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Dialysis residential care: a future dialysis service model

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Abstract
People with chronic kidney disease are ageing and have increasing co-morbidities. The current delivery of renal replacement therapy, dialysis and transplantation, needs to adjust to changing patient needs. This paper proposes a potential future service delivery model featuring a dialysis residential care facility and a care coordination focus. The residential care facility would be composed of four levels of care; high, hostel, independent and outpatient. The paper argues that this model may result in decreased morbidity, improved patient quality of life and may prove cost effective. Patients’ nutritional status, medication adherence and transport efficiency may be improved. We propose this model to stimulate further debate in order to meet the needs of current and future chronic kidney disease patients.

Abbreviations: APD – Automated Peritoneal Dialysis; CAPD – Continuous Ambulatory Peritoneal Dialysis; CKD – Chronic Kidney Disease; GP – General Practitioner; LOS – Length of Stay; NP – Nurse Practitioner.

Key words: dialysis; aged care; service delivery; care coordination.

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Introduction
People living with Chronic Kidney Disease stage 5 (CKD 5) require renal dialysis or transplantation to maintain health. Worldwide, there will be an estimated two million people requiring renal replacement therapy by 2010 [1] and furthermore, people requiring dialysis will be older, have more complex co-morbidities and will require greater healthcare resources. [2,3]

Dialysis treatment can require a patient to attend a dialysis facility at least three times per week. This results in an expensive, resource-consuming, pervasive therapy. This paper presents an alternative to the current hospital and satellite dialysis model that is dominant throughout the world. The proposed model will consist of a residential dialysis facility supported by care coordination. Although versions of this model have been reported previously, [4-6] we believe this is a new proposal to address a growing issue. We will argue that this new model will improve patient outcomes, decrease morbidity and possibly decrease healthcare costs.

Current model
The current model for dialysis mainly consists of hospital haemodialysis, satellite haemodialysis, home peritoneal dialysis and home haemodialysis. Hospitals treat the new patients entering onto the dialysis program, some acute renal failure and the ‘fragile’ patients who do not meet the patient acuity requirements for satellite haemodialysis units. [1]

Satellite haemodialysis facilities were introduced in Australia as ‘self care’ units in the 1970s. [7] Satellite units have had a rapid growth worldwide [8,9] and in 2006 provided 43% of all dialysis treatment in Australia. [10] They were originally designed to accommodate patients who could perform the entire treatment themselves with minimal assistance from dialysis-trained staff. Lower staff-patient ratios, a community setting and increased independence were features of the early satellite units, [11] decreasing the costs of dialysis treatment. [12]
Australian satellite dialysis units today are now caring for older and sicker patients. In Australian satellite units, 23% of all new patients commencing dialysis in 2006 were over 75 years of age, [13] up from 13% in 2000. [14] This trend is likely to continue. Subsequently, satellite units have had to cope with older and more dependent patients. This was not the case when the service satellite dialysis units were originally designed for.

Home haemodialysis contributes to improved patient outcomes, [15] and although there has been renewed and increased rhetoric about this modality, there has been a decrease in the number of people commencing home haemodialysis worldwide. [16] Various factors, such as funding arrangements, resources and patient preferences, have contributed to slowing the uptake of home haemodialysis. [7] We believe that the older, less independent person commencing renal replacement therapy is not willing, and is often not able, to perform home dialysis successfully.

In Australia, twenty one percent of all dialysis patients receive peritoneal dialysis. [10] Patients are offered either Continuous Ambulatory Peritoneal Dialysis (CAPD) or Automated Peritoneal Dialysis (APD). APD has increased in popularity over the past five years, [10] as it is usually performed overnight, allows a person greater freedom, is less time consuming and has demonstrated higher adherence rates. [17] We suggest that the increased APD uptake in Australia reflects the requirements of the more elderly, co-morbid people who prefer APD as a dialysis option.

Transplantation has provided improvements in quality of life, [18] costs and mortality compared with dialysis, however transplant rates are low in Australia and have not improved in the last 30 years. Our transplant rates remain constant while our dialysis incidence increases by approximately eight percent per year. [10] Unfortunately, we predict the transplant rates in Australia will not increase sufficiently to alleviate the pressures on hospital and satellite dialysis units.

The result of the traditional hospital, satellite, home model is what we see today. We currently have over-utilised hospital dialysis units [19,20] full of people who should not be there. [21] Our experience has been that these patients overflow into hospital inpatient beds increasing bed usage and unnecessary hospital Length of Stays (LOS). Nursing and medical staff concentrate on the technical requirements of the dialysis treatment, failing to address the complex primary health needs of these long-term, chronically ill people. [22] Our satellite units take up this slack and frequently are not sufficiently resourced and not designed to provide care for the complex needs of the increasingly co-morbid aged person requiring dialysis care. It is our experience that rehabilitation and primary healthcare needs are not prioritised.

Today patients are being transported from aged care facilities to haemodialysis units, requiring costly transport resources. [23] Patients performing dialysis at home may have limited support [24] and have restricted access to respite. [25] We believe the current system does not meet the needs of our dialysis population.

