

Evidence Highlights

Home-Based Dialysis for the Treatment of End-Stage Kidney Disease

Key Messages

- For patients diagnosed with end-stage kidney disease (ESKD) who have been deemed eligible for home therapies by their care provider, self-care, home-based dialysis – either with home hemodialysis (HHD) or peritoneal dialysis (PD) – is recommended.
- Patient eligibility, available capacity, reimbursement, patient preference, awareness and education about dialysis modalities, and quality of life (QoL) factors should be considered before treatment is assigned.



This summary is based on a Health Technology Assessment conducted by CADTH and recommendations developed by the Health Technology Expert Review Panel, an advisory body to CADTH.

This summary includes:

- a brief background on end-stage kidney disease, the current status of dialysis treatment in Canada, and dialysis modalities.
- evidence highlights from the clinical, economic, patient perspectives, ethical, and implementation findings of the CADTH review.
- a summary of considerations related to implementing and offering home-based dialysis to patients in rural or remote settings, as well as to patients in Indigenous communities.

Background

End-Stage Kidney Disease and Dialysis Treatment

Kidney failure, also known as end-stage kidney disease, is a life-threatening disease that occurs when the kidneys stop working well enough to meet the body's needs for filtering and excreting wastes and extra fluid. To ensure survival, treatment options focus on replacing the kidneys' function and mainly include therapy in the form of dialysis or kidney transplantation. When kidney transplantation is not an option, most patients living with ESKD are treated with dialysis, which is often a life-long treatment.

Dialysis in Canada

According to data from the Canadian Institute for Health Information, in 2013, an estimated 24,114 Canadians were being treated with dialysis, with the number of patients being initiated on long-term dialysis increasing every year. Hemodialysis (HD) and peritoneal dialysis (PD) are the two main types of dialysis provided by Canadian kidney care programs. Patients can have dialysis in a hospital or specialized dialysis units (in-centre), or at home. Even though several options for having dialysis treatment at home are available to ESKD patients, in Canada (all provinces), traditional HD offered in a clinical setting remains the most frequently used modality.

Based on the potential comparable clinical effectiveness, cost savings, and the potential for non-conventional, in-centre HD (ICHHD) dialysis modalities to be more desirable from a patient and caregiver perspective, it is often argued that home dialysis modalities, particularly PD, may be underused among eligible patients in Canada.

CADTH conducted a Health Technology Assessment (HTA) of dialysis modalities for the treatment of ESKD to evaluate the evidence related to clinical effectiveness and cost-effectiveness, as well as the evidence on patient experiences and perspectives, ethical issues, and other considerations related to implementing home-based dialysis programs. The Health Technology Expert Review Panel, an advisory body to CADTH, developed recommendations on the appropriate use of dialysis modalities for patients with ESKD based on the evidence presented in the HTA report.

Dialysis Modalities

Hemodialysis (HD): The patient’s blood is circulated to an external dialysis machine that filters waste and extra water from the blood before returning it to the body. It can be done in-centre (hospital, satellite units) or at home, either with the assistance of a health care professional (assisted HD) or by the patient and/or a caregiver without professional assistance (self-care HD). Usually, treatment sessions last three or four hours and must be repeated several times a week. Home HD modalities include conventional HD (three days a week; usually three to four hours per session), short-daily HD (six to seven days a week; two to three hours per session), and nocturnal HD (during sleep).

Modality	Treatment Description	Delivery Setting	Assistance
In-centre conventional hemodialysis	Three days a week; usually 3 hours to 4 hours per session	In-centre (hospital, satellite units)	Mainly assisted; can be self-care
Home conventional hemodialysis	Three days a week; usually 3 hours to 4 hours per session	Home-based	Self-care or assisted
Short-daily hemodialysis	Six to seven days a week; 2 hours to 3 hours per session	Home-based or in-centre	Self-care or assisted
Nocturnal hemodialysis	Three days a week Frequent nocturnal HD: 5 days to 7 days a week For both, 6 hours to 9 hours per session; performed during sleeping hours	Home-based or in-centre	Self-care or assisted

Peritoneal Dialysis (PD): Uses the lining of the abdomen and a solution called dialysate to filter and clean blood. Dialysate absorbs waste and fluid from the blood while the peritoneum (abdominal lining) acts as a filter. PD can be done at home while asleep (automated PD; performed by a machine) or awake (continuous ambulatory PD; manual exchange of solution), and with assistance (provided by a health care professional) or without (self-care). A permanent catheter in the abdomen is required.

