

THE ROLE OF THE DIETITIAN IN CHILDHOOD RENAL DISEASE

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Oct 2018

OUTLINE

Special diets used in Paediatric Nephrology

Specialist enteral feeds and supplements

Case study

SPECIAL DIETS USED IN PAEDIATRIC NEPHROLOGY

Low potassium

No added salt

Fluid restriction

Protein allowance

Low phosphate

HYPERKALAEMIA

What can make a potassium level high?

- Haemolysed blood sample
- Blood transfusion
- Certain medications
- Acidosis
- Catabolism
- AKI
- Blood haemoysis
- Aldosterone deficiency

POTASSIUM RESTRICTION

Once all other possible causes for hyperkalaemia has been addressed, the sample repeated and if the potassium is still high, then call the dietitian to give advice on a low potassium diet

Restrict when $K > 6.0 \text{ mmol/l}$

Low potassium diet is based on 1 mmol/kg so will be different for each child

Relax the restriction when $K < 5.0 \text{ mmol/l}$ on 2 subsequent blood tests.

WHAT FOODS ARE HIGH IN POTASSIUM



3.8mmol/100ml



4 mmol/100ml



10mmol/100g

POTASSIUM

Foods high in potassium

Jacket potato, shop bought potato products including frozen and chip shop

Mushrooms, spinach, tomatoes, spaghetti in tomato sauce, baked beans, pulses, hummus, tinned and packet soup

Chocolate, toffee, fudge, marzipan and liquorice

Alternatives

Boiled rice and pasta, noodles, bread, chapatti, naan and crackers

Carrot, cauliflower, swede, broccoli and cabbage

Boiled sweets, jellies, mints and marshmallows

POTASSIUM

Foods high in potassium

Chocolate biscuits

Chocolate cake and fruit cake

Milk, yoghurt, evaporated and condensed milk.

Alternatives

Plain biscuits, sandwich, jam filled, wafer biscuits

Plain sponge cake filled with cream/jam, plain scone, jam tarts, apple pie, doughnuts

Milk substitutes, fromage frais

SALT RESTRICTION – NO ADDED SALT

This is used mainly when a child is fluid restricted and /or bp is high

Conditions include Nephrotic syndrome, AKI and children with confirmed renal stones

The diet is No Added Salt, **not** low sodium or low salt

No added salt diet is difficult to achieve as most families use a lot of convenience foods

Relax the diet when fluid restriction is lifted but not for children with renal stones

Healthy diet as salt intake related to high bp.

HOW MUCH SALT DOES A CHILD NEED?

The maximum recommended amount of salt for babies and children is detailed below:

Age	Recommended level of salt per day	Recommended level of sodium per day
Up to 12 months	< 1g	0.4g
1-3 years	2g	0.8g
4-6 years	3g	1.2g
7-10 years	5g	2g
11 years and over	6g	2.4g

FOODS HIGH IN SALT



LOOK AT THE LABEL

UNDERSTANDING THE TRAFFIC LIGHT SYSTEM

	Sugars	Fat	Saturates	Salt
What is HIGH per 100g?	Over 15g	Over 20g	Over 5g	Over 1.5g
What is MEDIUM per 100g?	Between 5g and 15g	Between 3g and 20g	Between 1.5g and 5g	Between 0.3g and 1.5g
What is LOW per 100g?	5g and below	3g and below	1.5g and below	0.3g and below

Source: Food Standards Agency

FLUID RESTRICTION

Fluid levels are determined by the medical staff

In CKD levels can vary depending on whether the child is anuric or not

Some can be a little as 300-500ml per day

Encourage the child to use fluid apps on their phones

Some foods contain fluid and need to be counted

- Jelly, ice cream, custard, yoghurt, gravy, soup
- Fruit and veg are 80-90% water

PROTEIN ALLOWANCE

The protein allowance a child has will depend on their medical condition

- Children on Peritoneal Dialysis need more protein in their diet compared to a child on Haemodialysis

Children with Congenital NS will require high protein intakes

Children in end stage renal failure may need to limit their protein intake to delay dialysis.

