no growth
    ▪ Unable to tolerate any PO, IVF for hydration
    ▪ Normal CMP, lactate, KUB, and pyloric US
• Insert ARS question:

1. On initial presentation, the patient had an average weight gain of 10 grams/day since birth. Which of the following most closely matches your assessment of the weight gain trajectory since birth? (select all that apply)
   (1) This is in the normal range since the patient wasn’t expected to be back to birth weight until 2 weeks of age, making the average daily weight gain since that time 15 grams/day
   (2) I can’t make an assessment on the overall weight gain trajectory without a weight before the onset of the acute illness as there may have been acute weight loss related to vomiting
   (3) The patient should be gaining an average of 25-35 grams/day and is clearly malnourished
   (4) Dynamic changes in weight over time are preferred over solitary measures and I would want to obtain the growth curve from the PCP before making an assessment
Case 1 – continued

• Admitted from observation to inpatient unit on DOI #5, HD #3
  – Provisional diagnosis: post-viral gastroparesis
  – Intervention: bowel rest followed by introduction of trophic NG Pedialyte
  – Growth parameters:
    ▪ Weight **3.68 Kg** (3%ile)
    ▪ Length 56 cm (50%ile)
    ▪ Head circumference 37.5 cm (17%ile)
• Insert ARS question

1. Select all that apply Standard anthropometric measurements recommended for hospitalized infants up to 2 years includes:
   (1) weight accurate to 10 grams
   (2) weight accurate to 100 grams
   (3) supine length
   (4) head circumference
   (5) BMI
   (6) Mid upper arm circumference
   (7) Percentile from the 2000 CDC growth curves
   (8) Percentile from the 2006 WHO growth curves
   (9) z-score to assess individualized anthropometric data in relation to the population standard
   (10) I have no idea how to use z-scores in anthropometric assessments
**Skill:** Use anthropometric data to determine presence, degree, and chronicity of malnutrition

- www.Peditools.org

<table>
<thead>
<tr>
<th>Z-score</th>
<th>Growth indicators</th>
<th>Growth indicators</th>
<th>Growth indicators</th>
<th>Growth indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length/height-for-age</td>
<td>Weight-for-age</td>
<td>Weight-for-length/height</td>
<td>BMI-for-age</td>
</tr>
<tr>
<td>Above 3</td>
<td>Very tall-refer</td>
<td>Obese</td>
<td>Obese</td>
<td></td>
</tr>
<tr>
<td>Above 2</td>
<td>May have a growth problem</td>
<td>Overweight</td>
<td>Overweight</td>
<td></td>
</tr>
<tr>
<td>Above 1</td>
<td></td>
<td>Plot = possible risk of overweight</td>
<td>Plot = possible risk of overweight</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trend to 2 z-score line= definite</td>
<td>Trend to 2 z-score line= definite</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>risk</td>
<td>risk</td>
<td></td>
</tr>
<tr>
<td>0 (median)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below -1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below -2</td>
<td>Stunted—may become overweight</td>
<td>Underweight</td>
<td>Wasted</td>
<td>Wasted</td>
</tr>
<tr>
<td>Below -3</td>
<td>Severely stunted—may become overweight</td>
<td>Severely underweight or very low weight in IMCI</td>
<td>Severely wasted</td>
<td>Severely wasted</td>
</tr>
</tbody>
</table>
## Expected growth for age

