

# Compliance, peritoneal dialysis and chronic kidney disease: lessons from the literature

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## Abstract

Poor patient compliance with peritoneal dialysis (PD) has significant adverse effects on morbidity and mortality rates in individuals with chronic kidney disease (CKD). It also adds to the resource burdens of healthcare services and providers. This paper explores the notion of PD compliance in patients with CKD with reference to the relevant published literature. The analysis of the literature reveals that 'PD compliance' is a complex and challenging construct for both patients and health professionals. There is no universal definition of compliance that is widely adopted in practice and research, and therefore a lack of consensus on how to determine 'compliant' patient outcomes. There are also multiple and interconnected determinants of PD compliance that are context-bound, which healthcare professionals must be aware of, and which makes producing consensus of measuring PD compliance difficult. The complexity of the interventions required to produce even a modest improvement in PD compliance, which are described in this paper, are significant. Compliance with PD and other treatments for CKD is a multidimensional, context-bound concept, that to date has tended to efface the role and needs of the renal patient. We conclude the paper with the implications for contemporary practice.

## Introduction

Peritoneal dialysis (PD) is a home-based treatment for chronic kidney disease (CKD), which comprises a complex technical and lifestyle prescription. Health professionals often argue that successful dialysis outcomes hinge upon the renal patient following that prescription. They also note that the personal consequences of unsuccessful outcomes for the PD client, which include sepsis, cardiovascular morbidity, transfer to haemodialysis and death, also have implications for renal care providers and health insurers in terms of increased costs of care (Kutner, Zhang, McClellan, & Cole, 2002; Raj, 2002; Simpson et al.,

2006). Yet PD is an intricate regimen with multiple aspects – compliance in this context does not relate to the dialysis procedure alone. Patients are asked to adhere to instructions regarding numerous adjuvant medications such as antihypertensives, phosphate binders, vitamins, iron replacement and subcutaneously-administered erythropoietin and antiglycaemics. They must also adhere to the recommended aseptic technique, PD prescription and timing, blood glucose and blood pressure monitoring, diet, exercise, and attend follow-up appointments.

There is good reason to believe that patient compliance with many aspects

## Key Words

Compliance, adherence, peritoneal dialysis, chronic kidney disease

of this complicated regimen is poor, and can significantly undermine treatment benefits (Kutner, 2001; McDonald, Garg, & Haynes, 2002; Raj, 2002). This is reflected in the considerable time and energy that clinicians have expended in the last four decades in developing interventions to enhance the capacity of patients to comply with PD and the other regimens inseparable from it. In this paper, we review the literature to examine the concept of compliance in the context of CKD. The review, which first examines compliance theoretically and then moves to the phenomenon of PD compliance in practice, is organised into five key themes. These are defining compliance, measuring compliance, the factors influencing compliance, improving compliance, and the implications for nephrology nursing practice and research.

## Methods and Search Strategy

This review examined literature published in English between 1979 and 2009. Search parameters comprised the combination of the following terms: 'compliance', 'non-compliance', 'adherence', 'concordance', 'peritoneal dialysis', 'chronic kidney disease', 'home dialysis', 'end-stage kidney disease';

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'end-stage renal disease'; 'end-stage renal failure' and 'medication' and 'chronic illness'. The search focused initially on articles published in peer-reviewed journals that were relevant to patient compliance in PD. However, sentinel articles that examined the phenomenon of compliance with medical treatment more broadly were also included where relevant. These provided a valuable theoretical lens with which to examine the phenomenon. Databases searched included the Cumulative Index of Nursing and Allied Health Literature (CINAHL), Proquest, MEDLINE, OVID, PsycINFO, and Cochrane Collaboration. Meta-analyses, systematic reviews and randomised controlled trials (evidence Level I and II) were sought in the first instance. However, Level I and II evidence concerning compliance with specific dialysis procedures was limited, and because PD involves not just compliance with the dialysis technique but also with its many adjuvant regimens, the search necessarily extended to qualitative and quantitative compliance studies and literature reviews undertaken in these areas. A manual search of references in the identified articles was also conducted. In total 41 of the articles identified during the search were included in this review. These were assessed by the authors as meeting the inclusion criteria and of direct relevance to the review PD compliance in patients with CKD (see Table 1).