PROTEIN AND ENERGY REQUIREMENTS FOR CHILDREN ON HD

HD		
	Kcal/kg	Protein/kg
Preterm	110-135	3
0-2 months	96-120	2.2
3-12 months	72-96	1.7
1-3 years	78-82	1.2
4- puberty	Minimum EAR for chronological age. If height <2 nd centile use height age	1.1
Pubertal		1.1
Post pubertal		1.1

PROTEIN AND ENERGY REQUIREMENTS FOR CHILDREN ON PD

PD		
	Kcal/kg	Protein/kg
Preterm	110-135	3-4
0-2 months	96-120	2.4
3-12 months	72-96	1.9
1-3 years	78-82	1.4
4- puberty	Minimum EAR for chronological age. If height <2 nd centile use height age	1.3
Pubertal		1.2
Post pubertal		1-1.2

HYPERPHOSPHATEMIA

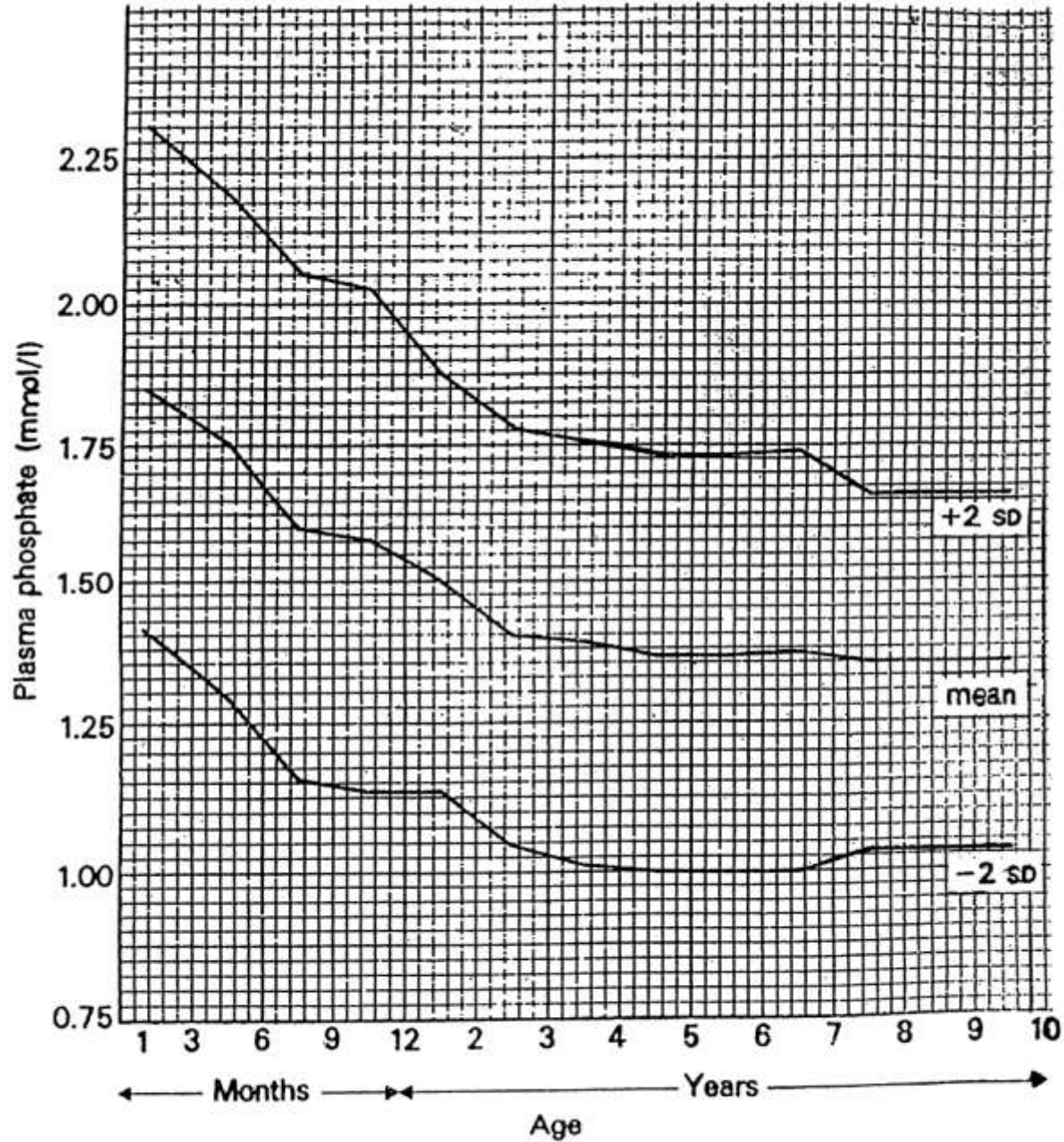
Common in children with CKD

Most children will be started on a phosphate binder

Best to have before main meals and snacks containing phosphate

Low phosphate diets are sometimes required

- Foods contain high amount of phosphate in the form of additives
- Look at the labels – dicalcium phosphate, sodium tripolyphosphate, tetrasodium pyrophosphate



Plasma phosphate.

PHOSPHATE

Found in most foods, especially those with a higher protein content

Phosphate in cereals foods, less well absorbed

Absorption of organic phosphate from foods 40 – 60 %

Absorption from inorganic phosphate >90%

Keep infants of first stage formula until 2 years of age.

GUIDELINE FOR PHOSPHATE INTAKE

Age	Weight	Intake per day
Infants	<10kg	<400mg
Children	10-20kg	<600mg
Children	20-40kg	<800mg
Children	>40kg	<1000mg

PHOSPHATE

Foods high in phosphate

All forms of cow's milk, dried milk

Large portion of meat, chicken, and fish. Processed meats containing phosphate additives

Yoghurt, fromage frais, rice pudding and ice cream

Evaporated, condensed milk and single cream.

Alternatives

Whey based infant formula, specified quantity of cow's milk, low protein milk substitute

Reduced meat portion

- Use child's palm size as a guide

