

**\*Pediatric Nutrition Case Study**

Management of a Toddler on PD  
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Rady Children's Hospital, San Diego

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**\*Objectives**

- Demonstrate the Nutrition Care Process with a toddler on PD
- Identify reference sources
- Outline unique challenges of pediatric renal patients
- Demonstrate various approaches to solving a nutrition problem

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**\*BJ's Profile**

- Left ureteral obstruction
- While NPO for procedure, had a hyponatremic seizure
- Left ureterostomy at age 3 wks
- Discharged from NICU at age 6 wks on Similac PM 60/40 orally with sodium bicarbonate and medication for GERD

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**\*Formula Review**



- Similac PM 60/40 (Abbott)
  - Powdered infant formula
  - Lower mineral/electrolyte content
  - 20 kcal/oz at standard dilution
  - Concentrating increases K & Phos

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**\*Comparison Per 100 mL**

Breast Milk	PM 60/40	Standard Infant Formula
• 19 mg Na	• 16 mg Na	• 18 mg Na
• 48 mg K	• 54 mg K	• 72 mg K
• 23 mg Ca	• 38 mg Ca	• 52 mg Ca
• 13 mg Phos	• 19 mg Phos	• 29 mg Phos
• 0.06 mg Fe	• 0.5 mg Fe	• 1.2 mg Fe

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### \*BJ's Profile

- First seen in San Diego at age 4 months
- Diagnosis: CKD Stage 4 due to R cystic dysplastic, L obstructed
- Fed orally
- Started eating solids at 7 months
- Developed hyperkalemia

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### LOW POTASSIUM BABY FOODS

#### ALLOWED

- Rice Cereal (infant)
- Applesauce
- Green Beans
- Peaches
- Pears
- Berry/Apple blends
- Cherry/Apple blends

#### AVOID

- Avocado
- Bananas
- Beans
- Prunes
- Spinach
- Squash
- Sweet Potato
- Potatoes

Pediatric Renal RD Listserv:  
pedsrenalrd@mailman.srv.ualberta.ca

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### \*Feeding Challenges of CKD

- G-tube placement may be indicated in infants due to:
  - Decreased appetite
  - Nausea, uremia
  - GERD
  - Frequent hospitalizations, procedures interrupting feeding
  - Developmental delays
  - Oral aversion

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**\*BJ's Profile**



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**\*About Growth Hormone**

- RDs are in a good position to evaluate potential need for GH
- Assess weight gain & diet first
- Consider genetic growth potential
- Consider disease factors that may impact growth

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**\*About Growth Hormone**

- How to calculate mid-parental height:
  - Boys  
Inches:  $(\text{Father's Height} + \text{Mother's Height} + 5) / 2$   
Cm:  $(\text{Father's Height} + \text{Mother's Height} + 13) / 2$
  - Girls  
Inches:  $(\text{Father's Height} - 5 + \text{Mother's Height}) / 2$   
Cm:  $(\text{Father's Height} - 13 + \text{Mother's Height}) / 2$

Mark chart at 20 year line  
Mark confidence intervals:  
Mean Height in inches +/- 2 inches (some use 3.3 or 4 inches)  
Mean Height in centimeters +/- 5 centimeters (some use 8.3 or 10 cm)

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■ For BJ:  
Cm:  $(\text{Father's Height} + \text{Mother's Height} + 13) / 2$   
 $180.3 \text{ cm} + 163.8 \text{ cm} + 13 / 2$   
 $= 178.6 \text{ cm}$

Confidence intervals:  
Mean Height in centimeters  $\pm 5$  centimeters  
 $= 173.6$  to  $183.6 \text{ cm}$

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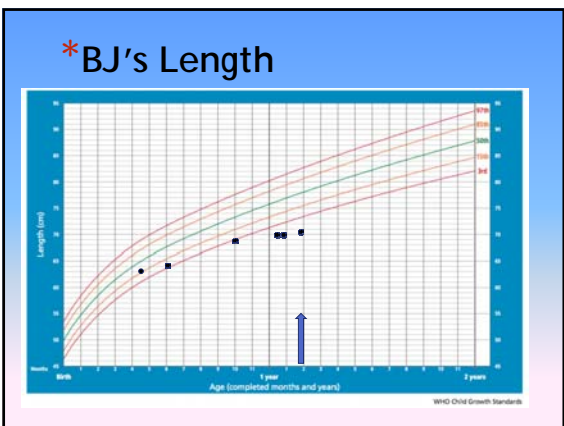
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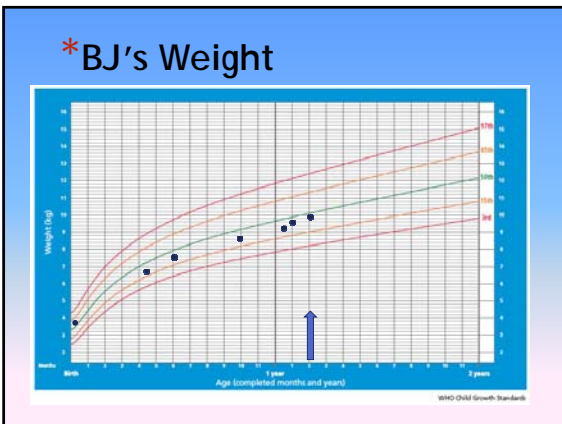
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- ### \*BJ's Profile
- Over the next year renal function declined
  - Hospital admissions for UTIs, line infection, vomiting, febrile seizure
  - At age 22 months BJ underwent L nephrectomy, PD catheter placed, PD was started

