



PROVINCIAL STANDARDS & GUIDELINES



Ordering, Reviewing & Follow-Up of Lab Work

Updated July 2018 (editorial update June 2020)
 Approved by the BC Renal Kidney Care Clinic Committee
 and the BC Renal Medical Advisory Committee



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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.bcrenalagency.ca for the most recent version.

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



BC Renal

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1.0 Scope

Lab work is a significant component of the management and monitoring of patients with chronic kidney disease (CKD). This guideline provides recommendations on:

- a) routine ordering of lab work;
- b) processes for review of lab work;
- c) protocols to follow-up critical and out-of-range lab values; and
- d) written information to provide to patients on lab work.

This guideline applies to both adult and pediatric patient populations. The protocols for out-of-range lab values and written information for patients is only applicable to adult populations as normal/target ranges differ for pediatrics.

2.0 Recommendations & Rationale

The recommendations in this guideline are based on reviews of the literature and the experience of staff and physicians working at BC Kidney Care Clinics (KCCs).¹

2.1 Routine ordering of lab work

Recommendations:

- 1. Either a nephrologist or renal nurse practitioner or KCC RN on the direction of the nephrologist may complete standing lab work orders.**
- 2. The patient's GFR is the basis for the recommended frequency of specific lab orders.**

¹Particular acknowledgement goes to the KCC team at Vancouver Hospital and Health Sciences Centre (VHHSC) for their work in this area and their willingness to share their efforts with other centres.

3. Guidelines for lab tests and frequency by GFR.

a) Adults

GFR (mL/min/1.73 ²)	G3a	G3b	G4	G5 (<15) &/or Unstable
	45-59	30-44	15-29	
Na ⁺ , K ⁺ , Cl ⁻ , HCO ₃ ⁻ , Urea, Creat	Q6 mos	Q3 mos	Q2 mos	Monthly
CBC (No ESA)	Q6 mos	Q3 mos	Q2 mos	Monthly
CBC, Retic Count (On ESA)	Monthly	Monthly	Monthly	Monthly
Ferritin, Serum Iron, TIBC, Iron Saturation (No ESA)	Q6 mos	Q3 mos	Q4 mos	Q3 mos
Ferritin, Serum Iron, TIBC, Iron Saturation (On ESA)	Q3 mos	Q3 mos	Q4 mos	Q3 mos
Albumin, Ca ²⁺ , PO ₄	Q6 mos	Q3 mos	Q2 mos	Monthly
iPTH	Q12 mos	Q12 mos	Q6 mos	Q3 mos
Alk Phos			Q12 mos	Q12 mos
ACR	Q3 mos	Q3 mos	Q4 mos	Q6 mos
Retic Count (No ESA)	As required	As required	As required	As required
Urinalysis: Routine & Micro	As required	As required	As required	As required
Hgb A1c	As required	As required	As required	As required
Other	As required	As required	As required	As required

b) Children (ages 0-18 years)

GFR (mL/min/1.73 ²)	G3a	G3b	G4	G5 (<15) &/or Unstable
	45-59	30-44	15-29	
Na ⁺ , K ⁺ , Cl ⁻ , HCO ₃ ⁻ , Urea, Creat	Q6 mos	Q3 mos	Q2 mos	Monthly
CBC, Retic Count (No ESA)	Q6 mos	Q3 mos	Q2 mos	Monthly
CBC, Retic Count (On ESA)	Monthly	Monthly	Monthly	Monthly
Ferritin, TIBC, Iron Saturation (No ESA)	Q6 mos	Q3 mos	Q2 mos	Q2 mos
Ferritin, TIBC, Iron Saturation (On ESA)	Q3 mos	Q3 mos	Q2 mos	Monthly (unstable) Q2 mos (stable)
Albumin, Ca ²⁺ , PO ₄ , Mg	Q6 mos	Q3 mos	Q2 mos	Monthly
iPTH, Alk Phos	Q6 mos	Q3 mos	Q2 mos	Monthly (unstable) Q2 mos (stable)
PCR and/or Albumin Creatinine Ratio (ACR)	Q6 mos	Q3 mos	Q2 mos	Q2 mos
Urinalysis: Routine & Micro	As required	As required	As required	As required
24 Hour Urine for volume, protein, sodium, creatinine	Annual	Annual	Annual	Annual
Fasting glucose, TChol, LDL, HDL, Non-HDL, Triglycerides, CRP, 25-OH Vit D, TSH, Uric acid	Annual	Annual	Annual	Annual
Other	As required	As required	As required	As required

See Appendix 1 for a cover letter to support a reduction in orders for duplicate lab work.

See [www.bcrenalagency.ca/health-professionals/clinical-resources/chronic-kidney-disease-\(ckd\)](http://www.bcrenalagency.ca/health-professionals/clinical-resources/chronic-kidney-disease-(ckd)) for sample lab requisitions for (1) adults (single and multi-centre); and (2) children (single centre).

2.2 Review of lab work

Recommendations:

1. Either a nephrologist, renal nurse practitioner or KCC team member reviews lab work on KCC patients within 3 days of the results being available. This timeframe assumes that critical lab values will be called to the attending nephrologist or renal nurse practitioner by the lab.
2. A suggested process for reviewing lab work for KCC clinic patients is:
 - a) Set up a lab list from Lab List Builder in PROMIS. This form allows staff to filter lab work for specific patients and/or specific lab test results for review.
 - b) At least three times a week, review the lab results on the lab results flow sheet in PROMIS.
 - c) At least three times a week, review hard copy lab results for:
 - i) new patients that have not yet been entered onto the Patient List (Patient Select in PROMIS
 - ii) lab tests from patients that have their lab tests done by one of the labs in BC that do not “autoload” their results into PROMIS (a few small hospital labs); and
 - iii) lab tests that are not included as one of the “tracked” tests on the Lab List.
 - d) Add new patients onto Patient List using Patient-> Select in PROMIS.
 - e) Fax hard copy results from labs that do not “autoload” into PROMIS to BC Renal (fax: 604- 806-8849) to be manually entered into PROMIS.
 - f) File lab results that do not show up in PROMIS in the patient’s chart. Other results may be discarded.