<table>
<thead>
<tr>
<th>Age</th>
<th>Weight gm/kg/d</th>
<th>Length cm/mo</th>
<th>Head Circumference cm/wk</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3 mo</td>
<td>25-35</td>
<td>2.6-3.5</td>
<td>0.5</td>
</tr>
<tr>
<td>3-6 mo</td>
<td>15-21</td>
<td>1.6-2.5</td>
<td>0.5</td>
</tr>
<tr>
<td>6-12 mo</td>
<td>10-13</td>
<td>1.2-1.7</td>
<td>0.5</td>
</tr>
<tr>
<td>1-3 yrs</td>
<td>4-10</td>
<td>0.7-1.1</td>
<td></td>
</tr>
<tr>
<td>4-6 yrs</td>
<td>5-8</td>
<td>0.5-0.8</td>
<td></td>
</tr>
<tr>
<td>7-10 yrs</td>
<td>5-12</td>
<td>0.4-0.6</td>
<td></td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-14 yrs</td>
<td>8-10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-18</td>
<td>11-14</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-14 yrs</td>
<td>9-13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-18 yrs</td>
<td>6-9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pediatric Manual of Clinical Dietetics, American Dietetic Association, 2011
Effect of malnutrition on growth

Table 3. Primary Indicators When Single Data Point Available.\textsuperscript{71-74,76,77}

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Mild Malnutrition</th>
<th>Moderate Malnutrition</th>
<th>Severe Malnutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight-for-height z score</td>
<td>$-1$ to $-1.9$ z score</td>
<td>$-2$ to $-2.9$ z score</td>
<td>$-3$ or greater z score</td>
</tr>
<tr>
<td>BMI-for-age z score</td>
<td>$-1$ to $-1.9$ z score</td>
<td>$-2$ to $-2.9$ z score</td>
<td>$-3$ or greater z score</td>
</tr>
<tr>
<td>Length/height-for-age z score</td>
<td>No data</td>
<td>No data</td>
<td>$-3$ z score</td>
</tr>
<tr>
<td>Mid-upper arm circumference</td>
<td>Greater than or equal to $-1$ to $-1.9$ z score</td>
<td>Greater than or equal to $-2$ to $-2.9$ z score</td>
<td>Greater than or equal to $-3$ z score</td>
</tr>
</tbody>
</table>

BMI, body mass index.

Table 4. Primary Indicators When 2 or More Data Points Available.\textsuperscript{71-74,76,77}

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Mild Malnutrition</th>
<th>Moderate Malnutrition</th>
<th>Severe Malnutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight gain velocity (&lt;2 years of age)</td>
<td>Less than 75%\textsuperscript{a} of the norm\textsuperscript{b} for expected weight gain</td>
<td>Less than 50%\textsuperscript{a} of the norm\textsuperscript{b} for expected weight gain</td>
<td>Less than 25%\textsuperscript{a} of the norm\textsuperscript{b} for expected weight gain</td>
</tr>
<tr>
<td>Weight loss (2–20 years of age)</td>
<td>5% usual body weight</td>
<td>7.5% usual body weight</td>
<td>10% usual body weight</td>
</tr>
<tr>
<td>Deceleration in weight for length/height z score</td>
<td>Decline of 1 z score</td>
<td>Decline of 2 z score</td>
<td>Decline of 3 z score</td>
</tr>
<tr>
<td>Inadequate nutrient intake</td>
<td>51%–75% estimated energy/protein need</td>
<td>26%–50% estimated energy/protein need</td>
<td>$\leq25%$ estimated energy/protein need</td>
</tr>
</tbody>
</table>


\textsuperscript{b}World Health Organization data for patients <2 years old: http://www.who.int/childgrowth/standards/w_velocity/en/index.html.
Risk factors for poor nutrition in hospitalized patients

- ↑ metabolic rate
- Stressed state vs. starved state
- Prolonged and frequent NPO due to procedures
- Lack of nutrition monitoring and interventions
- Unrecognized sarcopenia
- Delayed initiation of nutrition
- Poor appetite and intake
- Underlying illnesses and pre-existing malnutrition
- Socioeconomic situations
- Prolonged LOS
- Lack of mobility
Case 1 - continued

• Failed several trials of trophic NG Pedialyte, PPN started on DOI #7, HD #5
  – Weight 3.6 Kg
  – Additional work-up unrevealing: head CT, upper GI, repeat KUB and US, cortisol, lipase, GI/metabolic consultation/work-up
  – NJ placed DOI #8, emesis with NJ feeds, weight 3.45 Kg
  – PICC placed DOI #9, TPN initiated, weight 3.37 Kg
• Insert ARS question: Question on hospital-acquired malnutrition
• Insert ARS question:

1. When should enteral or parenteral nutrition be initiated in a hospitalized child? Select all that apply

   (1) This decision is multifactorial (e.g., duration of poor nutrition prior to admission, age, chronicity)
   (2) No later than 72 hours after admission to the hospital
   (3) 1 week following admission to the hospital
   (4) When the dietitian has bugged you for the umpteenth time
## Basic nutritional requirements

### RDA (EE)

<table>
<thead>
<tr>
<th>AGE</th>
<th>Kcal/kg</th>
<th>Protein gm/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6 mo</td>
<td>108</td>
<td>1.52</td>
</tr>
<tr>
<td>7-12 mo</td>
<td>98</td>
<td>1.2</td>
</tr>
<tr>
<td>1-3 yr</td>
<td>102</td>
<td>1.05</td>
</tr>
<tr>
<td>4-6 yr</td>
<td>90</td>
<td>0.95</td>
</tr>
<tr>
<td><strong>MALES</strong></td>
<td><strong>11-14 yr</strong></td>
<td><strong>15.9 kcal/cm</strong></td>
</tr>
<tr>
<td>11-14 yr</td>
<td>15.9 kcal/cm</td>
<td>0.85</td>
</tr>
<tr>
<td>15-18 yr</td>
<td>17 kcal/cm</td>
<td>0.85</td>
</tr>
<tr>
<td><strong>FEMALES</strong></td>
<td><strong>11-14 yr</strong></td>
<td><strong>14 kcal/cm</strong></td>
</tr>
<tr>
<td>11-14 yr</td>
<td>14 kcal/cm</td>
<td>0.85</td>
</tr>
<tr>
<td>15-18 yr</td>
<td>13.5 kcal/cm</td>
<td>0.85</td>
</tr>
</tbody>
</table>

### WHO (REE)

<table>
<thead>
<tr>
<th>AGE (years)</th>
<th>Kcal/day</th>
<th>Activity/Stress Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MALES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>60.9 x wt - 549</td>
<td>REE x 1.3: well nourished, bed rest, mild-moderate stress.</td>
</tr>
<tr>
<td>3-10</td>
<td>22.7 x wt + 495</td>
<td>REE x 1.5: Normally active, mild-moderate stress (trauma, cancer, etc) or minimally active needing catch-up growth.</td>
</tr>
<tr>
<td>10-18</td>
<td>17.5 x wt + 651</td>
<td></td>
</tr>
<tr>
<td><strong>FEMALES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>61 x wt - 512</td>
<td>REE x 1.7: Active child needing catch-up growth or active child with severe stress.</td>
</tr>
<tr>
<td>3-10</td>
<td>22.5 x wt + 499</td>
<td></td>
</tr>
<tr>
<td>10-18</td>
<td>12.2 x wt + 746</td>
<td></td>
</tr>
</tbody>
</table>
Skill: Worksheet # 1 – Calculating Needs

• Calculate the basic caloric, protein and fluid requirements on admit for Case #1.
• Calculate a) average daily needs, and b) catch-up growth needs
• Insert ARS question

1. Select all that apply At this stage, the patient is on DOI #5 and he has evidence of chronic malnutrition and may be at risk for refeeding syndrome. What factors go into the identification of risk for refeeding syndrome?
   (1) Age
   (2) Weight loss over 2-3 months of 10% or greater
   (3) Less than or equal to 70% ideal body weight
   (4) Total body fat percentage less than 20%
   (5) 5 to 7 days of NPO
   (6) A host of co-morbid conditions (anorexia, diabetes, short gut, CF, cancer)
   (7) Chronic medication therapy (antacids, diuretics)
What is Refeeding Syndrome

