Dedication of a nurse to educating suboptimal haemodialysis starts improved transition to independent modalities of renal replacement therapy

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Abstract

Background. Haemodialysis (HD) initiation is unplanned in up to 50% of patients, mainly due to late diagnosis and/or late nephrology referral. In these patients, time does not permit the multidisciplinary predialysis care that is associated with increased independent renal replacement therapy (RRT) modality choice and better access to kidney transplantation. We established a Renal Triage Nurse (RTN) position to educate suboptimal HD starts and to facilitate transition to independent modalities of RRT.

Methods. Adult patients starting HD from 1 January 2005 to 31 December 2008 with <180 days nephrology follow-up and surviving at least 180 days were included (suboptimal HD starts). The RTN educated suboptimal HD starts beginning in December 2006. Patients initiating RRT via the multidisciplinary predialysis clinic (MPC) were included for comparison. Multivariable logistic regression was used to determine the association between being seen by the RTN and achieving independent modalities of RRT.

Results. There were 176 patients: 78 suboptimal HD starts (38 of these were educated by the RTN) and 98 patients initiated RRT at a minimum 180-day follow-up at the MPC. Of the RTN patients, 27.8% switched to independent RRT modalities (peritoneal dialysis n = 7, home haemodialysis n = 1, transplant n = 2). RTN patients were more likely to live alone (33.3% versus 10.8%, P = 0.02) and to have cerebrovascular disease (25.0% versus 7.1%, P = 0.03); however, adjusting for these variables, suboptimal HD starts seen by the RTN were more likely to transition to independent RRT (OR 3.75, 95% CI 1.08–13.05) than those not seen. The proportion starting on an independent modality via the MPC was 39.8%. The RTN achieved a rate of independent RRT not statistically different to that observed in patients starting RRT via the MPC (OR 0.74, 95% CI 0.19–2.94 in multivariable analysis).

Conclusions. Addition of the RTN to the HD care team facilitated transition to independent modalities of RRT in suboptimal HD starts. This standardized approach to the care of such patients should be considered in HD units where suboptimal HD starts are common.

Keywords: independent dialysis; peritoneal dialysis; predialysis education; nurse educator; suboptimal haemodialysis start

Introduction

Despite the fact that 56% of nephrologists and renal nurses view independent modalities of renal replacement therapy (RRT) as best for their patients, at most only 15% of dialysis patients are on independent modalities worldwide [1]. This is undoubtedly related in part to the fact that dialysis initiation is unplanned in up to 50% of patients, mainly due to late diagnosis and/or late nephrology referral [2–5]. In such cases, time does not permit the multidisciplinary predialysis care that is associated with increased independent dialysis modality choice [i.e. peritoneal dialysis (PD) and home haemodialysis (HHD)] and better access to kidney transplantation [6–12].

Unplanned, or ‘suboptimal’, dialysis starts include patients diagnosed with end-stage renal disease (ESRD) during hospitalization, outpatients with a late diagnosis of kidney disease and/or late referral to nephrology and outpatients known to nephrology who have an unexpectedly rapid deterioration in kidney function or who are lost to follow-up [5]. Their default initial dialysis modality is generally haemodialysis (HD) via a central venous catheter (CVC), which is associated with an increased risk of infection, hospitalization and mortality compared to HD with an arteriovenous fistula (AVF) or graft [9,13–15]. Furthermore, such patients often remain on conventional HD and lose the potential benefits associated with independent modalities of RRT including lifestyle benefits (e.g. treatment closer to home, improved dietary freedom and ability to work), health benefits (particularly in the case of nocturnal HHD and early kidney transplantation) and cost savings to the health care system [16–23].

The optimal approach to the care of suboptimal HD starts is not addressed by currently available clinical practice guidelines which focus on patients with recognized chronic kidney disease progressing at a rate that allows...
timely education and advanced planning for RRT [24,25]. To address this important gap in patient care, we established a ‘Renal Triage Nurse’ (RTN) position in our hospital-based HD unit dedicated to the education of suboptimal HD starts with the specific objective of facilitating transition to independent modalities of RRT (i.e. PD, HHD and live donor kidney transplantation).

