**Peritoneal dialysis for chronic kidney disease.**

<table>
<thead>
<tr>
<th>Title of Guideline (must include the word “Guideline” (not protocol, policy, procedure etc)</th>
<th>Guidelines for children starting or receiving peritoneal dialysis for chronic kidney disease.</th>
</tr>
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<tbody>
<tr>
<td>Contact Name and Job Title (author)</td>
<td>Roy Connell – Clinical Nurse Specialist</td>
</tr>
<tr>
<td>Directorate &amp; Speciality</td>
<td>Family Health; Speciality: Renal</td>
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<tr>
<td>Date of submission</td>
<td>September 2015</td>
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<td>September 2020</td>
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<tr>
<td>Explicit definition of patient group to which it applies (e.g. inclusion and exclusion criteria, diagnosis)</td>
<td>Children and Young People treated with peritoneal dialysis under the care of the Children’s Renal Unit, QMC Campus.</td>
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<tr>
<td>Abstract</td>
<td>This guideline describes the assessment, care and management of peritoneal dialysis in paediatric patients.</td>
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<tr>
<td>Key Words</td>
<td>Dialysis, Peritoneal, Chronic, Child, Young Person, Renal.</td>
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**Statement of the evidence base of the guideline – has the guideline been peer reviewed by colleagues?**

1a meta analysis of randomised controlled trials | Yes |
2a at least one well-designed controlled study without randomisation |
2b at least one other type of well-designed quasi-experimental study |
3 well –designed non-experimental descriptive studies (ie comparative / correlation and case studies) |
4 expert committee reports or opinions and / or clinical experiences of respected authorities |
5 recommended best practise based on the clinical experience of the guideline developer |

**Consultation Process** | Children’s Renal Unit guideline review. Paediatric Clinical Guidelines Group |
**Target audience** | Clinicians and healthcare professionals caring for children and young people treated with peritoneal dialysis at Nottingham University Hospitals NHS Trust |

This guideline has been registered with the trust. However, clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt contact a senior colleague or expert. Caution is advised when using guidelines after the review date.
## Document Control

### Document Amendment Record

<table>
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<tr>
<th>Version</th>
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<th>Lead Author</th>
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<td>V3</td>
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<td>Roy Connell – Clinical Nurse Specialist</td>
<td>No major changes since last review.</td>
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### General Notes:

This guideline has had only minor changes made and therefore this version has not been circulated to all for review.

Martin Hewitt
Clinical Guideline Lead
14 August 2015
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A. **PRE-CATHETER INSERTION**  
(Perit Dial Int 21: 2001 : 240-244)

A.1 **ORGANISATION**
- Children are seen in clinic routinely as an outpatient and will have met with their named nurse, dietician, social worker, play specialist and youth worker as appropriate.
- A date for insertion of a chronic peritoneal dialysis catheter and possibly gastrostomy button is discussed and planned with the surgeons.
- The peritoneal dialysis training programme is organised with the family once a date for catheter insertion has been confirmed and agreed upon.
- For those children with gastrostomy buttons already in situ there must be no evidence of gastrostomy exit site infection prior to catheter insertion. Particular attention must be paid to any possible infections with Candida species.
- Ensure the child is not constipated and if necessary Lactulose should be commenced before the planned admission.

A.2 **PREPARATION OF FAMILY**
- Many children (esp <10yrs and even older) have a gastrostomy button (currently Mini Button) inserted at the same time as insertion of peritoneal dialysis catheter and appropriate preparation should be given for this.
- Preparation and education by team members including catheter information, video, booklets, dolls, home folder is undertaken during routine clinic visits before catheter insertion.
- A home visit is required to assess the suitability of dialysis at home and storage space (named nurse, dietician and social worker).
- The family may wish to meet with another family on peritoneal dialysis in clinic or planned home visit if requested (social worker to arrange).
- The named renal nurse plans the duration and timing of training programme and at least 2 family members or carers should be trained.

A.3 **INVESTIGATIONS TO BE COMPLETED ON ADMISSION FOR CATHETER PLACEMENT**

**Growth and Nutritional Data**
- Height cm (using stadiometer), height velocity
- Weight
- Surface area
- Head circumference (under 2 years)
- Pubertal rating
- Midarm circumference (MAC [cm])

**Radiology**
- Left hand and wrist x-ray if not done in last 12 months
- Echocardiogram
Blood Tests
- Most routine blood tests are completed during clinic visits prior to arranging inpatient admission for catheter insertion.
- Check through medical notes for any outstanding blood tests or ones not recently done.
- All children with CKD category 4 (5) are commenced on a chronic renal failure blood work-up chart in clinic.
- Once stable on dialysis routine bloods are taken at clinic visits, a chart detailing these is also kept in the patient notes.

Other Investigations
24 hr urine collection for volume and creatinine clearance.
Residual renal function needs to be detailed.

