

Assessment of an established dialysis nurse practitioner model of care using mixed methods research

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Aims and Objectives: To assess a dialysis nurse practitioner (NP) model of care by examining satisfaction, quality of life (QOL) and clinical outcomes of haemodialysis patients and explore experiences of dialysis nurses.

Design: Mixed methods.

Methods: Database analyses of dialysis indices amongst a sample ($n = 45$) of haemodialysis patients; a survey ($n = 27$) examining patient experience, satisfaction and QOL; and in-depth interviews with a sample ($n = 10$) of nurses.

Results: Nurses commended the NP role, with five themes emerging: “managing and coordinating”, “streamlining and alleviating”, “developing capability”, “supporting innovation and quality” and “connecting rurally”. Patients’ average age was 66 years and 71% were male. Patients’ satisfaction with the care they received was rated 3.5/4 or higher across seven parameters and the average QOL score was 7.9/10.

Conclusion: The NP model of care is effective in enhancing patient care within a collaborative framework. The challenge is to sustain, and enhance the model, through mentorship programs for potential candidates.

Keywords: kidney disease; chronic; nephrology; nurse practitioner; renal dialysis; quality of life; patient satisfaction

Introduction

End-stage kidney disease (ESKD) is the fifth and final stage of chronic kidney disease and involves severe life-threatening loss of kidney function. People with ESKD require renal replacement therapy, either dialysis or a kidney transplant, to survive. The incidence of chronic kidney disease around the world indicates that it is a global health problem and numbers have risen rapidly over the last two decades, predominantly related to the effects of an ageing population and the increasing rate of diabetes (Polkinghorne, Gulyani, Hurst, & McDonald, 2012). In 2009, 11 per 100,000 Australians were receiving dialysis and by 2020 this is projected to rise by nearly 80% (Australian Institute of Health & Welfare, 2011). Dialysis places a considerable burden on patients and often compromises their quality of life (QOL), leading to high levels of

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anxiety and depression (Theofilou, 2011). Kidney transplantation occurs in fewer than one in five Australians (Grace, Clayton, Cass, & McDonald, 2013) due to limited availability of organs for donation combined with an increasing incidence of ESKD amongst patients who are too old to be eligible for a transplant (Williams, Sandeep, & Catic, 2012). These trends are leading to an increasing number of ageing patients spending the rest of their lives on dialysis support with a high symptom burden (Murtagh, Addington-Hall, & Higginson, 2007). The challenge for health professionals caring for them is to provide a high standard of care aiming to meet QOL needs for each individual whilst managing multiple comorbid and age-related conditions.

Background

In Australia, the nurse practitioner (NP) is an advanced clinical role which requires completion of an undergraduate and Master's degree, plus at least five years clinical experience in the area of specialty (Nursing and Midwifery Board of Australia, 2010). NPs play an important role in the delivery of modern healthcare as they are directly responsible for patient management and the majority prescribe medications, order and interpret diagnostic investigations and provide referrals (Middleton, Gardner, Gardner, & Della, 2011). In 2002, the Department of Nephrology at the study hospital developed and implemented a pilot project for a dialysis NP model of care. At that time, there were no endorsed NPs in Victoria, despite similar roles being established in the USA and the UK for many decades (Bolton, 1998; Driscoll, Worrall-Carter, O'Reilly, & Stewart, 2005). The aim of the model was to have one consistent nephrology nurse overseeing the patient's routine nephrological care, including anaemia management and renal bone disease, with a timely and fine-tuned approach in collaboration with the medical team.

An initial evaluation of an NP candidacy in maintenance dialysis care at the study hospital was undertaken in 2002–2003. Results of the initial evaluation were encouraging because patients treated under the NP model were more likely to feel listened to, that their wishes regarding treatment were considered and their treatment was normally trouble free. Positively, there was a trend towards improvement in patients' self-rated QOL score from 5.9 pre-intervention to 7.0 post-intervention. Furthermore, fewer blood tests were ordered per patient in the intervention group compared to the control group, implying potential cost savings. Though there was an increase in the number of emergency hospital visits during the course of the study, this was noted in both the control and intervention groups (Allenby et al., 2003). Two dialysis NPs were endorsed by the Nurses Board of Victoria in 2006 and, in 2014 (just over 10 years since inception of the model) the same NPs continue to share joint responsibility for the dialysis care of over 290 patients on haemodialysis or peritoneal dialysis cared for by the study hospital Nephrology unit throughout metropolitan and rural Victoria, including patients dialysing at facility-based satellite units and those self-dialysing at home.

A key recommendation arising from the initial evaluation was that the efficacy of the dialysis NP role be revisited when it was operating at full capacity. Therefore, in 2012 this study was initiated. The aim of the research was to evaluate the effectiveness of the NP model in terms of the experience, satisfaction and clinical outcomes for patients as well as perceptions of metropolitan and rural nursing staff.

