Overview

- Nutritional Consequences of Premature Birth
- Nutrition & Growth Goals at Discharge
- Post discharge Supplementation of Human Milk for at Risk Infants – Evidence and Practice
- Micronutrients of Particular Concern at Discharge in the Human Milk Fed Preterm
- Case Discussions
- Summary/Conclusions
Clinical Consequences of Preterm Birth

- Limited body stores of all nutrients
- GOAL: intrauterine rates of nutrient accretion and growth
- Growth: very high requirements for all nutrients (esp. protein)
- Full parenteral nutrition unable to suppress proteolysis
- Regulatory mechanisms of insulin response are not able to affect proteolysis
- REALITY:
  - delay in provision of nutrition support
  - limitations in nutrient delivery with TPN, HMF and formulas
  → poor growth & significant nutrient deficits at discharge

3. AAP Committee on Nutrition 2003: 23-54
### Estimated Enteral Protein and Energy Requirements

<table>
<thead>
<tr>
<th>Body Weight (g)</th>
<th>500–700</th>
<th>700–900</th>
<th>900–1200</th>
<th>1200–1500</th>
<th>1500–1800</th>
<th>1800–2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetal Wt Gain (g/kg/d)</td>
<td>21</td>
<td>20</td>
<td>19</td>
<td>18</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>Protein Needs (g/kg/d)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3.9</td>
<td>3.6</td>
<td>3.4</td>
</tr>
<tr>
<td>Energy Needs (cal/kg/d)</td>
<td>105</td>
<td>105</td>
<td>110</td>
<td>127</td>
<td>128</td>
<td>131</td>
</tr>
<tr>
<td>Protein: Energy Ratio (g/100cal)</td>
<td>3.8</td>
<td>3.7</td>
<td>3.4</td>
<td>3.1</td>
<td>2.8</td>
<td>2.8</td>
</tr>
</tbody>
</table>


### Preterm Protein & Energy Requirements for Catch-up Growth

<table>
<thead>
<tr>
<th>Post–Natal Age</th>
<th>26–30 weeks</th>
<th>30–36 weeks</th>
<th>36–40 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catch-up Growth Required?</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Protein (g/kg/day)</td>
<td>3.8–4.2</td>
<td>4.4</td>
<td>3.4–3.6</td>
</tr>
<tr>
<td>Energy (cal/kg/day)</td>
<td>126–140</td>
<td>133</td>
<td>120–128</td>
</tr>
<tr>
<td>Protein: Energy Ratio (g/100cal)</td>
<td>3.0</td>
<td>3.3</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Consequences of Inadequate Growth

Growth velocity is correlated to developmental outcomes

- Ereknkranz et al. 8
  - N=495
  - BW 501–1000g
  - CP, MDI and PDI<70 increased in groups with slower growth velocity at 18–22 months corrected age

- Sices et al. 9
  - N=154
  - Mean BW 768±140g
  - 18% growth failure to 20 months corrected age
  - growth failure (~0.67 z score) between 0–4 mo and 8–20 mo correlated with poor PDI


Consequences of Rapid Growth
Including Catch-up Growth

Barker Hypothesis10–13

- poor fetal nutrition with postnatal high CHO/low protein & fat
  -> detrimental effects on adult health
- Relatively few studies/inconsistent results11
- SGA preterm & term infants -> higher risk than AGA preterm
- Both extremes of intake may have adverse long-term adverse health outcomes12
- effects small compared to other risk factors–genetic and environmental/lifestyle factors11,12

Consensus: maximize nutrition support in first year when most catch-up is likely to occur with potential for favorably affecting developmental outcomes12,13

Goals for Growth: Preterm Infants at Discharge from Hospital

GOAL for nutritional management:
“to achieve a body composition and rate of growth of a term infant of the same post-natal age” 12