A.4 PERITONEAL DIALYSIS CATHETER CHOICE
The current catheter of choice is a double cuff, coiled swan-neck catheter. Three sizes

- Infant (Flexneck) size 23cm priming volume – 1.7mls
- Paediatric size 42cm priming volume – 2.4mls
- Adult size 62.5cm priming volume – 3.6mls

Nb: Priming volume is catheter only. Not inclusive of extension set.

A.5 CHOICE OF DIALYSIS FLUID
- Each patient will be discussed on an individual basis as to any other preferred solution of choice.
- Dianeal PD4 (low calcium solution – 1.25mmols/l) at present is the routine solution of choice for both hospital and home peritoneal dialysis and is available in 3 strengths:
  1.36% Glucose
  2.27% Glucose
  3.86% Glucose
- Extraneal
- Nutrineal
- Physioneal (bicarbonate/lactate based)
- The following are PD solutions available only on a named patient basis and prescribed by a Nephrologist –
  0.5% Glucose
  Zero Calcium

A.5 PRE-OPERATIVE GUIDELINES
- The named nurse/nephrologist will discuss and suggest with the surgeon the preferred site on abdomen for the catheter exit site. The site should avoid belt line, be above the nappy line in infants and be on the opposite side to the gastrostomy.
- The operation should be planned in advance at an allocated time, this should be during daytime working hours to ensure appropriate medical and nursing support is available post-operatively.
 In certain urgent cases the child may need to be put on the emergency theatre list, as directed by the nephrologist.
 A dedicated surgeon familiar with the procedure will perform the operation
 Prior to theatre the nurse will put a sticker on “non dominant arm” with statement “avoid IVs in this arm if possible” (non dominant arm is saved for potential fistula formation in the future).
 IV Flucloxacillin [25mg/kg – max 1gram (TDS)] should be given at induction and continued for 24 hours. This can be changed to oral route if patient able to tolerate
 Cefuroxime [30mg/kg – max 750mg (BD)] and Metronidazole [7.5mg/kg (TDS)] should be given at induction and continued for 24 hours if a gastrostomy is being inserted at the same time as the PD catheter.
 IV fluids are the standard maintenance fluid for the child’s weight and age, unless the child is on a fluid restriction.

NB: Antifungal prophylaxis with Fluconazole should be considered in selected patients such as infants, patients with previous fungal peritonitis and in those having combined gastrostomy tube insertion.

B. INTRA-OPERATIVE

 Many children have a partial omentectomy, PD catheter insertion and PEG gastrostomy insertion at the same time using a laparoscopic technique. The gastrostomy should be sent to theatre with the child.
 PD catheters, connectors and extension sets are kept as a stock in theatre.
 The catheter is usually inserted on the right side and is downward facing.
 An exit-site suture SHOULD NOT be used unless absolutely necessary.
 The PD catheter will be flushed by the surgeon with Hepsal 10units/ml and capped off with a minicap.
 The surgeon should immediately secure the catheter with Mepore (without keyhole) and an immobiliser (occlusive dressings such as Opsite, Tegaderm are contra-indicated).
 The surgical staff and anaesthetist will ensure pain relief is written up and commenced intra-operatively. Morphine infusion is usually the therapy of choice and this should be tapered as appropriate.
 For older children a discussion and decision will be made before theatre regarding patient controlled analgesia.

C. POST-OPERATIVE

C.1 PERITONEAL DIALYSIS GUIDELINES
 Oral fluids are usually allowed the following day with agreement from paediatric surgeon.
 If gastrostomy has been inserted please check with paediatric surgical staff as to when gastrostomy can be used (usually after 24 hours).
 Catheter information is documented on audit form by named renal nurse.
 The peritoneal dialysis catheter should not be used following theatre for at least one week and preferably two weeks.
 However in certain individual cases it may be necessary to use the catheter immediately. Only low volume cycles (10ml/kg) will be maintained and the
patient kept supine with adequate analgesia to avoid high intraperitoneal pressures and possible leaks.