Methods

Study site

The study site is a tertiary public healthcare service in Victoria. The Nephrology unit provides a broad range of dialysis facilities for ESKD, including in-centre and in-home haemodialysis and home peritoneal dialysis. This study was conducted amongst patients and nursing staff from

four locations: the main in-centre facility for haemodialysis in inner-city Melbourne; one local satellite unit in the suburbs of Melbourne and two of the six rural Victorian haemodialysis units. Due to budget constraints the cross-sectional patient survey was limited to patients from the Melbourne metro and local satellite units.

Research team

The study was undertaken by research assistants from Australian Catholic University working with the dialysis NP in charge of the project. It was funded by a grant from the Australian and New Zealand Society of Nephrology-Amgen Quality Assurance Grants Programme.

Study design

The study employed a mixed-method approach which utilised retrospective analysis of various patient databases to assess clinical outcomes, a cross-sectional survey with patients regarding their care satisfaction and QOL using a visual analogue scale adapted from the survey used in the initial 2003 evaluation, and in-depth interviews with dialysis unit nursing staff. Patients were identified from the Nephrology database and screened using the following inclusion criteria: ESKD requiring chronic maintenance haemodialysis; dialysing in community facilities at one of the four selected study sites for longer than three months and receiving NP and nephrologist collaborative care between March and August 2012. Of the 81 patients who met the eligibility criteria, 45 provided written consent for their database results to be included in the analysis (Table 1). Twenty-seven metropolitan English-speaking patients consented to be interviewed for the cross-sectional survey. For the in-depth interviews, a purposive sample of permanent senior nursing staff ($n = 10$) from the dialysis units across the four study sites was selected, all of whom had worked within the NP model for at least two years.

Ethics

The study received ethics approval from the hospital's Human Research Ethics Committee. Informed written consent was obtained from all participants.

Data collection

Data on routine biochemistry, haematology and dialysis efficiency over the six-month period were collected. Nine biochemical and haematological targets (blood parameters) common to measurement of dialysis outcomes were selected (Table 2). Hospital attendance and background demographic data were collated from existing databases. Erythropoietin (EPO) dose data for 2002 were extracted from the Renal Anaemia Management database provided by Janssen-Cilag Pty Ltd Australia. The cross-sectional survey involved a short interview with a structured questionnaire, administered by an independent researcher. The questionnaire included seven satisfaction parameters and QOL was evaluated using an 11-point single linear visual analogue scale. In-depth interviews were conducted using an interview guideline, which included queries on understanding and experiences of working within the NP model of care, its influence on patient care and nursing experiences, and any concerns or improvements. All interviews were conducted by researchers independent of input from the dialysis NPs.

Table 1. Participant profile – haemodialysis patients, March to August 2012.

Total (<i>n</i> = 45)	<i>n</i> (%)
Age (mean, SD in years)	66 years (SD ± 13)
Age group	
30–39	2 (4)
40–49	2 (4)
50–59	12 (27)
60–69	10 (22)
70–79	14 (31)
80–89	5 (11)
Gender	
Male	32 (71)
Primary language	
English	38 (84)
Greek	4 (9)
Vietnamese	3 (7)
Years on dialysis	
1–2 years	20 (44)
3–8 years	17 (38)
9 or more years	8 (18)
Cause of chronic kidney disease	
Diabetic nephropathy	16 (36)
Hypertension	7 (16)
Glomerulonephritis	10 (22)
Renal cell carcinoma	3 (7)
Polycystic disease	3 (7)
Others	6 (13)
In-patient admissions	
Not admitted at all	27 (60)
Unplanned (acute) only	3 (7)
Planned (elective) only	7 (16)
Both acute and elective	8 (18)
Emergency presentations	
Presented to ED	15 (33)

Table 2. Summary blood parameter statistics.

<i>n</i> = 45 Units	Hb g/L	Fe mcg/L	Tsat %	K mmol/L	Albumin g/L	Ca mmol/L	PO4 mmol/L	PTH pg/L	URR %
Target Range (CARI guidelines)	110–115	200–500	20–50	4.0–6.0	35–50	2.12–2.63	0.8–1.6	130–195	>69
Range of results	91–135	50–824	9–79	3.9–5.9	27–44	1.7–2.7	0.8–2.9	36–2176	64–84
Mean	114	441	27	4.9	35	2.4	1.7	386	74
25th percentile	108	414	20	4.6	32	2.3	1.4	179	70
Median	115	452	28	4.9	35	2.4	1.6	270	74
75th percentile	119	498	31	5.3	37	2.5	1.8	449	79

Note: Hb, haemoglobin; Fe, ferritin; Tsat, percentage transferrin saturation; K, potassium; Ca, calcium; PO4, phosphate; PTH, parathyroid hormone; URR, urea reduction ratio. 2012 target ranges as per interpretation of CARI guidelines 2011. Data collected monthly over six months, then an average calculated per individual. Base: all patients (*n* = 45).

