Guideline for the optimal care of patients on chronic dialysis in South Africa

This guideline was updated by the members of the Executive Committee of the South African Renal Society, and adopted in May 2015.

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Introduction

The Executive Committee of the SA Renal Society was involved in updating this guideline. Individual members were tasked with updating sections of the previous guideline based on published evidence, and new sections were added that were felt to be of relevance. Professors Graham Paget and Sarala Naicker were primarily responsible for the collation and editing of the document. Updates and corrections were ratified by the members of the Executive Committee, and then sent out for comment to the general membership of the SA Renal Society. The document has been in preparation for around 12 months and is intended as a practical guide for all involved in nephrology in South Africa, in both public and private sectors.

1. Measurement of renal function by assessment of GFR

Measurement of GFR using exogenous markers may be required in special situations such as when dosing toxic drugs with a narrow therapeutic window, and in the assessment of living renal donors prior to kidney donation. Radioisotope markers such as ^{99m}Tc-DTPA are commonly used.

In practice, the usual way of assessing renal function is by estimating GFR from serum creatinine using a prediction equation like the Modification of Diet in Renal Disease (MDRD) Study and the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equations.

Serum creatinine can only be used to estimate GFR in individuals with stable kidney function. Other limitations include variations in the production, secretion and extra-renal excretion of creatinine, and issues associ- ated with creatinine measurement. Creatinine as a marker is less reliable with extremes of body size or muscle mass (e.g. amputation), unusual nutritional states (e.g. vegan diet) and pregnancy.

To reduce the variation in measurement, most laboratories now use creatinine assays which are traceable to reference materials. They therefore report "standardised creatinine" which has important implications for estimating GFR using the prediction equations.

Note 1: Screening for kidney disease should involve blood pressure measurement and urine dipstick testing. If any abnormalities are found then the estimated GFR should be determined by measuring serum creatinine concentration and the protein excretion quantified by measuring the protein/creatinine ratio or albumin/creatinine ratio on a random urine sample. The preferred method of estimating GFR is the CKD-EPI equation.

Note 2: The Cockcroft-Gault equation has not been revised for use with standardised creatinine and will substantially overestimate GFR.

Note 3: The 4-variable MDRD equation has been re-expressed to work with standardised creatinine and is still widely used, performing well at GFR values under 60 ml/min. Laboratories and clinicians should be sure to use the re-expressed MDRD equation when estimating GFR from standardised creatinine. It is not necessary to use the adjustment factor for black race in South African patients.

Note 4: Prediction equations should be validated in local populations. Measurement of GFR using exogenous markers can be considered when there is doubt about the validity of prediction equations.

Note 5: The use of 24-hour urine collection to measure creatinine clearance is limited by frequent errors in urine collection and increasing creatinine secretion as the GFR decreases. This latter factor leads to overestimation of the GFR.

2. Screening for chronic kidney disease

Chronic kidney disease is defined by the presence of a low GFR (<60 ml/min) and/or evidence of kidney damage (e.g. proteinuria, haematuria, imaging abnormalities) for more than 3 months. Individuals at increased risk for chronic kidney disease should be screened annually. These include individuals with the following:

- Diabetes mellitus
- HIV infection
- Hypertension
- Cardiovascular, cerebrovascular or peripheral vascular disease
- Obesity
- Autoimmune diseases
- Prior acute kidney injury
- Prior pre-eclampsia or eclampsia or HELLP syndrome
- Age >60 years
- Family history of kidney disease

Note 1: Screening should involve blood pressure and blood glucose measurement, urine dipstick testing and estimation of GFR. If proteinuria is found on dipstick testing then protein excretion should be quantified by measuring the protein/creatinine ratio or albumin/creatinine ratio on a random urine sample. The preferred method of estimating GFR is the CKD-EPI equation.

Note 2: Once a diagnosis of CKD is made, renal function should be monitored more frequently, especially in patients with:

- GFR <60 ml/min/1.73 m^2
- Rapid GFR decline
- Risk factors for rapid GFR decline e.g. use of NSAIDs

3. When to refer to a nephrologist

- Abnormal renal imaging e.g. cystic kidney disease, at any GFR
- Persistent proteinuria and/or haematuria
- eGFR <60 ml/min (recommended)
- eGFR <30 ml/min (mandatory)

Note 1: At GFR <60 ml/min interventions to retard or prevent the progression of CKD should be instituted.

Note 2: At GFR <30 ml/min, options for renal replacement need to be considered. Consider preparing vascular access and working up for transplantation.

Note 3: At GFR <15 ml/min, be vigilant for complications such as hypertension, fluid overload, electrolyte disturbances and malnutrition.

4. When to initiate dialysis

Dialysis is recommended when the eGFR is ~5-10ml/min, or when the eGFR is less than 15 ml/min and the patient has one or more of the following:

- Symptoms or signs of uraemia
- Diuretic resistant fluid overload
- Poorly controlled blood pressure
- Evidence of malnutrition
- Refractory metabolic acidosis

Note 1: There is no evidence that earlier initiation of dialysis improves outcome. The value of dialysis in the very elderly needs to be carefully evaluated.

