Pre-Term to Term Formula Transition in a Resident Clinic

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Introduction:
Every year over 500,000 preterm babies are born in the United States,¹ and each year these children are discharged from the neonatal intensive care unit and their care is transitioned to a primary care physician. The use of preterm formula, enriched formula and term formula are varied among providers, as is the point in which a transition from one to the other is made. Preterm formula is usually only available in the NICU and patients are usually discharged home on enriched formula. These enriched formulas not only have different protein and fat content but vary greatly from term formulas in their mineral content².

As we care for preterm babies we must be cognoscente not only of their weight and height outcomes but also that of their bones. Calcium and phosphorus are two very important minerals in bone development and strength. The time of greatest transitions from mother to baby is during the third trimester. Many of the preterm infants miss this crucial time in-utero and are thus at risk for osteopenia of prematurity. To prevent this and subsequent rickets they must receive supplementation with these minerals early in life. This issue is known in the neonatology community and thus patients are started on enriched formulas until discharge as they provide calcium and phosphorus in the right proportions to prevent osteopenia of prematurity.

Working with premature babies after discharge from the NICU it became apparent that some babies were being transitioned on weight measures alone and they were taking term formula earlier than they should without proper supplementation.

The aim of this quality improvement project is to increase resident knowledge of preterm, enriched, term formula and their role in catch up growth and osteopenia as well as proper timing of transition.

Methods:
A multiple choice pretest was distributed to all residents to assess knowledge of outcome measures that should be consider when transitioning patients to different formulas. The calorie content of the different formulas as well as the need for Vitamin D and Iron supplementation was also addressed. The benefits of enriched formula as well as the risks for early transition were included as well. Residents then underwent an informal 5-minute intervention where a flow sheet with basic transition guidelines was provided. The flow sheet also contained recommendations for vitamin supplementation if transition was indicated early as well as outcome measures that were affected by supplementation, specifically no change in long-term growth and reduced risk of osteopenia³,⁴. After completion of the informal intervention residents were asked to take a posttest of the same
questions originally asked before the intervention and invited to keep their individual copy of the flow sheet provided during the intervention.

Results:

Twenty-three residents completed the pretest survey. When asked about the calorie content of preterm and enriched formula 17% and 26% respectively answered correctly. The timing of transition was then assessed and 39% of residents answered correctly that it should be considered during six to nine months. The benefit of preterm or enriched formula in respect for growth was then assessed with only 4% of residents correctly answering. Next the need for additional supplementation of enriched formulas with iron and vitamin D was assessed and 22% and 74% answered correctly. The need to give an infant vitamin supplementation if transitioning early to term formula was asssed and none of the respondents correctly identified all vitamins and minerals that a patient would need. Finally the residents were asked what a preterm infant was at risk for if transitioned early and 30% answered correctly.

After the informal intervention sixteen residents completed posttest surveys. As evidence by Figure 1 there was dramatic increase in knowledge of calorie content of formula and correct age of transition (questions 1-3) with 100% correct response rate in all three categories. When asked about the lack of effect of enriched formula on long-term growth outcomes 81% answered correctly. When the need for iron and vitamin D supplementation was addressed 69% and 81% of residents were correct. Identification of the vitamins and minerals needed for supplementation in early transition was dramatically increased at 81% and correctly identifying osteopenia as the major risk factor in early transition was seen in 100% of those surveyed.

Figure 1.
Discussion:

This project identified that resident knowledge of contents in preterm/enriched formula as well as the ultimate outcome of giving infants fortified formula was lacking. There was a dramatic increase in content identification as well as need for supplementation in those transitioned early. There was a less dramatic increase in the need for Vitamin D supplementation and the lack of Vitamin D in the enriched formulas. This may be secondary to the recent press and research into Vitamin D deficiency and recommendation that it be supplemented in term neonates as well as preterm.

