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A standardized approach for the post-operative management of hypocalcemia in dialysis patients with secondary hyperparathyroidism requiring parathyroidectomy

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ABSTRACT

Dialysis patients with severe secondary hyperparathyroidism may require surgical parathyroidectomy. Hungry bone syndrome is a serious post-operative complication characterized by profound and prolonged hypocalcemia. This article describes an evolving quality initiative undertaken to improve post-operative patient care in dialysis patients after parathyroidectomy. Nephrology and otolaryngology stakeholders reviewed the evidence in the literature and current practice in Canada. A standardized approach for the management of hypocalcemia in dialysis patients after parathyroidectomy was developed and implemented using a pre-printed order (inpatient protocol), a calcium monitoring tool, and patient education materials. An evaluation of the inpatient protocol was conducted for continuous quality improvement. Standardization of the post-operative management of hypocalcemia (inpatient protocol) led to improved patient care, which is demonstrated by a reduction in the extent of hypocalcemia, duration of hospitalization, and readmission to hospital.

Keywords: total parathyroidectomy, dialysis, chronic kidney disease, hypocalcemia, quality improvement

In patients with kidney failure requiring maintenance dialysis, secondary hyperparathyroidism (SHPT) occurs due to abnormalities in mineral and bone metabolism, including hyperphosphatemia, vitamin D insufficiency, and hypocalcemia (Kidney Disease: Improving Global Outcomes CKD-MBD Update Work Group [KDIGO], 2017). The development of SHPT is associated with a marked increase in morbidity and mortality (Block et al., 2004; Ganesh et al., 2001; KDIGO; Soohoo et al., 2017; Tentori et al., 2015). Management includes the optimization of biochemical laboratory parameters such as calcium, phosphate, and intact parathyroid hormone (iPTH). This is accomplished through diet modifications and medication adjustments, including phosphate binders, vitamin D analogues, and/or calcimimetics (Khwaja & Salam, 2021; Holden et al., 2020; KDIGO; Lau et al., 2018). In severe cases, such as those with nodular hyperplasia (Cunningham et al., 2011; Rodriguez et al., 1999), patients can experience debilitating, treatment-resistant SHPT, and may ultimately require surgical parathyroidectomy (Khwaja & Salam; Holden et al.; KDIGO; Lau et al.). Although parathyroidectomy rates have decreased since the approval of cinacalcet (a calcimimetic) in 2004, the rate remains approximately 7.5 per 1,000 patient years in the United States and Canada (Tentori et al.).

Following total parathyroidectomy, there is a rapid reduction in iPTH and a resulting shift in calcium from the serum to the bones (Jain & Reilly, 2017). Hypocalcemia can be mild in nature or can be severe and prolonged (Jain & Reilly). Specifically, hungry bone syndrome (HBS) has been described in the literature as a dramatic drop of serum calcium to less than 2.1 mmol/L and/or prolonged hypocalcemia for more than four days after parathyroidectomy (Ho et al., 2017; Jain & Reilly; Lau et al., 2018). HBS occurs in up to 88% of dialysis patients after total parathyroidectomy (Ge et al., 2019), and has been associated with increased length of hospital stay, intolerable pill burden, and fatality (Anwar et al., 2018; Ho et al.; Radu et al., 2019). There are inconsistent recommendations in the literature guiding the management of hypocalcemia, in dialysis patients (Cozzolino et al., 2004; National Kidney Foundation [NKF], 2003; Kang et al., 2015; Vallée et al., 2007; Mazzaferro et al., 2000). In general, "high doses" of calcium and vitamin D analogues post-parathyroidectomy are required (Lau et al.), but formulations, doses, and durations of therapy vary (Cozzolino et al.; NKF; Kang et al.; Vallée et al.; Mazzaferro et al.). In the advent of improving patient safety, the aim of this quality improvement project was to review the post-operative management of hypocalcemia in dialysis patients with SHPT who undergo total parathyroidectomy, at the Queen Elizabeth II (QEII) Health Sciences Centre, Halifax, Nova Scotia. The Bone and Mineral Disorder (BMD) quality team, in the Central Zone, Nova Scotia Health Renal Program, reviewed the available literature, engaged in discussions with other Canadian dialysis programs, consulted with local experts in nephrology and otolaryngology, and interviewed patients for feedback on a standardized approach to the management of hypocalcemia in maintenance dialysis patients after total parathyroidectomy. Quarterly BMD quality team meetings provided a forum for interprofessional collaboration and facilitated ongoing Plan Do See Act (PDSA) cycle reassessments for continuous quality improvement.

