PROVINCIAL STANDARDS & GUIDELINES

BCRenal
Provincial Health Services Authority

Best Practices: Home Hemodialysis Programs

Created: March 2025
Approved by the Home Hemodialysis Committee

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LAND ACKNOWLEDGEMENT

BC Renal plans and monitors the delivery of kidney care services to a diverse population living in various settings and communities across BC. As a provincial network, we operate on the unceded traditional and ancestral land of many Indigenous peoples, including First Nation, Métis and Inuit people. Our main office is located on the traditional and ancestral territories of the Coast Salish peoples – xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh (Squamish), and Sə̓l̓ílwətaʔ/Selilwitulh (Tsleil-Waututh) Nations, and the Métis Chartered Community of the Lower Mainland Region.

We acknowledge the health inequities caused by the current and historical colonization of this territory, and we humbly listen and learn from the resilience and strength of Indigenous peoples. We will endeavor to provide culturally safe care and practice throughout our work.

IMPORTANT INFORMATION

This BC Renal guideline/resource was developed to support equitable, best practice care for patients with chronic kidney disease living in BC. The guideline/resource promotes standardized practices and is intended to assist renal programs in providing care that is reflected in quality patient outcome measurements. Based on the best information available at the time of publication, this guideline/resource relies on evidence and avoids opinion-based statements where possible; refer to www.BCRenal.ca for the most recent version.

For information about the use and referencing of BC Renal provincial guidelines/resources, refer to bcrenal.ca/health-info.

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Background to Home Hemodialysis

1.0 Background and Purpose

Home hemodialysis (HHD) is a vital option for patients with kidney failure, as it enables them to receive life-sustaining care in the comfort of their home. This provides increased autonomy, integration with lifestyle, and can positively impact their quality of life. There are several HHD programs in BC with varying sizes, staffing, processes, and practices.

The BC Ministry of Health endorses a strong home dialysis therapies mandate with a provincial target of 31% combined peritoneal and home hemodialysis rate since 2010. Care for patients is provided in 12 HHD programs across 5 Health Authorities in BC. Current patient numbers are available on the BC Renal website (BCRenal.ca).

BC Renal supports provincial strategies to optimize home dialysis therapy rates. Quality improvement in HHD programs is guided by the provincial HHD Committee and the HHD Educators group as they work collaboratively to ensure best possible independent (home or facility-based) hemodialysis across British Columbia.

The HHD best practice guideline (BPG) outlines practices to support consistent, standardized, and integrated delivery of HHD services across the province. The guideline combines current HHD literature with practitioner expertise, and program experience in British Columbia.

This document aims to:

- Support new HHD program development.
- Provide a standard for existing HHD programs across the province.
- Promotes equitable, effective, and safe delivery of HHD across the province.
- Build better resources for renal program administrators to manage HHD programs and staff.
- Incorporate an evidence-based approach with current practice to aid clinical decision making.
- Explore relationships between practice patterns and patient outcomes to drive improvement in care.
- Focus on accountability to patients, infrastructure research, innovation, and alignment of funding to quality patient centered care.
- Align with provincial standards and accountabilities to streamline the process and access to HHD.
- Integrate environmental conscious guidelines.
- Establish provincial and local HHD QI metrics/ KPIs to ensure continuous quality improvement in programs.

2.0 Target Population and Goals of HHD Programs

The target population for Home Hemodialysis are patients who have:

- been identified as requiring chronic dialysis.
- demonstrated an interest in home hemodialysis.
- been assessed as suitable for home hemodialysis.

A successful HHD program focuses on:

- support and education of the patient and family to perform HHD independently, effectively, and safely in their home environment.
- maximizing confidence and abilities of patients and families to adjust to and manage their health and home hemodialysis therapy.
- providing ongoing monitoring, support, and follow up of patients to assist in early identification and treatment of HHD related problems.
- planning and preparing for transition to other renal related modalities.

3.0 Requirements for a Successful HHD Program

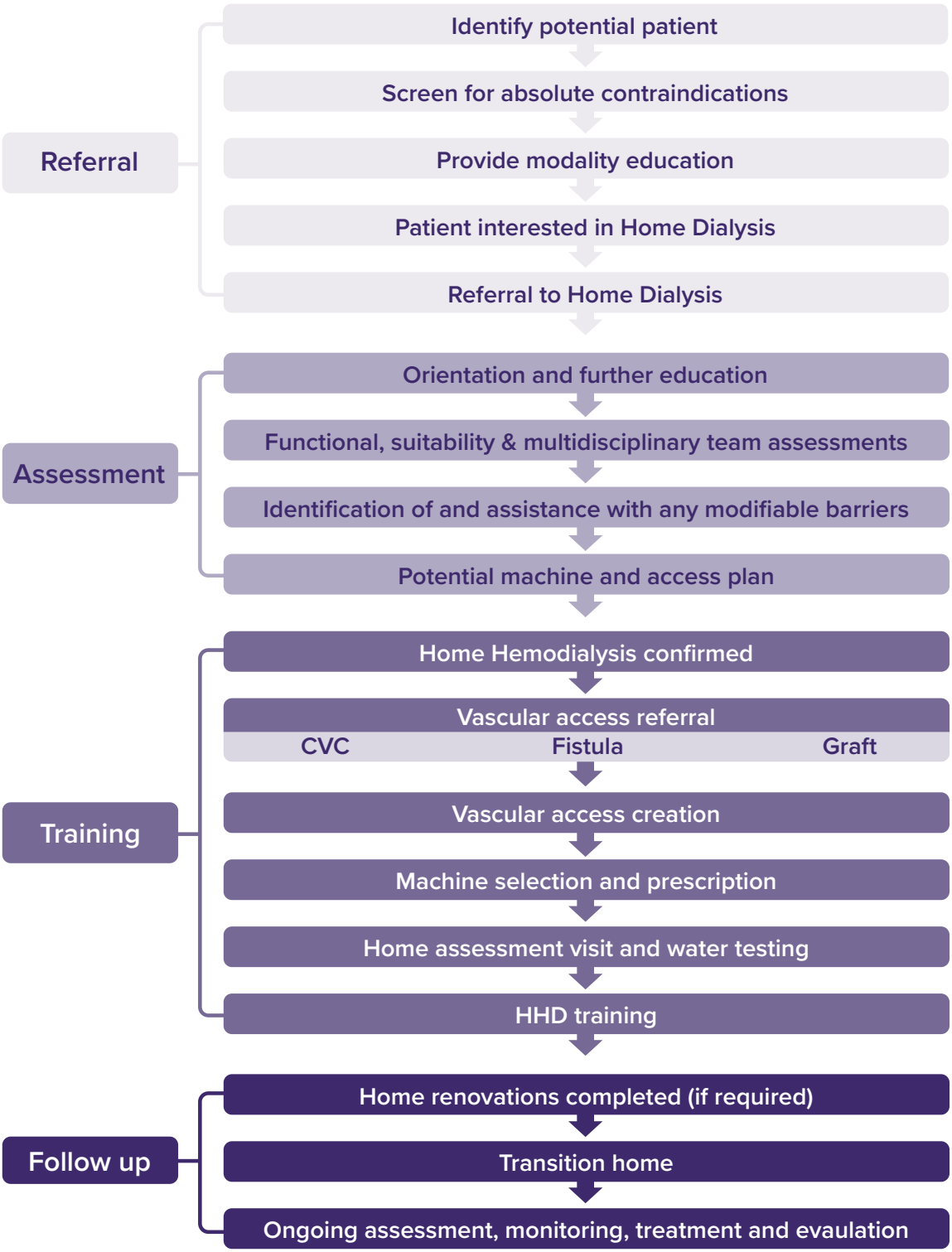
There is lack of literature validating any specific HHD training program, however components that may increase success are dependent on:

- an effective chronic kidney disease (CKD) education program that presents HHD as viable therapy option.
- a standardized assessment process to identify and triage patients for referral and formal assessment by HHD team.
- transition guides designed to support the care and preparation of patients from HHD referral to training
- a comprehensive, patient-centered support system that involve a multidisciplinary team (MDT), including but not limited to patients and their families, physicians, nurses, social workers, dietitians, pharmacists, occupational therapists, surgeons, radiologists, and specialists for comorbidities clinics (diabetic, cardiology, hypertension), and community support services.
- supportive counseling and effective communication that enhances patient acceptance of and compliance with HHD treatment.
- access to timely vascular access and interventional procedures.
- standardized patient training program incorporating adult learning principles.
- a focus on learning objectives and training tailored to the unique needs of each patient.
- prompt management of dialysis related complications.
- consistent monitoring of HHD training.
- continuous patient education and retraining of patients when necessary.
- standard documentation and support of achieving mandatory patient training milestones.
- continuous QI work to monitor a variety of domains at a program, health authority and provincial level.
- structured training and continuing education for the multidisciplinary HHD clinical team.

4.0 HHD Transitions: Milestones and Patient Flow Algorithm

The major milestones and associated timelines for patients transitioning to HHD are outlined in Figure 1.

Figure 1. HHD Patient Flow Algorithm



5.0 Transition to HHD

5.1 Patient Transition to HHD

Patients with kidney failure will encounter many transitions in their care journey as their health and care needs change. This can include commencing dialysis, changing the treatment modality, or deciding on supportive care. Transitions to HHD can follow an acute episode of kidney failure, occur via kidney care clinic, or from another modality such as in-center hemodialysis, peritoneal dialysis, or transplant. Although these transitions can appear routine to healthcare team members, for patients it can be stressful and overwhelming periods characterized by feelings of uncertainty, fear and loss. These feelings can also be exacerbated by changes in the healthcare team and care setting. It is therefore important for the multidisciplinary team to anticipate these issues and prepare patients as much as possible to facilitate a smooth transition (Forum of ESRD Networks' Medical Advisory Council 2022).

Literature is scant regarding care transitions in patients with CKD or kidney failure, especially for those transitioning to HHD. However, general strategies to help facilitate successful transition include:

- Early identification of suitable patients (Smart 2014)
- Maximizing time in MDT based predialysis care education (Mehotra 2005; Manns, 2005)
- Use of dedicated home-based education for suitable patients (Poinen 2021; Devoe 2016)
- Providing specific training to all staff, particularly dialysis nurses, so that patient education becomes part of the routine delivery of care (Perl 2023)
- Promotion of home therapies via transition nurses and patient navigators (Hanko 2011; McBrien 2018)
- Use of peer mentors to provide unique perspectives for prospective patients (Longley 2023; Hughes 2009)
- Providing clear roles and responsibilities of the multidisciplinary HHD team and KCC team (Shi 2017; Mitra 2015; Perl 2023)
- Provision of consistent, structured and standardized information and practices that focus on patient centered care, goal setting, care planning and self management (Poinen 2024; Hussein 2021)
- Appointing champions within the unit, such as a medical director or lead nurse (Mitra 2015, Walker 2015)

HHD programs in BC follow these principles, utilizing a MDT approach to guide patients with chronic kidney disease through a standardized predialysis pathway and referral process in preparation for kidney replacement therapy. Unit champions, peer mentors, and patient navigators are utilized to promote home modalities and smooth transitions.

Potential areas of focus that have been outlined in the literature include processes to capture facility-based hemodialysis patients such as Transitional Dialysis Units (Goldman et al, 2024), or increased

involvement in dialysis related tasks via Shared Hemodialysis Care (Fotheringham, 2021).Targeting Home-to-Home transitions from PD to HHD using an integrated care model study, while a challenge to implement seamlessly, provides another opportunity for transitions to HHD (Cheng, 2024).

Further information on transitions can be found at the:

- Patient Guide - Transitioning to Home Hemodialysis
- Care Team Guide: Transition to Home Hemodialysis/ Independent HD
- BCR Transitions between modalities overview

5.2 HHD Referral Process

Ideally, referrals would originate from Kidney Care Clinics (KCC) predialysis care. However, there are potentially many HHD patients that can come through as urgent start, late referrals, or due to a change in their renal replacement modality. Urgent starts and late referrals can potentially hamper the choice of home dialysis and should be a point of focus (Heaf, 2020).

Identifying Potential Patients

KCC, Hemodialysis and home dialysis staff have a role in identifying those patients who are potential HHD candidates or those who show an interest in pursuing HHD. Patients meeting basic criteria are referred to the HHD team for an in-depth assessment to determine suitability. Ideally this should occur more than 1 year before the need for dialysis, however it can be difficult to estimate when a patient may require dialysis (KDIGO CKD Workgroup 2024).

Renal program staff identify patients likely to need kidney replacement therapy in the near future by eGFR cut off of <25mL/min/1.73m2 and/or if felt to be at risk of rapidly progressing. In the KCC, introductory modality options education is provided when eGFR ~20mL/min/1.73m2 and declining. These include pamphlets, webinars, and peer support via the Kidney Foundation of Canada Kidney Wellness Hub. Staff then assess for potential suitability for home therapies via screening for absolute medical or social contraindications (Table 1). Similar education and assessments are conducted for suitable existing hemodialysis or peritoneal dialysis patients for whom clinic contact was not of sufficient length for a determination to be made prior to dialysis initiation.

In addition to eGFR, KDIGO CKD Evaluation and Management guideline (2024) recommend the use of an externally validated risk equation tool to estimate the absolute risk of kidney failure to aid in determining the timing for stages of KRT preparation. When using one such tool, the Kidney Failure Risk Equation (KFRE), a risk threshold >20% in 2 years is suitable to initiate modality education (KDIGO CKD Workgroup 2024). Refer to the Patient Flow Algorithm in the Best Practices for Kidney Care Clinics Guideline available on the BC Renal website for more information.