3. KCC team encourages patients to check their own lab results using ehealth, where available.

2.3 Follow-up of abnormal lab results

Recommendations:

1. When reviewing lab results, look for out-of-range results and/or changes out of the patient’s normal range. Bring concerns to nephrologist’s or renal nurse practitioner’s attention.
2. Utilize protocols for the follow-up of critical and out-of-range values for the following (see [Appendix 2](#)):
 - a) Potassium (critical and out-of range values)
 - b) Bicarbonate (critical values)
 - c) Calcium (critical values)
 - d) Phosphate (critical and out-of range values)
 - e) Anemia (critical and out-of-range values)
 - f) GFR monitoring (critical values).
3. KCC team encourages patients to check their own lab results using ehealth, where available.

3.0 References

Kidney Disease: Improving Global Outcomes (KDIGO) CKD-MBD Update Work Group. KDIGO 2017 *Clinical Practice Guideline Update for the Diagnosis, Evaluation, Prevention, and Treatment of Chronic Kidney Disease—Mineral and Bone Disorder (CKD-MBD)*. *Kidney Int Suppl.* 2017;7:1–59.

Levin et al. (2013). Kidney disease: Improving global outcomes (KDIGO) CKD work group. *KDIGO 2012 Clinical Practice Guideline For The Evaluation And Management Of Chronic Kidney Disease*. Kidney

International Supplements. 3(1). <https://jhu.pure.elsevier.com/en/publications/kidney-disease-improving-global-outcomes-kdigo-ckd-work-group-kdi-4>

National Kidney Foundation. *KDOQI Clinical Practice Guidelines and Clinical Practice Recommendations for 2006 Updates: Hemodialysis Adequacy, Peritoneal Dialysis Adequacy and Vascular Access*. Am J Kidney Dis 48:S1-S322, 2006 (suppl 1).

4.0 Sponsors

Developed by:

1. Working Group of KCC multidisciplinary care providers (pharmacists and registered nurses) from across BC.
2. Adapted from:
 - Lab work requisition, standard orders, follow-up protocols developed by the KCC team at Vancouver Hospital and Health Sciences Centre (VHSC).
 - Patient information sheets developed by the KCC teams at Fraser Health and Penticton Integrated Care Centre.

Approved by:

- BC Renal (BCR) Kidney Care Clinic (KCC) Committee (July 2018 version; only update to in the June 2020 version were to update the sample lab requisitions, which were approved by the BCR KCC Committee).
- BCR Medical Advisory Committee (as above).

For information about the use and referencing of BCR provincial guidelines/resources, refer to www.bcrenalagency.ca

5.0 Effective Date

- July 2018 (editorial update June 2020)

APPENDIX 1: Cover Letter to Attach to Standing Lab Work Orders

Dear Laboratory:

This patient is a patient at the _____ Kidney Care Clinic.

Attached are standing orders that are intended to be repeated at regular intervals.

In an effort to reduce duplicate blood work, if the patient has other standing orders on file, please reconcile these new orders with the existing orders.

If you are unable to reconcile these orders with existing orders, please contact the Kidney Care Clinic at _____.

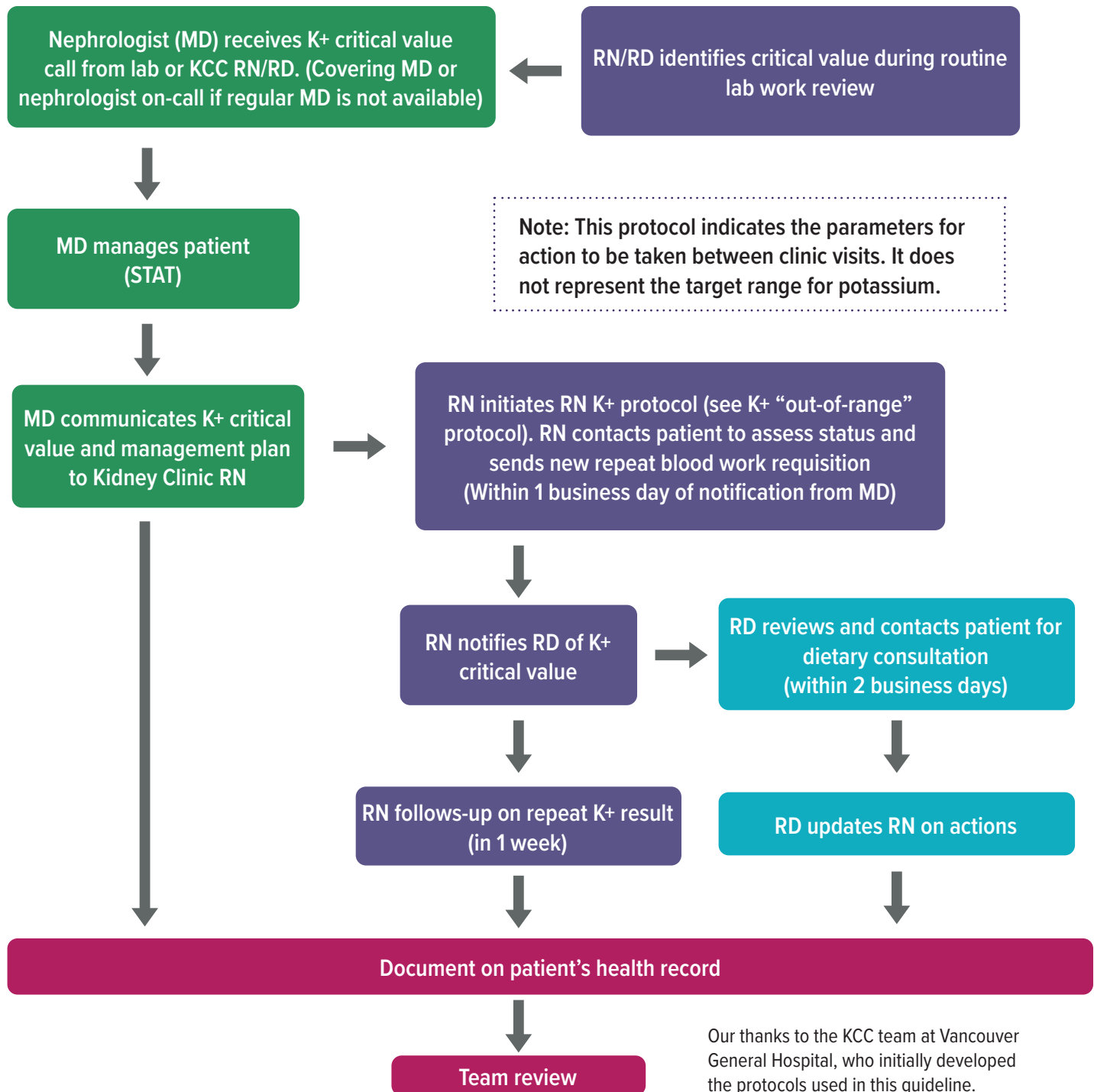
Thank you for your help in our effort to minimize duplicate blood work.

