



# PROVINCIAL STANDARDS & GUIDELINES



## Calcium Management for Patients Receiving Extended Duration Hemodialysis

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 Approved by the BCR Home Hemodialysis Committee



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Disclaimer: The procedure steps may not epic actual sequence of events. Patient/Client/Resident specifics must be considered in applying Interior Health Clinical Practice Decision Support Tools.

**PRINTED** copies of Clinical Practice Standards and Procedures may not be the most recent version. The most recent version is located on BC Renal website: [www.bcrenal.ca](http://www.bcrenal.ca)

## 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](http://www.BCRenal.ca) for the most recent version.

**For information about the use and referencing of BC Renal guidelines/resources, refer to <http://bit.ly/28SFr4n>.**



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## 1.0 Practice Standard

To provide guidelines to healthcare providers as to when and how to supplement the hemodialysis prescription with additional calcium.

The healthcare providers will review patient's blood work and under the direction of the nephrologist will determine the management plan for calcium metabolism management.

The Registered Nurse Patient Educators will have the necessary knowledge and skills to perform and teach the protocol competently.

The patient will demonstrate an understanding of the procedure, and have documentation included on the chronic dialysis clinic chart confirming successful certification in this procedure.

## 2.0 Definitions and Abbreviations

**Extended Duration Hemodialysis** is defined as equal to or greater than 24 hours of hemodialysis treatment time per week irrespective of frequency of treatments and/or durations of each treatment time.

**Calcium** – Ca; [Ca<sup>++</sup>] ionized calcium formula

**Calcium Chloride** - CaCl<sub>2</sub>

**Phosphate** – PO<sub>4</sub>

**Parathyroid** - PTH

## 3.0 Equipment

- CaCl<sub>2</sub> powder as ordered by nephrologist
  - as a 7.45g/L vial equivalent to an addition of 0.25mmol/L per 4.5L jug of dialysate
  - or as a 14.8 g/L vial equivalent to an addition of 0.5 mmol/L per 4.5L jug of dialysate
- 4.5L acid dialysate jug as ordered by the nephrologist
- Calibrated measuring cup

## 4.0 Procedure and Rationale

Procedure	Rationale
1. Target range for pre-dialysis serum calcium level is between 2.3-2.6 mmol/L	Goal is to maintain calcium within the normal to upper normal range pre-dialysis to ensure there is a neutral to slightly positive calcium balance.
2. Discharge extended duration hemodialysis patients on a 1.5 mmol/L calcium baths as the 'baseline' calcium bath or as appropriate for that patient.	In extended duration hemodialysis, the efficiency of the dialysis should reduce the need to remove extra calcium from the patients' blood and may require the addition of extra Ca to avoid negative calcium balance.
3. Laboratory testing should utilize total calcium levels.	Due to technical difficulties obtaining ionized calcium in a home hemodialysis patient.
4. As a correction factor for determining total calcium, add 0.2 mmol/L to measured calcium for each 10 g/L drop in albumin below 40 g/L. No correction factor is required for albumins in excess of 40 g/L.	To obtain the equivalent to ionized calcium. We recognize that there are other formulae available to correct the calcium, but this formula is simple and relatively reliable. Programs may opt to use another formula, which is reasonable, provided all providers use the same formula consistently.
5. Calcium, Phosphate, and Albumin levels should be drawn simultaneously.	To ensure validity of the calcium levels, the albumin level at the time the Ca is drawn is required.
6. If pre-dialysis calcium remains below 2.3 mmol/L despite Ca bath 1.5mmol/L, consider the addition of a vitamin D analogue to promote calcium (and phosphate) absorption from GI tract, in consultation with the nephrologist and the dietician.  Repeat levels 1 week after addition of vitamin D analogue.	Vitamin D activation remains low despite enhanced dialysis dose due to loss of 1-alpha hydroxyase activity. Activated vitamin D analogues will promote calcium absorption at the GI tract level.
7. If despite the addition of vitamin D analogue to the dialysate calcium bath of 1.5 mmol/L the pre-dialysis calcium remains below 2.3 mmol/L, consider adding oral Calcium supplementation using CaCO <sub>3</sub> on an empty stomach.  Repeat levels of calcium, phosphate and albumin after 1 week.	Supported by AJKD publications of the Canadian Society of Nephrology Guidelines for Intensive Hemodialysis.  If Vitamin D analogues are insufficient, addition of oral calcium carbonate on an empty stomach (to promote absorption) can be tried  Use of oral calcium may be poorly tolerated due to GI side effects.

continued...