5. Haemodialysis procedures

(a) Dialysis prescription

Both acute and chronic dialysis procedures must be performed by a dialysis trained nurse or technologist according to the nephrologist's prescription. Dialysis units not directly supervised by a nephrologist should follow the instructions outlined in section 11 (*Supervision of dialysis units*).

Dialysis prescription must be adjusted continuously and based on reassessment of a patient's target metabolic parameters, blood pressure control, fluid balance, decline of residual renal function, dialysis related symptoms, age, weight and vascular access efficiency. Particular attention should be given to the effect of dialysis on other comorbid conditions, like cardiovascular, respiratory, nervous system, and liver disease, etc. The timing of drug administration and dose adjustment should also be reviewed as a part of dialysis prescription.

A typical dialysis prescription should specify the following parameters:

- Dialysis frequency per week
- Duration of each dialysis session
- Mode of dialysis (e.g. convective/hybrid techniques)
- Dialysate fluid/concentrate choice based on preferred calcium, potassium and glucose concentrations, and main buffer type
- Dialysis filter choice
- Vascular access instructions (needle size, catheter pressures, etc.)
- Desired blood pump flow range
- Other machine-adjustable dialysate parameters: temperature, sodium and bicarbonate concentrations, and modelling programmes
- Target dry weight
- Ultrafiltration target volume, rate and modelling
- Prescribed dose of dialysis (Kt/V per session or weekly)
- Target blood pressure range and instructions on management of haemodynamic instability
- Management of dialysis-related symptoms
- Anticoagulation dose
- EPO/ESA and iron administration

(b) Dose of dialysis

The dialysis team should routinely monitor the delivered dose of haemodialysis using formal urea kinetic modelling, employing the single-pool, variable volume model (Kt/V), or at institutions where this is not possible, the urea reduction ratio (URR).

The dialysis care team should deliver a prescribed HD dose as follows:

- Thrice-weekly schedule, with a midweek Kt/V of at least 1.2 or URR of 65% per session.

Note 1: Twice-weekly schedules are not recommended, unless there is significant residual renal function.

Note 2: Clinical signs and symptoms alone are not reliable indicators of haemodialysis adequacy, and the delivered dose of haemodialysis should be measured monthly.

Note 3: To determine Kt/V, blood samples for urea measurement must be drawn at the same HD session, in a specified manner (see K/DOQI guidelines). Where available, online Kt/V can be performed more frequently and requires no consumables for blood draws, but usually requires a more costly machine.

(c) Membranes

Dialyser membranes causing the least complement and leukocyte activation should be used.

(d) Anticoagulation

The use of anticoagulation during haemodialysis is recommended to prevent clotting of the extracorporeal circuit.

For patients with a standard dialysis session of about 4 hours, we recommend an initial bolus of unfractionated heparin of 25 IU/kg followed by a continuous infusion of 1000 IU/hr, to be stopped 30-60 minutes before the end of the session. If the patient routinely requires more than 15 minutes clotting at the needle puncture sites, the maintenance infusion dose should be decreased to 500 IU/hr. (http://ajkdblog.org/2012/06/26/dialysis-and-heparin-whats-the-evidence/)

Note 1: Options for patients on haemodialysis who are at high risk for bleeding includes no-heparin haemodialysis, minimum dose heparin, and regional anticoagulation with protamine reversal, regional citrate anticoagulation and citrate dialysate. No-heparin and regional citrate anticoagulation are associated with the lowest risks of bleeding, but may have issues with dialyzer clotting. Protamine reversal has been largely abandoned due to its technical difficulties and to problems with rebound bleeding.

Note 2: Because of the occasional risk of heparin-induced thrombocytopenia, we recommend that platelet counts be checked every 3 months.

Note 3: Low molecular weight heparins can also be safely used for dialysis anticoagulation.

(e) Dialysate

Bicarbonate-based dialysis is recommended as the treatment of choice.

(f) Water treatment and purification

Chronic haemodialysis requires the use of pure water complying at a minimum with the Association for the Advancement of Medical Instrumentation (AAMI) standards that takes into consideration both chemical and microbiological purity. The recommendations of the European Pharmacopoeia are somewhat more stringent. When high flux dialysers or convective therapies like haemodiafiltration are used, ultrapure water should be used.