DESCRIPTION OF THE PRACTICE

The Nova Scotia Health (NSH), Central Zone Renal Program provides maintenance dialysis to approximately 550 patients in urban and rural in-centre dialysis units or at home (hemodialysis and peritoneal dialysis). Approximately six of these patients undergo total parathyroidectomy annually. The surgeries take place at the QEII Health Sciences Centre, which is a large tertiary care teaching hospital, affiliated with Dalhousie University, in Halifax, Nova Scotia. Patients are admitted to hospital under the direct care of an attending otolaryngology-head and neck surgeon, resident doctors, and interprofessional team. The nephrology team is consulted during the admission to coordinate dialysis and to provide support to the surgery team (i.e., laboratory monitoring and corresponding medication adjustments).

Between June and September 2016, three dialysis patients underwent total parathyroidectomy and developed profound hypocalcemia. Orders for laboratory investigations and medication prescriptions varied from one physician to another within each specialty. Post-operative dose escalations of oral calcium and vitamin D analogues resulted in significant pill burden for patients at hospital discharge. For example, one patient was finally prescribed a daily dose of thirty-two grams of oral elemental calcium daily (64 tablets, 500 mg each), which was intolerable upon discharge home. Concomitantly, this patient also received high doses of vitamin D analogue therapy (calcitriol) in hospital, with a maximum daily dose of 24 micrograms (mcg) daily. This patient required readmission to hospital for an additional two weeks for management of severe hypocalcemia. All three patients continued to experience hypocalcemia after discharge and required frequent medication adjustments in the dialysis units.

INTERVENTION

After reviewing these cases, the BMD quality team collaborated with colleagues from otolaryngology to develop a new post-operative model of care for dialysis patients undergoing surgical parathyroidectomy, which included an inpatient protocol for the management of post-operative hypocalcemia (Appendix A), a post-parathyroidectomy calcium monitoring tool for the dialysis units (Appendix B), and an updated patient pamphlet, entitled *Parathyroidectomy and Kidney Disease*, which included a medication table for patient education (Appendix C). The monitoring tool was requested by nephrology nurses. It was trialed and reviewed by stakeholders prior to submission for publication as an official NSH form. After patients are discharged from hospital post-parathyroidectomy, this tool is utilized by nurses and prescribers in the dialysis units when monitoring calcium levels and corresponding medication changes, as required over time. The patient pamphlet incorporated feedback from patients and included a customizable medication table. This table can be updated to communicate medication order changes for calcium and vitamin D analogues.

The first component of the inpatient protocol included scheduled laboratory monitoring for iPTH, ionized calcium (iCal), magnesium, phosphate, and electrolytes. Ionized calcium was identified as the preferred calcium test by stakeholders. The Canadian Society of Nephrology (CSN) suggests ordering ionized calcium when a precise measurement of calcium is required (Holden et al., 2020) and the NKF (2003) CKD-MBD guideline suggests ordering ionized calcium post parathyroidectomy for SHPT. Although HBS is often defined by hypocalcaemia parameters (Ho et al., 2017; Jain & Reilly, 2017; Lau et al., 2018), hypomagnesemia, hypophosphatemia, and hyperkalemia can also occur (Lau et al.), and require daily monitoring post-parathyroidectomy.