Note to KCC Staff:

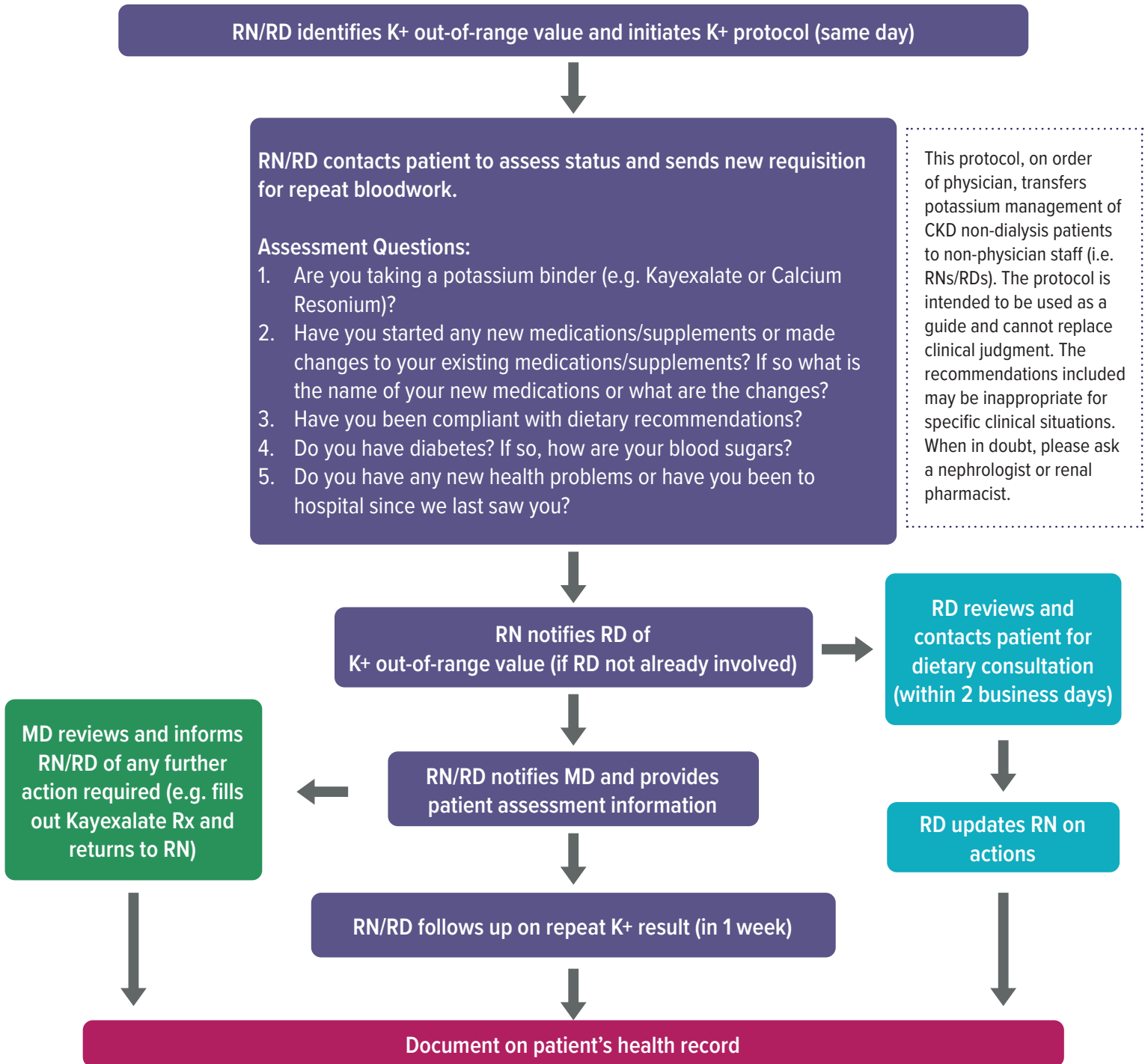
See [www.bcrenalagency.ca/health-professionals/clinical-resources/chronic-kidney-disease-\(ckd\)](http://www.bcrenalagency.ca/health-professionals/clinical-resources/chronic-kidney-disease-(ckd)) for sample lab requisitions for (1) adults (single and multi-centre); and (2) children (single centre). Requisitions can be modified to meet local needs of KCCs/health authorities.

Appendix 2: Protocols for Follow-Up of Critical & Out-of-Range Values between KCC Visits

2 (a) (i) POTASSIUM Protocol: Follow-Up of Critical Values between KCC Visits Critical Range: <3.0 or ≥ 6.0 mmol/L



2 (a) (ii) POTASSIUM Protocol: Follow-Up of Out-of-Range Values between KCC Visits
Out-of-Range: 5.5 – 5.9 mmol/L



Note: This protocol indicates the parameters for action to be taken between clinic visits. It does not represent the target range for Potassium.

