

**Standard Operating Procedures (SOPs) for the Management
 of a Patient's Haemodialysis Care**

CONTROLLED DOCUMENT

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This document contains SOP's used by the nursing team caring for patients on haemodialysis. The Dialysis Nursing Clinical Handbook will assist staff in understanding the rationale behind these procedures

Abbreviations used within this document

| | |
|-------|---|
| ANNT | Aseptic non touch technique |
| AVF | Arterial-venous fistula |
| AVG | Arterial-venous graft |
| BBV | Blood borne virus |
| BP | Blood pressure |
| BPM | Beats per minute |
| CDiff | Clostridium difficile |
| CVAD | Central venous access device (a standard term used by UHBFT and in this case relating to a dialysis catheter) |
| C | Centigrade |
| DNA | Did not attend |
| ESKD | End stage kidney disease |
| EHIC | European health insurance card |
| HD | Haemodialysis |
| HDF | Haemodiafiltration |
| Kt/V | Dialyser clearance, time / volume (measurement of dialysis efficiency) |
| MDT | Multi-disciplinary team |
| mmHg | Millimetres of mercury (scale used to measure a blood pressure) |
| MRSA | Meticillin resistant staphylococcus aureus |
| MSU | Mid stream urine |
| P | Pulse |
| QA | Quality assurance |
| Qb | Dialysis machine blood flow |
| R | Respiration |
| RBC | Red blood cells |
| RDC | Renal dialysis catheter |
| RPM | Respirations per minute |
| RN | Registered nurse |
| SOP | Standard operating procedure |
| T | Temperature |
| U/E | Urea / electrolytes |
| URR | Urea reduction ratio (measurement of dialysis efficiency) |

SOP for pre-dialysis assessment, care during dialysis and after completion of dialysis

Introduction:

On arrival, the patient can expect to see clearly displayed where they will be seated, the approximate time their machine will be ready and the nurses who will be caring for them on the shift.

The patient can generally expect to be started on dialysis within 30 minutes of their allocated appointment time. Occasionally unexpected situations may occur which cause a delay and this will always be communicated to the patients by the clinical team with an updated estimate for the dialysis start.

During the patient's dialysis session, they can always expect a registered nurse (RN), with experience and skills in dialysis to manage their care. Student nurses and 'new to dialysis' RNs, may deliver some or all of the patient's care, but always under the supervision of the responsible experienced dialysis RN. Health care assistants have a supportive role in delivering dialysis care.

In conjunction with dialysis treatment itself, the RN may also take blood and other microbiological samples, administer drugs orally, by infusion or injection and co-ordinate additional supportive care requirements.

Pre-dialysis assessment

Once the patient's dialysis machine and station are sufficiently ready for the patient to be able to settle down and be seated comfortably, a nurse will call the patient from the waiting area. Any special isolation or machine preparation needs to be checked and as ready as possible, before hand to ensure patients are dialysed safely and in the correct cohort.

For those patients that have an AVF/G, the patient will be asked to wash the relevant limb, along with their hands, with soap and water, before entering their dialysis station area. Assistance will be provided if required. Patients dialysing via a renal dialysis catheter (RDC) will be asked to wash their hands.

All patients should also be weighed before entering their dialysis area. Again they will be encouraged to perform this aspect of their care themselves with help given as required.

For those that can weight themselves and carry out and record their observations and those self-caring, encourage those that can do so. Ensure patients are aware of where and how to document the observations.

Pre-dialysis observations will be performed and recorded:

- Seated blood pressure. Ensure seated for at least 5 minutes and correct cuff size
- Pulse rate
- Temperature
- Respiratory rate

Patients wishing to perform their own observations should be appropriately trained and deemed competent as per self-competency documentation.

To ensure patients are treated safely and appropriately it is vital that a thorough assessment of the patient and their observations is performed before dialysis is commenced. This allows early identification of arising medical problems and appropriate delivery of dialysis.

1. Before commencement of dialysis assess and question the patient taking particular note of any changes since last session:

- mobility
- pain
- skin state
- any oedema
- signs of bruising /bleeding
- overall well-being including change in general health since last session
- whether the patient has complaints or signs and symptoms of infection (see *SOP for management of infection in haemodialysis patients*)

- document whether healthcare has been sought elsewhere since previous dialysis session and chase any correspondence relating to this.
2. Review information from previous dialysis session:
- Note pre and post dialysis observations
 - Note any recorded dialysis variances
3. Review baseline information:
- Weight gain - ideally <5% of prescribed dry weight.
 - If weight gains are higher than this:
 - Educate patient in safe fluid intake, diet and how to reduce high salt intake foods. Use dietitian as needed and consider discussion with carers / family.
 - Review whether there has been a reduction in native urine output; perform 24 hour collection (collected on days in-between dialysis). Consider frusemide prescription in those with native urine output
 - If diabetic, review blood glucose levels, as if high this may increase thirst and the need for fluids
 - If persistently finishing dialysis above dry weight consider if needs reassessment
 - Consider use of blood volume monitoring if available, to help assess fluid status
 - If weight gains become less than previously, consider need to reduce dry weight
 - Consider use of blood volume monitoring if available, to help assess fluid status
 - If patient reports shortness of breath in period before dialysis session consider dry weight reduction
 - If patient reports increasing subcutaneous oedema consider dry weight reduction
 - Blood pressure - ideally < 140/80mmHg. Acceptable up to 160 systolic and 90 diastolic. Higher systolic may be acceptable in patients with a wide pulse pressure and where rapid falls occur with dialysis
 - If BP has been gradually increasing then consider whether dry weight reduction is required
 - If BP persistently >160/90 then obtain some interdialytic recordings for review by consultant. Ensure up-to-date information on antihypertensive medications and doses
 - If BP is markedly lower than previous pre-dialysis recordings consider whether patient is unwell; eg sepsis, dehydration. Seek advice

- Pulse - Ideal pulse rate is 60-100 bpm and should be comparable with previous pre-dialysis recordings.
 - Feel rhythm manually to check pulse is regular in addition to machine recording
 - Outside of this range consider dehydration, sepsis, cardiac arrhythmia.

- Temperature - ideally 35.8 - 37.0°C and should be comparable with previous pre-dialysis recordings.
 - Outside this range consider sepsis, hypothermia.
 - Ensure no obvious access infection following CVAD protocol
 - Question as to whether patient has been systemically unwell at home eg fevers, rigours, poor appetite
 - Question patient with regards to localising symptoms of infection eg (ear, throat, coryzal, cough), diarrhoea and vomiting, urinary, skin breaks). Take skin swabs, urine cultures if indicated
 - Follow blood culture procedure
 - Discuss with unit consultant if concerns.

- Respiratory rate - ideally 18-24 rpm.
 - Outside this range consider fluid overload or other respiratory condition, sepsis.

3. Calculate fluid removal and dialysis plan based on observations and patient assessment. Seek advice from senior nursing staff if unsure. Ensure patient understands the need for any re-setting of dry weight or other changes to treatment

4. Review and prepare for any pre dialysis testing (such as BBV, MRSA, monitoring bloods etc). Complete any pre dialysis test checks, to ensure the dialysis is delivered in the correct environment (eg isolation or no isolation) BBV, MRSA, CDiff).

5. Prepare any other equipment such as mattresses, infusion pumps etc to support the patient during dialysis.

6. Assess patient's access and follow appropriate SOP for access preparation as per access protocols. See '*Guidelines for the cannulation, monitoring and surveillance of arteriovenous fistula and arteriovenous graft for the purpose of haemodialysis*' or '*Guidelines for the care of central venous access devices*'.

7. Take any necessary pre-dialysis bloods prior to commencement of treatment. (*SOP for obtaining blood samples from patients on haemodialysis*)

Care during dialysis

Once dialysis has commenced, all patients can expect to have their dialysis monitored and recorded, and any issues shared with the staff actioned. Observations should be recorded in electronic patient records and in Dialysis Care Round document (Appendix 1). Adequate observations will prevent unexpected dialysis emergencies, needle dislodgment and clotted circuits.