### Findings

#### Defining compliance

The notion of compliance is one of the most researched, yet least understood phenomena in the body of health knowledge, mostly because of its elusive nature (Denhaerynck, Manhaeve, Nolte, & de Geest, 2007; Evangelista, 1999; Kyngas, Duffy, & Kroll, 1999; Murphy & Canales, 2001). Several authors report that up to fifty percent of papers

describing compliance interventions fail to articulate a definition of compliance on which their study is based (Murphy & Canales, 2001; Vermeire, Hearnshaw, Van Royen, & Denekens, 2001). Adding to this problem is that the terms 'compliance' and 'non-compliance' are frequently used interchangeably, despite being quite different constructs (Kyngas et al., 1999; MacLaughlin et al., 2005; Murphy & Canales, 2001). Broadly speaking, non-compliance is the choice or ability *not to* do something, compliance is the choice or ability to *do* it. Many authors suggest that non-compliance is often used as a synonym for compliance (for example, see Leggat, 2005; Leggat et al., 1998; Raj, 2002). Defining the positive action of compliance in terms of its negative, equally elusive concept in this way is an understandable, but ultimately unhelpful strategy on which to base rigorous research. Moreover, compliance can be intentional or unintentional (Vermeire et al., 2001), but it is not often differentiated in studies as to whether intentional or unintentional compliance has been investigated.

Prior to 2000, most articulated definitions of compliance were congruent with dictionary definitions that emphasised ceding to the desires and demands of others; of conformity in deference to the social order of things (Evangelista, 1999). Given biomedicine's pervasive influence throughout all of the health professions, early and subsequent definitions of compliance are frequently centred in this worldview, conceiving it as the extent to which the patient's behaviour coincides with medical advice (for example, see Friberg & Scherman, 2005; Haynes, Taylor, & Sackett, 1979; MacLaughlin et al., 2005; McDonald et al., 2002; Rietveld & Koomen, 2002). Haynes et al's influential definition emphasised the need for patients "to yield [their emphasis] to the advice of health professionals ... whether declared

by an autocrat, authoritarian clinician or developed as a consensual regimen through negotiation between a health professional and a citizen" (Haynes et al., 1979:1-2). To this day, many definitions of compliance concentrate on the biomedical rather than the behavioural or psychosocial processes involved. They define compliance, for example, as the amount of drug taken versus the amount not taken (Rietveld & Koomen, 2002; Schaffer & Yoon, 2001); the level of renal biochemical markers such as serum phosphate and creatinine (Kutner et al., 2002); or the lowering of blood pressure (Vermeire et al., 2001).

Reflecting more recent debates about the patient's role in their health care, the term 'adherence' is now commonly used by those who object to the "negative and authoritative" (Evangelista, 1999:9) connotations of the term compliance, or to the inference that compliance is the sole responsibility of a passive patient who has no input into the decision (Evangelista, 1999; MacLaughlin et al., 2005; Schaffer & Yoon, 2001). After initial resistance, the pioneers of compliance study, Haynes and colleagues, eventually embraced the term 'adherence' in recognition of its apparently less judgemental overtones (Haynes, McDonald, & Garg, 2002; McDonald et al., 2002). Hence, their formal definition was amended to "adherence may be defined as the extent to which a patient's behaviour (in terms of taking medication, following a diet, modifying habits, or attending clinics) coincides with medical or health advice" (McDonald et al., 2002:1) Their amended definition, however, differs little from their original, except in terms of semantics; and they continue to discuss adherence synonymously with compliance. Furthermore, there is little consensus about the new term. 'Adherence' is criticised for its perpetuation of paternalism; while its supporters argue that although the patient should be given

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more responsibility in their health care actions, those actions should nonetheless still be prescribed by those in a position to know better (Friberg & Scherman, 2005).

Hence, another discipline, pharmacy, has developed a further alternative – ‘concordance’. It has been adopted by the Royal Pharmaceutical Society of Great Britain, who believe it emphasises the ultimate ethical *goal* of treatment rather than the *processes* implied in ‘compliance’. They also prefer its overtones of agreement and harmony between an empathetic professional and the patient as decision-maker (Vermeire et al., 2001). Concordance implies that the patient and the prescriber collaborate actively to create and implement a therapeutic regimen recommended, rather than prescribed by the health expert (Friberg & Scherman, 2005). It has not, however, been widely embraced among pharmacists or the other health disciplines (Loghman-Adham, 2003), for irrespective of disciplinary affiliation, ‘compliance’ remains the most commonly used term in the health literature (Carpenter, 2005).

Nephrology nurses’ views of compliance, adherence and concordance tend to reflect nursing’s general discomfort with the reductionist, moralistic implications of all of these terms and definitions (Murphy & Canales, 2001; Costantinini 2006; Russell, Daly, Hughes, & op’t Hoog, 2003). More recently, nephrology nurses have moved away from such definitions altogether, preferring the notions of self-care or self-management (Burrows-Hudson & Prowant, 2005). While these concepts are still evolving, and continue to recognise that something called ‘compliance’ may exist, such notions emphasise the patient as an active partner in their treatment, possessing the “knowledge and skills to care for themselves, making decisions about their care; identifying problems; setting goals; and monitoring

and managing symptoms” (White, 2004:388). It is argued that the notion of self-management is more useful than compliance because it is the client, after all, who self-manages the required PD regimen in their home, not the clinician (White, 2004).

