

Renal Unit
Royal Hospital for Sick Children
Glasgow.

For use across the Scottish Paediatric Renal and
Urology Network

**Guidelines on the Management of Acute and
Chronic Peritoneal Dialysis**

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Author: The Peritoneal Dialysis Working Group	Authorised by: Renal Clinicians Group	Issue Date: 1/10/2010
Date of Review: 1/10/2012	Q-Pulse Ref: YOR-REN-030	

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1. Guideline Development

1.1 Membership of Guideline Development Group

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1.2 Patient population and target audience

This document provides information on the provision of peritoneal dialysis for children requiring renal replacement therapy in both the acute and chronic setting. The guideline applies to children throughout Scotland who require peritoneal dialysis.

This document is intended for use by all health professionals (for example, doctors, surgeons, nurses, dieticians and pharmacists) who look after children on peritoneal dialysis within Scotland.

1.3 Objectives and clinical questions

Guideline objectives:

1. State indications for and contra-indications to peritoneal dialysis
2. Provide adequate (psychological and physical) preparation for children and their families prior to starting peritoneal dialysis, where this is a planned (non-urgent, non-acute) therapy
3. Define the preferred surgical principals for the insertion of peritoneal dialysis catheters, allowing the prospective audit of catheters to assess complications rates, with a view to minimising them in the future. .
4. Achieve maximum longevity of peritoneal dialysis access through appropriate monitoring, prevention of infections, and appropriate treatment of peritoneal dialysis catheter exit site infections and peritonitis
5. Achieve optimal peritoneal dialysis through appropriate monitoring of clinical and laboratory indices

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Clinical questions answered by the guideline:

1. What is appropriate post-operative care and pain management?
2. What is an appropriate initial dialysis prescription?
3. What approach should be taken if the peritoneal dialysis is not working?
4. What is the best-practice treatment of exit site infections and peritonitis?
5. What follow-up and monitoring do peritoneal dialysis patients require?

1.4 Methodology

This guideline was based on the Yorkhill "Guidelines on the Management of Acute Peritoneal Dialysis" (v1.2). Best evidence was used to inform recommendations based on literature searches of PubMed, using the terms "paediatric" / "children", "peritoneal dialysis", and "peritonitis". UK standards for peritoneal dialysis, published by the BAPN, were also used to inform best practice. Evidence based on double blind randomised control trials was deemed to be the best level of evidence, but little is available. Thus European Recommendations were used where available, and expert opinion where no other form of evidence was available. Only articles written in English were included.

Recommendations were based on consensus of opinion from the working group. There were no areas of disagreement.

2. Indications for Peritoneal Dialysis

Indications for renal replacement include: (1)

- Hyperkalaemia
- Fluid overload
- Refractory acidosis
- Symptoms from uraemia
- To create space for nutrition
- Poisoning
- Metabolic Abnormalities

Renal replacement therapy may also be initiated in cases of evolving but not yet established acute renal failure where there is an expectation of deteriorating renal function e.g. post cardiac surgery.

In cases of peritoneal dialysis for acute renal failure, the choice of renal replacement modality should be made following discussion between the responsible consultant and the on-call consultant paediatric nephrologist.

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3. Contraindications to Peritoneal Dialysis

Absolute contraindications to peritoneal dialysis are given below.(1) Those marked * are relative contraindications. If peritoneal dialysis is considered the only option for renal replacement therapy the technique for catheter placement (i.e. open v laparoscopic) should be discussed with the involved Consultant Paediatric surgeon and the balance of risk assessed.

- Omphalocele or Gastroschisis
- Diaphragmatic Hernia
- Bladder exstrophy
- Obliterated Peritoneal Cavity
- Recent abdominal Surgery*
- Abdominal Malignancy*
- Recent or planned Percutaneous Endoscopic Gastrostomy (PEG)*

Where children have had previous major abdominal surgery (e.g. Bladder Augmentation) the surgical difficulties of insertion must be discussed with the operating surgeon to plan the optimal approach.

Children who require a PEG should have the PEG inserted 4-6 weeks prior to insertion of the peritoneal dialysis catheter. This will minimise the risks of leakage, poor healing and infection in both the PEG and PD catheter. Such children should be discussed with the surgical team prior to booking either procedure.

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4. Patient and Family Preparation

4.1 Patient and Family Education

All children and young people with chronic kidney disease should have access to information that enables them, with their carers, to make informed decisions about their health, and encourages partnership in decision making. They should have an agreed care plan that supports them in managing their condition, to achieve the best possible quality of life. They should receive timely preparation for renal replacement therapy so that complications and progression of their disease are minimised, and their choice of clinically appropriate treatment options is maximised. Surgery for dialysis access should be timely.(2)

Some children, young people and families who may be struggling to adjust to their condition and the required treatments may benefit from more intensive psychosocial support via referral to a clinical psychologist or local CAMHS team, either before or after starting PD, depending when it becomes apparent that coping is compromised. For younger children starting PD, a play specialist can also help with facilitating understanding and reducing anxiety for PD procedures and associated surgery.

