

# Constipation in patients on peritoneal dialysis: a literature review

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## Abstract

**Aim** Constipation is a common medical condition that can lead to a loss of quality of life and increase health care costs. The incidence of constipation rises with increasing age in both sexes. In patients with chronic kidney disease (CKD) on peritoneal dialysis (PD), constipation is associated with peritoneal catheter malfunction and peritonitis, which can result in dialysis modality failure. For patients on PD, constipation needs to be dealt with in a proactive, preventative manner rather than when it becomes a problem.

**Method** A search of electronic nursing, medical and allied health databases including Medline, Ovid, CINAHL, PubMed, Proquest, Wiley, Scopus, Cochrane Library and Evidence-Based Resources (Joanna Briggs Institute) was performed. Keywords used were constipation, peritoneal dialysis, dialysis, chronic kidney disease.

**Results** Five research articles were found that were specific to patients on PD. A meta-analysis is included on the use of laxatives for chronic constipation as laxatives are widely used in PD patients. From the literature it is evident that constipation is a subjective term and, while laxative use is common, it is used as perceived by the patient and their requirements. There are compounding factors that contribute to constipation in the dialysis population such as diet and fluid restriction, use of medications such as phosphate binders and resins for controlling hyperkalaemia.

**Conclusion** Although constipation can have serious consequences for PD patients, there has been little research on best management. Information on chronic constipation management in the general population is helpful, but more research is required, particularly in the PD patient group.

## Keywords

Constipation, peritoneal dialysis, dialysis, chronic kidney disease.

## Introduction

Peritoneal dialysis (PD) is an accepted treatment modality for patients with chronic kidney disease (CKD), offering patients an effective treatment that can be carried out at home. In Australia there are over 2,200 patients on PD,

which makes up 21% of the total dialysis population (McDonald *et al.*, 2009). The prevalence of PD as a treatment modality differs substantially worldwide. According to the Australian and New Zealand Dialysis and Transplant Registry 2010 (ANZDATA) report, the proportion of patients receiving PD has decreased in both Australia and New Zealand. This is in line with other developed countries

such as the US, Canada and some European countries, where the use of PD has actually declined in the past 10 years. Interestingly over 65% of patients receiving PD live in developing countries (Lameire & Van Biesen 2010).

Constipation is a general symptom that can have both functional and organic causes and can occur in chronic illnesses such as depression and diabetes (McCallum *et al.*, 2009). Constipation is described as difficult or infrequent bowel movements, straining during defecation, passing hard stools and difficult stool evacuation (Huether, 2006; Saad *et al.*, 2010). The term constipation is difficult to define because it is a subjective experience and can have different meaning among individuals (Longstreth *et al.*, 2006). There is great variability in studies on the prevalence of constipation, primarily due to the differing criteria used to define constipation and that most studies rely on self-reporting of constipation by patients (Garrigues *et al.*, 2004; McCallum *et al.*, 2009). In the general population constipation is a common medical condition that can lead to a loss of quality of life and increase health care costs (Selby & Corte, 2010). There are various factors that contribute to constipation including a low-fibre

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diet, poor fluid intake, sedentary lifestyle, lack of exercise and various medications especially calcium and iron supplements (Digestive Health Foundation, 2007; Huether, 2006). The incidence of constipation rises with increasing age in both males and females (Digestive Health Foundation, 2007; Selby & Corte, 2010).

Early reports have referred to constipation as a major problem for patients with CKD both on PD and haemodialysis (HD) due to diet and fluid restrictions and the need for certain medications, in particular, phosphate binders (Adams, 1982; Chambers, 1983; Stone, 1977; Yasuda *et al.*, 1995). Constipation in itself is not a life-threatening condition; however, besides being uncomfortable for the patient, it can have devastating effects for some people on PD (Yasuda *et al.*, 1995). Constipation is associated with peritoneal catheter malfunction or catheter migration, usually characterised by poor dialysate outflow or failure to drain the peritoneal cavity (Gokal *et al.*, 1998). Peritonitis may also be related to constipation, which may lead to dialysis modality failure (Gokal *et al.*, 1998; Li *et al.*, 2010; Singharetnam & Holley, 1996). Colon perforation, a rare complication, has been reported as a result of chronic constipation in continuous ambulatory peritoneal dialysis (CAPD) (Tzanetou *et al.*, 2004).