Refeeding syndrome is the cascade of potentially fatal complications caused by shifts in fluid and electrolytes as nutrition is reintroduced into the body, taxing wasted and weakened tissues and demanding more nutrients than are readily available.
Risk Factors for Refeeding Syndrome

• ≥ 10% wt loss over 2-3 months
• ≤ 70% IBW

• Comorbidities
  • Anorexia nervosa
  • ETOH abuse
  • Cancer
  • Uncontrolled DM
  • Marasmus
  • Malabsorptive syndromes (pancreatitis, CF, short bowel, etc)

• Long term diuretic use (electrolyte losses)
• Long term antacid use (binds phosphorus)
• Prolonged fasting
• Profound weight loss
• Post-operative patients
• Elderly
• NPO >5 days
**Skill:** Initiate and advance parenteral nutrition using the appropriate solution and method of administration

**Skill:** Appropriately monitor laboratory values to ensure efficacy of nutritional support and screen for complications
• Insert ARS questions:

1. Select all that apply How does initiation of parenteral nutrition in refeeding syndrome differ from initiation in a non-refeeding patient?

   1. Decreased dextrose load
   2. Reduced volume
   3. Reduced macronutrient need
   4. Increased thiamin need
   5. There is no difference
• Insert ARS question:

1. Select all that apply Which labs should you monitor when refeeding a patient with parenteral nutrition and how often?
   1. Glucose, potassium, phosphorus and magnesium prior to initiation and every 6 hours until stable on full feeds
   2. Glucose, potassium, phosphorus and magnesium 1-4x/day, x 3 days depending on severity
   3. CBC on initiation and weekly until stable on full feeds
   4. CMP on initiation and weekly until stable on full feeds
• Insert ARS question:

1. What other macro- and micronutrient deficiencies would you screen for in this patient?

   1. Thiamin
   2. Vitamin C
   3. Vitamin D
   4. Iron
   5. Zinc
   6. Visceral protein stores
Indications for specific vitamin and mineral supplementation

- Exclusive breastfeeding
- Chronic anti-epileptic therapy
- Food allergies resulting in extreme dietary restrictions
- Wound healing
- Others
Signs and symptoms of common vitamin and mineral deficiencies

• Vitamin D
  • Bone pain
  • Muscle weakness

• Iron
  • Pale skin
  • Inflamed tongue
  • Poor temperature control
  • Fatigue
  • Cognitive and social delays

• Zinc
  • Impaired growth/development
  • Hair loss
  • Diarrhea

• Osteomalacia
• Rickets

• Pica
• Frequent infections
• Enlarged spleen
• Brittle nails

• Anorexia/wt loss
• Delayed wound healing
How does initiation of parenteral nutrition in refeeding syndrome differ from initiation in a non-refeeding patient?

<table>
<thead>
<tr>
<th></th>
<th>Standard Parenteral Advancement</th>
<th>Advance by</th>
<th>Refeeding Syndrome Advancement</th>
<th>Begin at</th>
<th>Advance by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dextrose</td>
<td>4-6 mg/kg/min</td>
<td>3 mg/kg/min daily, until goal calories</td>
<td>Dextrose</td>
<td>5% or 3-4 mg/kg/min</td>
<td>1-3% daily, reaching goal in 3-5 days</td>
</tr>
<tr>
<td>Intralipid 20%</td>
<td>1-2g/kg/day</td>
<td>0.5-1g/kg/day, until at a goal of 2-3g/kg/day</td>
<td>Intralipid 20%</td>
<td>0.5g/kg/day</td>
<td>0.5-1g/kg/day, reaching goal in 3-5 days</td>
</tr>
<tr>
<td>Protein</td>
<td>1-2g/kg/day</td>
<td>1g/kg/day, until at a goal of 1.5-3g/kg/d</td>
<td>Protein</td>
<td>50% of needs</td>
<td>0.5-1g/kg/day, reaching goal in 3-5 days</td>
</tr>
<tr>
<td>Fluid</td>
<td>100% maintenance</td>
<td>Adjust per needs</td>
<td>Fluid</td>
<td>&lt;50% of needs</td>
<td>Per needs, reaching goal in 3-5 days</td>
</tr>
</tbody>
</table>
Specifically, what micronutrient should be supplemented above the standard MVI dose in a refeeding patient?

