Cue Based Feeding in High Risk NICU Infants:

Barriers, Opportunities, and Outcomes
Objectives

1) Implement strategies to overcome barriers to achieving optimal feeding outcomes.

2) Address opportunities for collaborating, creating and sustaining potentially better practices.

3) Identify improved outcomes when using a standardized cue based feeding method.
Background

• The 3 physiologic competencies that are generally recognized as essential before hospital discharge of the preterm infant:
  - the ability to maintain normal body temperature in a home environment
  - sufficiently mature respiratory control
  - oral feeding sufficient to support appropriate growth

(Committee on Fetus and Newborn, 2008)
Background

Fig 2. Synactive model of behavioral organization.

(Als, 1986)
Background

Figure 6. Appearance of brain at successive fetal ages (age in weeks shown by figures)

(Holt, 1977)
Barriers

- Lack of Hunger
- High Risk Infant
- Oral Feeding Practices
- Breast Feeding
- Variability
High Risk Infants

- Extreme Prematurity
- BPD
- NEC, Surgery, Sepsis
- Neurological Impairment
- Congenital Anomalies
Variability

• Oral Feeding Practices

  – Scheduled: q 3, PO q day, BID, TID

  – On Demand/ Ad Lib: feed when awake, no specified volume

  – Cue Based: offering oral feeding based on infant readiness
Variability

• Care Givers
  - Prescribers
  - Nurses
  - Parents
Lack of Hunger

- Indwelling tubes
- Continuous feedings
- Medications
Breastfeeding

• Challenges
  – Establishing a supply
  – Maintaining a supply
  – Establishing direct breast feeding
  – Measuring volume during oral feeding
  – Fortification
Cue Based Feeding!
Development of the Protocol

• Interdisciplinary Collaboration
Potentially Better Practices

• Standardize the approach
  - To include readiness cues,
  - Disengagement cues,
  - **and** Developmentally supportive feeding techniques

(Comrie & Helm, 1997)
Potentially Better Practices

• Documentation

  Opportunity to increase objective consistent communication regarding infant’s feeding
Cue Based Feeding Scales and Documentation

Newland, L'Huillier, and Petrey (2013)
### Early Feeding Skills

(Thoyre, Shaker, Pridham, 2005)

<table>
<thead>
<tr>
<th>Oral Feeding Readiness</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Able to hold body in a flexed position with arms/hands toward midline</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Demonstrates energy for feeding—maintains muscle tone and body flexion through assessment period</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Feeding Skill</th>
<th>Maintains flexed body position with arms toward midline</th>
<th>Inconsistent tone, variable muscle tone</th>
<th>Some tone consistently felt, but somewhat hypotonic</th>
<th>Little or no tone felt; flaccid, limp most of the time</th>
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</thead>
<tbody>
<tr>
<td>Ability to Remain Engaged in Feeding</td>
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<tr>
<td>Predominant muscle tone (energy infant demonstrates for feeding)</td>
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<tr>
<td>Ability to Organize Oral Motor Functioning</td>
<td>All</td>
<td>Most</td>
<td>Some</td>
<td>None</td>
</tr>
<tr>
<td>Opens mouth promptly when lips are stroked at feeding onsets</td>
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<tr>
<td>Once feeding is under way, maintains a smooth, rhythmic pattern of sucking</td>
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<tr>
<td>Ability to Coordinate Swallowing and Breathing</td>
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<tr>
<td>Able to engage in long sucking bouts (7-10 sucks) without behavioral stress signs or an adverse or negative cardiorespiratory response</td>
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<tr>
<td>Ability to Maintain Physiologic Stability</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>In the first 30 seconds after each feeding onset, oxygen saturation is stable, and behavioral stress cues absent</td>
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<tr>
<td>Stops to breathe before behavioral stress cues appear</td>
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<tr>
<td>Clear breath sounds—no grunting breath sounds (prolonging the exhale, partially closing glottis on exhale)</td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Feeding Recovery (During the First Five Minutes Postfeeding)</th>
<th>Quiet Alert</th>
<th>Drowsy</th>
<th>Sleep</th>
<th>Fuss/Cry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant state</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range of oxygen saturation (%):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Thoyre, Shaker, Pridham, 2005)
# Infant Driven Feeding Scales

