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RA Guidelines - Peritoneal Access

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ACKNOWLEDGEMENTS

INTRODUCTION

The current version provides a summary of recommendations for best practice in creating peritoneal access for patients on peritoneal dialysis. A more detailed review of peritoneal access is available in the Report from the Renal Association Working Party on Peritoneal Access (final version April 2008). (www.renal.org).

These guidelines are evidence based where such evidence exists. The published literature was reviewed at www.ncbi.nlm.nih.gov/pubmed using the search term "peritoneal dialysis catheter" identifying 2320 references. Adding the term "trial" reduced this number to 216. These were individually reviewed to identify possible randomised controlled trials, meta-analyses, guidelines and reviews that were considered in the preparation of the document. The document has been reviewed by all authors and has been placed for consultation on the Renal Association website and discussed at the Clinical Guidelines Committee. It has also been reviewed by a consumer research panel run by Jane Ash (Special Projects Administrator, North and East Yorkshire and Northern Lincolnshire Comprehensive Local Research Network) and by renal patients in Sheffield UK.

The evidence for these recommendations has been assessed using the modified GRADE system. The modified GRADE system defines both the strength of the recommendations of the guideline authors and the level of evidence upon which each of the recommendations is based. This grading system classifies expert recommendations as "strong" (Grade 1) or "weak" (Grade 2) based upon the balance between the benefits and risks, burden and cost. The quality or level of evidence is designated as high (Grade A), moderate (Grade B), low (Grade C) or very low (D) depending on factors such as study design, directness of evidence and consistency of results. Grades of recommendation and quality of evidence may range from 1A to 2D.

The GRADE system has been developed by an international group of guideline developers and methodologists to maximise the usefulness of clinical practice guidelines in the management of typical patients (1-7). Most guideline organisations have recognised the need for a standard grading scheme and the GRADE system has been adopted by many leading organisations including NICE, SIGN, KDIGO, ERBP and KDOQI as well as UpToDate (8-9).

References

1. Atkins D, Best D, Briss PA et al; GRADE Working Group. Grading quality of evidence and strength of recommendations. *BMJ* 2004; 328:1490.
2. Guyatt, G, Gutterman, D, Baumann, MH et al. Grading strength of recommendations and quality of evidence in clinical guidelines: report from an American college of chest physicians task force. *Chest* 2006; 129:174-181
3. Guyatt GH, Vist GE, Falck-Ytter Y et al. An emerging consensus on grading recommendations? *ACP Journal Club*, 2006, 144:1
4. Guyatt GH, Oxman AD, Vist GE et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008; 336:924-926
5. Guyatt GH, Oxman AD, Kunz R et al. GRADE: Incorporating considerations of resources use into grading recommendations. *BMJ* 2008; 336:1170-1173
6. Guyatt GH, Oxman AD, Kunz R et al. GRADE: going from evidence to recommendations. *BMJ* 2008; 336: 1049-1051
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8. Uhlig K, MacLeod A, Craig J et al. Grading evidence and recommendations for clinical practice guidelines in nephrology. A position statement from Kidney Disease: Improving Global Outcomes (KDIGO). *Kidney Int* 2006; 70:2058-2065
9. Kidney Disease: Improving Global Outcomes. KDIGO clinical practice guidelines for the prevention, diagnosis, evaluation and treatment of Hepatitis C in chronic kidney disease. *Kidney Int* 2008; 73 (S109): S1-S99.

Grade of Recommendation	Clarity of risk/benefit	Quality of supporting evidence	Implications for clinical practice
1A Strong recommendation. High quality evidence.	Benefits clearly outweigh risk and burdens, or vice versa	Consistent evidence from well performed randomized, controlled trials or overwhelming evidence of some other form. Further research is unlikely to change our confidence in the estimate of benefit and risk.	Strong recommendations, can apply to most patients in most circumstances without reservation. Clinicians should follow a strong recommendation unless there is a clear rationale for an alternative approach.
1B Strong recommendation. Moderate quality evidence.	Benefits clearly outweigh risk and burdens, or vice versa	Evidence from randomized, controlled trials with important limitations (inconsistent results, methods flaws, indirect or imprecise), or very strong evidence of some other research design. Further research may impact on our confidence in the estimate of benefit and	Strong recommendation and applies to most patients. Clinicians should follow a strong recommendation unless a clear and compelling rationale for an alternative approach is present.