The recommended maximum limits for dialysis fluid contaminants are listed in the tables below:

Contaminant	AAmi	European Pharmacopoeia
Substances with documented toxicity (in mg/L)		
Aluminium	0.01	0.01
Chloramines	0.10	
Free chlorine	0.50	
Total available chlorine		0.1
Copper	0.10	
Fluoride	0.20	0.20
Lead	0.005	
Nitra e (as N)	2.00	2.00
Sulphate	100	50
Zinc	0.10	0.10
Substances normally included in dialysate (in mmol/L)		
Calcium	0.05	0.05
Magnesium	0.16	0.16
Potassium	0.2	0.2
Sodium	3.0	3.0
Other substances (in mg/L)		
Ammonia		0.2
Antimony	0.006	
Arsenic	0.005	
Barium	0.10	
Beryllium	0.0004	
Cadmium	0.001	
Chromium	0.014	
Chloride		50
Mercury	0.0002	0.001
Selenium	0.09	
Silver	0.005	
Thallium	0.002	
Total heavy metals		0.10

	Bacteria (CFU/mL)	Endotoxin (EU/mL)
AAMI	200	2
European Pharmacopoeia	100	0.25
European Pharmacopoeia UPW*	0.1	0.03

* = ultrapure water

Note 1: Pure water is the basic form of treated water that is suitable for conventional haemodialysis modalities. Purified water is obtained from a purification system consisting of pre-treatment (softener, activated carbon, micro-filters), and a reverse osmosis (RO) unit, implemented in series.

Note 2: Regular and effective disinfection procedures are an integral part of the hygienic maintenance of the water treatment system (including RO and/or deioniser, and distribution loop) and should be performed at least once per month.

Note 3: Monitoring of chemical contaminants should be done 3-monthly, and measurement of bacterial counts and endotoxin levels done monthly.

(*Ward RA. Worldwide water standards for haemodialysis. Haemodialysis International 2007; 11(s1): S18-S25*)

(g) Reprocessing of dialysers

The reuse of dialysers is practiced in some South African settings. The AAMI recommendations for reprocessing should be followed.

Note 1: Patients should be informed that reuse is being practiced and staff should be vigilant for any complications that could be due to reprocessed dialysers.

Note 2: Patients with following conditions should be excluded from re-use: sepsis, acute hepatitis, hepatitis B and hepatitis C infection, HIV infection.

Note 3: Reprocessed dialysers must be used on the same patient; labelling must identify the patient and include pertinent information about the reprocessing procedure.

Note 4: Water for reuse procedures should meet the same standards as water for dialysis.

Note 5: Peracetic acid or heated citric acids are the preferred sterilants.

Note 6: Haemodialyser performance and the delivered dose of dialysis may decline as a result of dialyser reuse. The total cell volume (TCV) of reused dialysers should be monitored and those having a TCV <80% of the original measured value should be discarded.

Note 7: The environmental load resulting from the reprocessing chemicals vs. that of discarded (single use) dialyzers needs to be considered. Adequate ventilation should be ensured in areas where reprocessing of dialysers is performed using noxious chemicals.

(*Reuse of Hemodialyzers: ANSI/AAMI RD47, Washington, DC, American National Standards Institute 2002 and UpadhyayA, Sosa MA, Jaber BL. Single-use versus reusable dialyzers: the known unknowns. Clinical Journal of the American Society of Nephrology 2007; 2(5): 1079-1086*).

6. Special forms of haemodialysis

Online haemodiafiltration (HDF)

Three meta-analyses came to disparate conclusions regarding potential benefits of convective therapies on cardiovascular mortality. Published data currently show that convective therapies, compared with conventional haemodialysis, have better removal of beta-2 microglobulin and improved haemodynamic stability.

Extended dialysis

Nocturnal haemodialysis (usually three 8 hour sessions per week overnight) offers a longer, slower treatment for patients who need additional time to remove fluids.

7. Patient well-being and health

(a) Clinical evaluation

Every patient on dialysis should have a clinical evaluation performed by a doctor regularly. Within treatment centres supervised by a nephrologist, chronic haemodialysis patients must be seen during routine rounds conducted at least once per week. In addition a consultation in rooms is recommended for a full clinical assessment at the initiation of renal replacement therapy and thereafter at least 2-3 times per year.

Treatment centres with no on-site nephrologist should refer patients for regular consultations with a nephrologist at least once a month. Dialysis records, laboratory tests and transplant related issues should be addressed during such consultations. The nephrologist must be available for telephonic consultations required for dialysis unit staff to provide adequate therapy, guide vascular access and transplant centre referrals.

Note 1: Particular attention should be paid to cardio-vascular risk factors as cardiovascular disease is the main cause of mortality. Interventions aimed at reducing risks should be instituted including cessation of cigarette smoking, addressing dyslipidaemia (per KDOQI guidelines), and optimizing blood pressure control.

Note 2: This patient contact session should also be used to detect any social problems, nutritional deficiencies and inform the patient of his/her suitability or otherwise for renal transplantation, and establish his/her readiness for transplantation.

(b) Nutrition

Basic nutritional requirements

Energy 35 kcal/kg/d, protein 1.2 g/kg/day, <30% total calories from fat and <10% from saturated fat.

Phosphate, sodium, potassium according to patient needs and residual renal function.

Interdialytic weight gain <5% of dry weight.