Modality	Treatment Description	Delivery Setting	Assistance
Continuous ambulatory peritoneal dialysis	Manual exchange (draining and filling of dialysis solution) 4 to 6 times in a 24-hour period; performed while awake	Home-based	Self-care or assisted
Automated peritoneal dialysis	Machine performs the cycling process; mostly during sleep hours	Home-based	Self-care or assisted

Evidence Highlights

CADTH conducted a Health Technology Assessment of dialysis modalities for the treatment of ESKD to evaluate the evidence related to clinical effectiveness and cost-effectiveness, as well as the evidence on patient experiences and perspectives, ethical issues, and implementation issues related to home-based dialysis programs. Here are the highlights from the evidence found in the CADTH review:



Bottom Line

Overall, home-based modalities appear to offer clinical benefits that are similar to those of ICHD. No consistent differences in patient health-related QoL outcomes were identified between HHD and ICHD or between PD and ICHD. There is no clear evidence of a survival benefit with any specific dialysis modality.

Clinical Findings

Based on a review of the evidence in six systematic reviews and 34 primary studies, overall, home-based modalities appear to offer clinical benefits similar to those offered by ICHD. No consistent differences in patient health-related quality of life (QoL) outcomes were identified between home conventional hemodialysis (HHD) and ICHD or between PD and ICHD. However, studies may not have been large enough to reliably detect a clinically meaningful difference. There is also no clear evidence of a survival benefit with any specific dialysis modality; however, the identified evidence suggests that younger patients on HHD and PD may have better survival outcomes compared with elderly patients on these modalities. Because of conflicting evidence or lack of evidence, it is uncertain whether patients' race or sex plays a role in survival outcomes while on HHD or PD. These findings must be qualified by the knowledge that most studies were not randomized. Patients were selected for types of dialysis according to their clinical conditions, situations, and preferences; these factors may have influenced the outcomes.

CADTH also reviewed evidence relevant to:

- **Patients with diabetes and other comorbidities.** The review found that survival outcomes are similar for HHD and ICHD, but that it is unclear whether there is a survival benefit for these patients when they are treated with PD versus ICHD. (The evidence is variable; the mortality risk may be higher among elderly patients with diabetes or other comorbidities on PD versus ICHD.)
- **Risk for hospitalization and adverse events (AEs).** Overall, the risk for hospitalization does not differ between HHD, PD, and ICHD (though some evidence suggests PD may be associated with fewer hospitalizations compared with ICHD); and it is uncertain whether HHD or PD are associated with more AEs compared with ICHD (limited or conflicting evidence). However, patients are more likely to transfer from HHD to ICHD and from PD to ICHD, as opposed to the reverse.
- **HHD versus PD.** It is unknown whether there is a difference in QoL for patients who are on HHD versus PD, but HHD may offer a potential survival benefit compared with PD (limited evidence).
- **Various HHD prescriptions.** The review found insufficient evidence to determine if any of the HHD prescriptions (i.e., conventional, short-daily, or nocturnal) offers greater clinical benefits.
- **Assisted PD.** The clinical outcomes for assisted PD are unknown.
- **Self-care HD.** No evidence was found regarding the clinical effectiveness and safety of self-care HD, either at home or in-centre.



Bottom Line

Home-based therapies, including PD (non-assisted) and all HHD modalities, are less costly than ICHD, with conventional HHD being the least costly from the health system's perspective.