In Australia, patients on PD tend to be in the older age group as shown by the ANZDATA registry, where 46% of

patients on PD are in the over 65 years age group and 41% of new PD patients are over 65 years. This is compounded by the fact that 45% of new PD patient have diabetic nephropathy as their primary renal disease (McDonald *et al.*, 2009); therefore making these patients already at increased risk of constipation.

Management of constipation in adults in the general population usually involves increasing dietary fibre and fluid intake, avoiding use of constipating medications and increasing physical activity (Digestive Health Foundation, 2007). However, for PD patients, constipation management options are usually restricted in some form, because of diet and fluid restrictions and the use of certain medications such as phosphate binders, which cannot be avoided.

Constipation in patients receiving PD, despite the potentially serious consequences, is poorly reported and tends to get overlooked in both national and international best practice guidelines (Caring for Australians with Renal Impairment [CARI] 2004; Piraino *et al.*, 2005). Currently there are no clear guidelines on the prevention and treatment of constipation in this group. Constipation in PD patients needs to be dealt with in a proactive, preventative manner rather than when it becomes a problem. The purpose of this paper is to review current research literature concerning constipation in patients receiving PD as a basis for management recommendations.

### Search strategies

A comprehensive search of electronic nursing, medical and allied health databases including Medline, Ovid, CINAHL, PubMed, Proquest, Wiley, Scopus, Cochrane Library and Evidence-Based Resources (Joanna Briggs Institute) was performed. Keywords used were constipation, peritoneal dialysis, dialysis and chronic kidney disease. The search dates were not restricted. The advanced search in PubMed included MeSH of major topic and terms constipation, peritoneal dialysis and chronic kidney disease.

### Search results

The main focus for this review was research papers with a specific focus on constipation in PD patients; however, the literature search yielded little information on constipation specifically in this patient group. Five research articles were found from the United Kingdom (UK), Taiwan, Denmark, Greece and Japan on constipation in both PD and HD patients and were included in this review. An Australian meta-analysis on the use of laxatives for chronic constipation was also included as it was felt to be relevant as laxatives are widely used in this group of patients. Table 1 summarises each of the articles. Papers where the focus was not specifically on constipation, such as Strid *et al.* (2002), who investigated the prevalence of gastrointestinal symptoms in patients with chronic renal failure were not included. The themes throughout the literature were that constipation is a

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subjective term and, while laxative use is common, it is used as perceived by the patient and their requirements. There are compounding factors that contribute to constipation in the dialysis population such as diet and fluid restriction, use of medications such as phosphate binders and resins for controlling hyperkalaemia.

### Findings

To prevent constipation, a diet which is high in fibre is generally recommended. Fibre stimulates bowel activity, increases stool bulk and decreases intestinal transit time (Sutton *et al.*, 2007; Yasuda *et al.*, 2002). For patients on PD, dietary restrictions, especially high-fibre foods, which are generally high in potassium and phosphate are restricted (Sutton *et al.*, 2007). In a UK study, Sutton *et al.* (2007) found that increased dietary fibre was as effective as laxatives and was the preferred choice for patients on PD. The authors suggested that patients on PD may not necessarily need greatly restricted fibre diets and this was supported by Yasuda *et al.* (2002) who found that patients on CAPD ate more potassium-containing foods such as fresh vegetables and foods higher in fibre than patients on HD yet had lower serum potassium levels and reported fewer episodes of constipation. Yasuda *et al.* (2002) found that increased rate of constipation was aligned with increasing age in CAPD patients ( $50 \pm 13.7$  years). The patients in this study are younger compared to the Australian PD population; therefore, it could be hypothesised that constipation in the

Australian PD group may be more prevalent due to the increase in the age of patients.

A major disadvantage in research on constipation is that information is based on self-reported bowel frequency through retrospective questionnaires. Wu *et al.* (2004) objectively investigated constipation by estimating total and segmental colonic transit times in both CAPD (n=63) and HD (n=56) patients and compared to healthy volunteers (n=25). Total and segmental colonic transit time was estimated by abdominal x-ray after ingestion of one gelatin capsule containing radiopaque markers daily for six days. After ingestion, these markers are followed by serial abdominal x-rays where colorectal transit time is estimated. Participants were asked to continue their usual habits, diet and activity. The authors found that, overall, HD patients had significantly longer colonic transit time ( $p < 0.05$ ). Patients on CAPD had longer total colonic transit times than the healthy volunteers; however, the difference was not significant. Furthermore the authors found that in both the healthy volunteers and the dialysis patients there was discrepancy between total colonic transit times and self-reported constipation, highlighting the limitations on self-reported information, as previously discussed. Again in this study PD patients were younger ( $50.3 \pm 11$  years) than the Australian population of PD patients, so the findings from Wu *et al.* may not be generally applicable.