Bearing this in mind, the following checklist should be completed to facilitate preparation:

Item	Date
Education from experienced paediatric nurse, including (as appropriate): <ul style="list-style-type: none">- written information- doll- play specialist- meeting PD patients- clinical psychology or CAMHS referral if required	
Home visit	
Liaison with nursery / school	

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4.2 Prevention of Constipation

Constipation at first use of a PD catheter is a significant risk factor for catheter malfunction hence prevention of constipation is an important and essential step.(3)

Pre Operative:

Laxatives will be started five days prior to PD catheter insertion. Thus when the date of operation is known, the family should be issued with a prescription, for laxatives to be started at home.

- If no previous history of constipation:
 - Movicol Paediatric Plain® sachets(4)
 - All children over 1 year - one sachet each day for 5 days prior to ward admission for insertion of PD catheter
 - Children under 1 year – discuss with lead consultant
- If history of constipation:
 - Movicol Paediatric Plain® sachets(4)
 - Children 1- 6 years - one sachet each day for 5 days prior to ward admission for insertion of PD catheter adjusted according to response
 - Children 6 - 12 years - 2 sachet each day for 5 days prior to ward admission for insertion of PD catheter adjusted according to response
 - Children over 12 years – up to 4 sachet each day for 5 days prior to ward admission for insertion of PD catheter adjusted according to response
- One Movicol Paediatric Plain® sachets should be mixed in 60-65mls of water.
- Children with severe constipation may require a disimpaction regimen.

On Admission:

- Check U&E's on day of admission, in case of electrolyte disturbance secondary to Movicol®.
- Prescribe regular Movicol® for all patients, to be continued on discharge
- Movicol® may be changed to 'as required' lactulose if bowel actions are loose on regular movicol®

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4.3 Pre-operative Checklist

	Result / Complete
FBC	
Urea, electrolytes, Creatinine and LFTs	
Clotting	
Group and Save	
Informed consent - signed by the carer, after explanation of the procedure by the surgeon performing the procedure	
Prescription of medications for management of constipation (section 4.2)	
Antibiotics at induction: <ul style="list-style-type: none"> - no central line: - IV cefuroxime 50mg/kg (max 1.5g) to be given at time of induction <li style="text-align: center;">[OR] - central line <i>in situ</i> or to be inserted: - IV Vancomycin, 10 mg/kg, infusion to be completed one hour prior to induction, or on return to the ward - IV gentamicin 2.5 mg/kg given on induction 	

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5. Surgical Recommendations

5.1 Size of PD Catheter:

All catheters are straight, single cuffed with terminal curls.

Patient Weight	Catheter
< 7.5 kg	39 cm Curlcath ®
7.5 to 20 kg	57 cm Curlcath ®
> 20 kg	60 cm Curlcath ®

5.2 Surgical technique (5-7)

The operating surgeon will assess the patient fully and consider all aspects of the procedure. The technique for insertion of acute (unplanned) catheters will be determined by the on-call consultant surgeon. In all cases the PD catheter must be inserted by an experienced surgeon.(5;6)

For insertion of planned, elective catheters:

- Emerging evidence suggests fewer catheter complications are associated with the laparoscopic technique. The catheter should be inserted using a laparoscopic technique, unless an open approach is preferred due to patient considerations (see section 3).
- At the time of consent an appropriate position for the exit site should be discussed and ideally marked by the operating surgeon. Consideration should be given to:
 - The exit site should avoid the belt line
 - The exit site should be above the nappy line in infants
 - The subcutaneous course of the catheter should be such that on exit from the skin the catheter points caudally(8)
 - The exit site should be located as far as possible from other exit sites: eg. gastrostomies, colostomies, urostomies.
 - The exit site should ideally be located on the left side of the abdomen where possible for planned catheters, as the majority will require future renal transplantation on the right
- Consider elective herniotomy if there is any evidence of inguinal or other hernia prior to or during catheter placement
- Consider the patients requirement for a PEG, to ensure appropriate timing of this procedure prior to catheter insertion (see section 3)
- Partial Omentectomy may reduce post-operative obstruction(5;9)
- All catheter connections should be Luer lock. Disconnect "flush-before-fill" systems should be used.
- PD catheters should be tested in theatre for patency. During normal working hours a renal clinical nurse specialist should be available to assist with this. Theatre staff should page the renal sister on 8080 as the surgeons are closing.