The residential care dialysis model
We argue that the present model of care is not meeting the needs of the current dialysis population and will definitely not meet the needs of dialysis patients in the future. The patients commencing dialysis are getting older and more dependent. [3,26] The largest increase in patients commencing dialysis is the over 75 age group. [26] We propose that a new model of care featuring a residential dialysis facility may provide an improvement in the delivery of dialysis services. This proposed model might improve patient outcomes and patient quality of life while decreasing the high cost of dependant dialysis patients currently trapped in the hospital system.

The facility would be predominantly nurse-managed, with a medical advisory board consisting of a nephrologist, general practitioner and gerontologist. Medical care, such as medical emergencies, would be managed in the same way they are managed from current satellite centres. In saying this, we believe this model has the potential to decrease unnecessary emergencies given the increased acceptance and confidence with gerontic and palliative care.

The residential dialysis facility would be developed similarly to existing aged care facilities and encompass different levels of care from high care to independent living units for couples and individuals. This would be designed for the major purpose of providing dialysis, both haemodialysis and peritoneal dialysis, to patients at various levels of dependency. Attached to the residential dialysis facility would be a day care haemodialysis treatment area providing dialysis for residents and outpatients. A haemodialysis and peritoneal dialysis home training service could be incorporated into this facility. Thus, the residential day facility would have four levels of care: High, Hostel, Independent and Outpatient.
High Care would be available for patients not sufficiently well to move back home with community support. These may be people who require rehabilitation, wound care or care related to dementia. Thus it is designed for patients who are physically dependent and require high level nursing care. High Care would also facilitate a hospice facility for terminal patients and support for their families. Nursing and allied health staff would be cognisant of chronic kidney care, palliative care and high level gerontic care potentially resulting in improved patients management.

The second level of care, Hostel Care, would be for the semi-independent person who might need slight assistance with activities of daily living. This may be assistance with meals or medications. Hostel Care is for the dialysis patient currently living alone with minimum support at home and perhaps unable to independently travel to dialysis. The facility would have the flexibility to offer high quality dialysis such as APD or nocturnal dialysis requiring limited nursing support.

The third level, Independent Living, would house people requiring dialysis in units with close access to the dialysis unit providing their treatment. They could perform therapies such as APD with minimum support if required. The units could be for patients and their partners. Limited support staff would be required at this level.

The fourth level of care is for those who are currently living at home and would provide them with an area that specialises in aged care dialysis with access to rehabilitation professionals and resources such as physiotherapists, podiatrists and occupational therapists. These people might become more dependent over time. This model would enable these people to move through the care levels without the necessity of being admitted to an acute hospital.

Ideally, management of the residential care facility would be between a private dialysis vendor and the supplier of the residential aged care facility. Instead of a private dialysis vendor, the dialysis aspect could be managed by a public hospital renal unit. The alternative is that the residential aged care facility would have overall responsibility but would sub-contract out the dialysis component to either a private dialysis vendor or to the public hospital renal unit. The variations proposed would depend on local conditions.

Ideally, the private dialysis vendor would provide staffing. Even in the situation of the dialysis unit being run by a public hospital, the dialysis component in terms of machines, consumables and staff, would be outsourced to a private dialysis vendor. It is expected that the aged care facility would provide staff for the residential and nursing care component. It is possible that some of these nursing staff might have dual roles in providing dialysis care and aged care. Nephrologist cover would come from public hospitals or interested private nephrologists.

In Australia, funding would be a combination of both federal and state government funds. We would anticipate that funding from state governments would be on a price-per-treatment basis for dialysis. For peritoneal dialysis this is a little more problematic but the benefit of peritoneal dialysis is that it would be a much cheaper proposal than haemodialysis. Once again the trade-off is that this would be a much cheaper dialysis option for state governments than having patients in acute wards of public hospitals.

**Benefits of the residential care model**

**Decreased costs**

Dialysis and associated costs are significant. [27] They include the direct costs of human and material resources, transport to and from treatment and hidden costs such as the social costs associated with chronic kidney disease. We argue that our proposed model would reduce costs associated with acute hospital admissions, reduced hospital LOS and reduced transport costs. Reduction of acute hospital admissions would result from improved coordination of care and facilities at the residential dialysis care facility, reduced LOS would result from earlier discharges due to improved capacity at the residential facility and reduced transport costs would result from patients close proximity to the dialysis services while living in the residential facility. Although the initial costs of developing a residential dialysis facility would be significant, the decrease in recurring costs would decrease significantly.

Our proposed residential care facility would not be more expensive than current facilities and it would include a residential care facility and a dialysis unit. Cost savings come from the efficiencies in having aged dialysis patients close to their treatment (transport, staff salaries, administration and data management).

Current inflexible patient scheduling decreases the flexibility of hospital and satellite dialysis facilities. The trend of encouraging more frequent dialysis could be managed far better in our facility given the negligible transport issues that restrict this treatment today. Our residential dialysis facility would be more flexible leading to cost savings. Examples of these cost savings would be the increased use of frequent dialysis, increased APD (with minimal but necessary nursing support) and the flexible 24 hour use of the dialysis machines (increased nocturnal dialysis) which...
increases the use of the capital equipment and decreases treatment and depreciation costs.

