

# PROVINCIAL STANDARDS & GUIDELINES


## **NOCTURNAL HEMODIALYSIS PROGRAM IMPLEMENTATION**

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Approved by the BCPRA Hemodialysis Committee

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**IMPORTANT INFORMATION**

This BCPRRA 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.bcrenalagency.ca](http://www.bcrenalagency.ca) for the most recent version.

**For information about the use and referencing of BCPRRA provincial guidelines/resources, refer to <http://bit.ly/28SF4n>.**



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# Nocturnal Hemodialysis Program Implementation Guide

## 1.0 Introduction to Guide and Acknowledgements

This guide provides practical information on setting up a nocturnal hemodialysis (NHD) program in BC. The information applies to both in-centre and community dialysis units and to dependent and independent NHD programs.

The information is based on the successful experiences of established NHD programs in BC:

TYPE OF PROGRAM	LOCATION	ESTABLISHED
Dependent NHD	St Paul's Hospital (Vancouver, BC)	2010
	Surrey Memorial Hospital (Surrey, BC)	2013
	Royal Columbian Hospital (New Westminster, BC)	2014
	Royal Jubilee Hospital (Victoria, BC)	2015
Independent NHD	Vancouver General Hospital (Vancouver, BC)	2008

BCPRA would like to express appreciation to the physicians and staff at these sites for their input into the creation of this guide and for providing examples of materials developed at their respective sites during the implementation of their NHD programs.

## 2.0 Information about Nocturnal Hemodialysis

## 2.1 What is nocturnal hemodialysis?

Nocturnal hemodialysis (NHD) is hemodialysis that is provided at night. It is a slower, longer treatment that occurs while a patient sleeps. This treatment takes 7 — 8 hours and occurs three times per week. It can be done at a dialysis centre or at home (aka home hemodialysis). This guide focuses on nocturnal dialysis that is done at a dialysis centre.

There are two models of dialysis centre-based NHD in BC:

1. Independent: Patient is expected to do his/her own care, including the set-up of equipment, self-cannulation, self-assessment (HD prescription) and self-management of the machine alarm conditions. Staff is available as a resource and to provide assistance with any emergencies.
2. Dependent: Patient is encouraged to participate in his/her own care to the extent possible but much of the nocturnal care is provided by nurses and, in some centres, renal technicians.

## 2.2 What are the benefits of NHD for patients?

NHD offers both medical and social benefits:

1. Medical: NHD provides a higher dialysis dose than conventional HD and results in better solute clearance and fluid removal. This, in turn, helps patients feel better and reduces renal related symptoms. NHD results in a 75%-100% increase in dialysis time for patients.

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2. Social: Through dialyzing at night, NHD improves employment opportunities, increases time with family and potentially improves quality of life.

While there have not been any random controlled studies on NHD, observational studies demonstrate<sup>1</sup>:

- Improved BP and LVH
- Improved anemia and Ca/Po4
- Improved nutritional status
- Reduction in medications, including antihypertensives, erythropoietic agents and phosphorus binders
- Decreased hospitalization
- Improved survival

## 2.3 Why implement a NHD program?

NHD programs:

- Provide patients with a wider choice of treatment options and facilitate the right modality being offered to the right patient.
- Increase the capacity of an HD program with a relatively small increase in resources.
- Improve the efficiency in the utilization of facilities, equipment and other resources
- Encourage higher levels of independence amongst patients and increase the likelihood of a patient transferring to home HD.

## 2.4 What are the prerequisites to successful implementation of a NHD program?

Fundamentals of effective and efficient NHD programs include, but are not limited, to:

- EARLY, FREQUENT AND ONGOING COMMUNICATION WITH STAFF, PHYSICIANS AND OTHER STAKEHOLDERS!
- Renal unit and hospital leaders' interest in and support for establishing a NHD program.
- HD team who are committed to make NHD work, including ongoing monitoring of NHD patients. Nurses and renal technicians (if utilized) must also be prepared to work night shifts.
- Appropriate lead time for planning and communication of changes. BC experience is that the time required from planning to implementation is 7 months or more.
- Availability of appropriate after-hours infrastructure and resources (e.g., housekeeping, urgent response for patients who are deteriorating).
- Effective patient selection criteria and patient/family education.
- Sufficient critical mass of patients eligible and willing to participate in NHD.
- Development of a well-defined project plan and schedule.
- Availability of a project manager to lead the implementation. This may be a dedicated project manager or a renal leader that has the interest, skills and time to fulfill this function.

