Kidney Functions

Removes waste - urea, creatinine and excess fluid

Electrolyte balance - regulates Na, K, Ca, PO4

Acid-base balance: Excretes H+, reabsorbs HCO3-

RAAS systems - BP regulation

Erythropoietin production - stimulates RBC production

Vit D activation - converts to calcitriol

CKD Stages

Stage

Stage 1: Normal-high GFR

Stage 2: Mild CKD

Stage 3A: Moderate CKD

Stage 3B: Moderate CKD

Stage 4: Severe CKD

Stage 5: End-stage

Stage 5D: End-stage on dialysis

Assessment

DRY Wt Hx – consider fluid status. Diuretics? Oedema? Ascites? Fluid restriction?

Higher weight = lower mortality = don't want to encourage weight loss while they are on dialysis. Optimal Nutrition Status = BMI 23 – 26 kg/m2

NIS

Protein-energy malnutrition

Inadequate fibre intake

Knowledge deficit – high K, PO4, Na foods

Excessive K+, PO4, Na intake *only a key concern if it reflects in biochem*

NIS (cont)

Hypokalaemia

Poorly controlled uraemic S/S –dry mouth, avoiding protein foods, N/V/D, ↓ appetite, Metallic taste, ↓ weight, fluid retention, anaemia

Polypharmacy – lots of S/E/S/S

Losses in dialysis: Water soluble vitamins, protein

Biochem

Marker		Expected in CKD
Urea (RR = 2.5-7.5 mmol/L)	↑	Urea Reduction Ratio (URR) used to assess dialysis adequacy. ≥70% reduction in blood urea levels per session. <70% may indicate inadequate clearance of waste products - potential malnutrition
Creatinine (RR = 35-50g/L)	↓	Reflects muscle mass/t-urnover. ↓ Cr = ↓ muscle mass = ↑ mortality.

Biochem (cont)

Albumin (RR = 35-50g/L)	↓	Indictor of mortality. Affected by urinary losses, liver function, inflammation etc. Urinary losses or fluid overload
Na (RR=135-145m-mol/L)	↓/↑	↓ **Hyponatremia** (<1-35mmol/L): fluid overload. Advanced CKD. ↑**Hypernatremia** (>145 mmol/L): Dehydration, poor fluid intake, excesive Na intake.
K (RR=3.5-5.2 mmol/L)	↑	Measure of renal function and progre-ssion of CKD.
Phosphate (RR=0.75 – 1.50 mmol/L)	↑	accumulates in blood as CKD progresses. Kidneys unable to process
Calcium (RR = 2.1-2.6 mmol/L (total serum)	↑	↑ in later stage - excessive intale, Vit D therapy, reduced renal excretion

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Biochem (cont)

Lipids	↓ HDL	Dyslipidaemia is common. Targets are similar to people with CVD or T2DM
eGFR		*Amount of blood filtered by the kidney per minute*
		Stage 1: > 90 mL/min
		Stage 2: 60-89 mL/min
		Stage 3A: 45-59 mL/min
		Stage 3B: 30-44 mL/min
		Stage 4: 15-29 mL/min
		Stage 5: <15 mL/min

Fluid quick reference

1/2 cup custard = 100mL fluid

1/2 cup canned fruit = 80mL fluid

Plastic feeder glass of fluid = 200mL fluid

Coffee cup of fluid = 150mL fluid

Fruit juice Tetra Pak of fluid = 250mL fluid

Juice glass = 120mL fluid

3/4 cup thick soup = 150mL fluid

2 scoops ice-cream = 70mL fluid

Fluid quick reference (cont)

200g carton yoghurt = 180mL fluid

1/2 cup jelly = 100mL fluid

Dialysis Terminology

Peritoneal dialysis (PD): A form of dialysis in which the lining of the abdomen, the peritoneal membrane, acts as a natural filter

Conventional HD: In clinic. 3x 4 hour sessions a week

Home HD: Tend to be done overnight. Less fluid restrictions due to longer dialysis. More flexible & less impact on life. Have to have support & health literacy.

Dialysate ("bath"): The solution (water and electrolytes) that passes through the artificial kidney to remove excess fluids and waste products from the blood.

Interdialytic weight gain (IDWG)

~2kg

Less = poor oral intake, losses (stomas, diarrhoea etc), loss of LBM

More (usually due to fluid/Na intake). Glycaemic control – hypoglycaemia = thirst.

Weight will stay in the body, due to not producing urine to expel it. Relying on dialysis to remove excess fluid.

Pumping around so excess fluid = ↑ CVD & puts more pressure on your heart – causing hypertension, oedema, shortness of breath, large IDWG

Intervention

Early stage: prevent co-morbidities

Late stage: preventing & treating malnutrition. Conserve lean body mass

Maintain weight/weight reduction – **to be eligible for a transplant** – correct malnutrition first, and then focus on weight control – communicate with team

ONS Nepro HP - stage 4 or more severe, energy dense, low electrolyte, mod protein

ONS Nepro LP - energy dense, low electrolyte, low protein

Lower K+ ONS: resourcse fruit, fortijuice, nutren, forticreme

Declining cognition = Invite family to attend. Write down. Give out resources. Repeating information. Keeping sessions short

Reduce dairy & meat portions, avoid protein fortified products

Na: No added salt diet. Educate on flavour alternatives

Fluid: Educate: what is a fluid? Jug method to measure fluid intake. For dry mouth: sucking on mints, chewing gum, brush teeth

