University Hospitals Coventry & Warwickshire NHS Trust

Clinical Guideline (full)

CHRONIC KIDNEY DISEASE (CKD) NUTRITIONAL RECOMMENDATIONS FOR PERITONEAL DIALYSIS	
E-Library Reference	CG1339

Version:	5
Approving forum (QIPS or equivalent):	Renal Services Group
Specialty Clinical Guideline Lead:	Dr Simon Fletcher Renal Clinical Director
Contributing Author(s) and reviewer(s):	Sarah Wallace Specialist Renal Dietitian sarah.wallace@uhcw.nhs.uk Sharon Huish (nee Parker) Specialist Renal Dietitian sharon.huish@uhcw.nhs.uk
Department(s) / Primary Speciality:	Renal dietetic team

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Superseded UHCW Clinical Guideline(s): (if applicable)	Chronic Kidney Disease (CKD) Nutritional Recommendations for Peritoneal Dialysis (Version 4)
UHCW Associated Records:	
Keywords:	Peritoneal dialysis + nutrition

Clinical Operating Procedures relating to this guidance (please list)	
Summary version available	☐

Guideline clinical content

Clinical Guidelines assist in decision-making; they do not replace clinical judgement. Regardless of the strength of evidence, it remains the responsibility of the clinician to interpret the application of the clinical guidance to local circumstances and the needs and wishes of the individual patient. Where variations of any kind do occur, it is important to document the variations and the reason for them in the patient's health record. If in doubt, seek senior advice.

Introduction

This document is for renal dietitians and other healthcare professionals who care for people with stage 5 CKD who need renal replacement therapy, specifically peritoneal dialysis (PD).

- All patients should be assessed by a renal dietitian when they commence PD.
- Thereafter patients should be reviewed either indirectly or directly every 6 months. A direct (face to face) review should be carried out annually. More frequent review may be required dependant on blood results and identified nutritional needs.
- All patients should be screened for undernutrition using the nutrition screening guidelines.
- The dietitian will participate in the multi-disciplinary PD Quality Assurance (PDQA) clinics (3 per month), during which Subjective Global Assessment (SGA) and Handgrip Strength (HGS) measurements will be carried out where possible, and patients requiring further review will be identified.

Summary

Recommendations for guideline content

Ideal Body Weight (IBW) should be calculated to determine nutritional requirements. Appendix C (i) gives guidance on this.

Energy: 30 – 35 Kcal/Kg IBW/day

Patients should be advised to consume 30 – 35 Kcal /Kg IBW/day in order to achieve and/or maintain IBW as well as appropriate nitrogen balance. Consideration should be given to energy gained through PD glucose absorption. Energy intakes can be reduced to 30 Kcal/kg/IBW/day in the elderly and patients with reduced activity (KDOQI 2006, RA 2010, BDA 2011).

Protein: 1 – 1.2 g protein/Kg IBW/day

Patients should be advised to have a minimum protein intake of 1 – 1.2g protein/Kg IBW/day in order to meet increased requirements associated with PD (increase in basic requirements in addition to PD losses). At least 50% of protein intake should be HBV (High Biological Value). Requirements increase during peritonitis and patients should be encouraged to increase their protein intake to reflect this (BDA 2011); a patient information leaflet has been developed and is available on eLibrary (see Section 12, UHCW Association Records).

Potassium: Maintain serum potassium between 3.5 – 5.5 mmol/L

All PD patients should maintain their serum potassium between 3.5 – 5.5 mmol/L. Any pre-existing dietary restrictions should be reviewed on commencement of dialysis. Reduced potassium diets may compromise nutrient intake and should only be used where appropriate. Non dietary causes of hyperkalaemia should be excluded prior to commencing dietary restriction e.g. inadequate dialysis, medications. Aim for a normal range of serum bicarbonate (22 – 29 mmol/L).

Phosphate: Maintain serum phosphate between 1.1 and 1.7 mmol/L

All PD patients should maintain their serum phosphate between 1.1 – 1.7 mmol/L (RA 2010). Dietary restriction and/or phosphate binders may be required. The phosphate binders used locally are: Calcium acetate (Renacet or Phosex), Calcium carbonate (Calcichew), Lanthanum carbonate (Fosrenol), Sevelamer carbonate (Renegel) or Sevelamer hydrochloride (Renvela). (See Appendix D). Calcium Acetate should be used as first line where appropriate (NICE 2013).