Supplementation of water soluble vitamins.

Note 1: Poverty may preclude the implementation of dietary modification. Assistance should be given to patients as far as possible.

Note 2: A dietitian should be involved in the care of these patients and the diet individualized as far as possible.

monitoring
Global clinical assessment, including assessment of average dry body weight at monthly visits. Follow-up patient interviews and assessment of food intake by the dietician if needed. Laboratory tests in stable patients should be performed according to the protocol in section g. Anthropometry or bioimpedance should be performed only if indicated.

(c) Haemoglobin

Patients on chronic dialysis should ideally have haemoglobin levels of 10-12 g/dl.

Note 1: Hb should be checked monthly and a full blood count done every 3 months.

Note 2: If the haemoglobin is below target levels, then first exclude other causes of anaemia that are not due to lack of erythropoietin (EPO) by:

- Clinical assessment
- Standard investigations (additional tests may be needed):
  - FBC with reticulocyte count
  - Serum ferritin and transferrin saturation

Supplement with iron if transferrin saturation <20% or serum ferritin <200 ng/ml:

- Administer iv iron 20 mg test dose, then 100 mg/week x 8-10 weeks and reassess
- Maintenance (iv) iron is usually needed (100-400 mg/month)
- Monitor iron status regularly (monthly until target levels are stable for 2 months then 3-monthly)
- Maintain transferrin saturation 20-50% and serum ferritin 200-500 ng/ml.

Note 3: TSAT and ferritin may be inaccurate in states of inflammation or malnutrition.

Note 4: If the patient has adequate iron stores, administer an erythrocyte stimulating agent (ESA).

Use short- or long-acting ESAs according to label; monitor Hb regularly until stable on target. Titrate the dose of EPO by adjusting the dose or frequency of injection. If large doses of ESA are required, then evaluate for EPO resistance:

- Missed ESA doses
- Inflammation (e.g. occult infection)
- Inadequate dialysis
- Hyperparathyroidism
- Trace metal (particularly aluminium) overload
- Poor water quality
- Occult haemolysis
- Recheck for other causes of anaemia again

Note 5: The management of anaemia should not occur in isolation but take into consideration factors such as the nutrition of the patient and the adequacy of dialysis.

Note 6: Blood transfusions should be avoided as far as possible and reserved for symptomatic anaemia unresponsive to EPO, for acute haemodynamic instability and in preparation for surgery that cannot safely be postponed. Written consent is required for each transfusion. Use leukocyte depleted blood products for transplant candidates.

(d) Blood pressure

Target blood pressure for CVD risk reduction in CKD should be <140/90 mm Hg.

Note 1: Antihypertensive agents should be prescribed as follows:

- Diuretics should be included in most patients, except those who are anuric
- Choose additional agents based on CVD-specific indications to achieve therapeutic and preventive targets and to avoid side-effects and interactions
- The antihypertensive regimen should be simplified as much as possible
- Long-acting (once-daily agents) should be used when possible, and taken at the same time each day
- Patients with intradialytic hypotension should take their medications post dialysis.

Note 2: Counsel patients on sodium and fluid restriction, and the use of diuretics in those with residual renal function. Daily dietary sodium intake should be restricted to no more than 5 g of salt (sodium chloride), equivalent to <2 g/day of sodium.

Note 3: Ultrafiltration should be optimized to render the patient euvolemic and normotensive. Increasing positive sodium balance by “sodium profiling” or using a high dialysate sodium concentration should be avoided.

(e) Preservation of residual renal function

Several actions and precautions are recommended to preserve residual renal function (RRF), which is a strong predictor of mortality for dialysis patients:

- Angiotensin-converting enzyme (ACE) inhibitors and/or angiotensin receptor blockers (ARBs) are the agents of choice in patients with significant RRF who need antihypertensive medication. Monitor for hyperkalaemia and use with caution in vasculopaths
- Avoid potential nephrotoxins, especially aminoglycoside antibiotics, contrast agents, and NSAIDs (including Cox-2 inhibitors)
- Avoid aggressive lowering of blood pressure and/or volume depletion
- Prerenal and postrenal causes of decreases in RRF should be considered in the appropriate clinical setting.

(f) Vascular access

An arteriovenous fistula (AVF) is the vascular access of choice in haemodialysis patients and should be fashioned timeously (GFR <25 ml/min) to ensure maturity (1-4 months later) when required.

Note 1: The order of placement of AVF is at the wrist and then the elbow starting with the non-dominant arm. The advantages of fistulae include excellent patency once established, improved flow over time, and a lower incidence of stenosis, infection and vascular steal phenomenon.

Note 2: If it is not possible to establish a fistula, access may be established using an arteriovenous graft of synthetic material (preferably PTFE).

Note 3: Cuffed tunnelled central venous catheters should be discouraged as a permanent vascular access.

Note 4: The initial cannulation of a native AVF must be performed by an experienced person.