Constipation: fibre supplements. Medications. (lack of fibre from K restriction)

PO4: Restrict in late stages. Promote whole, plant foods – less bioavailable PO4

Serum K+ constantly elevated = **restrict K+**

CKD & Dialysis Cheat Sheet

by Michellephillips02 via cheatography.com/214485/cs/46733/

Strategies

Label reading - Na. Low Salt: 120mg per 100g or less, Reduced Salt: 400mg per 100g or less

Salt-free flavour additives: fresh herbs, lemon/lime juice, pepper, garlic, ginger

Choose low salt, reduced salt, and no added salt products when available

Reduce processed meats like ham, bacon, sausages, deli meats, rotisserie chicken. Limit red meat to 1-2 times per week

More lentils, chickpeas, kidney beans, baked beans, cannellini beans, black beans, fish, poultry, lean meat, tofu, nuts and seeds

Only drinking from one measured bottle/measuring jug

Limit fluid from drinks, foods, and fluid you take with tablets

Spread your fluid allowance over the day - don't drink it all at once

Drink from small cups rather than large, or half fill cups

Try to stay out of the heat & use a wet washer to stay cool

Freeze some of your fluid allowance. Use ice, ice blocks, or frozen fruit

Sucking mints, peppermints, a slice of lemon or chewing gum

Keep lips moist by using lip balm. Pharmacist can help with oral lubricants.

Na - Choose fresh foods over processed

Guidelines & References

Ikizler et al. KDOQI clinical practice guideline for nutrition in CKD: 2020

Ash et al. Evidende based practice guidelines for nutritional management of of chronic kidney disease

Handbook p217

Nut Reqs (KDOQUI)

EER	
	Stage 3: 105-147kj/kg
	Stage 4:105-147kj/kg. 125-146/kg >60 years
	Stage 5: 105-147kj/kg
Protein:	*Low = ~0.6-0.8g.* just meet, or slightly under*
	Stage 3: 0.55-0.6g or 0.6-0.8g (diabetes)
	Stage 4: 0.55-0.6g or 0.6-0.8g (diabetes) *higher end if malnourished
	Stage 5: 1.0-1.2g
Na	< 2.3g per day (<100mmol/day (DAA & KDOQI). Low Salt: 120mg per 100g or less
Fluid: *Guided by nephrologist	
	Stage 3-4: Individualized based on CKD, oedema, hypertension etc
	Stage 5: 500mL + PDUO (HDx)
	Stage 5: 800mL+ PDUO (PD)
K	*Up to stage 3 not usually restricted*
	Stage 4: 1 mmol/kg

Nut Reqs (KDOQUI) (cont)

	Stage 5: 1 mmol/kg
Phosphate	800-100mg/day

Example PESS

Chronic disease or condition related malnutrition (NC-4.1.2) related uraemic S/S of CKD (nausea, ↓d appetite, fatigue), as evidenced by SGA-14B/9.5% LOW in 12/12/1.7% LOS 2/12/Dietary intake inconsistent with dietary reference standards.

Serum K+

Cause: constipation, elevated BGL, medications, missing dislysis or not enough time, acidosis, muscle breakdown & rapid weight loss

Avoid “salt-free” salt

Chop vegetables into small pieces and soak/boil

Boil rather than steam, stir-fry or microwave

High K foods = fruit, processed meat foods, fried foods, sausages, steak, deli meats, chocolate, vegemite toast, dairy, fruit juice, coffee, milkshakes

Drink mostly water. Reduce alcoholic drinks, coffees, milkshakes, fruit and vegetable juices

Swap processsed snacks for higher fibre, lower K options.

Lower K swaps

High K	Lower K
Potatos (all types)	Pasta, rice, couscous
Cow's milk	Soy, rice or almond milk
Cereal w/ dried fruit	Plain, honey-coated or sugar-coated breakfast cereals, oatmeal
Chips	Rice snacks, popcorn and pretzel
Cookies	Plain, fruit-f illed or wafer cookies
Choc cake	Plain cake f illed with cream or jam, toaster pastry, doughnuts, scones
Juice	Lemonade, cranberry cocktail, flavored water
Nutella, peanut butter	Jam/honey
Choc/fudge	Jelly beans, mints, marshm-ellows
Tomato sauce	Mayo

Phosphate Restriction

Restrict IF serum levels are high

Used as a food additive in processed and pre-packed foods. Naturally in meats, cheese, milk, nuts and seeds

Additive numbers: 101, 339, 340, 341, 342, 343, 450, 451, 452, 541, 542, 1410, 1412, 1413, 1414, 1442

Phosphate Restriction (cont)

Swap processed foods for fresh foods

Reduce large serves of milk or large serves of all type of meats

Phosphate binder medication helps to lower your blood phosphate levels by attaching to the phosphate and phosphorus in your food, stopping it from going into your blood

Check w/ MD dose is correct

Take phosphate binders with food

High PO4 foods: coke, processed cheeses, 2-min noodles, cakes, chicken nuggets, sausage rolls, sausages, corned beef, sauce, bacon

Moderate PO4 foods: Fresh fish/seafood. Have fish 1-2/week. Beef, lamb, chicken, canned tuna, eggs, soy milk, yoghurt

Low PO4 foods: vegetables, lentils, brown rice, pasta, nuts, fruit, seeds, EVOO, almond/oat milk, soft cheeses, nut butter