Post-operatively, the protocol-implemented guideline recommended doses for oral calcium (NKF, 2003) in combination with an aggressive approach to vitamin D analogue therapy. Although use of vitamin D analogues after parathyroidectomy is suggested in the literature, the optimal starting dose is not known (Viaene et al., 2008).

Post-parathyroidectomy, there are varying vitamin D analogue regimens (Cozzolino et al., 2004; Kang et al., 2015; Vallée et al., 2007; Yang et al., 2009; Tan et al., 2017; Wong et al., 2020), in doses of up to 4 mcg daily of calcitriol or alfacalcidol (Cozzolino et al.; Mazzaferro et al., 2000; Niramitmahapanya, Sunthornthepvarakul, et al., 2011; Niramitmahapanya, Sirirachta, et al., 2014). From an efficacy and safety perspective, Mazzaferro et al. suggested that in the initial post-operative period, vitamin D analogue therapy improved the luminal absorption of calcium and did not affect bone cell activity. Prior to protocol development in 2016, the three patients we reviewed were started on low doses of both oral calcium and vitamin D analogues; however, doses of both drugs escalated dramatically by the time of discharge from hospital, especially oral calcium. The goal of this aggressive approach with vitamin D analogue therapy would be to prevent this extreme oral calcium dose escalation in hospital, and ultimately, to improve patient tolerance. Lastly, the protocol promotes prompt repletion of calcium with parenteral calcium gluconate, as needed for hypocalcemia or symptoms of hypocalcemia, in addition to the oral calcium and vitamin D analogue.

The remaining components of the inpatient protocol promoted patient safety by outlining mandatory criteria for discharge (maintaining iCal above 1 mmol/L for a minimum duration without IV calcium administration); coordinating discharge planning between the otolaryngology and nephrology services; and ensuring that patients had access to oral calcium and vitamin D analogue medications (Appendix A).

This protocol was developed and trialed between October 2016 and January 2018. During this phase onwards, a renal pharmacist was consulted to see each patient with SHPT undergoing total parathyroidectomy to ensure the principles of the protocol were appropriately applied and to ascertain frequent feedback from team members and patients on essential protocol components. Suggested revisions were formally discussed with the BMD quality team at quarterly meetings. The final protocol was electronically available as a pre-printed order on January 25, 2018, at the QEII Health Sciences Centre, Halifax, Nova Scotia (Appendix A).

A timely evaluation of this inpatient protocol was planned to ensure patient safety. Based on the annual number of total parathyroidectomy surgeries in this patient population, the sample size was expected to be small. Specific outcomes included the extent of post-operative hypocalcemia (iCal), average doses of calcium and vitamin D analogues during admission and at the time of discharge, length of hospital stay, incidence of hypocalcamia after discharge (iCal below the laboratory specified normal range: 1.16–1.32 mm/L), and readmission for hypocalcemia within 30 days. Pre- and post-operative iPTH levels were collected to compare the severity of SHPT and impact of surgical parathyroidectomy. This project was deemed a quality improvement initiative and received a letter of exemption from the NSH Research Ethics Board (REB). In June 2018, a pharmacy student was hired for support with retrospective data collection and organization.

EVALUATION OF THE PRACTICE CHANGE

Twelve dialysis patients underwent total parathyroidectomy between June 2016 and July 2018, and were evaluated in three groups: three patients pre-protocol (June to September 2016, n = 3), six patients during protocol development (October 2016 to January 2018, n = 6), and three patients post-protocol (February to July 2018, n = 3). Baseline demographics are summarized in Table 1. There were equal numbers of male and female patients. Average patient age and dialysis vintage were 49.1 and 4.1 years, respectively. Pre-operatively, most patients were prescribed calcium-based phosphate binders, vitamin D analogues and cinacalcet (Table 1). The average pre-operative serum calcium was 2.4 mmol/L and iPTH 284.3 pmol/L. All parathyroidectomy surgeries revealed significant reductions in average iPTH post-operatively (Table 2).