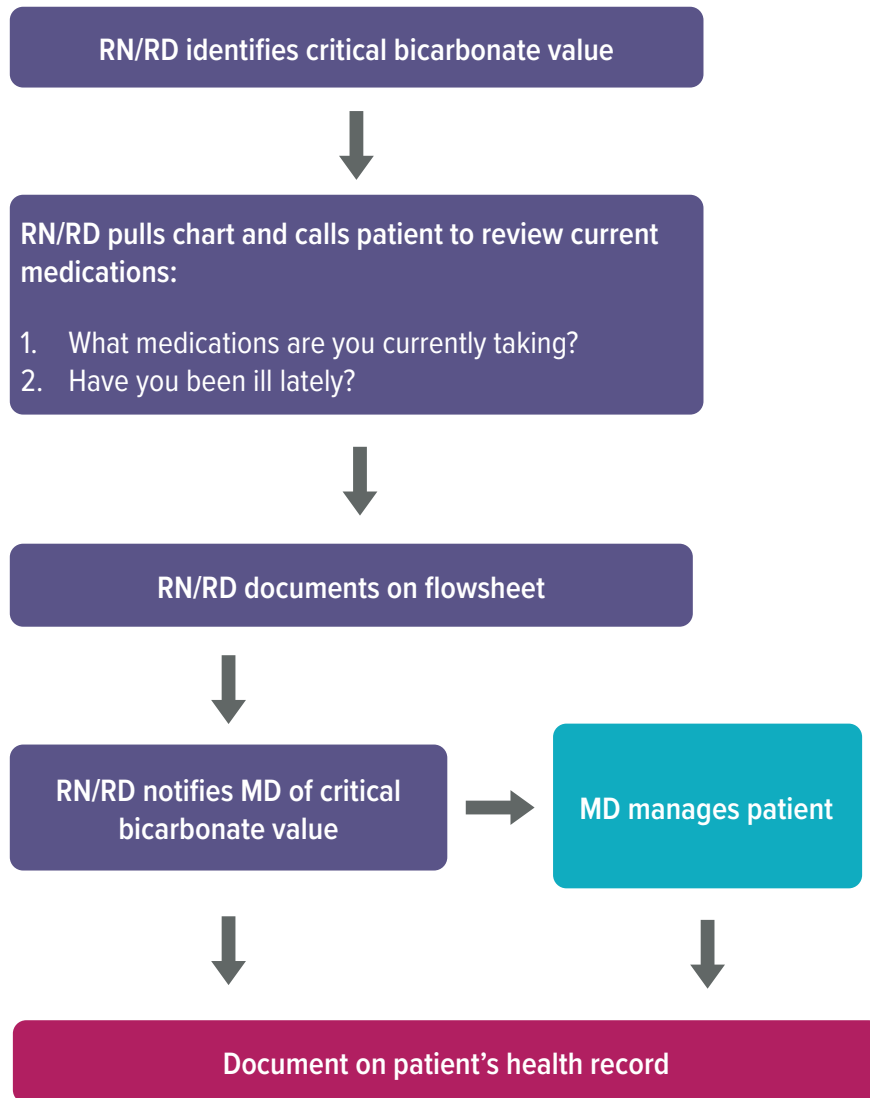
Our thanks to the KCC team at Vancouver General Hospital, who initially developed the protocols used in this guideline.

Potassium Protocol Flowsheet

* All potassium values are either critical (require action between clinic visits) or out-of-range values

Date	K+	Critical Value MD Notified (Date)	K+ Binders	Medication Review (Dose Changes re: ACE Inhibitors, ARB's, Diuretics)	Diabetic blood sugar / high? ↑ K+	RD Notified (Date)	Pt Called	Actions	Intl.

2 (b) BICARBONATE Protocol: Follow-Up of Critical Values between KCC Visits
Critical Range: ≤ 15 or ≥ 40 mmol/L



*Note: This protocol indicates the parameters for action to be taken between clinic visits.
It does not represent the target range for Bicarbonate.*

Our thanks to the KCC team at Vancouver General Hospital, who initially developed the protocols used in this guideline.