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<sup>1</sup>Supporting Literature:

- NDT 1998: The results of an 8 hr thrice weekly hemodialysis schedule (G. Laurent and B. Charra)
- NDT 2009: Prospective evaluation of an in-center conversion from conventional HD to an intensified nocturnal strategy (David et al)
- CJASN 2009: In-center Nocturnal HD: Another option in the Management of Chronic Kidney Disease (Goldstein et al)
- CJASN 2009: Outcomes associated with in-center nocturnal hemodialysis from a large multicenter program (Lacson E et al)
- JASN 2012: Survival with Three-Times Weekly In-center Nocturnal Versus Conventional Hemodialysis (Lacson E, Lindsay RM, Suri R, Garg A, Hakim)

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## 3.0 Setting up a Nocturnal Hemodialysis Program

### 3.1 Steps to setting up a NHD program

While the steps and processes required to set up a NHD program will vary from site to site, Table 1 provides an overview of the steps.

**Table 1: Steps to setting up a NHD program**

STEP		COMMENTS/RESOURCES
1	Develop a project plan.	There are many templates that can be used. Most health authorities have "standard templates". If not, there are many examples on the internet.
2	Confirm availability of resources.	Additional funding will be required to implement a NHD program. At a minimum, funds will be required for nursing and, if utilized, renal technician time and HD supplies. Funds may also be required for additional support services (e.g., housekeeping). Finally, funds might be needed for allied healthcare providers (pharmacists, social workers, RDs, etc.).
3	Establish an infrastructure to lead the project.	A "steering" committee and/or "working group(s)" are helpful in coordinating the NHD implementation. Membership might include operational and technical leaders, physicians, dietitians, pharmacists and social workers. Other stakeholders can be invited to provide input throughout the process.
4	Develop a communication plan and initiate communication about the project.	Early, frequent and ongoing communication with staff, physicians and other stakeholders is essential. Refer to section 3.5.
5	Confirm patient selection criteria and process.	Refer to section 3.2.
6	Confirm program size, hours of operation and scheduling.	Refer to section 3.3.
7	Confirm staffing model and mix. Develop rotations.	Refer to section 3.4.
8	Confirm the availability of support services.	Refer to section 3.5.
9	Review transportation options and parking for patients. Negotiate changes (e.g., HandyDART, safe/free parking for patients at night).	It may be possible to group patients by geography for HandyDART pick up and drop off.
10	Develop clinical guidelines, protocols, tools and forms.	Refer to section 3.6.
11	Create patient education materials +/- patient contract/agreement.	Refer to section 3.7.
12	Develop staff orientation program.	Refer to section 3.8.
13	Develop NHD sick-call and no-show staffing algorithms.	Creating a pool of NHD on-call staff, prioritizing NHD staffing needs and designating nocturnal shifts as "must fill shifts" may improve the NHD operation flow.
14	Develop plan for NHD evaluation.	Refer to section 4.0.

## 3.2 Patient selection criteria and process

### 3.2.1 Criteria for NHD

NHD is an excellent option for patients that have medical indications, prefer to have dialysis at night and may have barriers to home hemodialysis (e.g., home unsuitable, fear of needling, technical barriers, medically unstable and personal choice not to take dialysis home).

The BC experience has shown that NHD programs quickly gain popularity and the number of patients desiring this care modality often exceeds the number of available spaces. Patients with medical indications are prioritized above patients that simply prefer having their dialysis at night where there is no medical indication for needing longer treatments.