1. Perform observations (BP, P, R and record machine parameters, dialysis progress and medications administered etc). The frequency of observations should be risk assessed. In very stable patients who normally have no adverse dialysis events requiring intervention; observations can be taken pre, midway and post dialysis. Patients that are less stable will require as a minimum hourly observations.
2. Patients that are diabetic will require additional blood sugar monitoring, as a minimum pre and post dialysis (using at the point of care monitors)
3. Routine drug rounds should be completed for eg iron and erythropoietin
4. Prepare and administer any extra prescribed medication as per protocols eg antibiotics
5. Chase any recent test results and ensure actioned appropriately
6. Ensure the transport for patient's return journey is arranged.
7. Train patient in self care/ shared care competencies if interested
8. Spend time discussing any medical issues with the patient and updating their kidney care plans; help them understand their blood results and dialysis prescription suggesting self management strategies to make aid improvements. Refer to dietitian if needed.
9. Discuss any psychosocial issues referring to welfare support or psychological support service if needed.
10. Ensure patients and carers are aware of any approaching outpatient clinics and their time and location arranging transport if needed.
11. For patients that are on Warfarin, ensure INRs have been taken as scheduled with the result and new dosing conveyed to the patient and their yellow book completed.

Post dialysis care

1. As dialysis is approaching completion, prepare equipment ready to terminate dialysis and disconnect the patient from the machine.
2. Obtain any required post dialysis blood samples (*SOP for obtaining blood samples from patients on haemodialysis*)
3. Disconnect access as per protocols. *'Guidelines for the cannulation, monitoring and surveillance of arteriovenous fistula and arteriovenous graft for the purpose of haemodialysis'* and *'Guidelines for the care of central venous access devices'*.
4. Where possible, encourage patients to be involved in these procedures. See *SOP 'Supporting a patient to remove their dialysis needles'* in *'Guidelines for the cannulation, monitoring and surveillance of arteriovenous fistula and arteriovenous graft for the purpose of haemodialysis'*.
5. For patients with a RDC ensure the patient is aware of keeping their exit site dressing dry and procedures to follow should the catheter become dislodged, bleed or they feel unwell.
6. For patients with AVF or AVG, ensure the patient is aware of procedures to follow if any bleeding between sessions.
7. Post dialysis observations (BP, P, R, Temp and blood sugar in diabetic patients) are to be recorded before the patients dismounts the chair / bed. Where a patients systolic BP is <110mmHg systolic, ask the patient to wait a further 5 minutes and repeat. If after been seated for a further 15 minutes and the patient is symptomatic of a low blood pressure, refer to senior nurse / consultant.
8. Ensure all patients are aware of who and how to contact in the case of any emergency.
9. Administer Hepatitis B vaccination if required
10. Complete any outstanding documentation and record in diary any issues to be chased during next session.

SOP for managing patients that do not attend for dialysis

Patients that do not attend for dialysis may do so for a number of reasons. If contact is made with the unit ahead of the non-attendance then the procedures listed below in procedure 1 should be followed. At all times, the patient should be treated with respect and listened to, and offered alternative arrangements if at all possible.

If the patient has not made contact with the dialysis unit and not attended for their session then procedure 2 should be followed. Persistent non-attendance must be escalated to the wider MDT and unit consultant for review.

Procedure 1:

For patients that contact the dialysis unit ahead of not attending.

For any patients that do not attend, most of the discussions will be around attempting to persuade the patient to attend and trying to understand why they are choosing not to dialyse.

1. Try and establish the reason for non-attendance.
 - a. Does the patient have an important commitment elsewhere at that particular time eg funeral, job interview, other medical appointment?
 - b. If there are financial, family / carer responsibilities that are regularly causing non-attendance consider referral to benefits advisor with patient's permission
 - c. If patient states they are unwell, try to establish if further medical help is required. If necessary discuss further with unit consultant for advice
 - d. If patient is low in mood and finding dialysis difficult consider psychological referral with patient's permission.

Empathise with the patient, offering encouragement to attend.

2. Offer an alternative slot for later the same day or the next day if possible. If this is not possible in the patient's regular unit but they are willing to attend dialysis, discuss availability of slots elsewhere with satellite co-ordinator or 301 acutes if the co-ordinators are unavailable.
3. Offer advice on staying safe, individual to the patient's needs. Ensure that they know how to seek further help if they become unwell eg through local Accident and Emergency Department, via own dialysis unit or via QEHB.
 - a. Give advice with regards to fluid overload: ensure the patient knows how to recognise signs of fluid overload (breathlessness, unable to walk normal distances, unable to lie flat to sleep) and how to seek help, and that they are very careful with fluid intake

- b. Give advice with regards to potassium intake if relevant. Advise patient to be particularly careful with potassium rich foods. Advise that signs of high potassium may be weakness and aching in limbs but that dangerous levels can also occur without symptoms.
 - c. Patients with a dialysis catheter, must be made aware of the risks of infection should they choose not to attend, due to the exit site not been assessed / redressed and re- flushed with an antimicrobial lock. Document in patients CVAD care plan of non-attendance and CVAD advice given
4. For all DNA, ensure the Satellite Liaison Team, the patient's consultant and where possible, Ward 301 acutes, are informed, to ensure all teams are aware in-case the patient subsequently attends as an emergency
5. Document in the patient's medical records of their non attendance, any discussion with the patient, actions taken, and register as a treatment variance as per local protocols.
6. When the patient next attends for dialysis, the primary nurse should discuss directly with the patient the consequences of missed dialysis sessions in more detail, involving members of the wider MDT if felt helpful as above. When non-attendance becomes habitual, it is essential that the patient is reviewed by the unit consultant. It is also helpful to inform the patient's GP.
7. All patients that do not attend for dialysis, will be sent a letter by the patient's nursing team (appendix 2), explaining the risks, and copied to their GP. A copy will be scanned onto the patient's UHB electronic patient record.

Procedure 2:

When patients do not attend and have not contacted the dialysis unit prior.

1. Try and make contact with the patient by 'phone
2. If unable to contact the patient directly:
 - a. Contact the ambulance service if they normally receive hospital transport to establish whether the patient was at the address or whether they informed the transport service they were not attending
 - b. Contact the patient's next of kin to establish if recent contact has been made
3. Ensure unit consultant and satellite co-ordinator (ward 301 acutes QEH, if out of hours or weekend) are aware of patient's non attendance and lack of contact

4. If there are serious concerns for patient's well being:
 - a. Contact the patient's GP
 - b. Consider contacting the police service to further assess patient safety

5. Document in the patient's medical records details of their non-attendance, any discussion with the patient or next of kin, actions taken, and register as a treatment variance as per local protocol.

6. When the patient does next attend for dialysis, the primary nurse should discuss directly with the patient reasons for non attendance in more detail, involving members of the wider MDT if felt helpful as above. When non-attendance becomes habitual, it is essential that the patient is reviewed by the unit consultant. It is also helpful to inform the patient's GP (appendix 2), and a copy scanned into the patient's UHB electronic record.

SOP for managing patients who shorten their dialysis session

Patients who shorten their prescribed dialysis session endanger their health.

1. Try and establish the reason for shortening of session:
 - a. Does the patient have an important commitment elsewhere at that particular time eg funeral, job interview, other medical appointment?
 - b. If there are financial, family / carer responsibilities that are regularly causing treatment shortening consider referral to benefits advisor with patient's permission
 - c. If patient states they are unwell, try to establish if further medical help is required. If necessary discuss further with unit consultant for advice
 - d. If patient is low in mood and finding dialysis difficult consider psychological referral with patient's permission.

Empathise with the patient, offering encouragement to complete prescribed treatment.

2. Offer advice on staying safe, individual to the patient's needs. Ensure that they know how to seek further help if they become unwell eg through local Accident and Emergency Department, via own dialysis unit or via QEHB.
 - a. Give advice with regards to fluid overload: ensure the patient knows how to recognise signs of fluid overload (breathlessness, unable to walk normal distances, unable to lie flat to sleep) and how to seek help, and that they are very careful with fluid intake
 - b. Give advice with regards to potassium intake if relevant. Advise patient to be particularly careful with potassium rich foods. Advise that signs of high potassium may be weakness and aching in limbs but that dangerous levels can also occur without symptoms.
3. Document in the patient's medical records of their treatment shortening, any discussion with the patient, actions taken, and register as a treatment variance as per local protocols.
4. Ensure unit consultant is aware of patient's shortening of treatment. Ensure discussed at QA if becomes a regular occurrence.
5. Ask patient to sign 'Early termination of dialysis' form. Appendix 3
6. Ensure this form is stored within the patient's electronic record.