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- The catheter will be irrigated in theatre until the dialysate is clear, using 10-20 ml/kg normal saline, flushed with 5ml heparinised saline 500 u/L, then capped off.
- Where possible an exit catheter securing suture should be avoided. However, this will depend upon surgical approach employed. Where sutures are employed clear documentation is required to state the type of suture used and give instructions for removal when required.
- The catheter must be dressed with sterile gauze, covered with either mepore® or hypafix®.
- The catheter will be immobilised in theatre by the clinical nurse specialist. When the renal nurse is not able to attend the catheter should be dressed with gauze swabs and covered with mepore® or hypafix®. A skin fix immobiliser should be attached on return to ward, and the dressing checked to ensure it is secure.
- On return to the ward the PD catheter will be flushed with heparinised 1.36% Dianeal® in 10ml/kg cycles, until the dialysate is clear
- Manual PD:

Initial Fill	10ml/Kg
Solution	1.36% Dianeal
Fill Time	5 minutes
Dwell Time	1-5 minutes
Drain Time	5 minutes

- HomeChoice:

Fill Volume	10ml/kg
Therapy time	20-60 mins
Total volume	Fill Volume x 4 (May vary for initial flushes until fluid clear)
Dextrose	1.36% Dianeal
No Of Cycles and Dwell time	Calculated by homechoice machine

- HR, RR, Temp and Oxygen Saturation should be monitored every ½ hour for the first two hours, hourly for the following 2 hours, two hourly for the following 4 hours and 4 hourly thereafter
- A dialysate specimen from the initial flush should be sent for MC&S
- If the dialysate does not clear within the first 3 hours, or if there is a distinct increase in the degree of blood visible within the dialysate, the consultant nephrologist and surgeon should be contacted.

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5.3 Post-operative Management of PD Catheter (5-7)

- Avoid excessive movement at the exit site.
- The patient should mobilise gently over the following 24 hours.
- The child should not return to school for a week.
- Heavy exercise should be avoided for 6 weeks.
- Swimming is not allowed.
- The initial dressing should be left undisturbed for a week
- If the dressing comes loose, the parents should be instructed to secure the dressing if possible with the tape provided, or cover with further sterile mepore® or hypafix® provided on discharge. Discharge dressing guidelines should be followed and the renal unit contacted.
- If there is a haematoma along the catheter tract, a two week course of oral co-amoxiclav should be given, dosed according to current BNFC (according to age and estimated GFR) (4)
- After one week, the child should shower daily and have the dressing changed daily, following discharge dressing guidelines.
- The exit site should be assessed weekly throughout the bedding in period.
- Written information leaflets to be provided to the family

5.4 Post-operative Pain Management

5.4.1 Paracetamol

- Prescribe regular paracetamol post-op as per current BNFC for at least 48 hours.
- Review pain control after 48 hours. If appropriate, change to as required paracetamol.

NB: Watch dose of IV paracetamol in children & adolescents <50kg. Follow IV paracetamol monograph RHSC, Glasgow.

5.4.2 Dihydrocodeine:

- Add dihydrocodeine if pain not managed with regular paracetamol.
- Use a reduced dose for renal impairment:
 - Start at 50% of dose every 6 hours, as per BNFC. (4)
 - Commence regular Movicol® (if not already started).

5.4.3 Pain Team:

- Contact pain team if patient not coping with pain and further management required.

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6. Peritoneal Dialysis Prescription (10)

6.1 Dialysate Fluid (See Appendix 1)

- **Physioneal®:** 1.36%, 2.27% and 3.86% concentrations of bicarbonate based dialysate. May reduce inflow pain.(11) Physioneal is often useful in neonates and infants, and children with a lactic acidosis. Physioneal is available in 2.5L bags, which has implications for storage space required at home, and the number of prongs required on the dialysis giving set. A 5L bag is available but is marketed for adult patients.
Physioneal may reduce peritoneal membrane sclerosis and hence is a useful choice for children who are expected to be on long-term peritoneal dialysis.(12) Physioneal 35 contains 1.75mmol/L calcium, while Physioneal 40 contains 1.25mmol/L calcium.
- **Dianeal PD4®:** 1.36%, 2.27% and 3.86% concentrations. Most children will be dialysed on 1.36% solution, or a mix of 1.36% and 2.27% solutions. 3.86% dianeal is almost never used as it leads to sclerosis, and eventual failure, of the peritoneal membrane.(1) In neonates use of concentrations above 3% is potentially fatal. NB Dianeal PD1 contains a lower concentration of calcium (1.25mmol/L vs 1.75 mmol/L in Dianeal PD4) and may be useful in children with hypercalcaemia.
- **Extraneal®:** 7.5% icodextrin. Used as a last bag fill to provide ongoing dialysis throughout the day in children on Nocturnal Automated PD regimens.
Use of icodextrin is associated with circulating levels of metabolites that can interfere with laboratory assays for amylase (or actually suppress amylase activity). The measured level is reduced by 90%, leading to potential failure of diagnosing pancreatitis. Plasma lipase may be used to aid diagnosis.
Icodextrin metabolites also interfere with finger-prick blood sugar tests that utilise glucose dehydrogenase as their substrate (manufactured by Boehringer Mannheim). Methods using glucose dehydrogenase will *over*-estimate blood glucose levels, leading to a failure to diagnose hypoglycaemia.