**Table 2: Medical and psychosocial inclusion, exclusion and re-evaluation criteria**

INCLUSION CRITERIA	EXCLUSION CRITERIA	RE-EVALUATION CRITERIA
<ul style="list-style-type: none"> <li>#1 priority: Calciphylaxis</li> <li>#2 priority: Tumoral calcinosis</li> <li>Other:                             <ul style="list-style-type: none"> <li>Evidence of under-dialysis based on bloodwork and/or symptoms</li> <li>Difficulty with the large relatively rapid fluid removal on conventional HD</li> <li>Large fluid gains making it impossible to adhere to goal weight with conventional HD prescriptions</li> <li>Vascular access issues which prevent adequate blood pump speed to deliver adequate dialysis dose over 4 hours</li> <li>Prone to hypotension with conventional HD</li> <li>Blood pressure not controlled with medications</li> <li>Patients who would be suitable for home HD but have barriers</li> </ul> </li> </ul>	<p>Absolute:</p> <ul style="list-style-type: none"> <li>Unstable cardiac condition</li> <li>Active psychiatric disorder with potential liability (e.g., disruptive during HD etc.)</li> <li>Uncontrolled seizure disorder</li> <li>Cognitive impairment with confusion or agitation (symptoms may be exacerbated by unfamiliar surroundings and be disruptive for other patients)</li> <li>Active chemical dependency that impairs the patient's ability to assess health needs (alcohol, drug addiction)</li> </ul> <p>Possible:</p> <ul style="list-style-type: none"> <li>Uncontrolled and frequent diarrhea</li> <li>Incontinence</li> <li>Unstable vascular access (needs to be addressed before starting NHD)</li> </ul>	<p><i>The conditions below are triggers for the HD team to re-evaluate the suitability of an existing NHD patient for continuation in the NHD program. Any combination of these may result in transfer back to conventional HD. The patient may be re-evaluated in the future for readmission to the NHD program.</i></p> <ul style="list-style-type: none"> <li>Significant change in medical condition</li> <li>Admission as inpatient to hospital</li> <li>Increasing/frequent intradialytic complications</li> <li>Discharge of patient from hospital</li> <li>Violation of patient agreement/contract (e.g., substance abuse, safety issues)</li> </ul>

Selection criteria for independent nocturnal hemodialysis are similar to those used for assessing patients for home HD, and take into consideration the patients' physical and cognitive capacity for HD self-care.

## 3.2.2 Process for patient selection

### Initial cohort

Selecting the initial patients for an NHD program includes the following steps:

- Provide information to existing HD patients about NHD (see Appendix 5.1.1 Sample NHD information flyer in [Appendix 5.1](#)).
- If interested, ask patients to fill out an interest survey (see Appendix 5.2.1 Sample patient survey re interest in NHD in [Appendix 5.2](#)).
- Team to review each interested patient and select appropriate candidates based on the inclusion criteria and priorities.

It is recommended that the initial cohort be made up of patients who are considered “ideal” candidates for NHD according to the inclusion criteria above. This will help to promote success in the long-term.

### Ongoing selection

After the initial cohort of patients has been selected, a process needs to be established to fill new NHD spaces as they become available. Processes will be facility-specific but need to include:

- Providing eligible patients with information about NHD.
- A process of wait-listing eligible and interested patients.

- A way to prioritize patients on the waitlist.
- Notification of patients/families as a space becomes available.
- Orientation of patients/families to NHD.

See Appendix 5.2.2 Sample protocol for entry to NHD in [Appendix 5.2](#) for information on wait-listing patients and entry to NHD.

### Patient agreement

If patients are eligible and offered NHD as an option, they must agree to the conditions of facility-based NHD. They need to be aware they are moving towards a more independent dialysis and will be expected to take part in some or all of their own care and attend clinic appointments as scheduled. Patients may also be required to commit to NHD for a minimum period of time, e.g. one month. Most units provide these expectations to patients in writing and, in some cases, formalize the agreement through patient contracts/agreements. See Appendix 5.1.2 Sample patient orientation flyer and Appendix 5.1.3 Sample NHD patient agreement in [Appendix 5.1](#).

In some cases, patients wish to withdraw from participation in a NHD program, usually because they are unable to sleep or experience other discomforts while in the renal unit, or they wish to transfer to another treatment modality (e.g., home HD). See Appendix 5.2.3 Sample protocol for withdrawal from NHD in [Appendix 5.2](#).

## 3.3 Scheduling and program size

### 3.3.1 Scheduling, preparation and turnover

Depending on the size of the HD unit, some units will be required to do machine turnover and site cleanup before and after the night shift while others will have capacity to allocate part of their renal unit area to NHD patients such that no machine turnover and clean-up will be required between day and night shifts, except on the regular weekend clean-up day (usually Sundays).

For HD units that do not have sufficient space to allocate part of the unit to NHD patients, several machine turnovers and cleanups per day will be required. A sample site schedule is provided below which allows for 4 machine turnovers per day during the week and 3 on the weekends.