Confounders to Achieving this Goal:
- Increasing survival of smallest, sickest infants
- Earlier hospital discharge (35–36wks)
- Smallest infants at significant risk for
  - growth failure, developmental delay, infection and re–hospitalization
- Co–morbidities associated with prematurity (respiratory, GI, neurologic))
  affect nutrient requirements and method(s) of nutrient delivery14

12. Greer F Semin Perinatol 2007;31:89–95

Intrauterine & Post–natal Growth Chart15

- Most recent
  - Canadian intrauterine weight data for weight combined CDC growth data to 50 weeks (WHO in draft)
- Use for preterm infants to 40 weeks corrected age
  - WT increase15–16 g/kg/day
  - HC increase 0.5–1.0cm/wk
  - LT increase 0.9–1cm/wk
  - Greater increases anticipated if catch–up growth required
  ? catch–up → >5–10th %ile vs. return to birth %ile

Post-Natal Growth Charts—WHO Charts\textsuperscript{16}

- 2010 adapted for Canada from WHO Child Growth Standards

- Use in preterm infants after term corrected age (>40wks)
  - WT increase 30–40g/day (e.g. girls vs. boys 0–2mos)
  - HC increase 0.5cm/wk (e.g. girls & boys 0–2mos)
  - LT increase 1.0cm/wk (e.g. girls & boys 0–2mos)
  - Greater increases for catch-up growth

www.dietitians.ca/growthcharts


Nutrition Recommendation for Preterm Infants at Discharge

- CPS 1995\textsuperscript{17}
  - assume no in-hospital deficits—same requirements as for term
- AAP 2003\textsuperscript{3}
  - insufficient evidence upon which to base specific recommendations
- Tsang 2005\textsuperscript{13}—only published consensus statement of experts
- ESPGHAN 2006\textsuperscript{18}
  - position paper on Feeding PT Infants Post-D/C
- DRI's 2005,2010(VitD and Ca)—for term\textsuperscript{19}

- No official recommendation for most nutrient intakes
  - gradual transition from preterm to term requirements recommended,
    - based on achievement of term CA and/or catch-up growth

18. ESPGHAN Committee on Nutrition JPGN 2006; 42:596–603
“General” Consensus of Recent Publications\textsuperscript{12,13,18}

Goal for entire 1\textsuperscript{st} year of life

- achieve body composition & rate of growth of a normal fetus of the same post-menstrual age

- Specific nutrient data lacking
  - safe assumption that needs for catch-up growth are higher compared to term
  - Protein intake continues to be rate-limiting nutrient for lean tissue growth
  - Ca, P\textsubscript{04}, Vit A increased needs post-discharge
    - based on normalization of serum levels and improved bone mineralization in studies continuing in hospital preterm formulas in the early post-discharge period

Consensus Targets for Stable Growing and Post-Discharge Preterm Infants\textsuperscript{13,19}

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Stable/growing Target – Preterm Infants</th>
<th>Post–discharge Target – Preterm Infants</th>
<th>DRI’s–AI’s Term Infants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume mL/kg/d</td>
<td>120–200</td>
<td>135–220</td>
<td>700ml/d</td>
</tr>
<tr>
<td>Energy Kcal/kg/d</td>
<td>110–150</td>
<td>120–130</td>
<td>72–108</td>
</tr>
<tr>
<td>Protein g/kg/d</td>
<td>3.4–4.4</td>
<td>2.5–3.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Ca mmol/kg/d</td>
<td>2.5–5.5</td>
<td>3.7–4.4</td>
<td>5 mmol/day</td>
</tr>
<tr>
<td>P mmol/kg/d</td>
<td>2–4.5</td>
<td>2.9–3.4</td>
<td>3.9 mmol/day</td>
</tr>
<tr>
<td>Vit D IU/d</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Fe mg/kg/d</td>
<td>2–4</td>
<td>2–4</td>
<td>0</td>
</tr>
</tbody>
</table>
Human Milk for Preterm Infants at Discharge