The lowest average iCal values observed during admission and on the day of discharge were recorded pre-protocol (0.73 mmol/L and 0.99 mmol/L) and compared to protocol development (0.88 mmol/L and 1.18 mmol/L) and post-protocol (0.93 mmol/L and 1.23 mmol/L) (Table 2). Length of hospital stay was 10.3 days pre-protocol, 8.5 days during protocol development, and 6 days post-protocol. Although all patients experienced episodes of hypocalcemia after discharge, only one patient was readmitted for hypocalcemia within 30 days (pre-protocol).

Table 1

Baseline Characteristics

Characteristic	Value (*n* = 12)
Age in years, average (range)	49.1 (22–69)
Male sex, *n* (%)	6 (50.0)
Charleston Comorbidity Index, average (range)	4.3 (2–10)
Dialysis duration in years, average (range)	4.1 (2–8)
Preoperative lab data (normal range), average (range)	
Calcium (2.2–2.6 mmol/L)	2.4 (1.8–3.0)
Albumin (35–50 g/L)	34.9 (31–41)
Phosphorus (0.74–1.52 mmol/L)	1.9 (0.9–2.7)
iPTH (1.9–8.7 pmol/L)	284.3 (76.9–687)
Phosphate binders, *n* (%)	
Calcium containing	10 (83.3)
Sevelamer	6 (50.0)
Vitamin D, *n* (%)	
Alfacalcidol PO	9 (75)
Calcitriol IV	1 (8.3)
None	3 (25)
Cinacalcet, *n* (%)	8 (66.7)

CKD = chronic kidney disease; iPTH = intact parathyroid hormone; PO = oral; IV = intravenous

Table 2

Mineral and Bone Disorder Laboratory Parameters and Length of Hospital Stay

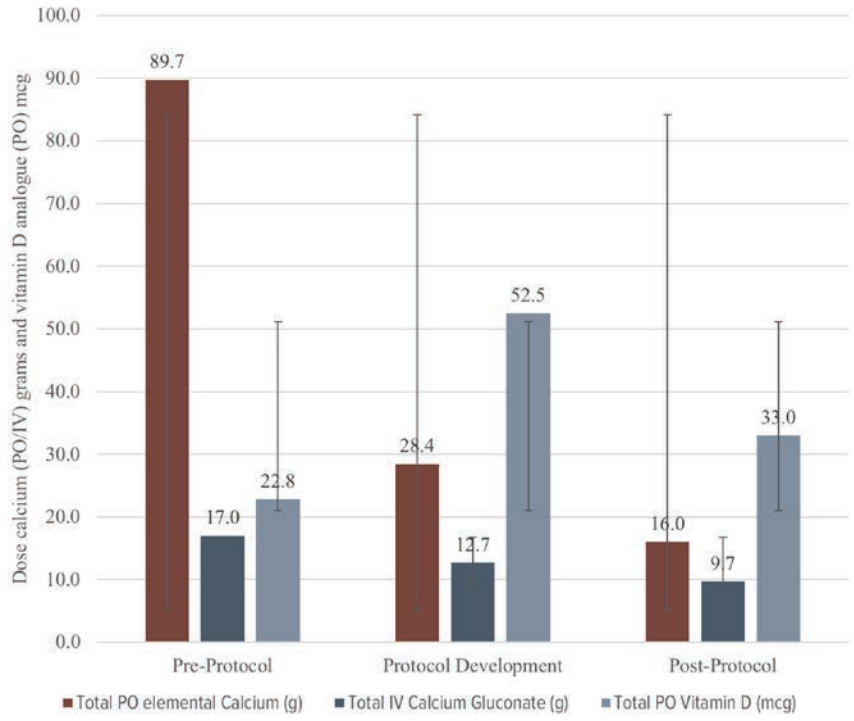
	Pre-Protocol (*n* = 3) Average ± SD (Range)	Protocol Development (*n* = 6) Average ± SD (Range)	Post-Protocol (*n* = 3) Average ± SD (Range)
Lowest iCal during admission (mmol/L)	0.73 ± 0.06 (0.67–0.79)	0.88 ± 0.19 (0.62–1.11)	0.93 ± 0.22 (0.73–1.16)
Lowest iCal on day of discharge (mmol/L)	0.99 ± 1.01 (0.92–1.12)	1.18 ± 0.16 (1.01–1.44)	1.23 ±0.04 (1.20–1.27)
Pre-operative iPTH (pmol/L)	357.83 ± 248.1 (155.7–687.0)	222.4 ± 133.3 (76.9–427.5)	334.5 ± 246.7 (143.4–612.8)
Post-operative lowest iPTH (pmol/L)	1.5 ± 1.91 (0.4–3.8)	6.33 ± 7.49 (0.4–19.3)	3.6 ± 5.5 (0.4–10.0)
Length of hospital stay (days)	10.3 ± 8.8 (7–15)	8.5 ± 3.9 (4–15)	6 ± 2 (4–8)
30-day readmission to hospital	1 patient	None	None

