

**Report of the Renal Association Working Party
On
Peritoneal Access**

**Final Draft for Consultation
May 2008**

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Recommendations

The Working Party has made the following recommendations:

- a) To adopt the European Best Practice Standard (1) for peritoneal access:
 - I. Each centre should have a dedicated team involved in implantation and care of peritoneal catheters.
 - II. Whenever possible, the catheter insertion should be performed at least 2 weeks before starting peritoneal dialysis. Small dialysate volumes in the supine position can be used if dialysis is required earlier.
 - III. Antibiotic prophylaxis should be given prior to catheter insertion.
 - IV. Prophylactic antibiotic cream should be applied to the exit site to reduce infection risk.
- b) Local expertise at individual centres should govern the choice of method of Peritoneal Dialysis (PD) catheter insertion.
- c) Renal units should have clear protocols for peri-operative catheter care.
- d) PD catheter insertion training should be available to all trainees with an interest and included in the Renal Curriculum as an optional component.
- e) There should be regular audit at not less than 12 monthly intervals of the outcome of catheter insertion as part of multidisciplinary meetings of the PD team and the access operators.
- f) The UK Renal Registry should collect appropriate information on access for dialysis including peritoneal dialysis.
- g) The number of day case catheter insertions should be increased.

Remit

The Clinical Affairs Board of the Renal Association was in 2006 asked by the then President, Prof John Feehally, to assemble a Working Party to make recommendations on the creation of peritoneal access for peritoneal dialysis. This followed publication of a survey and report on vascular access for haemodialysis *“The Organisation and Delivery of the Vascular Access Service for Maintenance Haemodialysis Patients”* by a Working Party of the Renal Association, The Vascular Society of Great Britain & Ireland and the British Society of Interventional Radiology. (www.renal.org/ServiceProvision/servicefiles/VascAccessJWP0906.pdf).

There were concerns that the variations in the services available for creation of peritoneal access was limiting the use of this RRT modality and the choice offered to patients. The Working Party was asked to:

1. survey the provision of the peritoneal access service in the UK;
2. describe the techniques for creating access, their indications and contra-indications, including the management of catheter complications including catheter manipulation and removal;
3. identify standards and describe how they should be audited;
4. set out the resources required and describe an ideal patient pathway;
5. consider training issues for nephrologists in relation to PD catheter insertion.

Recognizing the differences in circumstances and availability of skills in units in the UK it is not our intention to prescribe a particular technique. It is well recognised that a range of techniques are used successfully at individual centres throughout the UK.

Introduction

In the UK about 1700 patients are established on peritoneal dialysis (PD) each year. It is a home-based therapy which offers the patient independence and a degree of autonomy. If used as the first dialysis modality it has the advantage of preserving vascular access sites for haemodialysis which may be needed in the future. This is especially important in young patients expecting to receive a renal transplant. Establishing patients who reach end-stage renal failure without vascular access onto PD avoids the risk of bacteraemia associated with the use of central venous dialysis catheters. There is some evidence that the use of PD may be associated with a lower rate of decline of residual renal function than with haemodialysis (2).

Patients who reach end-stage renal failure (CKD Stage 5) should be able to make an informed choice of the modality of renal replacement based on personal preference. Although choice will be affected by medical and anatomical factors and resources, the personal prejudices and skills of clinicians should not limit patient choice. If free to choose, it is estimated that ~30% of patients would opt for PD as their first dialysis modality (3,4). The choice of PD and its efficacy should not be limited by the availability and safety of catheter placement.

To start a patient on treatment requires placement of a functioning peritoneal dialysis catheter. In this document we describe the four techniques for placement, their advantages and disadvantages and advice on the indications and contra-indications

for each. We do not believe that any one technique is superior but recommend that more than one be available to suit individual patients and circumstances. Safety and efficacy will depend on the expertise of the operator, the facilities and the support provided before, during and after the procedure.

There are four basic techniques for insertion.

- 1) An open surgical approach in which the layers of the abdominal wall are opened under direct vision and the catheter placed at laparotomy.
- 2) A percutaneous Seldinger approach.
- 3) Placement using a peritoneoscope.
- 4) Placement aided by a laparoscope.

A Cochrane review did not reveal significant differences between laparoscopy and laparotomy for peritonitis, exit-site/tunnel infection or catheter removal/replacement (5). There was no evidence to support double over single cuff catheters. NICE published guidance on the safety and efficacy of the laparoscopic implantation technique indicating that the evidence comparing outcomes with open insertion supported the use of this procedure (6).

The success of the technique depends on the expertise of the operator, careful patient preparation and post-procedure care. Catheter dysfunction causes considerable disruption to the lives of patients and it is important therefore that catheter implantation is given priority. It should not be performed by trainees unsupervised, until they have been signed off as competent to operate independently.

Results from the PD access survey

Because there was little information on the practice of PD catheter insertion in the UK an access survey was commissioned in the summer of 2007. The questionnaire required a prompt response and the data was based on the impression of an individual from each unit and was not collected prospectively. The results have been interpreted with these deficiencies in mind. A report from the peritoneal dialysis access survey is attached to this document as Appendix 1.

The headline results from the survey were:

- The median (range) number of catheters inserted annually was 34 (5-100).
- Most units reported more than 90% immediate catheter patency.
- In the majority of centres the wait for catheter insertion was 1 week to 1 month.
- There was considerable range in the use of day case facilities for catheter insertion.
- Most units use double cuff catheters inserted surgically.
- 76% of units used coiled PD catheters.
- Approximately 72% of PD catheters are placed by consultant surgeons and 19% by consultant physicians.
- 51% of responding units use the surgical open technique alone, with a further 30% using a combination of surgical open and medical percutaneous. The peritoneoscope is used in 16% of units.