Custard made with milk substitute, **specified** quantity of yoghurt or fromage frais

Double cream.

PHOSPHATE

Foods high in phosphate

Chocolate and chocolate containing foods

Sardines, pilchards, tuna

Baked beans and pulses

Cola drinks and others containing phosphoric acid.










Alternatives

Boiled sweets, mints and candy sweets

White fish

Vegetables

Squash, cordials, Lucozade, and lemonade.

Phosphate Binder	Type	Strength	Calcium (mg/tab)	Cost/average dose	Administration	Possible side effects	Maximum dose	
Renacet (Stanningley)	Ca acetate	475mg	120	£9.68/180tab (6/d)	swallow with meals	Nausea + constipation (rare), high Ca	14	
		950mg scored	240	£18.45/180tab (6/d)	swallow with meals	Nausea + constipation (rare), high Ca	7	
Phosex (Pharmacosmos)	Ca acetate	1000mg scored	250	£19.79/180tab (6/d)	swallow with meals	N+V, constipation, diarrhoea, high Ca	12	
Osvaren (Fresenius)	Ca acetate + mg	435mg	110	£24/180tab (6/d)	swallow with meals	Nausea, constipation, diarrhoea, belching, pruritis, high Mg/Ca	12	
Calcichew (Takeda)	Ca carbonate	1250mg	500	£8.40/90tab (3/d)	Chew 5-10mins pre meals	N+V, constipation, diarrhoea, high Ca	3	
Renvela (Sanofi)	Sevelemer carbonate	800mg	0	£167/180tab (6/d) or 2sachets	swallow with meals or disperse powder into 60ml water (1 sachet=3tab 2.4g)	N+V, abdo pain, constipation, diarrhoea, dyspepsia, flatulence	8-12 or 3-4 sachets	
Renagel (Sanofi)	Sevelemer hydrochloride	800mg	0	£167/180tab (6/d)	swallow with meals	N+V, abdo pain, constipation, diarrhoea, dyspepsia, flatulence	12-15	
Fosrenol (Shire)	Lanthanum carbonate	500mg, 750mg, 1000mg	0	£182.60/90tab (3/d 750mg)	Chew straight after meals or mix powder into soft food (750-1000mg sachets)	N+V, abdo pain, constipation, diarrhoea, dyspepsia, flatulence, headache	3g	
Alucaps (Meda)	Aluminium Hydroxide	475mg	0	£13.71/120tab (4/d)	swallow with meals	Constipation, high Al	Normal usage 3-9 Stop if serum Aluminium >1	

