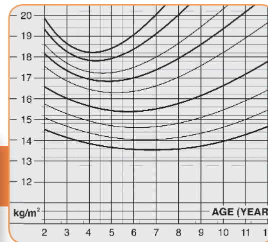
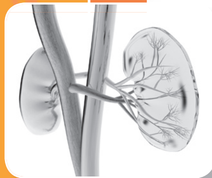
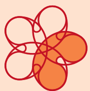
Nutritional Management

Children With a Kidney Transplant







National Kidney Foundation®

KDOQI

Based on the KDOQI Clinical Practice Guideline for Nutrition in Children With CKD: 2008 Update

Overview

Transplantation is not a cure. It is a state of chronic kidney disease (CKD), regardless of glomerular filtration rate (GFR) or other markers of kidney damage.

Management of children with a kidney transplant includes care of the graft, but also care of the complications of CKD stages 1–5T.

The short- and long-term effects of immunosuppressive medications present new and familiar nutritional challenges to children and their caregivers.

The frequency of nutritional assessment may be highest in the early post-transplantation period and decreases as the dosage and side effects of immunosuppressive medications are reduced.

Immediate and short-term nutritional goals:	Encourage intake. Promote blood pressure control. Maintain glucose, mineral, and electrolyte balance.
Long-term nutritional goals:	Prevent chronic complications of immunosuppressive therapy: – Excessive weight gain/obesity – Hyperlipidemia – Hypertension – Corticosteroid-induced hyperglycemia and/or osteoporosis

Immunosuppressive Medications

Dietary assessment, diet modifications, and counseling are suggested for kindney transplant recipients to meet nutritional requirements while minimizing the side effects of immunosuppressive medications. **(R 10.1)**

Nutrition-Related Side Effects of Immunosuppressive Medications

Maintenance Agents	Nutrition Side-Effects
Azathioprine	Nausea, vomiting, sore throat, altered taste acuity
Corticosteroids (prednisone, methylprednisolone)	Hyperglycemia, hyperlipidemia, sodium retention, hypertension, increased appetite and weight gain, osteoporosis, calciuria, muscle wasting, peptic ulcer disease, impaired wound healing, electrolyte disturbances
Calcineurin inhibitors (cyclosporine, tacrolimus)	Hyperlipidemia, hyperglycemia, hypomagnesemia, hyperkalemia, hypertension Avoid grapefruit
Sirolimus	Hyperlipidemia, gastrointestinal symptoms
Mycophenolate or Mycophenolic acid	Diarrhea, nausea

Induction Agents	Nutrition Side-Effects
Daclizumab	Minimal side-effects
OKT-3	Nausea, vomiting, diarrhea, loss of appetite
Rabbit antithymocyte globulin (ATG, thymoglobulin)	Decreased appetite

Immunosuppressed patients are more prone to develop infections, potentially including those brought on by disease-causing bacteria and other pathogens that cause food-borne illness (eg, E*scherichia coli*, *Salmonella*, and *Listeria* monocytogenes).

Counsel immunosuppressed children and families on food hygiene/safety and avoidance of foods that carry a high risk of food poisoning or food-borne infection. **(R 10.7)**

General Food Safety Recommendations for Immunosuppressed Children

Clean: To avoid spreading bacteria throughout the kitchen, wash hands and food preparation surfaces often.

Separate: Avoid spreading bacteria from one food to another by keeping high-risk foods, such as raw meat, poultry, seafood, and eggs away from ready-to-eat foods.

Cook to proper temperatures: Foods are safely cooked when they are heated to the USDA-recommended safe minimum internal temperature.

Chill: Refrigerate foods promptly to slow the growth of harmful bacteria.

Read labels to avoid purchasing food that is past its "sell by" or "use by" date.

Buy only pasteurized milk, cheese, and other dairy products from the refrigerated section. Read labels to be sure that fruit juice selected from the refrigerated section of the store is pasteurized.

Purchase canned goods that are free of dents, cracks, or bulging lids.

When eating out, avoid foods containing uncooked ingredients, such as eggs, meat, poultry, or fish. Avoid buffets, which may contain undercooked foods or foods that have been at room temperature too long.

Bone and Mineral Disorders

After transplantation, children are predisposed to progressive bone disease and osteoporosis. They are likely to have preestablished metabolic bone disease associated with CKD and residual hyperparathyroidism.

The use of corticosteroids and calcineurin inhibitors after transplantation may increase risk of bone demineralization.

Calcium and vitamin D intakes of at least 100% of the DRI are suggested. Total oral and/or enteral calcium intake from nutritional sources and phosphate binders should not exceed 200% of the DRI. **(R 10.5)**

Children with CKD stages 3 to 5T with bone mineral disorders should be managed according to established recommendations for non-transplanted children with similar GFRs.