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6.2 Additives to Dialysate Fluid

- **Heparin:** 500 units/L used for the initial flushes for elective catheter insertion and for the first 48 hours when started acutely on PD (unless the patient has a coagulopathy, in which case heparin is contraindicated). Also used if fibrin strands are present in the dialysate.
- **Antibiotics:** Gentamicin 5 mg/L & Vancomycin 25 mg/L of PD fluid (see peritonitis protocol, section 9).
- **Potassium:** Add 4mmol/L KCl to the dialysate bag when serum Potassium is <3.5mmol/L unless there are concerns regarding a potential sudden rise in Potassium. Decisions regarding adding potassium to PD fluid should be made by the on-call renal consultant.

6.3 Regular Prescription (5)

HomeChoice:

Fill volume	10-30ml/kg Target 30ml/kg for acute PD Up to 1200 - 1400ml/m ² for chronic PD
Therapy time	8-12 hours (24 hours for acute)
Total volume	Total volume required for therapy including last fill. Fill volume x therapy time(hourly cycles)
Last Fill Volume	Volume to be delivered at end of therapy and left in peritoneal cavity during the day.
Dextrose	The last fill volume can be programmed to be same or different dextrose concentration as other fills.
No of Cycles and Dwell Time	Calculated by the homechoice machine.

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Manual PD:

Fill Volume*	10-30ml/kg Target 30ml/kg for acute PD Up to 1200 - 1400ml/m ² for chronic PD
Solution**	(1.36%)
Fill Time	5 minutes
Dwell Time***	45 minutes
Drain Time	10 minutes

*Start with 10ml/kg of 1.36% Dianeal. If there is no leakage or respiratory embarrassment then increase fill volume, usually at 24 hour intervals.

**Combinations of concentration can be used.

***Variations in dwell time allow greater clearances of solute or fluid. In severe hyperkalaemia shortened dwell times down to 15 minutes may be used

A last fill of 50-100ml in female patients should be prescribed to reduce the risk of blockage by ovarian fimbriae.

Dialysis solutions are delivered monthly. Any change in the peritoneal dialysis prescription must be conveyed to the paediatric renal nursing team, as soon as possible, so that regular orders of fluid can be altered, and so avoid an extra delivery which is costly.

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7. Troubleshooting

Problem	Solution
Fluid won't run in	Check correct clamps open and seals broken Check for kinked lines Reposition patient
Fluid won't run out	Check correct clamps open Check for kinked lines Reposition patient Refill if first time
Fluid is cloudy	Check for peritonitis: 1. Test PD fluid with multistix for leucocytes 2. Send PD Fluid for: <ul style="list-style-type: none"> • Urgent microscopy • Gram stain • Culture
Fluid is leaking	Decrease fill volume Check catheter insertion site If leaking persists, discuss with consultant prior to discontinuing treatment
Line disconnection	Send PD specimen for urgent MC&S Replace extension set with new sterile extension set Commence IP Vancomycin and Gentamicin (as per peritonitis protocol) until cultures are known. If cultures are positive, continue on peritonitis protocol (section 9.3) Renal Nurse Specialist to inform family of PD fluid culture result.
Troubleshooting with Homechoice machine.	The Patient at Home guide (Section 8 - Correcting alarms) supplied with each Homechoice machine contains an alphabetical listing of all alarm messages. Each alarm listing will take you to the appropriate procedure to identify the cause of the alarm and to give you the necessary steps to correct it

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8. Nutrition for patients on PD

Nutritional management of children on peritoneal dialysis requires a multidisciplinary team approach. Every child should be under the care of a specialist paediatric renal dietician. Nutritional prescription is individualised according to the age of the child whilst taking into account the following:

- *clinical observations* including change in appetite, gastrointestinal symptoms, and energy levels
- *physical examination* including presence of oedema, urine output, and blood pressure
- *nutritional assessment*, for example anthropometry, dietary intake, nutritional requirements and fluid restriction
- *biochemical / haematological parameters* including U&E, LFT, PTH, Vit D (25HCC), Hb, and ferritin
- *medications*, for example phosphate binders, diuretics, antihypertensives, anti-reflux therapy, iron supplementation and micronutrient supplements
- *dialysis prescription* (dose, cycles, dialysate solutions, ultrafiltration, urine output and dialysis adequacy)
- *psychosocial assessment* including family supports and lifestyle