**Decreased hospital admissions**

Our model provides the potential for decreased admissions to and decreased length of stays in acute hospitals. This is through the coordination of care of an attached Nurse Practitioner (NP) and General Practitioner (GP) resulting in improved standard of dialysis care.

Coordination of care for dialysis patients has been the Achilles heel of our historically developed (but not always planned) current model. Time-poor nephrologists and dialysis nurses are in difficult positions to contribute to the overall complex care that CKD patients require. Coordinated care models in dialysis have been shown to improve patient outcomes and decreased hospital admissions. [28] Our residential dialysis facility model would feature coordinated care by a NP or GP. We believe that the facility manager would engage with the GP and NP to coordinate a patient-centred, advanced care plan.

**Improved quality of life**

We argue that this model would improve quality of life for people living with CKD based on better care coordination, improved dialysis treatment and lower acute hospital admissions. Each person living in the residential dialysis facility would have a coordinated care plan agreed by them for their future care needs. The care plan, based on the Flinders Model [29] and Primary Health Care (PHC) principles, will be a shared plan with the resident and significant others, with the assistance of appropriate healthcare professionals. Patient goals, embracing initiatives such as advanced care directives, would be reviewed frequently and enable the most appropriate healthcare interventions where required. This would result in a considered uptake of patient-centred care with the patient being the major player in their treatment plan.

Improved dialysis treatment would be provided to patients. Longer and more frequent dialysis, using the facilities overnight and decreased transport time would contribute to the improved patient care. This model would facilitate greater uptake of APD, long nocturnal and short frequent dialysis which has been shown to increase flexibility, decrease morbidity and mortality and improve quality of life of people requiring dialysis. [6,15]

Our residential care dialysis model would decrease hospital admissions through improved dialysis treatments, improved nutrition and improvements in healthcare provision such as medication management. CKD patients have high rates of malnutrition [30,31] and are required to take 10 to 20 tablets per day. [32] A residential facility would be able to monitor and improve the nutritional status of patients by individually assessing and assisting with nutritional requirements and by assisting with the complex medication management for these people. For example, a dietitian would only need to be in the one place where most of the nutritionally at risk patients would reside.

Overall, the major advantage of the residential model is its ability to assist those who are losing independence and improve the care of these people. We are not suggesting that this would replace home dialysis training, peritoneal dialysis and smaller satellite dialysis units in regional areas. We believe that different forms of this model can integrate and support current home, peritoneal and satellite dialysis programs.

**Implications for healthcare**

Currently in Australia (and many other countries) states or regions have set up state-wide renal networks. These networks have advised on the establishment of services, which includes decisions on the development of new satellite dialysis units. Our residential care proposal would require collaboration between both the state renal networks and federal government for the development and establishment of a residential care facility. We believe that this application is likely to be successful as the concept has major benefits particularly the freeing up of acute beds in public hospitals.

In the city of Adelaide (approximately one million people) where the authors reside, we predict that two such step-down facilities will be developed (one each in the northern and southern suburbs of the city). However, these centres would not replace existing satellite or community dialysis facilities where many local and Indigenous patients dialyse. The new facility fills a transition gap between patients who are leaving a public hospital and are waiting to return to home dialysis or are unable to return to home dialysis due to co-morbidities. Therefore, these facilities will not replace existing community dialysis facilities.

Measurement of the success of the proposed model would be fundamental to its success. Liaison with national data registries, in our case ANZDATA, and reporting mechanisms to health authorities and specialist organisations, would need to be established. In addition, close inclusion of academic colleagues would facilitate common research collaborations with the aim of measured positive patient outcomes such as improved quality of life and decreased morbidity measured by decreased hospitalisation.
There is both a local and global requirement for us to re-think our dialysis service models. Dialysis patients are ageing and becoming more dependent [3] and we will need to continue to adapt to these changes. The residential dialysis proposal has implications for health administrators, clinicians, researchers and patients. We believe health administrators are obligated to search for new service models to address the burgeoning costs and poor patient outcomes of chronic kidney disease. Clinicians can explore and debate the benefits and negatives of new service delivery models. Researchers can explore and further refine the effect of this new model using rigorous research methods. Patients will benefit from positive changes addressing need in dialysis service delivery.

**Limitations**

The residential care model we have presented has not been tested and is still a theoretical proposal and thus there has been limited empirical research to support the model’s influence on improved outcomes. A full cost and funding analysis is beyond the scope of this article as it was written to encourage discussion and stimulate us all to re-think our own dialysis services. We envisage that this model can be incorporated into a mixed private/public managed partnership however this is yet to be examined.

**Conclusion**

This paper has presented a strategy that may contribute to improved service delivery and improved patient outcomes for people with chronic kidney disease requiring dialysis. In particular the proposed residential dialysis facility would benefit those people who require greater assistance than the current model offers. We believe that this idea is worth pursuing and is worth researching in order to assess its value to healthcare for persons with chronic kidney disease.

**Competing interests**

The authors declare that they have no competing interests.

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