Laxatives are commonly used to treat constipation and there are a myriad of preparations readily available. Jones *et al.* (2002) conducted a meta-analysis of published studies on the efficacy of laxatives in constipation; however, only 11 studies produced usable data of patients on laxatives and placebo. Unfortunately Jones *et al.* (2002) did not define constipation and also found insufficient evidence to conclude that laxatives were superior to placebo in chronic constipation. A contributing factor was that patient perceptions of constipation or altered bowel function were not clearly defined. This was identified by the authors to be a possible explanation for the strong placebo effect as patients with less serious constipation included in the trials may have been easier to treat. A further limitation of this study is the lack of available data which reflects the current findings in relation to PD patients.

Laxatives are generally classed as bulking agents, osmotic laxatives, faecal softeners and stimulant laxative. In the Jones *et al.* (2002) study, the authors were unable to quantitatively assess the tolerability of laxatives; however, side effects such as abdominal distension from bran, bloating, gas production and increased fluid requirements for bulk laxatives, urgency, cramps and flatulence from senna fibre combinations were alleged. The use of laxatives and their effectiveness in PD patients varies according to usage, which is a result of the individuals'

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perceived requirements. This perceived requirement and the patient's perception of constipation can, in itself, result in constipation requiring medical intervention in the form of hospital visits, x-rays or hospital admission (Sutton *et al.*, 2007).

There is a lack of available literature on the use of laxatives in PD patients.

In a small study, Mimidis *et al.* (2005) examined the efficacy of polyethylene glycol (PEG), an osmotic laxative in 24 CAPD patients. All patients had previously tried other products and a high-fibre diet, with only partial response. Clinical efficacy and tolerability were assessed via a patient diary, where stool number and consistency, painful

defecation, rectal irritation, flatus and blood in stools were reported. Only 21 patients completed the protocol and all patients reported rapid improvement in bowel habits with PEG. As with previous studies, this study is limited by its small sample size. Patient reporting was by use of a daily diary and patients were asked to rate the number and consistency of stool in a 1–5 scale.

Although over 20 years old, Dessau *et al.* (1989) conducted a prospective, randomised, crossover trial in Denmark, on the influence of psyllium seed husk on azotaemia, electrolytes and bowel regulation in patients on CAPD. The authors found that psyllium husk could be used as a laxative in some CAPD patients; however, psyllium husk substituted laxatives for only three patients, whilst other patients needed psyllium husk and lower doses of another laxative. This study, as others, is limited by its very small sample size.

### Discussion

For patients on PD, constipation can have major repercussions by interfering with ongoing dialysis treatment through dialysate flow problems, its relationship to peritonitis and, in rare instances, colon perforation due to chronic constipation (Gokal *et al.*, 1998; Li *et al.*, 2010; Singharetnam & Holley, 1996; Tzanetou *et al.*, 2004). As identified by the literature, one major problem with diagnosing constipation is the reliance on self-reporting. The Rome