Calcium: Maintain between 2.2 – 2.5 mmol/L (corrected for serum albumin)

Calcium should be managed in line with PTH (see below). In the presence of hypercalcaemia all calcium therapies should be reviewed (agreed best practice).

Intact Parathyroid Hormone (iPTH): 8 – 38 pmol/L (2 – 9 times the upper laboratory target)

Treatment should be based on trends; patients with levels of iPTH above the target range should be assessed for hyperphosphatemia and hypocalcaemia (KDIGO 2009). Active vitamin D analogues calcitriol and alfacalcidol should be used to down regulate the PTH (KDIGO 2009, NICE 2009, RA 2010). Patients with an iPTH above the target range despite appropriate use of calcitriol or alfacalcidol should be prescribed paricalcitol. Patients with a PTH above 85pmol/L who are refractory to standard therapy (calcitriol, alfacalcidol and paricalcitol) should be considered for cinacalcet or if appropriate partial or total parathyroidectomy (NICE 2009).

Sodium: Aim <100 mmol sodium (<6g salt/d)

This should help to improve blood pressure control and minimise fluid gains. Salt substitutes that contain potassium salts should be avoided unless advised otherwise by your dietitian (Sign 2008).

Fluid: Aim 750ml + previous days urine output

Individual capacity for ultrafiltration must be considered. Sodium restriction will help to minimise fluid gains (RA 2010).

Vitamins & Minerals:

No specific criteria set. Consider water soluble vitamin supplementation, particularly vitamin C and folate for patients on restricted diets or those who have been identified as being nutritionally compromised. Avoid supplements containing fat soluble vitamins due to reduced excretion in dialysis patients and risk of toxicity. Suitable multivitamin preparations include Renavit and also standard pregnancy multivitamins.

Definitions

BMI = Body Mass Index

CKD = Chronic Kidney Disease

FR = Fluid Restriction

IBW = Ideal Body Weight

iPTH = Intact Parathyroid Hormone

PPI = Proton Pump Inhibitors

PD = Peritoneal Dialysis

PTH = Parathyroid Hormone

PDQA = PD Quality Assurance

PDUO = Previous days urine output

SGA = Subjective Global Assessment HGS = Handgrip Strength
Guideline details

Assessment

- All patients should be reviewed when they commence PD and followed up within two months. Thereafter, patients should be reviewed every six months. More frequent review may be necessary dependant on blood results or other identified dietetic needs.

- The dietitian will aim to attend multi-disciplinary PDQA clinics (3 per month), during which SGA and HGS measurements will be carried out where possible, and patients requiring further review will be identified.

- All patients should be screened for malnutrition using the following nutrition screening guidelines;
    - Actual Body Weight < 85% of Ideal Body Weight
    - Reduction in oedema free body weight (of 5% or more in 3 months or 10% or more in 6 months)
    - BMI (<20kg/m2)
    - Subjective Global Assessment (SGA) (1 – 5 on 7-point scale)

The above measures have been linked to increased mortality and other adverse outcomes (RA 2010).

Nutrient intakes

For the following nutrient requirements Ideal Body Weight (IBW) should be calculated using a BMI of 20kg/m² if the patient's BMI is <20kg/m², a BMI of 25kg/m² if the patient's BMI is above 25kg/m² and actual BMI if the patient's BMI is between 20 and 25kg/m² (RA 2010).

Energy

- 30-35 kcal/kg IBW/day for all patients depending upon age and physical activity (RA 2010).

- Additional calories gained from peritoneal absorption of dialysate glucose should be included when estimating total energy intake (Appendix A).

- Renal patients are at high risk of hyperlipidaemia and cardiovascular disease (CVD). As such, healthy eating guidelines should be followed where appropriate.

- Reduced intakes of 30 Kg/IBW/day may be appropriate in older adults (those >60 years of age), and patients with reduced activity (agreed best practice).

- Patients with CKD should ideally have a BMI of at least 20 and a maximum of 30 (agreed best practice). Individuals with a BMI > 30 or <20 should be referred to a dietitian for assessment.

- Regular dietetic review will help to identify when modifications to energy intake are needed.