- Human milk provides many benefits for PT infant\textsuperscript{20,21}
  - Host defense, Neurodevelopment, GI, Nutrition
- HM fed PT infants show slower growth vs. formula fed PT\textsuperscript{20,21}
  - exclusive human milk intake of >180ml/kg/day\textsuperscript{22}
    - required to achieve growth rate of 15g/kg/day
  - fortification often required to meet requirements for adequate growth/catch-up growth
- Many unable to exclusively breastfeed at discharge:
  - body size, physiologic immaturity, co-morbidities, requirements, etc.\textsuperscript{22}

\textsuperscript{20.} O’Connor et al JPGN 2003;37:437-46
\textsuperscript{21.} Schanler et al Pediatr 1999;103:1150-7
\textsuperscript{22.} Pediatric Nutrition Practice Group ADA 2009:p160-186

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Nutritional Limitations in Use of Human Milk for Preterm Infants\textsuperscript{23}

- Low protein density–stage of lactation
- Low mineral density (Ca, P04)
- Variability in composition (fat)
- Restricted milk intakes
- Availability

- Note preterm nutritional needs higher than at any other time in life

\textsuperscript{23.} Schanler R Am J Clin Nutr 2007;85:625S–628S
Fortification of Human Milk at Discharge²⁴, ²⁵

- Study patients
  - BW 750–1800g
  - Human Milk fed at D/C
- Study Groups
  - plain HM
  - ½ feeds HMF 1:25ml from d/c to 12 weeks
- Results
  - HMF group: >LT, >WT, >HC (<1250g BW)
  - Fortification no effect on duration of breastfeeding
  - Follow up study -> sustained results at 12mos CA


Fortification of Human Milk at Discharge²⁶

- Study Patients
  - BW 535–2255g
  - Human Milk fed at D/C
- Study Groups
  - Plain HM (n=102)
  - HMF: 5 packets in 20–50ml HM (1.375g protein & 17.5cal/day) (N=105) to 4 mos corrected age, given as one supplemental bottle feed daily
- Results
  - HMF group: no differences in anthropometrics to 12mos CA
- Main limitation: very low level of nutrient supplementation

Fortification of Human Milk
at Discharge\textsuperscript{27,28}

- 2010 Systematic Review: Multi-nutrient fortification of human milk for preterm infants following hospital discharge\textsuperscript{27}
  - Limited to O'Connor et al\textsuperscript{24}
  - Conclusion: limited evidence exists to provide multi-nutrient fortification to HM fed preterm infants post-discharge

- 2007 Systematic Review
  - Conclusion: cannot recommend nutrient enriched post-discharge formulas over term formulas despite a significant difference in linear growth in favour of PDF\textsuperscript{28}

\textsuperscript{27.} McCormick et al Cochrane Database of Systematic Reviews 2010
\textsuperscript{28.} Henderson G et al Cochrane Database of Systematic Reviews 2007

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Fortification of Human Milk for Preterm Infants after Discharge – Recommendations for Practice\textsuperscript{13,18,22,27}

1. Continuing HM encouraged as first choice
   - Wide variability in practice based on limited evidence

2. Use of multi-nutrient fortifier for at risk infants
   - Use of in-hospital fortification may be problematic
   - Preterm Discharge Formulas can be used to fortify HM
     - \( \rightarrow \) 24, 27, 30 cal/oz
     - generally poor sources of protein, calcium & PO\textsubscript{4}
   - No evidence for use of PDF fortification
     - reserved for the larger, healthier infants who require energy dense vs nutrient dense fortified HM
Comparison of Nutrition Targets & Various Human Milk Feeding Regimes

