The Year (or Two) in Review: Pediatric Renal Nutrition Literature
HELLO!
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At 2018 Annual Dialysis Conference…

Review of the Recent Research and Practical Applications for Nutrition Care

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Annual Dialysis Conference
March 4, 2018
Disclaimer...

This grouping of research is by no means comprehensive or meeting the scope of all influential research compiled in the last 2 years!!
Take home message…

**Key points**
Measurement of frailty (fragility): poor growth, low muscle mass, fatigue, inflammation BMI stabilization in year 2
Fragility markers (≥3) associated with 3.16-fold increase of infection and 2.81-fold increase in hospitalization

**Practical Applications**
Motivation for families to promote physical activity; use of growth hormone; encouraging intake?
May be complementary to PEW evaluation
Question: How would this compare to the general pediatric population in terms of infection and hospitalization risk?
Key points
Anemia 1.9 times higher in children that were vitamin D insufficient or deficient (even after adjusting for other factors)

Practical Applications
Assessing and treating vitamin D early is important – protocols are key!
Correcting vitamin D deficiency may lower ESA needs
Possible first line defense/adjunctive therapy

**Waist-to-Height Ratio, Body Mass Index and Cardiovascular Risk Profile in Children with Chronic Kidney Disease**

Kristen Sgambat, Ph.D.1, Jennifer Roem, M.S.2, Mark Mitsnefes, M.D.3, Anthony Portale, M.D.4, Susan Furth, M.D.5, Bradley Warady, M.D.6, and Asha Moudgil, M.D.1

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**Abstract**

**Background:** Cardiovascular (CV) risk is high in children with chronic kidney disease (CKD), and further compounded in those who are overweight. Children with CKD have a unique body habitus not accurately assessed by body mass index (BMI). Waist-to-height ratio (WHR), a better predictor of CV risk in populations with short stature, has not been investigated in children with CKD.

**Methods:** Analysis of 1723 visits of 593 participants enrolled in the Chronic Kidney Disease in Children (CKiD) study was conducted. CKiD participants had BMI and WHR measured and classified as: 1) lean (WHR<0.49, BMI <85th percentile), 2) WHR-overweight (WHR<0.49, BMI ≥85th percentile), 3) BMI-overweight (WHR<0.49, BMI ≥85th percentile), or 4) overweight by both BMI and WHR. Left ventricular mass index (LVMI), fasting lipids, FGF23, blood pressure, and glucose were measured as markers of CV risk. Linear mixed-effects regression was used to evaluate differences in CV markers between overweight and lean groups.

**Results:** Participants were 12.2 years old, 60% male, 17% African-American. Approximately 15% were overweight by WHR but not by BMI. Overweight status by WHR-only or both WHR and BMI was associated with lower HDL and higher LVMI, triglycerides, and non-HDL cholesterol.
**Key points**

Children classified by: 1) lean (WHr ≤ 0.49, BMI 0.49, BMI < 85%ile) 2) WHr-overweight (WHr > 0.49, BMI < 85%ile), 3) BMI-overweight (WHr ≤ 0.49, BMI ≥ 85th percentile) 4) overweight by both BMI and WHr

WHr overweight or WHr and BMI > 85%ile linked to cardiovascular risk factors, BMI > 85%ile only similar to lean patients

15% elevated WHr and not > 85%ile BMI (often shorter)

**Practical Applications**

More clinical data is needed for WHr – consider collecting and sharing!

Develop protocols for measuring waist circumference
**Key points**

Compared to controls, children with CKD had lower hand-grip z-scores.

Longevity of CKD decreases hand-grip strength.

Increased hours of physical activity improved hand-grip strength.

Delayed puberty, feeding support, need for alkali therapy and low Hgb associated with poorer hand-grip.

Poor QOL associated with poor hand-grip strength.

**Practical Applications**

Consider assessment of hand-grip strength and possibly interventions if poor.

Physical activity is important in CKD!
Marlais M, Stojanovic J, Jones H, Cleghorn S, Rees L.

Take home message...

Key points
Children with CKD stage 2-5 started on enteral feeds after the age of 2 still had improved height and weight SDS
Younger children and those not on dialysis had the most improvement
BMI stabilization in year 2
Height SDS continued to improve into second year

Practical Applications
Start enteral feeds early in age and stage of CKD if need suspected; however...
Don’t hesitate to initiate enteral feeds in older children
Careful dietetic management can prevent overweight with enteral feeds and improve linear growth
Karava V, Printza N, Dotis J, et al.

Take home message...

**Key points**
- Underweight and overweight children at greater risk for arterial stiffness
- BMI with height age highly correlated with fat mass
- Inflammation likely culprit

**Practical Applications**
- Mediterranean diet and exercise recommended for this population
- BMI with height age still a fairly accurate anthropometric marker
- Lean to fat mass important!
Take home message...

Key points
Protein provision important for survival with CRRT use
Patients only met protein goals ~38% of the time
Weaning from PN to EN = inadequate protein intake

Practical Applications
Need to increase protein in enteral feeds – possibly through modular
Be mindful in transitions from PN to EN
Renal RD’s communicate with critical care RD’s!
Esmaeili M, Rakhshanizadeh F.

**ORIGINAL RESEARCH**

**Serum Trace Elements in Children with End-Stage Renal Disease**

*Mohammad Esmaeili, MD,* and *Forough Rakhshanizadeh, MD†*

**Objectives:** Trace elements, which have a crucial role in metabolism and enzymatic pathways, are not routinely monitored in the blood of pediatric patients with chronic kidney disease. The present study was carried out to determine the serum levels of copper (Cu), zinc (Zn), selenium (Se), and lead (Pb) in children with ESRD who were currently receiving conservative management or were on long-term hemodialysis or continuous ambulatory peritoneal dialysis.