SOP for management when prescribed blood flow for dialysis is not achieved

In order to achieve adequate dialysis, it is important that the blood flow (Qb) achieved from vascular access is sufficient to allow adequate toxin clearance and fluid removal. If blood flow is suddenly lower than expected the procedure below should be followed.

Exceptions

- The fistula is newly formed, assessed as sufficiently mature and within the first two weeks of needling with a reduced blood flow.
- Patients with cardiac / medical problems that have a prescribed lower blood flow.

Actions:

Blood flow less than 200ml/min

General:

1. Check tubing for kinks and straighten tubing if needed.
2. Resume blood pump. If prescribed blood flow is achieved - no further action is needed
3. If blood flow remains at < 200 ml/min - consider fluid challenge by infusing boluses of 0.9% sodium chloride or online substitution fluid (150-200mls) if felt to be below true dry weight. Re-assess dry weight
4. Consider whether to continue treatment session at such low blood flow. Check U/Es or spot potassium level to ensure safe to terminate dialysis. Discuss any results or outcomes with the patient's consultant
5. Review anti-coagulation prescription; dosing may need to be increased if there is evidence of clotting in the circuit
6. Ensure close observation of circuit, document treatment and actions. Ensure any necessary follow up.

For patients with AVF/G:

1. Stop blood pump. Recheck position of needles, flush needles with 0.9% sodium chloride for injection. If AVF/G does not flush, refer to Access Team urgently.
2. Refer to protocols in "*Guidelines for the cannulation, monitoring and surveillance of arteriovenous fistula and arteriovenous graft for the purpose of haemodialysis*" for further guidance on assessment and management of AVF/AVG problems.

For patients with a RDC:

1. Stop blood pump. Re-position the patient and flush lumens with 0.9% sodium chloride for injection. If dialysis catheter does not flush follow the guideline '*Administration of Synerkinase into tunnelled haemodialysis catheters.*'
2. If a blood flow is achieved but still below the patient's prescribed blood flow, consider intra-dialysis infusion as per '*Administration of Synerkinase into tunnelled haemodialysis catheters.*'

SOP for obtaining blood samples from patients on haemodialysis

All bloods taken from haemodialysis patients must be taken in a standardised manner to ensure accuracy and maintain patient safety from infection and other complications.

In general:

1. A verbal explanation of the need for blood testing should be given and verbal consent obtained from the patient
2. All samples and forms must be accurately labelled preferably using patient labels. These should always include patient name, date of birth, dialysis unit location, UHB identification number and the NHS number. The latter is particularly important if being sent to non-UHB hospitals. Forms should include clinical details if requested. Without these details the samples cannot be properly processed and recorded.
3. All samples should be processed as per instructions in table 2 which details appropriate handling and storage.
4. All blood samples taken should be followed up to ensure results are available and acted upon. A robust system must be in place within the unit to facilitate this.
5. Patients should be informed as to the result of blood tests and any subsequent actions required.

Procedure For Taking Blood Pre Dialysis

Universal precautions are to be employed throughout each stage of this procedure. This includes the wearing of a visor and other personal protective equipment.

Patients with renal dialysis catheter

Includes blood culture sampling if required.

1. Prepare equipment to commence the patient's haemodialysis treatment in accordance with UHB '*Guidelines for the care of central venous access devices*'. In addition to the equipment required to perform CVAD connection, include the blood culture sampling used on CVAD.
2. As detailed in the renal CVAD connection procedure, and using an aseptic non touch technique, add the blood culture sampling kit to the first lumen and fill both bottles. This will include the lumen lock.
3. Continue to sample other specimens as required in order of priority, (1st blood cultures. 2nd U/E's (K+), 3rd INR, 4th FBC etc)

4. Flush lumen with 0.9% sodium chloride for injection
5. Continue to prepare second lumen and proceed to commence dialysis

A second set of blood culture samples should be taken midway through dialysis or when the patient spikes a temperature. This sample should be taken following UHB procedures using ANTT, from the machine blood circuit arterial port using the appropriate blood culture sampling kit.

Patients With AVF/Graft

1. Prepare to cannulate the patient as per '*Guidelines for the cannulation, monitoring and surveillance of arteriovenous fistula and arteriovenous graft for the purpose of haemodialysis*'
2. During the preparation procedure for AVF/G, ensure that only one fistula needle is primed with 0.9% sodium chloride for injection. The remaining sampling needle must be dry.
3. Cannulate the fistula arm using the dry needle, ensuring the clamp is closed. Secure with tape.
4. Allow the needle tubing to be primed with the patient's blood and then close the clamp.
5. Apply the Vacutainer and corresponding blood bottles to the end of the primed needle. Obtain the sample by releasing the clamp. Ensure bottles are filled in priority order (1st blood cultures, 2nd U/E's (K+), 3rd INR, 4th FBC etc)
6. Once the samples are obtained, flush the arterial needle with 10ml 0.9% sodium chloride for injection and continue with cannulation of the venous site.

Taking blood samples for INR

All haemodialysis patients on long term warfarin therapy should be under the care of an Anticoagulation Clinic who will monitor INR, prescribe warfarin and instigate any changes to therapy. **This is not performed by the consultant covering the dialysis unit.** It is therefore essential that it is clearly recorded within the patient's records as to which service is used by the patient for this monitoring with appropriate contact details and that a robust method exists within the unit to ensure that bloods are taken as scheduled and actioned.

In general, frequency of sampling should be guided by the patient's anticoagulation service. However, on occasions, other measurements of INR may be required:

1. A clinical indication, (for example reports of significant bleeding or bruising)
2. Recent commencement of a drug therapy with the potential to interact with Warfarin. This should be in conjunction with the anticoagulation service.
3. If the patient has an upcoming procedure

Procedure

If the patient has a fistula or graft, insert a dry dialysis needle. Attach a Vacutainer to the end of the needle tubing and slowly allow the patient's blood to fill the needle tubing. When it reaches the end, apply the INR bottle (blue tube) into the Vacutainer barrel and obtain the sample. It is essential that the blood bottle is filled up to the black arrow marker. Sample in order of 1st U/E's, 2nd INR, 3rd FBC

If the patient has a renal CVAD, follow the UHB '*Guidelines for the care of central venous access devices*'. Do not administer any bolus or stat anticoagulation at the start of dialysis.

Allow 10 minutes of dialysis to pass then sample using the appropriate Vacutainer kit, take the INR blood sample from the machine blood circuit arterial port. Ensure the port is dry after disinfection, so as not to contaminate the sample.

Label the sample, complete the request form and send as per the requirements of the patients Anticoagulation service. See table 4 for more details of local services.

When results are telephoned through by laboratory technicians, these must be documented in the results book. The member of staff receiving the result must sign their name. If this individual is not the RN caring for that patient, they must also indicate to whom they have handed over the result for action. The RN auctioning the result must then record the result on the patient's Anticoagulation chart and sign for doing so.

Table 1. Suggested anticoagulation clinic and monitoring hospital for patients at each unit

| Satellite Unit | Suggested Anti-coagulation service |
|-----------------|------------------------------------|
| Aston | City Hospital |
| Great Bridge | Sandwell Hospital |
| King's Norton | QEHB |
| Smethwick | QEHB |
| Woodgate Valley | QEHB |
| Worcester | QEHB |
| Hereford | Hereford Hospital |

Measurement of urea level pre and post dialysis

Introduction

Urea is a small molecular sized solute (60 Daltons) which is freely filtered across the dialyser membrane. By using a standardised method of urea sampling pre and post dialysis, an assessment of haemodialysis adequacy can be made by measuring:

- either urea reduction ratio (URR) > 65%
- or equilibrated Kt/V of >1.2 (or sp Kt/V of > 1.3) calculated from pre- and post-dialysis urea values, duration of dialysis and weight loss during dialysis. (Renal Association Clinical Practice Guidelines 2009)

When sampling the urea level for measuring dialysis adequacy, the blood sample for urea must be the first sample taken (after any bloods cultures) and collected in the correct blood bottle (Yellow top Vacutainer). Pre and post urea samples must be taken during the same dialysis treatment.