Note 5: Patients with AVF must adopt good personal hygiene habits; clean technique should be used before cannulation (see European Best Practice Guidelines).

Note 6: The placement of subclavian vein catheters for acute dialysis should be avoided as should venepuncture of antecubital fossa veins, in patients who are potential candidates for haemodialysis.

Note 7: The AVF should be monitored by regular physical examination, and surveillance for stenosis can be done by monitoring static dialysis venous pressure, by duplex ultrasound and by assessing for recirculation.

(g) Routine blood tests

Costs were carefully considered in drafting the protocol. Blood results should be checked on all patients on chronic dialysis as per the table on page 11 and the predialysis serum targets to be aimed for are as follows:

- Potassium 4.0-5.5 mmol/l
- Phosphate 0.8-1.4 mmol/l
- Calcium 2.05-2.45 mmol/l
- iPTH = 2-9 times the upper limit of the normal range
- Albumin >35 g/l (minimum), optimal >40 g/l

(h) Bone disease

Phosphate binders

The use of phosphate binders is indicated to control the serum phosphorus level towards the normal range. The binder must be taken at meal time (either just before or during the meal) for optimal phosphate binding. The dose can be adjusted according to the phosphorus “load” in the meal (e.g., 2 before breakfast, 1 before a light lunch, 3 before the main meal, usually at night).

Non calcium containing phosphate binders should be used when serum phosphate is elevated and:

- Calcium levels are above target
- iPTH levels are below twice the normal range
- Vascular calcification is present.

Note 1: The use of aluminium hydroxide should be very limited.

Note 2: Calcimimetics should be considered for suppression of PTH in the presence of hypercalcaemia.

Note 3: We recommend the use of low calcium dialysate (1.25-1.5 mmol/l) and dietary calcium restriction in patients prone to hypercalcaemia.

Note 4: Vit D3 levels may be measured at the initiation of dialysis

Note 5: Vitamin D preparations or analogues should be prescribed under the following conditions:

- Target phosphorus level achieved but calcium low or low normal range
- iPTH higher than 2 to 9 times normal
- Vitamin D can be given 3 times a week (with dialysis) to reduce the risk of hypercalcaemia
- Vitamin D preparations are contraindicated in the presence of serum calcium above target ranges, and high serum phosphate levels (needs individualised assessment).

Note 6: Parathyroidectomy should only be considered when the iPTH is higher than target and it has failed to respond to medical therapy.

Note 7, Cautionary: Adynamic bone disease is a potential complication of all measures that over-suppress iPTH (including aggressive use of vitamin D, chronic positive calcium balance, or parathyroidectomy).

(i) Rehabilitation and emotional support

The emotional and social/economic support of patients is integral to the holistic approach of the care given to patients on dialysis. In order to provide this care, it is recommended that each treatment centre has access to a social worker and/or psychologist.

8. Transplant work-up

Kidney transplantation is the treatment of choice for end-stage renal disease. Pre-transplant assessment should be carried out before the patient is entered on the transplant waiting list. The assessment serves to evaluate and prepare a patient for transplantation.

- Clinical examination (include urinalysis, breast, testes and prostate)
- For the list of routine and elective investigations, please refer to relevant guidelines and your local transplant team protocols.

The following conditions will need careful pre-transplant assessment and may require prior therapy or may be regarded as an absolute or relative contraindication for a particular potential kidney recipient:

- Active infection
- Malignancy (the time interval between treatment and transplantation depends on the type, stage, and grade of cancer, and the type of treatment given)
- Pregnancy
- Active organ disease which could limit recipient's life expectancy
- Non-correctable coronary heart disease
- Lung disease
- Liver disease
- Active/untreated peptic ulcer disease
- Cerebrovascular disease
- Peripheral vascular disease
- Uncontrolled HIV infection
- Uncontrolled psychiatric disease or any disease that has resulted in diminished mental capacity for patients to take responsibility for their actions
- Proven habitual medical non-compliance and/or substance abuse
- Smokers must be encouraged to stop
- Obesity (BMI >35) due to increased risk of complications and shorter graft survival. Exceptions can be made if the transplant surgeon determines that the recipient's body habitus does not constitute an increased surgical risk
- Age is not an absolute contraindication. A careful risk-benefit evaluation must be performed and the patient should be counselled on the increased risks associated with age. It is reasonable to exclude patients whose overall condition places them at an excessive risk of postoperative morbidity.

9. Infection control measures in HD units

To reduce the susceptibility to infection, optimal adequacy of HD should be attained, malnutrition should be prevented or treated, optimum haemoglobin concentration should be maintained, iron overload should be avoided and a dialyser with the lowest rate of complement and leukocyte activation should be used.

Preventing bacterial infections and antimicrobial resistance
Universal precautions for prevention of transmission should be rigorously respected in all HD units:

- Cleaning and disinfecting of instruments, machines and environmental surfaces after each treatment
- Avoidance of sharing articles among patients
- Frequent hand washing and use of disposable gloves
- Strict adherence to vascular access connection and disconnection protocols, tunnelled haemodialysis and peritoneal dialysis catheters care protocols.

