IS THERE AN INTEREST IN IMPLEMENTING A MULTIDISCIPLINARY CLINIC OR RENAL CARE NETWORK TO IMPROVE THE PROGNOSIS OF PATIENTS WITH CHRONIC KIDNEY DISEASE?

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ABSTRACT

Chronic kidney disease (CKD) is highly prevalent in several countries and is associated with the incidence of end-stage renal disease (ESRD) and also with premature morbidity and mortality, especially from cardiovascular origin. However, efficient treatments have existed for two decades but have not led to major decrease in either ESRD incidence or premature death of CKD patients. Some authors suggested that the deliverance of suboptimal care can explain, at least partly, these disappointing findings. Several observational studies support this idea by showing that some recommended medications are under-prescribed in CKD patients, and that some patients are sometimes insufficiently monitored for clinical and biological parameters. Therefore, new models of renal care deliverance have been developed, trying to optimise patient treatment with the hope that it could positively impact their outcomes. In this article, we will focus on the multidisciplinary clinic and the renal care network models and we will review the results of the main studies that sought to test the impact of these new structures on patient's prognosis. Although most of these studies are observational, they predominantly show a positive effect on renal prognosis and also survival. However, the only one randomised clinical trial with long-term follow-up failed to find any positive effect despite increased cost. Therefore, more evidence, based on results of randomised clinical trials, is needed before a wide implementation of this kind of program.

Keywords: Chronic kidney disease, quality of care, multidisciplinary care model, renal care network.

INTRODUCTION

Chronic kidney disease (CKD) is an increasingly prevalent progressive disease that ultimately leads to the requirement of chronic renal replacement therapy (RRT). This treatment is associated with high morbidity and mortality and a significant reduction in the quality of life for patients. Furthermore, this is an expensive care that has to be supported by the health care system. Therefore, the prevention of the progression to end-stage renal disease (ESRD) and of the premature deaths of CKD patients is of paramount importance and has become a public health issue.[1] Clinical studies have been led to find an efficient treatment to improve CKD patient prognosis.[2,3] Nevertheless, there has been no significant decrease in the incidence of ESRD in developed countries over the last 10 years.[4,5] Moreover, even if the mortality rate of non-dialysis CKD patients tends to decrease, it remains higher comparatively to non-CKD patients in the USA.[4] Although several factors may be involved, some authors emphasise the role played by suboptimal care delivered to CKD patients.[6] The inappropriate coordination of care, the lack of communication between the healthcare professionals (HP), and a certain degree of therapeutic inertia might explain the deliverance of suboptimal care.[6,7] This has led nephrologists to question how to provide multidisciplinary care in an efficient way to CKD patients. In this process, two different models have emerged: the multidisciplinary clinic (MDC) and the

dedicated renal care network (RCN). In this review, we will focus first on the recent Kidney Diseases Improving Global Outcomes (KDIGO) guidelines[8] about non-dialysis CKD management and then on the results of studies that sought to evaluate the quality of care received by CKD patients. We also focus on other studies which have found a link between this quality of care and patient prognosis. Finally, we will talk about the results of studies that aimed to test the impact of MDC or RCN on CKD patient outcomes.

What Do the KDIGO Guidelines Tell Us About Nephrologist Referral and the Model of Care?

The most recent clinical guidelines about the evaluation and management of CKD came from the KDIGO foundation and were published in January 2013.[8] An entire chapter has been dedicated to the clinical situations justifying a specialist consultation. Additionally, in this chapter some recommendations have been made about the model of care that should be used to optimally treat patients with progressive CKD. Amongst the situations that should lead to a nephrologist consultation we find the occurrence of acute kidney injury or of a rapid decrease of glomerular filtration rate (GFR), the progressive nature of CKD or the existence of a persisting proteinuria or haematuria. Regarding the level of estimated GFR (eGFR) which justifies specialist referral, irrespective of the presence of other factors, the work group advises an eGFR of less than 30 ml/min per 1.73 m^2. The level of evidence assigned to these guidelines is moderate. Moreover, the work group stresses the importance of evaluating the risk of requiring renal replacement therapy in the next 12 months for patients with progressive CKD, and in cases of a risk above 10-20%, they recommend referral of the patients. The level of evidence is moderate for this recommendation and relies on several studies and two meta-analyses. The benefits of timely referral of patients for preparing RRT are based on mortality (the 1 year mortality was decreased by more than 50%), morbidity (shorter length of stays in the hospital) and on the cost of the care. Finally, the work group also suggest that patients with progressive CKD should be managed in multidisciplinary care framework (level of evidence moderate) with access to dietary counselling, education, and psychological and social care. However, they did not suggest any particular model that would be the most suitable for reaching care appropriateness and state that the implementation of this structure may be customised to specific circumstances. As a conclusion, it can be said that these recommendations clearly express the clinical situations requiring a nephrologist referral, emphasise the crucial matter of the timely referral of patients with progressive CKD, and underline, for the first time, the importance of multidisciplinary care to reach the clinical targets enabling to ameliorate patient outcomes.