Data analyses

Quantitative data were analysed descriptively using SPSS v21. The six-month average of each blood parameter for each individual patient was calculated and categorised as normal (target) or abnormal (above or below target) using the national guideline recommendation from Caring for Australasians with Renal Impairment (CARI, 2013). Results were further categorised using ranges reported by the Australia and New Zealand Dialysis and Transplant Registry (Polkinghorne et al., 2012) then study data were compared to national data using two-tailed chi squared tests (Dean, Sullivan, & Soe, 2013). In-depth interviews were audio recorded and interview notes were transcribed and analysed by two researchers. Data were analysed thematically and inductively with comments firstly categorised into themes and then major themes (Speziale, Streubert, & Carpenter, 2011).

Results

Patient database analyses

Participant profile, including underlying cause of renal disease and length of time on dialysis, is provided (Table 1). Almost two-thirds (64%) of patients had a native fistula when they first started on dialysis, but at the time of the study (93%) had transitioned from venous catheter to a native fistula. Less than half of patients were admitted as in-patients during the six-month period and two-thirds of admissions were planned rather than acute (Table 1). The most common reason for a planned in-patient day procedure was for fistula-related angioplasty (affecting 22% of patients and accounting for 33% of all admissions). The most common reason for an acute in-patient admission was an infection (affecting 13% of patients and accounting for 18% of all admissions). One-third of patients presented to the emergency department (ED) during the period; two-thirds (68%) of ED presentations were for issues outside of the dialysis NPs' defined scope of practice, the most common cause being due to an infection.

Haemoglobin (Hb), potassium (K), albumin, calcium (Ca) and phosphate (PO₄) are all parameters monitored by the NP on a monthly basis. Ferritin (Fe), percentage transferrin saturation (Tsat), parathyroid hormone (PTH) and urea reduction ratio (URR) were monitored less frequently according to CARI guidelines. The mean result per patient for each parameter was compared to the CARI guideline target range (Table 2 and Figure 1). Comparing the study hospital patients to national data (Polkinghorne et al., 2012), the study patients were more likely to fall within the 200–499 µg/L range for Fe (69% vs. 39%, $p = .001$); more likely to have Ca > 2.2 mmol/L (95% vs. 64%, $p < .001$) and more likely to have PO₄ < 1.4 mmol/L (47% vs. 30%, $p = .05$) (Figure 2). The majority (93%) of the study patients received EPO therapy, similar to the level of EPO usage for all haemodialysis patients of Australia (Polkinghorne et al., 2012). The mean average weekly dose of Epoetin alfa per patient in 2012 was 8980 units, compared to 14,995 units in 2002. The mean average weekly dose of Darbepoetin alfa in 2012 was 32 mcg, compared to 50 mcg in 2002.

Cross-sectional patient survey

Analysis of an adapted care satisfaction survey commonly used by the study hospital identified that across seven aspects of their satisfaction of care experience, patients provided an average rating between “Always” (score 4) and “Nearly always” (score 3) for all performance indicators (Table 3). The average overall QOL rating was 7.9, where 10 is the best QOL possible. This signifies an upward trend compared to 2002 pre-NP intervention (5.9) and post-NP intervention (6.7). Half of patients (52%) rated their overall QOL as the best that it could be (9–10). At the other end of the scale, less than 1 in 10 patients (7%) rated their QOL as poor (0–4). Seven