The literature nonetheless demonstrates that irrespective of the notion of patient inclusiveness embedded in these alternative notions of adherence and self-management, focus must be placed on the patient-health professional relationship; and that furthermore, attention needs to be paid to the health care system issues that can compromise a patient’s adherence (Kammerer, Garry, Hartigan, Carter & Elrich, 2007; Orr et al., 2007; Sussman, 2001). As will be examined further in this paper, nurses have an important role to play in supporting patients, identifying system barriers, and implementing strategies to help patients understand the rationale and practice of adherence.

### Measuring compliance

There is currently no widely or universally-accepted standard for the measurement of compliance in any area of chronic disease, much less in PD compliance, mainly because the lack of a consensus definition makes it difficult to operationalise and then quantify compliance in a standardised way (Denhaerynck et al., 2007; Mattke et al., 2007). As a result, the heterogeneous outcome measures in the myriad studies undertaken to date are not amenable to the pooling and meta-analysis that would allow comparison of their efficacy (Bennett & Glazsiou, 2003; Connor, Rafter, & Rodgers, 2004; Higgins & Regan, 2004; Murphy & Canales, 2001; Schroeder, Fahey, & Ebrahim.S., 2004; Takiya, Peterson, & Finley, 2004). Nonetheless, in the PD context it is possible to categorise two broad areas that are often measured: 1) compliance with adjuvant medications

and 2) compliance with specific dialysis techniques.

### Compliance with adjuvant medications

Measurements of general patient medication compliance can be direct or indirect. Indirect measures are often biochemical metabolites or markers detected in a body fluid. For example serum low density lipoprotein cholesterol (Lee, Grace, & Taylor, 2006) or urine drug levels (Vermeire et al., 2001) are measured as surrogate markers of compliance. Other indirect biophysiological measures include blood pressure monitoring (Lee et al., 2006). These measures have been criticised, however, as they are not available for all of the relevant medications and cannot account for the individual pharmacokinetic variances of drugs and of the people who take them; particularly people with CKD (Vermeire et al., 2001). Nor can they account for the time of day at which the sample was drawn or measured (MacLaughlin et al., 2005) or the methods patients have developed to avoid the detection of undesirable biophysiological markers (McCarthy & Martin-McDonald, 2007; McCarthy, Cook, Fairweather & Shaban, 2009).

Direct measures of medication compliance by patients are also varied, and not many are related to the PD regimen. It is necessary in this instance to look for studies measuring compliance with medications that may be prescribed for PD patients. For example, Mattke et al measured the quantity of prescriptions filled, the time elapsed between obtaining prescriptions, and the amount of medication possessed by the patient over a prescribed length of time (Mattke et al., 2007); although this study did not include people with CKD. Similarly, the main outcome measure in assessing medication adherence in one recent prospective randomised controlled trial was a change in the

proportion of pills taken by patients compared to baseline (Lee et al., 2006). The limitation of these measures is that they may overestimate true rates of compliance, because obtaining medications and taking medications are two different things (MacLaughlin et al., 2005). Other researchers quantify apparent pill ingestion and express it as a percentage to measure compliance rates. Hence in one study, if a patient was prescribed an antibiotic to be taken as 1 tablet 4 times per day, but they took only 2 tablets per day for 5 days, the adherence rate was calculated at 36% (10/28) (McDonald et al., 2002). In a similar vein, one randomised controlled trial calculated drug compliance scores as the number of drugs that the patient was fully compliant with, divided by the total number of prescribed drugs, expressed as a percentage (Wu et al., 2007). None of these 'objective' methods for assessing medication compliance are considered completely reliable (MacLaughlin et al., 2005; Vermeire et al., 2001). They are criticised because direct questioning of patients may provide unreliable data, particularly if close-ended questions or those with judgemental overtones are used (MacLaughlin et al., 2005).

In addition, recent research reports that people with CKD and health professionals' perspectives of compliance with medications can be quite different (Orr, Orr, Willis, Holmes & Britton, 2007). In their qualitative study of consumers' and health professionals' perspectives to adherence to multiple, prescribed medications in diabetic kidney disease, Williams, Manias and Walker (2008) found that consumers were not convinced of the need, effectiveness, or safety of their medications. The authors also reported that health professionals considered medication-taking essential and believed that consumers over-rated concerns about medication-related adverse effects. Importantly, their study highlighted healthcare system issues that adversely affected relationships between

consumers with diabetic kidney disease and health professionals, which have the potential to impede adherence. Other authors (Kammerer, Garry, Hartigan, Carter & Elrich, 2007; Orr et al., 2007; Sussman, 2001) have also argued the influence of health system barriers such.