Techniques of catheter placement

There are no evidence-based recommendations to inform choice of method of implantation (5,7). The method of catheter insertion is therefore determined by a variety of factors including patient factors and local circumstances. Successful outcomes depend on appropriate patient selection, preparation and peri-operative care and training. Catheters should be inserted in a sterile operating theatre or clean procedure room, appropriately equipped and staffed. The procedure can be performed as an in-patient requiring an overnight stay, or as a day case (8). Relative advantages, selection criteria and complication rates of the various techniques are summarised in Table 1.

Pre-operative assessment

It is important that the patient is assessed for the presence of hernias and weakness of the abdominal wall, which if necessary should be repaired before, or at the time of, catheter insertion. The exit site should be identified and marked with the patient sitting or standing if possible. The ISPD recommends that the exit site should be directed downwards or laterally (7). It should lie either above or below the belt line, should not lie on a scar, or be in abdominal folds. A catheter of a suitable length for the patient's size should be selected (9). Screening and treatment of *Staphylococcus aureus* carriage should be according to local Trust policies.

Pre-implantation procedure

The pre-implantation procedures include bowel preparation with laxatives to debulk the bowel in preparation for insertion. The bladder should be emptied immediately prior to the procedure, and confirmation of full emptying by ultrasound may be advisable in men > 50 years of age. Administration of prophylactic antibiotics is recommended to reduce the risk of catheter site infection, peritonitis and wound sepsis, and there is RCT evidence for the use of vancomycin (10). The choice of antibiotic should be based upon local guidelines with consideration given to efficacy, risks of selection of resistant organisms and development of *Clostridium difficile* colitis.

The area of insertion should be prepared prior to implantation bearing in mind that if it is necessary to remove hair, that the use of clipping and depilatory creams results in fewer surgical site infections than shaving using a razor (11). The abdominal wall should be sterilised with an appropriate agent and dressed with sterile towels. Immediately before implantation the catheter is removed from the sterile pack and immersed in sterile saline. It is common practice for the Dacron[®] cuff to be wet thoroughly and air squeezed out.

Anaesthetic requirements

The anaesthetic requirement depends on the technique selected, which is influenced by the characteristics of the patient. Typically for percutaneous or peritoneoscopic routes sedation may be required (12,13). This is commonly achieved with a combination of an opiate and a benzodiazepine (e.g. pethidine and midazolam), with 1-2% lignocaine given subcutaneously (usually without adrenaline) to the insertion site, exit site and tunnel. Conscious sedation needs to be managed according to local

clinical governance procedures. A dedicated area should be used, with appropriate staffing, suction, oxygen and patient monitoring facilities.

Post-procedure care

Post-procedure it is common practice for the catheter to be flushed using a suitable dialysate solution and capped off. The exit site should be covered completely with an appropriate dressing and not disturbed for 5-10 days unless it is essential to do so because of bleeding or leakage. We recommend that the catheter should be immobilised since if it becomes pulled it is more likely to become loose and to leak (although the Cochrane review did not find conclusive evidence to support this approach (5)). Staff should dress and clean the exit site using a sterile technique, and when appropriate the patient should be trained in its care. At that stage the patient or carer should be trained in the use of a topical prophylactic antibiotic. If possible the catheter should be rested for 2 weeks to avoid the risk of peri-catheter leakage. However, there is published experience of catheters being used immediately after insertion with centres documenting either no increase in complications (14), or a higher mechanical complication rate (15). Post-operatively avoidance of constipation is essential for optimal catheter function and the patient should be discharged home with a supply of an appropriate aperient/laxative.

Catheter types

The Cochrane review did not find any advantage for straight versus coiled catheters, single or double cuff, median or lateral incision (5). However, a recent RCT reported improved PD technique survival for straight versus coiled catheters (16) and a further RCT reported that coiled catheters may have higher migration rates than straight catheters (17). These data relate to relatively small studies and we would not advocate at this stage that centres with good outcomes change their choice of catheter type until more information is available. Although subcutaneous burying of the catheter until use (Moncrief method) was not associated with a reduction in infectious complications, we are aware that its use may have advantages for the relationship between the timing of catheter insertion and the start of training.

1. Open (surgical) placement

A 5 cm vertical incision is made below the umbilicus in the mid-line and deepened through the subcutaneous fat to the *linea alba*. A paramedian incision can also be employed which requires splitting the rectus abdominis muscle with occasional risk of bleeding from the inferior epigastric vessels. The *linea alba* is then divided and extra-peritoneal fat exposed. The peritoneum is then elevated between haemostats and incised at the lowermost end of the incision, and the peritoneal cavity entered. The catheter is then inserted into the pelvis either with a pair of sponge holding forceps, an introducer or a positioner. A purse string absorbable suture including bites of the pre-peritoneal cuff is used to close the peritoneum, the pre-peritoneal cuff being positioned at the caudal end of the wound just outside the peritoneum. The *linea alba* is closed over the catheter with continuous absorbable sutures so that it buries 3-4 cm of the catheter under the *linea alba* and snugly encloses the catheter as it passes through it without causing a kink. Proper placement and patency of the catheter is verified by injecting 60 mL of saline and confirming that at least 30-40 mL is easily aspirated.

The catheter is tunnelled subcutaneously using a trocar such that the catheter exits in a caudal direction preventing sweat, water, and dirt flowing down into the exit site. Dissecting the tunnel with artery forceps is traumatic and should be discouraged since it increases the risk of haematoma formation and infection. The subcutaneous cuff should be positioned at least 2 cm from the exit site. The exit site incision should fit snugly around the catheter. No suture should be placed around the exit site. The skin is closed with an absorbable subcuticular suture. The external segment of the catheter should be immobilised with an adhesive plaster and the dressing over the exit site left undisturbed for 5 days unless bleeding or infection is suspected.