SPECIALIST ENTERAL FEEDS AND SUPPLEMENTS

Renastart

- Low in potassium, phosphate, protein and vit A
- High in energy, 1 kcal /ml at standard concentration
- Can be concentrated up to 2kcal per ml
- Whey based milk, containing LCP's
- Use when K is too high and child on mainly milk feeds
- Can be used up to 10 years of age



RENASTART COMPARISON PER 100ML

Name	Conc %	Energy Kcal	Protein g	Sodium mmol	Potassium mmol	Calcium mg	Phos mg	Vit A µg
Renastart	20%	99	1.5	2.1	0.6	22.6	18.4	25.4
Renastart	30%	149	2.25	3.12	0.87	33.9	27.6	38.4
Renastart	40%	198	3.0	4.16	1.16	45.2	36.8	51.2
First Infant milk (standard)		67	1.3	1.0	1.6	47	24	74
High Energy Infant milk		100	2.6	1.09	2.0	80	42	100

ENERGY SUPPLEMENTS

2 forms

- Liquid and powder
- Either as CHO, fat or a mix of CHO and fat

Used to add to feeds or foods to increase non protein energy content

Some will affect the taste others will not



OTHER SUPPLEMENTS USED

ProZero

- Low protein milk



Vitabite

- Low protein chocolate

Paediasure Plus Juice



Paediasure Compact



LOW PROTEIN MILKS PER 100ML

Name	Energy kcal	Protein g	Sodium mmol	Potassium mmol	Calcium mg	Phosphate mg
Snopro	89	0.16	<3.3	<1.3	<20	<30
Prozero	67	0	1.8	2.0	1.5	0
Full cream cow's milk	66	3.3	1.87	3.97	118	93
Semi skimmed Cow's milk	46	3.4	1.87	4.0	120	94

CASE STUDY

9 year old girl presented to UHW Dec 2014 with:

- Raised u+e's, presumed AKI
 - **Sodium 137 Potassium 6.1 Urea 17.5**
Creatinine 380 Corr Calcium 2.4 Phosphate 1.66
Albumin 27 Haemoglobin 93
- Bone marrow suppression
- Raised lymph nodes in her neck
- Large liver and spleen
- EBV PCR +ve

BIOCHEMISTRY

Date	8/12/15	9/12/15	10/12/15	11/12/15	12/12/15	13/12/15
Sodium	137	139	134	130	128	139
Potassium	6.1	5.2	4.6	4.0	4.4	4.7
Urea	17.5	18.6	19.1	17.8	18.6	28.4
Creatinine	380	402	402	431	480	659
Bicarbonate		19			12	14
Cor Calcium	2.4	2.36	2.39	2.14	2.35	2.34
Phosphate	1.66	1.83	1.75	1.65	1.66	2.21
Albumin	27	26	23	17		
Haemoglobin	93	94		73	80	

SO FAR, WITHIN 5 DAYS OF ADMISSION

Renal bloods deteriorating

- Permacath inserted to start Haemodialysis

Passing little or no urine

Acidotic

Potassium no longer an issue, therefore low potassium diet relaxed

Started on Prednisolone and hyper hydration

BIOCHEMISTRY CONT.