Table 1. Contraindications to home therapies

Absolute contraindications for home therapies
Unsuitable home conditions* and lack of facility-based independent dialysis options.
Significant mental health barrier: uncontrolled psychiatric condition, active substance use disorder (not including prescribed narcotics, marijuana, alcohol) and no dialysis support person.
Significant cognitive impairment (e.g. brain damage, dementia) and no dialysis support person.
Uncontrolled seizure disorder
Diabetes with hypoglycemic unawareness
Unstable ischemic heart disease or uncontrolled arrhythmia

*Example of this includes their residence having insufficient storage space for HHD supplies and equipment, patient lives in a residence that does not permit HHD and/or the necessary home modifications, Inadequate water quality/supply, power supply or delivery access to support HHD

Further information on:

- Referral criteria and further steps are outlined at Modality Selection & PROMIS Data Entry and the Home Dialysis Referral Pathway
- The Patient Flow Algorithm and KCC processes are detailed at Best Practices for Kidney Care Clinics Guideline
- Supporting potential dialysis patients is found at the Kidney Wellness Hub

5.2.1 Communication Between Programs

If there are no absolute contraindications, the patient is referred to the HHD team who perform an in-depth suitability and functional assessment. The referral can be from a nephrologist, nurse navigator, or any other member in the current modality care team. The method used to refer patients (e.g. referral form, modality rounds, PROMIS) is program specific. Acknowledgement of the initial referral by the HHD team is completed within 1-3 business days, and an appointment date for further education and suitability assessment is scheduled to a date within 1 month of referral. If the patient is determined to be unsuitable, the result is discussed with the patient and their care partners with feedback to the referrer made by letter and placed in the documented record. The MDT is notified, where applicable, via transition rounds or the center equivalent. This standardized process is important to avoid heterogeneity in documentation and communication practices.

Referrals should include the following information:

- Patient name
- Referring clinic
- Patient aware of referral (yes, no)
- Current GFR (if pre dialysis)
- Currently on dialysis (type)
- Comorbidities
- Modality medical contraindications
- Relative barriers to HHD

Further information:

- Home Dialysis Referral Pathway
- Care Team Guide: Transition to Home Hemodialysis/ Independent HD

5.3 HHD Eligibility Process

On receipt of the referral, the suitability assessment completed by the HHD MDT includes the following domains:

- Physical
- Cognitive
- Functional
- Home environment

An assessment of the caregiver would assess the same domains, if applicable.

The BC Renal HHD patient suitability assessment includes the identification of:

- potential barriers for successful HHD and appropriate solutions to address these
- appropriate HHD modality: short daily, conventional, nocturnal
- appropriate type, placement site and need for referral for creation or insertion of vascular access
- home environment and living arrangements
- water supply, power supply, septic system and renovation considerations
- patient's and/or caregivers' ability and readiness to learn
- potential individualized training plan inclusive of learning objectives, content, teaching methods and aids, and evaluation phases
- training schedule and potential barriers attendance

There is no internationally standardized list of suitability criteria. However, in addition to utilizing the BC Renal Patient Suitability Assessment, clinical judgment can be supplemented with the use of a suitability tool. The most widely recognized tool is the MATCH-D tool (Method to Assess Treatment Choices for Home Dialysis; http://homedialysis.org/match-d), which was developed by the Medical Education Institute, Inc. to aid nephrologists and dialysis staff identify and assess candidates for home dialysis therapies. In addition, it provides solutions to potential barriers. Some of these relative contraindications are outlined in Table 2.

Table 2. Relative contraindications to home therapies (Rioux 2015; Medical Education Institute 2013)

Relative contraindications to HHD
Unstable intradialytic hypotension
Cognitive impairment or otherwise reduced psycho-emotional capacity, but with dialysis support person
Non-ambulatory or limited use of arms/hands
Significant hearing or visual impairment
History of non-adherence
Lack of suitable vascular access
Contraindications to anticoagulant use during dialysis
Frailty
Limited space for supplies
Illiteracy
Personal and/or home hygiene concerns

Further information on:

- MATCH-D at Method to Assess Treatment Choices for Home Dialysis
- BC patient assessment using the Home Dialysis Patient Suitability Assessment and Home Hemodialysis Functional Assessment

5.3.1 Process for Addressing Barriers to HHD

Identifying potential barriers require an in-depth assessment by the HHD team. The suitability assessment process provides an opportunity for discussion with patients about their expectations, what is to be expected and any fears that they may hold. Functional assessments and tests such as hearing, vision, manual dexterity and strength are helpful when determining suitability, but any variations from the norm should not be considered absolute contraindications from HHD. It is important to be aware that these relative contraindications exist on a spectrum and potentially can be addressed by providing multidisciplinary specific support such as environmental modifications, technologies, and assistance from care-partners or professionals (Perl 2023; Rioux 2015). Examples of initially perceived barriers and possible solutions, individualized depending on each patient situation, are outlined in Table 3.

Table 3. Potential barriers and solutions (Adapted from MATCH-D tool and Rioux 2015)

Potential Barriers to Home HD and Possible Interventions	
Factor	**Possible Intervention**
Unkempt/poor personal hygiene	Hygiene education, dialysis partner
Frail/Nonambulatory/ bedridden	Physiotherapy, occupational therapy, dialysis care partner
Illiterate	Pictures to train, return demonstration to verify learning, tape recorders for patient reports
Hearing impaired	Light/vibration for alarms, dialysis partner
Brain damage, dementia, or poor short-term memory Reduced awareness/ability to report bodily symptoms	Dialysis care partner
No use of either hand or severe visual impairment	Dialysis care partner
Needle phobia	Health psychology, anesthetic cream
Psychosocial factors (Depression, psychosis, anxiety, overwhelming situation, drug or EtOH abuse)	Health psychology, psychiatry, drug rehabilitation program, dialysis care partner
Limited space for supplies	Increase delivery frequency, consider machine with fewer supply needs
Pets	Prevent pets from entering room while cannulating or connecting access

6.0 HHD Modality Prescription Options

One major benefit associated with HHD is its ability to provide patients the autonomy, in communication with the HHD unit, to adjust aspects of their dialysis prescription. These include changes to frequency, duration, timing and ultrafiltration (UF) targets in order to meet clinical and personal needs.

Adequacy of hemodialysis prescription was previously narrowly defined in terms of urea clearance targets. Patient centered care is now a priority, requiring individualized dialysis and modality prescription through shared decision making that incorporates patient preferences, quality of life, and symptom

control, whilst also aiming to control complications of advanced CKD and kidney failure. (National Kidney Foundation 2015; KDIGO 2018).

Important factors to a patient's decision-making process include keeping as much independence as possible, ability to travel, flexibility of daily schedule, and being able to perform dialysis in the privacy and comfort of the home (Shamy et al, 2024). Typically, patients will want the lowest duration and frequency of dialysis treatments due to the burden and intrusion into their lives (Lockridge 2015). These aspects are to be balanced against principles for HD prescription that are recommended to reduce adverse outcomes and improve survival. These include:

- Achieving normalization of blood pressure, cardiac structure, mineral balance and nutrition (Lockridge 2015)
- Avoiding a 3-day interdialytic break is associated with improved survival (Foley 2012; Zhang 2012)
- Maintaining stable interdialytic weight gain ≤3kg to maximize HD tolerability and avoid chronic fluid retention, as this is associated with increased cardiac morbidity and mortality (Flythe 2011; Hecking 2013)
- Increased total hours of HD per week is associated with improved survival (Tentori 2012; Nesrallah 2012)
- Targeting a single pool Kt/V of 1.4 (minimum 1.2) per HD session in those performing thrice weekly sessions and standardized Kt/V of 2.3 (minimum 2.1) for HHD schedules not on thrice weekly (National Kidney Foundation 2015)

Beyond these baseline clinical requirements, the frequency and duration of dialysis sessions is usually dependent on the lifestyle of the patient and/or their care partner. Other patient factors that may affect frequency include compliance with dietary/fluid restrictions, tolerance to ultrafiltration (UF) and degree of residual kidney function. Subsequent prescription indices are further individualized based on each patient's needs and are outside the scope of this guideline.

6.1 Conventional, Short Daily, Nocturnal

HHD prescriptions are categorised into Conventional (less frequent, mid range duration runs similar to in-centre schedules), Short Daily (shorter runs but with increased frequency), and Nocturnal (less frequent, but longer duration overnight runs).
In comparison to conventional facility-based haemodialysis, all HHD types appear to improve physical function and quality of life factors such as post dialysis fatigue, restless legs, depression, nausea, sleep quality, energy levels & scoring on QoL tools.
However, beyond this there is conflicting data on the advantages and disadvantages of one modality over another with limited randomized controlled trial (RCT) evidence and head-to-head comparison of Short Daily and Nocturnal modalities. Some studies have linked nocturnal and higher frequency HHD with increased risk of access failure, septic events and death (Jun 2013; Rocco 2011) while others have linked the same modalities to improvement in a host of biochemical, cardiac, quality of life (QoL) and physical measures (Lockridge 2015). Still others have found no significant differences (Tennankore 2018). Table 4 highlights major aspects of the most common modalities and patient characteristics to consider.

Table 4. Comparisons between home hemodialysis modalities (Adapted from Lockridge 2015)

Dialysis modality	Conventional hemodialysis (CHD)	Short daily hemodialysis (SDHD)	Alternate nightly nocturnal hemodialysis (aNHD)	Nocturnal hemodialysis (NHD)
Sessions per week	3	5 to 6	3 to 4	4 to 6
Session duration (hours)	3 to 5	2 to 4	6 to 8	6 to 8
Potential advantages	Similarity to in-centre haemodialysis provides familiarity for patients or staff of new units. Associated with improved survival outcomes.	For standard-flow SDHD, randomized controlled trial (RCT) evidence shows reduced ACM, improved phosphate (PO4) levels, reduced medication use^, & improved cardiovascular outcomes^^ For low-flow SDHD, observational studies showed improvements in QoL*, and lower rates of adverse events. Shorter duration increases flexibility to accommodate other daytime activities	Observational studies indicate reduced ACM, hospitalizations, cardiac remodeling & medication use^ with possibly slowed cognitive decline. Additionally, PO4, hemoglobin (Hb), & parathyroid hormone (PTH) control are improved. Easier of the extended HD regimens to maintain long term.	RCTs indicated improved blood pressure and PO4 control associated with reduced medication use^. Cohort studies indicated improved fertility & successful pregnancy outcomes. Lower UF rates which are associated with less intradialytic hypotension & cardiac stunning. Survival rates approach that of renal transplant recipients.
Potential disadvantages	Has a 3-day interdialytic break, which is associated with major adverse cardiovascular events (MACE) and all-cause mortality (ACM)*. Resistance future required prescription increases.	More frequent vascular access is linked with increased vascular access interventions & risk of infection-related hospitalization. Shorter sessions may result in unsafe UF rates. Increased supplies leading to higher costs and storage burden. Patients with cannulation phobias, or VA difficult cannulate or prone to complications may struggle. Association with higher technique failure in low-flow SDHD compared to NHD.	Increased risk of access events (e.g., infections, especially buttonholes), compared with CHD but less than with SDHD. Requires more exposure to anticoagulation. Needs reliable blood leak monitoring. Sleep disturbances. Higher interdialytic weight gains, which have been associated with increased mortality, compared with daily modalities.	Increased risk of access events and access related hospitalizations. Needs reliable blood leak monitoring. Has the most exposure to anticoagulation. Moderate increase in cost and storage space needs compared to non-daily HD. Patients with cannulation phobias, or VA difficult cannulate or prone to complications may struggle.
Patients who may benefit	Those with significant residual renal function. Those needing increased assistance can dialyze during normal hours. If minimizing dialysis time is the priority.	Those unable to tolerate long sessions. Those who need to fit dialysis around daytime schedules and cannot perform nocturnal home dialysis (NHD).	Those who have daytime commitments and do not need to get up frequently at night. Those who do not want to, or are unable to, perform daily/frequent HD. Those with unstable interdialytic weight gain if given a 2-day break. Those with cardiac dysfunction.	Those who have daytime commitments and do not need to get up frequently at night. Older or comorbid patients due to the stability conferred by increased dialysis hours. Those who are, or planning to, become pregnant. Those who emphasize dietary freedom.

Unless otherwise specified, outcomes comparisons are between the modality and conventional facility-based HD.
* For standard flow dialysate machines, there are no RCTs for low flow dialysate machines
^ Reduced used of medications including phosphate binders, erythropoietin stimulating agents & antihypertensives
^^ Cardiovascular outcomes include blood pressure control, regression of LVH & sleep apnea

6.1.1 Other Modalities - Facility Based Independent Hemodialysis

Facility-based independent hemodialysis is a modality option on the continuum between centre-based and home hemodialysis as an integrated care model. Dialysis sessions can be performed during the day or nocturnally. BC has one location that performs facility-based independent hemodialysis three nights a week, whereby the patient is expected to perform their own dialysis, but staff are present to provide assistance as required.

6.2 Machine Selection

Two home hemodialysis machines are available for patients considering HHD. Each machine has unique qualities that may suit different patient needs and abilities. The HHD team will determine machine suitability on a case-by-case basis in conjunction with patient preferences. An outline of considerations when assessing machine selection is displayed in Table 5 and a brief overview of each machine is discussed below.

AK Series

The Vantive AK series, of which the AK98 is most prevalent, are HD machines that can be used in both in-center and HHD, however they have a slimmer and lighter profile than other conventional HD machines that make it more suitable for the home environment. It has the ability to perform treatments at high dialysate flow (up to 800mL/min) and is able to provide all modality options including conventional, short daily or nocturnal. There are a variety of disinfection routine options available that do not require user attention or chemical handling.

NxStage

The Fresenius NxStage low flow dialysate system trades a lower ceiling of efficiency for solute clearance per session for increased flexibility due to its portability, decreased water usage and waste production, and ease of installation. These aspects may be helpful for some patients in rural areas without town water or sewerage, or those living in apartments or rental properties that cannot be easily modified. It is most used for patients on Short Daily dialysis but has some evidence for use when applied to NHD. Observational and cohort data suggest improvements in restless legs, sleep and other QoL indicators, a small mortality benefit, and reduction in LVH. Potential concerns include association with higher technique failure, intolerance of slower fistula flow and fixed dialysate concentrations.