iCal = ionized calcium (normal range for iCal = 1.16-1.32 mmol/L); iPTH = intact parathyroid hormone (normal range for iPTH = 1.9-8.7 pmol/L); SD = standard deviation

The average total doses of oral elemental calcium, IV calcium gluconate, and oral vitamin D analogue were compared between groups (Figure 1). At the pre-protocol stage, patients received more oral and IV calcium during hospital admission based on average total doses (89.7 g oral and 17.0 g IV) compared to protocol-development (28.4 g oral and 12.7 g IV) and post-protocol (16.0 g oral and 9.7 g IV). In contrast, patients received higher average total vitamin D analogue doses during protocol development (52.5 mcg) and post-protocol (33.0 mcg) compared to pre-protocol (22.8 mcg). There was limited use of IV vitamin D analogue therapy pre-protocol or during protocol-development, and no orders for IV vitamin D analogue post-protocol. Patients were discharged on lower average daily doses of oral calcium during protocol development and post-protocol (4.6 g and 3.6 g daily) versus pre-protocol (17.3 g). There were higher average daily doses of vitamin D analogues prescribed at discharge in patients during protocol development and post-protocol (7.7 mcg and 7.3 mcg) compared to the pre-protocol (3.7 mcg).

Figure 1

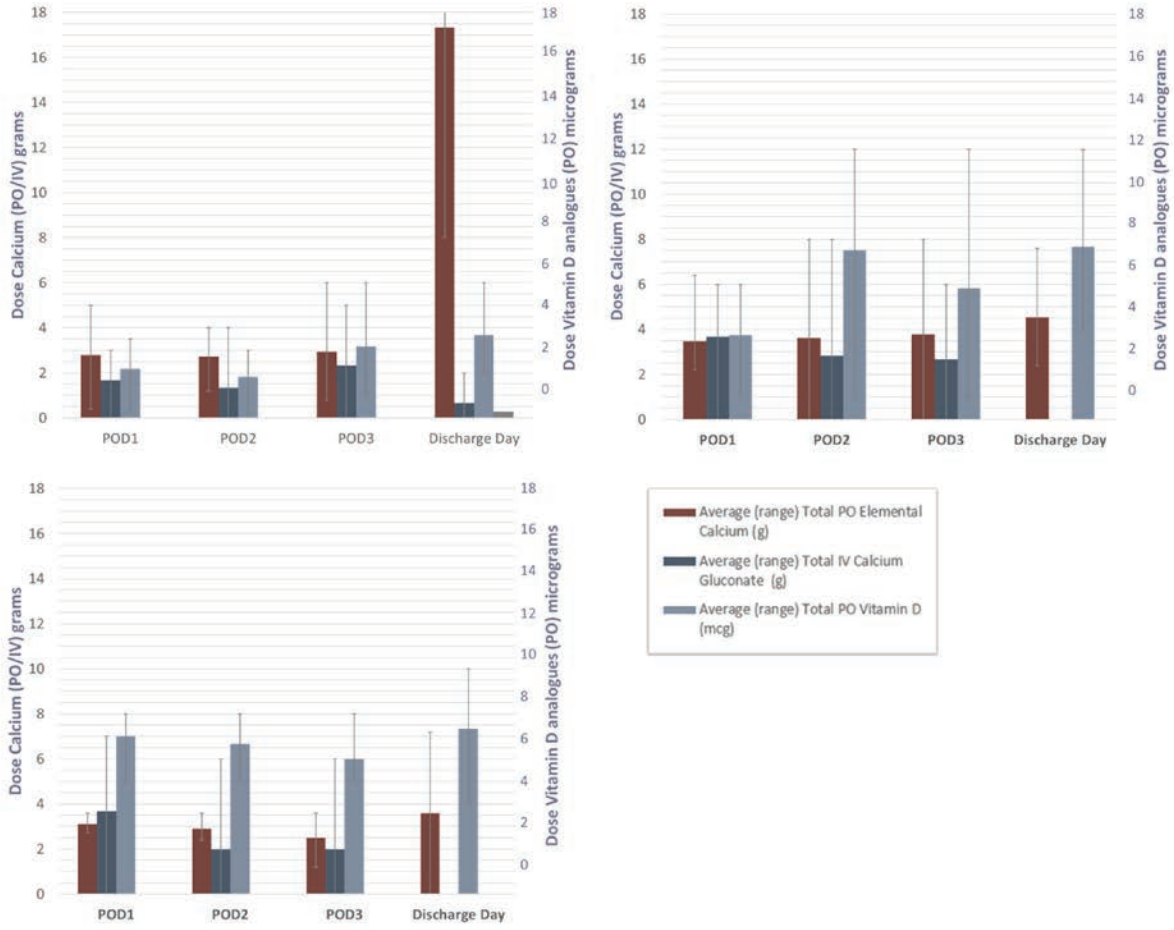
Average Total Doses of Elemental Oral Calcium, IV Calcium, and Oral Vitamin D Analogues During Hospital Admission



Note. PO = oral; IV = intravenous

Figure 2

Comparison of Average Daily Doses of Total Oral Elemental Calcium, Total IV Calcium, and Total Oral Vitamin D Analogue per Post-operative Day per Period of Protocol Implementation



Note. 1 g of IV calcium gluconate is equivalent to 0.093 g of elemental calcium
A = Pre-protocol (n = 3); B = Protocol Development (n =6); C = Post-protocol (n = 3); POD = Post-operative Day; PO = oral; IV = intravenous

IMPLICATIONS AND SIGNIFICANCE FOR PRACTICE