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Stable/Growing Target</th>
<th>Post-discharge Target</th>
<th>HM Alone</th>
<th>HM + 1:25HMF</th>
<th>HM + 1:50HMF</th>
<th>HM+PDF To 24cal/oz</th>
<th>HM: PDF 1:1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume mL/kg/d</td>
<td>120-200</td>
<td>135-220</td>
<td>175</td>
<td>150</td>
<td>165</td>
<td>150</td>
<td>165</td>
</tr>
<tr>
<td>Energy Kcal/kg/d</td>
<td>110-150</td>
<td>120-130</td>
<td>122</td>
<td>120</td>
<td>119</td>
<td>122</td>
<td>119</td>
</tr>
<tr>
<td>Protein g/kg/d</td>
<td>3.4-4.4</td>
<td>2.5-3.5</td>
<td>1.6</td>
<td>2.9</td>
<td>2.2</td>
<td>1.9</td>
<td>2.5</td>
</tr>
<tr>
<td>Ca mmol/kg/d</td>
<td>2.5-5.5</td>
<td>3.7-4.4</td>
<td>1.2</td>
<td>4.9</td>
<td>3.1</td>
<td>1.6</td>
<td>2.3</td>
</tr>
<tr>
<td>P mmol/kg/d</td>
<td>2-4.5</td>
<td>2.9-3.4</td>
<td>0.9</td>
<td>3.6</td>
<td>2.2</td>
<td>1.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Vit D IU/d</td>
<td>400</td>
<td>400</td>
<td>4</td>
<td>411</td>
<td>216</td>
<td>36</td>
<td>95</td>
</tr>
<tr>
<td>Fe mg/kg/d</td>
<td>2-4</td>
<td>2-4</td>
<td>trace</td>
<td>0.6</td>
<td>0.3</td>
<td>0.4</td>
<td>1.1</td>
</tr>
</tbody>
</table>

for a 2kg infant at Discharge (~120kcal/kg/d)²²

Discharge Nutrition Goals for the Breastfeeding Mother and her Preterm Baby²²

1. Promote adequate weight gain to include catch-up growth
2. Ensure adequate delivery of protein, Ca, PO₄, vitamin D, Fe
3. Maintain or increase mother’s milk volume
4. Maintain or improve feedings at the breast
   - Limit bottle feeding
5. Limit volume of supplemental formula feeds to that needed to achieve goals 1 and 2
Best Predictors of Breastfeeding Success in the Preterm Infant

1. milk supply at discharge >750ml/day
2. prenatal intention to breastfeed
3. pumping initiation within hours post-delivery
4. discharge plan for eventual breast transition
5. early follow-up post discharge

Micronutrients for Human Milk Fed Preterm Infants at Discharge

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Discharge Requirement:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>2-4mg/kg/day (to 1 yr)</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>400 IU/day (to 1 yr)</td>
</tr>
<tr>
<td>Ca</td>
<td>3.7–4.4mmol/kg/day</td>
</tr>
<tr>
<td>PO4</td>
<td>2.9–3.4mmol/kg/day</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>1400 IU/day (to 1 yr)</td>
</tr>
<tr>
<td>Zinc</td>
<td>1–2mg/kg/day (to 1 yr)</td>
</tr>
</tbody>
</table>

NOTE:
- Limited quantities in unfortified human milk
  - Assume trace Fe & Vit D, 203 IU Vit A/100ml HM13
  - Assume need for Ca, PO4 supplementation until normal serum AlkPhos, PO413
- High requirements/minimal body stores 1
Suggested Vitamin & Mineral Supplements
for a 2 kg Infant at Discharge