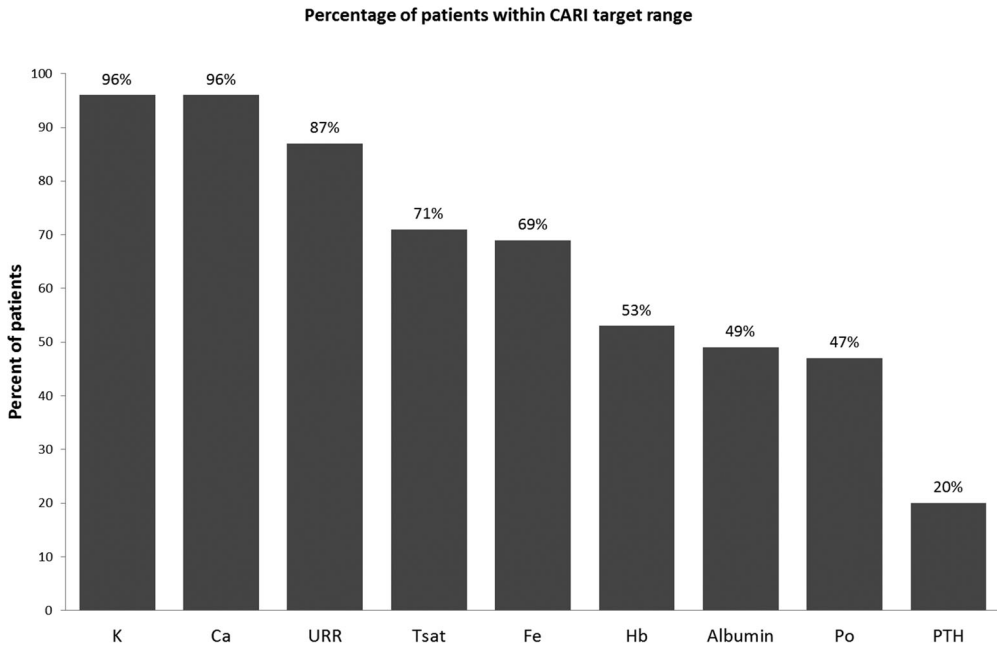


Figure 1. Percentage of patients within CARI target range. Note: Hb, haemoglobin; Fe, ferritin; Tsat, percentage transferrin saturation; K, potassium; Ca, calcium; PO₄, phosphate; PTH, parathyroid hormone; URR, urea reduction ratio. 2012 target ranges as per interpretation of CARI guidelines 2011. Data collected monthly over six months, then an average calculated per individual. Base: all patients ($n = 45$).

out of 10 patients (70%) reported that they normally have trouble-free treatment without any problems and the vast majority (93%) said they would recommend the service.

In-depth interviews with nursing staff

In-depth interviews with nursing staff using a question guide focussed on the individual nurse's perceptions and experiences of the NP model of care and, overall, results were very positive. The

Table 3. Results of the cross-sectional survey measuring patient satisfaction.

	Mean	"Always" n (%), total $n = 27^a$
Do you feel that enough information (is provided) about your dialysis treatment?	3.8	24 (89)
Do you feel that enough information is provided about your medications?	3.7	23 (85)
Are clear instructions and explanations provided when a change is needed to your medications?	3.7	24 (89)
Do you feel you are provided with enough explanation about your blood test results?	3.5	20 (74)
Do you feel that your worries and concerns and listened to?	3.6	22 (82)
Do you feel your wishes are considered in the way you receive your treatment?	3.7	24 (89)
Do you think there is good communication between the NPs and the rest of the health care team who look after you?	3.8	21 (84)

Note: Mean score calculation: 4 = Always, 3 = Nearly always, 2 = Sometimes, 1 = Occasionally, 0 = Never. Base: Metro patients ($n = 27$).

^aMelbourne metro patients only.