(Ludwig & Waitzman, 2007)

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Feeding readiness scale</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Drowsy, alert, or fussy before care Rooting and/or bringing of hands to mouth/taking of pacifier Good tone (presupposes autonomic stability)</td>
</tr>
<tr>
<td>2</td>
<td>Drowsy or alert once handled Some rooting or taking of pacifier Adequate tone</td>
</tr>
<tr>
<td>3</td>
<td>Briefly alert with care No hunger behaviors No change in tone</td>
</tr>
<tr>
<td>4</td>
<td>Sleeps throughout care No hunger cues No change in tone</td>
</tr>
<tr>
<td>5</td>
<td>Needs increased oxygen with care Apnea and/or bradycardia with care Tachypnea greater than baseline with care</td>
</tr>
<tr>
<td>B. Quality of nipple scale</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Nipples with a strong coordinated suck throughout feed</td>
</tr>
<tr>
<td>2</td>
<td>Nipples with a strong coordinated suck initially but fatigues with progression</td>
</tr>
<tr>
<td>3</td>
<td>Nipples with consistent suck but has difficulty coordinating swallow, some loss of liquid or difficulty in pacing Benefits from external pacing</td>
</tr>
<tr>
<td>4</td>
<td>Nipples with a weak/inconsistent suck, Little to no rhythm, may require some rest breaks</td>
</tr>
<tr>
<td>5</td>
<td>Unable to coordinate suck-swallow-breathe pattern despite pacing, may result in frequent or significant A/Bs or large amounts of liquid loss and/or tachypnea significantly greater than baseline with feeding</td>
</tr>
<tr>
<td>C. Caregiver technique scale</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>External pacing</td>
</tr>
<tr>
<td>B</td>
<td>Modified sidelying</td>
</tr>
<tr>
<td>C</td>
<td>Chin support</td>
</tr>
<tr>
<td>D</td>
<td>Cheek support</td>
</tr>
<tr>
<td>E</td>
<td>Oral stimulation</td>
</tr>
</tbody>
</table>
Oral Feeding Readiness and Quality Scales for Premature Infants
Cue Based Feeds

1. Infant ≥ 33 weeks,
   CGA, off ventilator and
   off enteral feeds

2. PROVIDE
   Parent teaching
   and handout

3. DOCUMENT
   Parent teaching

4. ASSIGN
   Readiness Score
   with every care

5. DOCUMENT
   Readiness Score
   4 or 5
   50% of cases
   in 24 hrs?

6. YES
   AdLib Feed

7. YES
   ORDERS
   Cue Based
   Feeding

8. ASSIGN
   Readiness Score
   with every care

9. DOCUMENT
   Readiness Score
   4 or 5?

10. NO
    - Gavage Feed
    - Oral feed

11. NO
    - Exceed oral feeding
        time limit of
        30 minutes?

12. YES
    - Baby finishes
        Oral feed

13. NO
    - Disengagement
        Goal?

14. YES
    - Gavage Feed

15. NO
    - Stop Feed

16. DOCUMENT
    Feeding Quality
    Score and Narrative note

17. DOCUMENT
    Feeding Quality
    Score and Narrative note

18. 2 days of Oral feeds?

19. NO
    - Gavage Feed

20. NO
    - Oral feed

21. YES
    - Gavage Feed

22. YES
    - Stop Feed
Sustaining

- Initial training to provide education
- Creating the momentum to change the culture
- Complete audits to ensure sustained change
Outcomes
Cochrane Review

• 8 small studies
• Small randomized clinical trials
• Infant driven feeding vs. scheduled feeding protocols
• Mixed results
  – Days to full oral feedings, PMA at discharge, average daily weight gain, and volume taken