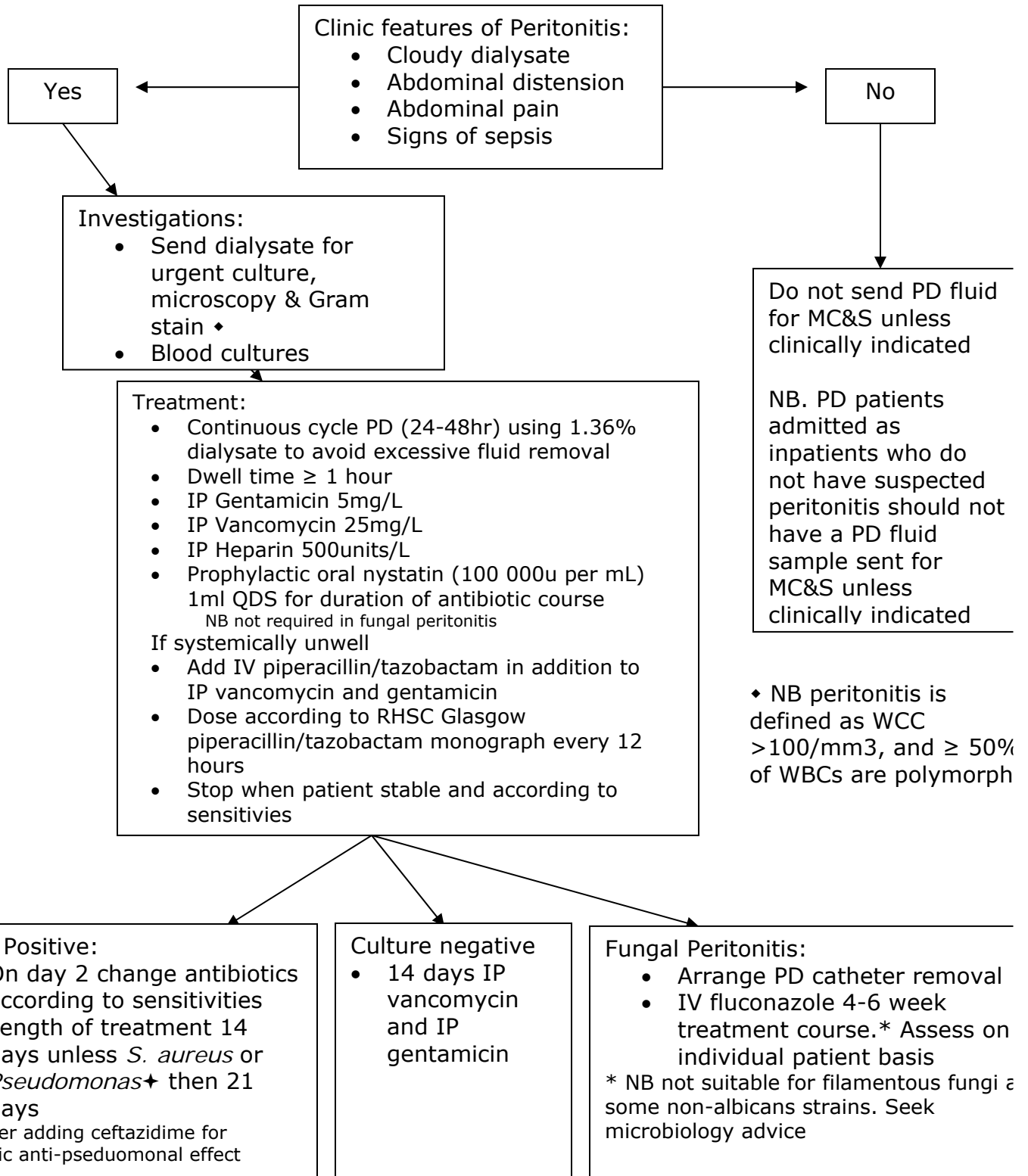
Where possible the child should be encouraged to achieve their nutritional requirements orally. However if this is unsuccessful and growth velocity is not maintained, supplementary tube feeding should be considered. (13)

For further information on this topic, please refer to the *Nutrition & PD Guidelines*:

<http://www.clinicalguidelines.scot.nhs.uk/Dietetics/Nutrition%20in%20Renal%20Disease%20YOR-DIET-001.pdf>

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9. Acute Peritonitis Protocol



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10. Care of PD catheter exit site

- Usual management of exit site: daily shower and dressing change
- Any exit site with evidence of infection (redness, swelling, discharge) should be cleaned with Chlorhexidine 70% as per dressing guidelines, and then bacterial swabs sent for culture. (5)
- While awaiting swab results, an Inadine® dressing should be applied.
- Treatment of positive swabs should follow the schema below.
- If cellulitis is present and tracks along the catheter tunnel, an ultrasound scan of the catheter tunnel should be performed. (6)
- Patients with signs of systemic illness should have a PD fluid sample sent for microscopy and culture.

<u>PD Insertion Site Infection Antibiotic Guidelines</u>		
Clinical presentation		
No obvious inflammation		
Micro-organisms do not require treatment		
Inflammation observed. Cellulitis absent		
<u>Micro-organism</u>	<u>topical</u>	<u>Antimicrobial</u>
		<u>oral</u>
bacterial	polyfax	add phenoxymethylpenicillin* for Group A strep
yeast	Nystatin	
Cellulitis present/ Systemic illness		
<u>Micro-organism</u>		<u>Antimicrobial</u>
		<u>oral</u>
<i>S. aureus</i>		flucloxacillin*
<i>Ps. aeruginosa</i>		ciprofloxacin
Beta haemolytic strep		phenoxymethylpenicillin*
Unknown		flucloxacillin* till Lab report available
Other bacterium		Significance uncertain. Reswab
Yeast	Unlikely cause of tissue damage.	Reserve
		Fluconazole for systemic illness.
Systemic illness		Add I/P vanc and gent to anti-microbial regime

* If allergic to penicillin, oral azithromycin should be used.

