Nutrition for Preterm Infants

Presented by
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Preterm Infants are at High Nutrition Risk

- Preterm delivery disrupts the supply of nutrients
- Low stores
- High needs to support growth
- Immature structure/function
Consequences of Inadequate Nutrition

- Impaired brain development - impact on neurodevelopment (IQ)
- Compromised immune response
- Extra uterine growth restriction
- Higher risk for bone disease/fractures
- Higher risk for Chronic Lung Disease
- Iron deficiency anemia
- Increased length of stay
Calorie and Protein Needs

• PN
  – Calories: 90-115 kcal/kg
  – Protein: 3.5-4 g/kg/day

• EN
  – Calories: 120-150 kcal/kg
  – Protein: 3.5-4.5 g/kg

ADA Pocket Guide to Neonatal Nutrition, 2009
Optimizing Nutrition in the First Week of Life

- Studies show that high protein/energy intake in the first days of life result in better growth at discharge in VLBW infants
  - For each 10 kcal/kg/day increase in energy intake in the 1\textsuperscript{st} week of life there is an associated ~ 5 point increase in Bayley MDI at 18mo
  - For each 1g/kg/day increase in protein intake there is an associated with >8 point increase in Bayley MDI at 18 mo

(Stephens et al, 2009)
Optimizing Nutrition in the First week of Life

• Start Bridge TPN as first fluids, 80-100 mL/kg/day
• Start IV lipids with bridge PN
• Advance daily towards goals using guidelines
  – There will be a link in the Small Baby Order Set
## Advancement Guidelines for Birth weight < 750 g

<table>
<thead>
<tr>
<th>DO L</th>
<th>Fluids (mL/kg)</th>
<th>GIR(^1) (mg/kg/min)</th>
<th>Protein(^2) (g/kg)</th>
<th>IL (mL/hr)</th>
<th>Ca(^3) (mg/kg)</th>
<th>Phos(^4) (mg/kg)</th>
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<tr>
<td>0</td>
<td>~100 Per MD</td>
<td>~3.5 (Dex 5%)</td>
<td>~3 (Trop 3%)</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1</td>
<td>Per MD</td>
<td>4</td>
<td>3</td>
<td>0.1</td>
<td>20</td>
<td>0</td>
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<tr>
<td>2</td>
<td>Per MD</td>
<td>5</td>
<td>3-3.5</td>
<td>0.2</td>
<td>27</td>
<td>0-20</td>
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<tr>
<td>3</td>
<td>Per MD</td>
<td>6</td>
<td>3.5-4</td>
<td>0.3</td>
<td>34</td>
<td>0-26</td>
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<tr>
<td>4</td>
<td>Per MD</td>
<td>7</td>
<td>3.5-4</td>
<td>0.4 or maintain 3 g/kg</td>
<td>41</td>
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<tr>
<td>5</td>
<td>Per MD</td>
<td>8</td>
<td>3.5-4</td>
<td>Up to 0.47 or maintain 3 g/kg</td>
<td>48</td>
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<td>6</td>
<td>Per MD</td>
<td>9</td>
<td>3.5-4</td>
<td>Up to 0.47 or maintain 3 g/kg</td>
<td>55</td>
<td>43</td>
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<tr>
<td>7</td>
<td>Per MD</td>
<td>10</td>
<td>3.5-4</td>
<td>Up to 0.47 or maintain 3 g/kg</td>
<td>62</td>
<td>47</td>
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### Advancement Guidelines for Birth weight 751 g - 1000g

<table>
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<tr>
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<th>Fluids (mL/kg)</th>
<th>GIR&lt;sup&gt;1&lt;/sup&gt; (mg/kg/min)</th>
<th>Protein&lt;sup&gt;2&lt;/sup&gt; (g/kg)</th>
<th>IL (mL/hr)</th>
<th>Ca&lt;sup&gt;3&lt;/sup&gt; (mg/kg)</th>
<th>Phos&lt;sup&gt;4&lt;/sup&gt; (mg/kg)</th>
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<tr>
<td>0</td>
<td>~80 Per MD</td>
<td>~5.5 (Dex 10%)</td>
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</tr>
<tr>
<td>1</td>
<td>Per MD</td>
<td>6.5 (Trop 3%)</td>
<td>3</td>
<td>0.2</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Per MD</td>
<td>7.5</td>
<td>3-3.5</td>
<td>0.3</td>
<td>27</td>
<td>0-20</td>
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<tr>
<td>3</td>
<td>Per MD</td>
<td>8.5</td>
<td>3.5-4</td>
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<td>0-26</td>
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<tr>
<td>4</td>
<td>Per MD</td>
<td>10</td>
<td>3.5-4</td>
<td>0.5 or maintain 3 g/kg</td>
<td>41</td>
<td>30</td>
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<tr>
<td>5</td>
<td>Per MD</td>
<td>11</td>
<td>3.5-4</td>
<td>0.6 or maintain 3 g/kg</td>
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<tr>
<td>6</td>
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<td>Up to 0.63 or maintain 3 g/kg</td>
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<td>47</td>
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</table>
Stim Feeds