2. Percutaneous placement

A horizontal 1–2 cm midline incision is made 2–5 cm below the umbilicus. A needle and sheath are advanced through the incision and subcutaneous fat down to the fascia, through the *linea alba* and then through the pre-peritoneal fat, and parietal peritoneum (2 “pops” are felt as the needle is advanced). The needle is removed and the abdomen is filled with appropriate fluid to facilitate catheter placement. A guide wire is passed into the peritoneal cavity (some centres advocate the use of radiographic imaging at this stage) and a series of dilators are then used to create a passage into the peritoneal cavity along a semi-rigid sheath large enough to accept a peritoneal dialysis catheter. The tip of the catheter is advanced through a caudally directed sheath into the abdominal cavity and then the pelvis. The distal cuff is advanced onto the rectus sheath. The proximal end of the catheter is then tunnelled subcutaneously lateral to an exit-site incision in the skin of the abdomen or occasionally the chest. Alternatively the catheter can be left in a subcutaneous tunnel and not exteriorized until it is needed (Moncrief-Popovich method (18)). Recently a modification of the technique involving a slightly more lateral incision placing the cuff in the rectus muscle allowing an immediate start to PD has been described (14).

3. Peritoneoscopic insertion

Peritoneoscopic PD catheter insertion requires use of a small (2.2 mm diameter) optical peritoneoscope for direct inspection of the peritoneal cavity. Peritoneoscopic placement varies from the laparoscopic technique in a number of ways: (i) the scope and puncture holes are both smaller; (ii) only one peritoneal puncture site is needed; (iii) it can be performed easily under sedation combined with local rather than general anaesthesia.

The abdomen is prepared as above and a small skin incision (2-3 cm) is made inferolateral to the umbilicus under local anaesthesia. Blunt dissection of the subcutaneous tissue is then performed down to the anterior rectus sheath. A Verres insufflation needle is passed into the peritoneal cavity and a 1 L pneumoperitoneum created by insufflation of carbon dioxide to separate visceral and parietal peritoneal surfaces. The patient is placed in the Trendelenberg position and a pre-assembled cannula with trocar and a spiral sheath is then inserted into the abdominal cavity through the rectus muscle. The trocar is then removed and replaced by the peritoneoscope to confirm the intra-abdominal position of the cannula. The cannula with the spiral sheath wrapped around it is then advanced towards the pelvis. The cannula and the peritoneoscope are then removed, leaving the spiral sheath in place. The spiral sheath is dilated to 6 mm diameter and the catheter is advanced into the desired location through the spiral sheath using an internal stylet. The deep cuff is secured into the rectus muscle using an implanter tool, without dissection of the

anterior rectus sheath or the muscle. The superficial cuff is implanted into the subcutaneous tissue and a tunnel and an exit site are created. The tunnel and exit site are directed either laterally or inferiorly. The skin and subcutaneous tissues are closed with no sutures placed on the external rectus sheath or at the skin exit site.

4. Laparoscopic insertion

Establishment of pneumoperitoneum

A pneumoperitoneum is established via a 10/12 mm laparoscopic port inserted below the umbilicus or in the right hypochondrium (19) using an open cannulation technique or by using the closed technique with the Verres needle. An intraperitoneal pressure of 10-15 mmHg is maintained using CO₂.

Insertion of ports

Various techniques have been described using either 2 ports (20) plus a cannula insertion port for the dialysis catheter, or a single port in conjunction with the Seldinger technique. The peritoneal membrane can be inspected through the laparoscope cavity to identify any pathology which may impair catheter function. If found these can be corrected by performing, for example, omentopexy or adhesiolysis (21,22).

Insertion of the catheter

Catheter insertion can be performed using either the Seldinger technique or an approach where the dialysis catheter is inserted using the laparoscopic grasping forceps. There is some variation in the location of the incision for the insertion of the dialysis catheter, most commonly this is placed 1 cm below and 2 cm lateral to the umbilicus, although other sites have been described. When choosing the site for this incision it is important to ensure that the external cuff is positioned at least 2 cm from the proposed exit site. The laparoscopic technique permits the rectus sheath tunnelling of the dialysis catheter which may help to prevent catheter tip migration (22).

If the Seldinger technique is used to position the catheter a needle is inserted through the incision under direct vision avoiding the bladder. A flexible guidewire is passed along the needle and angled down into the pelvis behind the bladder. The needle is removed and a well lubricated "peel-apart dilating plastic trocar and cannula" of sufficient diameter to accommodate the catheter is placed over the guidewire into the pelvis. The pre-immersed double cuffed dialysis catheter is placed over a long straight metal introducer straightening out the curled end and lubricated in preparation for insertion through the plastic cannula. The guidewire is removed then the central trocar removed and the lubricated double cuffed catheter passed through the cannula into the pelvis and positioned under direct vision. When a satisfactory position is obtained the metal introducer is removed and if a satisfactory position remains the peel apart plastic cannula is removed from around the catheter while maintaining its position under direct vision. The external end of the catheter is then attached to a tunnelling spike and may be tied on to avoid dislodgment during passage through the subcutaneous tissues. The spike is then passed subcutaneously with a curved trajectory to exit the skin at the pre-marked site at a downward angle. The internal Dacron[®] cuff lies in the subcutaneous space in the

suprapubic incision, the external cuff lies at least 2 cm away from the exit site. No attempt is made to insert the internal cuff into the peritoneal cavity or secure the cuff or the catheter with additional sutures. This makes subsequent removal of catheters much easier and reduces the risk of post-operative leakage around or dislodgement of the catheter.

The catheter is then connected to a dialysis set and trial flow tested and when there is clearly satisfactory in and outflow through the catheter the wounds closed. Local anaesthetic is used to infiltrate the fascia of the umbilical wound which is closed with a non-absorbable suture to prevent hernia. The skin wounds are closed with an absorbable subcuticular suture. Standard dressings are applied leaving the working end of the catheter exposed for access.

5. Catheter manipulation and removal

Removal of the PD catheter should be performed promptly in cases where the catheter is no longer functioning or needed. It should also be performed as an urgent or emergency procedure in cases of refractory peritonitis or if life-threatening infection occurs. This is usually done in theatre under general or local anaesthesia. Where the catheter has been placed percutaneously it is often possible remove it quickly and simply under local anaesthetic without recourse to a formal surgical procedure.