- **Unless indicated, antibiotics should not be used in the PD fluid post-op.**


- Exit site will be cleaned in theatre by surgeon, covered with Mepore and secured with an immobiliser.
- The exit site dressing is then to be left unchanged (unless excessive oozing) for 1 week. It should be immobilised well and excessive movement **avoided** (this should be emphasised to the child and family as the catheter has 2 cuffs and it takes 6 weeks before tissue in-growth secures the catheter).
- If a dressing change is required during the first week this should be done using aseptic technique and staff restricted for dressing care.
- Betadine and hydrogen peroxide are not used for cleaning as they are toxic to fibroblasts.
- After the first week the dressing is changed and the exit site assessed. Thereafter the dressing can be changed once or twice a week using normal saline and a Mepore dressing with an immobiliser.
- Any scabs or crusts around the exit site should not be forcibly removed.
- Avoid direct contact of water to the exit site during the first 6 weeks of healing period. Shallow baths with dressing intact can be taken.
- Swimming is not usually recommended after the healing period. If this is compromising the patient's quality of life then this can be discussed on an individual patient basis and appropriate measures taken to protect the exit site.
- After 6 weeks showers or shallow baths (not submerging exit site) can be taken.
- The routine use of Bactroban Cream can be discussed on an individual patient basis. The indication for use would be repeated staphylococcus aureus infections.
- Exit site infection is audited and formally evaluated by named renal nurse.
- If exit site infection is suspected, swab the site and send immediately to microbiology for culture and sensitivity.
- Oral Flucloxicillin for 7 days (standard dose for children, reduced to TDS for renal failure) is the first line of treatment unless culture results indicate otherwise.
- The use of Bactroban, Maxitrol or Fucidin H ointment for chronic exit site infection/over granulation is to be discussed on an individual patient basis.
- Cuff shaving will be considered for chronic cuff erosion and persistent infection.
- Silver nitrate sticks are only to be used after discussion with nephrologist.

### C.3 TRAINING PROGRAMME

- Once the catheter is capped off and the child recovered from surgery, he/she may go home and return to the unit on a planned date for training.
- The catheter should be flushed weekly when not in use with 1000iu heparin in 10mls 0.9% saline.
- It is important to ensure the catheter is working before training commences and if in doubt the catheter will need to be tested.
Training is coordinated by the named renal nurse. It is initially undertaken in hospital and can be finished at home. A structured training programme is followed.

- Dialysis supplies are ordered for delivery to the home when the patients needs have been assessed.
- The first dialysis session should be carried out during the day so any problems can be identified and resolved.
- The renal nurse will provide support for the family on their first night at home on dialysis.
- Dialysis fill volumes will increase from 800 ml/m² up to 1200 ml/m² (10mls/kg up to 30-50mls/kg) gradually.

D HOME SUPPORT & PSYCHOSOCIAL GUIDELINES

- All families should have access to a phone.
- The renal nurse will phone the family as required at first and then weekly once the treatment is stable and parents confident.
- Families should phone Ward E17 if they have a problem at home.
- The on-call renal nurse can be contacted by the ward if needed.
- Members of the team will contact and, if required, arrange a visit to the child’s nursery, school or college to ensure that they are informed and supported regarding the treatment.
- Appropriate links are established by the social worker with local resources and services for the families if they live some distance from the unit.
- The renal nurse and dietician should make an update visit at home every six months. This is formally structured and planned to ensure the family’s current knowledge of treatment is satisfactory.
- Each unit should have a suitably qualified and experienced social worker dedicated to the work of the unit.
- The social worker should be introduced to children and families in advance of peritoneal dialysis whenever possible.
- A social assessment on the family with recommendations should be discussed with multidisciplinary team members at the regular team psychosocial meeting. This assessment should be reviewed 6 monthly.
- The social worker should be informed when home dialysis patients are admitted to the ward.
- Contact with patients and families at home should be maintained by regular phone contacts by the social worker. 2 monthly visits by the social worker should be carried out for those families with a child under 5. Visiting patterns will be determined by need, demand, distance and problems.
- The social worker ensures that the families have information and invitations about parent support groups or relative days.
- The needs of siblings of children on chronic peritoneal dialysis need to be considered and addressed during family counselling.
- The social worker should constantly assess the economic impact of home peritoneal dialysis on the family and to discuss other possible sources of financial support.
- Adolescent patients will require an additional profile of education plans, social issues and careers advice. Discussion and transition to adult units
will also be discussed in conjunction with the family youth worker and other team members.
- Referral to the child psychologist will be made when appropriate.
- A hospital schoolteacher will link with all children and their schools and ensure continuity in teaching.

D.1 RESPITE CARE
This needs to be carefully considered for all families, but particularly with infants who may spend longer periods on dialysis. Where possible, this could include:
- Evening babysitting service
- Home care visits
- Short stay admissions to hospital or residential care
- Holidays either arranged for the whole family or as camps for children

E. GUIDELINES FOR NUTRITION FOR CHILDREN ON PERITONEAL DIALYSIS

All children will be referred to a named Paediatric Renal Dietitian for nutritional assessment and on-going dietary support.

Further evaluations should take place at clinic visits:
- minimum of monthly for infants and children <5 yrs and minimum of 2 monthly for older children
- Re-evaluation during ward admissions, particularly during peritonitis episodes.
- Telephone contact at home should be available for each family in between ward and clinic visits.
- A visit to home and school/nursery with other team members is beneficial to evaluate the practicalities of treatment.
- Dietary guidelines for energy and protein are available (appendix) and the dietitian will refer to these parameters to calculate nutritional requirements and formulate the nutritional prescription.
- The oral route should always be considered as the preferred route for providing nutrition.
- The enteral tube feeding route (gastrostomy or nasogastric tube) with use of nutritional supplements (Appendix) should be considered when:
  - the child’s oral intake fails to meet 80% of Reference Nutrient Intake (RNI)
  - the child fails to maintain adequate growth velocity (for example, when weight, height and/or head circumference measurements begin to fall from percentiles and height velocity is consistently below the 25th percentile)
  - and other non-nutritional causes are excluded.