This interprofessional quality initiative evolved in response to significant patient safety concerns in three dialysis patients who developed hypocalcemia after total parathyroidectomy. A standardized post-operative model of care was developed and implemented, including an inpatient protocol (pre-printed order set), an outpatient monitoring form, and an updated patient pamphlet. The overall process was regularly reviewed for continuous quality improvement during quarterly BMD quality team meetings and an evaluation of the inpatient protocol was conducted in 2018. Positive safety findings in this small sample included an observed improvement in post-operative hypocalcemia (higher average iCal nadirs), a corresponding reduction in IV calcium use, a potential reduction in hospital length of stay, and an avoidance of 30-day readmission to hospital for hypocalcemia. Although this quality initiative was limited by a small sample size that rendered it inadequately powered to detect a statistical significance between groups, the overall trends suggest improvement in patient safety.

The backbone of this protocol included guideline recommended doses for oral calcium (NKF, 2003) in combination with aggressive vitamin D analogue therapy. The basis of this approach was informed by local practice, expert opinion, and available literature (Cozzolino et al., 2004; Mazzaferro et al., 2000; Niramitmahapanya, Sunthornthepvarakul, et al., 2011; Niramitmahapanya, Sirirachta, et al., 2014). Our findings align with two small studies from Thailand, which suggest that an aggressive initial approach with vitamin D analogue therapy may minimize the severity of hypocalcemia and/or potentially reduce the IV calcium requirements after parathyroidectomy (Niramitmahapanya, Sunthornthepvarakul, et al.; Niramitmahapanya, Sirirachta, et al.). Although these single-centre studies from Thailand are limited by small sample sizes, it is reassuring to see that similar approaches are

currently being explored with vitamin D analogue therapies. As expected, this protocolized approach led to higher average doses of vitamin D analogues and lower doses of oral calcium prescribed at discharge, which would allow for a marked reduction in calcium pill burden, and potentially less out-of-pocket costs for patients.