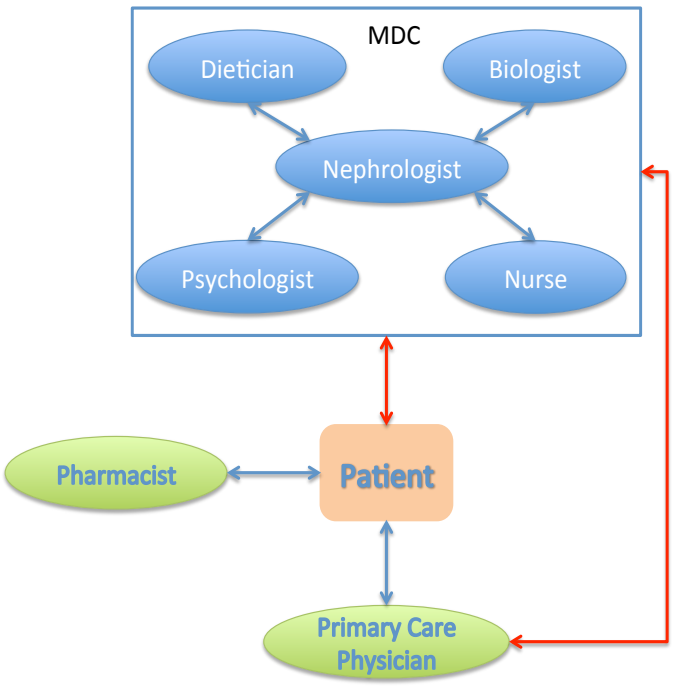

Figure 1. Multidisciplinary care model for chronic kidney disease patients. Arrows represent the interaction between the healthcare professionals and the patient.

Care of CKD Patients Could Be Optimised

Several studies showed that care for CKD patients could be optimised. Kausz et al.[9] showed, in an observational study of 600 patients with average eGFR of 22.2 ml/min/1.73 m^2, that both the frequency of biological parameters monitoring and of recommended therapeutic agents prescription were low in CKD patients. These findings were associated with a low proportion of patients achieving targets for the control of anaemia and calcium/phosphate disorders. In another large sample of American patients with moderate to severe CKD, Nissenson et al.[10] found that the prevalence of patients with an angiotensin-converting-enzyme inhibitor (ACEI) prescription ranged from 5% to 59% (although the proportion of CKD patients in USA with hypertension is 74% according to the US renal data system (USRDS) report).[5] Interestingly, there were no differences in ACEI prescription rates between patients who visited a nephrologist and

those who did not. Finally, they also found a low prevalence of Erythropoietin (EPO) prescription (7.4%) despite 36.2% of patients with haematocrit below 33%.[10] When we focus on the cardioprotective treatments prescription in CKD patients, the rate of prescription of this kind of treatments is also low. In a Canadian study, which included 304 patients with creatinine clearance <75 ml/min, the authors focused on the prescription rate of cardioprotective treatments. They found that cardiovascular disease (CVD) history was present in 38.5% of the patients and that several cardiovascular risk factors were highly prevalent (hypertension 80%, diabetes 37.5%, hyperlipidemia 43.4%). Nevertheless, they also found a low prescription rate of aspirin (45.3%), renin-angiotensin system (RAS) blocker (63.2%) and beta-blocker (50.4%). Moreover, among patients with known hyperlipidaemia, statin was prescribed in only 49%.[11] Taken together, these results suggest that the care of CKD patients could be improved at several levels: monitoring of biological parameters, renoprotective and cardioprotective treatments, and treatment of the metabolic complications of CKD.

Beside data about the care of the general population of the CKD patients, some investigators have studied specific populations at increased risk of adverse outcomes. Kausz et al.[12] studied the issue of care adequacy in a subset population of American patients aged over 67 years. In this study, the authors found that a low proportion of diabetic patients with CKD had been tested for HbA1c assay or fundus examination during the two year period before dialysis started (75% and 60% respectively). In addition, the proportion of CKD patients having been properly tested for anaemia condition (iron studies and research of occult blood in stool) and parathyroid hormone (PTH) was low (less than 50% and 15%, respectively), with an even lower proportion in the population of patients subsequently treated by haemodialysis. Lastly, the results of this study show that CKD patients were less frequently screened for cancer and were also less likely to receive some immunisations, despite a more frequent monitoring for hyperlipidaemia and heart conditions.