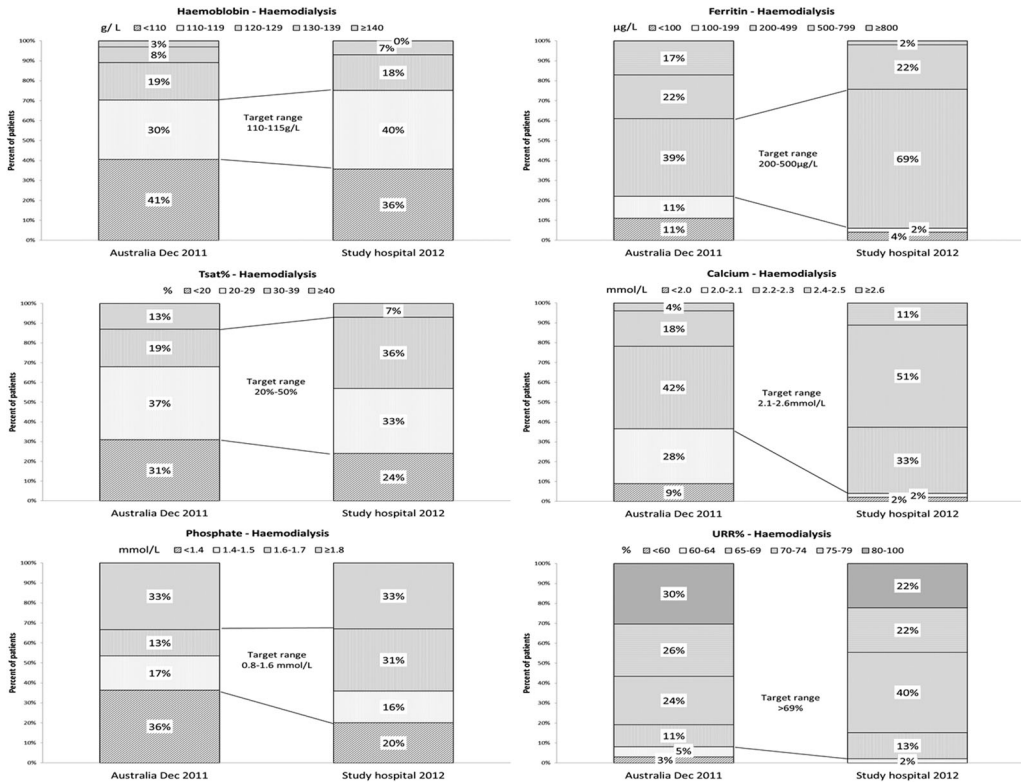


Figure 2. Comparison of study hospital patients' biochemistry data to national data.

following verbatim quote is typical in summing up the sentiment amongst staff: “Since we’re the first in Victoria in nephrology, we were just blessed to have two such great clinicians here” (N1 from interview recording). Five major themes emerged from the data (Figure 3). Some staff identified areas for improvement, reported below under the heading “concerns”.

Managing and co-ordinating

This theme describes the NPs’ central role in providing continuity and co-ordination of multidisciplinary care, overseeing the care of patients beyond the day-to-day dialysis routine, and increasing patient confidence and compliance. Continuity was described as important for both patients and staff and seen as a key benefit of the NP model of care. Whilst “registrars rotate, every year we have a new one” (N2) patients are allocated to a NP who remains with them throughout their dialysis journey: “They [the NP] pick up their patient at the beginning and stay with them all the way through” (N5). Seeing the patient on a monthly basis, the NP was perceived as becoming well acquainted with the patient’s individual needs, which sometimes include complex comorbidities, as well as their personal circumstances, psychosocial situation and level of familial support. Staff recognised that NPs are more involved than dialysis nurses in multidisciplinary care, liaising with the patient’s general practitioner, the nephrology consultant and registrars, vascular surgeons, access co-ordinators and specialists managing common comorbidities. For their elderly or very sick patients, the NPs’ role was seen to extend to co-ordinating end of life care with the palliative care team. The NP was described as the “best advocate” (N10) for their patients,

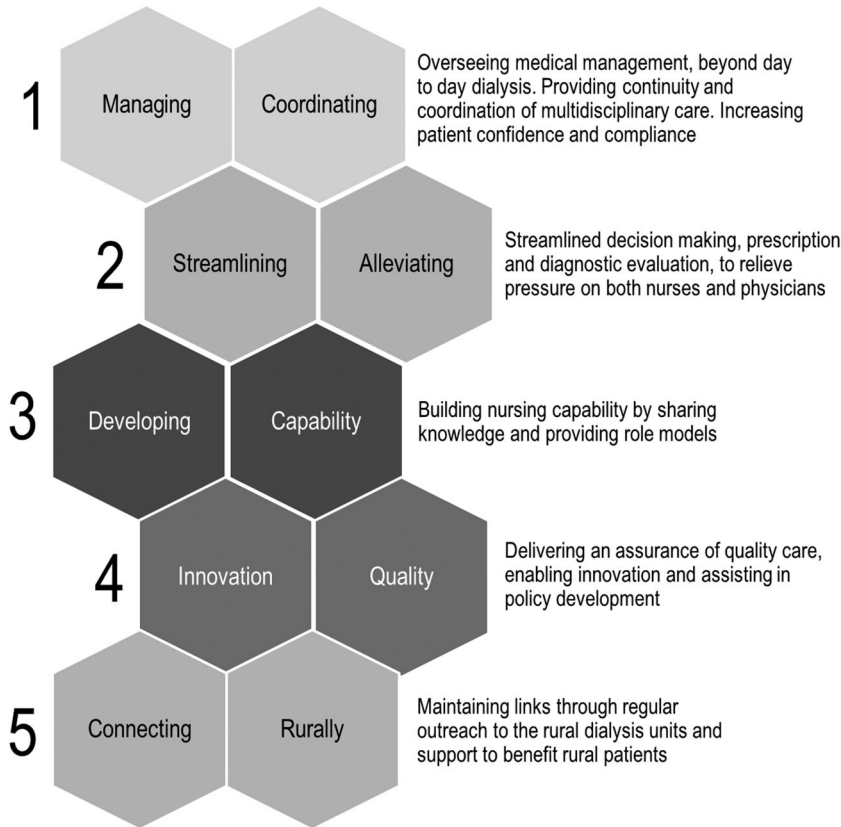


Figure 3. Five themes emerging from in-depth interviews with dialysis unit nursing staff.

helping them navigate complex issues relating to their overall health and well-being and linking them in with external systems.