- Also referred to as trophic feeds, minimal enteral nutrition (MEN), gut priming
- Most beneficial for babies <1500g birth weight or <32 weeks
- Initiate as soon as medically able, ideally DOL # 0-2
- 1-24 mL/kg/day (AAP, 2014)
- Purpose/Benefits:
  - Acclimates the GI tract to feedings
  - Stimulates gut hormones (i.e. gastrin)
  - Promotes GI maturation
  - Avoids pathophysiologic consequences of starving the gut
    - Mucosal atrophy
    - Villi flattening
    - Increased risk of bacterial translocation
Feeding

• Mom’s milk is best!
• Donor milk if contraindication to using mom’s milk or to supplement if it is not available
  – Infants are eligible if born < 32 weeks
• Preterm formulas if donor milk declined
  – Similac Special Care NOT Similac 24
Feeding Guidelines

- Advance stepwise 10-20 mL/kg/day towards goal 150-160 mL/kg/day
- Discontinue PN when tolerating 100 mL/kg/day of enteral feeds.

<table>
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<th>Wt. (Gms)</th>
<th>Start FDGs</th>
<th>day1</th>
<th>day2</th>
<th>day3</th>
<th>day4</th>
<th>day5</th>
<th>day6</th>
<th>day7</th>
<th>day8</th>
<th>day9</th>
<th>day10</th>
<th>day11</th>
<th>day12</th>
<th>day13</th>
<th>day14</th>
<th>day15</th>
<th>Full Feeds (ml/k/d)</th>
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<td>1 Q12</td>
<td>same</td>
<td>same</td>
<td>same</td>
<td>1 Q6</td>
<td>2 Q6</td>
<td>2.5 Q6</td>
<td>4 Q3</td>
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<td>8 Q3</td>
<td>9 Q3</td>
<td>10 Q3</td>
<td>11 Q3</td>
<td>12 Q3</td>
<td>160</td>
</tr>
<tr>
<td>600-749</td>
<td>1 Q8</td>
<td>same</td>
<td>1 Q6</td>
<td>1 Q3</td>
<td>2 Q3</td>
<td>3 Q3</td>
<td>5 Q3</td>
<td>7 Q3</td>
<td>9 Q3</td>
<td>11 Q3</td>
<td>13 Q3</td>
<td>14 Q3</td>
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<td>750-899</td>
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<td>2 Q6</td>
<td>2 Q3</td>
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<td>3 Q3</td>
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<td>2 Q3</td>
<td>2 Q3</td>
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<td>5 Q3</td>
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<td>19 Q3</td>
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<td>1001-1250</td>
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<td>18 Q3</td>
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<td>1250-1500</td>
<td>3 Q3</td>
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<td>25 Q3</td>
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<td>1801-2500</td>
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<td>15 Q3</td>
<td>20 Q3</td>
<td>30 Q3</td>
<td>36 Q3</td>
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</table>
Breast milk Fortifiers

• Unfortified breast milk does not meet needs of a preterm infant
• Add Similac Human Milk Fortifier to add calories, protein, and other nutrients when infant tolerating ~50mL/kg/day
Similac HMF Extensively Hydrolyzed Protein Concentrated Liquid (2nd Generation)

- Use for 22 and 24 cal/oz only
- Contains extensively hydrolyzed protein to promote digestion
- Add 1 packet (5 mL) + 25 mL of human milk to yield:
  30 mL of 24 kcal/oz human milk
- Epic order indicates Stocked on Unit

Similac HMF Concentrated Liquid (1st generation)

- Use for 26 and 27 cal/oz
- Allows for higher calorie and mineral intake without exceeding protein intake or AAP recommended osmolality
- EPIC order indicates from Formula Room (request new box when needed)
- Mixing Ratios:
  26 kcal/oz = 3.5 packet + 50 mL of human milk
  27 kcal/oz = 5 packet + 50 mL human milk
Monitoring Weight

• Expected Weight Loss in Preterm Infants: 8-15%
  – Regain birth weight ~ 2 weeks of age

• Day to Day weights provide little help with assessing adequacy
  – Day to day reflects fluid status
  – Average weight gain over 3-7 days; Follow trend

• Weight Gain Velocity
  – Goal to mimic intrauterine growth
    • Infants < 2000 g = 18-20 g/kg/day
    • Infants > 2000 g = 20-30 g/day
  – Higher velocities may be needed for catch-up growth
Good Growth pattern

Catch-up growth

EUGR
Monitoring Growth: Length

- Reflects lean body mass, protein accretion, and organ growth
- More difficult to accurately measure
  - Measure weekly
  - Should be measured to nearest 0.1 cm
- Length Goals: + 0.8 to 1.1 cm/week
Re-check length if there is a large discrepancy.
Monitoring Growth: Head Circumference (Occipital Frontal Circumference)

- Correlates with brain growth
- During 1\textsuperscript{st} week, OFC may decrease due to extracellular fluid space contraction
- Measured at largest frontal occipital plane to the nearest 0.1 cm
- Goal= + 0.8-1 cm/week
References

Thank You

QUESTIONS?