### Compliance with PD

With respect to the measurement of other aspects of the PD regimen, compliance with aseptic technique; dialysate dose, timing and frequency; catheter exit site care; and diet and fluid restrictions are all considered important indicators. Again a variety of direct and indirect measures have been used to assess these. These include patient self reports, observational checklists, observer subjective reports, attendance rates at clinics, hospitalisation rates, quality of life surveys, interdialytic weight gains; and shortening or skipping of dialysis sessions. These have all been utilised with varying degrees of success (Chow et al., 2007; Vlamincq et al., 2001; White, 2004). Similarly, electronic monitoring systems using computer chips in home dialysis machines (Sevick et al., 1999); and quantifying the supply of dialysate ordered by the patient (Bernardini, Nagy, & Piraino, 2000; Figueiredo, Santos, & Cruetzberg, 2005) have enabled the frequency and quantity of dialysate use to be determined – but not who is actually using it or how they are doing so. Moreover, none of these benchmarks can account for the intention to comply in situations where confounding factors beyond the patient's control, such as technical problems with the PD machine, thwart their efforts (McCarthy et al, 2009).

### Factors affecting PD compliance

Just as there is no adequate definition of PD compliance, there is little understanding of the factors that might contribute to it. Several authors note that predictors of compliance may be different for people over the age of 65, as they may have age-specific barriers

to compliance (such as co-morbidities that impair cognition, sight and hearing) that consequently make them more vulnerable to the incorrect use of renal medication (Higgins & Regan, 2004; MacLaughlin et al., 2005; van Eijken, Tsang, Wensing, de Smet, & Grol, 2003). Demographics have also been investigated, but have demonstrated only a tenuous relationship between medication adherence and factors such as socioeconomic status, gender or marital status (Schaffer & Yoon, 2001; Vermeire et al., 2001). PD and its associated regimens are costly, life-long treatments. It is known that compliance rates are lower in similarly chronic illnesses if the treatment is longstanding, inconvenient to lifestyle, entails a high number and cost of medications, or it attempts to manage concurrent asymptomatic conditions such as hypertension (Holley & De Vore, 2006; Lee et al., 2006; Loghman-Adham, 2003; Vermeire et al., 2001). Conversely, good rates of compliance are reported in patients who are disabled or incarcerated, or whose costs are contained, due to higher incidences of community responsibility and supervision (McCarthy et al, 2009).

Complex social determinants may be the most influential of all the factors related to compliance. For example, one study (Orr et al., 2005) identified that patients' personal loyalty to health professionals was an important influence on compliance to regimen, and that their non-adherence was unintentional, being largely due to forgetfulness and medication side effects. Patients' own knowledge, coping styles and experiences, as well as those of family members and friends, are among the few other variables demonstrated as associated with compliance in chronic diseases such as CKD (Christensen, 2000; Vermeire et al., 2001). In this context, it is unfortunate that many renal patients are prejudged by clinicians as unable to comply by the very nature of their perceived neglect of the conditions (such as diabetes and

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hypertension) that led to their CKD. White (2004:1), for example, argues that by the time “a typical patient reaches end-stage renal disease ... an individual pattern of nonadherence has been developed and refined for over 50 years”.

It is increasingly recognised that compliance behaviour cannot be understood by taking any of these variables in isolation, as they are usually mutually influential, socially-mediated, and can perhaps only be understood from a complex systems perspective (Rietveld & Koomen, 2002).

### Interventions to improve compliance

The literature offers a variety of methods and interventions to improve compliance. The interventions tested to enhance compliance are as various as the indicators used to measure it. These interventions fall into four broad categories: educational strategies; practical aids; simplifying the regimen; and a combination of one or more of these.

The first type of intervention to improve compliance that is most commonly reported in the literature is education. For example, one recent randomised controlled trial involving 502 people with chronic illnesses (but not CKD) investigated the effect on medication compliance of periodic telephone education by a pharmacist, with a resulting reported improvement in medication compliance (Wu et al., 2007). Similarly, Mattke et al (2007) undertook a pre-post test intervention with 24,943 patients to improve medication compliance. After first identifying the patients' potential for compliance through predictive modelling, those less likely to comply received regular personalised education and advice from a call-centre based nurse. The lowest risk patients were given access to information from a range of internet, call centre and print resources regarding their disease (Mattke et al., 2007). However, unlike

Wu et al's (2007) study and despite the considerable resources expended, the investigators concluded that the intervention had only a modest effect that was neither clinically or statistically significant (Mattke et al., 2007). It is unclear if similar strategies in patients receiving PD would improve medication compliance.