Note 1: When designing a haemodialysis unit, the key principles of adequate space, traffic flow from clean to dirty, and a functional design must be taken into account. Key areas to which attention must be paid include the following:

- Patient waiting area
- Restricted access to the dialysis treatment area
- Space between dialysis machines/chairs
- Storage rooms
- Isolation rooms
- Soiled utility rooms
- Dedicated hand-washing sinks
- Reprocessing rooms
- Invasive procedure rooms (not within free-standing dialysis units)
- Plumbing
- Supplementary and administrative rooms/areas

Note 2: Vaccinate patients regularly against influenza, pneumococcus, varicella and hepatitis B. Avoid live vaccines in kidney transplant recipients. We recommend adhering to vaccination principles outlined in chapter 12 of the KDIGO guidelines (Clinical Practice Guideline for the Care of Kidney Transplant Recipients).

Note 3: A high index of suspicion for tuberculosis must be maintained in all patients.

Prevention and management of HBV, HCV and HIV in haemodialysis patients

Note 1: Hepatitis B Virus

- Patients with progressive CKD should be vaccinated against HBV preferably before they start on HD
- Screening for HBV markers should be performed in all patients starting HD or transferring from another unit and patients not immune should be vaccinated
- Screening should be repeated every six months
- Anti-HB antibody testing is recommended 1-2 months after the primary series has been completed and 6-12 months thereafter. If antibody titre levels are not adequate, a booster vaccination should be administrated
- HBs Ag-positive patients should be treated in separate rooms with dedicated machines
- Immunisation against HBV should be undertaken in all HD staff members and thereafter according to a set schedule.

Note 2: Hepatitis C Virus

- Screening for HCV antibodies should be performed in all patients starting HD or transferring from another unit. A positive test should be confirmed with PCR as false positive antibody tests do occur
- Screening should be repeated every 6 months once on HD
- HCV patients should ideally be treated separately, but otherwise universal precautions must be employed throughout the unit.

Note 3: HIV infection

- Screening for HIV infection should be done in all patients starting HD and 6 monthly thereafter as well as when transferring from another unit
- Only the usual body fluid precautions attendant to routine dialysis need be followed and no special dialysis machine be set aside.

Note 4: management of patients colonized or infected with CRE (carbapenemase resistant Enterococci)

- The emergence and spread of carbapenem resistance among Enterobacteriaceae represents a serious threat to public health
- Multiple CREs like Klebsiella pneumonia and E. coli have been reported in SA. Patients who are colonized or infected with CRE should be isolated and placed on so-called "Contact Precautions"
- Contact Precautions include:
  - Performing hand hygiene before donning a gown and gloves
  - Donning gown and gloves before entering the affected patient's room
  - Removing the gown and gloves and performing hand hygiene prior to exiting the affected patient's room
- For details on surveillance and prevention strategies refer to the CDC Guidance for Control of CRE (http://www.cdc.gov/hai/pdfs/cre/CRE-guidance-508.pdf).

10. Peritoneal dialysis

(a) Suitable candidates

- Patients with a "virgin abdomen" or minor prior abdominal surgery, and residual renal function, should be offered the option of peritoneal dialysis
- The abdominal musculature should be reasonable, i.e., exclude those with significant obesity and/or hernias
- The patient should be physically capable of doing bag changes for continuous ambulatory peritoneal dialysis (CAPD), particularly with regards to visual acuity and limb dexterity
- The patient should be psychologically able to perform repetitive bag changes per sterile protocol
- Suitable storage space for dialysate and adequate hand washing facilities should be available.

(b) Equipment and resources

- Peritoneal dialysis should be delivered in the context of a comprehensive and integrated service for renal replacement therapy, which includes haemodialysis (includ-ing temporary backup HD), transplantation and conservative care
- Both continuous ambulatory peritoneal dialysis (CAPD) and automated peritoneal dialysis (APD) should ideally be available
- Dedicated PD nursing staff with a minimum of 1 PD nurse per 20 patients should be part of the multidisciplinary team.

(c) Preparation for peritoneal dialysis

- All patients should be adequately prepared for renal replacement therapy and receive information and education about PD treatment, delivered by an experienced member of the team
- Patients commencing RRF in an unplanned fashion for whatever reason should receive this information once appropriate.

(d) Initiating peritoneal dialysis

Timing of referral and surgery:

- Whenever possible, catheter insertion should be performed at least 2 weeks before starting PD
- Small dialysate volumes in the supine position can be used if dialysis is required earlier
- It is advisable to enable correction of early catheter-related problems without the need for temporary haemodialysis
- For timing of PD initiation refer to section 4 above.