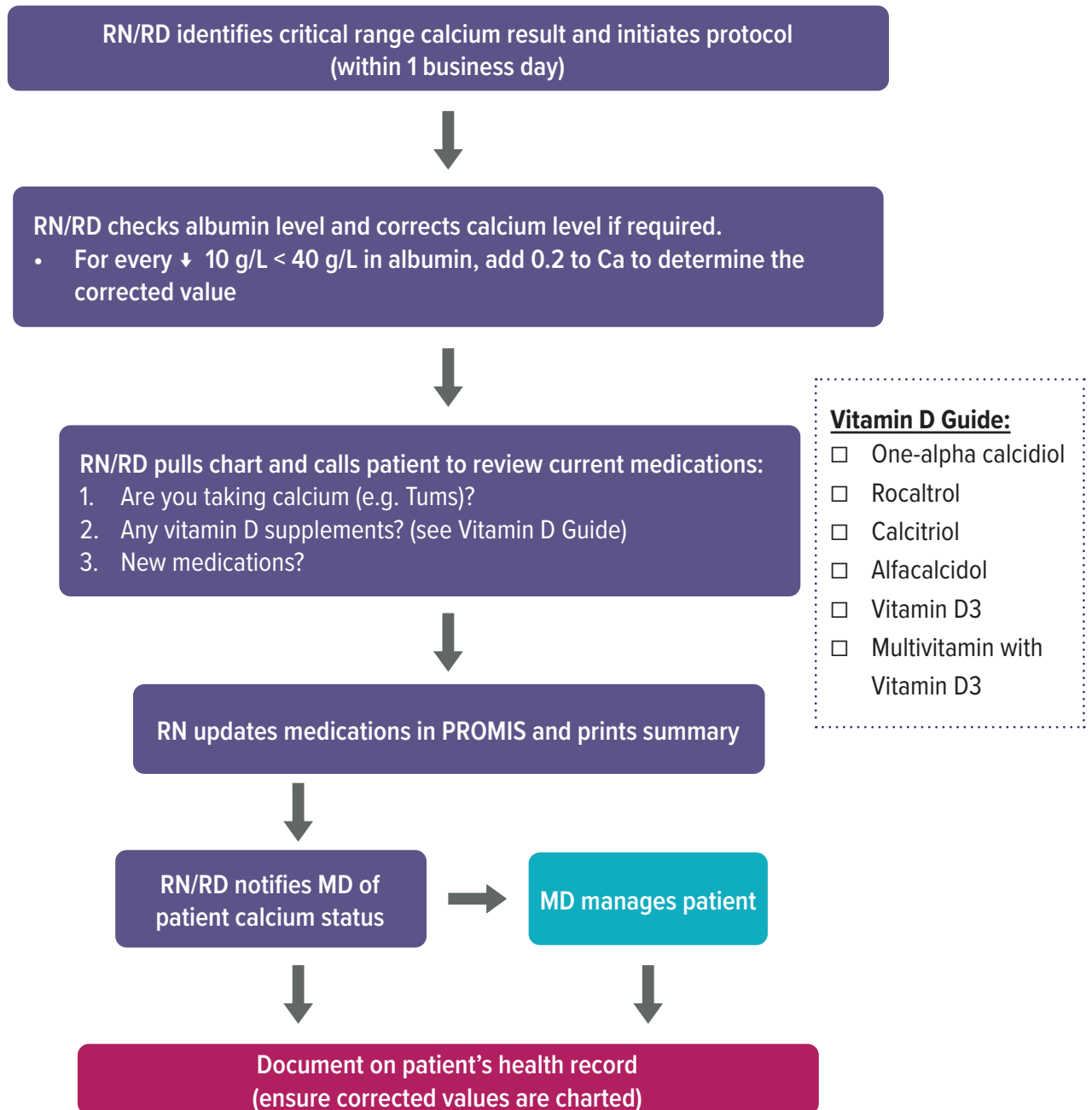
Bicarbonate Protocol Flowsheet

* All bicarbonate values are critical values

Date	HC03 level	MD Notified (Date)	HC03 Supplement Dose	Diuretic Medications	Patient Called	Actions	Intl

2 (c) CALCIUM Protocol: Follow-Up of Critical Values between KCC Visits Critical Value ≤ 1.8 or ≥ 2.8 mmol/L

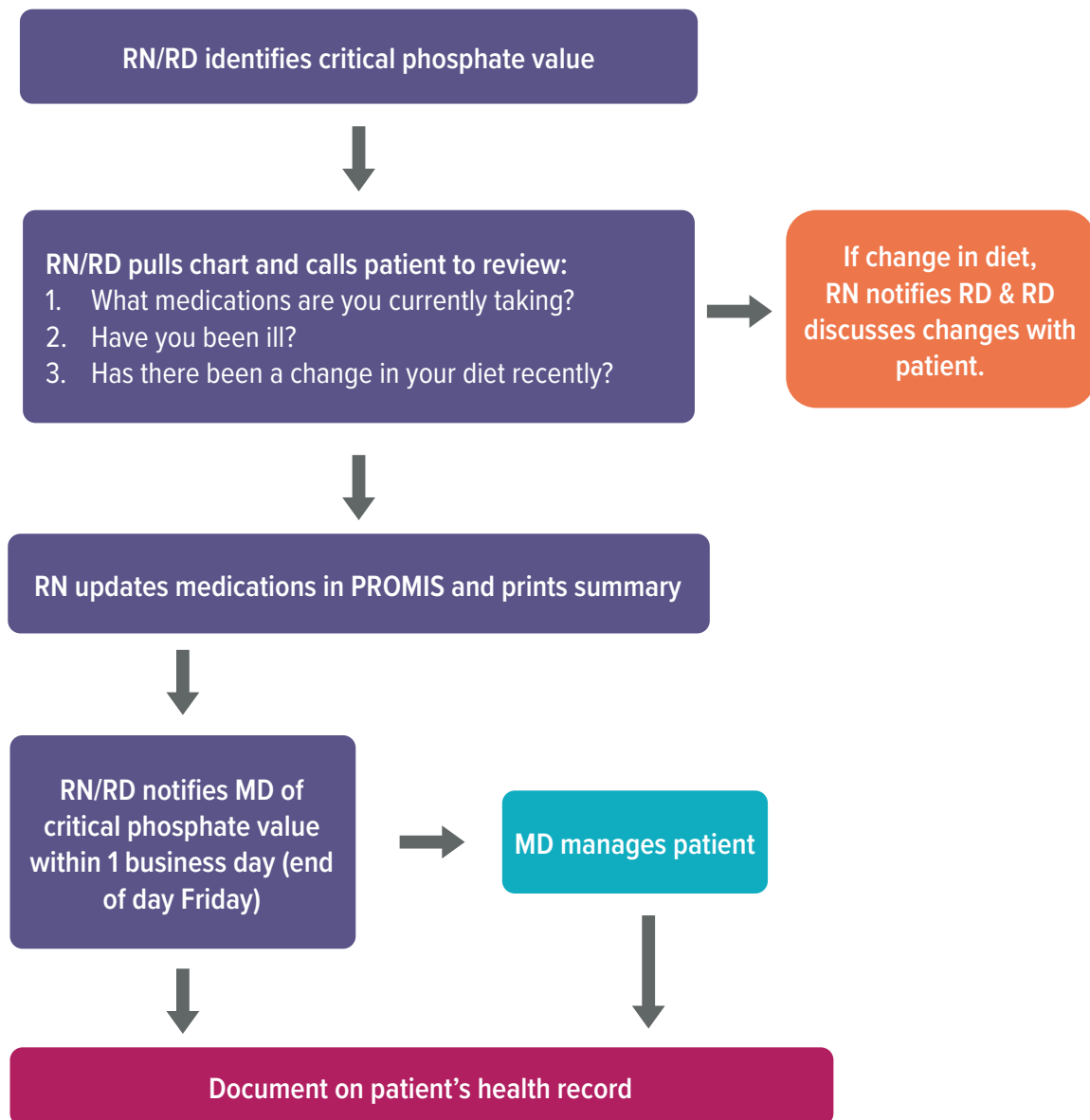
*Use corrected values



Note: This protocol indicates the parameters for action to be taken between clinic visits. It does not represent the target range for Calcium.