		risk.	
1C Strong recommendation. Low quality evidence.	Benefits appear to outweigh risk and burdens, or vice versa	Evidence from observational studies, unsystematic clinical experience, or from randomized, controlled trials with serious flaws. Any estimate of effect is uncertain.	Strong recommendation, and applies to most patients. Some of the evidence base supporting the recommendation is, however, of low quality.
1D Strong recommendation Very low quality evidence	Benefits appear to outweigh risk and burdens, or vice versa	Evidence limited to case studies	Strong recommendation based mainly on case studies and expert judgement
2A Weak recommendation. High quality evidence.	Benefits closely balanced with risks and burdens	Consistent evidence from well performed randomized, controlled trials or overwhelming evidence of some other form. Further research is unlikely to change our confidence in the estimate of benefit and risk.	Weak recommendation, best action may differ depending on circumstances or patients' or societal values
2B Weak recommendation. Moderate quality evidence.	Benefits closely balanced with risks and burdens, some uncertainty in the estimates of benefits, risks and burdens	Evidence from randomized, controlled trials with important limitations (inconsistent results, methods flaws, indirect or imprecise), or strong evidence of some other research design. Further research may change the estimate of benefit and risk.	Weak recommendation, alternative approaches likely to be better for some patients under some circumstances
2C Weak recommendation. Low quality evidence.	Uncertainty in the estimates of benefits, risks, and burdens; benefits may be closely balanced with risks and burdens	Evidence from observational studies, unsystematic clinical experience, or from randomized, controlled trials with serious flaws. Any estimate of effect is uncertain.	Weak recommendation; other alternatives may be reasonable
2D Weak recommendation Very low quality evidence	Uncertainty in the estimates of benefits, risks, and burdens; benefits may be closely balanced with risks and burdens	Evidence limited to case studies and expert judgement	Very weak recommendation; other alternatives may be equally reasonable.

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SUMMARY OF CLINICAL PRACTICE GUIDELINES

Clinical Practice Guideline for peritoneal access (Modified GRADE of recommendation and evidence)

1. Peritoneal Access (PD Access) (Guideline PD 1.1)

Guideline 1.1 – PD Access : Access Team

We recommend that each centre should have a dedicated team involved in the implantation and care of peritoneal

catheters (1C).

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2. Peritoneal Access (PD Access) (Guideline PD 2.1)

Guideline 2.1 – PD Access : Timing

We suggest, whenever possible, that 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 (2B).

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3. Peritoneal Access (PD Access) (Guideline PD 3.1)

Guideline 3.1 – PD Access : Implantation Protocol

We recommend that renal units should have clear protocols for peri-operative catheter care including the use of antibiotic prophylaxis (1A).

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4. Peritoneal Access (PD Access) (Guidelines PD 4.1 - 4.4)

Guideline 4.1 – PD Access : Implantation Technique

We recommend that local expertise at individual centres should govern the choice of method of Peritoneal Dialysis (PD) catheter insertion (1B).

Guideline 4.2 – PD Access : Implantation Technique

We recommend that each PD unit should have the ability to manipulate or re-implant PD catheters when necessary (1B).

Guideline 4.3 – PD Access : Implantation Technique

We recommend that urgent removal of PD catheters should be available where necessary (1A)

Guideline 4.4 – PD Access : Implantation Technique

We recommend that timely surgical support should be available for the review of PD patients (1A).

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5. Peritoneal Access (PD Access) (Guidelines PD 5.1 - 5.4)

Guideline 5.1 – PD Access : Facilities

We recommend that a dedicated area should be used for catheter insertion with appropriate staffing, suction, oxygen and patient monitoring facilities (1A).

Guideline 5.2 – PD Access : Facilities

We suggest that no particular catheter type is proven to be better than another (2C).

Guideline 5.3 – PD Access : Facilities

We suggest that a catheter of a suitable size should be used (2C).

Guideline 5.4 – PD Access : Facilities

We suggest that PD catheters should be inserted as day case procedures as long as this does not compromise the quality of care. (2C).

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6. Peritoneal Access (PD Access) (Guidelines PD 6.1 - 6.2)

Guideline 6.1 – PD Access : Training

We recommend that PD catheter insertion training should be available to all trainees with an interest (1C).

Guideline 6.2 – PD Access : Training

We recommend that PD catheter insertion should not be delegated to inexperienced unsupervised operators (1A).

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7. Peritoneal Access (PD Access) (Guideline PD 7.1)**Guideline 7.1 – PD Access : Audit**

We recommend that there should be regular audit at not less than 12 monthly intervals of the outcome of catheter insertion as part of multi-disciplinary meetings of the PD team and the access operators (1B).

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SUMMARY OF AUDIT MEASURES

1. Catheter patency - more than 80% of catheters should be patent at 1 year (censoring for death and elective modality change).
2. Complications following PD catheter insertion -
 - 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%.