Table 5. Home hemodialysis machine selection tool

	NxStage (Fresenius)	AK98 (Vantive)
Portability	• Smaller footprint. • Degree of portability - allows for travel or movement within home.	• Larger size including RO setup. • Fixed placement – travel requires use of in-center hemodialysis units.
Home	• No/minimal renovations - suitable for rental properties or other short-term housing. • Lower supply needs – materials occupy less space for patients with smaller homes.	• Electrical & plumbing renovations - requires landlord permission, long term tenancy or own home. • Higher supply needs – more space needed for deliveries, may exclude small homes/ units.
Patient	• Simplified design & interface – aspects may be easier to train.	• Similar to in-center dialysis units – more extensive maintenance, disinfection & programming aspects may complicate training.
Environmental and resources	• Less water use (up to 60L). • Deionization purification – unsuitable for water supply subject to bacterial contamination • Filter changes every 8-12 weeks	• More water use (up to 500L). • Reverse osmosis purification – more effective bacterial removal, bacterial water monitoring needs less stringent • Filter changes every 4 weeks
Scheduling	• Minimum 4-5 days a week. • Preplanning for dialysis required due to SAK (dialysate) preparation taking several hours.	• Minimum 3-4 days a week. • No restriction to starting dialysis session, can start with short notice.
Municipal	• Lower water needs - can be supplied by non-municipal water source. • Limited battery capacity – stable power and/ or backup needed. • Lower waste fluid amount – usable by patients on septic systems.	• Higher water needs – source supply threshold requires assessment. • 30 minutes backup battery capacity to complete session if power lost. • High waste fluid amounts – requires town sewerage connection.
Clinical	• More dependent on vascular access maintaining Qb > 300ml/min. • K baths available in 1 or 2 only. • Lactate buffer not suitable for patients with liver dysfunction. • Lower clearance per session, consider weight, symptoms & labs. • Potential for thrombocytopenia – use caution if baseline <75 10^9L.	• Could allow Qb > 200ml/min if using extended or nocturnal dialysis. • Increased flexibility with additives. • Bicarbonate buffer does not require additional metabolism. • Higher clearance ceiling due to higher dialysate flow. • No association with thrombocytopenia.

6.3 Home Assessment and Modification

Home assessments are performed by experienced professionals designated to review homes for HHD suitability. This is a key step of HHD preparation and includes aspects such as:

Electrical

A stable electricity supply is required due to the reliance on machinery.

- AK98 has battery power for 30 minutes of operation, this is sufficient for an emergency rinse back.
- NxStage has 2 minutes of backup power, therefore necessitating a gravity rinse back in the event of power loss.
- If frequent power failures are likely, then backup power to the home is needed via battery or generator to minimize the clinical complications of interrupting a dialysis session.

BC Renal does not currently cover the cost of a generator if required. Refer to the vendor manual for information about approved generator specifications.

Water

A sufficient supply of potable (drinkable) water is needed for dialysate generation.

- Municipal supply is preferred given increased consistency of supply and higher degree of baseline water treatment compared to other sources.
- Alternative sources include from tank, bore or well.
- Water quality must be initially tested for levels of bacteria, endotoxin, metals, minerals and other potentially harmful solutes.
- Plumbing changes may be needed to provide necessary water pressure for reverse osmosis filtration.

Waste Management

Plumbing connections are necessary to handle wastewater of approximately 90L/hr for AK systems.

- Requires town sewage access or a septic system that can handle this level of output.
- The patient is responsible for ensuring their septic system is functioning and maintained, particularly with the use of a AK98 machine.

See further information on the:

- Septic requirements (refer to BC Renal website)
- Precautions to be taken in the event of a Water Boil Advisory for HHD

7.0 Vascular Access

The creation and maintenance of vascular access (VA) for HHD is an essential factor for success. It would ideally be one that is easy to create and maintain, while providing adequate and consistent dialysis with minimal complications. The VA choice should align with the individualized dialysis prescription and patient or caregiver's ability. It is critical that they are familiar with self-managing their dialysis, including all aspects of use and maintenance.

The three options of VA available are the arteriovenous fistula (AVF), arteriovenous graft (AVG), or central venous catheter (CVC). Each has specific advantages and disadvantages, however current observational study evidence suggests that in general arteriovenous (AV) access is preferable to CVC or AVG in HHD regarding the reduced risk for mortality, hospitalization, bacteremia, thrombosis, vascular intervention and technique failure (Perl, 2016; Rivara 2016; Hayes 2014; van Eps 2010; Pipkin 2004). The current standard of practice is therefore aligned with in-center hemodialysis where the KDOQI Clinical

Practice Guideline for Vascular Access: 2019 Update recommends a patient-centered approach with AV (fistula or graft) access in preference to a CVC in most incident and prevalent HD patients.

Referral for vascular access planning should occur as part of predialysis care. KDIGO CKD Evaluation and Management guideline (2024) recommends using tools such as the KFRE to help determine timing. A 2-year kidney failure risk threshold >40% can be used in addition to eGFR-based criteria and other clinical considerations. The KDOQI vascular access guideline (2019) also recommends a similar KFRE risk-based threshold of >50% or eGFR <15mL/min per 1.73m2 for initiation for vascular access planning.

BC renal programs currently aim to refer for vascular access (VA) creation when the patient's eGFR has decreased to <15-20 mL/ min/1.73 m^2 and the patient is expected to require dialysis within 12 months. A retrospective cohort study on BC patients demonstrated that vascular access referrals using eGFR-based criteria in addition to KFRE 2-year risk of >40% resulted in a significantly higher proportion of patients starting HD on AVF/AVG (rather than CVC) compared to eGFR-based criteria alone. Furthermore, the additional use of KFRE 2-year risk >40% significantly reduced creations of VA that would have been too early (Atiquzzaman 2024).

Review in a dedicated Vascular Access Clinic (VAC) can help incorporate the various clinical factors and patient preferences in a timely manner.

Further information on:

- Creation and monitoring of vascular access at Provincial Guidelines for Vascular Access for Patients with Chronic Hemodialysis as Primary Modality
- Health Authority resources, contacts and algorithms for addressing VA problems at BC Renal Guiding Principles: VA Referrals & Transfers
- Recommendations for selection of VA at BC Renal Selection of Permanent HD Vascular Access

7.1 Fistula

BC supports a Fistula First philosophy with a patient-centered approach, consistent with local practice and expertise, due to several advantages outlined above. However, AVFs generally require 2-3 months to mature and have poorer maturation rates compared to AVGs. Therefore, careful predialysis vascular access planning is required (Chan, 2024).

7.1.1 Types

A variety of different anatomical types of AVF can be created. The preferred order of creation is.
a) Radio-cephalic fistula (RCF) (wrist or forearm)
b) Brachio-cephalic fistula (BCF) (elbow)
c) Transposed brachio-basilic fistula (tBBF) (elbow)

7.1.2 Buttonhole Versus Rope Ladder Cannulation

There are two main approaches for cannulation of an AVF

1. Rope ladder - this refers to alternating the needling site along the length of the AVF. Sharp needles are used.
2. Buttonhole - known as constant site needling, this is a cannulation method that uses the same location, angle, and depth repeatedly to create a scar tissue tract. The initial tract is created with sharp needles, however creating a buttonhole then enables the use of blunt needles.

High quality data is lacking regarding which cannulation type is superior and additionally focuses largely on the in-center HD population. They found an increased risk of localized site infection and bacteremia associated with buttonhole cannulation

technique (Vaux 2013; MacRae 2014; Toma 2003; Struthers 2010, Chow, 2011). RCTs in the HHD population have previously been attempted but stopped early due to poor feasibility/small sample size because of insufficient patient consent and patient preference for one technique over another (Huang, 2019). However, observational trials in the HHD and self-care dialysis population have shown similar findings (Muir 2014; van Eps 2010; Bechade 2015). Conversely, buttonhole cannulation is thought to be associated with fewer thrombotic complications (Suri, 2013; van Loon 2010) and increased fistula survival (Vaux 2013). However, these studies again were predominantly in the in-center HD population, and other more recent systematic reviews have not come to the same conclusions (Peralta 2023).

Current guidelines for cannulation technique in HD recommends the use of rope ladder cannulation due to increased risk of AV access-related infection with buttonhole cannulation, and to limit buttonhole cannulation only to special circumstances (KDOQI,2020). These circumstances include.

- AVFs that have only a short or small viable segment for cannulation
- If there is an enlarging or large aneurysm in order to prevent further expansion
- When rope ladder technique is unsuccessful and HD cannulators have otherwise established excellent hygiene and cannulation technique

Considerations for when to use rope ladder vs buttonhole are outlined in Table 6.

Table 6: Considerations for use of rope ladder vs buttonhole cannulation (Ward et al; KQODI 2020; Faratro 2015; Muir 2014)

	Rope ladder cannulation	Buttonhole cannulation
AVF factors	• AVF is relatively straight. • Persistent skin irritations or infections along access arm, or active staphylococcus infection	• AVF is short or only has short useable segments. • AVF has tortuous anatomy. • AVF has aneurysmal dilatation. • AVF is difficult to cannulate or has had failed rope ladder cannulation
Patient factors	• Patient or carer has tremulous hands or poor dexterity making it difficult to cannulate in same tract. • Patient or carer has poor vision that may affect placement of needle in tract if using buttonhole cannulation. • Patient has a bioprosthetic (e.g. mechanical heart valve, artificial joint) • Patient or carer has capacity to understand concept of rope ladder and assess and track rotation of sites. • Immune suppression such as those with systemic lupus, failed transplant, or patients on immunosuppressive medications	• Patient preference after risk factors, primarily infection, discussed and understood by patient. • Patient or carer has capacity to understand and perform the additional measures to reduce infection risk such as scab removal and topical prophylaxis. • Needle phobia
System factors	• Simplified design & interface – aspects may be easier to train.	• Initial and ongoing staff time requirements are significantly higher with buttonhole cannulation. • Availability and capacity of specialized trainers to perform frequent re-evaluations of patient cannulation techniques

Cannulation practice in BC is varied. Thus, if there is equipoise between the pros and cons, the choice between rope ladder and buttonhole should be based on patient preference in conjunction with local clinical preference and expertise. The latter is particularly important for buttonhole cannulation as the insertion technique and care of the tract needs to be taught correctly to minimize infection risk. BC Renal vascular access guidelines follow the finding that using topical antibiotic prophylaxis with mupirocin cream or antimicrobial gauze at the site after cannulation reduces potential bacterial infection (Marticorena 2009; Nesrallah 2010).

The utilization of polycarbonate pegs to create buttonhole tracts have been emerging as a tool to reduce tunnel formation time and complications (Faratro 2015). Further research and exploration of the utility of this product could be useful to BC HHD programs in the future.

Further information

- For recommendations of patient selection, process of creation, and infection prevention in buttonhole cannulation, see BC Renal Buttonhole Cannulation of AV Fistulas for Self Cannulation.
- For full technique and recommendations for rope ladder cannulation see BC Renal Rope Ladder cannulation guideline.

7.2 Graft

AV grafts may be appropriate for initial access due to patient factors such as limited life expectancy, medical comorbidities and poor AVF suitable sites increasing the risk of AVF failure. It is also suitable if an AVF has failed to develop. Compared to AVF, AVG have superior maturation rates but have an increased risk of thrombosis and infection (Chan, 2024). Only rope ladder cannulation is recommended in patients with synthetic AV grafts due to the concern of pseudoaneurysm and "one-site-itis" with buttonhole cannulation (KDOQI 2020).

7.2.1 Types

Like AVFs, AV grafts can have multiple anatomical locations. Current BC practice recommendations regarding the preferred order of creation by site and type of graft are:

a. Forearm looped graft
b. Upper arm straight graft
c. Femoral looped graft

7.3 Central Venous Catheter (CVC)

CVCs are not preferred in patients requiring long-term dialysis due to the risk of central stenosis and higher rate of infectious complications. KDOQI guidelines (2020) therefore recommend that those patients who do start dialysis with a CVC convert to either an AVF or AVG if possible.

However, for those transitioning to HHD there are some benefits including relative ease of use, avoiding fear of cannulation, and lower potential for disconnection. The latter can be a significant source of anxiety for patients. Furthermore, they are still necessary in certain situations such as in patients requiring urgent initiation of dialysis waiting for fistula creation, patients who lack other access options, and patients who decline AV access creation (Chan 2024). The use of CVC access can facilitate timely transition to HHD training rather than waiting for AV access. However, a plan for permanent AV access is still required and the patient will return for cannulation training once AV access is created. For patients who are expected to remain with a CVC for more than 2 weeks, a tunnelled cuffed catheter is preferred.

Further information

- See BC Renal Vascular Access resources for further information and protocols regarding CVC use and care.

7.4 Vascular Access Monitoring

Complications of vascular access such as infection, bleeding, stenosis, thrombosis, ischemia or aneurysm are important to detect early. It is important to integrate the vascular access Multi Disciplinary Team (MDT), including interventional radiology and vascular surgery, into patient care given the critical importance of maintaining patient access. However, there is insufficient evidence into the value and required frequency of access surveillance amongst HHD patients. Therefore, practice is typically extrapolated from standards established for in-center HD patients.

After creation, the VA team will reassess a pre-emptive AVF/ graft for patency until dialysis is initiated. Patients should also be taught to recognize signs and symptoms suggestive of potential complications such as

- development of a hematoma or aneurysm
- erythema, tenderness, swelling, induration or discharge
- cannulation difficulties, prolonged bleeding, changes in the trend of arterial and venous pressures, or absence of a bruit

After initiation of dialysis, monitoring should be performed by the following methods.

- dynamic venous pressure measurements
- access flow measurements.
- access recirculation using 2 needles.

In-centre HD patients are monitored every 4-6 weeks, however given the need for access flow/recirculation monitoring to occur at a facility, HHD patients do not typically follow such a frequent schedule. Expert opinion is instead to perform such monitoring when the patient attends clinic every 3 to 6 months (Chan, 2024; Faratro 2015). Catheter function should be monitored in a similar fashion using clinical indicators such as ability to flush, pump speeds, alteplase use and recirculation values. These recommendations are in line with practice across BC, however continual local review of protocols specific to the practical constraints of each centre are still needed.

Further information on

- Potential complications and identification of complications in AVF and AVG is outlined in Assessment of Newly Created AVF/AVG.
- Creation and monitoring of vascular access is found in Provincial Guidelines for Vascular Access for Patients with Chronic Hemodialysis as Primary Modality

8.0 Patient Training

Patient training for HHD is a crucial component of the program and involves the multidisciplinary team using evidence-based practices and guidelines where available. Unfortunately, there is a paucity of literature validating any specific training program or structure in HHD.

Initial patient HHD training and ongoing education is typically conducted by HHD trained nurses.