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- ### \*Nutrition Assessment
- General:
- 23 month old male on PD
  - High urine output from right kidney, not concentrated
  - No fluid restriction
  - All nutrition and medication taken orally

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■ Labs:  
BUN 38  
Cr 3.94  
Alb 3.8 (+proteinuria)

K, Phos, Calcium, Ca x P, Vitamin D levels  
all in goal range

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■ Medications:  
Calcitriol  
Cholecalciferol  
Colace, Miralax  
Renvela Powder, 800 mg packet x 2/d  
Epo/iron  
NaCl  
Growth Hormone  
Renal B/C vitamin

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Medical Issues:

- Hx poor growth - on GH
- Hx hyperphosphatemia - controlled on phosphate binders
- Hx hyperkalemia - controlled with diet

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■ Anthropometric Data:  
Weight: 12.01 kg (47<sup>th</sup>ile, z-score = -0.06)  
Height: 83.5 cm (9<sup>th</sup>ile, z-score = -1.33)  
FOC: 49 cm (50<sup>th</sup>ile)  
Weight/length: 81<sup>st</sup>ile  
Previous Wt: 11.8 kg (29 days prior)  
Wt change: +210 grams, 7.2 grams/day  
Goal rate of wt gain: 3.5 - 9 g/day

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Current Nutrition Intake:  
■ Similac PM 60/40, 20 kcal/oz  
■ Drinking 40 oz/day (1200 mL) by bottle  
■ Mom adding ~5 oz pureed fruit and ~2.5 oz pureed vegetables to the bottles  
■ Working with Occupational Therapy on oral feeding skills but still averse to solids & spoon-feeding

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■ Assessment of Intake:  
Energy:  
800 kcal (formula) + ~130 kcal from purees  
=~900 kcal/day, 75 kcal/kg/day  
  
Protein:  
17.6 g (formula) + ~1 g from purees  
=18.6 g/day, 1.5 g/kg/day

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▪ Estimating Energy Needs:  
KDOQI Clinical Practice Guidelines for  
13 - 35 months:

EER= [89 x weight (kg) - 100] + 20  
= [89 x 12.01 - 100] +20  
= ~990 kcal/day  
Actual intake ~900 kcal/day  
+ calories absorbed from PD fluid

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▪ Estimating Protein Needs:  
KDOQI recs for 1-3 yrs old on PD:  
1.3 g/kg/day

Practice based recommendations:  
>1.3 g/kg/day  
Actual intake ~1.5 g/kg/day

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▪ Calcium Needs:  
From KDOQI:  
DRI 500 mg (KDOQI -old)  
700 mg (updated)

Upper limit of dietary calcium plus calcium  
from phosphate binders  $\leq$ 1000 mg/day

Actual intake ~448 mg/day

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- Good rate of weight gain
- Height at 9%ile (z score -1.33) compared to 0%ile (z score -2.5) when starting GH
- Wt/ht slightly high at 81% but looks good
- Meeting needs for energy & protein
- Receiving B and C vitamin supplement
- Calcium intake low

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- \* Nutrition Diagnosis**
- Inadequate calcium intake related to home diet with low calcium content (meeting 64% of DRI) as evidenced by diet analysis.

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- \* Intervention**
- Supplementation with liquid calcium carbonate to meet calcium needs (+ 200 mg elemental calcium/day)

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**\*Follow Up...**

- Assessed monthly
- At age 2 yrs 5 months, noted K starting to increase - recommended modify foods added to formula
- At age 2 yrs 6 months, K continued to increase and Phos elevated

Time to make some changes!