We recommend that for infection related removals, all the cuffs are removed with the catheter and that this is documented in the operation note. These cuffs can otherwise become a source of ongoing sepsis or can become secondarily infected (23). Unrecognised infection in retained cuffs can cause diagnostic difficulty in identifying a septic source and may be more difficult to locate to remove at a later date. A technique of catheter removal using sustained traction has been described which will in most cases remove the catheter while the cuffs are left *in situ*. This is a quick and successful technique where infection is not an issue e.g. for removal post renal transplantation (24). If this technique is employed the number of retained cuffs should be clearly documented and the patient should be informed.

Simultaneously removed and replaced catheters

For many infection-related removals a short period of haemodialysis is usual before catheter replacement. Where the tunnel is not involved and where it is necessary to continue PD, it may be possible to perform a removal and replacement of the PD catheter at the same operation. This has been performed successfully when the peritoneal fluid WBC count is $<100/m^3$ and intraperitoneal antibiotics can be continued (25). This technique is not suitable for *Pseudomonas*, fungal, mycobacterial or faecal peritonitis.

PD catheter manipulation

Several approaches to manipulation of malpositioned PD catheters have been described. It is conventional to try aperients/laxatives in the first instance, but if this fails the catheter can be repositioned using a number of techniques. The success rate is variable and recurrent malposition after correction is common. Radiographic methods using a wire (26) or Fogarty catheter have been described. Laparoscopic methods for repositioning have also been described (27). Open surgical repositioning

is also possible and has the advantage that an omentectomy can be performed in cases of omental wrap. It is, however, often better to simply remove and replace the malpositioned catheter. The latter can also be easily performed for percutaneously placed catheters under local anaesthetic, in the same way as insertion.

Governance issues surrounding PD catheter insertion

Catheter insertion for peritoneal dialysis should be performed in an environment appropriate for a surgical procedure. Catheter implantation should be considered a priority by those responsible for theatre operating list schedules and surgical staff. Appropriate training and expertise of the operator is essential and it must not be performed by unsupervised trainees until competence has been confirmed and signed off.

Facilities should be available for a catheter to be inserted within 2 weeks of the patient requiring it because, if catheters are not inserted promptly, patients may default to haemodialysis. There should also be the facility for urgent catheter insertion in patients requiring acute peritoneal dialysis and for catheter removal at short notice (within 1 day) for example in patients with unresolving peritonitis.

Quality should be underpinned by appropriate training and knowledge of standards and audit.

Standards and audit

The primary marker of successful outcome is primary catheter patency. Although we do not have a specific audit standard in this area it has been recommended that >80% of catheters should be patent at 1 year (censoring for death and elective modality change) (7). It seems appropriate this should be a target to which to aspire. The committee recommended the following audit standards for catheter related complications:

- Bowel perforation < 1%
- Significant haemorrhage <1%
- Exit site infection within 2 weeks of catheter insertion <5%
- Peritonitis within 2 weeks of catheter insertion <5%
- Functional catheter problem requiring manipulation or replacement or leading to technique failure <20%

At least every 12 months a combined meeting between surgeons (or other health providers inserting PD catheters) and the nephrology team should be held to review PD catheter data.

Data to be collected and used in the audit should include:

- Date of catheter implantation and first use
- Operator name and rank
- PD catheter type
- Implantation technique
- Catheter failure and reason
- Complications of insertion

- Whether PD catheter was first insertion or a revision.

Data on catheter related complications should include:

- Peri-operative complications including bowel perforation, significant haemorrhage (requiring transfusion or surgical intervention)
- Early infections – peritonitis and exit site infections within 2 weeks of catheter insertions
- Dialysate fluid leaks
- Catheter dysfunction at the time of first use that requires catheter manipulation or replacement or results in technique failure.

We recommend that a subset of data should be shared **nationally** via the UK Renal Registry in the form of a simple access screen to be completed at the time of the procedure that would cover peritoneal and vascular access. The following fields are suggested¹:

- Date of procedure
- Type of procedure from comprehensive pick list (including catheter manipulation)
- Details of the operator – name and rank
- Primary patency determined by the time line – i.e. was the patient successfully established on PD?
- Immediate complications (picklist).

¹ It is envisaged that by combining this information with timeline and microbiology data it should be possible to establish success rates based on whether patients continue on the modality, require a recurrent procedure, or develop infective complications. Any data collected for the Registry is a compromise between the complexity of the dataset and likelihood of data completeness. Local audit will provide clinicians with the opportunity to review more complex outcome data.

Organisation and delivery of a PD access service

Resources

Peritoneal access surgery is generally considered as part of the overall requirement for dialysis access and should include facilities for both catheter insertion and removal. Data from the UK Renal Registry indicates that the incident renal replacement population was 113 per million of the population in 2006, with 20% starting on PD (28). The Kidney Alliance recommend capacity for 50 PD catheter insertions per million (http://www.kidneyalliance.org/docs/appendix_four.htm). International Guidelines on catheter insertion (1) do not give an indication of resource requirements. It is difficult to make a recommendation defining the required amount of surgical time necessary to support a PD program, since the uptake of PD varies considerably across the country. About two thirds of catheters inserted in the UK are performed using the open surgical technique, with the majority of the others being done using the medical percutaneous technique. Any resource recommendation needs to take into account the following assumptions:

The facility

- 25% incidence rate of PD – i.e. approximately 25 per million of the population per year
- The requirement for catheter manipulation and re-implantation
- Suitable operating environment with all necessary support facilities
- An appropriate catheter insertion training program
- Appropriate surgical support

The procedure

- The importance of avoiding delegation to an inexperienced unsupervised operator
- The need to remove catheters urgently when required
- The requirement for catheter insertion to be performed promptly in patients in whom it is indicated i.e. 2 week waiting list
- The need to perform the procedure urgently in patients presenting late for RRT to avoid the need for central catheter HD

Where should the service be sited?