E.1 ANTHROPOMETRY
1) The reliable assessment of growth requires staff that have received training in the use of appropriate measuring techniques and equipment. Measurements should be plotted on reference growth charts for healthy children at baseline and clinic visits thereafter.

2) Weight* - Infants should be weighed in the nude (monthly)
Older children should be weighed in light clothing without shoes

3) *Supine Length* - Recommended up to the age of 2 years on a flat surface
   (Note that change in height difference between recumbent length and standing height is ~2.5cm)

4) *Standing Height* - Taken without shoes, with the child standing with heels and back in contact with an upright wall using a height stadiometer

5) *Head circumference* – Measured using a non-stretchable measuring tape

6) *Mid-arm circumference* – Ensure measurement in same non-dominant arm with a non-stretchable measuring tape.
   (Record to nearest 0.1cm)

7) *Skin-fold thickness* – Not popular with children and not recommended for routine clinical use

8) *Height velocity* - Calculated and plotted over a yearly period

9) *Body Mass Index* - Wt (kg)/Ht^2 (cm)

10) *Bone Age* - Checked annually usually using a single AP film of hand and wrist

Standard deviation scores relative to age or height (in case of severe growth retardation) must be used when calculating BMI, height, weight, height velocity, mid-arm circumference and skin fold thickness.

*For premature infants (<30/40) correct for gestational age up to 2 years of age,
For premature infants (>30/40) correct for gestational age up to 1 year of age on growth chart

**E.2 DIETARY ASSESSMENT**

- A 3-day dietary diary should be completed at initial clinic visit and within 3-4 months of starting dialysis and ideally 6 months thereafter. In infants more frequent adjustments will be required.
- All nutrients should be computer analysed (qualitatively/quantitatively) whenever possible and compared with recommended intakes for children of the same sex and chronological age:
  - If the child is within the normal percentile ranges for height (>2nd percentile), energy and micronutrient requirements can be based upon the recommendations for children of the same chronological age.
  - If the child falls below the normal percentile ranges for height (<2nd percentile), the child’s **height age** may be used to determine acceptable baseline energy and micronutrient requirements when compared with recommended intakes and adjusted accordingly thereafter.

- The dietary aim should include:
  1. Adequacy of energy and regulation of protein intakes sufficient for growth but regulated to minimise fluctuations in pre-dialysis blood urea levels.
  2. Fluid balance and electrolytes (nutritional supplements and foods with high water content e.g. jelly, gravy, sauces, custard need to be accounted for when fluid id severely restricted).
  3. Regulation of calcium, and phosphate intake and the use of binders.

Roy Connell 11 of 22 August 2013
4. Review of potassium intake.
5. Adequacy of micronutrient and iron intakes.

NB Serum albumin levels can be affected by many factors and must be interpreted on an individual basis together with the nutritional and clinical assessment.

F MEDICATIONS

- Children and their families are advised on the correct administration and timing of medications to ensure compliance, optimise absorption and minimise potential side effects.
- Review of each medication with the family should be routine at every clinic visit, admission or change of treatment. Adjustments of particular medications and dosages may be necessary.
- An updated list of medications should be available in the patient’s folder. The families may need additional support with a dosage container or additional charts to aid compliance.
- Compliance with medication and treatment should always be considered for any unexpected change in blood results.

F.1 PHOSPHATE BINDERS
Calcium Carbonate based phosphate binder or Sevelamer hydrochloride (Renagel capsules) is calcium and aluminium-free and should be the first choice. Calcium Carbonate should be chewed or crushed to a fine powder. A suspension of Calcium Carbonate can also be prepared. It should be taken before meals/snacks (usually 3-5 times daily) as a lower pH improves binding capacity, and should be taken in the absence of oral iron supplements. Alternatively crushed tablets or solution can be added to bottle feeds or overnight/daytime bolus feeds. Calcium Acetate (Phosex) is a more potent phosphate binder. It must be taken during meals and swallowed whole (not chewed), which will limit its use in young children. It should be administered in the absence of iron supplements. Aluminium hydroxide binders should be avoided. If phosphate control remains a problem a combination of the above may be required to optimise management.