The NPs were identified as holding more authority than a general registered nurse, having a “different rapport” (N5) with their patients and increasing patient confidence, compliance and self-efficacy. One nurse explained: “They [patients] get a bit blasé with us telling them off or trying to educate them, whereas [the NP] gets their undivided attention”(N5). Nurses mentioned that the NP provides a different perspective or the “big picture” view, which enables them to pick up on longer term trends or changes that might otherwise be obscured because there are many different nurses managing daily patient care: “The nurse practitioner sees things from a different angle to the nurses on the floor” (N7). Patient care was seen as being monitored more closely because of the NP model of care.

Streamlining and alleviating

This theme relates to decision-making, prescribing medication and tests, and relieving pressure on both nurses and doctors. Staff saw the NPs as the “first port of call” (N5) when they needed advice and assistance. The NPs were considered accessible and available to help nurses make more informed decisions, give recommendations and answer queries, thus expediting the process and enabling greater responsiveness in patient care: “They [NPs] are very good at coming

back [to you], so you can deal with things straight away” (N5). Being able to prescribe certain dialysis drugs within the formulary and order blood tests and investigations was seen as a further benefit and relieving some of the pressure on other staff: “It’s providing that extra support for the doctors who are particularly busy” and “It reduces the need to get registrars over to make small decisions” (N4).

Developing capability

This theme relates to the transmission of knowledge and capability building amongst nurses. Capability has been defined in the international literature as utilising skills, knowledge, values and self-esteem to manage change and move past competency (O’Connell, Gardner, & Coyer, 2014). Staff described the NPs as a valuable source of information, education and advice both for themselves and their patients. Due to their advanced qualifications and experience nurses viewed NPs as having in-depth knowledge of their specialised field and a greater understanding of pharmacology, physiology and comorbidities that was beyond competency: “They are an up-to-date resource of what’s going on in the renal world” (N6). Informal education and knowledge sharing was felt to occur during the course of every day interactions empowering nurses to feel capable of managing less predictable or unfamiliar situations: “They educate us and push us to be better nurses as well ... they push us to be critically thinking about our patients.” The NPs were described as providing “role models and a wealth of information” for nursing staff at all levels; in the way they interact with patients, by providing oversight, raising nursing standards and generating a “marked improvement in professionalism” within the unit (N6). Working with the NPs was described as increasing nurses’ confidence and ability to interpret pathology results and assess patients: “Things like using the MAP (mean arterial pressure) as a guide for when you might pause the ultra-filtration in somebody who has had a drop in their MAP” (N8). Thus, the NP model of care was seen as building nursing capability through knowledge sharing and spreading best practice: “I don’t think the NP takes away from our job at all, I think they just make it better care for the patients” (N8).

Supporting innovation and quality

This theme largely emerged from interviews with managers because they were aware of the NPs’ involvement in reviewing policy, delivering quality assurance and enabling innovation. It also incorporated the NPs’ involvement with broader professional issues, such as attending Renal Society of Australasia meetings. One manager described positive interaction with the NP who provides advice and assistance when policies undergo their periodic review. Another manager mentioned that the NP role “closes a loop-hole” ensuring that patients’ blood tests are looked at and medications are adjusted if need be. The NPs were described as the “go to people” if the unit wants to undertake a project, for example, when the unit was looking at introducing haemodialysis filtration: “They did a literature search, discussed it with patients and put up a patient for us to start with” (N1). Thus, the NP model of care supports innovation, quality and evidence-based practice because: “They have greater authority to instigate positive initiatives for the patients’ welfare” (N1).

Connecting rurally

The NPs were recognised as having an important role in rural outreach and one rural dialysis unit nurse explained how the NP model had “revolutionised” things. Going back 20 years, she described feeling isolated and having problems communicating with people who knew enough

about renal issues. Now, with the NP model at full efficacy, rural nurses described being far more supported and connected. One described the NP as: “Someone who really knows where you are coming from, particularly in the country.” The NP was seen as providing the link between satellite and rural units, the parent hospital and the patient. Regular visits from the NP, in addition to everyday availability via telephone and email, have improved communication between metro and rural units. An NP was recognised as being well acquainted with each rural patient’s medical history, so she can be consulted, provide advice and make decisions according to the specific circumstances:

We used to spend a lot of time on the phone talking to medical staff in Melbourne who had never laid eyes on our patients, asking them to make decisions based on their care. Whereas now, [the NP] provides that link.

Rural dialysis unit nurses described the benefits of the NP model for their patients who receive a full assessment at their local dialysis unit, meaning less frequent visits to Melbourne, saving patients’ time, discomfort and inconvenience: “It’s a huge thing for an elderly person who’s on dialysis, on their day off to get themselves physically to Melbourne ... It’s a cost, it’s a physical strain on them.” Aside from the logistics of travel, nurses believed rural patients benefited from being able to talk to the NPs: “It’s much more personal for the patients and there’s no pressure with time. They are able to go through their questions with her.”