Pre dialysis sampling from a fistula

1. The urea sample must be taken from a dry fistula needle before the needle is flushed with 0.9% sodium chloride for injection.
2. The procedure must be undertaken using an aseptic non-touch technique (ANTT)

Pre dialysis sampling from a renal CVAD

1. Using an ANTT procedure, aspirate 7mls of blood from *both* lumens and discard.
2. Proceed to attach a Vacutainer to one lumen and apply the blood bottle to draw required sample of blood. Continue to flush both lumens with 0.9% sodium chloride for injection.

Urea sampling immediately at the end of dialysis will result in a falsely low measurement of post dialysis urea concentration and an over-estimation of dialysis dose. True venous blood urea concentration rises rapidly in the first few minutes after dialysis as the effects of access and cardiopulmonary recirculation dissipate and equilibration of blood urea from poorly dialysed compartments occurs. In real time this takes about 30 minutes. It is, however, impractical to wait 30 minutes before blood sampling post dialysis and so it is recommended that the 'stop-dialysate flow' method is used to collect post dialysis blood urea samples.

The stop dialysate flow method is recognised by the Renal Association and is the method adopted by UHB. The stop dialysate flow method is simple, easily reproducible and is suitable for all forms of vascular access, is validated in HDF as well as HD, and is currently the most widely used method in the UK. It is described in more detail in the Renal Association Clinical Practice Guidelines; Haemodialysis (2009).

Post urea sampling by **STOP DIALYSATE FLOW** method.

1. At the end of the prescribed dialysis treatment time turn the dialysate flow off.
2. Keep the blood pump running for 5 minutes.
3. After 5 minutes take the post urea blood sample from the arterial sample port.
4. Re-infuse the patients blood using 0.9% sodium chloride for injection or online substitution fluid .

Samples Preparation Prior to Sending to Laboratory

Table 2. Handling and storage of blood samples

| Sample | Bottle (Vacutainer brand) | Number | Preparation | Storage (2-8°C) |
|-------------------------|---------------------------|--------|--|--------------------------|
| Pre dialysis chemistry | Yellow top | 1 | 1. Stand for one hour 2. Centrifuge for 10mins at 3000rpm | Fridge |
| Post dialysis chemistry | Yellow top | 1 | 1. Stand for one hour 2. Centrifuge for 10mins at 3000rpm | Fridge |
| B12 | Yellow | 1 | | Fridge |
| Ferritin | Yellow | 1 | | Fridge |
| CRP | Yellow | 1 | | Fridge |
| PTH | Purple | 1 | | Fridge |
| INR | Blue | 1 | Fill to black arrow mark | Send to labs immediately |
| FBC | Purple | 1 | Mix 3 – 4 times | Fridge |
| HbA1c | Purple | 1 | Mix 3 – 4 times | Fridge |
| Hepatitis B | Red | 1 | Mix 3 – 4 times | Fridge |
| Hepatitis C | Red | 1 | Mix 3 – 4 times | Fridge |
| Hep C PCR | Purple | 1 | | Fridge |
| HIV | Red | 1 | | Fridge |
| Tissue Typing | Red | 2 | | Fridge |
| Aluminium | Dark Green | 1 | | Fridge |
| Glucose | Grey | 1 | | Fridge |

SOP for administration of blood transfusion during dialysis

Introduction

Stored red blood cells (RBC) in bags of blood ready for transfusion, can contain more than 20mmols/L of potassium. Because of this potential risk of high and unknown levels of potassium, patients with ESKD requiring a blood transfusion should, if at all possible, receive blood transfusions during a dialysis session.

In addition it is safe practice is to administer blood in the form of packed red blood cells rather than whole blood; the administered volume is added to the total fluid loss required during the dialysis.

All other aspects and polices related to sampling, prescribing, checking and administering blood for transfusion must be followed and no safety measures breached.

Administration of Blood for Transfusion during Dialysis

How?

Administer all blood transfusions via the arterial port in the dialysis blood circuit. This ensures it is passed through the dialyser removing some of the additional potassium before reaching the patient's circulation

Time?

Administer each unit over 45-60 minutes

Ensure dialysis continues for 30 minutes after the last unit of blood has finished.

Anticoagulation?

Administer as normal prescription

For patients that are not prescribed anticoagulation, additional flushes of the dialysis circuit with 0.9% sodium chloride for injection or on-line substitution fluid may be required

Fluid consideration?

Ensure the blood volume administered is also calculated into the total fluid volume to be removed / ultrafiltrated

Rechecking of haemoglobin?

If required this should be performed the following day or dialysis session.

An accurate result will not be obtained if sampled immediately after transfusion.

Administration of Fresh Frozen Plasma (FFP) and Platelets

Unlike RBC, FFP and Platelets must be administered via the venous chamber using a volumetric pump. There is not the risk associated with additional potassium administration present in RBC transfusions.

Administration of Fresh Frozen Plasma or Platelets

How?

Administer directly into the venous air chamber using a volumetric pump

Time?

Administer during the last 20-30 minutes

Anticoagulation?

Administer as normal prescription or prescribed for that day

Fluid consideration?

Ensure the volume administered is calculated into the total fluid volume to be removed/ ultrafiltrated

SOP to follow when patient is not dialysed on their regular machine.

It is vital to keep to a minimum the risk of transmission of any blood borne virus within a chronic haemodialysis unit. One of the components of such a strategy is to ensure that all patients should be dialysed where possible on the same dialysis machine, at the same station position at every treatment. Patients treated on 'named for their sole use machines' must be treated on the same machine at all times. More details of patients in this category can be found in 'Clinical Policy for Screening, Prevention and Management of Blood Borne Virus in Patients Under the Care of UHB Renal Service. 2nd Edition'.

The maximum machine changes per month should be no more than two for each patient.

When a patient is dialysed on a machine which is not recorded as their regular machine, this must be documented as a dialysis incident event and recorded in a dialysis machine change log. This machine change must be recorded with the patient name, date, time and reason why as below. In addition as treatment variance should be recorded as per local policies with regular auditing.

If a patient is treated on a machine which is not their regular machine and there is a potential for harm to either this patients or others, a dialysis incident report must be completed, the lead consultant for HD, Matron for ERF and Satellite liaison Team informed.

Patients should only dialyse on a different machine when:

1. The regular machine is removed from its position for repair or service. Once repaired this machine must return to the same station
2. The patient requires dialysis at a different time / day or is not at their regular dialysis unit.

Dialysis machine change log detail required

- Date
- Patient name
- Patient hospital ID number
- Patients regular dialysis machine number
- Swap dialysis machine number
- Reason

SOP for nurses guiding patients who wish to dialyse away from their home unit

All patients wishing to arrange a holiday and dialyse away from their home unit should be supported and adequately prepared to ensure their experience is safe and prepared for. Within each unit there should be a holiday link nurse who is able to provide specific advice and ensure all documentation is completed. However, all RN should be able to discuss dialyse away from base with their patients.