F.2 ORAL IRON SUPPLEMENTS
A dosage of 2-3mg/kg body wt/day is recommended and administered in 2-3 divided doses and administered either one hour before or 2 hours after food. They should not be added to formulae feeds and not taken with phosphate binders. If possible, children taking oral iron should have a prescribed micronutrient supplement containing vitamin C to enhance absorption. (It is important not to over-supplement with vitamin C for risk of increased oxalate formation.)
Iron supplements should ideally not be taken with phosphate-rich foods (cereals and legumes), tannins (tea, cocoa, chocolate) and dairy products that interfere with absorption.
F.3 INTRAVENOUS IRON
Intravenous Iron Sucrose is a more effective way of improving iron stores and should be given to patients on peritoneal dialysis when indicated. It can also be considered as a regular infusion (See IV Iron guidelines)

F.4 DIURETICS AND ANTIHYPERTENSIVES
Can alter balance of electrolytes.

F.5 ANTIBIOTICS
May cause diarrhoea (sometimes confused with nutritional supplements/tube feeding) and some can interfere with vitamin metabolism.

F.6 MICRONUTRIENT SUPPLEMENTS
- Children and young people commencing dialysis should be prescribed Paediatric Dialyvit at the following dose:
  - < 5 years of age ½ caplet daily
  - > 5 years x 1 caplet daily
Paediatric Dialyvit has been specially designed to meet the micronutrient requirements of children and account for potential CPD losses of folic acid and vitamins C and B6. The caplet can be chewed and swallowed, or crushed and mixed with water to swallow or administer via an enteral tube feed.
- If the child is receiving enteral supplements, Paediatric Dialyvit should only be prescribed following an individualised dietary assessment. Recommended intakes are based on the Recommended Nutrient Intake (RNI) and from the few paediatric studies available, and would suggest intake of:
  a) vitamin C 25 (infants)-60mg/day
  b) vitamin B6 0.2 (infants)-1.5mg/day
  c) folate 60 (infants)-1000µg/day
All other vitamins and trace minerals should meet with 100% of the Reference Nutrient Intake with the exception of vitamin A, which should not exceed 100% of the RNI and should not be present in prescribed micronutrient preparations.
Nutritional supplements suitable for paediatric use are shown in Appendix

G. GUIDELINES FOR PERITONITIS
- Refer to Guidelines for Peritonitis in Paediatric Peritoneal Dialysis Patients.

H. GUIDELINES FOR CONTAMINATION OF PERITONEAL DIALYSIS CATHETER
- Refer to Guidelines for Peritonitis in Paediatric Peritoneal Dialysis Patients.

I. GUIDELINES FOR INADEQUATE FILLING OR DRAINAGE OF PERITONEAL DIALYSIS FLUID
- If the peritoneal dialysis fluid fails to flow in or out adequately and fibrin is present then heparin 500iu/litre should be added to each bag of dialysis
fluid. Parents will have been taught how to administer this in the training programme.

- If flow problems persist check that the child is not constipated.
- A blocked peritoneal dialysis catheter or persistent flow problems will need admission to hospital and the catheter flushed with 1000iu heparin in 20mls 0.9% Sodium Chloride
- An abdominal x-ray will be taken to check the position of the catheter if the flow problems persist
- A urokinase flush/lock may be considered by the Nephrologist. This should be: 2500iu in 5ml 0.9% Sodium Chloride <10kg.
  5000iu in 5ml 0.9% Sodium Chloride >10kg
- NB In all cases of a blocked catheter peritonitis must always be considered.

J. GUIDELINES FOR BLOOD STAINED DIALYSATE

- Dialysis fluid may be blood stained immediately after surgery or when the catheter is first used following the two week resting period.
- Increased activity may cause a minimal blood stained fluid
- Girls that are menstruating can also have blood stained dialysate
- In all these cases no action will be taken if this is minimal and clears during the dialysis session
- For persistent blood stained dialysis fluid the child will require admission
- Peritonitis must always be considered

K. CATHETER EXTENSION LINE CHANGE

The peritoneal dialysis extension line is changed routinely every 6 months at a planned clinic visit. The adapter is cleaned with alcoholic wipes and sterile gloves are worn.

L. IMMUNISATION AND IMMUNITY TESTING FOR CHILDREN ON PERITONEAL DIALYSIS

L.1 BACKGROUND

Children with chronic renal failure are at least as susceptible to infectious diseases as other children. We should therefore ensure that routine immunisation is undertaken as per the D.o.H guidelines wherever possible. Immunisation is less effective in patients with advanced renal failure and early immunisation therefore allows a better response and more time for immunity to develop.

These guidelines are based on the following documents:

- Immunisation against Infectious Diseases 1996, Dept of Health HMSO
L.2 AT TIME OF DIALYSIS-TRANSPLANT ASSESSMENT

- Confirm full vaccination history including Hep B, BCG, VZV
- Serological Testing

(2-5mls “for immunity testing”) VZV, CMV, EBV, Rubella, Measles, Hep C and HIV
- Vaccinate
  If non immune or missing any of the primary vaccinations

L.3 PERITONEAL DIALYSIS PATIENTS

- HB-VAX 11 contains 40micrograms/ml – doses at 0, 1 & 6 months + booster dose if no seroconversion (<10IU/l) at 12 months
- Serology for – all 12 monthly – unless Hep B non immune (then HBsAg 6 monthly)
- Influenza – not routinely advised – can be given at parent/doctor’s discretion
- Meningitis C to be given

M MANAGEMENT OF ANAEMIA

The following guidelines are based on recommendations from NICE

M.1 TARGET LEVELS
Management of anaemia should be considered in patients with anaemia of chronic kidney disease when their haemoglobin level is less than or equal to 110 g/l (or 100 g/l if younger than 2 years of age).