Our approach to the care of suboptimal HD starts is presented in this report. To assess the effectiveness of this model of care, we focused on the following major objectives: (i) to determine whether the RTN was able to increase the likelihood of transition to independent RRT modalities and (ii) to compare the renal replacement modality of suboptimal HD starts educated by the RTN to that of the patients educated by the multidisciplinary predialysis clinic (MPC).

Materials and methods

This was a retrospective cohort study of patients starting RRT at the Vancouver General Hospital (VGH), a tertiary care teaching hospital affiliated with the University of British Columbia (Vancouver, Canada) with an in-hospital HD unit accommodating 180 patients. For most patients, HD is administered for 4 h, three times per week using high-flux dialysis membranes. Clinical and laboratory (e.g. haemoglobin and serum albumin) data were collected prospectively for patients followed by the RTN. For all others, data were abstracted by chart review and using PROMIS, an electronic medical record for chronic kidney disease patients in the province of British Columbia.

Patient selection

Suboptimal HD start patients. All patients starting HD at VGH from 1 January 2005 to 31 December 2008 and surviving at least 180 days were considered for inclusion. A minimum 180-day survival was used to select for individuals living long enough to allow time for education and a potential modality switch. The RTN position was established on 1 December 2006. Suboptimal HD starts were defined as patients who started HD within 180 days of initial outpatient consultation with a nephrologist, individuals who saw a nephrologist only once even if more than 180 days elapsed between this visit and HD start date (indicating loss to follow-up or unexpected deterioration in kidney function) and patients diagnosed with ESRD during a hospital admission. Late referral is variably defined in the literature at between 4 and 12 months from RRT start [2,3,25,26]. We chose 180 days based on our experience that this is the minimum time required for education and creation of a functioning AVF for the majority of patients choosing HD. All patients in this group commenced dialysis via a CVC. If the initial catheter was a non-tunneled line, patients transitioned to a tunneled line within the first 2 weeks.

MPC patients. Patients initiating RRT via the MPC were included for comparison of RRT modalities with patients educated by the RTN. The personnel dedicated to patient care at the MPC included physician, nurse, dietician, pharmacist and social worker. All patients with a minimum follow-up of 180 days at the MPC and initiating RRT (dialysis or live donor kidney transplant) between 1 December 2006 (same date that RTN position was established) and 31 December 2008 were included.

Study exclusion criteria included acute kidney injury, previous RRT (including kidney transplant) for any reason and patients transferred from other health authorities.

Suboptimal HD start triage and education process

A weekly multidisciplinary HD meeting (nephrologist, HD unit charge nurse, pharmacist, dietician, social worker, vascular access nurse) was established in 1997 to review incident HD patients with respect to blood pressure, goal weight, medications, nutritional status, laboratory variables, other pertinent medical issues (e.g. cardiovascular disease) and social circumstances impacting on care. The potential for modality switch was also considered; however, prior to the establishment of the RTN position, no personnel was specifically dedicated to patient education regarding modality choice. In December 2006, with the support of the British Columbia Provincial Renal Agency (BCPRA), the RTN position was added to the team to address modality selection in suboptimal HD starts. Suboptimal HD starts were referred by a nephrologist to the RTN upon initiation of HD using a standardized referral form. The RTN usually met with patients during their scheduled treatments in the hospital-based HD unit. On occasion, further discussion was arranged outside of the patient’s regular dialysis time, either in person or by telephone. The RTN assessed and educated the patients as follows:

1. Initial assessment: chart review; interview(s) with patient and, if relevant, next-of-kin/caregivers; and review of the assessments of other team members (e.g. assessment of home life by the social worker).
2. Suitability for independent modalities: advantages, potential barriers and contraindications to independent RRT modalities were identified using standardized criteria including the Match-D tool (designed specifically to aid assessment of suitability for home dialysis modalities) [27].
3. Education: during face-to-face meetings, the RTN assessed the patient’s preferred learning style taking into account the patient’s language, literacy, education and their expressed preferences (e.g. web-based information versus reading material). Education was then tailored to the individual with resources including individual counselling, written material, audio/visual material, web browsing and group discussions. Most resource materials were obtained from Baxter Healthcare, the United States National Kidney Foundation and the Kidney Foundation of Canada. In addition, all patients were given the opportunity to watch a DVD produced by the BCPRA entitled ‘Patient to Patient: Kidney Care in BC’. The DVD outlines RRT modalities and is available in English, Cantonese, Mandarin, Punjabi and Tagalog.
4. Modality choice: if no contraindications or significant barriers were identified, patients were encouraged to consider independent modalities of RRT. The RTN initiated referral for PD catheter insertion, permanent HD vascular access creation, HHD assessment and/or kidney transplant assessment as appropriate and in consultation with the nephrologist.
5. Follow-up: the RTN followed the patient until a long-term plan for RRT was established.