<table>
<thead>
<tr>
<th>Feeding</th>
<th>Micro nutrient</th>
<th>Supplement Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive Human Milk</td>
<td>All fat soluble vitamins and most minerals including Ca, P04, Zn &amp; Fe</td>
<td>Tri-vi-sol 1ml/day (1400U VitA, 400U VitD, 30mg VitC/ml)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fer-in-sol 0.5–1ml/day 15mg elemental Fe/ml (2–4mg/kg/day up to Maximum reasonable dose of 15mg/day)</td>
</tr>
<tr>
<td>Fortified Human Milk 1pkt:25ml</td>
<td>Iron if fortifier does not contain Fe (example: Similac HMF)</td>
<td>Fer-in-sol 0.5–1ml/day 15mg elemental Fe/ml (2–4mg/kg/day up to Maximum reasonable dose of 15mg/day)</td>
</tr>
<tr>
<td>Fortified Human Milk 1pkt:50ml</td>
<td>Some fat soluble Vitamin, Iron if fortifier does not contain Fe (example: Similac HMF)</td>
<td>Fer-in-sol 0.5–1ml/day 15mg elemental Fe/ml (2–4mg/kg/day up to Maximum reasonable dose of 15mg/day)</td>
</tr>
<tr>
<td>Human Milk Enriched With PDF to 24cal/oz</td>
<td>All fat soluble vitamins and most minerals including Ca, P04, Zn &amp; Fe</td>
<td>Tri-vi-sol 1ml/day (1400U VitA, 400U VitD, 30mg VitC/ml)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fer-in-sol 0.5–1ml/day 15mg elemental Fe/ml (2–4mg/kg/day up to Maximum reasonable dose of 15mg/day)</td>
</tr>
<tr>
<td>1:1 Human Milk :PDF 22cal/oz</td>
<td>All fat soluble vitamins and most minerals including Ca, P04, Zn &amp; Fe</td>
<td>Tri-vi-sol 1ml/day (1400U VitA, 400U VitD, 30mg VitC/ml)</td>
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Case Example 1

- 31+3 wk GA male  →  Discharged @ 36+2 wks
- Prematurity, Mild Respiratory Distress, Feeds/Growth
- BW 1223g (10th)  →  D/C WT 1890g (<3rd)
- BLT 40cm (10–15th)  →  D/C LT 43cm (3rd)
- BHC 27cm (10th)  →  D/C HC 32cm (25th)
- excellent milk supply (300ml/pump; >1.5L/day)
  - breastfed a previous term infant x12mos
- Uneventful feeding course:
  - Immediate TPN
  - day 1 → lipids, initial feeds
  - day 5 → full TPN & lipids (3.7g protein/kg/d; 95cal/kg/d)
  - day 11 → full volume enteral feeds (1 HMF:50ml HM)
  - day 12 → full fortified feeds (1 HMF:25ml HM)
Case Example 1 – Cont’d

- last 4–5 days prior to discharge -> transition to full breastfeeds
  -> drop in WT gain from 15g/kg/day to 7g/kg/day (<3rd)
- INTAKE: 150ml/kg/day (285ml/day) (wk 4 preterm milk)
  ~105cal/kg/day & ~2.1g protein/kg/day

DISCHARGE FEEDING PLAN:
1. 5–7 breastfeeds/day
2. 2–3 fortified (HMF 1:25) feeds added at discharge
3. Daily supplements: Trivisol 1.0 ml, Ferinsol 0.5 ml
   > 400 IU Vit D, 1400 IU/d Vit A, 2–4mg/kg/day
4. Iron Haberman/slow flow nipple required R/T strength
   of suck vs. coordination of swallow : breathe

NUTRITION FOLLOW–UP PLAN:
1–2 weeks post–discharge in preterm breastfeeding clinic

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Stable/ growing Target</th>
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<td>120</td>
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<td>119</td>
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<tr>
<td>Protein g/kg/d</td>
<td>3.4–4.4</td>
<td><strong>2.5–3.5</strong></td>
<td><strong>1.6</strong></td>
<td>2.9</td>
<td>2.2</td>
<td><strong>1.9</strong></td>
<td>2.5</td>
</tr>
<tr>
<td>Ca mmol /kg/d</td>
<td>2.5–5.5</td>
<td><strong>3.7–4.4</strong></td>
<td><strong>1.2</strong></td>
<td>4.9</td>
<td>3.1</td>
<td><strong>1.6</strong></td>
<td>2.3</td>
</tr>
<tr>
<td>P mmol /kg/d</td>
<td>2–4.5</td>
<td><strong>2.9–3.4</strong></td>
<td><strong>0.9</strong></td>
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<td>2.2</td>
<td><strong>1.1</strong></td>
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</tr>
<tr>
<td>Fe mg /kg/d</td>
<td>2–4</td>
<td><strong>2–4</strong></td>
<td>trace</td>
<td>0.6</td>
<td>0.3</td>
<td><strong>0.4</strong></td>
<td>1.1</td>
</tr>
</tbody>
</table>