Several studies have also focused on the care delivered to CKD patients with heart failure (HF), a population that raises particular concern due to a growing prevalence of HF in American CKD patients, and a high mortality rate.[5] Furthermore, this population is also of interest because the prescription of some medications is recommended by both the guidelines for treatment of CKD and those for HF treatment (leading to expectation of a higher prescription rate of these treatments). In 2004, Ezekowitz et al.[13] analysed data from the Canadian prospective cohort APPROACH (6,427 patients with HF and with coronary artery disease ascertained by angiographic sutdy) in which 39% of the patients had creatinine clearance below 60 ml/min. The comparison of three groups categorised according to the level of eGFR (>60 ml/min, between 30 and 60 and <30 ml/min) showed that the proportion of patients receiving aspirin or other antiplatelet agents, beta-blockers, RAS blockers and statins lowered as renal function decreased. In patients with eGFR below 30 ml/min, the prescription rates of aspirin, beta-blockers, and RAS blockers were respectively 67%, 52% and 52%. In another Canadian cohort of patients with CKD and HF, McAlister et al.[14] also showed that the CKD patients were less frequently treated with certain therapeutic agents like ACEI, beta-blockers and spironolactone while they were receiving diuretics more often. The rate of prescription of RAS blockers and beta-blockers were respectively 75% and 34% in patients with CKD stage 4 or 5 while it was 92% and 57% in patients with eGFR >90 ml/min.[14] Taken together, these findings suggest that the prescription rate of some pivotal drugs for HF and CKD treatment, like ACEI, are quite low. In addition, other recommended types of drugs are probably under-prescribed as well. Therefore, it is likely that patients with both CKD and HF are more prone to suboptimal treatments. Thus, there is an opportunity for improvement that could possibly lead to less morbidity and mortality in these patients.

Impact of the Quality of Care on Patient Outcomes

The first step in order to improve outcomes of patients with advanced CKD seems to be the referral to a nephrology consultation. This is especially justified in the 1 to 2 year period before starting dialysis, when patients request adequate preparation for dialysis treatment. It is well known that late referral of patients leads to start acutely RRT, which is largely detrimental for early outcomes in dialysis.[6] The importance of the nephrologist visit has been underlined by two large observational and retrospective studies from the DOPPS that showed a 35% decrease of patient mortality during the first 4 months of dialysis treatment in patient groups that have been followed by a nephrologist[15] and a 43% decrease of mortality in the first year.[16] In patients with less severe CKD, Jones et al.[17] showed that nephrology referral allowed a decrease in the renal disease progression

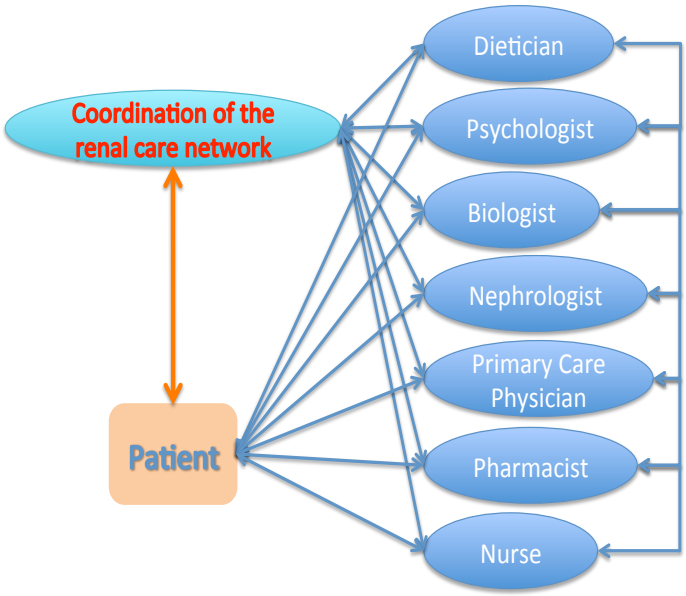

Figure 2. Renal care network model for chronic kidney disease patients. We can note the existence of a structure dedicated to the care coordination and the manifold interactions between the healthcare professionals and the patient.

and that this effect was associated with significant improvement in patient survival over a 1 year period. However, if we refer to some results of previously cited studies about CKD patient care, some further improvement seems possible, even in the case of a nephrologist follow-up.