## Bristol Stool Chart

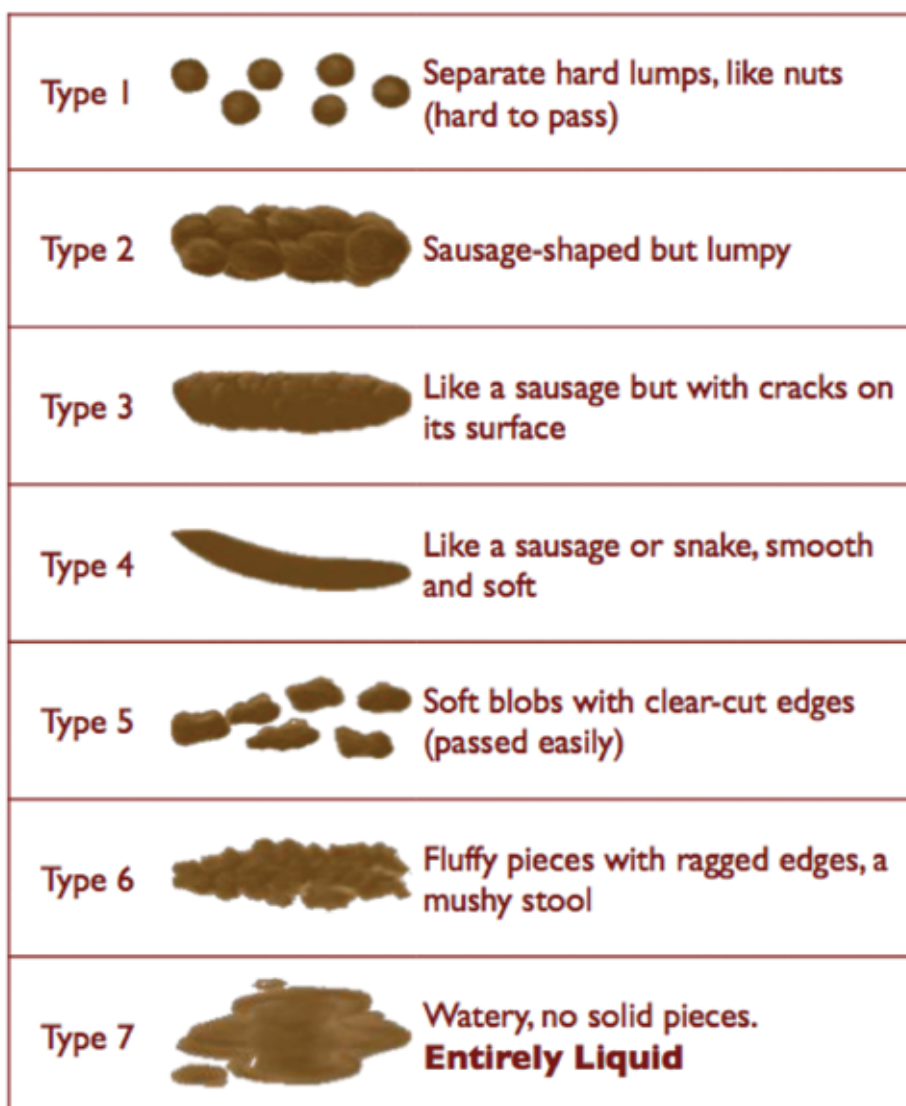


Figure 1. Bristol Stool Chart. [http://upload.wikimedia.org/wikipedia/commons/b/b4/Bristol\\_Stool\\_Chart.png](http://upload.wikimedia.org/wikipedia/commons/b/b4/Bristol_Stool_Chart.png)

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Table 1.