In addition to education, providing practical aids appears to enhance compliance. People receiving PD may have peripheral neuropathies, digital amputations and decreased visual acuity as a result of the diabetes. Making it easier for them to visualise, locate and open medication bottles may readily improve compliance. In addition, simplifying patient instructions for medications, particularly those that require multiple daily doses, appears to reduce the risk of patient misinterpretation (MacLaughlin et al., 2005). For patients, the meaning they ascribe to phrases like 'every 6 hours' and 'three times daily' vary. In their study, MacLaughlin et al. suggested that using 'every 6 hours' rather than 'three times daily' minimises incorrect self-administration. Fixed-dose combination pills and unit-of-use packaging designed to simplify medication regimens and by implication, enhance medication compliance in chronic illnesses, have been tried repeatedly. A systematic review of these strategies concluded that the limitations of the available evidence meant that their clinical efficacy was not able to be determined (Connor et al., 2004)

Another common strategy to improve compliance is to simplify the treatment regimen. In a systematic review of antihypertensive medication compliance Schroeder et al. (2004) concluded that a reduction in the number of daily doses appeared to be effective in increasing adherence as a first time strategy. An earlier meta-analysis of studies investigating the relationship between patient adherence and antihypertensive drug dosing frequency

similarly concluded that compliance with a once-daily dose was significantly higher than for multiple-daily or twice-daily dosing (Iskedjian et al., 2002). A review of interventions to enhance clinic attendance noted that simplifying procedures such as patient-initiated appointments, shorter intervals between referral and appointment, shorter clinic waiting times and prepayment were all effective in improving patient compliance with appointments (Vermeire et al., 2001). Hence for patients undergoing PD for CKD, a thorough review of treatment plans could improve patient compliance with appointments. For example, the review could provide opportunities to schedule concurrent specialist appointments or procedures, or to co-locate their provision.

It has been argued that the most successful strategies comprise a combination of these three categories of intervention, because multifaceted approaches are posited as addressing a more comprehensive range of compliance barriers (Ogedegbe & Schoenthaler, 2006; Schroeder et al., 2004; Takiya et al., 2004; van Eijken et al., 2003). However, the present examination elicited little evidence to support complex multimodal interventions. For example, Higgins and Regan systematically reviewed the effectiveness of interventions to enhance the compliance of older people with their medication regimens, most of which involved a combination of external cognitive supports and educational interventions (Higgins & Regan, 2004). Few of these had clinically significant effects and their findings support other meta-analyses that concluded there is little evidence to support one type of compliance intervention over another (Haynes et al., 2002; Higgins & Regan, 2004; MacLaughlin et al., 2005; McDonald et al., 2002). A systematic review of all randomised controlled studies to enhance medication adherence in chronic conditions, undertaken

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between 1967 and 2004, found that informational, behavioural and social interventions undertaken alone or in combination may improve medication adherence, but were not likely to affect clinical outcomes (Kripilani, Yao, & Haynes, 2007).

One of the significant deficits in all intervention studies, no matter how successful, is that they provide limited information about their apparently considerable human, financial and material resource implications (Beswick et al., 2005). In the Australian context, the establishment of nephrology nurse practitioners provides a valuable opportunity to re-examine health service delivery to people treated for CKD. Nephrology nurse practitioners have considerable potential to create synergies in education, providing practical aids and simplifying treatment regimens for improved patient compliance.

### Implications for nephrology nursing practice and research

Four main issues arise from this review. First, there is currently little consensus on how to define compliance, particularly as it relates to PD, which makes it difficult to operationalise the concept in a rigorous or meaningful way. This contributes to the second challenge apparent in the literature: in the absence of a standard working definition, it is difficult to develop valid and reliable measures of compliance with any aspect of PD regimen. Third, despite these challenges, numerous interventions based on the vaguest notion of PD compliance have been developed to improve it, with varying success. Fourth, compliance appears to be a result of multiple determinants in all domains of health; hence some approaches to this issue have tried to account for these by developing complex 'bundled' interventions. Again, these have reported mixed outcomes with generally only modest improvements in compliance. They are not likely to enhance it in the PD context.

In addition, the literature review has made it apparent that compliance is a multidimensional, context-bound concept, involving numerous perspectives, procedures and levels of measurement. It is the synergy of these factors that probably influences whether a person wants to comply with all or part of their PD regimen; or indeed, if they are able to. People generally seek treatment approaches that are manageable, tolerable and effective for their situation; hence, they may not necessarily view all of the treatments recommended as in their best interests (Friberg & Scherman, 2005; Vermeire et al., 2001).