Procedure	Rationale
8. If pre-dialysis total calcium levels are below 2.3mmol/L despite the use of a vitamin D analogue, oral calcium supplementation and the use of a 1.5mmol/L calcium dialysate bath, comment calcium supplementation into the dialysate.	Oral supplementation has now been maximized. Addition of calcium to the dialysate will be readily and reproducibly absorbed into the systematic circulation to achieve target calcium levels.
9. Recommended initial dose of CaCl <sub>2</sub> additive is ½ of a 7.45g/L vial calcium “spike” added to 4.5L dialysate acid concentrate jug (Ca**) by 0.125mmol/L)	To permit cautious achievement of the target calcium levels, as noted above.
10. Repeat pre-dialysis calcium level 1 week following initiation of supplementation.	To assess levels and monitor for calcium levels outside of target range (above or below target limits)
11. If within target range, continue with same amount of additive to every dialysis treatment.	To maintain Ca levels within target range.
12. If after supplementation as noted in item #9 the blood calcium level remains below target range, repeat steps 9-10, until within target range. Then proceed to #13 below.	To achieve target Ca levels
13. When within target range, continue with same volume of CaCl <sub>2</sub> additive every dialysis treatment.	To maintain Ca levels within target range
14. Chronic monitoring of pre-hemodialysis calcium, phosphate and albumin levels should be performed with monthly blood testing.	To maintain Ca levels within target range

## 5.0 Document Considerations

1. Document “Certification of Competence” for the patient in the permanent hemodialysis record.
2. Document “Independent Hemodialysis Calcium Additive” changes in Doctors Orders sheet on the permanent hemodialysis record.
3. Process, as per other medication orders and dialysis orders. Ensure the correct amount is recorded and updated on the patient Kardex, and in the hemodialysis treatment field in PROMIS database.
4. Document patient’s response to treatment as reported by the patient.
5. Document communications with nephrologist.
6. Notify equipment vendor of additives to concentrates, to allow for adjustment of machine conductivity limits, if needed.

## 6.0 Special Considerations

In the treatment of patients on chronic hemodialysis, abnormalities in both calcium and phosphate metabolism are very common and are interrelated. Phosphate management is covered in a separate clinic guideline.

In patients on dialysis, abnormalities of calcium levels can be either that the serum calcium level is too low (hypocalcemia), or too high (hypercalcemia). Calcium abnormalities are due to many factors, including alteration in vitamin metabolism (ie, Vitamin D deficiency), alteration in hormonal functions (ie, altered parathyroid hormone homeostasis), and changes caused by medications (ie, calcium-containing phosphate binders).

With the extended duration hemodialysis protocols the spectrum of observed calcium abnormalities

changes. This is because of changes in the dietary consumption, the dialysis prescription, the medication requirements (i.e. elimination of phosphate binders), and normalization of the hormonal milieu (i.e. suppression of PTH). Additionally, the weekly volume of ultrafiltrate is often significantly increased. As each litre of ultrafiltrate is balanced electrolyte solution, there is the potential for significant ultrafiltrate calcium losses. Failure to account for this will result in a negative calcium balance over time.

Despite the higher calcium targets endorsed for patients receiving extended duration hemodialysis, the risk of extra-osseous calcification appears to be rescued, due to an overall improvement in the Ca<sub>x</sub>P product (primarily because of an improvement in phosphate levels)> The risk of vascular calcification in nightly nocturnal hemodialysis is not known at this time, and is the source of ongoing research.

## 7.0 References

Daugirdas, J., Blake, P., & Ing, T., (Eds.). (2001) Handbook of Dialysis. Lippincott, Williams & Wilkins, NY.

National Kidney foundation Dialysis Outcomes Initiative (KDOQI Guidelines).

## 8.0 Developed by

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## 9.0 Reviewed by

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## 10.0 Endorsed by

- BCR Provincial Medical Advisory Committee