Summary table					
Authors	Design	Sample	Method	Major findings	
Sutton D (2007).	Interventional study.	PD for at least 3 months (n=126).	Intervention 1: high-fibre supplement (n=23). Intervention 2: high-fibre diet (n=17).	High-fibre supplement gave best result in terms of stool form and side effects such as bloating, flatulence and predictability.  PEG laxative is effective in increasing bowel frequency and improving stool consistency and ease of passage. PEG is safe and effective in CAPD patients in the short term. Increasing fibre in diet often inadequate.	
Mimidis K (2005).	Interventional study.	*24 out-patients on CAPD pts (n=24) 9 male, 15 female, mean age 70.14 years.	Intervention was polyethylene glycol (PEG) laxative orally daily.	HD patients had significantly longer colonic transit time $p<0.05$ , times correlated positively with age $p<0.01$ and interdialytic weight gain $p<0.01$ . Female sex was associated with longer total colonic transit time $p<0.05$ . CAPD patients had longer colonic transit times than control group; no significant difference. Age and female sex correlated well with total colonic and transit times in the CAPD group. Constipation frequency based on self-reported defecation frequency and use of laxatives. Age correlated to longer colonic transit times	
Wu M (2004).	Prospective study. Patients selectively randomised based on dialysis modality HD/ CAPD/control group.	Adult uraemic patients attending centre during previous six months: *HD (n=56); 29 male, 27 female; mean age 53.1±10.6 years (range 24–75 years). *CAPD (n=63); 30 male, 33 female; mean age 50.3±11.0 years (range 21–73 years). *control group healthy volunteers (n=25); 13 male, 12 female; mean age 51. ±12.1 years. Statistical analysis: *t-test, post hoc analysis, logistic regression method used for statistical significance (p<0.05).		HD patients of all ages had higher frequency of constipation. Increased rate of constipation in line with age, especially in CAPD patients. Clinical risk factors suggested to influence constipation: *medication *lifestyle *fluid restriction especially in HD patients *dietary fibre restriction.  *Chronic constipation difficult to define because of subjectivity.	
Yasuda G (2002).	Multicentre comparative study.		*CAPD (n=204) 128 male and 76 females; mean age 50±13.7 years. *HD (n=268) 165 males and 103 females; mean age 55.8±10.1 years. *CKD (n=105) 70 males and 35 females; mean age 59.1±11.9. *Normal renal function (n=325); 170 males and 155 females; mean age 57.7 ±12.1 years.		
Jones M (2002).	Meta-analysis.		n=375 16 cohorts of laxative therapy; mean age 68 years; sex ratio 79% female.  7 cohorts of placebo therapy; mean age 64 years; sex ratio 67% female.	*Large, well-controlled published studies with comparative data lacking. *Insufficient comparable quantitative evidence to conclude laxatives are superior to placebo in chronic constipation. *There needs to be a formalised definition of constipation. *Trial need to distinguish between patients whose bowel habits are actually altered from those who have a perception of altered bowel function.	
Dessau R (1989).	Prospective, randomised, crossover study.		Patients on CAPD (n=36); median age 54, range 19–74 years.	Psyllium husk can be used as a laxative in some CAPD patients.	

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criteria, a useful instrument for defining constipation, has been used as a research and clinical tool and can be useful in defining and identifying constipation (Garrigues *et al.*, 2004; Pappas *et al.*, 2008; Rome Foundation, 2010; Selby & Corte, 2010), yet it was not referred to in the literature concerned with PD patients. More recent literature has identified the discrepancy between self-reported constipation and the actual condition, based on Rome criteria. The findings indicating that the rate of constipation is considerably higher when based on self-reported definitions, probably due to personal perception rather than the actual problem (Garrigues *et al.*, 2004; Pappas *et al.*, 2008). The limitations of self-reporting were identified by Jones *et al.* (2002) and Wu *et al.* (2004) in their studies and certainly needs to be taken into consideration in future research.

Another limitation in the current research is the use of questionnaires that depend on the patients' ability to recall symptoms (Pappas *et al.*, 2008). In the study by Yasuda *et al.* (2002) a 12-month retrospective questionnaire was administered; however, the reliability of the data is questionable as it relies on the patients' ability to recollect information on their bowel habit for the previous 12 months.

Sutton *et al.* (2007) and Mimidis *et al.* (2005) used prospective studies and administered diaries that patients recorded in daily. This gives more credit to the information as it does not rely on

patient recall; however, it does rely on the accurate record-keeping by the patient.

The Bristol Stool Form Scale (BSFS) (Figure 1) is another tool that can assist in the evaluation and diagnosis of constipation. The stool form scale was first reported by Lewis and Heaton (1997) to monitor change in intestinal function. The BSFS enables patients to identify their stool form by using seven categories to classify stool images as well as written descriptions. Stool form has been found to better correlate to intestinal transit time than stool frequency, even when altered by laxatives or constipating agents (Saad *et al.*, 2010). In the literature pertaining to PD patients, the study by Sutton *et al.* (2007) was the only one to use the BSFS, recognising its simplicity and easy use; however, there was no commentary on the results. As the BSFS is readily available, its use in any future research on constipation should be highly considered.

### Implications for nurses

Nurses need to become proactive in the management of constipation in PD patients through patient education, prevention strategies and the utilisation of currently available tools such as the Rome III criteria and the BSFS.

The importance of preventing constipation should be included in pre-dialysis education programmes promoting early patient awareness. Prior to commencing PD, the patient's bowel patterns should be clearly identified

using the Rome criteria and BSFS. What the patient perceives to be a normal bowel action for them in the pre-dialysis stage may not be sufficient to maintain dialysate flows and prevent constipation. The aim is not necessarily for increased bowel movements but for achieving a stool consistency type as per the BSFS.