Comparison of Nutrition Targets & Various Human Milk Feeding Regimes

for a 2 kg infant at discharge (~120kcal/kg/d)
Fenton Growth Data
Case 1

**Visit 1:**
- 2 fortified bottles, breast x 7
- WT gain 12g/kg/d (27g/day)
- HC gain 0.75cm/wk
- LT gain 0.75cm/wk

**Plan:**
1. Continue 2 fortified bottles/d + demand breastfeeding
2. Breast + 1-2 pumps/day

**Visit 2:**
- Demand breastfeeding
- ~ 9-10 feeds/day (last 1/52)
- WT gain 27g/day
- HC gain 0.7cm/wk
- LT gain 0.8cm/wk

WHO Growth Data
Case 1

**Plan:**
- Continue Breast on demand
- Continue 1ml/day Tri-vi-sol
- Increase Fer-in-sol to 0.7ml/day = 3.7mg/kg/day Fe
- Wean pumping gradually over next 1-2 weeks

**Subsequent Visits:**
- Full demand breast feeding with stable growth
- Fer-in-sol to maximum reasonable dose of 1.0 ml/day (15 mg Fe/day)
- 1 Pediatric D Drop/day
  - replace Tri-vi-sol @ ≥4kg
WHO Growth Data

Case 1

- 31+4 wks male → discharged at 35+4wks
  - BW 1925g (75th) → D/C WT 2460g (≥25th)
  - BLT 43cm (50th) → D/C LT 48cm (≥50th)
  - BHC 29.25cm (50th) → D/C HC 31.5cm (≥25th)

At Discharge:
- Demand breastfeeding: transferring 180–200ml/kg/day
  - ~500ml/day, ~120cal/kg/day, ~3.2g protein/kg/day
- Mom had excellent milk volumes ≥1L/day
  - Continued to pump 60–100ml pc Breastfeeds at discharge
- Weight gain ~14g/kg/day
- Daily supplements to meet A, D & Fe needs
  - Tri- vi-sol 1.0ml, Fer-in-sol 0.5 ml

Case Example 2
**Fenton Growth Data**  
**Case 2**

**Visit 1:**  
Demand breastfeeding 8-10 x’s/day  
- WT gain 15g/kg/d (44g/day)  
- HC gain 1.4 cm/wk  
- LT gain 1.6 cm/wk  

Mom weaned pumping to once/day for comfort  

**Plan:**  
- Continue breast on demand  
- Continue 1 ml/day Tri-vi-sol, increase Fer-in-sol to 0.7ml/day  
  = 2.5 mg/kg/day Fe  
- D/C pumping gradually over next week

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**WHO Growth Data**  
**Case 2**

**Subsequent Visits:**  
- Full demand breast feeding with stable growth  
- Fer-in-sol to maximum reasonable dose of 1.0 ml/day (15mg Fe/day)  
- 1 Pediatric D Drop/day  
  - replace Tri-vi-sol @ ≥4kg  
- Continue to 1 year CA
WHO Growth Data

Case 2

- 29+4 wk GA female  →  Discharged @ 39+1 wks
- R/O Sepsis @ birth, RDS, PDA, Feeds/Growth
  - BW 1075g (20th)  →  D/C WT 2846g (≥10th)
  - BLT 39cm (50th)  →  D/C LT 50cm (<50th)
  - BHC 26cm (20th)  →  D/C HC 35cm (50th)