As a result of the strict discharge criteria in the protocol, calcium levels were more stable at the time of discharge post-protocol. Standardized patient education was provided with the new patient pamphlet (containing a medication chart), and a take-home supply of medications was offered to prevent delays in therapy. Collectively, these measures appear to improve patient safety, which is reflected by the higher average iCal values at discharge and from the absence of readmission to hospital for hypocalcemia after protocol implementation. Although our numbers are small and we did not perform a cost-savings analysis, avoiding hospital readmission (or reducing length of stay) could result in significant cost savings to the health care system (Canadian Institute for Health Information, 2020). The timely collection of results validated this new model of care and encouraged the early adoption of the inpatient protocol at our institution; however, it also limited the sample size. For this reason, quality assurance initiatives are underway to monitor the sustained impact of the inpatient protocol on patient care and to evaluate the significance of these initial observations. Ongoing collaboration between the nephrology and otolaryngology services continues in the care of patients with SHPT who require surgical parathyroidectomy and now extends beyond the scope of this article.

CONCLUSION

A quality improvement initiative was identified by the NSH Renal Program BMD quality team to improve the post-operative management of hypocalcemia in dialysis patients after total parathyroidectomy. Leadership from the BMD quality team fostered extensive interprofessional collaboration across the departments of medicine and surgery, with involvement from pharmacy, nursing, and medicine colleagues. This initiative, which began as a result of feedback from dialysis nurses, led to the development, implementation, and evaluation of an improved model of care. Standardizing the post-operative management of hypocalcemia with an inpatient protocol appears to improve patient safety. A larger, prospective, multi-centred study is required to evaluate the significance of these observations in clinical practice.

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Appendix A

Pre-printed Order for Post-operative Parathyroidectomy – Calcium Management in a Dialysis Patient

nova scotia health authority

PRE-PRINTED ORDER

Otolaryngology, Nephrology

Post-operative Parathyroidectomy –
Calcium Management in a Dialysis Patient

Patient: _____ Allergies: _____

Items preceded by a **bullet** (•) are active orders. Items preceded by a **checkbox** (☐) are only to be carried out if checked

1. **Laboratory Investigations**
   - Post-op in Post Anesthesia Care Unit (PACU) - iPTH and ionized calcium
   - Ionized calcium q _____ h (At least twice daily: 06:00 and 14:00) To be adjusted at prescriber's discretion.
   - Daily – magnesium, phosphate, electrolytes

2. **Monitoring**
   - Routine Vitals
   - Hypocalcemia symptoms with routine vitals (e.g. tingling, muscle cramps, numbness in hands / feet or around mouth)
   - Page on-call resident if experiencing hypocalcemia symptoms or ionized calcium less than 1 mmol/L. (See reverse for IV calcium gluconate dosing; separate order required)

3. **Medications**
   - Discontinue sevelamer, lanthanum, cinacalcet and all previous calcium orders.

Start when patient able to take oral medications

Oral Calcium Supplement (Choose one only)

☐ Calcium (elemental) chewable 900 mg po tid between meals (Tums Extra Strength)

OR

☐ Other _____ Reason _____

Vitamin D Analogue

☐ Alfacalcidol 4 mcg po bid (Note: Requires liver activation. In liver disease, use calcitriol (see reverse).