- The recommended target haemoglobin concentrations are for Epoetin/iron therapy and are not to be used as an indication for blood transfusion therapy
- To achieve and maintain target Hb concentration sufficient iron should be administered to attain the following in all patients –
  - Optimum levels –
  - Serum Ferritin – 200-500g/l
  - TSATs > 20% (unless ferritin is greater than 800 micrograms/L)

M.2 IRON THERAPY
- Children on peritoneal dialysis can often be maintained in iron balance using oral iron.
- Intravenous Iron Sucrose can also be used when iron stores are considered to be very low and can be considered as a regular infusion in place of oral iron
- Oral iron dosage in the form of Ferrous Salts should be 2-3mg/kg in 2-3 divided doses without concomitant food or other medicines

M.3 ESA THERAPY
ESA treatment should be started when the Hb concentration is consistently less than 11g/dl (haematocrit <33%) on repeated testing and when other possible causes of anaemia have been excluded

- The starting dose of Epoetin Beta or Aranesp should assessed on an individual basis for each patient

- Children younger than 5 years of age may require greater doses of ESAs on a body weight basis.
- The target should be to increase the Hb concentration by 1-2g/dl per month
- Once the Hb target is stable the Hb concentration should be monitored once a month at clinic visits
- Children on peritoneal dialysis should receive ESAs subcutaneously wherever possible
- The site of injection should be rotated between legs and arms each administration, the abdomen should not be used
- Parents and older children can be taught to administer the drug themselves at home, although local community or practice nurses should be considered in those cases where families are having difficulties in performing the procedure.

N. RECOGNISED STANDARDS FOR SPECIFIC BLOOD BIOCHEMISTRY LEVELS

- **PTH** levels should be <110ng/L
- **Phosphate levels should be kept within the normal range**
  - Albumin levels should be >35. Serum albumin levels can be affected by many factors and must be interpreted on an individual basis together with the nutritional and clinical assessment
  - Bicarbonate levels should be above 22
  - Potassium kept within the normal range
  - Urea levels kept below 30

O. DENTAL PROPHYLAXIS AND ENT OPERATIONS FOR CHILDREN ON PERITONEAL DIALYSIS

The advice of a working party of the British Society for Antimicrobial chemotherapy is that patients who have indwelling peritoneal catheters do **not** require antibiotic prophylaxis for dental treatment provided there is no other indication for prophylaxis.

P. TECHNICAL SUPPORT

- All equipment at home must meet British Safety Standards.
- The following equipment should be available for the child and family in the home:
  a) Dialysis machine/bag warmer
  b) Electronic scales
  c) Blood pressure device
  d) Feeding pump (if applicable)
e) Clean wipeable surface
f) Dialysis supplies

- Families are advised to include insurance for the equipment in their house content insurance
- Technical support for all Homechoice machines is provided by a Baxter Healthcare Ltd technical contract.
- The servicing of machines contract includes a 24 hour service.
- Faulty machines will be repaired or replaced within 24 hours.

- A 24 hour helpline for the Homechoice machine provides a technical advice service for staff and families at home. Families can use this service out of hours linking closely with their named renal nurse – contact number (01635) 201902 for instructions and advice.

P.1 HOMECHOICE PRO MACHINE

- All patients should be using the Homechoice Pro at home.
- Patients should bring their pro-cards to clinic for data to be transferred onto the PD link computer programme. The named nurse checks therapy parameters and changes the programme, if necessary, after discussion with the Nephrologist.
- An on-going record of dialysis treatment is at hand which is constantly reviewed and supervised by the named renal nurse.
- If a child requires admission to the ward the Homechoice Pro machine can be used manually without the card.

Q HOLIDAY STRATEGY

- For families travelling abroad to UK and European destination the Baxter Holiday Club can provide supplies and technical support
- The nephrologist must agree to the patient travelling a long distance abroad
- The nearest health centre will be contacted and informed if the child needs treatment whilst away
- The named nurse provides the family with a holiday information sheet
- Contact address and telephone number are documented in the nursing notes
- The named nurse informs team members
- For patients travelling abroad – on-call for transplantation must be discussed and the transplant coordinator informed

R. EDUCATION

- All children on peritoneal dialysis can attend normal schooling and follow education curriculum.
- The hospital schoolteacher maintains a link with the child’s school and may attend the initial school visit.
- Concerns over schooling are fed back to the hospital school, with continuous liaison between the child’s school and hospital school
- The hospital schoolteacher attends the weekly psychosocial meeting to feed back information to team members
- Attendance and school performance are monitored
S. **EXERCISE**

- Children on peritoneal dialysis can undertake most activities within their own capabilities. Physical education and school sports are usually encouraged but contact sports should be avoided.
- Swimming is not recommended for children on peritoneal dialysis. Only in special circumstances swimming may be allowed after consultation with the nephrologist and named renal nurse in which case a waterproof dressing is used.