Concerns

The only consistent concerns nurses expressed related to the NPs’ high and increasing workload as a result of the growing number of patients. One or two nurses noted that NPs were occasionally asked to do things which were beyond their scope of practice, causing delay as the NPs were required to refer these requests to their medical colleagues. Several participants expressed concern about what will happen if one of the NPs decides to move on or retire. As one of the managers explained: “I am genuinely concerned about succession management. It’s quite a lot of study and takes time ... my greatest concern is whether I’ll be able to replace them.” In terms of training to become an NP, the nurses we interviewed in this study were uncertain about the amount of study involved and how a potential candidate would be supported and rewarded by the hospital.

Discussion

The key findings from this research were that haemodialysis patients treated under the NP model of care felt their information and communication needs were well met and the majority rated their QOL the best it could be. Furthermore, clinical measures of haemodialysis efficiency for patients treated under the NP model of care were comparable to Australian averages and CARI guideline targets. Perceptions amongst nursing staff were positive and they believed that the NP model improved patient care experiences.

Published research both nationally and internationally on the role of dialysis NPs, is limited. However, looking at patients’ understanding of the role of the NP, in line with our own findings, one study (Allnutt et al., 2010) found that the majority of patients rated the education, quality of care, knowledge and skill of their consulting NP as either “excellent” or “very good”. A qualitative study conducted amongst a sample of recently authorised NPs identified three core components: “dynamic practice”, “professional efficacy” and “clinical leadership” (Carrier, Gardner, Dunn, & Gardner, 2007). Our study offers an external perspective, by exploring the experiences of patients and nurses working with the NPs, rather than the NPs

themselves. Furthermore, we assessed the NP model of care in a specific haemodialysis situation where NPs are well established in their roles. Despite these differences, there are a number of consistencies between the findings of our study and the one by Carryer et al. (2007): both noted the NPs' multidisciplinary engagement in the management of patients; both emphasised the NPs' ability to initiate therapy and investigation; and both identified the NPs' leadership role. In our study, however, there was a greater appreciation of the benefits of the NP model of care in terms of raising standards of patient care and QOL as perceived by nurses and patients themselves.

Our patient population was representative of Australia and New Zealand Dialysis and Transplant Registry (ANZDATA) in terms of cause of renal disease, though our patient population was older (65% aged >65 compared to a national statistic of 51%) (Polkinghorne et al., 2012). In Australia, only one in two patients survives beyond five years after commencing haemodialysis (Polkinghorne et al., 2012), so it is noteworthy that a proportion (16%) of our patients have been dialysing for 10 years or longer. Achieving or exceeding URR targets through regular haemodialysis has a direct impact on patient morbidity and mortality (Owen, Lew, Liu, Lowrie, & Lazarus, 1993). Despite being an older group of patients, all receiving thrice weekly haemodialysis for four to five hours, most biochemical and haematological parameters (with the exception of PTH) were being managed to target in >50% of patients. To achieve this, the NPs actively encourage patients to sustain longer dialysis hours. They also perform direct vascular access surveillance to maintain adequate access function and expedite vascular access angioplasty by liaising directly with the angiography suite without the need for medical referral. As regular screening with pre-emptive repair (either angioplasty or surgery) may reduce access thrombosis and prolong arteriovenous fistula survival (Sidawy et al., 2008), the finding of the higher native fistula rate amongst study patients compared to national data (93% vs. 79%) is of particular importance (Polkinghorne et al., 2012). The Dialysis Outcomes and Practice Patterns Study (DOPPS) (Pisoni et al., 2004) described the difficulties maintaining dialysis patients' Hb within what has continued to become an increasingly lower and narrow target range, but noted that a greater mean Hb concentration was associated with preventing both hospitalisations and overall patient mortality. Although not statistically significant, patients in our study were slightly less likely to have Hb < 110 gm/L compared to national data (36% vs. 41%). Furthermore, Hb, Fe and Tsat targets were achieved using less EPO than in 2002, which represents a considerable cost saving. In accordance with recommendations (Irving et al., 2006), the Nephrology unit at the study hospital introduced protocols by which NPs proactively titrate intravenous iron requirements to meet individual patient needs on a monthly basis, thus supporting Hb targets and likely contributing to lower EPO requirements.