**Table 3: Weekday runs (4 turnovers per day)**

07 00	08 00	09 00	10 00	11 00	12 00	13 00	14 00	15 00	16 00	17 00	18 00	19 00	20 00	21 00	22 00	23 00	24 00	01 00	02 00	03 00	04 00	05 00	06 00
1 <sup>st</sup> run — AM HD patients.				Machine Turnover	2 <sup>nd</sup> run — Noon HD patients				Machine Turnover	3 <sup>rd</sup> run — PM HD patients				Machine Turnover	4 <sup>th</sup> run — NHD patients. 7-8 hour runs during the weekdays. (23:00-06:00 h)						Machine Turnover		



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**Table 4: Weekend run (3 turnovers per day)**

07 00	08 00	09 00	10 00	11 00	12 00	13 00	14 00	15 00	16 00	17 00	18 00	19 00	20 00	21 00	22 00	23 00	24 00	01 00	02 00	03 00	04 00	05 00	06 00
1 <sup>st</sup> run — AM HD patients.					Machine Turnover	2 <sup>nd</sup> run — Noon HD patients					Machine Turnover	Unit idle time (18:00 - 20:00h)	Machine Turnover	3 <sup>rd</sup> run — NHD patients. 7-8 hour run during the weekend (Saturday or Sunday, 23:00-06:00 h)					Machine Turnover				

### 3.3.2 Program size

Because of staffing ratios (refer to section 3.4), 10 patients per night shift is usually the minimum number of patients to be cost effective. If the number of patients is more than 10, multiples of 5 patients are the most cost effective (e.g., 15 patients, 20 patients, etc.). If NHD operates 6 nights per week, this would allow double the number of patients to participate in the program. For example, if there are 10 patients per night, this provides capacity for 20 patients in the program at a time (10 patients x 3 days each x 2 patient cohorts/week).

Existing BC programs operate 6 days per week. One cohort attends Mondays, Wednesdays and Fridays, and another cohort attends Sundays, Tuesdays and Thursdays.

### 3.4 Care model and staffing

#### 3.4.1 Staffing models and mix

Staffing numbers will vary with the number of patients and the amount of care patients can do for themselves. Usual ratios are listed in Table 5 on the next page.

**Table 5: NHD staffing ratios**

Type of NHD	RN/Patient Ratio	Care Aide/ Patient Ratio	Renal Tech/ Patient Ratio
Independent NHD	1:8	1:8	NA
Dependent NHD	1:5	NA	1:10 - 1:15

## Notes about staffing:

- While the ratios above are effective for established NHD programs, lower ratios are recommended during the start-up phase (e.g., 1:4 RN to patient ratio).
- Patient staggered start is also recommended during the start-up phase (e.g., 6 pts./night ramping up to full capacity of 10 or 15 pts./night over the course of several weeks).
- Start and stop times of staff will vary depending upon arrival times of patients. Common shift times start at 2100 or 2130 hrs and end at 0600 or 0630 hrs (10 or 10.5 paid hours).
- Some centres build in overlap between the evening and night shift so the evening shift can assist with HD start-up of the NHD patients. Similarly, one of the day shift staff can be scheduled to come in early (e.g., 0530 hrs) to assist with take down and holding access sites.
- Examples of activities that appropriate patients can be taught to perform (even in a dependent NHD setting): Machine set-up, weight calculation, vital signs and take down. Encouraging self-needling for appropriate patients is another strategy to support patient independence.
- One example of an actual (site-specific) RN rotation covering daytime HD patients plus a total of 20 NHD patients (10 pts./night) with 2 RNs per night is provided in [Appendix 5.3](#).
- Regardless of the staffing level, plans must be in place to manage emergencies (medical and psychosocial) and staff breaks. Many centres pay the RN(s) during breaks so that he/she is available to the unit if required.

- In addition to the model for providing nursing care, it is also important to consider how care will be provided to NHD patients by others on the HD team - e.g., physicians, pharmacists, renal dieticians, social workers, etc.

## 3.4.2 Typical NHD Routine

Table 6 (on the next page) describes a typical shift on a dependent NHD unit.

**Table 6: Typical routine on a dependent NHD unit**

20:00 - 21:00 hours	<ul style="list-style-type: none"> <li>• Patients arrive on the unit, take their weight and get supplies together.</li> <li>• Staff prepare items, clean/disinfect and set-up HD machines</li> </ul>
21:00 - 22:30 hours	<ul style="list-style-type: none"> <li>• Hook patients up to dialysis.</li> <li>• Provide intradialytic medications</li> <li>• Transonic assessments, if required.</li> <li>• Other assessments/measurements, if required (e.g. blood glucose measurements for patients with diabetes on insulin or oral hypoglycemics).</li> <li>• Documentation.</li> <li>• Settle patients for the night.</li> </ul>
22:30 - 05:00 hours	<ul style="list-style-type: none"> <li>• Hourly checks of patients:                             <ul style="list-style-type: none"> <li>• Check access, look for bleeding.</li> <li>• Check machine</li> <li>• Take blood pressure and other vital signs taken if clinically warranted (otherwise not taken during night).</li> <li>• Update log sheet.</li> </ul> </li> <li>• Review orders.</li> <li>• Check blood work results &amp; follow-up as necessary.</li> <li>• Complete treatments (e.g., minor wound care).</li> <li>• Staff breaks.</li> </ul>
05:00 - 06:00 hours	<ul style="list-style-type: none"> <li>• Take patients off dialysis in the same order they were put on (allows each patient to receive ~8 hours of dialysis).</li> </ul>