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**\*Nutrition Assessment**

- Anthropometric Data:
  - Weight: 15.4 kg (87%ile)
  - Height: 91.7 cm (53%ile)
  - Weight/height: 92%ile
- Significant Labs Include:
  - K: 5.6 (3.5 - 5 mmol/L norm)
  - Phos: 7 (4.5 - 6.5 mg/dL norm)

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- Current Nutrition Intake:
  - 48 oz/day Similac PM 60/40 (20 kcal/oz)
  - ~4-8 oz pureed foods
  - Supplemented with sodium, calcium
  - No fluid restriction
  - Working with OT on feeding skills

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▪ Current Intake Provides:  
960 kcal (62 kcal/kg)  
21 g protein (1.4 g/kg)  
537 mg Ca (+ supplementation)  
269 mg Phos  
768 mg K  
230 mg Na (+ supplementation)  
58 mg Mg

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**\*Nutrition Diagnosis**

▪ Altered nutrition related lab value/hyperkalemia related to excess dietary intake of potassium as evidenced by labs showing K 5.6

▪ Altered nutrition related lab value/hyperphosphatemia related to excess dietary intake of phosphorus as evidenced by labs showing Phos 7

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**\*Intervention**

▪ Replace 25% of calories from Similac PM 60/40 formula with the same amount of calories from RenaStart

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### \*Formula Review



- Renastart (Vitaflo)
  - Powdered formula
  - For use in ages 1 and older in the US
  - Low in protein, Ca, Cl, K, Phos, Vit A
  - Can be mixed to 1-2 kcal/mL
  - Designed for use in combination with other formulas
  - Not for use as sole source of nutrition*

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#### PM 60/40

- \*960 kcal
- \*21 g protein
- \*537 mg Ca
- \*269 mg Phos
- \*768 mg K
- \*230 mg Na
- \*58 mg Mg

#### PM 60/40 + RenaStart

- \*954 kcal
- \*19.5 g protein
- \*454 mg Ca ↓
- \*246 mg Phos ↓
- \*630 mg K ↓
- \*291 mg Na ↑
- \*68 mg Mg ↑

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### \*1 month follow up...

Labs:

K 5.6 → K 4.5  
Phos 7 → Phos 5.2

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**\*Other options?**




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**\*Formula Review**



- Suplena (Abbott)
  - Designed for adults with CKD 3 & 4
  - For supplemental or sole source of nutrition
  - High calorie (1.8 kcal/mL)/can dilute
  - "Low protein" (45 g/L)
  - Low Phos, K, Na
  - Has fiber and prebiotics

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**PM 60/40**

- \*960 kcal
- \*21 g protein
- \*537 mg Ca
- \*269 mg PO4
- \*768 mg K
- \*230 mg Na
- \*58 mg Mg

**Suplena (530 mL)**

- \*951 kcal
- \*23.7 g protein
- \*559 mg Ca ▲
- \*380 mg PO4 ▲
- \*603 mg K ▼
- \*425 mg Na ▲
- \*112 mg Mg ▲▲

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**\* Additive Review**



- Duocal (Nutricia)
  - High calorie soluble powder
  - Contains carbohydrate & fat
  - 42 kcal/Tbsp, 25 kcal/scoop
  - Protein free
  - Has trace amounts (<2 mg per Tbsp) of Na, K, Ca, Cl, Phos

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**\* Formula Review**



- Renalcal (Nestle)
  - High calorie (2 kcal/mL)
  - Contains protein (34 g/L)
  - Minimal electrolyte content
  - Unflavored
  - *Not for use as sole source of nutrition*

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**\* Pharmaceutical Options**



- Kayexalate (Sodium Polystyrene Sulfonate)
- Inactive ingredients in suspension include:
  - Distilled water
  - Magnesium aluminum silicate
  - Methylparaben, propylparaben
  - Propylene glycol
  - Saccharin, sorbic acid, sorbitol
  - Xanthan Gum

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
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### \*Pharmaceutical Options



- Formula can be pre-treated prior to feeding
  - Binds to potassium
  - Lowers calcium & magnesium content
  - Increases sodium content

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
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### \*Instructions For Use



- Calculate mEq of K in the formula
  - $mEq\ of\ K = mg\ of\ K / 39.1$
- Dose 0.5 - 1 gram of Kayexalate Powder per mEq K
- 1 level tsp of Kayexalate Powder = 3.75 grams

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
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### \*Instructions For Use



- Add Kayexalate to formula
- Agitate for 1 minute
- Refrigerate, let sit for 30 minutes
- Decant the formula slowly leaving the sediment behind
- If adding other meds or nutrition modulars to formula, do so *after* decanting

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### \*Concluding Remarks

- Don't fear creativity!
- Every patient is different
- Use the Pediatric Renal RD listserv
- KDOQI guidelines

<https://www.kidney.org/sites/default/files/docs/cpgpednutr2008.pdf>

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