Recommended Frequency of Measurement of Calcium, Phosphorus, PTH and Total CO_2 After Transplant

Parameter	Week 1	First 2 Months	2-6 Months	>6 Months
Calcium	Daily	Weekly	Monthly	As per guidelines for stage of CKD
Phosphorus	Daily	Weekly	Monthly	
PTH	Optional	At 1 month, then optional	If normal initially, optional	
Total CO_2	Daily	Weekly	Monthly	

Hypertension and Electrolyte Disturbances

Dietary modification is recommended for children with a kidney transplant who have hypertension or abnormal serum mineral or electrolyte concentrations associated with immunosuppressive drug therapy or impaired kidney function. **(R 10.4)**

Hypertension	Occurs in the majority of children who undergo transplantation Most children receive antihypertensive medications throughout the immediate and follow-up post-transplantation period. Dietary sodium restriction is indicated to aid in blood pressure management.
Hyperkalemia	Occurs frequently during immediate post-transplantation period in association with the medications cyclosporine and tacrolimus, especially when blood levels achieve or exceed therapeutic targets. Serum potassium levels should be monitored and a low-potassium diet implemented when indicated.
Hypophosphatemia	Commonly seen in the early post-transplantation period. Occurs in association with an increase in urinary phosphate excretion, decreased intestinal phosphate absorption, and hyperparathyroidism persisting beyond the pretransplantation period. Encourage a diet high in phosphorus, but supplements may be required.
Hypomagnesemia	Occurs early in the post-transplantation period as a common side effect of calcineurin inhibitors. Increased dietary magnesium intake may be attempted, but supplements may be required.

Children who are obese before kidney transplantation have shown an increased risk of mortality and decreased long-term kidney allograft survival.

After transplantation, all age groups have shown rapid weight gain in the first 6 months, with children gaining weight in the first year.

Obesity may develop after transplantation, and weight gain may be more significant in those who were obese before transplantation.

Glucose intolerance and hyperglycemia occur early after transplantation in association with surgical stress and corticosteroid and calcineurin inhibitor therapy, with serum glucose levels decreasing as immunosuppressant dosages decrease.

Dyslipidemia occurs frequently after kidney transplantation and promotes atherosclerosis.

Dyslipidemia may be associated with proteinuria in chronic allograft nephropathy, recurrent disease, obesity, and/or use of immunosuppressive medications.

To manage weight gain, consider energy requirements to be equal to 100% of the EER for chronologic age, adjusted for (PAL) and (ie, BMI). Adjust energy intake based upon the response in rate of weight gain or loss. **(R 10.2)**

Balance calories from carbohydrates, proteins, and unsaturated fats according to the physiological ranges recommended as the acceptable macronutrient distribution ranges (AMDR) of the dietary reference intake (DRI), in order to prevent or manage excessive weight gain, dyslipidemia, and corticosteroid-induced diabetes. **(R 10.3)**

Encourage children to avoid simple sugars in the early post-transplantation period (the first 3 to 6 months) when corticosteroid doses are highest and weight gain is most rapid.

– When blood sugar levels stabilize, it may still be necessary to restrict simple sugars to manage weight gain and hypertriglyceridemia.

Encourage intake of fluids low in simple sugars for children with high minimum total daily fluid intake (except those who are underweight, ie, BMI-for-height-age <5th percentile) to avoid excessive weight gain, promote dental health, and avoid exacerbating hyperglycemia. **(R 10.6)**

– A high volume of fluid intake generally is prescribed to stimulate kidney function, replace high urine output, and regulate intravascular volume.

– The majority of fluid intake should come from water, fat-free or low-fat milk, and sugar-free drinks (except for in children who need to gain weight).

In children who resist overt dietary modification, healthy food preparation methods should at least be emphasized, including the use of such heart-friendly fats as canola or olive oils and margarines.

Dietary Treatment Recommendations for Children With Dyslipidemia and CKD Stages 5, 5D, and Kidney Transplant

Macronutrient	Serum LDL-C >100 mg/dL	Serum TG >150 mg/dL
Energy		If associated with excess weight, energy balance + activity recommendations for weight loss
Dietary fat	<30% of calories	Low
Dietary cholesterol	<200 mg/d	
Trans fatty acids	Avoid	
Saturated fatty acids	<7% of calories	
Carbohydrate		Low simple carbohydrate

Encourage exercise, in combination with diet modification, to prevent and/or aid in the management of overweight, hypertension, and dyslipidemia.

– Recommendations for children include encouraging time spent in active play (goal ≥1 hour/day) and limiting screen time (television + computer + video games) to 2 hours/day or less.

Abbreviations

AMDR	Acceptable macronutrient distribution ranges
BMI	Body mass index
CKD	Chronic kidney disease
DRI	Dietary reference intake
EER	Estimated energy requirement
GFR	Glomerular filtration rate
PAL	Physical activity level
R	Recommendation
SD	Standard deviation
T	Transplant

Reference:
National Kidney Foundation. KDOQI clinical practice guideline for nutrition in children with CKD: 2008 update. *Am J Kid Dis*. 2009;53(suppl 2):S1-S124.

Notice:

SECTION I: USE OF THE CLINICAL PRACTICE GUIDELINE

This Clinical Practice Guideline document is based upon the best information available at the time of publication. It is designed to provide information and assist decision–making. It is not intended to define a standard of care and should not be construed as one, nor should it be interpreted as prescribing an exclusive course of management. Variations in practice will inevitably and appropriately occur when clinicians take into account the needs of individual patients, available resources, and limitations unique to an institution or a type of practice. Every health care professional making use of these recommendations is responsible for evaluating the appropriateness of applying them in the setting of any particular clinical situation.

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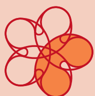

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