The siting of services will depend upon local factors. It may be appropriate for larger units to provide a catheter placement service for neighbouring smaller units because a critical case load is required for quality and training. However, a local service is to be preferred because without it the development and uptake of PD as a modality may be inhibited. A well-trained and experienced operator should be able to maintain expertise with a relatively low procedure frequency. We do not feel that it is appropriate to specify a minimum number of catheters to be performed by an individual operator annually.

Timing and co-ordination of referral and surgery

There are two main patient groups requiring PD access.

(1) Patients with progressive renal failure predicted to need dialysis; for these access should be co-ordinated from the CKD low clearance clinic. The objective is that access is placed sufficiently early to enable the patient to train for PD in a timely fashion while residual renal function is sufficient to avoid the need for temporary vascular access for HD if there are problems with catheter function. It is not recommended that patients commencing PD have an arterio-venous fistula formed, unless there is a plan to transfer to HD within a few months.

(2) Patients with stage 5 CKD presenting as uraemic emergencies (late referrals – 23% new patients in the UK); for these there should be a pathway that allows the choice of PD as a modality. This requires adequate patient education to be available to permit choice. The advantage of placing PD access in patients who have not had the opportunity to be prepared for RRT is that the requirement for prolonged use of central venous access can be reduced. This has to be balanced against the potential for complications associated with the early use of PD catheters (15).

It seems appropriate to adopt the European Best Practice Guidelines standard for the timing of PD catheter insertion – “Whenever possible, the catheter insertion should be performed at least 2 weeks before starting peritoneal dialysis. Small dialysate volumes in the supine position can be used if dialysis is required during this period” (1).

Training considerations.

The Renal Association Training & Education Committee should recommend inclusion of PD catheter insertion as an optional component of the curriculum for specialty registrars. Those who select this option need to be able to demonstrate that they have mastered the technique. Each Deanery should provide training for local interested trainees, and where such facilities are not available within the Deanery arrangements should be made for this to be provided outside the Deanery. The Renal Association Training & Education Committee should consider the following:

- A recommendation that procedure-based competency for PD catheter insertion be included in the Joint Royal Colleges of Physicians Training Board [Renal Medicine Specialty Training Curriculum](#) (a potential example is included in appendix 2).
- A standard DOPS that can be used to support training (an example has been attached as appendix 3). All operators should keep a log book of procedures and be subjected to audit.
- A recommendation that trainees have access to available PD training materials which include the PD Academy, the PD Access Academy and the Renal Academy (PD component) which is available online via the Renal Association website, and supported by Doctors.net.uk.

Recommended topics for future research

The Renal Association Research Committee should encourage research directed at the following unresolved questions. Suitable clinical trials could be conducted via the Clinical Research Networks:

- Does *Staphylococcus aureus* eradication prior to PD catheter insertion reduce infection rates?
- Does catheter type influence outcome – comparing catheters with coiled versus straight intraperitoneal segments?
- What is the influence of exit site direction on outcome?
- What is the role of antibiotic prophylaxis on outcome and which agents are best?
- What is the role of bench preparation and intra-operative technique – e.g. soaking the cuff, flushing the catheter after insertion?
- What is the optimal type and frequency of aperient to be used as part of pre-procedure bowel preparation?

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Table 1. A comparison of advantages, disadvantages, and indication and contraindication and complication rates for the various insertion techniques.

	Open surgical (Os)	Laparoscopic (Lp)	Percutaneous (Pc)	Peritoneoscopic (Pp)
Obese patient	Yes	Yes	Possible but not ideal	Yes
Previous surgery	Yes	Yes	RC*	RC*
Poor GA risk	Possible using LA	Not suitable	Ideal	Possible
Uraemic emergency	RC*	RC*	Yes	Yes
Intolerant to conscious sedation	Yes	Yes	RC*	RC*
Can be performed by a suitably trained nephrologist	Possible but not ideal	No	Yes	Yes
Suitable for day case	Possible but not ideal	Possible but not ideal	Yes	Yes
Presence of a hernia	Yes	Not ideal	No	No
1 year catheter survival	62.5 – 71% (6) (29)	79 – 91% (6)	33-90% (30-32)	77.5% (29)
Mechanical failure	11-31%	12-24%	11-24%(31, 32) (33)	7.9% (29)
Fluid leak	9.3-14%	0-10%	20-28%	14%(34)
Peritonitis [#]	14-46%	5-32%	No significant difference with open surgical	2.6% (29)
Exit site infection [#]	2.7-4.6% 10-17%	5-29%	4%	1.3% (29)
Bleeding	1-8%	0-5%	5%	(?)

*RC relative contra-indication; [#]the time frame for these complications is not consistent across the various reports.

Complication frequencies are for guidance only – it is important to bear in mind that most are based on case series and that there may be positive reporting bias for new techniques particularly when compared with established techniques. It is possible that success is determined more by the experience of the operator rather than the specific technique. Patient selection has an important influence on outcomes. The Cochrane review did not find any differences between the laparoscopy and laparotomy (5).