For patients to achieve optimal understanding and success from their training sessions, it is important to individualize their training program. This also allows the trainer to address any identified barriers and potential risks of failure. Individualizing patient training can involve:

- Inclusion of family members and/or partners to provide support for the patient
- Modifying length or number of training sessions to accommodate the patient's learning ability
- Evaluating the patient's progress and readiness to assume responsibility for HHD activities
- Identifying their learning style e.g. VARK (visual, aural, read/write, kinesthetic) and utilizing resources to adapt to them
- Setting Specific, Measurable, Achievable, Relevant and Time bound (SMART) goals and action plans

Table 7. Adult learning principles and teaching recommendations. (Kaufman 2003)

Adult learning principles	Recommendations
• Adults are independent and self-directing • They have accumulated previous lived experience which they can draw on for learning • They value learning that is relevant and integrates to their everyday life • There is more interest in immediate problem-centered approaches rather than subject centered approaches • Motivation is fueled more by internal drives than external ones	• Establish a safe learning environment • Involve the patient in mutual planning of curricular content • Involve the patient in identifying their own needs, to help find their internal motivation • Encourage them to formulate their own learning objectives • Involve learners in evaluating their own learning, to develop their skills of critical reflection

8.1 HHD Teaching Support and Tools

Teaching tools should be utilized in HHD training sessions to aid and meet specific individual learning styles. Aspects applicable to the major learning styles are outlined in Table 8.

Table 8. Learning styles and potential tools (VARK Learn Limited, 2025)

Learning style	Tools
Visual	• Visual aids e.g. posters with step-by-step photography • Diagrams or flowcharts • PowerPoint presentations
Aural	• Audio and video recordings of procedures (YouTube series, vendor sites) • Discussion, telephone chats, peer support • Rhymes and mnemonics
Read/write	• Written materials such as manuals, lists • PowerPoint presentations • Web chat • Online eLearning HHD modules
Kinesthetic	• Demonstrations with hands on approach • Role playing • Situational scenarios/simulation training • Dummy models

A brief list of BC and vendor resources for patients and health care providers are listed below, however refer to the relevant section of this guideline for further information

- SharePoint (only accessible via Intranet)
- BC Home Hemodialysis Patient Resources
- BC Vascular Access Patient Resources
- Home Hemodialysis HCP Resources
- NxStage Nursing Manual

8.2 Training Location and Environment

There is no data that supports the superiority of one training setting over another. Generally, the options for HHD training location include

- Adjacent to or within hospital dialysis facilities
- Adjacent to or within community-based satellite dialysis facilities
- Stand-alone facility
- Patient's home

Currently in BC there are no facilities with the resources to provide HHD training in the patient's home. Therefore, when choosing the training location, it is important to factor in accessibility for the patient, not only for travel distance, but also for ease of parking and proximity to public transport.

The key to a suitable teaching environment is one that is physically and psychologically comfortable for the learner. The dedicated space should be well lit, free from external distractions, large enough for supplies, teaching aids, patient, family and HHD nurse. This includes space for educational resources such as DVD players, television monitors, whiteboard, and computer or mobile wireless computer workstation. An effort can be made to make the environment as 'homelike' as possible, however there is no clear data to support whether this makes a significant difference, and care must be taken to ensure local hospital requirements for clinical spaces are still met. Table 9 outlines clinical and non-clinical requirements for the HHD facility space.

Table 9. Infrastructure requirements for a HHD facility (Adapted from Marshall et al., 2015)

Clinical	Non-clinical

• Procedure room - wound dressings, CVC removal/ insertion
• Crash/resuscitation cart
• Scale
• Adequate number of training areas to allow flexibility in providing respite, training and clinic capacity
• Training tools including cannulation/CVC simulation equipment
• Written/ audiovisual training materials
• Portable devices such as laptops to aid in patient education
• Training area with
  • Space for dialysis equipment, table, guest chair, and training aids.
  • Curtains/blinds to maintain privacy and avoid distractions
  • Mobile workstation
  • Handwashing facilities
  • Appropriate water and electricity supply
  • Ability for easy disposal of dialysis supplies/fluids
	• Reception and waiting area
	• Communications equipment - telephones, fax, video conferencing
	• Nurse's workstations with option for privacy for confidential calls
	• Multipurpose conference room - handover, meetings, staff tutorials, group patient education
	• Storage room - supplies and sterile equipment
	• Administrative staff workspace
	• Staff, patient and public bathrooms
	• Staff break area

8.3 Length of Training

Length of training varies anywhere between 4 to 12 weeks internationally. This wide range likely reflects the heterogeneity between local practices and patient populations. There has been no data correlating length of training with outcomes, however 6 weeks is generally felt adequate to cover most required topics. Similarly, there is no data regarding the optimal number of training sessions per week, but this varies internationally between 3 to 5 (Rioux et al., 2015). Training ultimately must be individualized to the patient with time added as needed to identify any learning barriers or failure risks. An Ontario based study has recommended the use of an Objective Structured Clinical Examination (OSCE) to track progress during and at the end of training and help assess competency (Cheng 2024).

BC patient training timelines start at 6 weeks with 4 sessions per week. This reflects historical practice and experience across BC training centers. Training is continued until the HHD nurse determines that the patient can meet the following training objectives:

- Able to safely perform all required procedures
- Recognizes contamination and infection
- Able to identify appropriate responses to specific complications/situations
- Understands when and how to communicate with the HHD clinic

It is recommended that these objectives should be assessed via an Objective Structured Clinical Examination (OSCE) at the end of training.

For further information:

- See the Process Checklist for NxStage Training (NxStage) and New Patient Training Checklist (Vantive) for detailed list of suggested competencies (only accessible via Intranet)

8.4 Training Content

Patient training is highly individualized, however before training begins the educators and patient should agree on and set an appropriate timeline for training that approximates a 6-week schedule with 4 sessions per week that mimic intended home dialysis days. An example schedule outlining important pre-training tasks and overarching topics to be addressed each week is shown in Table 10. The schedule should include incremental milestones/goals that can be used to recognize difficulties in the training process and serve as markers of success and progress. The timeframe can be shortened at any stage, for example if more frequent sessions are conducted each week, if the necessary skills have been attained.

Training sessions should be held with frequent breaks scheduled according to the patient's learning pace. A 1:1 nurse to patient approach is preferred for training, ideally with the same HHD RN to ensure consistency. After each training session, key points should be reiterated, discussions should be held with patients to ensure learning objectives have been met, and patient understanding reaffirmed.

Table 10: Outline of training timepoints including summary of potential teaching topics.

1 month prior to start of training	• Confirm presence of functional access
	• (confirm has plans for optimal access, e.g. vascular access plan for fistula if starting with CVC)
	• Notify Vendor to perform home assessment (2 weeks prior, dependent on local contractor availability and resources)
	• Finalize training dates/period
	  • Confirm stability on in-centre hemodialysis
	  • Confirm educator availability
	  • Confirm patient availability and need for transport and/or accommodation
	• Order training supplies and materials
	• Confirm VARK learning style assessment (completed as part of Suitability Assessment) and consider individualized training approach as appropriate
	• Initial HHD prescription via Nephrologist
	• Signing of Patient Agreement
	• One week of in-centre HD sessions immediately prior to training start

Week 1	• Predialysis baseline lab collection
	• Teaching topics
	  • Overview of HHD
	  • Aseptic technique, handwashing, masking
	  • Record keeping and fluid status self-assessment
	  • Vascular access care
	  • Machine setup
	  • Buttonhole creation or rope ladder demonstration
	  • Demonstration of hook-up procedure

Week 2	• Predialysis CBC to assess thrombocytopenia (NxStage only)
	• Teaching topics
	  • Prescription principles and machine programming
	  • Hook up practice
	  • Dialysis concepts and steps in dialysis procedure
	  • Take off procedure

Week 3	• Interim lab collection to assess adequacy of prescription
	  • Predialysis CBC to assess thrombocytopenia (NxStage only)
	• Teaching topics
	  • Prescription principles and machine programming
	  • Self-cannulation
	  • Complications and troubleshooting
	  • Water testing
	  • Ordering supplies
	• Midpoint Checkpoint with MDT
	  • Nursing – scenario-based assessment and overall judgement
	  • Nephrologist - assess progress, medications & prescription
	  • Allied health – aid in addressing any new/ongoing barriers

Week 4	• Teaching topics
	  • Review of areas identified in checkpoint assessment
	  • Home lab collection
	  • Troubleshooting with focus on emergencies
	• Notify contractors to complete home renovations
	• Notify vendor to deliver machine and supplies

Week 5	• Teaching topics
	  • Machine maintenance
	  • Assess training checklists for uncovered topics
	• End of training Checkpoint with MDT
	  • Nursing – final scenario-based assessment
	  • Medical – full clinic assessment
	  • Allied health – final assessment of barriers and/or concerns

Week 6	• Teaching topics • Consolidation and review • Notify pharmacy to finalize medications for delivery

Week 7+	• Training completed
	  • Transition to home with initial home dialysis sessions supervised by educator*
	  • Maintenance dialysis within Home Therapies unit if transition to home delayed, e.g. by renovations or carer availability
	• Training extended
	  • Ongoing education if deficits identified affecting safety to perform dialysis independently

* Home visits are recommended but remote supervision may be appropriate depending on patient location and staffing

For further information:

- Refer to Vantive Machine Training Checklist and NxStage Training Checklist for more detail on training content (only accessible via Intranet)

8.5 Challenges in Patient Training

There have been many studies focusing on barriers to HHD both from patient and health care provider perspectives. These can be broadly classified into situational, psychological, and functional, as illustrated in Table 11.

Table 11. Potential challenges to HHD training

Situational	Psychological	Functional
• Inadequate housing / limited space • Inadequate water supply • Financial barriers • Inadequate home-based support	• Fear of performing dialysis • Fear of self-cannulation • Fear of burden to family • Fear of complication or catastrophic event whilst on dialysis • Anxiety surrounding perception of suboptimal care	• Visual impairment • Hearing impairment • Cognitive impairment / learning disability / illiterate • Problems with manual dexterity • Frailty • Language barrier

There are generally two stages at which these barriers may be identified. The first is during the referral or pre-training stage, allowing planning for these to be addressed during training or even pre-training, and the second is during the training process itself. The latter is part of the rationale for introducing 'checkpoints' during the training process to ensure any such challenges are identified, acknowledged and addressed.

8.5.1 Situational Challenges

Situational barriers can be difficult to overcome, even if the patient has the desire to continue with HHD (Pipkin 2010). Issues with adequate housing contributed to approximately 20% of training or technique failure in a study by Schacter 2013, particularly in those who rented. Internationally, and in other regions of Canada, government-based funding is available to support home modifications, financial barriers, and assisted HHD through paid carers. Similar funding models are being considered in BC and may help in the future to avoid precluding otherwise suitable patients from continuing the HHD pathway.

The suitability of housing, storage, water and electricity supply is usually performed by the vendor. If there is insufficient storage space for supplies and equipment, this could be potentially resolved through more frequent delivery of HHD supplies, exploration of alternative storage options, or optimization of home space to create storage.

8.5.2 Psychological Challenges

Fear and anxiety surrounding the dialysis process and potential complications were amongst the top 3 patient perceived barriers to starting on HHD (Reddy 2024). These fears can continue despite commencing HHD training but can be alleviated through a variety of different strategies. These could include small patient-centred group education sessions or peer support groups (Hope 2013; Duncanson 2023), an empathetic and supportive clinician (Wong 2009), or increased education regarding processes such as self-cannulation and what to expect pre-dialysis (Jayanti 2015).

Self-cannulation

Most fears regarding the dialysis process and potential complications tend to reduce over the course of HHD training due to increased knowledge and confidence (Hanson 2016), however one aspect that can be particularly difficult to overcome is self-cannulation. 25 – 47% of adults on dialysis have been reported to have needle fear, with past traumatic or unsuccessful experiences likely contributing to the onset and ongoing distress surrounding cannulation (Duncanson 2023). Concerns for self-cannulation can include fear regarding all aspects of the procedure, potential complications, pain, and apprehension regarding required technical skills (Jayanti 2015).

Several small studies have explored the training experiences and psychological approaches related to managing fear associated with cannulation (Fielding 2023, Hanson 2016, Moore 2018). Key themes identified in interviews with HHD trainees, which appeared to help patients accept and normalize their fears regarding self-cannulation, are outlined below:

- Gaining control
  - Empowering patients to take control of their own needling, which could be facilitated through desensitization techniques such as using smaller needles needed for insulin or erythropoietin injections.

    - The desire for achieving greater control over their lifestyle via HHD often outweighed fears or hesitation regarding self-cannulation.
    - A sense of control was achieved when patients were psychologically and physically prepared, preventing fear of needles from taking root in their minds.
- Building confidence and a sense of safety
    - Confidence developed through experience, positive reinforcement when self-cannulation was successful, and support from nursing staff and family.
    - The tolerability of cannulation was influenced by how safe the patients felt. This can be based on multiple factors such as the environment, skills of the cannulators, or the technique used.
- Self-cannulation becoming routine
    - Viewing self-cannulation as an integral part of their treatment.
    - Through acceptance and normalization, self-cannulation became part of their identity, allowing them to perceive themselves as self-reliant.

Pre-training education, structured training environments, counselling, identifying personal motivations for starting HHD, and referrals to mental health professionals, when necessary, could therefore support patients in overcoming their fears of self-cannulation.

Additional strategies to assist with overcoming self-cannulation difficulties include (Ward 2015; Duncanson 2023; Hanson 2016; Mott 2020):

- Visualization of access anatomy via use of a skin marker and ultrasound
- Warm compress prior to cannulation
- Topical analgesia
- Imaginal exposure therapy whereby the patient visualizes the situation until acclimatization occurs
- Exposure therapy
- Relaxation techniques such as deep breathing or meditation prior to cannulation
- Hypnotherapy
- Medications to alleviate anxiety
- Self-talk
- Peer support or mentoring
- Adjunct cannulation teaching techniques including tap cannulation, touch cannulation and tandem hand cannulation

A multifaceted approach to managing patients with self-cannulation fears is required, and caregiver assistance could also be considered if self-cannulation is something that cannot be overcome despite the above.

8.5.3 Functional Challenges

Training patients who have visual, hearing, learning, or physical impairments can be more challenging and may require more time and sessions to complete training. Although there is little evidence available on the best methods to assist with the training process, Table 12 lists potential strategies to overcome these challenges.