OR

☐ Other _____ Reason _____

4. **Discharge Planning**
   - Plan for discharge when ionized calcium is above 1 mmol/L **AND** IV calcium not required - **for at least 24 h**.
   - Notify Nephrology consult team prior to discharge for follow-up bloodwork and dialysis arrangements.
   - Fax completed Pass Medication Form (CD0471MR) for 3-day supply of oral calcium supplement and vitamin D analogue to pharmacy at least 24 h prior to discharge.

Prescriber's Signature _____ Date _____ Time _____

Prescriber's Name _____ Reg. No. _____
Print

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IV Calcium Supplement for Ionized Calcium less than 1.15 mmol/L and/or Symptomatic Hypocalcemia

Ionized Calcium (mmol/L)	**Calcium Gluconate Dosing***
0.9 to 1.15	Calcium gluconate 1-2 g IV x 1 dose
Less than 0.9 **OR** **If symptomatic**	Calcium gluconate 2 g IV x 1 dose - Consider calcium gluconate maintenance infusion 1 g/h IV over 2-4 h. - Repeat ionized calcium in 2 h and reassess infusion rate.

*See NSHA IV Drug Therapy Manual for Calcium Gluconate Monograph for details.

Oral Calcium Supplements**

Product	**Elemental Calcium**
Regular Tums®	200 mg per tablet
Extra Strength Tums®	300 mg per tablet
Calcium carbonate tab	500 mg per tablet
Calcium lactogluconate liquid	500 mg per 25 mL

** Administration times depend on phosphate levels

Oral Vitamin D Analogues

Drug	**Considerations**
Alfacalcidol (One-Alpha®)	• Does **not** require kidney activation • Requires liver activation. • Supplied: 0.25 mcg or 1 mcg caps or 2 mcg/mL liquid
Calcitriol (Rocaltrol® or generic)	• Does **not** require kidney or liver activation. (Consider in liver disease.) • Supplied: 0.25 mcg or 0.5 mcg caps

Page 1 (Reverse)

Appendix B

Post-parathyroidectomy Medication Management Tool for the Hemodialysis Unit

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Renal Program - Hemodialysis Unit

Post Parathyroidectomy Medication Management

			Date (YYYY/MM/DD)		Date (YYYY/MM/DD)		Date (YYYY/MM/DD)		Date (YYYY/MM/DD)		Date (YYYY/MM/DD)		Date (YYYY/MM/DD)		Date (YYYY/MM/DD)	
			Ionized Calcium	Phos.	Ionized Calcium	Phos.	Ionized Calcium	Phos.	Ionized Calcium	Phos.	Ionized Calcium	Phos.	Ionized Calcium	Phos.	Ionized Calcium	Phos.
Dialysate Calcium																
Activated Vitamin D	IV qHD (mcg)	**Calcijex®** *Calcitriol*														
	PO (mcg) Circle one	**One Alpha ®** alfacalcidol **OR** Rocaltrol® *Calcitriol*														
Calcium Carbonate *Taken in between meals*	**Tums ®** (Chew)	Regular (tab) 200 mg *elemental/tab*														
		Extra (tab) 300 mg *elemental/tab*														
		Ultra (tab) 400 mg *elemental/tab*														
	Calcium Tablets	_____ mg elemental/tab														
	Other *specify															
Signature / Status																

Medication Records
CD3121MR_08_2017

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Appendix C

Calcium and Vitamin D Analogue Medication Chart

Medication Chart

Please show this chart to your community pharmacist(s) and doctor(s)

Valid as of: Date (YYYY/MM/DD) _____ Time (hh/mm) _____

Pharmacist name: _____ Doctor name: _____

Allergies: _____

Medications	Directions for use	Comments	Time							
				Bkfast		Lunch		Supper		Bed
Calcium elemental (Tums® Extra Strength)		**Calcium supplement**								
Alfacalcidol (ONE-ALPHA®) or other (specify drug):		**Activated vitamin D**								

NOTES:

- Try to take your medication(s) at the same time each day to help you remember.
- Make sure you or your community pharmacist keep this schedule up to date if your medications change.
- Avoid taking over the counter medications (e.g. cough and cold medicines) without first checking with your pharmacist or doctor.