My overall goal of increasing resident knowledge of content and timing of transition was met as 100% of respondents answered correctly to the questions pertaining to those questions in the post intervention survey. As far as addressing what may be a common misconception about the calorie dense formulas providing sustained long term growth benefits I feel that an increase from 4% to 81% correct response is encouraging but points out that this may be a persistent belief that may require multiple interventions.

The intervention itself was quick and preformed in under 5 minutes and was accompanied by a simple flow sheet with the correct supplementation of minerals and vitamins included. The survey did not assess the knowledge of amount of supplementation because that can be obtained from reference materials, which is what the flow sheet is intended to be. The more important aspect is to recognize the deficiency of these elements initially and this was achieved by 81% of the respondents.

While not every aspect of the survey was answered at 100% each question showed marked improvement with the highest being in calorie content, followed by identification of vitamins and minerals need for supplementation both of which has a greater than 80% increase in correct answer choice.

There is still more assessment that could be completed. A chart review before and after the intervention would be helpful in assessing if the new awareness and knowledge of the this issue resulted in more appropriate transition of infants to term formula as well as assessing our ability of documenting or assessing the need to continue on fortified formula.

Given the ease of the intervention, the fact that it is also not very time consuming it would also be possible to complete a PDSA cycle with community physicians. It would be beneficial to further educate them on proper nutrition at the time that care of patient was transitioned and this information could be easily incorporated in NICU discharge paper work that is currently being faxed to their offices.
Reference:
**Pudgy Preemie—Time to Transition**

Is patient 6-9 mo old?

- **Yes**
  - Transition to 20kcal
  - Continue Vitamin D and **START** iron supplementation

- **No**
  - Overweight?
    - **Yes**
      - Transition to 20kcal formula and start vitamins below.
    - **No**
      - Stay on enriched 22kcal formula

<table>
<thead>
<tr>
<th></th>
<th>Less than 9 mo</th>
<th>9 mo or older</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>10mg</td>
<td>10mg</td>
</tr>
<tr>
<td>Phos</td>
<td>75-100mg/kg</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>100-200mg/kg</td>
<td></td>
</tr>
<tr>
<td>Vitamin D</td>
<td>400 IU</td>
<td>400IU</td>
</tr>
</tbody>
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Pre-term formula: 24kcal Transition to Enriched prior to discharge from NICU
Enriched Formula: 22Kcal only need to supplement Vitamin D

**Fun Formula Facts:**

- Most Calcium and phosphorus is deposited in 3rd trimester and thus preterm’s infant are at risk for Osteopenia of prematurity and require supplementation either through formula or vitamins.

- Enriched/Pre-Term formulas do not affect long-term growth (@ 2 years they are the same as peers that did not receive enriched formula)

- **Studies on enriched formula and neurodevelopment are ongoing**
Got Milk?—Pos! Test:

1. What is the caloric intake of Preterm formula?
   a. 20
   b. 24
   c. 22
   d. 26

2. What is the caloric intake of Enriched formula?
   a. 20
   b. 24
   c. 22
   d. 26

3. At what age should you consider transitioning a preterm infant to term formula?
   a. 2-4 mo
   b. 4-6 mo
   c. 6-9 mo
   d. 9-12 mo

4. Preterm/Enriched formulas have been shown to be beneficial in catch up and long term growth?
   a. True
   b. False

5. If on Preterm/Enriched infants do not need iron supplementation?
   a. True
   b. False

6. If on Preterm/Enriched infants do not need vitamin D supplementation?
   a. True
   b. False

7. If transitioning early you must consider supplementing all the following (circle all that apply)
   a. Calcium
   b. Phosphorus
   c. Vitamin D
   d. Iron
   e. Magnesium

* For extra credit do you know the dosing for number 7, if so write it in.

8. Transitioning patient early puts them at risk for
   a. ROP
   b. FTT
   c. Delayed motor development
   d. Decreased adult height
   e. Osteopenia