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FULL CLINICAL PRACTICE GUIDELINES**1. Peritoneal Access (PD Access) (Guideline PD 1.1)****Guideline 1.1 – PD Access : The Access Team**

We recommend that each centre should have a dedicated team involved in the implantation and care of peritoneal catheters.

Rationale

The access team should comprise nurses, nephrologists and surgeons who have experience in peritoneal dialysis. Each member of the team should understand the importance to the patient of successful access placement and the need for attention to detail in the reduction of complications¹.

Reference

1. Flanigan M, Gokal R. Peritoneal catheters and exit-site practices toward optimum peritoneal access: a review of current developments. *Perit Dial Int.* 2005 Mar-Apr; 25(2):132-9.

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2. Peritoneal Access (PD Access) (Guideline PD 2.1)**Guideline 2.1 – PD Access : Timing and co-ordination of referral and surgery**

We suggest, whenever possible, that 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.

Rationale

There are two main patient groups requiring PD access.

(1) Patients with progressive renal failure predicted to need dialysis; for these patients 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 or some clinical doubt regarding the viability of peritoneal dialysis in a given patient beyond a few months.

(2) Patients with stage 5 CKD presenting as uraemic emergencies (late referrals – 23% new patients in the UK¹); for these patients 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 catheters².

It seems appropriate to adopt the European Best Practice 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”³.

References

1. New adult patients starting renal replacement therapy in the UK in 2004. UK Renal Registry Report 2005. Chapter 3.
2. Povlsen JV, Ivarsen P. How to start the late referred ESRD patient urgently on chronic APD. *Nephrol Dial Transplant*. 2006 Jul;21 Suppl 2:ii56-9.
3. Dombros N, Dratwa M, Feriani M, Gokal R, Heimbürger O, Krediet R, et al. European best practice guidelines for peritoneal dialysis. 3 Peritoneal access. *Nephrol Dial Transplant*. 2005 Dec; 20 Suppl 9:ix8-ix12

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3. Peritoneal Access (PD Access) (Guideline PD 3.1)

Guideline 3.1 – PD Access : Implantation Protocol

We recommend that renal units should have clear protocols for peri-operative catheter care including the use of antibiotic prophylaxis.

Rationale

The following points should be included in the peri-operative catheter care protocol-

- Pre-operatively – checking for hernias, screening for MRSA and nasal carriage of *Staphylococcus aureus*, identifying a catheter of a suitable length and marking the exit site with the patient sitting or standing.
- Pre-implantation – bowel preparation with laxatives, ensuring bladder emptying, administration of prophylactic antibiotics, surgical site preparation according to NICE guidance¹,
- Post-procedure – catheter flushed and capped off using suitable dialysate; exit site covered with a suitable non-occlusive dressing and if possible not disturbed for 5 – 10 days; immobilisation of the catheter; patient to be discharged home with supply of aperients with advice on recognition of potential complications. Once the catheter is placed, and until healing is completed, the dressing changes should be done by a dialysis nurse using sterile technique.

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 vancomycin². The Cochrane collaboration found 4 trials of iv antibiotics and found the evidence to be strong in preventing catheter insertion associated early peritonitis, but not tunnel or exit site infection³. This evidence is also reviewed in the ISPD peritonitis guidelines⁴. 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.

References

1. Leaper D, Burman-Roy S, Palanca A, Cullen K, Worster D, Gautam-Aitken E, et al. Prevention and treatment of surgical site infection: summary of NICE guidance. *Bmj*. 2008; 337:a1924.
2. Gadallah MF, Ramdeen G, Mignone J, Patel D, Mitchell L, Tatro S. Role of preoperative antibiotic prophylaxis in preventing postoperative peritonitis in newly placed peritoneal dialysis catheters. *Am J Kidney Dis*. 2000 Nov;36(5):1014-9.
3. Strippoli GF, Tong A, Johnson D, Schena FP, Craig JC. Antimicrobial agents to prevent peritonitis in peritoneal dialysis: a systematic review of randomized controlled trials. *Am J Kidney Dis*. 2004 Oct;44(4):591-603.
4. Piraino B, Bailie GR, Bernardini J, Boeschoten E, Gupta A, Holmes C, et al. Peritoneal dialysis-related infections recommendations: 2005 update. *Perit Dial Int*. 2005 Mar-Apr;25(2):107-31.

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4. Peritoneal Access (PD Access) (Guidelines PD 4.1 - 4.4)

Guideline 4.1 – PD Access : The Implantation Technique

We recommend that local expertise at individual centres should govern the choice of method of Peritoneal Dialysis (PD) catheter insertion.