The review also highlights the importance of understanding just how messy and dynamic the concept of 'compliance' really is, and how laden it is with a range of moral assumptions. In the context of PD, these judgements are concerned with measuring and correcting acceptable ways to care for the self, standards of personal cleanliness, levels of intelligence, frugal use of material and economic resources, and other criteria that determine who should and should not be allowed to self manage their CKD with this home-based therapy. As a consequence, renal compliance incorporates a range of factors which, from the client perspective, may not be the concern of the health professions at all and which they may believe renal clinicians have no business in promoting.

This review has illustrated how treatment regimens such as PD "fulfill theoretical, physiological, and empirical considerations about optimal care, while ignoring practical patient-centred concerns, such as the nature, nurture, culture, and stereotyping of the patient, and the inconvenience, cost, and adverse effects of the treatment" (McDonald et al., 2002:1). We really know very little about how important adherence to an inflexible, medically-oriented treatment regimen is to people receiving PD, or whether there are other outcomes that

are more desirable for them. As some authors have argued, efforts to enhance adherence must focus on patient-health professional relationships and the health care system that surrounds the patient, rather than just patient factors alone (Kammerer, Garry, Hartigan, Carter & Elrich, 2007; Orr et al., 2007; Sussman, 2001). We know that patients do not blindly follow professional advice but negotiate their PD therapy into their lifestyle to enable them to live with their CKD in the way that best suits them (McCarthy et al., 2007; Polaschek, 2007). What we may need to facilitate is a better understanding of how to enhance the patient-health care provider relationship and ameliorate the effects of the health care system within which patients are situated.

Finally, with respect to improving compliance, of the four broad interventions offered in the literature—educational strategies; practical aids; simplifying the regimen; and a combination of these—it is the last, the combination of them, that is most likely to be effective in maximising opportunities for PD adherence and compliance in CKD. Nephrology nurses, who specialise in PD, are well positioned to maximise patient-health care provider relationships, and integrate education, practical aids, and treatment regimens to improve patient compliance.

### Conclusion

The implications of this review for research into PD compliance or for those who practise PD nursing are two-fold. First, robust research into PD compliance means revisiting the basics. It would be useful if each investigation established an unambiguous definition and a sound theoretical basis for its use of the term 'compliance' and its variants. Without these tools, there are very few options with respect to operationalising or measuring the concept in a practical or meaningful way. Because PD compliance is a dynamic construct, involving an array of medication, procedure and lifestyle

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choices, it is unreasonable to expect that every researcher arrive at the same definition or employ the same theoretical framework across diverse contexts. However, a definition and theoretical framework suitable to the context should be articulated in each investigation from the outset, and remain a constant guide for action within that project. It can be reasonably argued that this consistent lack of conceptual clarity on which to base research has contributed to the current paucity of Level I and II evidence with respect to PD compliance.

Second, PD compliance is complex. It means different things to different people, particularly to different patients. Moreover, most successful compliance strategies in areas other than PD are those that make life easier and simpler for patients. It is therefore essential for researchers and practitioners to make every effort to understand how patients understand compliance, and how it might complicate their specific situation. Given the inherent complexity and flexibility of the notion of PD compliance, we should hesitate to apply the concept to patients in a blanket fashion, and without awareness of the moral judgements implicit in the term. Patients should not be burdened with the unconscious value judgements of health professionals. It is relatively easy to dichotomise patients as 'compliant', 'non-compliant', 'adherent' or 'non-adherent'; but it is not so easy for patients to carry these labels, particularly when they have not been self-determined.

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## Compliance, peritoneal dialysis and chronic kidney disease: lessons from the literature