T. **PERITONEAL EQUILIBRATION TESTING**

* (Neph Dial Trans 2002; 17: 380-385)  

T.1 **GUIDELINES FOR TESTING**

- Peritoneal Equilibration Tests can be carried out on children receiving peritoneal dialysis to gain further insight into their membrane characteristics or if clinically indicated eg: Post peritonitis, UF failure, changes in residual function etc.
- This can be carried out by a renal trained nurse in hospital to coincide with clinic visit or at a planned home visit
- Parents are given a “home instruction” sheet (Appendix) prior to the test.
- Patients need to be stable on dialysis and have had no peritonitis episodes within 6-8 weeks.

T.2 **METHOD**

**Step One**

Determine the patient’s body surface area (BSA). This can be accomplished in PD ADEQUEST as follows:

1. Enter the **patient’s date of birth and gender** in the **Patient Details** window.
2. Enter the **collection date** in the **General Collection Data** window. The system will now calculate the patient’s age.
3. Enter the **patient’s height and weight** in the **24-Hour Collection** window. The system will now calculate the patient’s BSA (using the Haycock formula for paediatric patients) and volume of estimated total body water.

For example, a child who is 77cm tall and weighs 11kg would have a BSA of 0.49 metres squared ($m^2$) using the Haycock method.

**Step Two**

Determine the appropriate fill volume for the PET. Studies by Dr Brad Warady and the Paediatric Peritoneal Dialysis Study Consortium suggest the following method for determining the PET fill volume for paediatric patients:
1. Multiply the patient’s BSA in metres squared (m²) times 1,100 ml to arrive at the appropriate fill volume.
   For example, the child with a BSA of 0.49 m² would require a fill volume of 539 ml (0.49 m² x 1,100 ml = 539 ml).

Step Three
Collect a sample from a long dwell immediately preceding the 4 hour PET. For purposes of the PET in PD ADEQUEST, there are two possible methods for obtaining overnight/long dwell information just prior to the PET.

A) The night immediately preceding the 4 hour PET, commence the normal APD treatment but begin earlier in the evening (e.g., 7.00 pm). Programme the cycler to infuse a “wet day” long dwell at 4.00 or 5.00 am using the “last bag” option. Note the volume and dextrose concentration used. For best ultrafiltration predictions it is preferable, but not mandatory, to use a 2.5% dextrose/2.27% glucose solution. The fill volume and dextrose/glucose concentration should be the same for the overnight/long dwell and the 4 hour PET. In addition, avoid using a 4.25% dextrose/3.86% glucose when performing these tests.

B) For the 24 hours preceding the PET, substitute CAPD exchanges for the normal APD therapy. The dwell time for this CAPD exchange should be between 8-12 hours in length. Note: this method should NOT be used as a 24 hour collection.
   1. Drain the overnight dwell (8-12 hours). Record the length of the dwell and the volume drained (patient should be sitting upright for this drain). Also note the dextrose concentration and volume infused.
   2. Mix dialysate thoroughly and draw a sample. Send the sample to the lab for analysis or urea (or urea nitrogen) and creatinine.

Step Four
Perform the 4 hour PET.
1. Heat a bag (large enough to accommodate the fill volume calculated in Step Two) of Dianeal (2.5% dextrose/2.27% glucose) to body temperature. For best ultrafiltration predictions it is preferable, but not mandatory, to use a 2.5% dextrose/2.27% glucose solution. The fill volume and dextrose/glucose concentration should be the same for the overnight/long dwell and the 4 hour PET. In addition, avoid using a 4.25% dextrose/3.86% glucose when performing these tests.

2. As closely as possible, infuse the volume of solution calculated in Step Two (patient needs to be supine during infusion). It may be necessary to use a Buretrol or infant scale to accurately measure PET volume. During infusion, have the patient roll from side to side if able. Note and record the infusion time. Do not record the standard value of 10 minutes unless it is the patient’s actual fill time.

3. Collect dialysate samples at Zero and 2 hour dwell times. Zero hour is defined as the time at which the infusion was completed. Follow these procedures:
   a) Drain 20 ml into a drain bag and thoroughly mix the sample by inverting the bag 2-3 times.
   b) Draw a 5 ml dialysate sample and re-infuse the remaining 15 ml.
c) Clearly label each sample (PET Dialysate Sample 1 and 2, along with patient name, ID number, date and time) and send them to the lab for a separate analysis of glucose, urea and creatinine.