Patients already on PD need to be individually assessed on a routine basis on their daily bowel pattern and have an established bowel regimen to prevent complications associated with constipation. Patients should be encouraged to refer to the BSFS to identify their stool form routinely and be proactive in their laxative use; this will avoid relying on the patients' perception of constipation and their laxative requirements as has been identified in the literature.

Patients on PD may not necessarily require dietary fibre restrictions; therefore, nurses should ensure PD patients are referred to a dietician for their individual needs.

### Conclusion

Constipation can have serious consequences for PD patients; however, there has been little research on best management in this group. Patients on PD are at increased risk of constipation because of fluid or diet restrictions, the use of unavoidable medications such as phosphate binders and their increased age.

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Information on chronic constipation management in the general population is helpful; however, research is required involving patients on PD, taking into account their specific requirements or restrictions. Current studies on constipation in PD patients are limited and provide little information on management for this particular patient group. Further research needs to be undertaken to establish best management options with regard to the study design, ensuring adequate patient numbers and the use of tools, such as the Rome criteria and the BSFS, to provide more consistent information and credible data. While laxative use in PD patients is common, more information is required on their safety and efficacy when used in patients on dialysis. Patient assessment in the pre-dialysis stage using the Rome criteria and BSFS will establish patients' current bowel habits, raise awareness of the potential risk of constipation and provide opportunity for early intervention. Raising patient awareness and encouraging daily use of the BSFS may prevent having to deal with constipation when it becomes a problem and interferes with the dialysis procedure. Avoiding the devastating complications of constipation in PD patients will require health professionals and patients themselves to have an awareness and understanding of the problem.

### References

- Adams P, Rutsky E, Rostand S & Sang H (1982). Lower Gastrointestinal Tract Dysfunction in Patients Receiving Long Term Hemodialysis. *Archives of Internal Medicine*, 142, 303–306.
- Bristol Stool Form Scale. Retrieved from [http://upload.wikimedia.org/wikipedia/commons/b/b4/Bristol\\_Stool\\_Chart.png](http://upload.wikimedia.org/wikipedia/commons/b/b4/Bristol_Stool_Chart.png)
- Caring for Australians with Renal Impairment (CARI). Peritonitis Treatment and Prophylaxis. Retrieved from <http://www.cari.org.au/guidelines.php> (accessed 25 May 2011).
- Chambers J (1983). Bowel Management in Dialysis patients. *American Journal of Nursing*, 83(7), 1051–1052.
- Dessau R, Olsen B, Frifelt J & Skotv H (1989). Influence of psyllium seed husk on azotemia, electrolytes and bowel regulation in patients on CAPD. *Peritoneal Dialysis International*, 9(4), 351.
- Digestive Health Foundation (2007). Facts about Constipation. In Gastroenterology Society of Australia (ed.). Sydney: Digestive Health Foundation.
- Garrigues V, Galves C, Ortiz V, Ponce M, Nos P & Ponce J (2004). Prevalence of Constipation: Agreement Among Several Criteria and Evaluation of the Diagnostic Accuracy of Qualifying Symptoms and Self Reported Definition in a Population based survey in Spain. *American Journal of Epidemiology*, 159(5), 520–526.
- Gokal R, Alexander S, Ash S, Tzen C, Danielson A, Holmes C, Joffe P, Moncrief J, Nichols K, Piraino B, Prowant B, Slingenyey A, Stegmayr B, Twardowski Z & Vas S (1998). Peritoneal Catheters and Exit Site Practices Toward Optimum Peritoneal Access. *Official Report from the International Society for Peritoneal Dialysis*. Retrieved from <http://www.ispd.org/media/pdf/Optimum.pdf>
- Huether S (ed.). (2006). *Alterations of Digestive Function* (5th edn). Philadelphia: Elsevier.
- Jones M, Talley N, Nuyts G & Dubois D (2002). Lack of Objective Evidence of Efficacy of Laxatives in Chronic Constipation. *Digestive Diseases and Sciences*, 47(10), 2222–2230.
- Lameire N & Van Biesen W (2010). Epidemiology of peritoneal dialysis: a story of believers and non believers. *Nature Reviews Nephrology*, 6, 75–82.
- Lewis S & Heaton W (1997). Stool Form Scale as a useful Guide to Intestinal Transit Time. *Scandinavian Journal of Gastroenterology*, 32(9), 920–924.
- Li P, Szeto C, Piraino B, Bernardini J, Figueiredo A, Gupta A *et al.* (2010). Peritoneal Dialysis Related Infections Recommendations: 2010 Update. *Peritoneal Dialysis International*, 30(4), 393–423.
- Longstreth G, Thompson W, Chey W, Houghton L, Mearin F & Spiller R (2006). Functional Bowel Disorders. *Gastroenterology*, 130, 1480–1491.
- McCallum I, Ong S & Mercer-Jones M (2009). Chronic constipation in adults. *British Medical Journal*, 338 (b831).
- McDonald S, Excell L & Dent H (2009). Australian and New Zealand Dialysis and Transplantation Registry Report. Adelaide, SA.
- Mimidis K, Mourvati E, Kaliontzidou M, Papadopoulos V, Thodis E, Kartalis G *et al.* (2005). Efficacy of Polyethylene Glycol in Constipated CAPD Patients. *Peritoneal Dialysis International*, 25(6), 601–603.
- Pappas G, Alexiou V, Mourtzoukou E, & Falagas M (2008). Epidemiology of Constipation in Europe and Oceania: a Systematic Review. *BMC Gastroenterology*. Retrieved from <http://www.biomedcentral.com/content/pdf/1471-230X-8-5.pdf>
- Piraino B, Bailie G, Bernardini J, Boeschoten E, Gupta A, Holmes C, Kuijper E, Li P, Lye W, Mujais S, Paterson D, Fontan M, Ramos A, Schaefer F & Uttley L (2005). Peritoneal Dialysis-Related Infections Recommendations: 2005 Update. *Peritoneal Dialysis International*, 25, 107–131.