**Table 1** Compliance in peritoneal dialysis articles

Author/s	Date	Type of study/paper	Outcome of interest	Conclusions
Bernadini et al	2000	Longitudinal, prospective, observational, descriptive	Noncompliance with PD, defined as performance of less than 90% of prescribed PD exchanges (n = 92)	72% consistently compliant, 2% consistently noncompliant, 15% noncompliant at beginning of PD but became compliant at follow up, 11% intermittently noncompliant. Recommend a home visit during 1st 6 months to determine compliance.
Carpenter	2005	Literature review of concept	Relationship of concept of perceived threat to treatment adherence	Little consistency in operationalising 'perceived threat' relating to treatment adherence, nor incorporation of personal and contextual patient factors
Chow et al	2007	Prospective observational	Adherence with PD, measured by late arrival for PD training and subsequent peritonitis (n = 159)	Late arrival in >20% of PD training sessions associated with >50% increased likelihood of subsequent peritonitis. RR 1.56 (95% CI; 1.02-2.39; <i>p</i> = 0.04).
Connor et al	2004	Systematic review	Studied 15 trials investigating role of fixed dose combination pills and unit of use packaging in promoting medication adherence	Note a trend towards improved adherence that was statistically or clinically significant; however outcome measures were heterogenous and studies limited by small sample sizes.
Costanini	2006	Discussion paper	Compliance, adherence and self management in CKD patients	Compliance and adherence poorly understood in this population. Patient perspectives need to be accounted for, and 'self-management' is promising as a conceptual basis for improving outcomes
Denhaerynck et al	2007	Literature review	Prevalence and consequences of non-adherence to haemodialysis prescriptions	Inconsistencies in definitions and invalid measurement methods hamper research.
Evangelista	1999	Concept analysis	Compliance	Patient should be viewed as active participants in health care and more understanding of patient perspective of compliance required
Figueiredo et al	2005	Descriptive, telephone self-report by patients	Compliance measured by PD supply inventories. Patients performing at least 90% of prescribed exchanges considered compliant (n = 30).	Patients who first treatment choice was PD were more likely to be compliant than patients for whom PD was not the first choice (74% vs 64% compliance), hence participation in the decision-making process improves compliance
Friberg and Scherman	2005	Discussion paper	Compliance	Understanding of the teaching and learning components of compliance, and understanding patients' perspectives, is essential
Higgins and Regan	2004	Systematic review	Review of RCTs between 1966-2002 studying effectiveness of interventions for improving medication compliance in the elderly. 7 studies assessed.	Studies too heterogenous to compare; used variety of behavioural and social interventions that had little statistical or clinical effects. No strong evidence to support any one intervention type.

## Compliance, peritoneal dialysis and chronic kidney disease: lessons from the literature

Author/s	Date	Type of study/paper	Outcome of interest	Conclusions
Holly and DeVore	2006	Descriptive survey	Medication compliance dialysis patients (PD and haemo: n = 54)	Inadequate prescription coverage, lack of transportation, medication cost are primary contributors to medication noncompliance.
Iskedjian et al	2002	Meta analysis	Relationship between daily dose frequency and adherence to antihypertensive medication, 8 studies pooled	With antihypertensive regimens, once-daily dosing schedules are associated with higher rates of adherence than twice daily or multiple dosing schedules.
Kammerer et al	2007	Discussion paper	Strategies for success Adherence in patients on dialysis:	Interventions need to focus on patient–health care provider relationships and the health care system that surrounds the patient that compromise the patient’s adherence, rather than just patient factors alone. Nurses have an important role to play in supporting patients, identifying barriers, and enabling strategies to help patients improve adherence.
Kripalani et al	2007	Systematic review	RCTs published between Jan 1967 and Sept 2004 reporting unconfounded interventions intended to enhance medication adherence with self-administered medications in chronic medical conditions, 39 studies assessed	Adherence increased with behavioural interventions that reduced dosing demands or involved monitoring and feedback; involved multisession information or combined intervention. Several interventions may be effective in improving adherence in chronic medical conditions, but few significantly affect clinical outcomes.
Kutner	2001	Literature review	Compliance with dialysis	Further study required into psychosocial determinants, compliance behaviour patterns over time, and parameters in which compliance can vary and still remain safe
Kyngas et al	2000	Literature review of concept	Compliance	No agreement on definition or measurement
Lee et al	2006	Randomised controlled trial	Effect of pharmacy care program on medication adherence (n= 200)	Intervention increased medication adherence to 96.9% (5.2%; $p < 0.001$ ) 6 months post intervention
Loghman-Adham	2003	Literature review	Compliance in renal disease	Suggests simplifying treatment regimen, establishing a partnership with client and increasing patient awareness through education and feedback to improve compliance
MacLaughlin et al	2005	Literature review	Assessing medication adherence in the elderly	Personal and contextual factors influence medication adherence. Traditional methods for measuring adherence are unreliable.
Mattke et al	2007	Non-randomised, pre-test/post-test intervention study	Effect of disease management program on medication compliance, measured by prescription fill rates, medication possession ratio and length of gap between refills (n = 24,943)	Different ways to operationalise compliance can lead to ‘fundamentally different conclusions’ in measurement methods