Our thanks to the KCC team at Vancouver General Hospital, who initially developed the protocols used in this guideline.

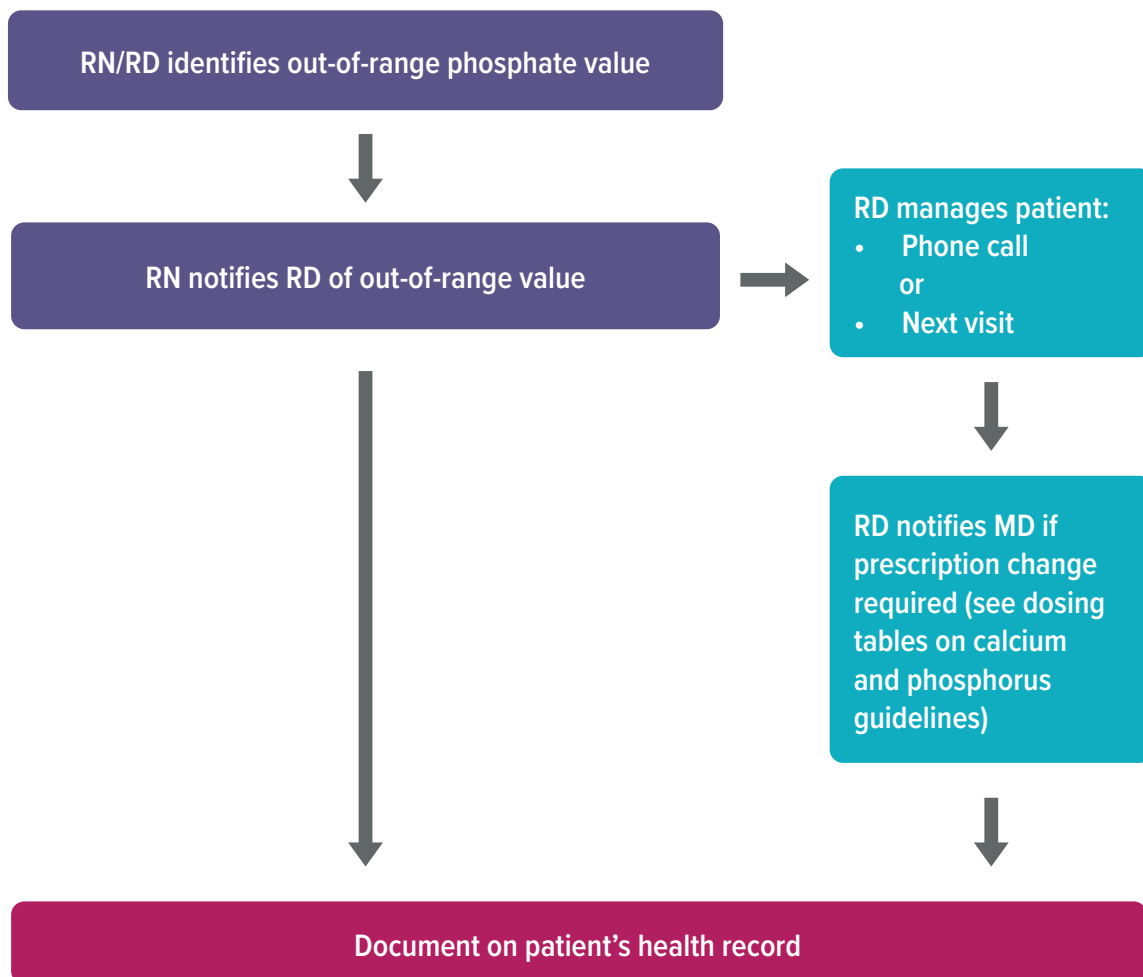
2 (d)(i) PHOSPHATE Protocol: Follow-Up of Critical Values between KCC Visits Critical Range < 0.8 or > 3.0 mmol/L



*Note: This protocol indicates the parameters for action to be taken between clinic visits.
It does not represent the target range for Phosphate.*

Our thanks to the KCC team at Vancouver General Hospital, who initially developed the protocols used in this guideline.

2 (d)(ii) PHOSPHATE Protocol: Follow-Up of Out-of-Range Values between KCC Visits
Out-of Range ≥ 1.6 to ≤ 3.0 mmol/L
Target Range 0.8 to 1.5 mmol/L



*Note: This protocol indicates the parameters for action to be taken between clinic visits.
It does not represent the target range for Phosphate.*

Our thanks to the KCC team at Vancouver General Hospital, who initially developed the protocols used in this guideline.

Phosphate / Calcium Protocol Flowsheet

* All values are either critical (require action between clinic visits) or out-of-range values

Date	Ca ⁺	Alb	Corrected Ca ⁺	PO ₄	Calcium Supplement	Vitamin D Medications	Critical Value MD Notified (Date)	Pt Called	Actions	Intl.