Guideline 4.2 – PD Access : The Implantation Technique

We recommend that each PD unit should have the ability to manipulate or re-implant PD catheters when necessary.

Guideline 4.3 – PD Access : The Implantation Technique

We recommend that urgent removal of PD catheters should be available where necessary.

Rationale

Catheter removal is indicated either acutely in the case of PD peritonitis, or as a planned procedure for example following renal transplantation or switch to haemodialysis. For the planned procedure this can be performed as a day case. Under certain circumstances simultaneous removal and replacement has been described for certain indications eg localised exit site infection or during remission following relapsing peritonitis¹. This should not be done for tunnel infection or active peritonitis.

References

1. Mitra A, Teitelbaum I. Is it safe to simultaneously remove and replace peritoneal dialysis catheters? Review of the literature and suggested guidelines. *Adv Perit Dial* 2003;19:255-9.

Guideline 4.4 – PD Access : The Implantation Technique

We recommend that timely surgical support should be available for the review of PD patients.

Rationale

There is no RCT evidence to support one method of insertion over another – however, the method needs be determined by patient characteristics. For more complicated patients, including those with previous significant abdominal surgery, a technique that involves direct vision is necessary such as laparoscopic or open insertion¹.

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 Renal Registry indicates that the incident renal replacement population was 113 per million of the population in 2004, with 20% starting on PD². About 2/3rds 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.

References

1. Crabtree JH. Fluoroscopic placement of peritoneal dialysis catheters: a harvest of the low hanging fruits. *Perit Dial Int.* 2008 Mar-Apr; 28(2):134-7.
2. New adult patients starting renal replacement therapy in the UK in 2004. UK Renal Registry Report 2005.Chapter 3.

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5. Peritoneal Access (PD Access) (Guidelines PD 5.1 - 5.4)

Guideline 5.1 – PD Access : The Facilities for PD Catheter Insertion

We recommend that a dedicated area should be used for catheter insertion with appropriate staffing, suction, oxygen and patient monitoring facilities.

Rationale

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 required¹. Conscious sedation needs to be managed according to local clinical governance procedures.

Reference

1. Zappacosta AR, Perras ST, Closkey GM. Seldinger technique for Tenckhoff catheter placement. *ASAIO Trans.* 1991 Jan-Mar; 37(1):13-5.

Guideline 5.2 – PD Access : The Facilities for PD Catheter Insertion

We suggest that no particular catheter type is proven to be better than another.

Rationale

The Cochrane review did not find any advantage for straight versus coiled catheters, single or double cuff, median or lateral incision¹. However, an RCT reported improved primary catheter function² and improved PD technique survival for straight versus coiled catheters³. A further RCT reported that coiled catheters may have higher migration rates than straight catheters⁴. These data relate to relatively small studies and we would not advocate at this stage that centres with good outcomes change their choice of catheters type until more information is available. Although subcutaneous burying of the catheter until use (Moncrief method) was not associated with a reduction in infectious complications⁵, its use may have advantages for the relationship between the timing of catheter insertion and the start of training.

References

1. Strippoli GF, Tong A, Johnson D, Schena FP, Craig JC. Catheter type, placement and insertion techniques for preventing peritonitis in peritoneal dialysis patients. *Cochrane Database Syst Rev.* 2004(4):CD004680.
2. Stegmayr BG, Wikdahl AM, Bergstrom M, Nilsson C, Engman U, Arnerlov C, et al. A randomized clinical trial comparing the function of straight and coiled Tenckhoff catheters for peritoneal dialysis. *Perit Dial Int.* 2005 Jan-Feb;25(1):85-8.
3. Johnson DW, Wong J, Wiggins KJ, Kirwan R, Griffin A, Preston J, et al. A randomized controlled trial of coiled versus straight swan-neck Tenckhoff catheters in peritoneal dialysis patients. *Am J Kidney Dis.* 2006 Nov;48(5):812-21.
4. Lo WK, Lui SL, Li FK, Choy BY, Lam MF, Tse KC, et al. A prospective randomized study on three different peritoneal dialysis catheters. *Perit Dial Int.* 2003;23 Suppl 2:S127-31.
5. Danielsson A, Blohme L, Tranaeus A, Hylander B. A prospective randomized study of the effect of a subcutaneously "buried" peritoneal dialysis catheter technique versus standard technique on the incidence of peritonitis and exit-site infection. *Perit Dial Int.* 2002 Mar-Apr;22(2):211-9.