In France, Thilly et al.[18] conducted the AVENIR study, which aimed specifically to study the impact of pre-dialysis care on early patient outcomes after dialysis start. In one published report, they showed that physicians failed to reach recommended blood pressure and proteinuria level in a high proportion of CKD patients in the year before starting dialysis (respectively 75% and 85%) and that this result was not modified when the patients had been followed-up by a nephrologist. Although there was more intensive treatment of patients when a nephrologist followed them, the lack of differences can be explained by a trend to preferentially address the most severe patients to a nephrologist. In another study, this team aimed to describe the proportion of patients reaching the clinical target for the control of the metabolic complications linked to CKD. The clinical objectives were achieved in a variable proportion of cases, sometimes low (16.7% to 72.4% depending on parameters considered) and 12.2% of the patients have been considered as receiving low quality care. In addition, the authors showed a low prescription rate of some medications (vitamin D, bicarbonates, statins) that has probably contributed to the previous findings. Even more interesting was their observation that, after adjustment, the quality of care and the number of nephrology consultations were positively related.[19] Finally, they have recently shown that the quality of care was also positively related to the patient's 1 year survival on dialysis.[20] Taken together, these results show the impact of the care provided by the nephrologist (that could theoretically lead to better survival) and suggest that the quality of care could be related to the number of nephrology consultations. Interestingly, this research group also found that the quality of care and the time since referral to a nephrologist can independently impact the quality of life (QoL) of patients at dialysis onset.[21] This is an important finding because it is known that the QoL of patients with severe CKD is greatly impaired[22] and that few interventions are available to improve it.

Two Models of Multidisciplinary and Coordinated Care to Improve the Prognostic of CKD Patients

The first model is generally called multidisciplinary clinic (MDC), but also can be named 'low-clearance clinic'. In this model, every kind of HP involved in the treatment of CKD patients is in the same place (nephrologists, dieticians, nurses, pharmacist etc.). MDC is commonly intended for patients with advanced CKD that require enhanced monitoring with quite frequent consultations. Because of its multidisciplinary nature, this type of structure allows a theoretically appropriate coordination of the different treatments, leading to optimal care for patients (Figure 1). In theory, MDC can also provide educational sessions that allow enhancement of patient understanding of their disease in order to motivate them and help to improve QoL. The second model is called renal care network (RCN), which is a care network dedicated to the treatment of CKD patients. Compared to the MDC, which centralises care in the same location, RCN allows more 'flared' care, favouring the maintenance of ambulatory links with HP located outside of the hospital. The communication and coordination between HP are provided by the availability of electronically-shared medical records and a dedicated coordination staff (Figure 2).[23] As in the MDC, RCN can deliver education to the patients.

Several investigators in different countries have tested the clinical efficacy of MDC and RCN on the outcomes of CKD patients (Table 1). The studies

Table 1. Studies that have assessed the effect of multidisciplinary clinic (MDC) or renal care network (RCN) on outcomes of patients with chronic kidney disease (CKD).

	CKD Severity	Study type	Country	Number of patients included	Intervention	Main endpoint	Length of follow up	Result	Others
Rognant et al.	Predialysis	Observational (2013)	France	160	Dedicated renal care network	Composite: CV mortality or events	One year before and after dialysis start	Negative	Positive effect on eGFR decrease and hospitalisation days per patient
Curtis et al.	Predialysis	Observational (2005)	Canada/ Italy	288	MDC	All cause mortality	Median follow up of 14 months	Positive	Positive effect on the control of biological parameters
Goldstein et al.	Predialysis	Observational (2004)	Canada	87	MDC	All cause-mortality	3 years	Positive	Reduced hospitalisations days and positive effect on the control of biological parameters
Hemmelgarn et al.	CKD	Observational (2007)	Canada	374 (patients >66 years)	MDC	All cause mortality	3.5 years	Positive	No effect on hospitalisations
Hotu et al.	CKD	Randomised clinical trial (2010)	New Zealand	65 (diabetic patients)	Community-based medical care	BP control	One year	Positive (for systolic BP)	Larger proteinuria decrease and better prevention of LV mass increase
Harris et al.	CKD	Randomised clinical trial (1998)	USA	437	MDC	eGFR decrease and all cause mortality	5 years	Negative	More frequent consultations and significant cost increase
Wu et al.	MRC	Observational (2009)	Taiwan	573	MDC	ESRD incidence, all-cause mortality, hospitalisations	One year	Positive	Positive effect on the control of biological parameters
Bayliss et al.	MRC	Observational (2011)	USA	2002	MDC	eGFR decrease	Mean follow up of 2 years	Positive	No effect on the control of BP, HbA1C and lipids