Protein

- Adequate dietary protein is required to meet basic requirements, to compensate for dialysis induced catabolism, and to replace peritoneal losses (4 – 12 g/d). Peritoneal losses can increase by up to 70% during peritonitis.

- Patients should be advised to have a minimum protein intake of 1 – 1.2 g protein/Kg IBW/day (BDA 2011).

- At least 50% of protein intake should be HBV (High Biological Value) (BDA 2011).

- Requirements increase during peritonitis, aim for 1.5 g protein/Kg IBW/d.

- Any PD patients with peritonitis should be referred to the dietitian for dietary assessment. PD staff can provide the patient with the information sheet from eLibrary (PD peritonitis and diet) and supply them with some nutritional supplements (Fortisip Compact Protein) to trial, until the dietitian reviews them.

Potassium

- Maintain serum potassium levels at 3.5 – 5.5 mmol/L.

- Patients should be reviewed by a dietitian on commencement of PD and given dietary advice.

- Reduced potassium diets may compromise nutrient intake and should only be used where appropriate, target 1 mmol/Kg IBW/day if needed.

- Non dietary causes of hyperkalaemia should also be considered (Appendix B).

- Aim for a normal range of serum bicarbonate (22 – 29 mmol/L).

- Where serum potassium levels are consistently <3.5 mmol/L an increased potassium diet should be advised.

Phosphate

- Maintain serum phosphate levels at 1.1 – 1.7 mmol/L.

- Dietary restriction and/or phosphate binders may be required.

- The phosphate binders used locally are: Renacet, Phosex, Calcichew, Fosrenol, Renegel and Renvela.

- Calcium Acetate should be the first line calcium-based phosphate binder (NICE 2013).

- Patients should be reviewed by a renal dietitian when commencing or changing phosphate binders to ensure appropriate advice is given regarding correct usage, timing and types of foods they need to be taken with.

- Phosphate binders should not be taken at the same time as oral iron supplements as this will reduce the effectiveness of both medications. Calcium carbonate should be used with caution in patients on PPI's since this can affect efficacy.
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- Phosphate restriction can compromise nutritional adequacy, particularly protein intake and therefore should be given under dietetic supervision.
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- It may be difficult in some patients, especially vegetarians, to achieve an adequate protein intake on a low phosphate diet and this should be taken into consideration.

Calcium

- Maintain serum calcium levels at 2.2 – 2.5 mmol/L (corrected for serum albumin).

- If calcium levels are >2.5 mmol/L then all calcium based therapies should be reviewed.

- If a patient's serum calcium exceeds the upper limit of the target range then lower calcium dialysate should be considered.

- Calcium should be managed inline with iPTH (see below).

Intact Parathyroid Hormone

- Treatment should be based on trends; patients with levels of iPTH above the target range should be assessed for hyperphosphatemia and hypocalcaemia (KDIGO 2009).

- Abnormalities should be addressed by: reducing dietary phosphate intake and/or administering phosphate binders, calcium supplements and active vitamin D analogues; calcitriol or alfacalcidol (KDIGO 2009, NICE 2009, RA 2010).

- Patients with an iPTH above the target range despite appropriate use of calcitriol or alfacalcidol should be prescribed paricalcitol.

- Patients with an iPTH above 85pmol/L who are refractory to standard therapy (calcitriol, alfacalcidol and paricalcitol) should be considered for cinacalcet or if appropriate partial or total parathyroidectomy (NICE 2009).

Sodium

- Dietary salt intakes >6g/d precipitate hypertension.

- All patients (with the exception of 'salt losers') should be advised on achieving a sodium intake of <100 mmol (6g salt) a day (SIGN 2008).

- Dietary sodium restriction is important for the regulation of sodium balance and will also aid adherence to a fluid restriction by reducing thirst.

- Dietary sodium restriction should not be maintained at the expense of nutritional status. Temporary relaxation of the restriction may be appropriate to encourage improved oral intake (agreed best practice).

Fluid

- Patients should be given advice to help them adhere to their fluid restriction (FR).

- Recommendations for FR are made by the medical team.

- As a general guideline FR = 750ml + PDUO (Previous days urine output) (RA, 2010), however the ultrafiltration capacity of each patient will need to be taken into consideration.

- Sodium restriction will help to control fluid intake by reducing thirst.