- Mom has reduced milk supply (400–700ml/day);
  - Domperidone increased to 20mg QID TID at discharge
  - pumping 7–8 times/24hr
- Maternal Hx.: 1st baby, underlying renal disease, is a RN (adult), high anxiety re: preterm birth

Case Example 3
Case Example 3 – Cont’d

- Eventful feeding course for management of PDA:
  - Immediate -> TPN
  - Day 1 -> lipids, initial feeds
  - Day 20 -> full volume enteral feeds (1 HMF:50ml HM)
  - Day 24 -> full fortified feeds (1 HMF:20ml HM for increased protein needs of ELBW (1kg BW))
- Discharge:
  - Good WT gain @ 12g/kg/day on HMF 1:25ml HM
  - Slow flow nipple
  - Tires after 50ml of feeding q 3hr (tachypnea, supplemental O₂ D/C at 36 weeks)
  - ~140ml/kg/day, ~110cal/kg/day, ~2.8g/kg/day (wk 9 milk)
  - Poor transfer @ breast per ac/pc breast scale of < 20ml

Discharge Feeding Plan:
- Fortified (HMF 1:25) feeds by bottle at discharge with plan for mom to wean to ½ fortified feeds at home and start Tri-vi-sol 0.5ml/day
- Practice at breast 1–2 times/day with full/part top-up by bottle (unfortified)
- Ferinsol 0.7ml daily (Fe 3–4mg/kg/day (ELBW))
- Continued pumping 7–8 times/day

Nutrition Follow-up Plan:
- 1–2 weeks post-discharge in preterm breastfeeding clinic
Fenton Growth Data

Case 3

Visit 1:
3 fortified/unfortified bottles/day
Breast feeds x 2/day (1hr/session, no top-up)
Pumped volumes ~ 600ml/day
- WT gain 19g/day
- HC gain 0.8cm/wk
- LT gain 0.8cm/wk

Plan:
- Increase to 5 fortified bottles/day until HMF supply out (next 2 weeks)
- Increase Breast to 3x/day
- Continue 6-7 pumps/day

WHO Growth Data

Case 3

Visit 2:
3 Breast/day (no top-up)
5 fortified bottles/day
~500ml/d pumped + Breastfeeds
- WT gain 44g/day
- HC gain 0.7cm/wk
- LT gain 0.8cm/wk

Plan:
- AC/PC scale for Breast
- Preterm discharge formula
  1 tsp/100ml HM if bottles (24cal/oz)
- Increase in Breast to ~650ml/d -> ~180ml/kg/d of unfortified HM
- Tri-vi-sol to 1ml/d (@ D/C HMF)
- Fer-in-sol to 1ml/d (4 mg Fe/kg/d)
WHO Growth Data

Case 3

Visit 3:
Transition to full demand breast
9-10x’s /day; 60-80ml/feed using
AC/PC weigh scale
➢ WT gain 24g/day
➢ HC gain 0.9cm/wk
➢ LT gain 1.0cm/wk

Plan:
• D/C AC/PC scale for breastfeeds
• D/C Tri-vi-sol, start 1 Ped D
  Drop/day with wt ~4kg
• continue 1ml/d Fer-in-sol

Subsequent Visits:
• Full Breast with slight fall off in
  WT but stable HC, LT

Summary

▪ Majority of preterm infants continue to be at nutritional risk at the time of hospital discharge
▪ Goal for preterm infant growth post-discharge:
  • achieve a body composition and rate of growth of a normal fetus of the same post-menstrual age during the entire 1st year of life
▪ Human milk continues to be the preferred choice for feeding for all infants
▪ Multi-nutrient fortification of HM may be required in specific infants to achieve growth and body composition goals
▪ Specific vitamin and mineral supplementation is important in this population
References and Resources

References and Resources