Outcomes

The primary outcome of interest was the likelihood of suboptimal HD starts switching to an independent RRT modality by 180 days after HD start in patients assessed by the RTN versus those not assessed. Independent RRT modality was defined as PD, HHD or live donor kidney transplant (no patient received a deceased donor transplant). The secondary outcome of interest was a comparison of the likelihood of independent RRT modality (at 180 days) in the suboptimal HD starts educated by the RTN versus that in the ‘planned’ starts initiating RRT via the MPC.

Statistical considerations

Baseline characteristics were summarized using proportions or mean (standard deviation), and comparisons were made using the Chi-squared or t test, as appropriate. The number of RTN visits and RTN time spent per patient was summarized using median [interquartile range (IQR)]. For outcomes expressed as proportions, comparisons were made using the Chi-squared or Fisher’s exact test. Potential confounders for multivariable analysis were determined based on a threshold statistical significance of $P \leq 0.2$ in univariate analyses. Two multivariable logistic regression analyses were performed: (i) comparison of RRT modality at 180 days in suboptimal HD starts seen by the RTN to those not seen by the RTN and (ii) comparison of RRT modality of suboptimal HD starts seen by the RTN (assessed at 180 days after HD start) to the first modality of patients initiating RRT via the MPC (followed for at least 180 days prior to RRT start).

All suboptimal HD starts after 1 December 2006 were seen by the RTN except for 11 patients who were not seen due to transient lack of staffing of the position. These patients were included in the ‘not seen by RTN’ group. Analyses were repeated with and without these individuals to determine any effect on the outcomes of interest.
Statistical analyses were performed using SAS version 9.3. All P-values were two tailed, and P-values < 0.05 were considered statistically significant. This study was approved by our hospital Clinical Research Ethics Board.

Results

During this 4-year study, 309 patients started RRT with <180 days of follow-up by nephrology; all started HD via a CVC as the initial modality. Many of these HD starts were hospitalized patients with acute kidney injury who recovered self-sustaining renal function (n = 139, 45%). Of the remainder, 57 patients (18.4%) died (most of whom died during hospitalization complicated by acute kidney injury), 16 patients (5.2%) withdrew from dialysis and 19 patients (6.1%) were transferred to other hospitals or lost to follow-up (Figure 1). The remaining 78 patients remained on RRT at 180 days and were included in the study as suboptimal HD starts. Of these suboptimal HD starts, 52 patients (67%) were followed by a nephrologist for <1 month or were diagnosed with ESRD during a hospital admission, 11 (14%) were followed for 1–3 months, 14 (18%) were followed for 3–6 months and 1 patient saw a nephrologist only more than 6 months prior to HD start.

Over the same time period, 192 patients initiated RRT via the MPC (with at least 180 days nephrology follow-up). The initial RRT modality is shown in Figure 1. Only 98 of these patients starting RRT via the MPC after 1 December 2006 were included in the statistical analyses to ensure that all comparisons to the suboptimal starts seen by the RTN were made using contemporaneous populations.

Comparison of suboptimal HD starts seen by the RTN to those who were not

In our HD unit, 42% of patients starting HD were suboptimal starts in the time period between the establishment of the RTN position and study end (1 December 2006–31 December 2008). Thirty-six of 78 (46.2%) suboptimal HD starts were seen by the RTN. Patients were similar in

![Fig. 1. Patients starting RRT from 1 January 2005 to 31 December 2008. Abbreviations as follows: RRT, renal replacement therapy; MPC, multidisciplinary predialysis clinic; RTN, renal triage nurse; HD, haemodialysis; PD, peritoneal dialysis; LD transplant, living donor transplant. *Refers to the patient groups used for modality comparison in the study.](image-url)
both groups with respect to baseline characteristics; however, those seen by the RTNs were more likely to live alone (33.3% versus 10.8%, P = 0.02) and to have comorbid cerebrovascular disease (25.0% versus 7.1%, P = 0.03) (Table 1).