The typical routine on an independent NHD unit is similar to that described above except that patients assume responsibility for their HD care. This includes the set-up and take-down of the HD machine, self-cannulation, self-assessment (HD prescription) and self-management of the machine alarm conditions. Staff is available as a resource and to provide assistance with any emergencies. Patients are trained by a home HD nurse educator and the training is the same as provided to home HD patients. The only thing patients are not responsible for is disinfecting and filter changes on the HD machines after their treatment.

Arrangements are in place for staff to be able to access emergency services as needed during the

night (e.g., emergency department, MD on call, Code Blue team). If patients are unwell when they arrive on the HD unit, they are sent to the ED for an assessment prior to starting dialysis.

### 3.5 Communication and involvement of other departments/stakeholders

Communication and involvement of other departments/stakeholders is important in the successful launch of a NHD program. A plan needs to be developed to engage each group of stakeholders at the appropriate time. In-person communication (individual and group) with sufficient time for questions usually works the best, particularly for the groups that will be the most impacted.

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Table 7 identifies the services/stakeholders that are most likely to be impacted, the specific impact and the suggested plan for reducing the impact.

A sample of a HA-wide communication about the establishment of a new NHD program is provided in [Appendix 5.4](#) (see Appendix 5.4.1: Sample general communication on the establishment of NHD program).

**Table 7: Stakeholder impact analysis**

ORGANIZATION OR BUSINESS AREA	IMPACT	PLAN
<b>Renal Care Team</b> <ul style="list-style-type: none"> <li>HA renal and other leadership</li> <li>HA nephrologists</li> <li>HA renal nursing staff</li> <li>HA allied health staff (renal technicians, pharmacists, dieticians, social workers, etc.)</li> </ul>	<p>Will drive and/or support implementation of the changes.</p> <p>Responsible for disseminating information to their staff.</p> <p>Possible increase in workload. May require reallocation of resources to service the overnight shift of NHD patients.</p>	<p>Centralized communication using established organizational structures and communication channels.</p> <p>Clear expectations of service levels.</p> <p>Clear feedback loops.</p>
<b>Support Services</b> <ul style="list-style-type: none"> <li>Housekeeping</li> <li>Laundry</li> <li>Security services</li> <li>Parking services</li> <li>Plant services</li> <li>Stocking and supplies (e.g., add calcium concentrate 1.5 mmol/L)</li> <li>Portering</li> <li>IMITS</li> </ul>	<p>Possible increase in workload. May require additional or reallocation of resources to service the overnight shift of NHD patients.</p>	<p>Centralized communication using established organizational structures and communication channels.</p> <p>Clear expectations of service levels.</p> <p>Clear feedback loops.</p>
<b>Clinical Support Services</b> <ul style="list-style-type: none"> <li>ICU / code team</li> <li>Emergency department</li> <li>Biomedical engineering</li> <li>Laboratory</li> <li>Medical imaging</li> <li>Hospital site leaders and on-site medical staff (e.g., hospitalists), if applicable</li> </ul>	<p>Possible increase in workload, including after-hours work (midnight to 07:00).</p>	<p>Same as above.</p>
<b>Other stakeholders</b> <ul style="list-style-type: none"> <li>HA renal and other leadership</li> <li>HA nephrologists</li> <li>HA renal staff — nursing, allied health and support staff</li> <li>HA human resources and unions</li> <li>HA professional practice and integration</li> <li>BC Provincial Renal Agency</li> </ul>	<p>Will drive and/or support implementation of the changes.</p> <p>Responsible for disseminating information to their staff.</p>	<p>Same as above.</p>

## 3.6 Clinical guidelines and protocols

### 3.6.1 Typical nocturnal dialysis prescription

<b>Time</b>	8 hours
<b>Dialyzer</b>	High flux/high efficiency dialyzer
<b>Qb</b>	250 mL/min
<b>Qd</b>	300 mL/min
<b>Needle size</b>	17 gauge needles
<b>Na</b>	Individualized
<b>K</b>	2 or 3
<b>Calcium</b>	1.5
<b>HCO<sub>3</sub></b>	28-30
<b>Heparin</b>	1500 bolus/1000 running

### 3.6.2 Pre-printed orders for common problems

A NHD pre-printed order sample for common issues as suspected vascular access-related bacteremia is available in [Appendix 5.5](#). Additional documents in the appendix include sample NHD nursing care guidelines, and sample NHD patient care checklist and checklist summary.