Table 12. Potential strategies for physical challenges (adapted from Ontario Renal Network, 2023)

Challenge	AK98 (Vantive)
Difficulties with self-management • Frail or unable to walk or stand • Cognitive impairment • No use of either hand • Impaired personal hygiene • Controlled or managed active substance abuse • Controlled or managed active psychiatric issues	• Family or caregiver assisted HHD • Caregiver education/support (e.g. regarding respite care or mental health) • Community nursing supports for home care (e.g. personal hygiene) • Involvement of geriatric or psychiatric health professionals • Peer or mentor support system • Medications to reduce agitation or stabilize mood • Support from other providers (e.g. primary care)
Visual impairment	• Family or caregiver assisted HHD • Extended training and practice • Educational materials with high contrast, enlarged or magnifiable text • Resources in Braille • HHD equipment technologies that offer voice commands, text to speech or larger text font • Audio recordings of training steps, resources and procedures
Hearing impaired	• Family or caregiver assisted HHD • American Sign Language (ASL) translators • Extended training and practice • HHD equipment technologies that have light or vibration-based alarms or alerts
Language barriers	• Translator services during training, clinic and for machine troubleshooting including outside of clinic hours • Support from family members and/or caregivers, particularly if able to be present during training and clinic visits • Translation of training manuals • Videos of setup for training or reference • Set of picture or cue cards • HHD equipment technologies with language assistance
Inability to read/write, cognitive impairment, learning disability	• Family or caregiver assisted HHD • Shorter training sessions, longer overall training duration, and repetition as required to maximize information retention • Dialysis machine and technology with less complexity • Set of picture or cue cards • Videos of setup for training or reference • Chronologically organized checklists

Further information on

- Barriers and possible strategies are outlined in the Ontario Renal Network - Home Dialysis Assessment Document

9.0 Patient Monitoring and Maintenance

Follow-up with a multidisciplinary care team is viewed as a key requirement to facilitate a seamless transition from training to HHD, and to ensure patients have adequate post-training support. However, there is currently no data on the optimal follow up interval or format. The care model is also dependent on local centre capabilities, staffing, patient population, geographical factors and local utilities. Therefore, a wide range of approaches may be potentially utilized.

An international survey of large HHD centres across Europe, Australia, Hong Kong and the US (Mitra 2015) noted key similarities in their practice:

- Clinics: Regular patient reviews ranging from monthly (United States) to every 3-6 months (United Kingdom) by the multidisciplinary team which includes the nephrologist, nurse, social worker, dietitian, and pharmacist as necessary
- Correspondence: Dialysis log sheets and blood samples every 4 to 6 weeks
- Home visits: One home visit with the first HHD session or in the first week, potentially with another pre-scheduled visit after 1 month then further visits as required. Visits could include retraining or review of emergency procedures.
- Support: 24/7 technical and nursing support via telephone or internet communication
- Dialysis backup: Available either in-centre or in the HHD unit to provide respite for patient or caregiver burnout, retraining, and troubleshooting of vascular access, cannulation issues, or other concerns.

BC practice parallels these consensuses on aspects of patient care as outlined in the following sections.

9.1 Clinics

Clinic Overview

In BC a follow up clinic includes a comprehensive review of clinical status by the MDT. Aspects such as vital signs, weight, symptoms, fluid status and bloodwork are assessed to monitor dialysis adequacy. Systems review including assessment of the vascular access site, discussion of any complications or concerns, dietary counseling, and psychosocial checks are also conducted.

Importantly, ongoing targeted or general education may be provided ad hoc during a HHD clinic appointment, home visit or phone/telehealth contact. Periodic review of hand hygiene, connection procedures, steps of dialysis, troubleshooting and vascular access care helps to identify adherence to protocols while determining if the patient's abilities to perform procedures and understanding of HHD concepts has changed over time. Additionally, the BC Renal Home Hemodialysis Log, that patients are instructed to use each dialysis session and bring to clinic, contains a pre-dialysis safety checklist that reinforces critical points of machine, environmental and vascular access care.

A Canadian centre has proposed conducting audits of vascular access technique every 6-12 months during clinic visits, and retraining as indicated, after finding it reduced the number of patient-reported errors (Dhruve, 2019). Recertification audit tools for patients are available in BC and recommended at least annually, however consistent use is limited by patient acceptance and facility resources.

Clinic Interval

Clinic interval varies significantly across BC due to factors including geographical realities, patient preference and historical practice. Generally, the

first formal clinic with the HHD MDT occurs just prior to training completion, as a post training summary and review. Subsequent clinics follow up occurs every 3-6 months. To reduce patient travel time in regional areas, some programs utilize hybrid models by incorporating telehealth sessions or having a HHD team travel to satellite sites including the patient's home.

Further information

- Home Hemodialysis Log
- HHD Audit Tool for CVCs and AVF or AVG

9.2 Laboratory Testing

Laboratory monitoring is recommended every 4-6 weeks in line with those on in-center hemodialysis. Centrifuges can be provided to allow self-collection, particularly for those patients living in rural or remote areas. Table 13 provides general guidance on recommended tests and timing; however, test types and frequency are at the discretion of each unit and nephrologist depending on the needs of each patient.

Table 13. Recommended schedule of laboratory tests

Adult HHD patient	Initiation	Monthly	Every 3 Months	Every 6 Months	Annually
CBC					
Iron saturation, ferritin, Fe, TIBC					
Na, K, Cl, HCO3, urea, creatinine					
Calcium, phosphate, albumin					
iPTH					
Alk Phos, ALT, AST					
Uric acid					
Magnesium					
Hba1c (if diabetic)					
Cytotoxic antibodies (those on transplant wait list)					
Hepatitis BsAg, Hepatitis BsAb, Hepatitis BcAb, Hepatitis C, HIV					
Total cholesterol, LDL, HDL, triglycerides, blood glucose					
Tb screening (chest x ray, IGRA)					
TSH				PRN	
INR		PRN			

9.3 Home Visits

Home visits are completed by HHD nurses and are at the discretion of the local program, based on availability of staff and HHD unit needs. Some BC programs now provide visits via telehealth rather than in person. Costs for home visits are not covered under the BC Renal Activity Based Funding Model and must be funded internally to the extent felt clinically necessary by each individual Health Authority.

Typically, home visits are scheduled for the initial 1-2 sessions after graduation from HHD training to support a smooth transition to home. Research on home visits and clinical outcomes in HHD is limited, but despite being time-consuming and costly, they can offer valuable insights into a patient's transition home and their adaptations, uncover potential safety concerns, or suggest beneficial alterations to treatment parameters and procedures (Francois 2015). Considerations for when to perform additional home visits include:

- Post lengthy hospitalizations.
- Identified changes in patient's/family's ability to self-manage, and/or cope with aspects of care.
- Evidence of caregiver burnout
- Change in home environment.

9.4 Other Supports

Correspondence

Once a month patients forward their blood work and dialysis log sheets to their unit. Nursing contact may occur every 4 to 8 weeks, however the frequency of communication can vary depending on the patient's level of experience and current issues.

In BC, 24/7 vendor technical support is available via telephone or internet communication. Timing of access to on-call nursing support varies by program based on resources and need.

Respite

Respite dialysis, where the patient performs haemodialysis for a period of time within the HHD, hospital, or satellite dialysis unit rather than at home, can be an important temporary period of rest and relief available to patients across BC. The indication may be for vascular access or cannulation issues, retraining, acute illness, technical problems, burnout and other changes to home or social circumstances. It is recommended that the training HHD facility, rather than hospital or satellite units, provide the respite sessions in order to maintain continuity of care and focus on self-management.

Support for Care Partners

Care partners and family support are vital to the success and expansion of HHD with care assisted HHD patients having no difference in outcomes compared to independent patients (Tennankore 2013). However, it is known that the burden of performing dialysis is a common reason for dropping out (Schacter 2013) and that over time, the physical and mental health of care partners can become strained leading to depression and resentment (Rioux 2012, Walker 2014). The National Kidney Foundation (NKF) has pinpointed care partner support as a key focus to overcome home dialysis barriers. They recommend the use of a care partner burden inventory to support sustainability of HHD by identifying areas of concern and burnout early, in addition to peer support groups, mentoring, and respite dialysis to support care partners (Chan, 2020).

9.5 Retraining

Retraining, where a patient has knowledge or technique refreshed or updated after the initial training period has ended, targets patients who may have started deviating from the standard procedures they were initially taught and is thought to aid in the reduction of mistakes or complications.

Limited literature in the home therapies area come from peritoneal dialysis (PD). Small studies showed that six months after starting PD up to 50% of patients had modified their exchange technique, skipped steps, or failed to follow proper hygiene practices (Dong, 2010) and that retraining could significantly lower rates of exit site infection and peritonitis (Chang, 2018). However, there is limited data on the optimum timing, frequency, technique, or situations for when retraining in HHD should occur.

BC recommends conducting retraining for all patients in the event of a prolonged hospitalization or episode of technique failure. Retraining for selected patients in the event of other scenarios, such as interruption to HHD, deficiency on competency reassessment, or changes in equipment, home setting, dialysis partner, or medical condition, is at the discretion of the program and subject to staff availability.

9.6 Treatment Interruptions

Occasionally, despite the unit's best efforts, some patients are unable to attend follow-up clinic appointments, complete the required blood work, or follow the prescribed treatment plan. Currently, there is no province-wide policy addressing non-adherence to follow-up care or monitoring, and limited literature exists regarding the optimal management of such patients in HHD.

Similar to in-centre hemodialysis, non-adherence to prescribed dialysis sessions may also occur in the HHD setting. However, there is no data regarding the prevalence of non-adherence to HHD schedules. It is recommended to identify and address potential barriers to adherence, which may include issues such as painful blood draws, inadequate understanding of the consequences of non-adherence, work schedule conflicts, transportation difficulties, anxiety, or forgetfulness (Jones et al, 2015). As outlined in the HHD Patient Agreement, patients are expected to attend all follow-up clinics and complete necessary blood work as instructed. They are also made aware that there is a possibility of removal from the HHD program and transfer to an appropriate hemodialysis facility for their own safety, should ongoing participation pose risks to the patient which includes persistent non-adherence.

If these challenges are encountered, it is recommended that involved members of the MDT speak to the head of their unit regarding subsequent steps and that liaison with BC Renal for further support is initiated before withdrawal of a patient from the program is considered. Ultimately, the timing and implementation of such decisions are at the discretion of the local unit.

Further information:

- Home Hemodialysis Provincial Program Patient Agreement Letter (only accessible via Intranet)

9.7 Emergencies

It is common for patients and caregivers to fear adverse events and whether they can manage dialysis-related emergencies independently. HHD programs must have safeguards and training

frameworks that aid staff and patients to prevent serious adverse events and manage them effectively if they occur.

Medical Emergencies

Examples of home dialysis-related emergencies include.

- blood loss related to needle dislodgement, vascular access rupture, CVC disconnection, or circuit compromise.
- air embolism
- hemodynamic compromise from ultrafiltration or dialysate leak
- hemolysis
- acute electrolyte abnormalities
- dialysis water contamination
- dialyzer reaction

These are no different to facility-based dialysis, however a review of published cases indicates that most deaths were related to bleeding as a result of human error and deviation from safety procedures. The same review found that, while vigilance is necessary, limited cohort epidemiological data from centres in Canada and Australia/New Zealand show low numbers of life-threatening adverse events with the relative risk for death being significantly lower than facility HD patients (Pauly et al, 2015). We can therefore reassure patients that HHD is very safe as long as standard safety procedures are followed.

In general, in the event of any bleeding, air in access, altered level of consciousness, or any other concerning symptom, emphasis should be placed on immediate clamping of lines followed by medical alert via phone, caregiver or personal alarm. An emergency disconnect kit (including clamps, scissors, sterile gauze, tape, pre-filled saline syringes) should always be kept near the dialysis machine. The use of devices to detect blood leaks can also be considered given the significance of blood loss events in HHD.

Further information on

- The specific response to a given emergency is found in the Patient and Educator Training Workbooks/Checklists
- The fistula, graft or CVC Emergency Disconnect Procedures

External Emergencies

Natural disasters, such as blizzards, earthquakes, floods, hurricanes, or other major events can directly affect dialysis care by disrupting

- power
- water supply
- physical and telecommunications access to medical services.
- access to HHD supplies

These can occur quickly and without warning. Therefore, being prepared is vital to minimize the potential impact on patients. It is recommended that units consider.

- Identification of potential hazards and how likely they are to occur in the area.
- Patient education including specific plans for power outages, supply cut offs and water treatment failure.
- Assigning backup facility dialysis locations

- Maintaining liaison with local emergency and utility services so they are aware to aid/prioritise a patient.
- 'Go bags' and survival kits for regional patients, such as keeping at least a 3-day supply of survival disaster diet which would include non-perishable lower salt foods.
- A Natural Disaster Response to stay in place vs relocate to backup CDU/in-centre dialysis.
- Advising selected patients to maintain back up power (generators are not currently reimbursed by BC)

Further information on

- Suggestions for survival packs, diet and other initial responses are outlined in Emergency Preparedness Information for Dialysis Patients
- Other quick reference forms are found at the BC Renal Emergency Preparedness page
- Plans specifically for regional patients are detailed in the Guideline for Rural HHD Programs

10.0 HHD Guidelines and Protocols

Evidence based practice is a principal element in achieving positive clinical outcomes. The availability of HHD guidelines, protocols and standards at a local, provincial and international level are to be implemented to provide standardized, safe, efficient, cost effective, and quality care for the patient on HHD.

10.1 International Guidelines

- Implementing Hemodialysis in the Home: A Global Perspective - Ishd.org/Home-HD-Toolkit
  - Peer-reviewed manual developed by The Global Forum for Home Hemodialysis to guide healthcare teams to develop a successful HHD program.
- Home dialysis: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference - Kdigo.org/wp-content/uploads/2023/04/Home-Dialysis-Conclusions-from-a-KDIGO-Controversies-Conference.pdf
  - Conference report identifying approaches and strategies to expand the use of home dialysis and how best to improve the experience for individuals and care partners.
- Home Dialysis Toolkit - Media.esrdnetworks.org/documents/Home_Dialysis_Toolkit_2023.pdf
  - Reference tool published by a workgroup under the National Forum of ESRD Networks, Inc. to provide health providers information about overcoming barriers to starting or growing a home dialysis program.
- KDOQI Clinical Practice Guideline for Vascular Access: 2019 Update - Ajkd.org/article/S0272-6386(19)31137-0/fulltext
  - Evidence-based guidelines for hemodialysis vascular access including guidance on vascular access choice, targets for AV access and management of complications.

10.2 Provincial Standardized HHD Resources

Many BC Renal protocols, guidelines and forms are linked in the relevant sections of this Best Practices Guideline. Access to further resources is outlined below, however these are not exhaustive, and many other documents can be found on the BC Renal and SharePoint websites.