The difficulty of achieving Ca, PO₄ and PTH targets in dialysis patients has also been well described in the dialysis literature and discussed by the CARI working group, with particular reference to a study exploring this issue using DOPPS data (Young et al., 2004). In that study, only 41% of patients achieved guideline recommended targets for serum corrected Ca and PO₄ and 21% achieved PTH targets. The mineral bone disorder associated with chronic kidney disease is extremely complex with many interdependent biochemical parameters, patient demographics, nutrition and additional comorbidities all impacting on biochemical interpretation. Guideline targets for PTH alone vary from two to nine times the upper limit of normal depending on which national or international working group is followed (London, Coyne, Hruska, Malluche, & Martin, 2010). The CARI Guideline for PTH used in our analysis is the lowest and most narrow, making achievement difficult and explaining why this target was the least likely to be achieved.

Unlike international studies, which cite cardiovascular disease as the most common reason for hospitalisation of dialysis patients (Lafrance et al., 2014), hospitalisation amongst our patients

was more likely to be due to an infection. Dialysis nurses identified the co-ordination of multi-disciplinary care for comorbidities such as cardiovascular disease as an important feature of the NP model of care. This is a feature that we believe contributes to improved longevity and QOL in our patients.

Reduced QOL of patients with ESKD has been the subject of a number of recent studies (Boateng & East, 2011; Theofilou, 2011). Patients with ESKD have to cope with many adversities and their QOL is often affected in terms of physical and mental well-being, with high rates of anxiety and depression noted amongst those on dialysis (Chilcot, Wellsted, Da Silva-Gane, & Farrington, 2008). A close relationship has been observed between QOL and morbidity and mortality (Morsch, Goncalves, & Barros, 2006). Therefore, it is encouraging to note a trend towards improving QOL for haemodialysis patients treated under the NP model of care in this study, particularly since a significant proportion of patients have been on dialysis for over 10 years.

It has been recognised that the numbers of people with chronic kidney disease and the complexities of their comorbidities are too large for optimal care to be delivered by nephrologists alone and that this type of collaborative model of care is required (Shah & Mehrotra, 2012). A series of reviews of the quality and effectiveness of care provided by NPs have found that patient outcomes are equally as good as when care is provided solely by physicians (Peeters et al., 2013; Stanik-Hutt et al., 2013; van Zuilen et al., 2012). Our findings support conclusions by Harwood, Wilson, Heidenheim, and Lindsay (2004) that the NP-nephrologist collaborative care model may increase the efficiency of care provided to dialysis patients and provide a solution to the ever-growing ESKD population. Importantly, the emphasis of the NP model of care provided at the study hospital is collaborative and complementary; NPs work with nephrologists, thus enabling more time to be spent by the medical staff on a wider range of patient health issues than previously possible.

One of the main concerns nurses expressed in this study was in regard to the NPs' increasing workload of patients and the need for succession planning. The transition into the NP role has been described as "stressful" (Hill & Sawatzky, 2011). Mentorship is recommended as an effective transition strategy for novice NPs, along with the need for multidisciplinary collaboration and communication to develop "legitimacy and credibility" for those transitioning to the role (Desborough, 2012; Hill & Sawatzky, 2011). Recent work has sought to develop recommendations for the clinical education required to prepare nephrology NPs (Douglas & Bonner, 2013). However, as Harvey, Driscoll, and Keyzer (2011) have noted "the development of the NP role is controlled by powerful groups external to the nursing profession" and nurses' internalisation and acceptance of those influences may serve to discourage them from putting themselves forward for advancement to the role of NP. A 2010 study seeking to understand perceived barriers to the sustainability and progression of NPs, found that lack of ongoing funding, lack of understanding from the organisation and medical staff about the NP role, legislative constraints, and cost of the Master degree programme were the main issues (Keating, Thompson, & Lee, 2010). Our participants mentioned similar deterrents, as well as concerns over workload, work-life balance and uncertainty about whether or how this type of professional development would be endorsed by the hospital.

Limitations

This study was restricted to patients with a good command of English, however, with a response rate of 56% (45 out of 81), we believe that it offers a good representation of the outcomes and attitudes of our patient population.

Conclusions

The NP model is effective in enhancing patient care within a collaborative nursing and medical framework across both metropolitan and rural settings. The challenge is to sustain, perpetuate and enhance the model, which will require initiation of a training and mentorship program for potential candidates. Critical to this will be the establishment of longitudinal studies tracking patients' clinical outcomes and QOL measures to further support and assess performance.

Relevance

This study provides evidence demonstrating the high quality of care being delivered to chronic haemodialysis patients under the NP model of care. It strongly advocates for the continuation and enhancement of the model into the future. It also provides evidence to support the introduction of NP models of care on a broader national and international scale.

What does this paper contribute to the wider global clinical community?

- Adds to a growing body of evidence demonstrating the effectiveness of NPs in managing ESKD patients;
- First assessment of an established dialysis NP model of care in an Australian context;
- Detailed data and analysis of haematological measures of dialysis efficiency for a cohort of patients with comparisons to national data.

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