- Fluid overload is often treated by increasing ultrafiltration, using hypertonic dialysis fluids (strong bags). Regular use of hypertonic fluids will increase the glucose load on the body and lead to a greater risk of obesity, hypertriglyceridaemia, as well potentially decreasing the lifespan of PD.

Vitamins and Minerals

- Little is known about the specific vitamin and mineral requirements of PD patients.

- Dietary restrictions, early satiety, and periods of illness all impact on intake of some micronutrients.

- Water soluble vitamins, particularly folate and vitamin C are removed during dialysis.
- Micronutrient losses during dialysis may be offset to some extent by reduced urinary losses and altered renal metabolism.
- Consider water soluble vitamin supplementation, particularly vitamin C and folate for patients on restricted diets or those who have been identified as being nutritionally compromised.
- Avoid supplements containing fat soluble vitamins due to reduced excretion in dialysis patients and risk of toxicity. This includes fish liver oils. Suitable multivitamin preparations include Renavit and also standard pregnancy multivitamins.
- Dietitians should ensure patients are not following any unnecessary dietary restrictions. Where dietary intake is considered to be inadequate advice should be given on appropriate supplementation

Additional Considerations

- Changes to dialysis regimen need to be considered with regards to calories gained from the dialysate.
- Nutrineal solution is generally used by diabetic patients; this exchange needs to be undertaken around meal time. It can also be used when the protein intake is inadequate although patients should be well dialysed and monitored for signs of acidosis.
- Dialysis adequacy (ideally a combined urinary and peritoneal Kt/V urea of >1.7L/week or a creatinine clearance of >50L week/1.73m^2 minimal treatment (RA 2010). However, at UHCW we aim for a higher creatinine clearance of > 60L/wk for CAPD, >65L/wk for APD, and a Kt/V of 2.0L/week.
- Inadequate dialysis is likely to have a detrimental effect on nutritional status due to uraemia.

End of clinical content
Guideline Governance
Implementation
These guidelines have been disseminated and implemented through the dietetic and renal multidisciplinary meetings, and are on the e-library so that all members of the renal multidisciplinary team have access to them.
Training
All new renal dietitians have an introduction and training programme. Included within this is training on the implementation of the renal dietetic guidelines.
Patient Information
▪ Everything I need to know about CAPD associated peritonitis; Reference No HIC/LFT/596/07 ▪ Renal Disease: Peritoneal Dialysis and Diet; Reference No HIC/LFT/848/09 ▪ Renal Disease: Peritonitis and Diet; Reference No HIC/LFT/2041/16 ▪ The Management of Fluid Balance; Reference No COP 77 V3 ▪ Renal Disease: Eating well on dialysis; Reference HIC/LFT/457/09 Renal Disease: Fluid

allowance; Reference No HIC/LFT/458/07

Audit & Monitoring				
Aspect being monitored	Monitoring method	Responsible department(s)	Frequency	Group / committee receiving report & responsible for actions
PD patient spreadsheet	Excel Spreadsheet, colour coded to identify patients who are close to (or fall outside) of RA audit criteria (date of review, SGA and HGS).	Dietetics	Monthly	Renal Clinical Forum / Renal Dietetics Team
Initial assessment	Audit of dietetic records against proton timeline to check patients have been seen during PD training.	Dietetics	Annually	Renal QIPPS / Renal Dietetics Team
End of Governance content				

Guideline References

CEBIS Evidence Summary

British Dietetic Association evidence-based guidelines for the protein requirements of adults undergoing maintenance haemodialysis or peritoneal dialysis. Journal of Renal Nutrition (2013); 26 (4); 315–328

KDOQI Clinical Practice Guidelines for Bone Metabolism and Disease in Chronic Kidney Disease. American Journal of Kidney Diseases (2003); 42 (4 Suppl 3).

Kidney Disease: Improving Global Outcomes (KDIGO) CKD–MBD Work Group. **KDIGO clinical practice guideline for the diagnosis, evaluation, prevention, and treatment of chronic kidney disease–mineral and bone disorder (CKD–MBD).** Kidney International 2009; 76 (Suppl 113).