Resources for Health Care Professionals

Clinical Resources

- Programs -> Guideline for Rural HHD Programs, Home Dialysis Referral Pathway
- Clinical -> Anemia, Phosphate and Calcium for extended HD, NxStage Heparin and Thrombocytopenia

Vascular Access

- Buttonhole Cannulation Guideline and patient teaching tools.
- Rope Ladder Cannulation Guideline and patient teaching tools.
- Provincial Guidelines for Vascular Access

SharePoint (only accessible via Intranet) is an extensive resource containing.

- Nurse training aids, checklists, and education
- Patient documents for assessments, logistics, orders, workbooks, training aids, travelling, and waste.
- Vendor information on roles, machines, contacts and educational resources
- Emergency procedures

Resources for Patients

- Introduction to Home Dialysis
- Transitioning to Home Hemodialysis
- BC Home Hemodialysis Patient Resources including Home Hemodialysis Patient Workbook
- BC Vascular Access Patient Resources
- Emergency Preparedness including Information Booklet and Disconnect Procedures

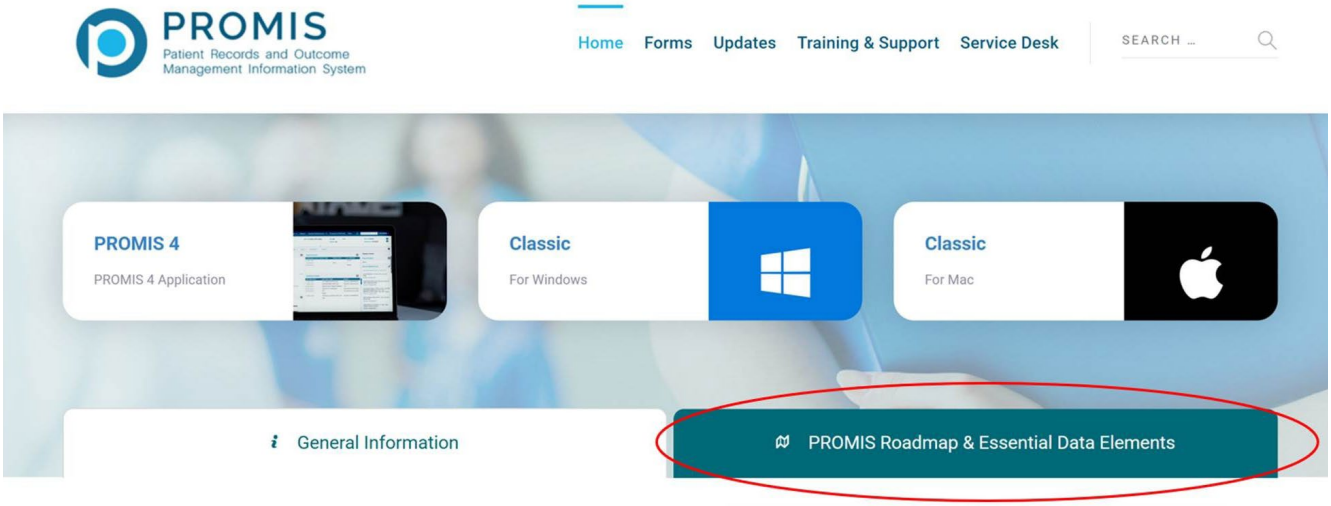
10.3 Quality Data Indicators

Quality data indicators are standardized measures that reflect aspects of health care and are essential in guiding quality improvement across a system. These indicators provide transparency in the health care system while supporting monitoring and evaluation of clinical patient and program outcomes.

10.3.1 Essential Data Elements

PROMIS contains patient information from the whole of British Columbia that supports clinical, administrative and research purposes. BC Renal led a collaborative process including program, committee, and/or medical leadership from all health authorities, to determine what data are essential. Data may be deemed essential for one or multiple reasons, including for funding purposes, to meet CORR, Ministry of Health, or health authority reporting requirements, to support emergency planning, and to support provincial coordination and care for kidney patients. These data are required for BC Renal to fulfill its mandate, and health authority data entry in PROMIS is supported through the renal funding model. Some of these data may also be captured in health authority information systems; unless there is integration between PROMIS and a health authority system for the data in question, dual entry between PROMIS and health authority systems must continue.

The Essential Data Elements file outlines those essential data elements that are mandatory for completion, and “what, where, why and when”. The Essential Data Elements are reviewed for relevance on a regular basis. You can access the current version of the Essential Data Elements on the PROMIS portal at Promis.phc.bc.ca/promis/. Click on the PROMIS Roadmap & Essential Data Elements Tab. Elements are grouped by PROMIS module or information domain and include general renal entry requirements applicable across programs, as well as HHD specific data elements.



10.3.2 Provincial HHD Quality Data Indicators

In British Columbia, HHD data indicators reflect the structure of the program, the processes within the program and the outcomes of the program. See table 14 below for a list of indicators and technical definitions of each. HHD indicators are categorized within 4 domains: prevalence, intake, attrition, patient centered care with stratification of data by provincial, health authority and local HHD programs.

Comprehensive reviews of HHD quality data indicators occurs through provincial committees, health authority leadership teams and local HHD programs. HHD and PD prevalence rates are provincially reported to the PHSA board and the BC Ministry of Health.

Table 14. Potential challenges to HHD training

Domain	Indicator	Rationale
Intake	**% patients started HHD training for the first time**	All patients necessitating RRT should be considered for home therapies, including HHD. Obstacles to proper education, timely referral and thoughtful patient selection should be identified for suboptimal numbers.
	% patients who succesfully transition from training to home	This help to indirectly validate the selection of patients for HHD training and its specific challenges that could be improved to ease the process.
	Median training time	HHD training duration ranges in general from 4 to 6 weeks. Identifying unusual training times could trigger research for associated modifiable structural or individual factors.
	% AVF, %AVG, % CVC at time of HHD training	AVFs are considered the first line vascular access for chronic dialysis. A well developed and functional access at time of training will ease cannulation and minimize the need for further specific access retraining. Increasing trends in AVGs and CVC utilization should be identified and their contributing factors addressed.

Domain	Indicator	Rationale
	% HHD training starts from KCC **% HHD training starts from HD In-centre or CDU** **% HHD training starts from Transplant**	Validate the consideration of home therapies in the transitioning pathway from predialysis and other RRT and make sure that programs are providing timely education to permit so.
	Median time from In-centre/ CDU HD to HHD training	Recognize undue delays towards consideration and referral of potentially eligible patients to HHD
	Median wait-time	Recognize undue delays towards consideration and referral of potentially eligible patients to HHD
Prevalence	**% dialysis patients dialyzing on HHD**	Home dialysis is associated with significant medical, social and economic benefits. Programs should seek to expand the proportion of their patients on home therapies to allow patients to experience these enhanced outcomes and lower costs. Identifying declining trends and their associated systematic barriers could help improve these numbers.
Attrition	**6-months attrition**	Following the early exits trend is a key to identify barriers to sustainable home dialysis, for the most part in relation to training and possibly suboptimal patient selection.
	12-months attrition	From a more long term point of view, this indicator intends to point out intercurrent challenges to sustain HHD that could be improved.
	Annual attrition by reason categories	If possible, further identify in a precise manner what are the causes for HHD attrition with a focus on modifiable or clearly undesirable reasons.
Patient-Centered Care	**Choice vs Actual:** **% pts who chose Home HD and started Home HD training within 3 months of chronic dialysis initiation**	Patient-centered metric for which any systematic obstacle restricting patients from their modality of choice should be addressed (if possible).

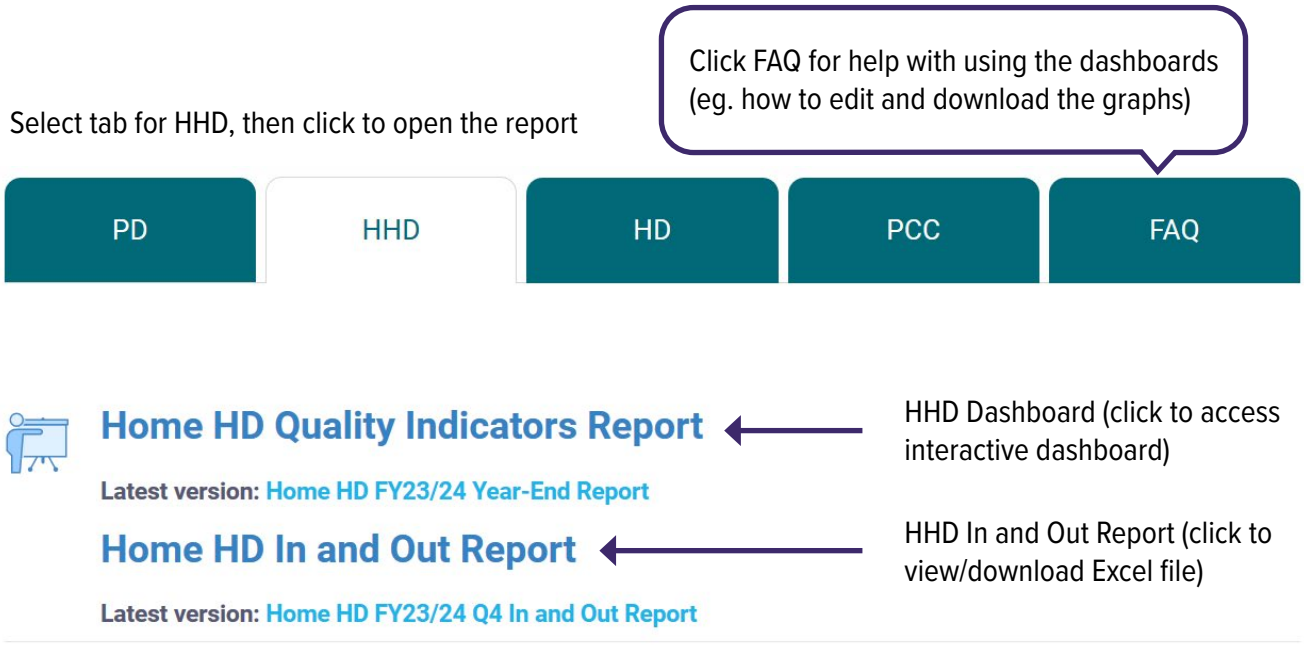
BCR Interactive HHD Dashboard

The interactive user-friendly HHD dashboard reports are created based on key quality indicators over the chosen time by the HHD Committee. Depending on patient population size, indicators are reported by health authority or primary management center. The intent is to supplement the patient-level reporting that is available in PROMIS with visual data representation that can be used by the HHD programs.

Note: No PROMIS User account needed! Everyone with the log-in details may access these reports.

Where to find the reports:
Go to PROMIS website > https://promis.phc.bc.ca.
Insert login details.

Navigate to > Updates > Indicators Reports. Then click “Login and view Indicator Reports HERE” Insert 2nd login details.



How to request data that is not available in the dashboard or PROMIS reports:

Request For Information (RFI) form requests patient level or summary data for administrative, QI or research.

The RFI can be completed here: Apps.bcpra.ubc.ca/jira/servicedesk/customer/portal/101/create/121

If you don't have a JIRA Service Desk account set up yet, please contact PROMIS Support at support@bcpra.ubc.ca or 1-855-806-8868 or 604 806 8868 to get an account.

You may also visit BCR website summary stats page: BCRenal.ca/about/disease-system-statistics to see which stats are already publicly available.

10.3.3 Future Areas of Research

Home dialysis is associated with significant medical, social and economic benefits. Programs should seek to expand the proportion of their patients on home dialysis to allow patients to experience these enhanced outcomes and lower costs. Identifying declining trends and their associated systematic barriers could help improve these numbers. Future research could include other indicators such as infection rate, hospitalizations, access flow as per the needs identified by the HHD programs.

10.4 Planetary Nephrology

As a priority of the BC Renal 2023-2028 Strategic Plan, Planetary Health has become a focus for all areas of renal programs, including HHD. Home therapies may have advantages over facility-based dialysis with potential reduction in water usage, lower energy consumption, and less travel (hence lower patient costs as well as travel related emissions to health centers). Home therapies maintain patient autonomy and potentially lower medication use which in itself lead to positive downstream environmental impacts.

Although still at an early stage, the HHD committee has looked at ways to integrate evolving research findings and ensure steps are taken to foster sustainable nephrology practices. This include

improving awareness amongst patients and clinicians of the positive impacts for HHD on both patients' quality of life and the environment as a whole. Most recently BC Renal has partnered with UBC Planetary Healthcare Lab and UBC Engineering to research life cycle assessments of kidney therapies including HHD with initial results suggesting positive outcomes for home therapies (Saleem et al., 2023). Over time, there will be better understanding of how to engage patients, stakeholders, vendors and the clinical team of ways to choose practices with system environmental impacts.

Further information can be found on the BC Renal website: BCRenal.ca/about/accountability/planetary-health
*Contributors: Dr. Caroline Stigant, Nephrologist VIHA

11.0 Advance Care Planning

Patients with advanced chronic kidney disease have complex care needs. Hospitalizations and critical incidents often lead to a reactive and intervention-focused approach to care. Multiple providers manage distinct acute episodes, resulting in care that may not align with the patients' values, wishes, or priorities. This situation leaves healthcare providers, patients, and families unprepared for challenging end-of-life decisions.

In September 2011, legislation came into effect to provide British Columbians with improved options for expressing their wishes about future health care decisions. This legislation allows capable adults to put plans into place that outline the health care treatments they consent to, or refuse based on their beliefs, values and wishes.

The province of British Columbia and the BC Ministry of Health, in partnership with BC health authorities and health care providers, developed and published a resource for British Columbians to help with advance care planning (ACP). Over the past few years, an Integrated Palliative Care approach has been suggested for patients undergoing renal care throughout BC. The integrated palliative approach focuses on the patient's wishes and maintenance of quality of life optimizing functionality, and reduction of pain, symptoms and stress through clear communication with the clinical team, encouragement to share their wishes, and accessing appropriate resources when needed. The integrated palliative nephrology resource guide is a comprehensive document of resources for patients undergoing renal care throughout the province and can be utilized by the clinical team throughout the patient's journey.