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11. Pre Discharge Checklist

Prior to discharge, the following must be completed:

11.1 Catheter Insertion record

Date of catheter insertion: Open / Laparoscopic
 Surgeon who inserted catheter: Omentectomy: Y / N
 Problems during first 24 hours:

If HD line inserted: Type: Length:
 CXR screened: Y / N Antibiotics given: Y / N

11.2 Pre-discharge education and planning checklist:

	Date	Signature	Comments
Catheter care / showering instructions given			
Immobilisation of catheter			
Observation of exit site			
Extensions / cap disconnection			
Leakage from catheter			
Weekly flushes arranged			
Treatment of constipation discussed			
Initial OPA given			
Date to start PD given			
School / nursery visit arranged			
Renal Medication Information Booklet provided/updated			
Current medications updated on Proton			
Written information leaflets provided			

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12. Outpatient Management and Follow-up

Dialysis access must be monitored and maintained to achieve its maximum longevity.(2) Initially, patients will be seen frequently, often weekly until the patient's condition is stable. Thereafter, most children will be seen on a monthly basis.

12.1 Monitoring (6)

- Monitoring of biochemical and haematological parameters should be performed monthly, or at each clinic visit if less often than monthly
- Peritoneal membrane function should be monitored regularly: 6 weeks after starting peritoneal dialysis, and at least annually thereafter, or when clinically indicated, using a PET test. Daily urine and peritoneal ultrafiltration volumes should be monitored at least 6 monthly. (6;10)
- A Kt/Vurea of 1.7/week and Creatinine clearance 50L/week/1.73m² is the minimum standard for solute clearance for children.(6)

12.2 Standards for laboratory and clinical indices: (6)

- Serum bicarbonate concentrations should be between 20 and 26mmol/l.
- Serum potassium should be between 3.5 and 6.5mmol/l.
- Serum phosphate should be within, and preferably nearer to the 50th centile, for the age appropriate normal range (figure 1).
- Serum calcium, adjusted for serum albumin, should be within the age appropriate normal range.
- (Serum albumin corrected) calcium x phosphate product should be <5mmol²/L² (14;15)
- Serum PTH levels should be maintained at less than twice the upper limit of normal.
- Serum aluminium concentration should be measured every three months in any patients receiving oral aluminium hydroxide (bearing in mind aluminium is not a recommended phosphate binding agent in children). No patient whose ferritin level is <100 µg/l should have a serum aluminium concentration >60 µg/l (2.2 µmol/l).
- Pre-dialysis haemoglobin concentration should be between 100g/L and 120g/L for children <2 years of age, and between 105g/L and 125g/L for children older than two years of age. Hb <110g/L is an indication to start iron supplementation +/- an erythropoietin stimulating agent. (16;17)
- Ferritin levels should be between 100 and 800 µ/L. In children at risk of thrombosis (e.g. those with heavy proteinuria, arteriovenous fistulae or synthetic grafts), serum ferritin levels above 500 µ/L should be avoided.

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- Height and head circumference (in those under 2 years of age) should be measured monthly, and the rate of growth checked against normal centiles. The best assessed weight ("dry weight") should be estimated regularly, at least monthly or every 2 weeks in infants.
- Pubertal stage should be assessed every 3 months in those over 10 years of age, or sooner if clinically indicated.
- An assessment of school progress, both in the hospital, if applicable, and locally, should be made annually.
- Blood pressure should be maintained within the age appropriate normal range. For normative data please refer to *The Management and Investigation of Hypertension* guideline <http://www.clinicalguidelines.scot.nhs.uk/Renal%20Unit%20Guidelines/Hypertension%20.pdf>