National Institute for Health and Care Excellence (NICE) Hyperphosphataemia in chronic kidney disease: Management of hyperphosphataemia in patients with stage 4 or 5 chronic kidney disease. CG157. 2013 London: NICE (online) available from http://guidance.nice.org.uk/cg157

National Institute for Health and Care Excellence (NICE): **Cinacalcet for the treatment of secondary hyperparathyroidism in patients with end-stage renal disease on maintenance dialysis therapy:** NICE technology appraisal guidance 117 available from: http://www.nice.org.uk/Guidance/TA117

Scottish Intercollegiate Guidelines Network (SIGN) Diagnosis and Management of Chronic Kidney Disease. SIGN 2008 available from: http://www.sign.ac.uk/pdf/qrg103.pdf

Woodrow G, Davies S. **Clinical Practice Guidelines: Peritoneal Dialysis.** 5th ed. 2010. Petersfield: UK Renal Association. [online] available from: http://www.renal.org/Clinical/GuidelinesSection/PeritonealDialysis.aspx

Wright M, Jones C. **Clinical Practice Guidelines: Nutrition in CKD.** 5th ed. 2010. Petersfield: UK Renal Association. [online] available from: http://www.renal.org/Clinical/GuidelinesSection/NutritionInCKD.aspx

References cited in guideline	Grade*
KDOQI Clinical Practice Guidelines for Nutrition in Chronic Renal Failure (2000) and KDOQI Clinical Practice Guidelines for Bone Metabolism and Disease in Chronic Kidney Disease (2003)	3 – 5
Renal Association Guidelines (2010)	3 – 5
KDIGO- Clinical Practice Guidelines for the Diagnosis, Evaluation, Prevention & Treatment of Chronic kidney disease and mineral and bone disorders (CKD-MBD), 2009	3 – 5
National Institute for Health and Care Excellence (NICE) Hyperphosphataemia in chronic kidney disease: Management of hyperphosphataemia in patients with stage 4 or 5 chronic kidney disease. CG157. 2013	3 – 4
BDA Renal Nutrition Group. Evidence Based Dietetic Guidelines Protein Requirements Of Adults On Haemodialysis And Peritoneal Dialysis 2011	3 – 5

***Grade:- The references are graded through the CEBIS process according to the criteria outlined below.**

Grade of evidence	**Based on**
1	Systematic review or meta-analysis
2	Randomised controlled trial/s
3	Controlled study without randomisation (e.g. case controlled) or quasi-experimental study, such as a cohort study
4	Descriptive studies such as case series and reports.
5	Expert opinion, narrative review

APPENDICES

Appendix A

Estimation of Energy Gains from CAPD Dialysis Fluid*

% Glucose	Volume (ml)	Kcal Content	Kcals Absorbed	
1.36	2000	109	76	Assuming approx. 70% absorption
2.27	2000	182	127	Assuming approx. 70% absorption
3.86	2000	309	216	Assuming approx. 70% absorption

Icodextrin (Extraneal)	2000	600	120	Approx. 20% absorption (8 hrs dwell time)
			270	Approx. 35% absorption (12 hrs dwell time)

*Baxter Dialysis Fluids
Calculations based on information from Baxter Healthcare Ltd.

Appendix B:

Factors affecting serum potassium levels in renal failure

Normal serum potassium levels:
Pre-dialysis: 3.7 – 5.5 mmol/l
HD patients: 3.5 – 6.0 mmol/l
PD patients : 3.5 – 5.5 mmol/l

An **INCREASE** in serum potassium could be due to :-

Diet

- High potassium foods

Drugs

- Erythropoetin (EPO) therapy.
- Regulan treatment - Original flavour version contains 6 - 7 mmol k+ per sachet, the orange and lemon/lime flavour versions contains < 1 mmol k+ per sachet.
- Fybogel – The original flavour contains approximately 2.5mmol k+ per sachet, the orange flavour contains 0.7mmol k+ per sachet
- ACE inhibitors, for example; Captopril, Enalopril, Lisinopril
- ARBs, for example losartan, candesartan, irbesartan
- Potassium salts for example Slow K (prescribed when serum k+ low and not reviewed/stopped).
- Potassium sparing diuretics, eg. Spironolactone etc. (Not usually used in renal failure for this reason).

Metabolic

- Poor diabetic control / Insulin deficiency
- Dehydration.
- Acidosis.
- Hypoaldosteronism.