### 3.6.3 Communication with physicians and the rest of HD team

#### Emergencies

All NHD units will require an emergency response (e.g., rapidly deteriorating patient, code blue, etc.). The specific response will depend on the resources available at each centre. Some may have an on-site response (e.g., on-site resident or physician) while

others may have alternative arrangements in place (e.g., take patient to ED; if off-site, call 911, etc.).

#### Urgent situations

All centres will require procedures to manage urgent situations (e.g., suspected bacteremia). Again, the specific response will depend on the resources available at each centre. At a minimum, all centres require access to a nephrologist on-call.

#### Non-urgent situations

Communication of non-urgent situations can be challenging as the night staff does not overlap with the usual hours that physicians and allied health staff are on the unit.

Many units have successfully implemented a “communication log” (aka nocturnal binder or nocturnal log) to communicate non-urgent patient situations to physicians and others on the HD team. See Appendix 5.4.2 Sample NHD communication log in [Appendix 5.4](#).

## 3.7 Patient education/orientation

Points to include in a patient education/orientation to NHD:

- Similarities and differences between conventional and nocturnal HD.
- Benefits of nocturnal HD.
- Process of enrolling and participating in a nocturnal HD session, including:
  - Transportation and parking
  - What to bring, including food, headphones, toothbrush
  - Linen
  - Lockers

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- Expectations of patients:
  - Code of conduct during NHD
  - Visitors
  - Drugs and alcohol
  - Clinic follow-up
- Self-care:
  - Specifics of the education will depend on whether the NHD program is dependent or independent. Education for independent NHD will be in more depth.
- Reasons for leaving the NHD program and transferring to other modalities.
- Names and contact details of the care team, including NHD unit supervisor, primary nephrologist, pharmacist, dietician, social worker, etc.
- Best time and way to contact the patient and/or his/her family. Review protocol in case the patient misses hemodialysis treatments (see Patients Missing (“No Shows”) or Shortening Hemodialysis Treatments guideline and related materials here: <http://www.bcrenalagency.ca/health-professionals/clinical-resources/hemodialysis>)

See sample patient education materials in [Appendix 5.1](#).

## 3.8 Staff orientation

The focus of staff orientation is on: (a) preparing the staff to the changes in the duties required at night (vs daytime) and (b) enhancing the understanding of staff of the benefits of NHD to patients, thereby motivating staff participation in the NHD program.

Specific components to include:

- Similarities and differences between conventional and nocturnal HD.
- Benefits of nocturnal HD to patients.
- Patient selection criteria and process.
- Details of NHD-specific clinical protocols (e.g., NHD pre-printed orders, algorithm for suspected bacteremia), procedures (e.g., emergency response) and workflows (e.g., typical NHD shift, NHD sick-call and no-show algorithms).
- Differences between NHD and conventional HD dialysis prescriptions (e.g., length of time, blood pump speed, dialysate flow rate, temperature and calcium and heparin requirements).
- Communication with other units, services and physicians (including nephrologists).
- Staff rotations.
- Support from other on-site teams/resources (e.g., ICU, housekeeping, security).
- Common concerns identified by staff which require discussion include:
  - Working with reduced support at night
  - Decreased nurse to patient ratio and how this may impact workload
  - Ways to channel concerns and initiate changes, if necessary

Refer to [Appendix 5.6](#) for a sample presentation for staff orientation.

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## 3.9 NHD program challenges

Active NHD programs in BC have come across several common challenges.