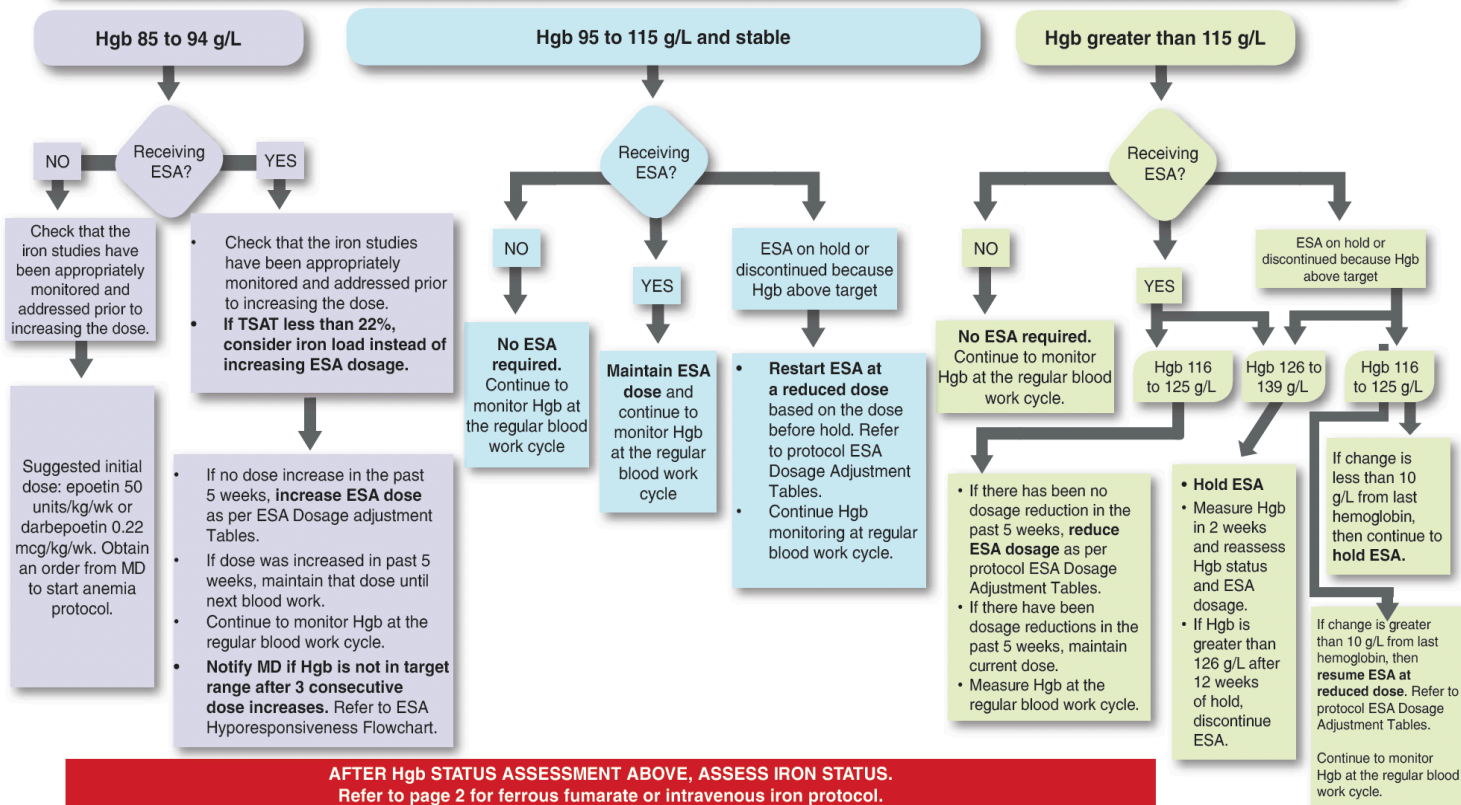
2(e) ANEMIA MANAGEMENT Protocol:
Follow up of Critical & Out-of-Range Values between KCC Visits
Critical: Change in Hgb > 15 g/L, OR if Hgb is < 85 g/L OR if Hgb is > 139 g/L AND on ESA
(or ESA on hold)
Out of Range: See algorithm

BCPRA CKD Non-Dialysis Anemia Management Protocol



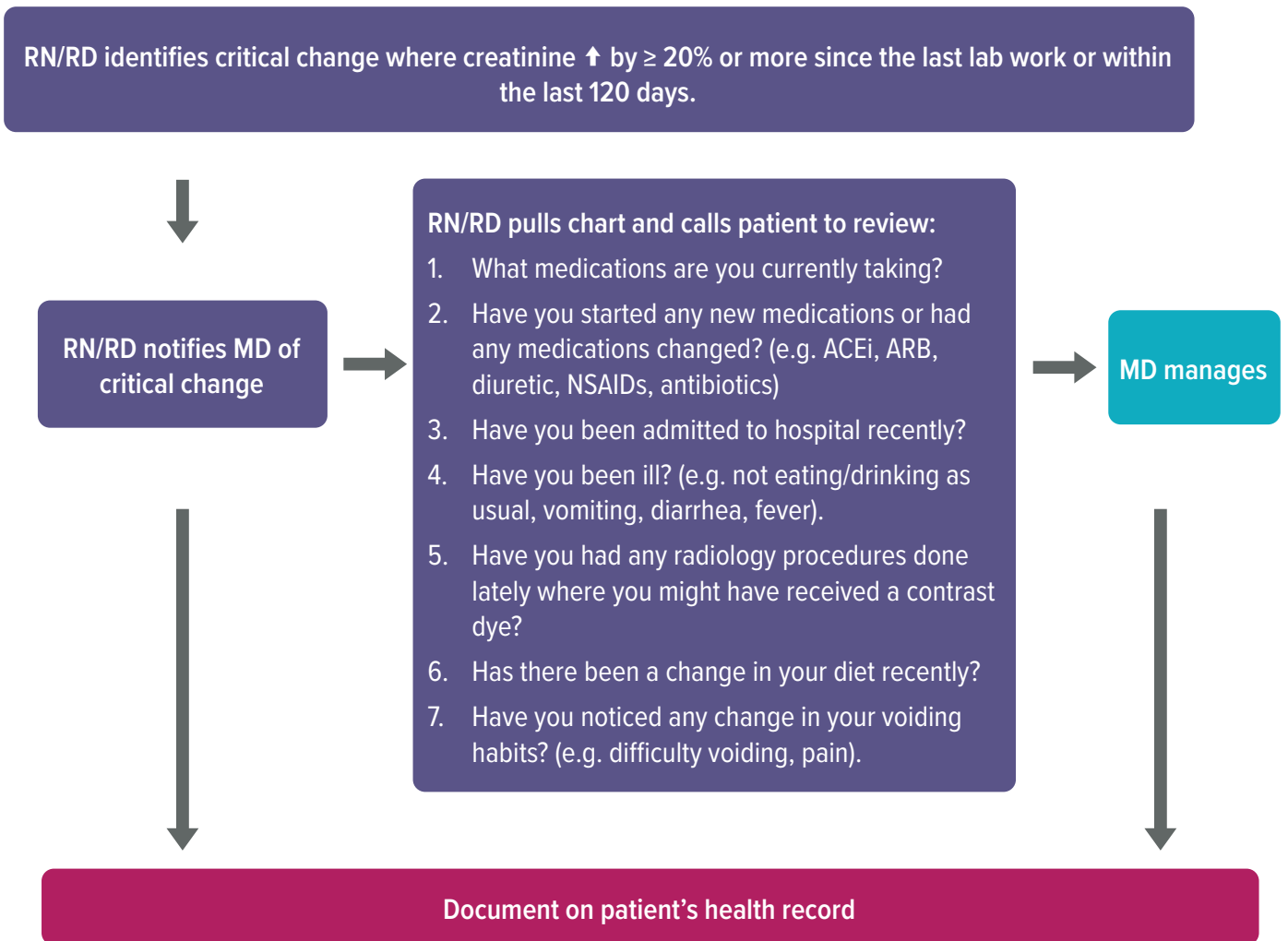
The following protocol, on order of physician, transfers anemia management of CKD non-dialysis patients to non-physician staff (i.e. RNs and renal pharmacists). **The following protocol is intended to serve as a guide and cannot replace clinical judgement.** The recommendations included may be inappropriate for specific clinical situations (e.g. patients with hemochromatosis, thalassemia, PRCA, allergy to IV iron or an erythropoiesis stimulating agent (ESA), hx of stroke, active malignancy, hx of malignancy, etc.). The lowest ESA dosage to achieve acceptable Hgb range should be used. This algorithm is based on the assumption that the patient is compliant to medication and blood work.
Note: ESA refers to both epoetin alfa (Eprex®) and darbepoetin alfa (Aranesp®).