The framework can be found on the BC Renal website: BCRenal.ca/resource-gallery/Documents/Integrative_Palliative_Nephrology_Resource_Guide.pdf

The advance care planning guide can be found at:

- My Voice: Expressing My Wishes for Future Health Care Treatment
  Transition from Dialysis Treatment to Palliative Care Guidebook
- BCRenal.ca/resource-gallery/Documents/Transition_from_Dialysis_Treatment_to_Palliative%20Care.pdf
  Checklist for indicators, Serious Illness Conversation starters, triggers to update ACP/GOC BC Government resource for Advance Care Planning

- The Government of BC's Advance Care Planning page
  The BC Government resource for Aboriginal Health Advance Care Planning
- Aboriginal Health Advance Care Planning brochure

The BC Renal has prioritized the advance care planning process as an essential part of renal care. ACP discussions should take place throughout the patient journey BCRenal.ca/resource-gallery/Documents/Starting_the_Conversation-Exploring_Key_Concepts_Through_the_Renal_Journey.pdf and be revisited every time a patient's medical condition changes.

The primary goals of ACP are:

1. To enhance patient and family understanding of their End Stage Kidney Disease (ESKD) and End of Life (EOL) issues, including prognosis and likely outcomes of renal replacement therapies and alternative plans of care.
2. To define the patient's key priorities in EOL care and develop a care plan that addresses these issues. Advance care planning is an effective tool for facilitating communication among patients, their families and the health care team and is integral to providing high quality dialysis care.
3. To enhance patient autonomy by shaping future clinical care to fit the patient's wishes and values.
4. To improve the health care decision process generally, including patient and family satisfaction.
5. To identify a substitute decision-maker for future medical decision-making (as appropriate).
6. To help the substitute decision-maker understand their role in future medical decision-making.
7. To promote a shared understanding of relevant values and preferences among the patient, substitute decision-maker and health care providers.

For more information, please visit the BC Renal website.
BCRenal.ca/health-professionals/clinical-resources/palliative-care

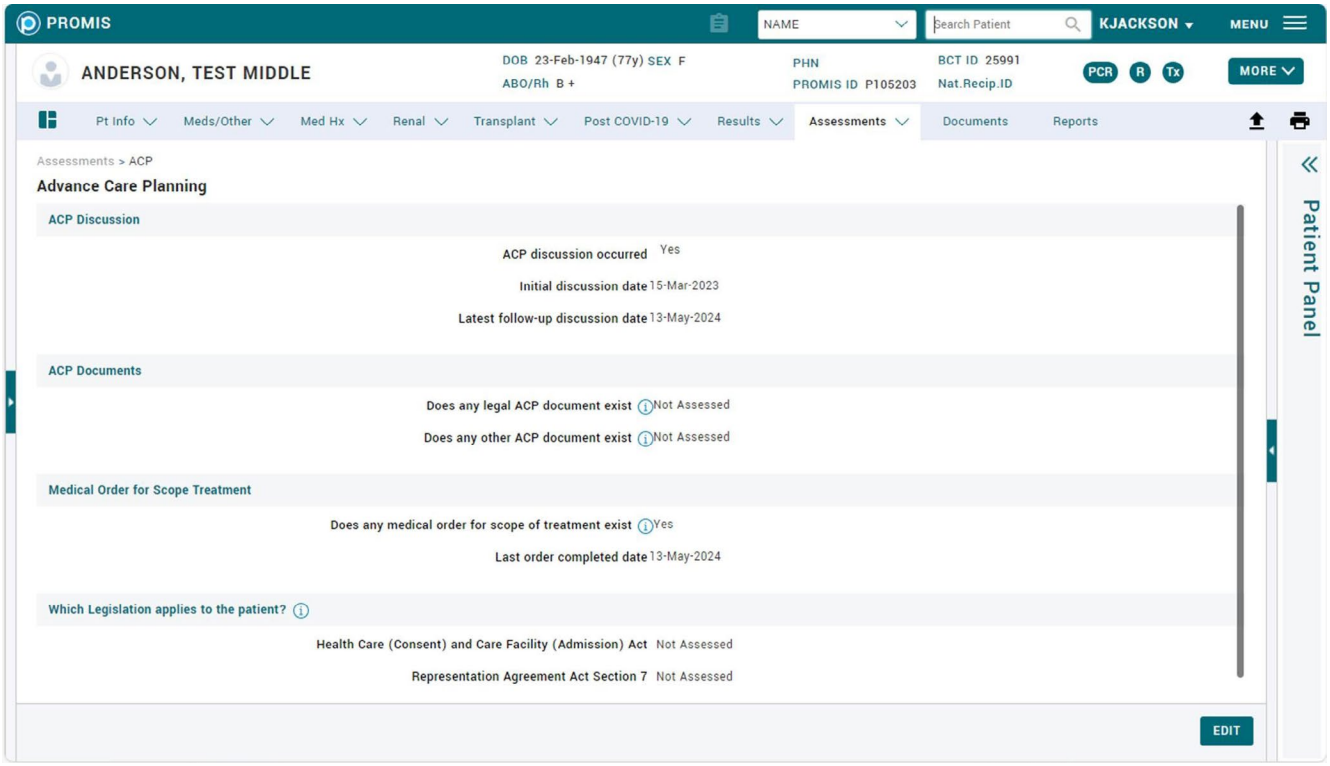
Advance Care Planning Documentation

Documentation is an essential component to ACP. Documented discussions will improve the care of patients entering the final stages of their lives through:

- Gathering information about ACP activities that have occurred throughout the life of the renal patient.
- Track activities as the patient interact with any BC renal program and modality (i.e. CKD, HD, HHD, PD, Transplant)
- Offer a report that may assist programs identify patients who may need focus on ACP activities based on GFR levels.

Documented ACP discussions must be entered into PROMIS. The diagram below will help you navigate the PROMIS module for ACP. The ACP module in PROMIS is not a comprehensive charting tool for ACP- it is a tracking tool for patient and program planning purposes. Entering this information will later assist in identifying which HHD patients still need conversations as well as help improve the services offered to all patients.

Advance Care Planning Module (PROMIS)



Symptom Assessment and Management

The symptom burden of HHD patients can be extensive, severe and with significant impact on quality of life. The Modified Edmonton Symptom Assessment System (ESAS) has been recognized in the literature as an effective tool for assessing symptoms in ESKD patients and is recommended to be completed on a routine basis with all renal patients. The Symptom Assessment and Management resources for patients can be found on the BC Renal website at:

BCRenal.ca/health-info/managing-my-care/symptom-assessment-and-management

You will also find several symptom management guides to assist patients with symptom burden.

There are two sets of guides for both health care professionals and patients. Please refer to the website at:

For Health care Professionals: BCRenal.ca/health-professionals/clinical-resources/symptom-assessment-and-management

For Patients: BCRenal.ca/health-info/managing-my-care/symptom-assessment-and-management

Additional Resources for Conservative/Palliative Care

- BC Renal website for
  - Guidelines and Tools: BCRenal.ca/health-professionals/clinical-resources/palliative-care
  - Other resources: BCRenal.ca/health-professionals/clinical-resources/palliative-care#Resources

*Contributors: Dr. Gaylene Hargrove, Nephrologist VIHA

12.0 Special Populations

12.1 Pediatric

Currently there are no pediatric patients in BC undergoing HHD, yet there have been instances for pediatric HHD in Toronto based programs (SickKids). Most pediatric patients are maintained on peritoneal dialysis, while a smaller number will be on intermittent hemodialysis. This population tends to have rates of eligibility for kidney transplantation and, appropriately, this is ultimately the goal modality in most patients. If in the future a situation arose where HHD were to be indicated for a pediatric patient, the pediatric program would work collaboratively with the adult HHD programs to co-manage the patient.

*Contributors: Dr. Cherry Mammen, Nephrologist BCCH"

12.2 Indigenous

The HHD committee recognizes the need for culturally safe care among Indigenous populations and strongly supports the work on culturally safe care that is being undertaken by BC Renal. We acknowledge the reality of systemic racism within the healthcare system in general in British Columbia and are committed to true and meaningful reconciliation with the Indigenous Peoples of British Columbia.

The HHD Committee recognizes the importance of exploring ways to allow members of the Indigenous Population to remain within their own community wherever possible. The role of Home-based dialysis including Home Hemodialysis may offer significant benefits and opportunities to help support this goal. HHD enables patients to remain in the home for treatment with less emphasis on health care institutions and more community/family involvement in care. Patient training must be provided in a culturally safe environment by staff who have an understanding of the impacts of colonialism and systemic racism on indigenous health. There is renewed focused efforts to ensure appropriate protocols and resources are in place to help support indigenous HHD patients in BC. The San'yas Anti-Racism Cultural Safety Training is encouraged for all HHD professionals and health authorities in BC. Local Health Authorities also have plans and training available for Health Authority employees and BC Renal and the HHD Committee strongly encourage participation in these options.

*Contributors: Dr. Mike Copland, HHD Committee Chair and Angela Robinson, HHD Nursing Educator Lead NHA

12.3 Elderly

Elderly CKD patients may experience benefits with home hemodialysis (HHD) if they are adequately trained, carefully supported and have regular follow-up.

HHD provides flexibility in scheduling, potentially enhancing blood pressure control, decreasing cardiac strain/fluctuations in hemodynamics, reducing transportation issues while providing care in the home setting.

Suitability for HHD includes appropriate patient assessment and alleviation of any physical and cognitive limitations by the multidisciplinary team . Adjustments to training to account for arthritis, vision impairments, reduced mobility, short term memory loss and executive function challenges, requires staff

to be knowledgeable and adaptable in training plans. Potential considerations, such as a longer training, having family members/caregivers engaged through the training process, and assistive devices/ modifications may be of great importance. Utilization of a multidisciplinary approach to ensure that the home environment is safe and that the patient/support persons are aware of protocols if complications were to arise.

BC Renal programs use a standardized approach to home dialysis referral, which includes appropriate suitability and functional assessments to plan the necessary support for those of older age or frailer overall. Various tools may be used in the process of selection and candidacy assessment such as the match–D guide to better identify and categorize barriers. If there are still concerns about eligibility, referral for comprehensive geriatric assessment to better understand functional capacity and assessment for cognitive impairment would be a viable next step.

In the future, expedited cognitive/functional screens prior to modality selection may be beneficial for elderly candidates for HHD.

*Contributors: Dr. Wayne Hung, Nephrologist FHA

12.4 Pregnancy

There is accumulating evidence that demonstrates the benefits of home hemodialysis for pregnant patients.

From a clinical lens, extended and frequent hemodialysis has been associated with improved fertility, higher frequency of term pregnancy, reduction in maternal and fetal complications, including better live birth rates (Hladunewich et al., 2014).

This would be in addition to the personal benefits of pregnant patients having their care in a home environment, avoiding excessive travel to/from facilities, better ability to make adjustments in real-time, having flexible scheduling, and more autonomy overall.

Although there does not exist any specific provincial policies for HHD in pregnant patients at this time, there is a provincial renal obstetrics clinic that patients may be referred to as a way to gain insight into the unique renal care aspects when pregnant.

HHD patients will require ongoing surveillance and adjustments of their therapies over their time of pregnancy.
*Contributors: Dr. Amanda Cunnigham, Nephrologist BC Transplant

12.5 Rural

The HHD committee recognizes the importance of home dialysis amongst those living in rural areas of BC and the avoidance of relocation for treatment purposes. There is renewed efforts to ensure appropriate protocols and resources are in place to help support the rural population. Currently, there is a BC Renal document titled “Caring for the home hemodialysis patient: A resource for remote health care facilities in British Columbia and the Yukon territory,” that serves as a starting point to address specific concerns for this population. The topics include approaches to emergency situation, acute medical problems requiring hospitalization, and contacts in case of complications.

This document may be accessed at: BCRenal.ca/ resource gallery/Documents/Guideline%20for%20 Rural%20HHD%20Programs.pdf

*Contributors: Angela Robinson, HHD Nursing Educator Lead NHA

Roles and Responsibilities Within the HHD Program

13.0 Home Hemodialysis Team Functions

The successful initiation and ongoing maintenance of an effective HHD program relies on a team of professionals with specialized skills and expertise to provide optimal patient care. The proficiency of the entire multidisciplinary team is crucial for the success of an HHD program, enhancing both the utilization and quality of HHD care.

The HHD multidisciplinary health care team may include nephrologists, - nurses, dietitians, social workers, pharmacist/pharmacy techs and unit clerks. All staff members work with patients and their families to develop patient-centered training plans, goal setting and advanced care planning. To ensure effective and cohesive teamwork among HHD team members, definition and understanding of individual roles is important.

13.1 Nephrologist

There may be several nephrologists involved in the patient HHD journey. A nephrologist will be involved with the patient transition pre- dialysis care or from an alternative modality of renal replacement therapy to HHD. In certain programs, there may be a dedicated HHD nephrologist assigned to promote home HD, while bringing expertise and experience in HHD clinical management. In programs where the nephrologist who specializes in HHD care differs from the patient's primary nephrologist, the transition of care should occur between physicians once the patient commences training for home hemodialysis. Nephrologists work in partnership with the multidisciplinary team to deliver safe patient centered care. They play an important role in pre-dialysis assessment and education, patient treatment and monitoring, and quality patient management.

13.2 Nurse

HHD nurses play an essential role in ensuring the success of HHD programs and the quality of patient care. They serve as a patient caregiver, educator, advocate, and care coordinator. HHD nurse conduct suitability assessments for potential HHD patients, provides patient training and ongoing educational support throughout the HHD patient journey. They ensure continuity of care through a case management approach, fostering strong relationships and communication among patients, the wider healthcare team and the HHD product vendors.

13.3 Vascular Access Nurse

Vascular access (VA) nurse is responsible for the development and delivery of a high-quality care to ensure timely creation and maintenance of vascular access for patients with end stage kidney disease. VA Nurse work closely with the dialysis nurses, vascular surgeons, radiologists, sonographers, and nephrologists.

13.4 Dietitian

The significant role of nutrition in the care of dialysis patients is well documented. The dietitian provides education and clinical guidance to assess HHD patients' nutritional needs, develop and implement individual nutrition programs and monitor and evaluate the patients' response.

13.5 Social Worker

The Social Worker is essential to the wellbeing of

HHD patients as they transition and adjust to all phases of renal care. They are an essential part of the healthcare team to develop a plan of care inclusive of assessment, support, consultative and direct services to address patient needs related to social determinants of health and risk factors in adaptation to chronic illness, self-care and self-management. The social worker assesses patients for any barriers to HHD and incorporates goals of care discussions in the care of the patient throughout the renal journey.