The Access Team

- All renal physicians should be familiar with the percutaneous technique of insertion of the Tenckhoff catheter
- Each centre should have a dedicated surgical team involved in the implantation and care of peritoneal catheters
- The access team should comprise nurses, nephrologists, and surgeons who have experience in peritoneal dialysis and understand the importance of successful access placement and the need for attention to detail in the reduction of complications.

insertion Protocol

- Treatment units should have clear protocols for peri-operative catheter care, including the use of antibiotic prophylaxis
- Local expertise should govern the choice of method of PD catheter insertion; insertion should not be delegated to inexperienced, unsupervised operators
- A dedicated area should be used for catheter insertion, with appropriate staffing, suction, oxygen, and patient monitoring facilities
- PD catheter insertion training should be available to all nephrology trainees
- **Preoperative:** check for hernias and identify a catheter of suitable length; mark the exit site with the patient sitting or standing; screen for nasal carriage of methicillin-resistant Staphylococcus aureus (MRSA) and S. aureus
- **Pre-implantation:** prepare the bowel with laxatives; ensure bladder emptying and prepare the surgical site; use antibiotic prophylaxis
- **Post-procedure:** flush catheter and cap off; immobilise the catheter; cover the exit site with a non-occlusive dressing and, if possible, do not disturb for 5-10 days; discharge the patient home with supply of laxatives and advice on recognizing potential complications

- Once the catheter is placed and until healing is completed, the dressing changes should be done by a dialysis nurse using a sterile technique
- Peri-operative catheter care and catheter complications (leaks, hernias, obstruction) should be managed according to the International Society of Peritoneal Dialysis guidelines (www.PDIconnect.com).

(e) Ultrafiltration and fluid management

- Peritoneal membrane function should be monitored 6 weeks after commencing treatment and at least annually or when clinically indicated using a peritoneal equilibration test (PET) or equivalent
- Daily urine and peritoneal ultrafiltration volumes should be monitored at least six-monthly. A patient diary of UF volumes should be kept for evaluation
- Dialysis regimens resulting in fluid reabsorption should be avoided. Knowledge of transporter status is useful in individualizing prescriptions. Patients with high or high average solute transport should be considered for automated PD (APD) and the use of icodextrin
- Residual renal function must be formally assessed and preserved by avoidance of nephrotoxins or episodes of hypovolaemia/hypotension, and by the use of ACE inhibitors and ARBs
- Dialysis regimens resulting in routine utilisation of hypertonic (3.86% or 4.25%) glucose exchanges should be avoided
- Anuric patients who consistently achieve a daily ultrafiltration of less than 750 ml should be closely monitored and the benefits of a modality switch considered.

(f) Solute clearance

- Both residual urine and peritoneal dialysis components of small solute clearance should be measured to assess clearance targets
- A combined urinary and peritoneal Kt/Vurea of 1.7/week or a creatinine clearance of 50L/week/1.73m^2 is the minimum treatment dose
- The dose should be increased in patients experiencing uremic symptoms
- A continuous 24 hour PD regime is preferred to an intermittent regime.

(g) Metabolic factors

- Use standard strategies to optimise diabetic control; complement these with dialysis prescriptions that minimise glucose, where possible
- Central obesity can worsen or develop in some PD patients; this risk can be reduced by avoiding excessive glucose prescription
- Plasma bicarbonate should be maintained within the normal range; this can be achieved by adjusting the dialysis dose and/or dialysate buffer concentration; occasionally bicarbonate buffered solutions will be required.

(h) Infectious complications in patients on peritoneal dialysis

- PD units should undertake regular audit of their peritonitis and exit-site infection rates, including causative organisms, treatment and outcomes. They should enter into active dialogue with their microbiology department and infection control teams to develop optimal local treatment and prevention protocols
- The flush-before-fill dialysis delivery systems should be used
- Patients should undergo regular revision of their technique (annually or more frequently if indicated, such as after an episode of PD-related infection or an interruption to performing PD) and receive intensified training if required.

Treatment

- Exit site infection is suggested by pain, swelling, crusting, erythema and serous discharge; purulent discharge always indicates infection. Swabs should be taken for culture and initial empiric therapy should be with oral antibiotics that will cover S. aureus and P. aeruginosa
- Methicillin resistant S. aureus (MRSA) will require systemic treatment (e.g. with vancomycin) and will need to comply with local infection control policies
- Initial treatment for peritonitis should include cover for bacterial Gram positive and Gram negative organisms including Pseudomonas species until the result of culture and antibiotic sensitivities are obtained
- Intraperitoneal administration of antibiotics is superior to IV dosing for treating peritonitis; intermittent and continuous dosing of antibiotics are equally efficacious
- Once culture results and sensitivities are known, antibiotic therapy should be adjusted to narrow spectrum agents as appropriate. For patients with substantial residual renal function the dose of antibiotics may need to be adjusted
- The full ISPD treatment guidelines for PD-related infections are available from www.PDIconnect.com.