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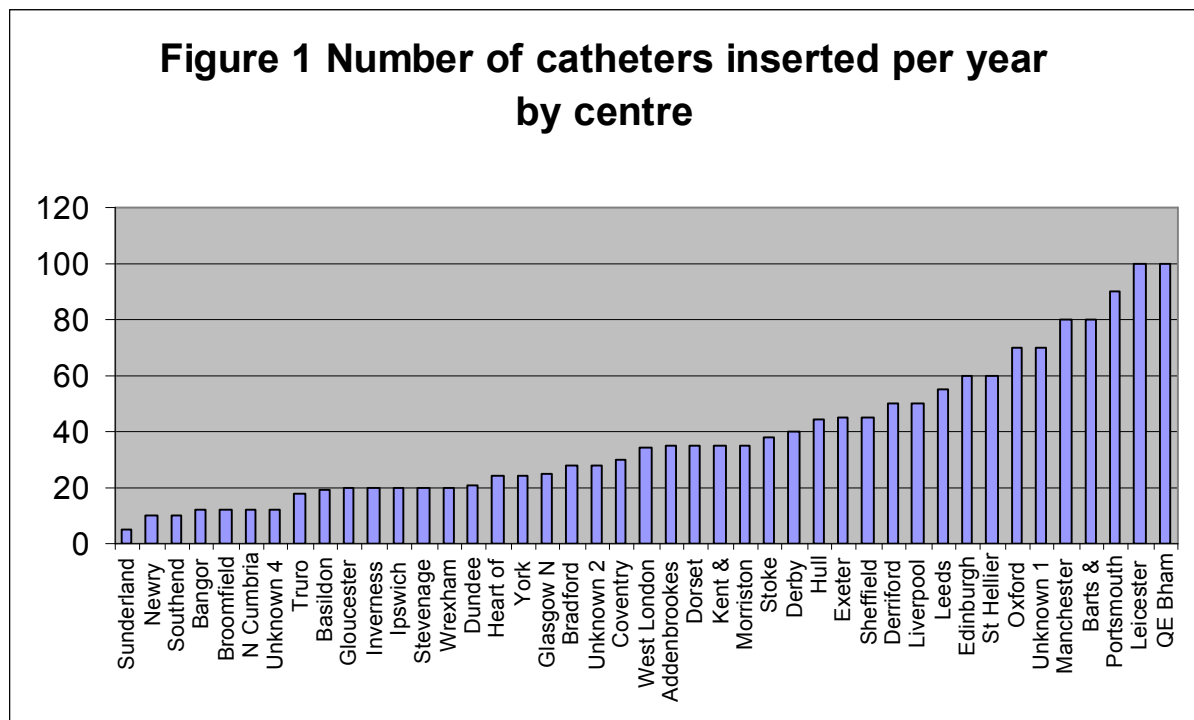
Appendix 1. PD access survey report

The following responses are based on a questionnaire sent out by email in July 2007 to the clinical directors of 80 renal units in the UK. 43 survey reports were returned (Table 1) Three centres were anonymous.

The survey was answered retrospectively and thus the data may not be reliable. However, the intention was to gain an impression of practices relating to PD catheter insertion in the UK, with a view to more detailed future data collection. Not all questions were answered by every respondent – this was sometimes a consequence of the nature of the question. For example it was not possible to give a single waiting time for PD catheters if it varied according to operator or technique. These variations were sometimes identified in the comments.

On average how many PD catheters are inserted per year in your unit?

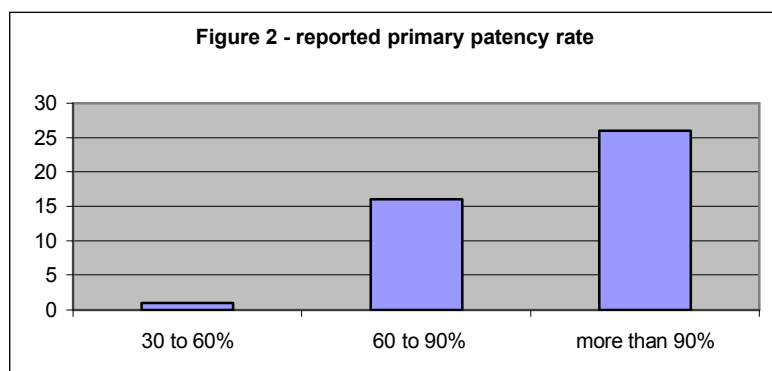
The mean number of reported annual catheter insertions per centre was 38, median 34, range 5 – 100. These results are presented by centre detail Figure 1.



What is the primary patency rate (i.e. catheter works immediately when required without recourse to surgical or radiological intervention)?

43 units responded to this question.

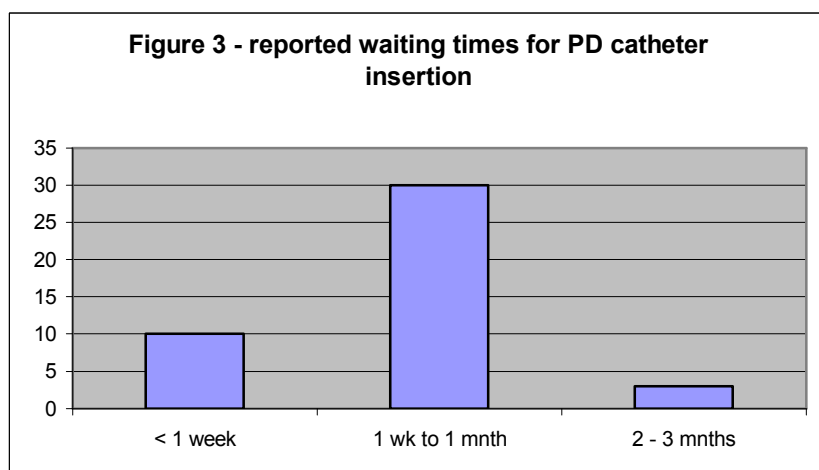
Reported catheter primary patency rate.		
30-60%	60-90%	More than 90%
1	16	26



How long is the wait for PD catheter insertions at your centre?

In two units the insertion waiting time depending on the planned technique – the waiting time for physician inserted catheters under local anaesthetic being much shorter than if the patient required the surgical insertion technique. Some units commented that the waiting time was determined by clinical need.