The RTN spent a median education time of 5.6 h (IQR 1.5–9.2 h) over a median of 8 visits (IQR 3–8 visits) per patient. At 180 days from HD start, 10 of 36 (27.8%) suboptimal HD starts in the RTN group switched to an independent RRT modality as follows: 7 switched to PD, 1 switched to HHD and 2 received a live donor kidney transplant. Only 6 of 42 (14.3%) suboptimal HD starts not seen by the RTN switched RRT modality as follows: 3 switched to PD, 1 switched to HHD and 2 received a live donor kidney transplant. Although this difference was of borderline statistical significance (P = 0.08), logistic regression analysis adjusting for the variables living alone and comorbid cerebrovascular disease demonstrated that patients seen by the RTN were significantly more likely to be on an independent RRT modality at 180 days than those not seen (OR = 3.75, 95% CI 1.08–13.05) (Table 2). There was also a trend toward an association between living alone and a lower likelihood of transitioning to an independent RRT modality (OR 0.14, 95% CI 0.02–1.24; P = 0.18); however, this did not reach statistical significance, possibly due to the relatively small sample size.

In univariate analysis, albumin level reached the threshold for inclusion in the multivariable model (P = 0.17). The logistic regression model including serum albumin gave similar results to the one adjusting only for the variables living alone and cerebrovascular disease. Furthermore, in the multivariable analysis, albumin level was not significantly associated with the outcome of interest (OR 1.14, 95% CI 0.98–1.32). Since 11 patients were missing serum albumin values, we presented the model without serum albumin in Table 2 so that all the patients were included.

Table 2. Multivariable logistic regression analysis of factors predicting switch to independent RRT modalities in suboptimal HD starts at 6 months after dialysis initiation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio</th>
<th>95% Confidence limits</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seen by RTN</td>
<td>3.75</td>
<td>1.08–13.05</td>
<td>0.04</td>
</tr>
<tr>
<td>Lived alone</td>
<td>0.14</td>
<td>0.02–1.24</td>
<td>0.18</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>0.60</td>
<td>0.10–3.67</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Continuous variables are expressed as mean (standard deviation).

*Estimated glomerular filtration rate (GFR) was calculated using the four-variable MDRD equation [35].
by the RTN due to staffing difficulties, 2 recovered renal function after being on dialysis for more than 180 days, 1 received a live donor kidney transplant and 1 switched to PD. Exclusion of these patients from the analyses did not substantively affect our results.

Comparison of patients followed in the MPC to suboptimal HD starts seen by the RTN

Baseline characteristics of suboptimal HD starts seen by the RTN were compared to patients starting any modality of RRT via the MPC. Suboptimal HD starts were more likely to be of white race (P = 0.01 for white versus any other race) and to have lower haemoglobin (92 versus 112 g/L, P < 0.001) and serum albumin levels (28.3 versus 37.5 g/L, P < 0.001) at RRT start. There were no significant differences in sex, age, presence of diabetes, primary renal disease or other laboratory variables (Table 3).

Of the 98 patients followed at the MPC for at least 180 days prior to RRT start, 59 patients (60%) started on hospital-based HD, 26 (27%) on PD, 3 (3%) on HHD and 10 (10%) received a pre-emptive live donor kidney transplant. Thus, a total of 39.8% started RRT on an independent modality compared to the independent RRT modality rate of 27.8% achieved by the RTN (P = 0.20). Logistic regression analysis adjusting for age, sex, race, serum albumin and haemoglobin levels confirmed no statistical difference in the rates of independent RRT modality achieved by the RTN (assessed at 6 months after HD start) and those achieved by the MPC (assessed at RRT start) (OR 0.74, 95% CI 0.19–2.94) (Table 4). In this model, higher serum albumin levels were predictive of an increased likelihood (OR 1.10, 95% CI 1.01–1.20), and advancing age was predictive of a decreased likelihood (OR 0.95, 95% CI 0.92–0.97) of achieving an independent RRT modality.