(i) Diet and peritoneal dialysis

Substantial loss of protein into dialysate occurs with PD. The average loss varies between 5 and 15 g/24 h.

A protein intake of 1.0 g/kg body weight/day is enough to preserve nutritional status. Energy requirements are dependent on the level of physical activity. In general, dietary energy intake for adult PD patients should be 35 kcal/kg/day, adjusted for age.

(j) Indications for switching from PD to HD

The decision to transfer a patient from PD to HD should be based on clinical assessment. Indications include the following:

- Inadequate solute transport or fluid removal
- Unacceptably frequent peritonitis, persistent peritonitis or other PD-related complications
- Development of technical/mechanical problems
- Severe malnutrition resistant to aggressive management (relative).

10. Auditing

Until a formal structure to audit dialysis in the country is established, it is recommended that all units perform a self-audit annually. It is mandatory to submit annual data on all chronic dialysis and transplanted patients to the South African Renal Registry. The compliance of units with the National Guidelines will be monitored.

11. Supervision of dialysis units

Legislation has been drafted that will make it illegal for any unit to operate unless it is under the supervision of a nephrologist. In the event of a nephrologist not being available then a physician accredited by the South African Renal Society and ratified by Department of Health will be allowed to supervise under the guidance of a nephrologist.

12. Staffing of chronic haemodialysis units

Medical staff should be readily available to attend to any emergencies. The overall care of patients on dialysis should be under the supervision of a nephrologist.

Other staff: The staff to patient ratio for chronic dialysis should be 1:4 (including nurses and clinical technologists). A registered nurse with experience in haemodialysis should be present in the dialysis unit at all times.

Summary Practice Guidelines

Assess GFR using the CKD-EPI equation. A calculator for estimating GFR can be found at http://www.kidney.org/professionals/kdoqi/gfr.cfm. This is also available as a smartphone app

Refer to a nephrologist when GFR <60 ml/min

An AV fistula should be fashioned when the GFR <25ml/min

Start HD when GFR is 5-10 ml/min or if symptomatic

Adequacy targets for HD: Kt/V >1.2 or URR >65%

Target Hb is 10-12 g/dl

IV Fe needed if transferrin saturation <20% or serum ferritin <200ng/ml

Blood pressure target <140/90

Bone disease: maintain phosphate 0.8-1.4 mmo/l and Ca 2.05-2.45 mmol/l

Start CAPD when GFR 5-10 ml/min or if symptomatic

Adequacy targets for CAPD: weekly Kt/V of 1.7 or creatinine clearance 50l/1.73 m^2

Laboratory tests protocol for patients on chronic dialysis

	Per Annum	Jan or Entry	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Haemoglobin*	12	x	x	x	x	x	x	x	x	x	x	x	x
White Cell Count only	4	x			x			x			x		
Platelets	4	x						x			x		
Iron	4	x			x			x			x		
Ferritin	4	x			x			x			x		
Transferrin Saturation	4	x			x			x			x		
Sodium	3	x				x				x			
Potassium	6	x		x		x		x		x		x	
Bicarbonate (CO2 or HCO3)	6	x		x		x		x		x		x	
Urea Pre/Post Dialysis#	12	x	x	x	x	x	x	x	x	x	x	x	x
Creatinine	3	x				x				x			
Albumin	4	x			x			x			x		
Parathyroid Hormone (PTH)**	3	x				x				x			
Vitamin D Level	1	x											
Alkaline Phosphatase	1	x											
Calcium Total Corrected (with Albumin)***	6	x		x		x		x		x		x	
Phosphate***	6	x		x		x		x		x		x	
Glucose Random	2	x						x					
HbA1C (Diabetic patients only)	2 (Diabetics only)	x						x					
Lipogram Fasting	1	x											
Total Cholesterol only	1							x					
Hepatitis B S-Antigen	2	x						x					
Hepatitis B E-Antigen****	1	x											
Hepatitis B S-Antibody (if >10, repeat once a year)	2	x						x					
Hepatitis B C-Antibody****	1	x											
Hepatitis C Antibody	2	x						x					
Hepatitis C PCR (only if Hep C Ab positive)	1 (Hep C pos only)	x											
ALT	1	x											
Gamma GT	1	x											
HIV ELISA (with informed consent only)	2	x						x					
CD4 (positive patients only)	3 (HIV pos only)	x				x				x			
Viral Load (positive patients only)	3 (HIV pos only)	x				x				x			

***Repeat Hb:**
Shortly after blood transfusion or hospital admission / As often as weekly if <8.0 / Monthly if <9.0 or >12.5

****PTH level - additional protocol should apply:**
PTH levels above x10 normal range - repeat monthly together with calcium and phosphate levels

*****Post-parathyroidectomy repeat calcium tests:**
Twice per week if <2.0 / Weekly for the first 4 weeks / Monthly for the first 3 months

******Only for patients with Hepatitis B S-antibodies <5 level**

#Can reduce test frequency when online clearance monitoring is used