1. Introduction and who guideline applies to:

Patients with progressive kidney disease who require renal replacement therapy require an arterio-venous fistula/graft (AVF/AVG) to allow access to the circulation for haemodialysis or insertion of peritoneal dialysis (PD) catheter. These guidelines are designed to give general guidance for the preparation and referral for both AVF formation and PD catheter insertion in a timely manner.

These guidelines are designed to give general guidance for the preparation and referral for both AVF formation and PD catheter insertion.
The use of central lines is not recommended unless in urgent situations as they are associated with higher risk/morbidity (infections, central veins stenosis, and line retention) and increased mortality compared to vascular access surgery. Patient choice and comorbidities should be taken into account.

2. Recommendations, Standards and Procedural Statements

2.1 Preservation of forearm veins

As many patients have co-morbid conditions (e.g. cardiovascular disease, diabetes mellitus) they have often experienced previous hospital admissions and interventions that have necessitated frequent venepuncture and IV cannulation that may have permanently damaged forearm or elbow veins. It is crucial to the success of future vascular access creation that *all staff* involved in the care of patients with kidney disease makes every effort, even at an early stage to preserve native veins for future vascular access and to protect established AVF/AVG.

The cephalic vein at the wrist or antecubital fossa veins should not be used for cannulation or blood sampling unless it is for life saving measures in any patient with progressive kidney disease since they may one day require haemodialysis (even one venepuncture or IV cannulation may cause irrevocable damage, particularly if it is traumatic). Cephalic vein is the preferred site for primary AVF formation.

Clinical staff should emphasise to patients that all venepuncture and IV cannulation should be done from the back of the hand or, if necessary, the back of the forearm, but avoid the non-dominant arm. Any patient with chronic kidney disease who has planned surgical access in theatre from the Nephrology wards or listed for access from outpatient should have the intended access side arm taped with an instruction not to use them for blood sampling, cannulation or BP measurement anywhere.

All patients who are referred for an AVF/AVG formation should be provided with copies of the patient information leaflet on AVF/AVG.

Hierarchy of Access formation (bilaterally):

1- Radiocephalic
2- Brachiocephalic
3- Brachiobasilic
4- Brachioaxillay bypass graft
5- Lower limb loop AV graft
6- Extra-anatomical access formation

2.2 Care of arterio-venous fistula

After AV access creation, patients are scheduled for surgical review after 4 weeks post-operatively. During this review, the access patency is tested and a time frame for needling for HD is advised unless further reviews, imaging or intervention is needed.

All patients who have an AVF/AVG should be provided with copies of the patient information leaflet on AVF/AVG which should be reinforced by advice on AVF/AVG bleeding (first aid) – see section 4.

Traditionally it has been taught that once an AVF has been constructed it should never be used for venesection. This is probably an unnecessarily restrictive view given that the purpose of making an AVF is to facilitate vascular access. However, it is prudent to avoid this whenever there is an alternative available, with escalation to an expert, for venesection of AV access. A mature AVF which is in regular use for haemodialysis may be used for venepuncture by an experienced phlebotomist if there is no alternative vein available, although as an outpatient, patients should have blood taken at the time of dialysis. Similarly, for inpatients, often additional venepuncture can be avoided by planning for blood samples to be taken at time of next scheduled dialysis, and only urgent blood tests should be taken outside of the expected dialysis schedule.

An AVF recently formed which has not been used for dialysis should not be used for venepuncture. An AVF should not be used for an indwelling IV cannula, with the exception of in an emergency setting (e.g. cardiac arrest to give adrenaline). Prolonged constriction of an arm with a functioning AV fistula should be avoided (e.g. tourniquet, BP recording).

2.3 Bleeding from an arteriovenous fistula or graft

This is a potentially life threatening event and deaths have occurred from uncontrolled bleeding. Please see separate guideline (***Guideline: Bleeding from an Arteriovenous Fistula of Graft. UHL Renal Guideline/Pathway chart, Trust Ref: C11/2016***).

2.4 Photographing arteriovenous fistula/grafts

When a patient complains of pain, redness or swelling over the fistula/graft or if there are any concerns about the appearance of the skin or the needling sites then a photograph should be taken, labelled and dated and stored in the patient's file (and electronically on Nervecentre). Photographs to be repeated and compared to provide a permanent record and guide management until problem resolved (UHL written consent form for photography to be completed and filed in notes). These photographs should be sent by email for senior review by the transplant surgical and nephrology teams following the referral pathway guidance.