Discussion

Suboptimal HD starts were common in our HD unit, accounting for 42% of incident HD patients during the time period from establishment of the RTN position to study end. This large group of patients is neglected in current models of care. We addressed this lack of focus in our hospital-based HD unit by creating the RTN position, as an addition to the dialysis care team, to provide a systematic approach to the education of suboptimal HD starts with the hypothesis that informed decision-making would improve transition to independent modalities of RRT. The commitment required from the RTN to complete the education process was significant at almost 6 h over eight visits per patient; however, the time spent was rewarded by an improvement in transition to independent modalities of care: patients educated by the RTN were 3.75 times more likely to switch to PD, HHD or live donor kidney trans-

Table 3. Comparison of baseline characteristics of suboptimal HD starts seen by the RTN to patients initiating RRT via the multidisciplinary predialysis clinic

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>RTN patients</th>
<th>MPC patients</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 36</td>
<td>n = 98</td>
<td></td>
</tr>
<tr>
<td>Male—no. (%)</td>
<td>23 (63.9)</td>
<td>50 (51)</td>
<td>0.18</td>
</tr>
<tr>
<td>Race—no. (%)</td>
<td>11 (30.6)</td>
<td>45 (45.9)</td>
<td>0.17</td>
</tr>
<tr>
<td>Asian</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>20 (55.6)</td>
<td>37 (37.8)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>5 (13.9)</td>
<td>16 (16.3)</td>
<td></td>
</tr>
<tr>
<td>Age—year</td>
<td>63.0 (16.8)</td>
<td>58.0 (19.0)</td>
<td>0.16</td>
</tr>
<tr>
<td>Renal disease—no. (%)</td>
<td></td>
<td></td>
<td>0.73</td>
</tr>
<tr>
<td>Diabetes</td>
<td>8 (22.2)</td>
<td>27 (27.6)</td>
<td></td>
</tr>
<tr>
<td>Glomerulonephritis</td>
<td>8 (22.2)</td>
<td>24 (24.5)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>20 (55.6)</td>
<td>47 (48.0)</td>
<td></td>
</tr>
<tr>
<td>Diabetes—no. (%)</td>
<td>16 (44.4)</td>
<td>42 (43.3)</td>
<td>0.99</td>
</tr>
<tr>
<td>Estimated GFR at RRT start—mL/min/1.73 m²</td>
<td>8.0 (4.3)</td>
<td>10.5 (3.3)</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>n = 33</td>
<td>n = 95</td>
<td></td>
</tr>
<tr>
<td>Albumin—g/L</td>
<td>28.3 (5.8)</td>
<td>37.5 (5.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>n = 32</td>
<td>n = 95</td>
<td></td>
</tr>
<tr>
<td>Haemoglobin—g/L</td>
<td>92.0 (12.0)</td>
<td>112.3 (13.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>n = 33</td>
<td>n = 96</td>
<td></td>
</tr>
<tr>
<td>Intact PTH—pmol/L</td>
<td>31.9 (19.5)</td>
<td>27.7 (19.9)</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>n = 18</td>
<td>n = 88</td>
<td></td>
</tr>
<tr>
<td>Phosphate—mmol/L</td>
<td>1.7 (0.6)</td>
<td>1.8 (0.5)</td>
<td>0.70</td>
</tr>
<tr>
<td></td>
<td>n = 23</td>
<td>n = 95</td>
<td></td>
</tr>
</tbody>
</table>

Continuous variables are expressed as mean (standard deviation).

Table 4. Multivariable logistic regression analysis of factors associated with independent RRT modalities

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio</th>
<th>95% Confidence limits</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTN (versus MPC)</td>
<td>0.74</td>
<td>0.19–2.94</td>
<td>0.67</td>
</tr>
<tr>
<td>Age (per year increase)</td>
<td>0.95</td>
<td>0.92–0.97</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Male</td>
<td>0.92</td>
<td>0.40–2.12</td>
<td>0.84</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian vs white</td>
<td>0.90</td>
<td>0.38–2.24</td>
<td>0.4</td>
</tr>
<tr>
<td>Other vs white</td>
<td>0.27</td>
<td>0.03–2.48</td>
<td>0.26</td>
</tr>
<tr>
<td>Haemoglobin (per g/L increase)</td>
<td>0.99</td>
<td>0.96–1.03</td>
<td>0.87</td>
</tr>
<tr>
<td>Albumin (per g/L increase)</td>
<td>1.10</td>
<td>1.01–1.20</td>
<td>0.03</td>
</tr>
</tbody>
</table>
Transition of suboptimal HD starts to independent RRT

Both of these factors may negatively impact a patient's cerebrovascular disease than those not seen by the RTN. RTN were more likely to live alone and to have comorbid findings. Lyses adjusting for potential confounders confirmed our results, neither of these factors reached statistical significance in the multivariable model, it is possible that they may have with a larger sample size.