(McCormick, Tosh & McGuire, 2010)
## Cochrane Review

<table>
<thead>
<tr>
<th>First author, Year</th>
<th>Feeding methods</th>
<th>Weight gain</th>
<th>Nutritional intake</th>
<th>First to full oral feedings</th>
<th>Enrollment to discharge</th>
<th>PMA at discharge (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saunders, 1991</td>
<td>Prescribed volume &amp; route q3h (n=14) vs. on demand (n=15)</td>
<td>No data; reported as no significant difference</td>
<td></td>
<td></td>
<td>8.4 vs. 7.2 days; reported as not significant</td>
<td></td>
</tr>
<tr>
<td>Waber, 1998</td>
<td>Prescribed volume &amp; route q3-4h (n=5) vs. on demand (n=5)</td>
<td>34.1 vs. 26.4 g/day</td>
<td></td>
<td></td>
<td>31 vs. 33 days</td>
<td></td>
</tr>
<tr>
<td>Pridham, 1999</td>
<td>Prescribed volume &amp; route q4h (n=56) vs. ad libitum (n=94)</td>
<td>Reported in a graph, not significant</td>
<td></td>
<td></td>
<td>No data; reported as not significant</td>
<td></td>
</tr>
<tr>
<td>Pridham, 2001</td>
<td>Volume &amp; route q3h (n=18) vs. ad libitum (n=18)</td>
<td>Reported in a graph, not significant</td>
<td></td>
<td></td>
<td>No data; reported as not significant</td>
<td></td>
</tr>
<tr>
<td>McCain, 2001</td>
<td>Prescribed volume &amp; route q3h (n=41) vs. semi-demand (n=40)</td>
<td>26.3±8.3 vs 23.5±8.9 g/day MD -2.8 [-6.55, 0.95]</td>
<td>10 vs 5 ml/kg/day MD -3 [-21.3, 15.3]</td>
<td>10±3.1 vs 5±4.2 days MD -5 [-6.61, -3.39]*</td>
<td>34±0.8 vs 33±0.9 weeks MD -0.60 [-0.97, -0.23]*</td>
<td></td>
</tr>
<tr>
<td>Collinge, 2002</td>
<td>Prescribed volume &amp; route q3-4h (n=18) vs. ad libitum (n=18)</td>
<td>11.2 vs. 14.6</td>
<td>154.4 vs. 154.9 ml/kg/day</td>
<td>No data; reported as not significant</td>
<td>8.9 vs. 2.7</td>
<td></td>
</tr>
<tr>
<td>Kansas, 2004</td>
<td>Scheduled oral feedings (n=30) vs. ad libitum (n=29)</td>
<td>11.9±6.1 vs 8.6±5.3 ml/kg/day MD -3.3 [-6.21, -3.9]</td>
<td>152±35 vs 129±23 ml/kg/day MD -23 [-40.91, -5.09]*</td>
<td>3.1±2.4 vs 0.9±0.3 days MD = -1.4 [-12.52, 9.72]</td>
<td>36±1.4 vs 36±1.8 weeks MD 0 [-0.82, 0.82]</td>
<td></td>
</tr>
<tr>
<td>Puckett, 2008</td>
<td>Prescribed interval &amp; route (n=40) vs. on demand (n=40)</td>
<td>12.7±3.5 vs 12.6±4.1 MD -0.1 [-1.78, 1.58]</td>
<td>155.8±20.1 vs 154.4±20 ml/kg/day MD -2.2 [-3.07, 1.33]*</td>
<td></td>
<td>36.5±1.5 vs 35.8±1 weeks MD -0.7 [1.26, -0.14]*</td>
<td></td>
</tr>
<tr>
<td>Meta-analysis when ≥2 studies with data</td>
<td>MD -0.90 [2.36, 0.56] g/kg/day</td>
<td>MD -7.41 [-16.86, 2.04] ml/kg/day</td>
<td>MD -0.48 [-0.94, -0.01] weeks*</td>
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</table>
Outcomes

• Simpson, Schaner, and Lau (2002)
  – Prospective randomized trial
  – N=29
  – First to full much sooner
  – Earlier initiation of oral feedings provided more practice opportunities and improved their oral skills and coordination of suck/swallow/breathe pattern
Outcomes

• Kirk (2007)
  – Prospective study group vs. historic cohort controls
  – N=51
  – Significant past medical histories
  – Study group= cue based feeding clinically managed by nurses vs. Control group= physician discretion
  – Study group reached full oral feeds 6 day earlier, and showed better weight gain
Summary

Cue Based Feeding Can:

• Decrease days from 1st to full oral feeds
• Lower resource utilization
• Minimize practice variability
• Provide more consistent objective documentation
• Increase confidence among caregivers
References


References