• Before initiating IV glucose, give 200-300 mg IV thiamin and continue daily.
  • Thiamin is necessary for carbohydrate metabolism.
  • Providing carbohydrates without sufficient thiamin can lead to Wernicke-Korsakoff Syndrome and BeriBeri.
  • Thiamin deficiency can occur within 1 week of poor nutrition.
Which labs should you monitor when refeeding a patient and how often?

- Monitor glucose, potassium, phosphorus and magnesium.
  - Check initially
  - Recheck 1-4x/day, x 3d – depending on severity
  - Then, as needed until labs are stabilized (roughly every 6 hours).
- Hyperglycemia
  - If glucose sharply rises, do not advance GIR until resolved.
- Hypophosphatemia
  - Dose???
- Hypokalemia
  - Dose???
- Hypomagnesemia
  - Dose???
How does the IV access affect the composition of parenteral nutrition?

**Peripheral Access**
- ≤ 900 mOsm/L
- Difficult to obtain full nutrition without excessive fluids.
- Phlebitis, infiltration, infection

**Central Access**
- ≥ 900 mOsm/L
- Full nutrition easily obtained
- Infection, thrombosis and erosion
Case 1 - continued

• Follow up and transition
Monitoring needs for chronic enteral or parenteral nutrition

• Electrolyte and mineral disturbances
• Growth
• Other parameters
Case 2 - ?? year old with congenital heart disease and morbid obesity admitted with sternal wound dehiscence
**Skill:** Consult a nutritionist, gastroenterologist, or other subspecialties when indicated
Indications for consultation with a nutritionist

- BMI >85\textsuperscript{th}%ile + comorbidities/complications
- BMI >95\textsuperscript{th}%ile
- 1 initial inpatient visit with a Dietitian
- Individuals with a BMI >95\textsuperscript{th}%ile are best managed through an interdisciplinary approach including nutrition, exercise, behavior modification and psychological assessment and intervention if indicated.
- Patient/parents are ready for education and to make lifestyle changes.
• JC requirements around screening – Jennie and Susie
Table 1. The 5As of Obesity Counseling

<table>
<thead>
<tr>
<th>Assess</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comorbidities (metabolic syndrome, diabetes, high cholesterol)</td>
</tr>
<tr>
<td></td>
<td>Family history (including family history of obesity)</td>
</tr>
<tr>
<td></td>
<td>Psychiatric history</td>
</tr>
<tr>
<td></td>
<td>Current depressive/anxiety symptoms and coping mechanisms</td>
</tr>
<tr>
<td></td>
<td>Medications</td>
</tr>
<tr>
<td></td>
<td>Previous weight loss attempts</td>
</tr>
<tr>
<td></td>
<td>Dietary behavior</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
</tr>
<tr>
<td></td>
<td>Stage of change</td>
</tr>
<tr>
<td></td>
<td>Social history and interpersonal barriers to weight loss</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advise</th>
<th>Weight loss: specifics! 5%–10% over 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Review patient's weight loss goals</td>
</tr>
<tr>
<td></td>
<td>Suggest changes to diet</td>
</tr>
<tr>
<td></td>
<td>Suggest changes in physical activity</td>
</tr>
<tr>
<td></td>
<td>Discuss treatment options for psychosocial comorbidities</td>
</tr>
<tr>
<td></td>
<td>Give information about treatment options: (1) Medication pros and cons when appropriate; (2) Surgery pros/cons when appropriate</td>
</tr>
<tr>
<td></td>
<td>Address patient's concerns and answer questions re treatment options</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Agree</th>
<th>Clarify patient's preferences about behavior change options that you advised/discussed with the patient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Allow patient to help choose 1–3 mutual behavior change goals</td>
</tr>
<tr>
<td></td>
<td>Give written exercise/diet prescription based on the goals</td>
</tr>
<tr>
<td></td>
<td>Make sure the goals are SMART (specific, measurable, achievable, realistic, and time-bound)</td>
</tr>
<tr>
<td></td>
<td>Make it clear when you will check in again with the patient to monitor adherence to these goals</td>
</tr>
<tr>
<td></td>
<td>Make sure that these goals are revisited and revised during subsequent visits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assist</th>
<th>Address barriers to change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Help patient reflect on support systems</td>
</tr>
<tr>
<td></td>
<td>Verbalize your support for patient's goals, be empathetic</td>
</tr>
<tr>
<td></td>
<td>Describe services that can offer patient support (group therapy, nutritionist, CBT therapist, etc)</td>
</tr>
<tr>
<td></td>
<td>Prescribe medications and/or refer to bariatric surgery</td>
</tr>
<tr>
<td></td>
<td>Apply motivational interviewing skills to stages of change/transtheoretical model to help move patient further in their stage of change and activate the patient to change behaviors</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Arrange</th>
<th>Frequent follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Referral to weight-management clinic</td>
</tr>
<tr>
<td></td>
<td>Referral to community resources/commercial programs</td>
</tr>
<tr>
<td></td>
<td>Bring family members/social support in weight loss plan to future visits if applicable</td>
</tr>
</tbody>
</table>
Systems Organization and Improvement:

Work with hospital administration/staff, subspecialists, and other services/consultants to promote prompt nutritional screening for all hospitalized patients and multidisciplinary team care to address nutritional problems when indicated.

Lead, coordinate, or participate in the development and implementation of cost-effective, evidence-based care pathways to standardize the evaluation and management for hospitalized children with nutritional needs.
Overweight screening and communication for hospitalized children

- Insert figures from Hospital Pediatrics article
Obesity assessment and interventions in hospitalized pediatric patients

<table>
<thead>
<tr>
<th>Grading of Guidelines</th>
<th>Levels of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Supported by at least two level I investigations</td>
<td>I Large randomized trials with clear-cut results; low risk of false-positive (alpha) and/or false-negative (beta) error</td>
</tr>
<tr>
<td>B Supported by one level I investigation</td>
<td>II Small, randomized trials with uncertain results; moderate to high risk of false-positive (alpha) and/or false-negative (beta) error</td>
</tr>
<tr>
<td>C Supported by at least one level II investigation</td>
<td>III Nonrandomized cohort with contemporaneous controls</td>
</tr>
<tr>
<td>D Supported by at least one level III investigation</td>
<td>IV Nonrandomized cohort with historical controls</td>
</tr>
<tr>
<td>E Supported by level IV or V evidence</td>
<td>V Case series, uncontrolled studies, and expert opinion</td>
</tr>
</tbody>
</table>

**Table 2. Nutrition Support Guideline Recommendations of Hospitalized Pediatric Patients With Obesity**

<table>
<thead>
<tr>
<th>Guideline Recommendation</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Body mass index is the preferred practical method to screen children for obesity.</td>
<td>D</td>
</tr>
<tr>
<td>2. Pediatric obese inpatients may be at increased nutrition risk. We recommend testing for potential laboratory abnormalities for safety reasons (e.g., fasting blood sample, including lipid profile, glucose, phosphorus, and complete blood count).</td>
<td>E</td>
</tr>
<tr>
<td>3. When possible, energy requirements of obese hospitalized children should be assessed using indirect calorimetry rather than predictive equations.</td>
<td>D</td>
</tr>
<tr>
<td>4. There is no adequate evidence to assess the clinical outcomes of hypocaloric or hypercaloric feeding during hospitalization of obese children. Therefore, the goals for the provision of energy to the pediatric obese inpatient should be similar to their nonobese counterparts.</td>
<td>E</td>
</tr>
</tbody>
</table>