## Constipation in patients on peritoneal dialysis: a literature review

- Rome Foundation (2010). Rome Criteria for Constipation Retrieved from <http://www.romecriteria.org/criteria/> (accessed 5 November 2010).
- Saad R, Rao S, Koch K, Kuo B, Parkman H, McCallum R *et al.* (2010). Do Stool Form and Frequency Correlate With Whole Gut and Colonic Transit? Results from a Multicenter Study in Constipated Individuals and Healthy Controls. *The American Journal of Gastroenterology*, 105, 403–411.
- Selby W & Corte C (2010). Managing constipation in adults. *Australian Prescriber*, 33(4).
- Singharetnam W & Holley J (1996). Acute Treatment of Constipation May Lead to Transmural Migration of Bacteria resulting in Gram Negative Polymicrobial or Fungal Peritonitis *Peritoneal Dialysis International*, 16(4), 423–425.
- Stone W (1977). Therapy of Constipation in Patients with Chronic Renal Failure. *Dialysis & Transplantation*, 6, 30–32.
- Strid H, Simren M, Johansson AC, Svedlund J, Samuelsson O & Bjorntsson E (2002). The prevalence of gastrointestinal symptoms in patients with chronic renal failure is increased and associated with impaired psychological general well-being *Nephrology Dialysis Transplantation*, 17, 1434–1439.
- Sutton D, Dumbleton S & Allaway C (2007). Can Increased Dietary Fibre Reduce Laxative Requirements in Peritoneal Dialysis *Journal Renal Care*, 33(4), 174–178.
- Tzanetou K, Triantaphyllis G, Tsoutsos D, Petropoulou D, Ganteris G, Malamou-Lada E *et al.* (2004). Stercoral Perforation of the Sigmoid Colon in a Patient Undergoing CAPD: Case Report *Peritoneal Dialysis International*, 24(4), 399–404.
- Wu M, Chang C, Cheng C, Chen C, Lee W, Hsu Y *et al.* (2004). Colonic Transit Time in Long Term Dialysis Patients *American Journal Kidney Disease*, 44(2), 322–327.
- Yasuda G, Shibata K, Takizawa, T, Ikeda Y, Tokita Y, Umemura S *et al.* (2002). Prevalence of constipation in continuous ambulatory peritoneal dialysis patients and comparison with haemodialysis patients *American Journal Kidney Disease*, 39(6).
- Yasuda G, Takeshita Y, Kimura T, Tochikubo O, Ikeda Y, Tokita Y *et al.* (1995). Constipation Occurs Less Frequently in CAPD Patients than in HD Patients *Peritoneal Dialysis International*, 15(6), 283.



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