## Compliance, peritoneal dialysis and chronic kidney disease: lessons from the literature

Author/s	Date	Type of study/paper	Outcome of interest	Conclusions
McCarthy et al.	2007	Original research	Qualitative study of renal nurses constructs of compliance in PD	Historically, the notion of compliance is poorly conceptualized or defined. Renal nurses consider it complex and difficult to manage, so much so that it may be pointless to tame 'compliance' through rigid definitions and measurement, or to rigidly enforce it in PD patients.
McCarthy et al.	2009	Original research	Enactment of roles for PD in Indigenous Australians	PD for Indigenous Australians is bound by complex and contested networks which makes translating renal healthcare networks across cultural contexts difficult, and are inexorably linked to notions of compliance.
McDonald et al	2008	Systematic review	Patient adherence to medication prescriptions. All RCTs published between 1967 and 2001 reporting interventions to improve medication adherence in the elderly. 33 studies assessed	Studies too disparate to warrant meta-analysis. Current methods for improving medication adherence are 'complex, labor-intensive, and not predictably effective'.
Murphy and Beanland	2001	Discussion paper	Definition of compliance from nursing perspective	Advocate an 'emancipatory' definition on which to base further nursing research
Ogedegbe and Schoenthaler	2006	Systematic review	11 RCTs reviewed for effects of home blood pressure monitoring on medication adherence	Complex interventions report more statistically significant improvements in adherence; interventions conducted in hospital and home settings more successful than those in primary care settings.
Orr et al.	2007	Original research	Patients perceptions of factors influencing adherence to medication following kidney transplant	Motivators for adherence were to avoid kidney failure and loyalty to the renal team and donors. Non-adherence was largely due to forgetting and medication side effects.
Polaschek	2007	Critical interpretive	Attitude of home dialysis patients to therapy and adherence (n = 20)	Many variables affect compliance, and understanding these variables may help improve outcomes
Raj	2002	Literature review	Compliance with PD	Reviews predictors, consequences, methods to identify and monitor. Concludes noncompliance should be managed by patient education and therapy modification.
Rietveld and Koomen	2002	Literature review	The effect of complex systems on medication compliance	Knowledge, illness beliefs, symptom perception, anxiety, symptom self-efficacy, medication self-efficacy, social support and patient/health professional congruence are variables that mutually influence medication compliance.
Russell et al	2003	Discussion paper	Non compliance	A patient-centred approach necessary to enhance compliance

## Compliance, peritoneal dialysis and chronic kidney disease: lessons from the literature

Author/s	Date	Type of study/paper	Outcome of interest	Conclusions
Schaffer and Yoon	2001	Literature review	Medication adherence	Classifies adherence interventions into affective, behavioural and cognitive domains.
Schroeder et al	2004	Systematic review	Improvement of adherence to anti-hypertensive medication in ambulatory care, 38 RCTs undertaken between 1975 and 2000 assessed	Results not pooled due to heterogeneity of studies. More successful strategies are reducing the number of daily doses, with motivational and complex strategies more promising.
Sevick et al	1999	Descriptive, observation of behaviours	PD adherence, measured by self-reported daily logs and electronic monitoring of dialysis fluid use (n = 20)	Significant disparities found between self- and computer monitored reports
Takiya et al	2004	Meta-analysis	Pooled 16 RCTs using interventions to enhance adherence to antihypertensives from 1970–2000.	Interventions varied and study groups non-homogenous. No single intervention improves adherence over others. Suggest a patient-specific intervention approach be modelled.
Van Eijken et al	2003	Systematic review	Improving medication compliance amongst older community dwellers, 14 RCTs reviewed	Telephone-linked interventions achieved 'the most striking effect', with multifaceted and tailored interventions resulting in more favourable compliance rates
Vermeire et al	2001	Literature review	Patient adherence to treatment	Research hampered by failure to define 'adherence'. Further research required.
Vlaminck et al	2001	Multicentre, cross-sectional, self-report survey	Construct and criterion validity of Dialysis Diet and Fluid Non-Adherence Questionnaire (DDFQ) in Flanders (n = 564)	Suggest that DDFQ is valid self-report instrument to assess non-adherence behaviour haemodialysis patients in Flanders
White	2004	Discussion paper	Adherence to dialysis prescription	Patient-centred approaches that removal barriers to adherence and provide education and cognitive behavioural strategies may improve adherence outcomes.
Williams, Manias and Walker	2008	Original research	Adherence to multiple, prescribed medications in diabetic kidney disease	Different perspectives between consumers, who were not convinced of the need, effectiveness and safety of all of their medications, and health professionals who considered consumer concerns about medication-related adverse effects were over-rated.
Wu et al	2007	Randomised controlled trial	Telephone intervention to enhance compliance (n = 506)	Drug compliance defined as taking 80–120% of prescribed daily dose. Main outcome measure = all cause mortality. Telephone counselling associated with 41% reduction in the risk of death (RR 0.59; 95% CI; 0.35–0.97; p = 0.0039); patients receiving polypharmacy, poor compliance associated with increased mortality.

## Compliance, peritoneal dialysis and chronic kidney disease: Lessons from the literature

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