CHALLENGES	POSSIBLE MITIGATION STRATEGIES
<p>This column lists most common challenges encountered by NHD programs.</p>	<p>This column lists some mitigation strategies and solutions that one or more NHD programs have used to address the challenges.</p>
<p><b>Staffing</b></p> <ul style="list-style-type: none"> <li>• Staff resistant to nocturnal shift work</li> <li>• Staff may need more support and resources during nocturnal shifts</li> <li>• Nocturnal shifts end up covered by more junior staff</li> <li>• Patient to nurse ratio of 5:1 is difficult to maintain as some patients require extra care/time</li> <li>• Overtime for nocturnal shift staff may be an issue</li> </ul>	<ul style="list-style-type: none"> <li>• Have ensured early, clear and direct communication of NHD plans to staff.</li> <li>• Have involved nurses in the development of rotations to ensure better buy-in.</li> <li>• Have incorporated nocturnal shift work in regular schedule.</li> <li>• Have considered introducing more rotations that involve night shifts so night work is more spread out among staff to ensure a better mix of junior and more experience nurses on NHD shifts.</li> <li>• Have considered changing nocturnal shift from 10.5hrs to 12hrs to give staff more time to accomplish tasks.</li> <li>• Have introduced a mix of independent, slightly dependent, and dependent patients — this approach helped address many issues with both staff and patients.</li> <li>• Have met with staff on a regular basis to review patients, which helps address staff needs and boost confidence.</li> <li>• Have had site leaders available to help nurses during nocturnal shifts and/or identified a nurse champion to be the go-to person for nocturnal staff.</li> <li>• Have worked continuously to enhance staff skills and make them more confident during NHD shifts through training and ongoing leadership support.</li> <li>• Have established clear and effective feedback channels for staff to voice concerns.</li> <li>• Have allowed RNs to shadow a NHD shift at an active program to gain hands-on experience.</li> </ul>
<p><b>Patient selection and suitability for NHD</b></p> <ul style="list-style-type: none"> <li>• Usually high interest in NHD, with demand being higher than available spots on NHD programs.</li> <li>• Many patients are not suitable for NHD or become unstable/unsuitable later</li> <li>• Once patients are on NHD, it may be difficult to ask them to leave if they are not suitable</li> <li>• Processes for transferring patients from the NHD program to other modalities may not be clearly defined, including for ethical reasons</li> <li>• Processes for transferring patients from the NHD program to other modalities are not standardized across sites</li> </ul>	<ul style="list-style-type: none"> <li>• Have successfully used waitlists to keep NHD running at capacity.</li> <li>• Have established strict patient selection criteria, including provisions for patients who require more complicated care so they may be sent to dialyse during the day.</li> <li>• Have established strict criteria regarding patients who are sick and can't do nocturnal dialysis safely so they may be sent to dialyze in emergency or during daytime.</li> <li>• Have required patients to sign patient agreements with provisions outlining criteria for transferring from the NHD program to other modalities (may not be suitable for all programs).</li> <li>• Have encouraged patients to be independent and taught them how — this has resulted in positive attrition as some fully independent patients have gone to independent dialysis at home.</li> <li>• Have had the team meet weekly to review the nocturnal program and suitability of patients. The outcomes of the review have usually been well-received by patients (team includes HD unit nurses and staff, nurse practitioner, social workers, pharmacists, etc.).</li> <li>• Have had nocturnal nurses bring issues to unit leaders and sometimes involve the primary nephrologist. Have followed up with a discussion about suitability if NHD patients presented with persistent issues.</li> <li>• Have had a nephrologist independently decide if a patient needs to be transferred from the NHD program to another modality.</li> </ul>