Catabolic

- Infection / Sepsis.
- Rapid catabolism / Weight loss.
- Burns.
- Crush injuries / Rhabdomyolosis / Ischaemia.

Other

- Constipation (more potassium is generally excreted in the stools of renal patients)
- A small temporary increase in potassium of 0.5 mmol/l is usual following exercise
- Blood Transfusion.
- Haemolysed blood sample.

In HD patients, other factors to consider

- Inadequate dialysis
- Incorrect dialysate used
- Recirculation

Treatment for high potassium:

Medical Management (managed by the medical team)

- Calcium gluconate
- Sodium Bicarbonate
- Dextrose and insulin

- Dialysis – haemodialysis, haemofiltration
- Ion exchange resins e.g. calcium resonium

Dietary Management

- Dietary potassium restriction

A **DECREASE** in serum potassium could be due to:-

Diet

- Over enthusiastic dietary restriction

Drugs

- Diuretics that cause potassium loss e.g. frusemide (note: potassium levels will rise when patient ceases these).
- Salbutamol – orally or high dose inhaled
- Amphotericin – damages the renal tubule and causes potassium loss from the body.
- Sodium bicarbonate treatment lowers potassium.
- Laxative abuse

Increased potassium losses

- Recovery of renal function while maintaining reduced dietary intake
- Vomiting
- Fistula/wound losses
- Diarrhoea
- Ileostomy

Metabolic

- Alkalosis

Appendix C:

UHCW renal dietitian's outpatient referral criteria for renal dietetic review

Please refer the following patients for dietetic review:-

Peritoneal Dialysis Patients with any of the following:

- Phosphate > 1.70mmol/l on 2 or more consecutive results, or patients commencing phosphate binders
- Potassium > 5.5mmol/l with a normal bicarbonate (22-29)
- Symptoms of poor appetite or weight loss
- Queries or questions relating to diet
- Poor diabetic control IFCC HbA1c >58mmol/mol

Contact us on 02476966151, or ext 26151 at UHCW NHS Trust or email GMRENDIET@uhcw.nhs.uk

Appendix Ci:

Nutritional screening:

Subjective assessment

Height (m) (first contact only)

Weight (Kg) (this is the weight including the fluid from the bag)

Body mass index (BMI)

Ideal body weight (IBW) is equivalent to:

Actual BMI if BMI between 20-25

BMI of 20 if BMI is less than 20

BMI of 25 if BMI is greater than 25

(Renal Association Guidelines 2010 - Screening for undernutrition in CKD)

Biochemistry Monitoring;

Routine; Urea and Electrolytes, Bone, Phosphate, Albumin, iPTH, Haemoglobin, Ferritin,

The following additional bloods may also be appropriate; Magnesium, C-Reactive Protein, Cholesterol, Triglycerides, HbA1C, Glucose

Diet history / food diary

Estimated nutritional requirements

Estimated calorie and protein intake

Appendix Cii:

Renal Association Guidelines 2010; Screening for undernutrition in CKD

Screening methods for undernutrition in CKD

We recommend that all patients with stage 4-5 CKD should have the following parameters measured as a minimum in order to identify undernutrition (1C):

- Actual Body Weight (ABW) (< 85% of Ideal Body Weight (IBW))
- Reduction in oedema free body weight (of 5% or more in 3 months or 10% or more in 6 months)
- BMI <20kg/m2
- Subjective Global Assessment (SGA) (B/C on 3 point scale or 1-5 on 7 point scale)

The above simple audit measures have been linked to increased mortality and other adverse outcomes.

Appendix D

Phosphate Binders used in UHCW NHS Trust

Phosphate Binder	Administration
Calcium acetate (Renacet 475mg or 950mg, Phosex1g)	Swallow whole (or can be snapped into two pieces) **with meals**
Calcium carbonate (Calcichew) (500mg)	Chewed or sucked **10-15minutes before meals**
Lanthanum carbonate (Fosrenol) (500mg/750mg/1000mg chewable tablets and 750mg and 1000mg powder sachets)	To be taken at the **end of meals** or **immediately after meals**
Sevelamer carbonate (Renvela) (800mg or 2.4g powder sachet)	Swallow whole or take powder mixed with 60mls water as a drink **with meals**
Sevelamer hydrochloride (Renagel) (800mg)	Swallow whole **with meals**