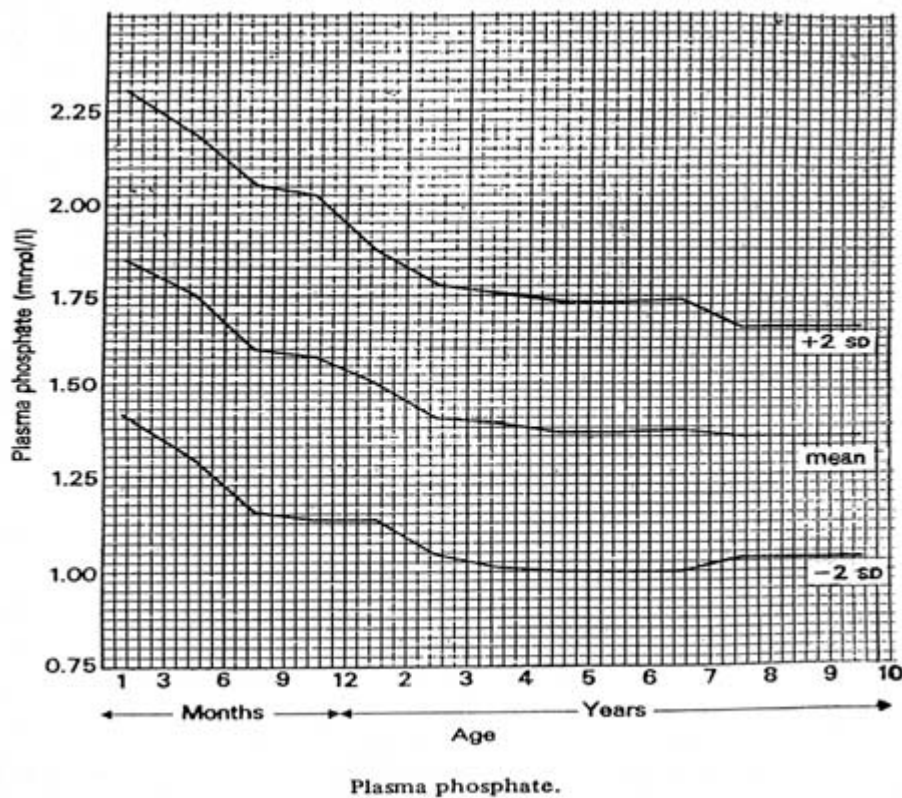


Figure 1. Plasma phosphate by age (6)

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13. Future Guideline Development

Future review of this guideline is due 1/6/2012. This guideline will be audited prior to its review to assess the impact of implementation of the guideline, and to determine changes required to improve patient outcomes.

Audit of the guideline may cover:

Medical monitoring (see 12.2. 12.2)

- PET
- biochemical parameters
- haematological parameters
- growth assessment
- pubertal assessment
- BP
- school progress

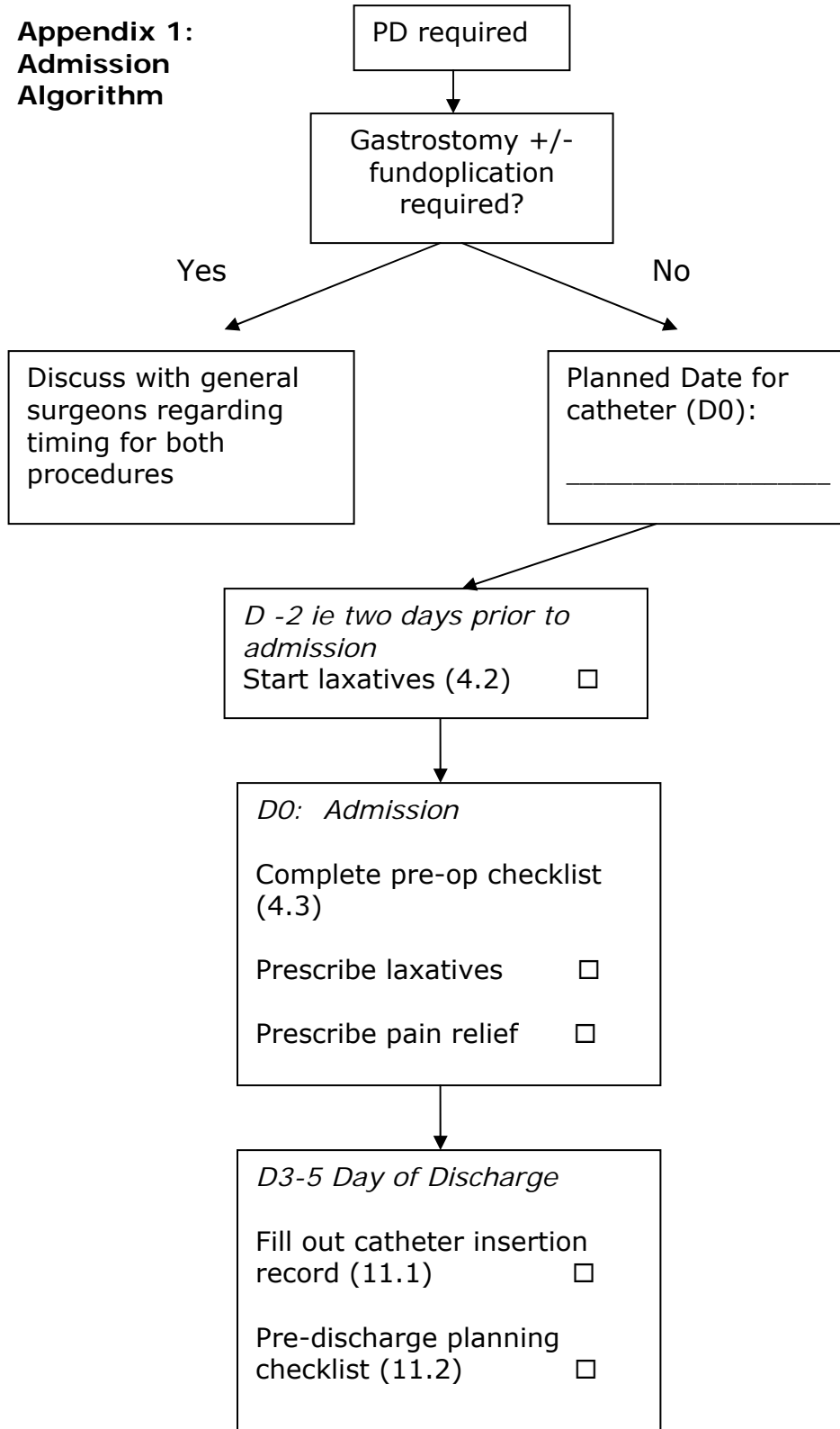
Surgical complications, including

- catheter blockage
- catheter displacement
- peritonitis rate
- rate of exit site infections