Economic Findings

Assuming no clinical difference between modalities, the cost-effectiveness analysis indicates that from a Canadian health care payer (health system) perspective:

- Home-based therapies – including PD (non-assisted) and all HHD modalities (i.e., conventional, short-daily, nocturnal) – are less costly than ICHD for eligible patients, despite significant initial training costs; conventional HHD is the least costly. Assisted PD delivered continuously may be more costly than ICHD and all other home-based modalities. However, short-term assisted PD (at initiation) or intermittent assisted PD (for respite) may be less costly than ICHD.
- While home-based therapies are associated with lower patient travel costs and offer potential benefits in terms of home and workforce productivity for employed patients, moving the dialysis site to the home means patients may have to assume costs that would otherwise be absorbed by the health care system (e.g., increased utility charges for power and water, and costs for home modifications to accommodate the dialysis equipment and supplies). Depending on a patient's employment status, these additional costs may be offset by the gains in home and workforce productivity. Contrarily, if the health care payer assumes these costs, HHD still remains a cost-saving option when compared with ICHD to the health care payer. The need for assistance may be an additional cost or a source of financial loss if a family caregiver must decrease or cease employment.

No Canadian data were identified regarding the costs of self-care ICHD. (However, if the same number of ICHD patients can be treated with much less nursing time per patient, it is possible that the ongoing costs of self-care ICHD would be lower than those of ICHD.)



Bottom Line

Preference for any specific modality (home-based or in-centre) may vary according to individual circumstances. Patients want to be informed about all available options and want their treatment conditions to be least disruptive to their lives and day-to-day activities, as well as to their caregivers' lives.

Patient Perspectives

Based on an overview of six systematic reviews and a thematic synthesis of the literature, the following issues seem to influence patients' perspectives and, sometimes, the choice of dialysis modalities.

Preference for a specific modality may vary according to individual circumstances. What is important to patients is that their treatment conditions are the least disruptive to their lives and day-to-day activities, as well as their caregivers' lives. For some patients, it means choosing home-based dialysis, while for others the preferred choice is in-centre treatment.

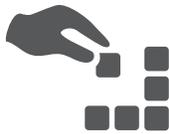
Having information about all treatment options and being involved in the decision regarding their treatment helps patients feel more empowered to make choices and more comfortable with their treatment.

Patients on dialysis experience significant life and identity changes due to their condition and treatment. However, caregivers are also faced with lifestyle, relationship, and family role changes, many of which lead to feelings of loneliness, guilt, fear, and anxiety. Patients emphasized that having the support of their family, especially of their caregivers, contributes to their success of remaining on HHD. Given that family and caregivers play a significant role in supporting patients' treatment and are also affected by the choice of modality, it is important to share information and involve them in the treatment-decision process.



Bottom Line

A cultural shift toward supporting home-based dialysis services while preserving the fundamental values of the *Canada Health Act* will occur only with a sustained effort at multiple levels (policy, health institutions, and patients) over an extended period of time.



Bottom Line

Education to address existing knowledge gaps appropriately at various levels of health care decision-making (policy, health administration, medical staff, patients, caregivers), as well as sharing successful strategies already underway across Canada, may facilitate the implementation of home-based programs in areas where this option is not currently available.

Ethical Considerations

Relevant literature to identify key ethical, legal, and social considerations that may be relevant when recommending or implementing a treatment modality for ESKD was reviewed.

Administrators are responsible for directing resources toward the most efficient treatment options that meet standards for quality patient care. However, in North America, due to a variety of complex and systemic factors, including structural incentives (e.g., physician reimbursement) and the availability and distribution of specialty services, a preference for conventional ICHD has developed over the past decades. Among these factors, lack of health care provider education regarding home dialysis has been identified as a primary factor in the underutilization of non-ICHD modalities.

To support patients' decision-making about their options for treatment, the informed consent process should provide accurate and unbiased information about all available options, including the impacts of various modalities on patients' QoL. Individual preferences for therapy should also be considered. Any efforts to increase home-based HD or PD should ensure patients do not assume a heavier financial burden in using these modalities.

Implementation Issues

Two surveys of a cross-Canada network of stakeholders (administrators and clinicians) and a literature review were conducted to identify information on issues relevant to implementing home-based and/or self-care dialysis in Canada.

