Striving to Achieve an Integrated Home Dialysis System
A Report from the Ontario Renal Network Home Dialysis Attrition Task Force

Brendan B. McCormick and Christopher T. Chan for the ORN Home Dialysis Research Group


Introduction
The integrated home dialysis model has been proposed as an optimal model of care for patients with ESRD (1). It involves the initiation of peritoneal dialysis (PD) followed by a timely switch to home hemodialysis (HD) if a kidney transplant is not available. Globally, the use of a PD first model has been advocated by a number of groups as a cost-minimization strategy (2). To date, there are limited published data examining the actual implementation of an integrated home dialysis care strategy (3–5).

The largest published study comes from the Australia and New Zealand Dialysis and Transplant Registry (3). Between 2000 and 2012, 156 of 10,710 patients on incident PD ultimately transitioned to home HD compared with 2915 who transferred to in-center HD. Men, obese patients, and patients with longer times on PD were associated with a higher likelihood of transfer to home HD, whereas older patients, patients with diabetes, and aboriginals were less likely to transfer to home HD. The overall rate of home to home transition was 5% in this cohort.

In Australia and New Zealand, the outcomes of patients who transition from PD to home HD seem to be comparable with those treated initially with home HD as the only home modality (4). Similar findings were reported in a smaller cohort of Ontario patients with equivalent mortality and technique failure rates, despite higher rates of comorbidity among patients initially treated with PD (5).

A Closer Look at Integrated Home Dialysis Care in Ontario
Promoting the appropriate use of home dialysis is a major strategic direction in Ontario that is supported by a number of initiatives collectively known as the “Home First Strategy” (6). The Ontario Renal Network Home Dialysis Research Group has undertaken a number of evaluations to better understand provincial performance, between-program variability, and determinants of outcomes. Home to home transitions are of particular interest, because we hypothesize that home PD to home HD transition is an ideal dialysis strategy if a kidney transplant is unavailable.

We analyzed all adult Ontario patients registered within the Ontario Renal Reporting System treated with home PD from April 1, 2010 to March 31, 2016. During this period, 6358 patients initiated PD, of whom 1713 died and 897 received a kidney transplant; 1295 patients transferred to in-center HD for at least 60 days. In this cohort, 193 patients were initiated on home PD and transitioned to home HD: 50 of them did so directly, 50 transitioned from PD to in-center dialysis for 60 days or fewer and then, to home HD, and 93 transitioned from PD to in-center HD for >60 days and then, to home HD. The overall provincial home to home dialysis transition rate was 2% per year, with programs ranging from 1% to 12%. Of the 1395 patients with PD technique failure, 193 (14%) ultimately made a home to home transition. We found that age, aboriginal race, cardiovascular disease status, and larger program size were associated with a lower likelihood of home to home dialysis transitions. Conversely, patients with larger body mass index and patients of black race were more likely to transition from home PD to home HD.

We confirmed the low overall rates of home to home transition as previously described, but note that our provincial rate is higher than the Australian average, with 14% of those with PD technique failure ultimately receiving home HD (3). Notably, our cohort is more recent, and the higher rates of home to home transition may reflect a secular change in practice rather than geographic variation.

We noted a few centers achieving high annual rates of transfer, whereas the majority of centers had rates in the range of 2%. The fact that two smaller centers had high rates of transition seems to have led to our finding that larger centers had lower transition rates. This finding was not seen in previously published studies, although it is well established that smaller PD centers have higher rates of technique failure and thus, more potential candidates for home transition (7). The determinants of transition rates need further exploration, because it is unlikely that having more suitable candidates is the only reason for the observed variability. Overall, the finding that only 14% of those with PD technique failure transitioned to home HD suggests that there are still missed opportunities.

Moving Forward
The use of PD as an incident modality has a number of advantages, including lower cost, better quality of
life, more flexible treatment options, preservation of residual kidney function, and vascular access (8,9). Patient outcomes on PD are as good as or better than in-center HD, particularly in the first 2 years, and where there is a relatively short wait for kidney transplant, PD provides an excellent bridging therapy (10). Technique survival on PD diminishes significantly after 2 years, and given the long kidney transplant wait time in many centers, switching to in-center HD is prevalent (11). Patients who are adapted to home dialysis may find home HD to be a preferred modality after PD technique failure, and they may be willing to invest the time required for training and performing home modifications. Patients may also be motivated to transition to home HD when they are made aware of the excellent clinical outcomes with home HD and that those transferring from PD to home HD seem to fully accrue these benefits (4).