If any further information is required regarding guideline development please contact Dr Leah Krischock: Leah.Krischock@ggc.scot.nhs.uk

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**Appendix 1:
Admission
Algorithm**



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Appendix 2

Peritoneal Equilibration Test - Data Collection

Name: Date: No:

Weight: Height: Surface Area:

Overnight Dwell:

Duration: Volume In: Volume Out:

TIME	Urea	Creatinine	Sodium	Glucose
Serum				
Overnight Dialysate				
0-Time Dialysate				
2-hours Dialysate				
4-hours Dialysate				

Equilibration Test:

Time Start: Time to fill: Finished:

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Appendix 3: Composition of Dialysate Fluids.

	DIANEAL 1.36% (1.36%,2.27% & 3.86%)	PHYSIONEAL 35 (1.36%, 2.27% & 3.86%)	PHYSIONEAL 40 (1.36%, 2.27% & 3.86%)	NUTRINEAL (1.1% Amino acids)	EXTRANEAL (7.5% Icodextrin)
Na	132mmol/l	132mmol/l	132mmol/l	132mmol/l	133mmol/l
Ca	1.25mmol/l	1.75mmol/l	1.25mmol/l	1.25mmol/l	1.75mmol/l
Mg	0.25mmol/l	0.25mmol/l	0.25mmol/l	0.25mmol/l	0.25mmol/l
Cl	95mmol/l	101mmol/l	95mmol/l	96mmol/l	96mmol/l
Bicarbonate-		25mmol/l	25mmol/l	-	-
Lactate	40mmol/l	10mmol/l	15mmol/l	40mmol/l	40mmol/l
pH	5.5	7.4	7.4	5.5	5-6
Volume	3L and 5L	2.5L and 5L	2.5L and 5L	2.5L	2L
Cost	£6.03 / £5.01	£9.78	£9.78	£10.65	£14.78

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Appendix 4: Audit Measures and Paediatric Standards (6)

- Audit measure 1 Adequacy of staffing levels (medical, surgical, radiological, anaesthetic, nursing, dietetic, play therapists, psychosocial, pharmacy, and schooling)
- Audit measure 2 Presence of a transfer process for adolescents that is agreed by referring and receiving units
- Audit measure 3 Availability of modality choice
- Audit measure 4 Monitoring of modality switching
- Audit Measure 5 Systems in place to check medical equipment
- Audit Measure 6 Systems in place to ensure purchase of dialysis fluid fulfil legal requirements
- Audit Measure 7 Use of non-standard systems with documentation of clinical indication
- Audit Measure 8 Use of biocompatible solutions and indication for use
- Audit Measure 9 Audit of care pathway for dialysis preparation to include information given, when and who delivers it
- Audit Measure 10 Audit of care pathway for catheter insertion to include timeliness and need for temporary haemodialysis
- Audit Measure 11 Catheter complications and their resolution
- Audit Measure 12 Frequency of solute clearance (residual and peritoneal) estimation
- Audit Measure 13 Cumulative frequency curves for the total solute clearance
- Audit Measure 14 Frequency of measurement of membrane function, residual urine and peritoneal ultrafiltration volume
- Audit Measure 15 Identify patients with fluid reabsorption in long dwell
- Audit Measure 16 Routine annual audit of infection prevention strategies
- Audit Measure 17 Routine annual audit of infection outcomes (exit site and peritonitis rates)
- Audit measure 18 Cumulative frequency curves of plasma bicarbonate
- Audit Measure 19 Processes in place to increase awareness of interference of assays by icodextrin metabolites
- Audit measure 20 Cumulative frequency curves of serum calcium, phosphate, calcium x phosphate product and PTH concentrations
- Audit measure 21 Cumulative frequency curves of haemoglobin concentration
- Audit measure 22 Height, weight, head circumference and pubertal progression
- Audit measure 23 School attendance
- Audit measure 24 Cumulative frequency curves of BP pre-dialysis

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Audit measure 17 Record of the serum creatinine, the estimated GFR and comorbidity at initiation of chronic renal replacement therapy (dialysis or transplantation)

Paediatric standard 1 PD for children should take place in specialised paediatric centres able to provide multidisciplinary support

Paediatric standard 2 A transfer process for adolescents must be in place and agreed by referring and receiving units

Paediatric standard 3 Peritoneal dialysis catheter insertion should be undertaken by appropriately trained and skilled staff (good practice)

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