Suboptimal HD starts are increasingly recognized as a major challenge in renal care. They account for 15%–60% of all HD starts depending on the centre and on the definition of suboptimal initiation [2–5]. This is consistent with the 42% of patients observed in our study. These patients have a 2-fold increase in mortality, increased hospitalization, suboptimal laboratory parameters and poorer quality of life [28–32]. In addition, the cost of an admission for unplanned HD start is estimated at $16,740 (Canadian dollars) versus $3485 for an admission for planned HD start [5,33]. Suboptimal HD starts are likely to be a 'sicker' group of patients, as suggested by our finding that they had significantly lower serum haemoglobin and albumin levels than those starting RRT via the MPC, which may partly account for their poorer outcomes. However, other factors are likely to play a role in the poorer outcomes of these patients, such as the duration of HD via a CVC. In view of this, we believe that the improved transition to independent RRT modalities facilitated by the RTN will translate into improved health outcomes for patients and significant cost savings for health care systems.

Considering PD specifically, education by the RTN resulted in 19% of suboptimal HD starts switching to PD compared to 7% of those who were not educated by the RTN. In a study of 3014 incident RRT patients in New Jersey, 35% of whom were referred within 90 days of RRT start, 11.9% of those who started on HD subsequently switched to PD [2]. Recent data from the United Kingdom Renal Registry showed that, in those who started dialysis in 2005 with <90 days nephrology follow-up, 13.2% started PD as their initial modality, and at 90 days following dialysis initiation, 22.1% were on PD [4]. Both of these studies show that it is possible to transition patients from HD to PD within different health care systems; however, neither study outlined how transition was facilitated or how it might be improved.

One other example of a similar model of care for suboptimal HD starts is reported in the literature. In Toronto, following creation of a similar position to our RTN in 2005, suboptimal HD start patients choosing a home dialysis modality increased from 13 to 67% [34]. This is a higher proportion than the 28% who switched in our study. In the Toronto study, a nurse provided education for 233 individuals of whom only 119 remained within the health region and had full follow-up information available. Of the 119 patients, 39 (33%) remained on in-centre HD, 51 (43%) switched to PD and 29 (24%) switched to HHD. Since HD patients from other regions were trained and followed in Toronto, the independent modalities were likely overrepresented among the 119 patients. Taking into account all patients educated, 34% (80 of 233) switched to an independent modality [or 44% if those who recovered renal function or died (n = 52) are excluded]. As the author noted, there were several extrinsic factors influencing patients' modality choice such as lack of community dialysis capacity and travel distance. These factors are likely to vary, even between centres in the same country, and may partly explain the difference in the rates of independent RRT achieved between their study and ours. Regardless, the education of suboptimal HD starts by a dedicated nurse improved transition to independent modalities of RRT in both Toronto and Vancouver.

The results of our study must be interpreted within the context of the study design. Although data collection was rigorous, the study was retrospective, observational, small in size and from a single centre. In addition, we compared data from sequential time periods and thus it is possible that the effects attributed to the institution of the RTN position may have occurred naturally with changes in clinical practice over time. However, this seems unlikely to account for a substantial effect as a weekly team meeting was established and essentially unchanged since 1997. Despite these limitations, we feel that our results are valid and applicable to hospital-based HD programmes elsewhere.

Conclusion

In this study, an RTN dedicated to the education of suboptimal HD starts, who survived more than 180 days, increased the likelihood of switching to an independent modality of RRT. The rate of independent RRT achieved by the RTN was comparable to the rate in those patients starting dialysis with a minimum 6-month education at an MPC. This standardized approach to the care of suboptimal HD starts should be considered in HD units where such patients are common. We hypothesize that improved health outcomes and potential cost savings may be realized.

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Conflict of interest statement. None declared.

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