From a patient perspective, transitioning between different dialysis therapies requires changes in dialysis access, accommodation at home, training, and cost. Additional patient barriers include increasing frailty, especially during the time of transition, making a home to home switch impossible. This may be further compounded by the relatively greater technical complexity of home HD. Patients may also question whether a transition to home HD is worthwhile if they have accrued significant wait time on the transplant list. Similarly, those with a limited prognosis and a high comorbid burden may not derive any benefit from a home to home transition.

Addressing these patient barriers requires a multifaceted approach. A patient management model with a strong relationship with home dialysis nursing may facilitate the identification and encouragement of home to home transition. Patients with an imminent transplant or those with a limited prognosis are unlikely to accrue benefit from home HD. Peer support can be indispensable, especially when a patient is struggling with the dialysis modality decision. A flexible home HD training program will also allow for more time for those who may have difficulty with the cognitive or technical aspects.

The nephrologist and the multidisciplinary team must avoid the tendency to delay the clinical acknowledgment of PD technique failure, because this makes it challenging to facilitate a direct or even timely transition from PD to home HD. The optimal timing of kidney replacement therapy transitions has yet to be defined; hence, clinicians must rely on personal experience. This is more difficult in smaller programs, where there is less clinical experience with successful home to home transitions. It has been well described in the PD literature that smaller PD programs have higher rates of technique failure, and this is almost certainly true for home HD (7).

Systems barriers are important, especially for those programs that only perform PD and do not offer home HD. The reluctance to transfer patients to a neighboring program may include patient preference, continuity of care, and reimbursement. Reimbursement rates for home HD training may also be perceived to be a disadvantage given the uncertainty of training duration. Furthermore, it can be difficult to justify the investment in a program when the number of patients is anticipated to be small.

Addressing these physician- and system-level barriers is challenging, even within a single-payer system in Ontario. There are modest financial incentives for programs to encourage home dialysis use in Ontario, but the marked variability in home to home transfers between programs suggests that there are other confounders. A high transition rate may reflect more available candidates due to a younger patient population, higher PD technique failure rates, or low rates of kidney transplant. In some programs, patients are encouraged to start PD and then, transition to home HD, whereas in others, a direct start on home HD is the standard of care for appropriate patients. Thus, headline rates of home to home transition may not necessarily be comparable between programs or helpful in identifying or addressing barriers.

We feel that the degree of implementation of an integrated dialysis care model depends on local factors and individual patient characteristics. All PD programs should have either local expertise in home HD or a strong alliance with a neighboring program with such expertise. Among incident patients who are candidates for either PD or home HD, factors, such as transplant eligibility, transplant wait time, and life expectancy, will be major determinants of the recommendation for home HD or PD. For those programs with a relatively long transplant wait time of 5 years or more, it is quite reasonable to recommend home HD as an incident modality, because the likelihood of technique failure on PD before 5 years exceeds 50% in most programs. For patients who are likely to require PD for <5 years due to life-limiting comorbidities or a short wait time for transplant, then initiation of PD should be recommended. We believe that the care team needs to be constantly vigilant for events that may herald impending technique failure among patients on PD. For example, loss of residual kidney function or a peritonitis relapse may be a trigger for a discussion of home HD. Although we do not advocate for strict adherence to numerical adequacy targets in PD, any clinical evidence for underdialysis should also prompt a discussion about home HD.

**Recommendations for Implementation**

Our task group has recommended increased awareness and incentives to facilitate home to home dialysis transition. Funding models should ensure adequate compensation for training, especially accounting for frailty and deconditioning associated with transitioning away from PD. We have also recommended further qualitative evaluation that may facilitate home to home transitions and research evaluating outcomes of home to home transitions.

Globally, it would be beneficial to convene an expert panel on home to home transition to increase awareness of this underused strategy and provide guidance for its implementation. We recognize that these data are observational and that recommendations would be opinion based, but we feel that it is important to promote and study the clinical utility and outcomes of the home to home dialysis strategy.

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The ORN Home Dialysis Attrition Task Force membership includes Co-Chairs B.B.M. (Nephrologist, The Ottawa Hospital) and C.T.C. (Nephrologist, University Health Network) and members Dr. Arsh Jain (Nephrologist, London Health Science Centre), Dr. Jeffrey Perl (Nephrologist, St. Michael’s Hospital), Ms. Mina Kashani (Nurse Navigator, St. Michael’s Hospital), Mr. Bill Campbell (Regional Director, Mississauga Halton), Dr. Philip Boll (Provincial Medical Lead, Home First, ORN), Mr. Gokulan Kandasamy (Manager, Clinical Programs, ORN), Dr. Gihad Nesrallah (Nephrologist, Humber Regional Hospital), and Mr. Marc Hebert (Senior Specialist, Dialysis, ORN).

Disclosures
None.

References

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