Any change in Hgb greater than or equal to 15 g/L, OR if Hgb is less than 85 g/L OR if Hgb is greater than 139 g/L AND on ESA (or ESA on hold) → Notify MD



2 (f) UNEXPECTED DECLINE IN KIDNEY FUNCTION Protocol: Follow-Up of Critical Values between KCC Visits

↑ in Creatinine ≥ 20% from previous to current value OR within the last 120 days



Our thanks to the KCC team at Vancouver General Hospital, who initially developed the protocols used in this guideline.

Unexpected Decline in Kidney Function Protocol Flowsheet

* An **increase** in Creatinine \geq 20% from previous to current value OR within the last 120 days are **critical values**

Date	Cr	GFR	% Change	MD Notified (Date)	PROMIS update (Date)	Rounds / Summary Forms Updated (Date)	Actions	Intl.

Appendix 3: Get to Know Your Kidney Lab Work (Information Sheet for Adult Patients)

Your lab work tells us a lot about your kidneys and how they are functioning. Understanding what each lab value means will help you to keep track of your own kidney health.

Test	Approximate Normal Values	What it is
Estimated Glomerular Filtration Rate (eGFR)	Greater than 60	<ul style="list-style-type: none"> This is a guide to your kidney health. It tells how well your kidneys are working. The lower your eGFR, the less your kidneys are working. Goal is to keep your eGFR stable and delay progression of the disease.
Creatinine	45 to 110	<ul style="list-style-type: none"> Waste made by muscle activity. Level goes up as kidney function goes down.
Urine Albumin to Creatinine Ratio (ACR)	Less than 3	<ul style="list-style-type: none"> Amount of protein in the urine. In some people, protein from the blood leaks into the urine. Good blood pressure control helps slow the loss. You may also need medication to control protein loss in the urine.
Urea	Less than 9	<ul style="list-style-type: none"> Waste made by the body. Level goes up as kidney function goes down.
Hemoglobin (Hgb)	Greater than 115	<ul style="list-style-type: none"> Part of your red blood cells that carry oxygen. Level often goes down as kidney function goes down. With chronic kidney disease, your target may be between 90 and 115.
Iron Saturation	Greater than 0.22	<ul style="list-style-type: none"> Tells how much iron you have available to make new red blood cells. If low, you may need iron supplements.
Ferritin	100 to 500	<ul style="list-style-type: none"> A form of stored iron.
Hemoglobin A1C (HgbA1C)	Less than 7.0	<ul style="list-style-type: none"> Shows how your blood sugars have been over the past three months. Good blood sugar control helps protect your kidneys. A higher level may be recommended based on your overall health.
Potassium (K⁺)	3.5 to 5.0	<ul style="list-style-type: none"> Mineral found in most foods. You may need diet changes or medication to keep levels safe.
Sodium (Na⁺)	135 to 145	<ul style="list-style-type: none"> Mineral that helps balance water in your body. Important in blood pressure control and fluid balance.
Calcium (Ca²⁺)	2.1 to 2.6	<ul style="list-style-type: none"> Mineral found in food, such as dairy products. Helps to keep bones healthy. May go down with low kidney function. You may need medication to help maintain normal levels.
Phosphate (PO₄)	0.8 to 1.5	<ul style="list-style-type: none"> Mineral found in foods such as dairy products and in the form of phosphorous additives. May go up with low kidney function. You may need diet changes or medication to help maintain normal levels

continued...

Test	Approximate Normal Values	What it is
Intact Parathyroid Hormone (iPTH)	Less than 8	<ul style="list-style-type: none"> • Hormone that helps to balance calcium and phosphorus. • Often goes up when kidney function goes down. • You may need diet changes and/or take medications to maintain normal levels. • If on treatment, your health care team will suggest a target iPTH range for you.
Albumin	Greater than 35	<ul style="list-style-type: none"> • Protein in blood that helps fight infections and heal wounds. • If too low, ask your dietitian for help.
Bicarbonate (HCO₃)	24 to 40	<ul style="list-style-type: none"> • May go down with low kidney function • A low HCO₃ means your blood has too much “acid” • You may need medication to help maintain normal levels

If you have further questions or concerns about your blood work results, please discuss them with your nephrologist, renal nurse practitioner, family physician or your kidney care team.



You can download this handout from the BC Renal website:

[BCRenalAgency.ca](https://www.bcrenalagency.ca) ➔ [Health Info](#) ➔ [Managing my Care](#) ➔ [Chronic Kidney Disease \(CKD\)](#)