1. Patients need to be aware that any preparations for dialysis away from home requires a minimum of three months to organise and that it is vital their dialysis arrangements are confirmed before booking the holiday
2. Dialysis within any NHS and partner facility and some UK holiday only dialysis centres is free to British Citizens and those from within the European Union holding a current European Health Insurance Card (EHIC).
3. In general dialysis outside the EU and even within some European private facilities is not covered within this reciprocal agreement and has to be funded by the patient. Particular attention needs to be applied to cruises as even within Europe these may not be covered. Prices vary considerably and can be as much as £250 per dialysis session.
4. Patients must be aware of the differences of dialysing in high and low risk countries as per table 1. Standards of care within the high risk countries are felt to be such that the patient is exposing themselves to increased risk of poor hygiene and possible dangers from less regulated dialysis practices. For the patients, this means that the risk of exposure to blood borne virus is increased. They must understand that on their return they will need to dialyse in isolation for three months and that this maybe out of their normal slot and centre. They will also be suspended from the transplant list during this time. They must be issued with the patient information leaflet -Information on the risks of having haemodialysis abroad

Table 1 – Countries considered as either high or low risk for DAFB

| Low Risk Countries | High Risk Countries |
|---|---|
| UK/Ireland Belgium/France/Germany/Netherlands Italy/Spain/Portugal/Greece Sweden/Norway/Denmark/Luxembourg North America (USA and Canada) Japan Australia / New Zealand | All other countries not listed in the low risk group are considered 'high risk' |

5. By ensuring patients are vaccinated against Hepatitis B and have adequate immunity, protection against the disease whilst the patients dialyse away is provided. Full protection should be provided with anti HBs antibodies > 100U/L. Titres between 10-100U/L provides some protection. Refer to Hepatitis B Vaccinations for renal patients guideline for more information.

To consider when a patient is arranging a holiday.

1. Where is the nearest dialysis unit to where they wish to holiday and do they have space during the time they wish to visit?
2. Will they need to pay and how much?
3. Is the dialysis unit a recognised safe dialysis unit in a low risk area? If not then ensure patient is aware of risks and consequence of such dialysis.
4. Is the patient well enough to travel?
5. Does the patient have good functioning access? Ideally an AVF or AVG but a RDC is suitable if working without problems
6. Has the patient been established on dialysis for a minimum of 6 months? Patients can travel before this time but it may need further medical discussion.
7. Is the patient currently negative to MRSA and BBV?
8. What specific tests are required to attend dialysis at the patient's chosen unit and have they been completed along with all the relevant paperwork?
9. Has the patient obtained travel insurance if travelling abroad?
10. Has the transplant team been informed that the patient will be away during that period of time to allow suspension from the list?
11. Have any other outpatient appointments or procedures been postponed if required?
12. Ideally the patient should be vaccinated against hepatitis B

SOP for quality assurance meeting preparation and feedback

Each month the dialysis multidisciplinary team (MDT), led by the unit consultant, hold a quality assurance meeting to review all aspects of patients care. At this meeting, which has a set agenda (see '*Guidelines for management of patients on chronic haemodialysis at QEHB*'), the following are reviewed for all patients.

1. Monthly blood results
2. Vascular access
3. Transplantation status
4. Any other significant clinical, social or psychological factors.

This process works alongside the usual medical and nursing review and in order for it to be effective it is vital that

- Nursing staff are adequately prepared for this meeting
- The outcome of this review is shared with the patient and their care plan updated.

This document will support nurses in reviewing their patients' care and following up on treatment changes, to update the patients' care plans and to engage patients in decisions regarding their care.

Pre patient quality assurance meeting

All patients can expect to meet with their named nurse at least once a month as a minimum to discuss routine blood and monitoring results, medication, review any problems and to provide feedback for the following month.

Registered Nurses should do the following with their named patients. If the named RN is not available this should be performed by another team member to ensure information is available for all patients prior to QA meeting. This information should then be handed over to the relevant team member attending the meeting so that it can be discussed in an informed manner.

- Initial discussion with the patient re the routine monitoring bloods from that month. Explanations should be given in a way that is easily understood and the patient information leaflet '*Haemodialysis – all you need to know about your blood results*' re-issued if required. Enlist dietary advice if needed
- Review their medications and compliance to these prescriptions. Medication reviews are more effective if the patient brings with them all their medications, so an educational review of compliance and tolerance can be understood. These can then be compared against clinic letters and previous agreed changes and documented.

- Review dry weight and blood pressure during the relevant time period and ensure that any changes or needed changes can be discussed at the QA meeting.
- Ensure that the QA meeting is informed of any treatment variations during the relevant time period
- Confirm what elements of shared care are currently being performed and which are being learnt.
- Ensure that any clinical issues, including treatment for non-renal conditions elsewhere are known about and any documentation has been obtained if at all possible.
- Discuss with the patient their current care plan and any issues for discussion at the MDT– QA review meeting. This should include any psychosocial issues and with referral onto relevant MDT member if required

Feedback after the patient quality meeting

Following the MDT QA meeting, the RN should share any suggested changes with their patients. These changes might include adjustments to medications, dialysis time / clearances, changes in dry weight, dialyser size, blood flow, access reviews, diet and fluid. These changes should be confirmed in a letter (appendix 4) to the patient and updated in their care plan. Feedback time, should also be used to educate the patient and encourage participation in shared care.

It is accepted that, as part of shared decision making, there are occasions when patients do not wish to follow the suggested changes from the MDT QA meeting. This needs to be discussed in a supportive manner, in a way which the patient understands involving any other carers, of the plan and document, when any variation to agreed treatment occurs this should be documented and discussed with the consultant and MDT as necessary

SOP to guide weight and blood pressure management on dialysis.

Fluid removal (ultrafiltration) during dialysis

A patient's tolerance to dialysis and ultrafiltration (UF) is more easily accepted when performed separately, but as this would double the treatment time a compromise is necessary. This SOP guides safe fluid removal during dialysis. If a patient is gaining excessive amounts of fluid weight between dialysis sessions this should be addressed in a sensitive and supportive manner by the wider MDT.

During dialysis, fluid can only be removed from the vascular compartment. This facilitates slower re-filling from the extra-vascular compartment. In order to prevent precipitation of hypotension, which would occur when fluid removal from the vascular compartment exceeds the ability of the physiological compensatory response, and is associated with changes in myocardial blood supply and poor outcomes, UF can only be performed at a maximum rate of 10ml-15ml/kg/hr.

1. Assessment of residual urine output. It is essential that this is regularly recorded as it is a vital piece of information for guiding individualised fluid intake guidance. It should be measured within a month of commencing chronic haemodialysis and every six months thereafter. Frusemide should be used to help maintain urine output. In addition, nephrotoxic drugs should be avoided in patients with residual renal function.
2. Insensible loss (ie fluid lost through sweating and the gastrointestinal loss) is approximately 750mls/day. This may be greater in hot weather or in patients with higher than average activity levels. Individualised fluid intake guidance should be developed. In an anuric patient this generally amounts to a 1000ml/day fluid restriction but will obviously depend on the patient's size. This can be increased in a patient passing urine. In general fluid intake should be such that fluid gained between dialysis sessions is 2 litres or less and always such that weight gain is <5% between even a 3 day break. Dietetic advice should be given with regards to low salt intake in addition.
3. Calculated fluid removal should be based on the patient's dry weight. However ultrafiltration rates should not be higher than 10-15ml/kg/hr. This is often misquoted as '1 litre per hour' but of course will depend on the patient's dry weight (a 50kg patient is very different from a 120kg patient) and other co-morbidities affecting tolerance to rate of fluid removal.
4. Effective estimation of dry weight is important and should be reviewed regularly. This can be difficult and should be based upon blood pressure changes (using sitting and standing if necessary), central venous pressure, peripheral oedema, any symptoms of pulmonary oedema and bioimpedance measures if available. Senior nursing staff should be skilled to adjust dry weight and all nursing staff should be

- able to communicate the need to adjust dry weight effectively to patients.
5. If fluid removal results in hypotension or symptoms of hypovolaemia above dry weight various methods can be utilised to aid adequate fluid removal:
 - a. Consider use of blood volume monitoring to guide ultrafiltration
 - b. Use HDF if not already prescribed
 - c. Advise against eating and drinking during dialysis
 - d. Consider alternative ultrafiltration schedules. Sodium profiling should not be used as tends to sodium load patients and worsen interdialytic fluid gains
 - e. If hypotension occurs at the beginning of dialysis, consider a fluid bolus at start of dialysis
 - f. Consider lowering temperature of dialysate to 36°C or even 35.5°C. Further reduction is unlikely to be helpful
 - g. Consider cautious changes in dialysate sodium following discussion with unit consultant.
 6. If patient is still not able to tolerate removal of gained fluid, then consideration should be given increased frequency of dialysis. This can be performed in centre if short term to allow 're-setting' of dry weight or if serious co-morbidity, but consideration should also be given to home haemodialysis to allow regular increased frequency dialysis.
 7. In intractable cases, periods of isolated UF may need considering although this will extend length of dialysis session.