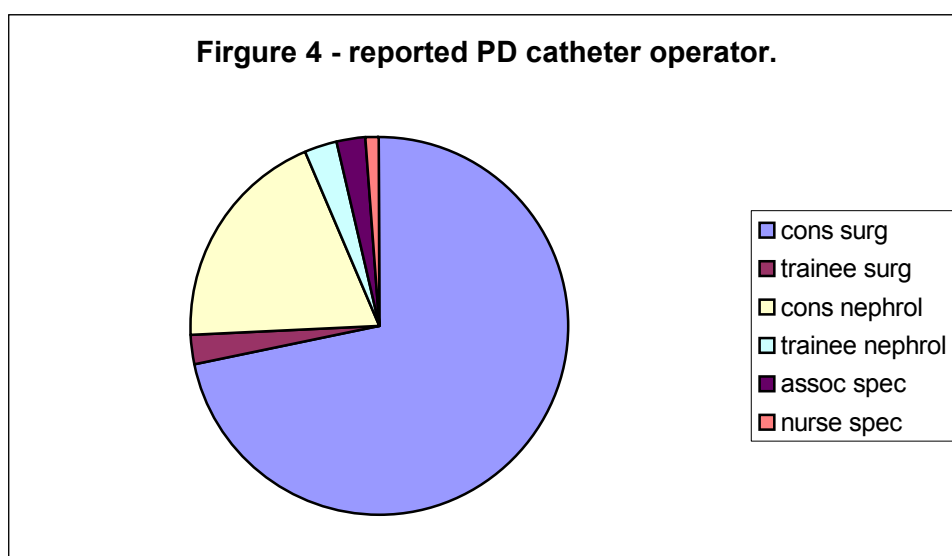
Reported waiting times for catheter insertion		
Less than 1 week	1 week to 1 month	2 to 3 months
10	30	3



Who inserts PD catheters at your centre?

43 centres responded to this question. The data below is the percentage of overall activity attributed to various operators, however this is not adjusted for the number of catheters inserted at each site. It is instructive to review the more unusual practices – for example in Wrexham a nephrology associate specialist inserts all the catheters using a minilap technique; in Manchester 50% of catheters are inserted by a nurse specialist, and Derby where a radiology insertion technique is used.

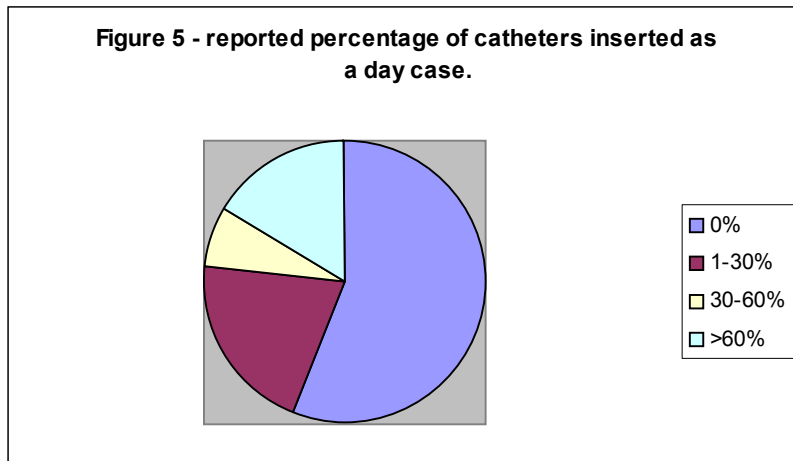
Reported PD catheter insertion operator.					
Cons surgeon	Trainee surgeon	Cons nephrologist	Trainee nephrologist	Associate specialist	Nurse specialist
71.7%	2.4%	19.3%	2.9%	2.4%	1.2%



What percentage of catheters are inserted as a day case?

43 centres responded to this question. In one case a comment indicated that “day case” included one overnight stay. Others indicated plans to increase the day case activity. It is clear from the data that most units do not insert PD catheters as day case procedures.

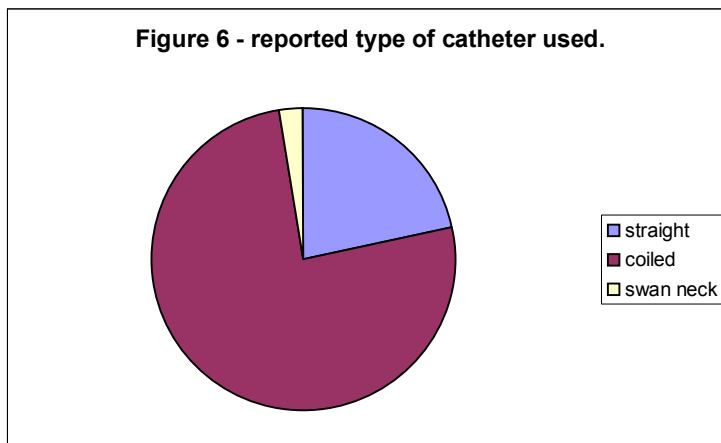
Reported percentage catheter insertion as a day case procedure.			
0%	1-30%	30-60%	>60%
24	9	3	7



What type of PD catheter is used?

Of the 41 centres that responded to this question 29 reported using coiled catheters exclusively; 7 exclusively use straight catheters; 5 used a combination of catheter type with only 1 centre using the swan necked catheter, and only in 5% of their cases. 34 centres reported using double-cuffed catheters, whereas 6 reported using single cuffed catheters – 1 centre did not answer this question. Catheter use is given as a percentage in the table.