Date	15/12/15	15/12/15	16/12/15	18/12/15	19/12/15	21/12/15
Sodium	137	139	138	139	140	146
Potassium	3.1	2.7	3.0	3.2	3.3	3.4
Urea	26.9	9.7	24.1	32.4	23.7	31.1
Creatinine	601	231	418	456	389	454
Bicarbonate	22				22	21
Cor Calcium	2.36			2.36	2.41	2.25
Phosphate	1.83			0.72	1.18	1.8
Albumin	20			22	24	26
Haemoglobin	94			91	91	83

ASSESSMENT OF THE DIET

Breakfast:

- 1 x toast with butter or
- 2 x weetabix with milk and sugar or
- breakfast bar
- Sugar free squash to drink

Mid morning:

- fruit

Lunch:

- Ham and cheese sandwich,
- chocolate bar,
- packet of crisps,
- water to drink

Mid afternoon:

- Sugar free squash or water to drink

Evening meal:

- Spaghetti bolognese or
- Tuna pasta mayonnaise or
- Fish fingers/chicken nuggets/sausages
- Potatoes/rice/garlic bread
- Vegetables
- Sugar free squash to drink

Bedtime:

- Water to drink

ASSESSMENT OF THE DIET

Breakfast:

- 1 x toast with butter or
- 2 x Weetabix (4) with milk (6) and sugar or
- breakfast bar
- Sugar free squash to drink

Mid morning:

- fruit

Lunch:

- Ham(6) and cheese(6) sandwich, (4)
- chocolate bar, (2)
- packet of crisps,
- water to drink

Mid afternoon:

- Sugar free squash or water to drink

Evening meal:

- Spaghetti bolognese or
- Tuna pasta mayonnaise or
- Fish fingers/chicken (12) nuggets/sausages
- Potatoes/rice/garlic bread (2)
- Vegetables
- Sugar free squash to drink

Bedtime:

- Water to drink

THE FOLLOWING 2 WEEKS

Fluid intake became an issue, the IDWG 's started to increase despite a fluid restriction of 800ml

Renal transplant work up was commenced

BIOCHEMISTRY CONT.

Date	24/12/15	29/12/15	18/1/16	29/2/16	28/3/16
Sodium	144	137	138	140	140
Potassium	5.1	5.0	5.0	5.5	5.3
Urea	38.0	26.0	19.6	28.7	26.2
Creatinine	425	444	495	628	512
Bicarbonate	19	19	23	21	18
Cor. Calcium	2.3	2.48	2.54	2.62	2.44
Phosphate	1.84	2.97	1.66	1.62	1.96
Albumin	27	32	33	35	35
Haemoglobin	91			137	117

MARCH 2016 TO DATE

A PD catheter was inserted in March 2016 and she was admitted to the ward for the family to learn the techniques of PD