SOP for managing hypotensive episodes during dialysis

Introduction:

Hypotension on dialysis can have several causes. In an individual it may be multifactorial:

1. When the rate of fluid removal exceeds vascular refilling rate. This is more likely to occur when ultrafiltration exceeds the rate of 10ml-15ml/kg/hr and when fluid gain between dialysis sessions is excessive
2. When a dry weight is not correct and is too low.
3. When antihypertensive medication or medication affecting the pulse rate does not allow physiological adaptation to fluid removal
4. With significant cardiac disease preventing physiological adaptation to fluid removal. This includes significant left ventricular failure, dialysis-induced ischaemia and rhythm abnormalities
5. When a patient has significant extra-renal fluid losses resulting in reduced intravascular volume either temporarily eg diarrhoea and vomiting, blood loss on dialysis or long term eg high output ileostomy
6. With serious infection particularly sepsis syndrome
7. As a chronic condition in long term, particularly anephric patients

Immediate action if clinically significant hypotensive episode occurs:

- Place the patient in the Trendelenburg position
- Stop ultrafiltration and re-assess fluid loss. Keep off ultrafiltration for at least 10-15 mins.
- Administer oxygen
- Administer 150ml bolus of sodium chloride 0.9% or online substitution fluid if clinically necessary
- If recovery not within 5 minutes consider need for medical review

Causes should then be sought as per list above.

Prevention:

- Ensure all patients have a personalised fluid intake guide that they understand. Engagement of other family members / carers may be necessary. This should be reassessed regularly taking into account residual urine output, size, degree of physical activity and any other fluid loss. Dietetic advice should be employed to aid salt and water intake
- Regular assessment of dry weight using clinical parameters and bioimpedance measurements if available
- Regular assessment of use of antihypertensive medications. Pre-dialysis blood pressure is only a snap shot of blood pressure control over 48 hours and should be treated in context of other measurements. There is little evidence to suggest that dialysis patients should have the same degree of BP control as within the non-dialysis CKD population.

Consider alternative scheduling of medication such as after dialysis or on non-dialysis days

- Consider use of HDF if not already prescribed
- Consider use of blood volume monitoring to guide ultrafiltration
- Consider full cardiac assessment to identify severe left ventricular failure, valvular abnormalities, marked ischaemia or rhythm abnormalities
- Consider further cooling of dialysate; it is unlikely that reduction to below 35.5°C will be helpful.
- Consider increasing frequency of dialysis in patients with significant cardiac disease
- Consider home haemodialysis and increased frequency/prolonged hours dialysis for patients who struggle with interdialytic weight gains.
- Consider cautious changes in dialysate sodium
- Consider alternative ultrafiltration schedules. Sodium profiling should not be used as tends to sodium load patients and worsen interdialytic fluid gains.
- Advise against eating and drinking during dialysis
- If hypotension occurs at the beginning of dialysis, consider a fluid bolus at start of dialysis

In patients with chronic hypotension;

- perform cardiac work up to rule out cardiac causes
- perform short synacthen test
- consider use of midodrine, ephridine, fludrocortisone
- use HDF not standard HD
- consider suitability for more frequent dialysis whether at home or in centre
- consider use of compression stockings and advise re postural symptoms
- where transplant listed, ensure that transplant team aware that may need perioperative inotropes. If very severe, consider referral to complex transplant clinic for further discussion
- ensure very close observation of dialysis access; lower BP may accentuate haemodynamic effects of any vessel stenoses
- consider screening for ischaemic proliferative retinopathy

SOP for managing cramps during haemodialysis

Introduction:

Patients may complain of cramp at varying times during their dialysis session. Mostly the cramp is felt in the lower calf muscles but it is not uncommon for cramping pain to be felt in hands, feet, abdomen etc. This can vary from mild to extreme pain and muscle spasm.

Causes (these are often multifactorial but commonly):

- Excessive fluid removal due to;
 - Large interdialytic fluid gains
 - Incorrect dry weight
- Poor circulation – unable to adequately perfuse extremities

Signs and symptoms of physiological complications secondary to rate of fluid removal:

- Often the patient recognises no symptoms
- Gradual hypotension during dialysis session
- Yawning
- Muscle tightening and cramps

Dialysis management of severe cramps:

- Immediate:
 - Reduce ultrafiltration rate
 - Reduce blood flow rate
 - Massage limb if possible
 - Administer oxygen
 - Administer 0.9% sodium chloride (or machine prepared solution) in measured boluses
 - Re assess fluid removal and patient's dry weight
- Then:
 - Re-educate patient re fluid intake if weight gain is excessive
 - Measure native urine output and maximise with diuretics
 - Refer to dietitian to review sodium intake
 - Consider use of quinine sulphate
- If problem remains refer to SOP '*Fluid removal during dialysis*' and '*Hypotensive episodes on dialysis*':

SOP for management of infection in haemodialysis patients

Introduction:

Patients with ESKD treated with haemodialysis are by definition already immunosuppressed in that the body's normal responses to infection are impaired. Also, some patients may be on medication related to their clinical condition that further suppresses their immune system. In addition, they are exposed to more risk of infections. These include:

1. Presence of renal dialysis catheter (RDC). Despite careful adherence to all CVAD care policies, the risk of infection, both local and systemic, with RDC remains very significant and should be actively monitored and treated promptly.
2. Frequent needling of peripheral access can insert skin microorganisms into the skin and circulation. This is less likely than in patients with RDC but remains a risk, particularly in patients buttonhole needling.
3. Intercurrent co-morbidity such as diabetes increases infection risk and may be associated with other skin and soft tissue infections
4. Frequent contact with other patients within dialysis units and on transport can facilitate rapid spread of infectious disease.

It is thus vital that any symptoms and signs of infection are acted on promptly to prevent severe illness.

In addition to having a high risk of infection, haemodialysis patients may not display the same signs of severe infections as other patients. In particular sepsis guidelines need adapting for this particular group who may not display classic signs such as marked pyrexia. The baseline temperature of dialysis patients may be lower than the general population and tempered on dialysis because of the temperature of the dialysate.

Dialysis nurses in satellite units have only a few basic observations to support and diagnose severe infection, but need to use their skills to ensure prompt management is instituted. If there are any concerns that the patient is not as well as they should be then infection should be sought. Table 1 should be used to guide management.

Table 1. Considerations in the potentially infected haemodialysis patient

| | |
|--------------------------------|--|
| Additional risk factors | <ul style="list-style-type: none"> • Is the patient taking immunosuppressive medication? • Is the patient diabetic? • Does the patient have a dialysis catheter (CVAD) or urine catheter in situ? • Does the patient buttonhole needle? • Has the patient had recent surgery, have healing wounds or ulcers? |
| Symptoms | <ul style="list-style-type: none"> • Has the patient complained of abdominal pain? • If still passing urine, is the amount the same or less? Have they had any pain passing urine or noticed change in colour or odour? • Has the patient had a cough, earache, a sore throat or symptoms of a cold within the last 2 days? • Is the patient short of breath? • Is the patient off their food, and lost their appetite? • Has the patient complained of diarrhoea or vomiting within the last 2 days? • Has the patient been suffering from chills, fever or frank rigours? • Does the patient have a severe headache or stiff neck? • Has the patient noticed a rash or any other skin abnormalities • Is the patient complaining of unspecified weakness? • Has or does the patient appear confused, disorientated or their mental state appear to have deteriorated? |
| Observations | <ul style="list-style-type: none"> • Has the patient arrived more than 0.5Kg below their dry weight? • Respirations are either <10 or > 25 per minute • BP at the beginning of dialysis or during the session is <100mmHg systolic or significantly reduced for them • Pulse is <50 or >110 beats per minutes or significantly different to usual observations • Temperature is <35.5 or >37.1 C • Any observed rigours? • Oxygen saturations are <95% on air • Blood sugar level is >7.7 mmol/L (in non diabetic's) • CVAD score is greater than 0 |