**Methods:** This study involved 200 children who met the inclusion criteria. The children were divided into 4 groups: a hemodialysis group, a peritoneal dialysis group, a group of children with ESRD treated with conservative management, and a control group. Serum levels of Zn, Cu, Se, and Pb were evaluated using an atomic absorption spectrophotometer and compared between the groups.

**Results:** There was no significant difference in the serum concentration of Cu among the 4 study groups. There was also no significant difference in the serum concentrations of Zn, Se, and Pb between healthy children and children with CKD treated with conservative management or between the hemodialysis and peritoneal dialysis groups. The levels of Zn and Se were significantly lower in the hemodialysis and peritoneal dialysis groups than in the healthy children or in children with CKD treated with conservative management. The level of Pb in the blood was significantly lower in healthy children and children with CKD treated with conservative management than in the hemodialysis or peritoneal dialysis groups.

**Conclusions:** The levels of trace elements were substantially different between the dialysis groups and healthy children and children with CKD treated with conservative management. These results highlighted the role of osmosis during dialysis, as dialysate impurities can cause a disturbance in the levels of trace elements and the role of the kidney, even with minimum residual function, in the homeostasis of trace elements.

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Key points
- Copper levels similar in PD, HD, pre-dialysis and control groups
- Zinc, selenium, and lead similar in controls and pre-dialysis patients vs HD and PD
- Zinc and selenium lower in dialysis groups
- Lead higher in dialysis groups

Practical Applications
- Start supplementation of Zn and Se upon initiation of dialysis – don’t wait
- Consider annual Pb evaluation
- What about transport status, other dialysis variables?
- What is the role of the diet?
Other....
Take home message...

Key points
World-wide, both obesity and underweight are a problem in pediatric dialysis patients – more than would be comparable to healthy children
Enteral feeds can be a risk for young children for obesity
Mortality increases in underweight teens and obese young children

Practical Applications
Don’t over-feed infants and young children on tube feeding
Careful monitoring of growth very important!

**Children Tolerate Intradialytic Oral Nutrition**

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**Abstract**

**Background**—Haemodialysis (HD) patients have poor nutrition, which contributes to worse outcomes. Inadequate nutrition has a particularly deleterious effect on growth and neurocognitive development, as well as mortality, in children and adolescents. Nutritional supplementation can improve outcomes but can be difficult to administer.

**Objective**—Determine the tolerability of intradialytic oral nutrition in paediatric patients.

**Design**—Cross-sectional quality improvement study in an outpatient paediatric HD unit. Intervention was intradialytic oral nutritional supplementation provided as protein bars and/or meals.

**Subjects**—Children and adolescents on outpatient HD who were able to participate in surveys and eat by mouth.

**Measurements**—Adverse effects and symptoms on nurse- and patient-reported surveys, respectively. Relationships between the predictor variables and the outcomes were assessed using generalized estimating equations.

**Results**—The majority of children felt better after eating on dialysis (72%) with no adverse effects (80%). On unadjusted analyses and confirmed with generalized estimating equation
Key points
Majority of patients felt better when eating on dialysis; most had no adverse effects
Inadequate nutrition a problem for many pediatric dialysis patients

Practical Applications
Meal trays, sack lunches, snacks...feed your patients on dialysis!
Monitor patients individually for tolerance
Management of side effects does not necessarily exclude eating on dialysis
Le Palma K, Rampolla Pavlick E, Copelovitch L.

Key points
Sodium Polystyrene Sulfonate (SPS) formula treatment effective at lowering serum potassium, but...
Half of lab values reflected serious biochemical derangements
  - Hypokalemia
  - Hypernatremia
  - Hypocalcemia

Practical Applications
May consider other means for lowering serum potassium
If SPS is used, monitor labs very closely
Take home message...

**Key points**
Quality of life scores low in CKD and dialysis patients
Related to nutritional issues such as short stature and poor appetite

**Practical Applications**
Nutritional intervention addresses mental health as well
Height and appetite important to children and teens
Key points
9 times the risk of developing DM (greatest risk in first year)
Risk continues even after 10 years
3 times greater risk of death if DM developed
Good news – kidney recipients lower risk than other organs

Practical Applications
Dietetic involvement important to prepare for transplant (and educate on long-term risks) and long-term

Take home message...
Notable mentions

**Research Topic**

**Nutrition and Growth in Children with Chronic Kidney Disease**

Submission closed.

**About this Research Topic**

Providing optimal nutrition is a critical aspect of nutritional management in pediatric renal transplant recipients. It is also a major modifiable risk factor for cardiovascular disease, a top cause of morbidity and mortality of transplant patients. While most knowledge about post-transplant dyslipidemia has been generated in adults, recommendations and treatment strategies also exist for children and are presented in this review. Awareness of these applicable guidelines and approaches is required, but not sufficient, for the reliable management of dyslipidemia in our patients, and additional needs and opportunities for comprehensive care in this area (e.g., quality improvement) are outlined.

**Abstract**

Dyslipidemia after kidney transplantation is a common complication that has historically been underappreciated, especially in pediatric recipients. It is also a major modifiable risk factor for cardiovascular disease, a top cause of morbidity and mortality of transplant patients. While most knowledge about post-transplant dyslipidemia has been generated in adults, recommendations and treatment strategies also exist for children and are presented in this review. Awareness of these applicable guidelines and approaches is required, but not sufficient, for the reliable management of dyslipidemia in our patients, and additional needs and opportunities for comprehensive care in this area (e.g., quality improvement) are outlined.

**Keywords**: Cholesterol; Dyslipidemia; Kidney; Pediatric Transplant; Triglycerides.
THANKS!
Any questions?
What favorite articles have you found in the last couple of years?