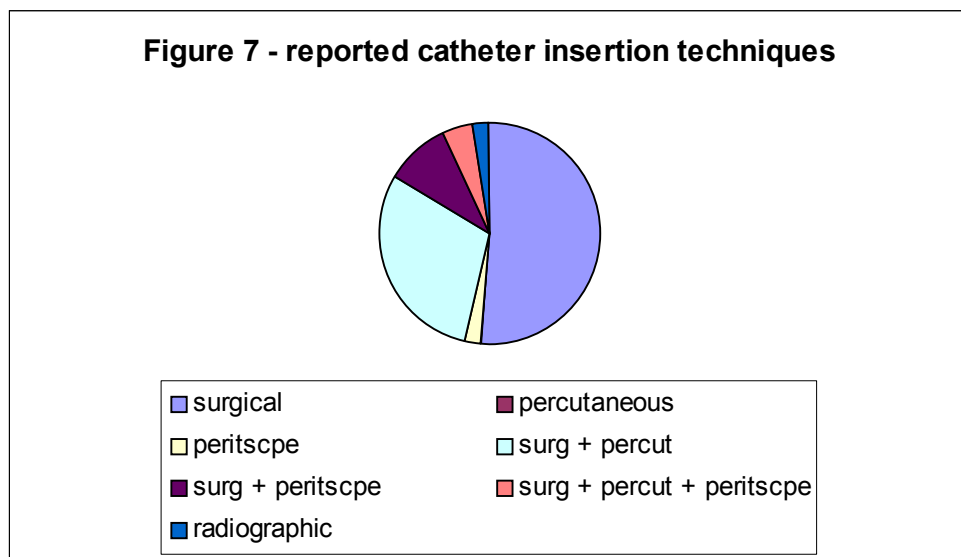
Percentage reported use of each type of catheter		
Straight	Coiled	Swan neck
21.7%	75.8%	2.5%



What techniques are currently used to insert PD catheters in your centre?

Of the 20 centres using multiple techniques these are predominantly a combination of surgical and “medical percutaneous”, and in some cases the peritoneoscopic technique. One centre reported having abandoned that technique following an audit due to pain consequent on CO₂ insufflation. In Ipswich the nephrology SpR inserts as many catheters as the consultant renal physician. In Derby a radiographic insertion techniques is used, whereas in Wrexham the nephrology associate specialist uses a surgical mini-lap technique.

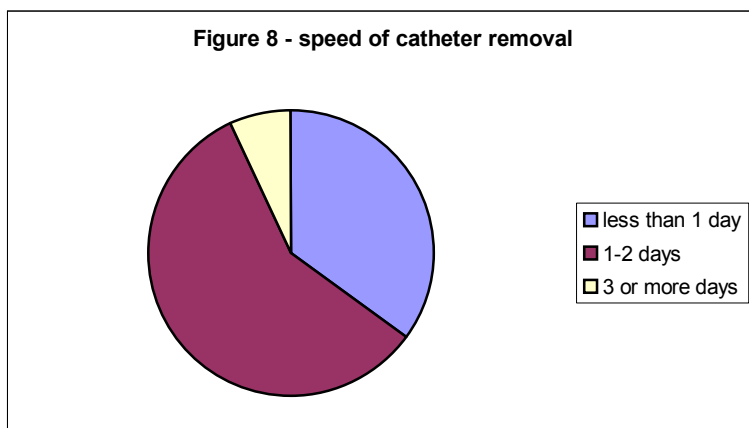
Techniques of catheter insertion.	
Surgical only	22
Percutaneous only	0
Peritoneoscopic only	1
Surgical and percuteous	13
Surgical and peritoneoscopic	4
Surgical, percutaneous and peritoneoscopic	2
Radiographic (localisation)	1
Laparoscopic	0
Total	43



How quickly can a PD catheter be removed when necessary?

43 responses

Speed of catheter removal		
Same day	1 – 2 days	3 or more days
15	25	3



Responsiveness of surgical team to replace poorly functioning catheters and for management of hernias and leaks

Reported waiting times for PD related surgical interventions			
	Less than 1 week	1 – 4 weeks	More than 4 weeks
Catheter replacement 43 responses	5	35	3
Repair of hernias and leaks 39 responses	2	30	7

There were several comments in this response to the question of timing of surgery. In particular these highlighted the issue of whether the timing of surgery was determined by clinical need or surgical schedules; the role of theatre availability or other surgical emergencies in delaying these procedures.

If all catheters are inserted surgically would you be interested in training in percutaneous catheter insertion?

23 centres indicated some interest in a PD catheter insertion training program and indicated that this would be appropriate for staff of all disciplines – surgeons, physicians both consultant and training grade, associate specialists and in some centres nursing staff. At least 2 centres indicated that they already had such a training program in place.

The individual completing the form.

The respondent to the survey was equally likely to be a nurse as a physician. Occasionally the form was completed by both PD nurse and physician. This Question was not answered in 3 cases.

Individual completing the form.			
Consultant PD lead	PD nurse lead	Clinical director	Associate specialist
17	18	4	1

Appendix 2. Suggested knowledge and skills framework for the insertion of peritoneal dialysis catheters

The trainee will be competent at carrying out the medical insertion technique for peritoneal dialysis catheters		
Knowledge	Skills	Attitudes and behaviour
To describe the relevant anatomy and the most appropriate location for catheter insertion.	To discuss indications, benefits and adverse events of the procedure to patients, relatives and carers in a manner that will allow informed consent.	To appropriately manage a catheter post-insertion and to ensure education of the patient and carers.
To describe patient selection and preparation for PD catheter insertion defining indications and contraindications. To understand the principles of patient preparation and issues relating to conscious sedation and anaesthesia	To perform catheter insertion.	To demonstrate appropriate self confidence and recognition of limitations.
To describe the prevention and management of catheter related complications including exit site infection, peritonitis, catheter blockage and migration.		To appreciate the importance of audit to determine the quality of procedural outcome.

Appendix 3. Direct observation of procedural skills (DOPS)

Additional section for Local anaesthetically placed peritoneal dialysis catheter

Assessor's GMC Number.....

Date (DD/MM/YY).....

SpR's GMC Number Year of StR training 1 2 3 4 5 6

	Below expected at this level	Expected at this level	Above expected at this level
1. Explanation/Consent <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9
2. Positioning of patient <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9
3. Aseptic technique <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9
4. Sedation, anaesthesia and monitoring <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9
6. Entry into peritoneum <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9
7. Seldinger and dilatation <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9
8. Creation of tunnel and exit site <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9
9. Closing and dressings <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9
10. After-care <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9
11. Documentation <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9
11. Overall competence in this technique <input type="radio"/> Not observed or applicable	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 needs more experience	<input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 Nearly there	<input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9 competent
11. Any specific comments for feedback			

Trainee's signature

Assessor's signature