Management:

1. Take blood for blood cultures, CRP, U/Es, FBC. See '*SOP for obtaining blood samples from patients on haemodialysis*'.
2. Administer 1g paracetamol (if none taken within last 4 hours)
3. Swab all catheter exit sites and wounds
4. If applicable obtain a MSU for assessment for urinary tract infection
5. If any concerns that this is more than a simple infection then should be discussed with the unit consultant or on-call team if out of hours as per usual protocols. The patient may need admission or hospital review.
6. Ensure antibiotics are administered appropriately before end of session if prescribed following medical discussion.
7. If there are concerns that the patient is displaying signs as indicated by observation that they are seriously unwell then other measures should be instituted as appropriate. These might include:
 - a. Administration of oxygen at 4 litres /min
 - b. If hypotensive administer 0.9% sodium chloride or online substitution as per '*SOP to guide weight and blood pressure management on haemodialysis*'.
 - c. Stopping dialysis session
 - d. Calling for medical help or 999 in a satellite unit.
8. If the patient is discharged home, ensure they are instructed how, who and where to contact in an emergency should they feel unwell and deteriorate
9. Follow up either the following day or by the next dialysis, blood and swab results and communicate these to the unit consultant or on-call team if abnormal.

SOP for management of headache on haemodialysis

Introduction:

Patients often experience headaches during haemodialysis and this can be for a number of reasons. If patients continue to complain of headaches on repeated occasions, the cause may not necessarily be related to dialysis and further investigation may be required. This SOP should only be used for patients who routinely develop headaches. If any patient develops a sudden and very severe headache then medical advice should be sought.

Causes of headache during dialysis:

- Disequilibrium
- Blood flow too fast
- Hypertension
- Reduction in caffeine levels
- Magnesium deficiency
- Dehydration
- Dialysate sodium levels too high
- Causes unrelated to dialysis

Intervention:

- Check observations – treat cause if able using listed interventions
- Discuss with consultant if blood pressure markedly raised
- Administer prescribed analgesia
- Consider reducing blood flow (but no less than 250mls/min)
- Reassess fluid removal and dry weight (if considered too low). See '*SOP to guide weight and blood pressure management on haemodialysis*'.
- Consider stopping ultrafiltration until headache has settled
- Consider changing from HD to HDF
- Dim lights
- Treat magnesium deficiency
- Consider adjusting dialysate sodium levels (following discussion with consultant)
- Ask patient to keep a headache diary and discuss with the patient's consultant or at the next patient MDT quality review meeting. Ensure medication list is up-to-date prior to medical review.

SOP to guide management of nausea & vomiting during haemodialysis

Introduction:

Nausea and vomiting during dialysis can occur for a number of reasons:

1. Motion sickness from the journey to dialysis.
2. Food consumed just before or during dialysis. Dialysis may divert blood flow away from the gut.
3. Rapid fluid removal
4. Hypotension
5. Non-dialysis related reasons eg intercurrent illness.

Prevention and management:

- Address any intercurrent illness, seeking medical advice if required
- Advise patient not to eat prior to and during dialysis
- If nausea is related to travel, consider prescribing anti-emetics for the patient to take prior to commencing their journey.
- Commence dialysis slowly, increasing blood flow during first 30 minutes of treatment
- If related to hypotension or excessive fluid removal refer to '*SOP to guide weight and blood pressure management on haemodialysis*'.

SOP for management of air embolism during haemodialysis

Introduction:

There is a risk of air embolism during the preparation of the patient's dialysis access and via the dialysis machine blood circuit. It is a serious event, with the symptoms and consequences depending on the site of passage of the air embolus within the circulation. It can lead to peripheral circulatory obstruction, convulsions, stroke or a cardiac event. The risk of air embolus is increased if the patient / nurse repeatedly silences an air alarm. During an air alarm both the venous and arterial machine line clamp close. Overriding these alarms re opens the clamps allowing the blood flow and air to either flow backwards up the arterial line or past the venous air chamber to the patient

Air emboli may occur:

- During preparation of the dialysis catheter; if the dialysis catheter is not clamped when the end cap is removed, air may enter into the patient's circulation.
- If dialysis needles / access are dislodged air may enter the circulation
- Via the dialysis circuit; when the dialysis circuit lines and catheter or needle connections are not secured adequately, or the dialysis circuit is not primed thoroughly, air may enter the patient's circulation
- Once in "dialysis mode" should air enter the blood circuit, this will be detected and stopped from entering the patient via the venous air detector. However if air enters via the arterial line of the dialysis blood circuit before the blood pump, it is possible for this air through gravity, to flow back to the patient should the patient be lying / sat lower than the blood pump.

Preventing air from entering the patient and causing an air embolism:

- Ensure all connections (blood circuit, dialysis / fistula tubing to dialysis circuit, clamps, caps) are closed or capped.
- Ensure dialysis catheter is not cracked and that clamps function correctly to seal the ends of the lumens.
- Ensure venous dialysis circuit line is securely placed in venous air detector and air detector and line clamp function correctly
- Monitor any infusions carefully and where possible add these via venous air chamber. Packed red cell transfusions should however always be infused via the arterial port.
- Where possible have patient lying / sat above the level of the blood pump

Recognising air in the dialysis machine circuit:

- Visible air is detected in the dialysis circuit en-route to the patient. Venous air chamber alarm recognises air in the circuit.

Management of identifying air in the dialysis machine circuit:

- Stop the blood pump, clamp the blood lines
- Disconnect the arterial and venous lines from the patient and re-circulate the blood lines
- Flush the patients access with 0.9% sodium chloride for injection
- Circulate the blood circuit until all evidence of air has been removed, by collecting it in the venous air chamber.
- When there is no further evidence of air in the circuit, reconnect the patient and re commence dialysis

Recognising an air embolism:

- Patient complains of sudden chest pain, shortness of breath, cyanosis, seizure, cardiac/respiratory arrest.

Management of an air embolism:

- Stop blood pump and clamp blood lines
- Place patient on left side with head lower than their heart (Trendelenburg position)
- Administer 100% oxygen
- Call for help and medical support if within the hospital or 999 in satellite units.
- Monitor and record pulse, respirations, blood pressure and oxygen saturations.

SOP for dealing with a severely ill patient

From time to time patients experience unexpected clinical emergencies, which could be life threatening. As this document does not have the scope to advice on each individual emergency the following actions can be applied to any situation.

If patient develops severe clinical symptoms on dialysis:

1. Call 999 or for medical help if in hospital
2. Disconnect patient from dialysis, washing patient back if possible.
3. Consider maintaining fistula needles in situ for venous access
4. Follow BLS and AED algorithms if required
5. Reassure patient and other patients
6. Inform next of kin
7. Inform unit consultant
8. Inform matron for ERF or satellite co-ordinator
9. Document dialysis incident and report according to category of incident
10. Ensure debrief of staff and reinforcement of learning points

SOP for management of clotted circuit causing blood loss

Introduction

A dialysis extracorporeal circuit (containing blood lines and a dialyser) contains between 200-300mls. This blood filled circuit can clot at any stage resulting in blood loss to the patient.

Measures to minimise the risk of clotting within the circuit include:

- Ensuring adequate anticoagulation is used.
- Maintaining optimal blood flow.
- Removing fluid within the patients safe / tolerated limits (no more than 5% of body weight or 10-15mls/kg/hr)
- Ensuring that the dialysis machine tests are complete and passed, indicating the machine is safe to use.

Unfortunately from time to time loss of blood via the circuit still occurs.