Overnight PD was commenced and starting volumes of fluid was 400ml per cycle

This cycle volume increased up to 1100ml on d/c

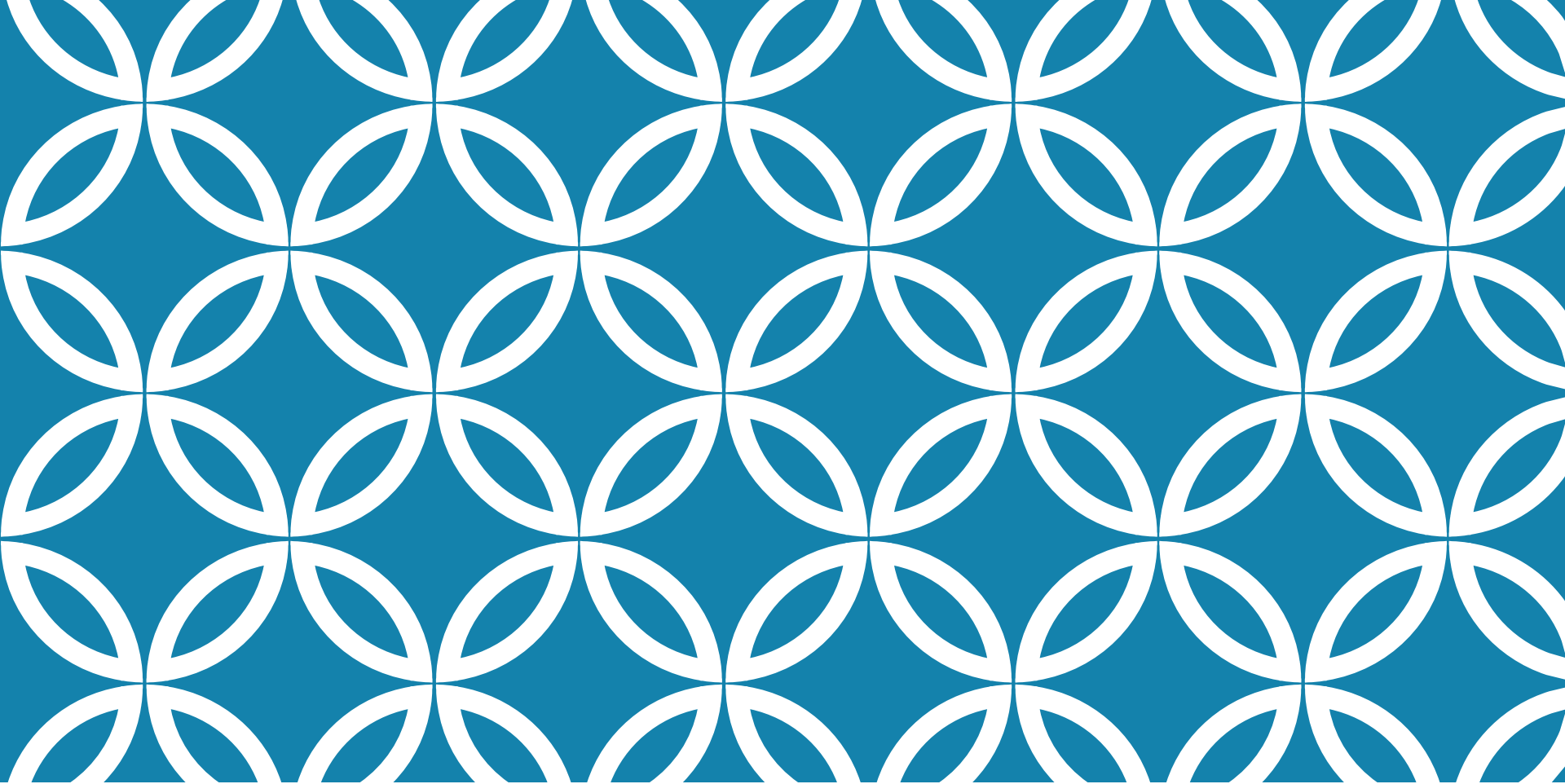
Dialysis 1100ml fill, 10 cycles over 10 hours with a mix of weak and medium dialysate fluid

PD continued until May 2017 when she received a renal transplant from her grandfather

Kidney still functioning well.

WEIGHT HISTORY

Date	Weight Kg	Weight centile	Height cm	Height Centile
15/12/15	25.5			
15/1/16	25.6	9-25 th	125.8	2-9 th
15/2/16	26.4	9-25 th	126.0	2-9 th
30/3/16 *	27.5	9-25 th	127.9	2-9 th
23/5/16	28.1	25 th	129.8	9-25 th
15/8/16	29.8	25-50 th	131.7	9-25 th
31/10/16	30.9	25-50 th	131.6	9-25 th
19/12/16	30.3	25-50 th	133.0	9-25 th
30/1/17	32.1	25-50 th	134.5	9-25 th
10/5/17 *	34.8	25-50 th	136.5	9-25 th
16/4/18	46.9	75-91 st	140.2	9-25 th
1/10/18	49.4	75-91 st	142.8	9-25 th



THANK YOU