are mainly observational and retrospective and, so far, just two randomised controlled trials (RCT) have been reported in the field.[24,25] Moreover, some studies included patients with severe CKD and were interested in the outcomes of patients in the early dialysis period, though others included patients with less advanced CKD and evaluated mainly the effect on CKD progression (Table 1).[24,26-31] The first study by Harris et al.[24] was a RCT including 437 patients with mean eGFR of 34 ml/min. The authors found no differences between the two groups after a follow-up of 5 years, even with an important increase of the cost of patient care due to more frequent consultations. The second, by Hotu et al.[25] was positive for progression of CKD in diabetic patients but the intervention, although close to the RCN model, was pretty atypical and the follow-up was of 1 year only.

Other studies were observational, with some including prospective follow-up. The follow-up duration was generally short, leading some authors to question the long-term benefit of the MDC.[32] However, it may be noted that even an unsustainable effect is not without interest for the patients, particularly for care delivered in the predialysis period. It seems likely that some studies have looked at the impact of optimised care of the patients during this period because of their potentially important impact on patients' subsequent outcomes.[28,29,31]

The studies were mainly positive for primary outcome, including one with the longest follow-up, which showed a 50% decrease of all-cause mortality in Canadian patients aged 66 years or more and presenting mainly stage 4 CKD.[30] Three studies showed a positive effect on mortality during early dialysis period[28,29,31] while another showed a positive effect on CKD progression in patients with less severe CKD.[27] An interesting study is the one by Jones et al.[33] that tested the effect of a RCN without nephrology consultation (but with remote management by a nephrologist) on the outcomes of CKD patients with a less severe health condition otherwise. The authors showed that around 30% of CKD patients referred to the nephrology department can be managed appropriately on a period of three years, with a hazard ratio for death reduced by 36% in the RCN group (however, largely explained by the initial selection of patients).[33] Finally, our recent study is, to our knowledge, the only one that tested the impact of a true RCN on patient outcomes during the early dialysis period. Although the main outcome was not different between the two groups, we found a positive effect on several secondary endpoints, including CKD progression and the rate of hospitalisation per patient during the 1 year before and the year after dialysis started.[23]

LIMITATIONS

Although the results of most of these studies are positive, it should be considered that there are some limitations that prevent unequivocal conclusions about the effect of MDC and RCN. In addition to the short follow-up of most of these studies, just two studies are RCT and the evidence brought only by observational studies is weaker because of the presence of potential confounders. Another clinical trial by Devins et al.[34] was not included in this review because of the intervention that was not really multidisciplinary (i.e. involving HP like dieticians, nurses, etc.) and was mainly based on psycho-educational care which is beyond the scope of this review, even if education of the patients is part of the MDC intervention.[34]

Another limit that has been mentioned by Van Biesen et al.[32] is that the patients were included in the MDC on a voluntary basis in several studies. As such, we can suppose this has created a bias in their results because these patients are probably more implicated and motivated in their care. Thus, Van Biesen et al.[32] underlined the potential effect of this bias on the impact of educational sessions: because these sessions are more likely to benefit well-motivated patients, that could have artificially increased the true effect of MDC (and therefore preclude its generalisability). Another drawback of this selection bias is the possible inclusion of patients who are more compliant about treatment and dietetic in the treated group. However, if this potential selection bias could explain a part of the positive effect associated with MDC or RCN, it is also probable that optimised care exerts a positive effect through others factors like prevention of iatrogeny and better vascular access management. Finally, another limitation is the lack of data regarding cost-effectiveness of such interventions. To our knowledge, there is no study on this issue and this should be requested before considering a large-scale implementation.

CONCLUSION

Several studies suggest that an optimisation of CKD patient treatment is needed in order to prevent renal disease progression and premature death of these patients. In addition, efficient therapeutic interventions are needed in order to improve the QoL of these patients. Although some studies suggest a possible global benefit of care when delivered in the context of MDC and/or RCN comparatively to conventional care, more robust evidence, which should come from RCT, are awaited to draw definitive conclusions about the positive effect of these models on CKD patient outcomes. Besides that, it would be interesting to try to define a critical amount of renal care exposure that would allow the avoidance of adverse patient outcomes during the early period following the dialysis start.

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