2.5 Referral for vascular or peritoneal access

This should be done by SpR or consultant.

2.5.1 For arteriovenous fistula/graft formation

Patients should be referred by letter to the consultant transplant surgeons and this should be done initially when patient is predialysis with GFR 20 or under. Patients requiring primary vascular access or straightforward radio cephalic or brachiocephalic AVF should be referred generically with letter addressed to 'Consultant Transplant Surgeons'. Patients requiring more complex procedures should be referred by name to consultant most familiar with the case. Patients without any visible forearm veins or obvious above elbow cephalic vein should be referred for ultrasound venous mapping or if necessary venography at time of referral; this should be made clear in referral letter. If in doubt, discuss with nephrologist/surgeon the need for venography or vein mapping Doppler studies prior to outpatient appointment. Outpatients should be referred by letter to vascular access clinic.

Imaging should not delay referring the patient to the Vascular Access Clinic for surgical review to expedite access formation plan.

Inpatients should be referred by contacting the transplant registrar to be reviewed within 24hours.

Referral of complicated or immature vascular access should follow the referral pathway guidance.

2.5.2 For CAPD insertions
Since September 2006 many PD catheters can be placed using a percutaneous (ultrasound guided) technique either as a day case or overnight stay rather than as a surgical procedure (laparoscopic/open). Patients should be referred to Dr Osasuyi Iyasere / Dr Jorge Jesus-Silva if they are suitable for percutaneous insertion and to 'Consultant Transplant Surgeons' if they require a laparoscopic or open surgical approach. The following criteria apply:

1. Laparoscopic or open surgical approach (GA or LA)
    - second PD catheter insertion
    - previous abdominal surgery
    - patients unwilling to have procedure under LA (+/- sedation)
    - BMI greater than 35
    - failed percutaneous insertion

2. Percutaneous (medical) insertion with overnight stay:
    - patients without care at home
    - other criteria as defined by the clinician

3. Percutaneous (medical) insertion as day case
    - all other patients for CAPD catheters should be suitable for this insertion as daycase procedure via renal planned care hub for pre-assessment, with the procedure taking place at Glenfield hospital.

2.6 Day case surgery
All patients having radiocephalic or brachiocephalic AVF should be assumed to be having local anaesthesia or block and, the majority will be a daycase surgery. This should be stated clearly in the TCI Form as well as suitability to be done in LGH or GGH, and it should be discussed with the patient by the surgeon at the time of listing for AVF surgery. Exceptions to this policy are few and generally limited to very frail patients who do not have a carer at home. Diabetes mellitus is not a contraindication to day case surgery under LA as the patients do not need to be fasted. However, patients planned for block need to fast at least 6 hours. Patients should continue on their normal insulin or oral hypoglycaemic treatment. For those patients not suitable for day case surgery for other reasons, the aim should be to admit on day of surgery.

2.7 Anticoagulants for surgery
2.7.1 Patients on clopidogrel usually do not need to stop this drug (case by case discussed and operator dependent). If the patient has had a coronary stent in the previous 12 months, the risks of stopping this may not be acceptable and this should be discussed with the patient's cardiologist.
2.7.2 Other anti-platelet agents (i.e. aspirin or dipyridamole) can be continued.
2.7.3 Patients on warfarin may have this stopped if possible. Patients who are on warfarin for atrial fibrillation or for maintaining patency of vascular access may have this stopped 4 days before surgery. Generally surgery can be performed if INR 2-2.5 at time of surgery for local anaesthetics but for nerve block, anaesthetists accept INR 1.5 or less as per their guidelines.

Transitional bridging plan in patients who need to continue on anticoagulation (e.g. prosthetic values, recurrent thromboembolic disease) should follow the haematology guidance available on insite. Bridging protocol should not be necessary unless specified by consultant surgeon. Warfarin should start immediately after access creation or as recommended by the consultant surgeon.
2.7.4 Patients on newer agents (eg. Apixaban) will need case by case discussion with surgeons, and if stopped may need a bridging plan depending on reason for being on that agent

3.Education and Training

All staff caring for patients with advanced chronic kidney disease should be familiar with the contents of this guideline.

4.Monitoring and Audit Criteria

Key Performance Indicator	Method of Assessment	Frequency	Lead

5. Supporting References (maximum of 3)

6. Key Words

Vascular Access, Dialysis

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title)	**Executive Lead: Dr Jorge Jesus SIlva**
Details of Changes made during review:	