## Nocturnal Hemodialysis Program Implementation Guide

CHALLENGES	POSSIBLE MITIGATION STRATEGIES
This column lists most common challenges encountered by NHD programs.	This column lists some mitigation strategies and solutions that one or more NHD programs have used to address the challenges.
<b>Patient discipline and disruptive behavior</b> <ul style="list-style-type: none"> <li>• Patients coming late to the nocturnal shift</li> <li>• Snoring and patients quitting due to sleep problems</li> <li>• Substance abuse</li> </ul>	<ul style="list-style-type: none"> <li>• Have individually reviewed the NHD modality and entry requirements with each patient and required patients to sign patient agreements (may not be suitable for all programs).</li> <li>• Have put patients in isolation rooms and drawn curtains, which helped solve the issue of TV lights being disruptive.</li> <li>• Have grouped people who snore together to minimise disruptions.</li> </ul>
<b>Medications and IV administration</b> <ul style="list-style-type: none"> <li>• Medication side effects</li> <li>• Staff struggling with cannulation</li> </ul>	<ul style="list-style-type: none"> <li>• Have given preference to using the pill form of medication instead of IV.</li> <li>• Have attempted to give fewer medications at night (other than antibiotics).</li> <li>• Have talked to patients routinely about medication side effects and driving.</li> <li>• Have offered advanced cannulation courses to nocturnal staff to boost confidence and eliminate issues with IV medications.</li> </ul>
<b>Clinic attendance and time with pharmacists, SWs, dieticians, etc.</b> <ul style="list-style-type: none"> <li>• Patients may be reluctant to make additional visits to the clinic on top of their NHD treatments</li> </ul>	<ul style="list-style-type: none"> <li>• Have required all patients to be seen by clinic regularly.</li> <li>• Have included provisions regarding clinic visits in patient agreements (may not be suitable for all programs).</li> <li>• Have scheduled clinic appointments for the morning after dialysis, plus accommodated some evening appointments. Have assigned a clerk to make appointments and follow up with patients.</li> </ul>
<b>Shift start and end issues</b> <ul style="list-style-type: none"> <li>• NHD may limit the run hours during the regular dialysis evening shift</li> <li>• Some patients may be unstable coming off NHD and require more support</li> <li>• Some patients may struggle with holding IV sites and sleeping in the morning</li> <li>• Communication between nocturnal staff and daytime staff</li> </ul>	<ul style="list-style-type: none"> <li>• Have started patients with staggered approach at 9-11PM; have ended shift at 6:15 or about that time to ensure ~8 hrs of dialysis.</li> <li>• Have had daytime nurse start earlier in the day (6AM) to help support unstable patients coming off NHD.</li> <li>• Have established a nocturnal binder for communication between nocturnal staff and daytime staff.</li> <li>• Where staff have not been receptive to the idea of a communication binder, have had a daytime clinical nurse leader start early (6:30AM) to ensure overlap with nocturnal nurses so concerns can be passed on.</li> </ul>
<b>Patient transportation</b> <ul style="list-style-type: none"> <li>• HandyDART schedules and routes may influence hemodialysis appointments</li> </ul>	<ul style="list-style-type: none"> <li>• Have engaged HandyDART early to align schedules and routes to patient and program needs.</li> <li>• Have grouped patients geographically for more efficient HandyDART service.</li> </ul>



## 3.10 Program costs

Increase in program costs will vary depending on site specifics and the ability of some units to provide certain services at no additional cost (e.g., housekeeping, physical plant, security services, etc.). BCPRA's current nocturnal patient-per-year funding differential is 1.3 times the regular patient-per-year funding.

## 4.0 Program Evaluation

Developing a plan for evaluation prior to the start-up of NHD is recommended. Typical measurement periods are prior to NHD start-up, 6 months post start-up and annually thereafter.

Recommended components of an evaluation include:

- Outcomes measures: BP, cardiac function, anemia, mineral metabolism, nutritional status, number of medications (e.g., erythropoietin, blood pressure medications and phosphate binders), infections, vascular access complications, transfers to home HD, hospital admissions and survival rates.
- Quality of life measures: Intradialytic symptoms, appetite, energy levels, sleep and cognition.
- Patient/caregiver satisfaction.
- Nursing, physician, renal technician, pharmacist, dietician, social worker and other staff satisfaction.

For samples of patient surveys, refer to [Appendix 5.7](#).

## 5.0 Appendices: Sample Materials

### 5.1 Appendix 1: Patient Education

- Appendix 5.1.1 Sample NHD information flyer
- Appendix 5.1.2 Sample patient orientation flyer
- Appendix 5.1.3 Sample NHD patient agreement
- Appendix 5.1.4 Sample patient orientation checklist

### 5.2 Appendix 2: Patient Selection and Flow Management

- Appendix 5.2.1 Sample patient survey re: interest in NHD
- Appendix 5.2.2 Sample protocol for entry to NHD
- Appendix 5.2.3 Sample protocol for withdrawal from NHD

### 5.3 Appendix 3: Staff Planning and Operation Flow

- Appendix 5.3.1 Sample rotation schedule

### 5.4 Appendix 4: Stakeholder Communication

- Appendix 5.4.1 Sample general communication on the establishment of NHD program
- Appendix 5.4.2 Sample NHD communication log

### 5.5 Appendix 5: Clinical Guidelines and Protocols

- Appendix 5.5.1 Sample pre-printed orders for NHD
- Appendix 5.5.2 Sample NHD nursing care guidelines
- Appendix 5.5.3 Sample NHD patient care checklist
- Appendix 5.5.4 Sample NHD patient care checklist summary

### 5.6 Appendix 6: Staff Orientation

- Appendix 5.6.1 Sample staff orientation presentation

### 5.7 Appendix 7: Patient Surveys

- Appendix 5.7.1 Sample patient satisfaction survey
- Appendix 5.7.2 Sample patient quality of life survey