Identified issues included barriers at the policy and funding levels (e.g., lack of policies for promoting home-based modalities and lack of funding for establishing the requirements of home-based programs); at the organization or health institution level (e.g., lack of health administration and clinical staff support, lack of appropriate infrastructure, education and training); at the health care provider level (e.g., nephrologist preference for ICHD); and at the patient level (e.g., lack of education, increased utility costs, housing issues, burden on family, lack of interest in home treatment or preference for ICHD).

Central to the findings is the importance of informed patient choice in decision-making about dialysis treatment, while considering the relevant policy and clinical context.

Considerations

A summary of considerations related to implementing and offering home-based dialysis to patients in rural or remote settings, as well as to patients in Indigenous communities.

Patients in Rural or Remote Settings

Home-based dialysis may reduce the requirement for central facilities and travel or relocation for patients who live outside of urban centres. However, many jurisdictions in Canada do not have the resources to provide support and assistance for patients outside of urban areas.

The economic review found that providing ICHD in rural and remote regions is more costly; annual costs were estimated to be 1.6 to 2.5 times that of urban HD units. As such, in these areas, home-based dialysis and the provision of assisted PD may be more economically attractive.

Challenges to consider when planning home-based dialysis programs include transportation, storage of supplies, and difficulties with water quality and supply. However, most of these are not considered insurmountable barriers to providing patients in these communities with dialysis treatment at home.

Comprehensive training for patients, caregivers, and nursing support staff — along with well-established procedures regarding medical evacuation and emergent care — may facilitate the successful implementation of home-based dialysis programs in these settings. Teledialysis (telehealth consultations of patients and caregivers with nephrologists and nurses through audio-visual teleconferencing) may be a viable option for increasing the use of home-based dialysis in rural or remote settings.

The CADTH review did not identify any information about the experience of patients living in remote or rural areas without ready access to dialysis facilities.

Bottom Line

Home-based dialysis modalities may reduce the requirement for central facilities and travel or relocation for patients who live outside of urban centres, and may also be more cost-effective for patients and the health care system. Comprehensive training, well-established procedures that account for challenges specific to these settings, and the use of relevant health technology may facilitate the successful implementation of home-based dialysis programs in rural or remote areas.

Patients in Indigenous Communities

The prevalence of ESKD is reported to be approximately four times higher among Indigenous patients in Canada versus the general Canadian population. Findings from a CADTH supplemental review of limited evidence also suggest that, compared with non-Indigenous patients, Indigenous patients in Canada have higher rates of diabetes (making ESKD more likely) and are less likely to see renal care specialists, initiate treatment, or receive a kidney transplant.

The evidence regarding differences in outcomes for Indigenous patients undergoing PD versus those undergoing HD is limited. However, it is reported that Indigenous patients receiving PD may be more likely to experience technique failure and switch to HD, as well as to have worse health outcomes (e.g., higher rates of mortality and peritonitis) compared with non-Indigenous patients. Given the limited evidence reviewed, it is unclear whether or not some of the differences in outcomes could be due to factors such as lack of access to care (for patients in remote areas). Perspectives and experiences of Indigenous patients were not identified in the reviewed literature.

PD provides patients with a more flexible schedule to accommodate working or caring for children, and enables them to receive treatment in their place of residence with minimal infrastructure requirements. As Indigenous patients also tend to be younger when initiating dialysis, improving access to PD treatment and care for PD-related adverse events might be a suitable option.

The cost-effectiveness of different dialysis modalities for Indigenous people in Canada is not known and may differ depending on the setting, accessibility to care, reimbursement of and availability of infrastructure requirements for home-based dialysis modalities (e.g., access to appropriate electricity and water conditions), and patient preferences.

Teledialysis may improve access to nephrology care and the delivery of home dialysis to Indigenous patients in remote settings, eliminating the need to move to urban centres for treatment.

Bottom Line

Given the unique ESKD profile and context of patients of Indigenous communities in Canada, factors that may contribute to successful ESKD outcomes include early screening, early prevention programs, and a flexible approach to education and dialysis care according to the unique cultural, social, and physical needs of individuals and their communities.

References

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