Guideline 5.3 – PD Access : The Facilities for PD Catheter Insertion

We suggest that a catheter of a suitable length should be used.

Rationale

It is good practice to make an assessment of the required length of peritoneal catheter since a catheter of inappropriate length can lead to pain or impaired function^{1,2}. We draw attention to the publications by John Crabtree describing a method to determine the appropriate length for the PD catheter².

References

1. Crabtree JH, Burchette RJ, Siddiqi NA. Optimal peritoneal dialysis catheter type and exit site location: an anthropometric analysis. *ASAIO J.* 2005 Nov-Dec;51(6):743-7.
2. Crabtree JH. Selected best demonstrated practices in peritoneal dialysis access. *Kidney Int Suppl.* 2006 Nov(103):S27-37.

Guideline 5.4 – PD Access : The Facilities for PD Catheter Insertion

We suggest that PD catheters should be inserted as day case procedures in selected cases as long as this does not compromise the quality of care.

Rationale

The use of day case facilities has considerable advantages for the patient and resource utilisation¹. However, local practices vary with respect to patient preparation and post insertion care and these should take priority over the length of in patient stay².

References

1. Kelly J, McNamara K, May S. Peritoneoscopic peritoneal dialysis catheter insertion. *Nephrology (Carlton)*. 2003 Dec;8(6):315-7.
2. Henderson S, Brown E, Levy J. Safety and efficacy of percutaneous insertion of peritoneal dialysis catheters under sedation and local anaesthetic. *Nephrol Dial Transplant* published online ahead of print 25 June 2009 (doi:10.1093/ndt/gfp312).

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6. Peritoneal Access (PD Access) (Guidelines PD 6.1 - 6.2)

Guideline 6.1 – PD Access : Training for PD Catheter Insertion

We recommend that PD catheter insertion training should be available to all trainees with an interest.

Rationale

The Renal Association Training Committee should advise the inclusion of PD catheter insertion as an optional component of the curriculum for trainees, although this will not be taken up by all trainees¹. A procedure-based competency for PD catheter insertion should be included in the JRCPTB Renal Medicine Specialty Training Curriculum.

Reference

1. Berns JS, O'Neill WC. Performance of procedures by nephrologists and nephrology fellows at U.S. nephrology training programs. *Clin J Am Soc Nephrol*. 2008 Jul; 3(4):941-7.

Guideline 6.2 – PD Access : Training for PD Catheter Insertion

We recommend that PD catheter insertion should not be delegated to inexperienced unsupervised operators.

Rationale

Successful peritoneal access is crucial and should be performed by an operator (surgeon, specialist nurse or physician) with training and expertise in creating peritoneal access¹.

Reference

1. Flanigan M, Gokal R. Peritoneal catheters and exit-site practices toward optimum peritoneal access: a review of current developments. *Perit Dial Int*. 2005 Mar-Apr; 25(2):132-9.

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7. Peritoneal Access (PD Access) (Guideline PD 7.1)

Guideline 7.1 – PD Access : Audit for PD Catheter Insertion

We recommend that 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.

Rationale

There is RCT evidence to demonstrate that audit can improve practice¹. 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)². The following are 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 –

- 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.

References

1. Jamtvedt G, Young JM, Kristoffersen DT, O'Brien MA, Oxman AD. Audit and feedback: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2006(2):CD000259.
2. Flanigan M, Gokal R. Peritoneal catheters and exit-site practices toward optimum peritoneal access: a review of current developments. *Perit Dial Int.* 2005 Mar-Apr;25(2):132-9.

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DECLARATION OF COMPETING INTERESTS

Ana Figueiredo has received speakers' honoraria from Baxter and travel sponsorship from Baxter and Fresenius.

Dr Bak-Leong Goh has received speakers' honoraria from Baxter.

Sarah Jenkins has received speakers' honoraria and a travel grant from Baxter.

David Johnson has received speakers' honoraria from Baxter and Fresenius and has participated in clinical trials with Baxter, Fresenius and Gambro. He has been a consultant to Baxter and Gambro and received travel sponsorships from Baxter and Fresenius. He is also the recipient of a Baxter Extramural Research Grant.

Robert Mactier has received travel sponsorship from Amgen, Leo and Roche and has participated in multicentre clinical trials sponsored by Amgen, Baxter and Roche. He has participated in Advisory Board meetings for Amgen and Baxter.

Dirk Struijk has received lecturing honoraria from Baxter and has participated in clinical trials with Baxter.

Martin Wilkie has received speakers' honoraria from Gambro, Baxter and Fresenius and has participated in clinical trials with Baxter and Fresenius.

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