Signs to help recognise when a circuit may be clotting are:

- Venous blood returning is much darker than blood in arterial line or pre dialyser
- Blood clots and line of blood is visible around venous chamber
- Venous pressure increases
- Transmembrane pressure (TMP) rises
- Air detector alarm is activated

Actions if dialysis circuit is thought to have clotted:

1. Ensure access is still patent and flush with 0.9% sodium chloride for injection
2. Establish reason for clotted circuit, such as inadequate anti-coagulation, over-excessive ultrafiltration, blood flow <200ml/min, rising venous pressure, dropping arterial pressure, rising trans-membrane pressure (TMP), high haemoglobin etc
3. Once the clotted circuit reason / cause has been identified, re prime a new set of blood lines and ensure no further loss of blood through clotting occurs again
4. Where necessary rehydrate the patient, by infusion 0.9% sodium chloride for injection to the volume of blood lost if required.
5. At the patients next dialysis session, check haemoglobin if the previous result is <100g/L and if loss is greater than 100ml

6. Complete documentation and incident report, indicating estimated blood loss volume.
7. Discuss incident with the patient

SOP for management of dialyser blood leak during haemodialysis

Introduction:

Rupture of a dialyser membrane can occur due to:

- Dialyser being dropped
- Application of excessive trans-membrane pressure (TMP) (during isolated UF or excessive fluid removal, coupled with high VP)
- Clotting of the blood circuit
- Clotting of the dialyser.

Careful observation of the blood circuit for colour, clots and monitoring of the TMP by ensuring the maximum pressure according to the manufacturer is not exceeded, should ensure any leak is prevented. In addition, dialysis machines use an optical sensor to detect any passing of blood into the dialysate compartment by looking for a colour change in what should be clear fluid.

False alarms (which activate the machine alarm system as if it were a true blood leak), can be caused by tiny air bubbles passing through the intact membrane. This is generally caused by inadequate priming before dialysis has commenced or air which has entered the blood circuit during the treatment requiring “recirculating” until all air is removed and the alarm cleared.

What happens following a blood leak alarm?

- Blood pump will stop
- Arterial and venous clamps close
- Dialysate fluid will bypass the dialyser.

Why?

To ensure no neat dialysate fluid passes through the rupture and into the patient’s blood.

Interventions to be performed

- Check blood pump has stopped
- Clamp both arterial and venous patients access and blood circuit lines
- Check fluid in dialysate tubes for signs of discolouration
- Non-visible blood can be checked for by removing the out-flow dialysate tube and allowing some fluid from the dialyser to moisten a urine multistix.
- True blood leak – dispose of the whole blood circuit. NEVER return any blood from the circuit to the patient.
- Check patients observations: (blood pressure, pulse, temperature, respiratory rate, O₂ saturations)

- Re-prime a full dialysis circuit again and complete the patients prescribed dialysis.
- Ensure the dialysis machine completes a heat citric internal disinfection following dialysis
- Record as a dialysis incident as per local protocol
- If the dialyser problem is a manufacturing fault. Notify the manufacturer with the equipment batch and lot numbers and assess whether further stock needs withdrawing from use

False blood leak alarm or negative to blood on multistix

- Check the blood circuit for air and remove by placing the circuit into re-circulation until alarm is clear and no visible air is seen
- If the blood leak alarm cannot be reset – remove machine from service and request technical attention.
- If the dialysis machine has not been internally disinfected, document on the technician request repair form.

Clinical Procedure prepared by:

Liz Simpson Matron, Established Renal Failure
Clara Day Nephrology Consultant

Clinical Procedure submitted to and approved by:

Executive Chief Nurse

P. Day
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Date:

03/10/14
.....

Executive Medical Director

[Signature]
.....

Date:

14/10/14
.....

Associate Director of Nursing, Division B

[Signature]
.....

Date:

3.10.14
.....

Matron for Established Renal Failure

[Signature]
.....

Date:

23/09/14
.....

Lead Consultant for Haemodialysis

[Signature]
.....

Date:

24/09/14
.....

Appendix 1: Dialysis Care Round example

| | | | |
|---|--------------|---------------|------------|
| Date | | | |
| Start time | | | |
| Care round checks | Start | Midway | End |
| Insert time of check: | | | |
| Patient is comfortable / Skin tool completed? | | | |
| Patient is nursed on appropriate mattress or seating? | | | |
| Is the patient in pain? | | | |
| Does the patient require the use of toilet facilities? | | | |
| Does the patient request activities, books etc? | | | |
| Dialysis catheter / AVF needle connections are secure? | | | |
| Dialysis catheter / or other dressings are checked? | | | |
| Patient buzzer / table and personal items are in reach? | | | |
| Drinks offered? | | | |
| Meal required and offered? | | | |
| Patient has appropriate transport arranged for home? | | | |

Appendix 2

Patients that do not attend for dialysis

Please copy letter detail onto appropriate headed paper, add patient details, date, dialysis clinic / area details and name, designation and signature of nurse

Patient letter

On you chose not to attend for your regular prescribed dialysis session. We recognise that there are many reasons why patients are not able to attend their sessions from time to time and we will always try and offer you an alternative if we can.

Whilst no dialysis will ever achieve the same blood cleaning and fluid control as your natural kidneys once did, it is important that you receive your prescribed dialysis to stay safe. When you choose not to attend or reduce your dialysis time in any way, you will put yourself at danger from increased fluid overload and blood abnormalities such as a high potassium which can give you an abnormal and dangerous heart rhythm with no warning. This can be very serious, even causing you to die.

We really want to make it possible for you to complete your treatment as prescribed to keep you safe. Please discuss with your primary nurse, kidney doctor or clinic manager how we can help you to do this if you are finding it difficult for any reason.

GP letter

Please copy letter detail onto appropriate headed paper, add patient details, date, dialysis clinic / area details and name, designation and signature of nurse

Your patient..... did not attend for dialysis at..... on occasions during the month of 2014. The reasons given for this were.....

They were given advice on the risks and outcomes of not attending and we will discuss if there are any barriers that need to be overcome to facilitate attendance. We would however be most grateful if you could encourage regular attendance if at all possible as patient outcomes are far worse with intermittent attendance when 3 x 4hr a week time schedules are not met.

Appendix 3
Early termination of dialysis

Early Termination of Dialysis

Please copy letter detail onto appropriate headed paper, add patient details, date, dialysis clinic / area details and name, designation and signature of nurse

Your dialysis nurse has asked you to read and sign this form to ensure you are aware of the complications that could occur as you have chosen to finish your dialysis early.

Occasional early terminations of dialysis of just a few minutes will cause minimal problems to you. Repeated reduction of dialysis by more than 10 minutes will have long term effects on your health and life expectancy.

Whilst no dialysis will ever achieve the same blood cleaning and fluid control as your natural kidneys once did, it is important that you receive your prescribed dialysis to stay safe. When you choose to reduce your dialysis time in any way, you will put yourself at danger from increased fluid overload and blood abnormalities such as a high potassium which can give you an abnormal and dangerous heart rhythm with no warning. This can be very serious, even causing you to die.

As you have not completed your full dialysis, if you become ill at home, have problems breathing or your limbs are aching, these can be signs of under dialysis and you must go to your nearest accident and emergency department, or the Queen Elizabeth Hospital, if this is your nearest hospital, and inform the staff you are a dialysis patient.

We really want to make it possible for you to complete your treatment as prescribed to keep you safe. Please discuss with your primary nurse, kidney doctor or clinic manager how we can help you to do this if you are finding it difficult for any reason.

| | |
|----------|--|
| Name | |
| Date | |
| Time | |
| Nurse | |
| Comments | |

Appendix 4

Letter from the named nurse to their patient following the outcomes of the patient quality MDT meeting

Dear patient,

Following a review of this month's dialysis clearance and your current medications your consultant and renal multi-disciplinary team have suggested the following changes are necessary for you to stay well and achieve the best dialysis possible.

| | Changes following MDT meeting |
|---|--------------------------------------|
| Dialysis hours | |
| Blood flow | |
| Dialyser size | |
| Dry weight | |
| Type of dialysis (HD / HDF) | |
| Phosphate binders | |
| 1 alfa-calcidol | |
| Anaemia status (IV iron or EPO) | |
| Access (referral for investigation or access change) | |
| Other medications or changes | |

I have discussed these changes with you and updated your care plan. The consultant will write to your GP to also inform him of these changes to your care.

If you have any further questions please feel free to ask any of the nurses.

Yours sincerely,

Named Nurse
(print name and designation)