4. At the 2 hour dwell time, draw a blood sample (4ml), clearly label it (PET Blood Sample along with patient name, ID number, date and time) and send it to the lab for a separate analysis of glucose, urea (or urea nitrogen [BUN]) and creatinine.

5. At 4 hours dwell time, place patient in a sitting position and drain completely. Note the time it takes to drain the patient completely. Do not record the standard value of 20 minutes unless it is the patient’s actual drain time.
   a) Mix the sample by inverting the bag 2–3 times.
   b) Draw a 5ml dialysate sample. Clearly label each sample (PET Dialysate Sample 3, along with patient name, ID number, date and time) and send it to the lab for a separate analysis of glucose, urea and creatinine.

6. Measure and record the volume drained (including the volumes of each sample taken).

Sample Summary: At the completion of the procedure, you should have laboratory results for the following five samples:
- Overnight/long dwell immediately proceeding the PET. Tested for urea, creatinine and glucose.
- Hour Zero: Dialysate Sample 1. Tested for urea, creatinine and glucose.
- Hour Two: Dialysate Sample 2. Tested for urea, creatinine and glucose.
- Hour Two: Serum Sample. Tested for urea, creatinine and glucose.
- Hour Four: Tested for urea, creatinine and glucose.

Step Five
Enter the results from the PET procedure in the PET window computer programme for this patient.

T.3 IMPORTANT POINTS
- With ALL the samples mark EXACT time there were taken.
- Ensure pre-printed labels are used and these are clearly labelled.
- Send all samples together to the laboratory for urea, creatinine and glucose once the test is completed. Good communication with labs is essential.
- The patient resumes normal dialysis therapy once the test is completed.
- Once results are obtained input data on a request package

U. ADEQUACY TESTING

U.1 GUIDELINES FOR TESTING
- Adequacy testing is done alongside PET.
- A home instruction sheet will be given to parents (appendix 12)
- Adequacy should incorporate the following -
  - Clinical assessment of well being
  - Physical measurements
  - Dietary input
  - Measurement of small molecule solute clearance
Fluid removal
Impact of treatment on patients life
Adequacy involves collecting samples from home and bringing to a clinic visit.
The test is explained to parents and they are given a home instruction sheet and, 24 hour urine collection container
Patients should be free from infection and well with no recent peritonitis episode

U.2 METHOD
24 hour collection procedures for an APD patient (wet day), no PET are as follows:

1. Start collecting urine for the 24 hour collection, discarding the first void on day one.
   - If residual function is low, and the patient voids less than 3 times per day, obtain a urine sample for 48 hours and divide the volume by 2.
   - Keep urine refrigerated, or if refrigeration is not available, add a preservative (find out which one is most appropriate).
2. Start APD treatment in the evening as usual.
   - Save the dialysate from the “wet day” drained at this time.
   - Note the volume drained.
   - Dialysate may be stored at room temperature.
3. In the morning, collect the dialysate and measure the volume drained from the overnight infusions.
   - Note the total volume (volume from wet day plus volume from overnight infusions) that was infused for the 24 hour period.
   - If possible, infuse the “wet day” volume on day 2 manually in order to avoid diluting the effluent with unused dialysate. This might happen if the last fill is a different dextrose/glucose than that used at night.
4. If all the effluent is in one drain bag, mix the bag thoroughly, draw a sample and send to the lab for analysis of creatinine and urea.
5. If the effluent is in more than one bag, mix each effluent bag thoroughly just prior to drawing each sample.
   - Draw a 1% sample from each bag. For example, if the bag weighs 2300g, draw 23ml of effluent. Mix all the samples together.
   - Draw a final sample from the total mixed effluent and send to the lab for analysis of creatinine and urea.
6. Send the urine to the lab for analysis of creatinine and urea.
7. In conjunction with the 24 hour collection, draw a serum sample (should be taken before the afternoon if possible). Send to the lab for analysis of creatinine, urea and albumin.
8. Be sure to obtain the patient’s weight and height.
9. Record findings in the patient’s record.

U.3 IMPORTANT POINTS
- Urine sample collection must be started the day before the clinic visit
- Specimens must be clearly labelled with dates and times
V OPTICHOICE THERAPY GUIDELINES

V.1 REASONS FOR USE OF OPTICHOICE TREATMENT

Medical
- Anuric patients needing increased solute clearance
- Patients with high body surface area with low residual renal function
- Benefits low transporters

Social
- For those patients on CCPD who have adequate dialysis - the number of cycles overnight can be reduced
- Increased convenience
- Less restricting for evening social activities

V.2 METHOD
- Optichoice can only be used with the Homechoice machine
- Patients can be shown at home or during a clinic visit
- Families are explained the procedure and shown the programme and given the appropriate written guidelines by a renal trained nurse
- An adequacy test should be performed 6 months after commencing Optichoice