13.6 Pharmacist

HHD patients often require multiple medications and complicated drug regiments to manage their condition. The pharmacist provides medication compliance counseling, drug interaction screening, medication reconciliation, evaluation of drug level assays, education for staff and patients, and enhanced overall medication management.

13.7 Unit Coordinator

The unit clerk provides administrative support to ensure the day-to-day operations of HHD programs are seamless and efficient.

14.0 HHD Staffing

The application of staffing models in the dialysis practice settings remains an under-investigated component of a growing body of research assessing various aspects of the nephrology workforce. In British Columbia (BC), home hemodialysis programs adopt a multidisciplinary approach to effectively address patient needs and overcome barriers to HHD. This comprehensive strategy involves not only the provision of clinical care but also the integration of various administrative functions.

The staffing requirements for HHD programs in BC are diverse and encompass both clinical and operational leadership roles. These programs rely on a coordinated team that includes nephrologists, nurses, dietitians, pharmacists, social workers, and clerical staff. Each member of this multidisciplinary team plays a vital role in ensuring that patients receive holistic care tailored to their unique circumstances, which is essential for optimizing outcomes in HHD.

By employing a variety of skilled professionals, HHD programs can better navigate the complexities of patient management, facilitate effective communication among team members, and ultimately enhance the overall patient experience. This collaborative model not only helps to meet individual patient needs but also contributes to the efficiency and effectiveness of the home hemodialysis care delivery system.

15.0 Health Care Clinician Training and Resources

Initial and ongoing training and education is a key component of a successful HHD program. A variety of educational support opportunities are available to all members of the multidisciplinary team at a local, provincial, national, and international level. Resources to consider are structured training programs, continuing education opportunities, mentorship from senior members of the multidisciplinary team, conferences, BC Renal resources, and literature/ internet resources.

15.1 HHD Nurse Training

In the United States, it is recommended that HHD nurse educators have a minimum of 1 year experience in chronic kidney disease and 3 months in HD. There are no similar broad mandates in BC, however it

is generally expected that they be an experienced Hemodialysis nurse and ideally also have some teaching experience. They should maintain continued education to ensure HHD machine competency skills remain up-to-date and show adaptability to apply the principles of adult learning (see table 7). Education support via Vantive and NxStage is available and is essential to help meet ongoing development.

The essential attributes of HHD nurses include:

- Enthusiasm and motivation to inspire staff and patients.
- Knowledge of different learning styles and how to adapt teaching to the individual
- Advocacy for self-care
- Self-direction with ability to multitask.
- Confident with evaluating, troubleshooting, and counseling patients and caregivers

Some of the frequently used resources by HHD Nurses are:

- New HHD Nurse Orientation package
- HHD Patient Training Workbook
- BC Renal HHD contracts operational guide
- Consolidation HHD equipment nursing skills
- PROMIS user guide for HHD Nurses

15.2 Conferences

Annual conferences are designed to provide continuing education on relevant renal subjects targeting the multidisciplinary team. The following recommended renal conferences include:

British Columbia

- BC Kidney Days BCRenal.ca

National

- Canadian Society of Nephrology (CSN) Csnscn.ca
- Canadian Associations of Nephrology Nurses and Technicians (CANNT) Cannt.ca

North American

- Annual Dialysis Conference Annualdialysisconference.org
- American Nephrology Nurse Associations (ANNA) Annanurse.org

International

- European Renal Association-European Dialysis and Transplant Association (ERA-EDTA) Era-online.org

HHD Equipment and Resources

16.0 HHD Supply and Service Delivery

16.1 Roles and Responsibilities

16.1.1 Vendor

The vendor is responsible for integrating equipment, products, supplies, and home hemodialysis (HHD) services as outlined in a negotiated provincial contract. BC Renal currently manages several contracts for HHD equipment and supplies. Through these contracts, vendors supply machines and services to all the HHD programs across BC.

16.1.2 HHD Program

Each Health Authority is responsible for ordering HHD training supplies and ancillaries. Orders are to be placed directly with the vendors. Ideal supply stock levels for HHD programs are maintained by the hospital stores departments in most hospital based HHD programs. HHD staff may be required to use a dedicated inventory system to determine the amount of stock required for a functioning HHD clinic. In community-based clinics, the training nurse may be responsible for ordering all HHD training supplies and ancillaries through the vendor.

To ensure efficient HHD supply and delivery, HHD nurse/supply coordinator will be responsible to:

- Order and coordinate arrangements for initial home dialysis patient supply order.
- Order unique, or patient specific supplies, from the hospital purchasing department or vendor.
- Rotate stock and monitor expiry dates for hospital supplies/training areas supply if not done by hospital store departments.

- Store all supplies according to vendor recommendations.
- Ensure all patient prescription changes are communicated to vendor in a timely manner.

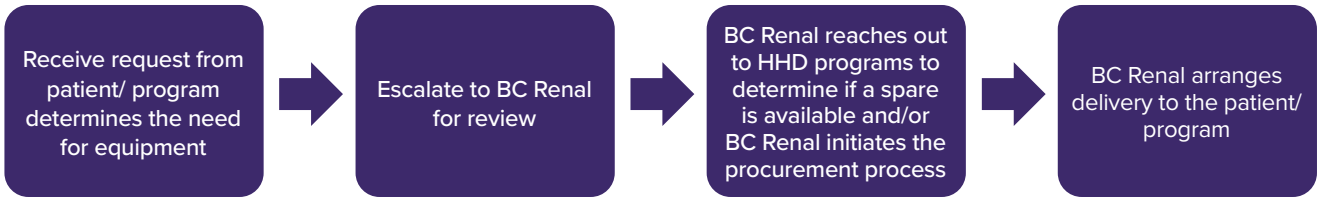
HHD Equipment, Product or Special Service Request

Additional products and services that are not included in the HHD vendor contracts can be requested. Such requests require consideration and approval from BC Renal and includes products such as Express fluid warmers, Wheelchair scales, Medfusion pumps, Centrifuges, Pre-mixed bags; and services such as Multiple delivery locations or Travel requests exceeding 4-week allowance.

Submitting an Equipment Request

Several devices and equipment are owned by BC Renal and shared across programs in the province. When not in use, excess inventory may be transported to other programs when there is a new request. If there are no available devices at the time a new request is received, BC Renal will purchase additional inventory for the program.

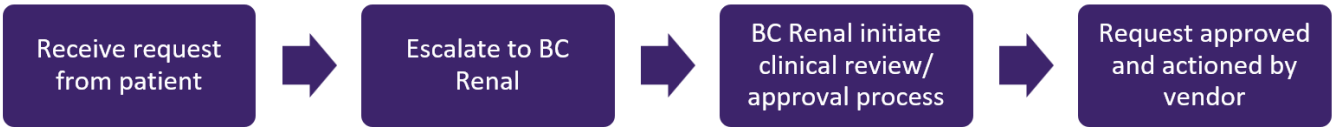
Following is the process to assess and fulfill device/ equipment requests:



Once received, the program manages the product and assigns it to patients, as required. When it is no longer required the product should be returned to the program and stored until needed. Upon off boarding the HHD program, patients should drop off the product to the program directly. In cases where the patient is not able to return the product to the program, a request can be sent to BC Renal to arrange a courier service to retrieve it.
*It is not possible for patients to purchase HHD products/ supplies directly as there is no way for the vendor or BC Renal to accept payment from the patient. In addition, there are Health Canada regulations related to the sale of medical devices and supplies that the vendor must comply to.

Submitting a product or special service request
Similarly, there are some products and services that incur additional costs. If HHD staff identify a patient that would benefit from a certain arrangement, a request can be sent to the Contracts Operations team for review. Consideration is given to the patient's situation and the need for these services.

To assess the request, BC Renal follows the below approval process:



16.1.3 Patient

The HHD team will determine the patient's supply order based on prescription and ancillary needs. These supplies will be on the patient order form. Upon completion of training, the patient will be responsible to:

- Order supplies according to delivery schedule. A minimum of 5 business is required for orders to be placed.
- Store all supplies according to vendor recommendations.
- Sort supplies and note expiry dates.
- Use products accordingly to prescription.
- Ensure availability of someone in the home to receive supply deliveries.
- Allow 60 days' notice for travel. Discuss travel plans with HHD team.

16.1.4 BC Renal

The BC Renal is responsible for:

- coordination of the provincial HHD program in collaboration with all Home Hemodialysis programs in BC
- HHD provincial contracts
- financial costs for all home hemodialysis supplies and products.
- Coverage of HHD related costs as per BC Renal travel coverage policy for HHD patients in BC
- The Contracts Operations team is a part of the Business Operations portfolio at BC Renal. This team oversees the following items for the provincial HHD program:
- Provincial contracts, amendments, and procurement projects
- Supplier product/service issues escalation and performance monitoring

- Order form product changes
- Review home renovations exceeding approved costs
- Assess and approve special requests including delivery services, equipment/device orders, and travel

For more information, please refer to BC Renal HHD Contracts Operational Guide on Sharepoint site for HHD.

Product Supply Shortage or Recall

When product supply disruptions, manufacturing change, recalls or backorders occurs; vendors will communicate and manage inventory availability and replenishment. Vendors work closely with PHSA and BC Renal to administer a communication plan and provide quick resolution for any disruptions.

16.2 Contract

16.2.1 Process

The provincial contract provides equipment and supplies to patients with costs covered by BC Renal. The Home Hemodialysis Committee, BC Renal and PHSA Supply Chain reviews evidence-based products using specific evaluation criteria to identify the product that delivers the greatest overall clinical, technical and financial value.

16.2.2 Expectations

A set of quantifiable key performance indicators are used to ensure efficiency, capability, and effectiveness of various operational aspects of the contract.

16.2.3 Monitoring

The BC Renal manages, and monitors the Provincial HHD equipment, supplies, and delivery contracts, and facilitates the contract with PHSA Supply Chain. Key performance indicators are reviewed at quarterly business review meetings.

Any concerns regarding any vendor products or services, that are unresolved, frequently occurring or is patient therapy impacting, are to be forwarded to the BC Renal contracts team. This team will assess the issue and escalate to the vendor and/or leadership group, as required, to reach a resolution.

The process of issue tracking and management is essential to evaluate vendor performance and ensure that any ongoing or reoccurring issues are addressed.

16.3 Home Renovations, Removal and Restorations

Renovations, such as plumbing and electrical, may be required to use hemodialysis machines in the home. The renovation process varies for each machine and is taken into consideration when determining which machine is most suitable for the patient. To support the patients, BC Renal covers the cost of renovations that are identified as necessary for setting up home hemodialysis and not for cosmetic work through the following approval process:

When the patient no longer needs to be on home hemodialysis, take down requests are sent. Baxter will coordinate the take down process and restore patient home if they completed the initial home renovation. For take down/restoration quote from contractors over the allowed limit it will be forwarded to BC Renal for review and approval. If Baxter is not coordinating take- down, patients will be responsible for finding a licensed contractor to complete the work.

Lead Times and Considerations

Home Assessments are scheduled at a time convenient to the patient (and HHD Educator, if required) within 14 days of the request. Home assessments must be completed before training begins to ensure the patient's home is conducive to home dialysis on the vendor's system.

Several factors can delay the completion of home renovations. Some common causes for delay include patient and contractor availabilities and landlord/ strata approvals.

For more information, please refer to 'Home Renovation' document on BC Renal HHD SharePoint site resources.

17.0 Recommended Allocation of Resources for HHD

17.1 BC Renal HHD Funding Model

In BC, the funding for HHD service delivery is provided by the Ministry of Health and allocated based on patient volumes. The mandate of BC Renal is to advocate for funding to support delivery of services in an equitable manner throughout the province. Operation and delivery of services is the responsibility of the health authority renal programs.

BC Renal is accountable to the Ministry of Health for the annual budget for kidney care services in the province and for health outcomes for this patient group. In 2003, BC Renal developed an activity-based funding approach for kidney patients with the overarching objective of establishing a sustainable model for renal services. BC Renal is accountable for the entire provincial renal budget in partnership with the health authority renal programs. Once renal funding is delivered to a health authority, the funds can be used at the discretion of its renal program, allowing the ability to address regional targets in view of local circumstances by accommodating both province-wide and regional targets. The transparency of the funding model enables the direct comparison

of patient outcomes by location across the province and the fair evaluation of non-standard approaches to care.

17.2 Application of the BC Renal HHD Funding Model

The BC Renal Activity Based funding model is founded on the concept of:

- funding follows the patient
- funding is based on outcomes

The funding model covers the costs of delivering multidisciplinary care for all patients with kidney disease in British Columbia, regardless of their location or treatment modality. The BC Renal activity model describes each care activity required, identifies the staff needed to complete the activity, estimates the time required for completion (validated by time motion studies), defines the frequency of the activity and estimates the probability of the activity being required for patients in each treatment modality. The number of direct patient care hours required for each category of care provider was determined. Hours were then converted to FTE requirements and corresponding labor costs after adjusting for fatigue and delay factors, indirect patient care activities, sick time, statutory holidays, vacation time and professional development time.

In addition, BC Renal is responsible for contract negotiations and supervision of Key Performance Indicators with vendors on behalf of the province. From the Home HD perspective, this includes:

- Initial home evaluation and renovations (contractually with equipment vendors)
- Restoration to baseline when no longer participating with HHD (contractually with equipment vendors)
- Equipment (Water treatment and dialysis device) contract negotiation and maintenance
- Contract for Consumables used during Hemodialysis (blood lines, dialyzers, concentrates, ancillary supplies)
- Preventative Maintenance scheduling
- Machine repairs

17.3 Utility Cost Reimbursement

Water, electricity and garbage costs are identified as barriers to having patient on home hemodialysis due to the additional cost. Patients often share their concern with HHD staff and social workers about rise in their utilities cost due to home hemodialysis. In Year 2018, a report from Kidney Foundation of Canada 'The Burden of Out-of-Pocket Costs for Canadians with Kidney Failure' discussed that respondents on home hemodialysis indicated that their average out-of-pocket cost for electricity and water for their home hemodialysis machine run was significantly high. Utilities (water and electricity) cost have increased significantly since then. A working group assessed this issue in December 2023, focusing on estimating a reasonable annual amount that could cover additional expenses for utilities and garbage removal related to home hemodialysis. Efforts will be made to support this work in future, but at the time of this writing, this benefit is not available.

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