

CKD AND PD PROGRAMS

POLICY MANUAL

SUBJECT/TITLE: Anemia Management	NUMBER: 05	PAGE: 1 of 3
ADDITIONAL REFERENCE NAMES:	DATE ESTABLISHED: CGH ACH GRACE	DATE ESTABLISHED: FHH CDHG
AUTHORIZATION: CKD Program Management Team, Nephrology Division	DATE ESTABLISHED: September 2007	DATE REVISED:

PURPOSE:

To achieve adequate hemoglobin and iron levels in chronic kidney failure (CKD) patients.

DEFINITIONS:

Ferritin: an iron-binding protein that stores iron in the body. About 30% of iron is stored in the liver and the reticuloendothelial system in a form that is bound with ferritin.

Transferrin: an iron-binding protein that carries iron in the plasma.

Transferrin Saturation (TSat): is a measure of the proportion of serum iron bound to transferrin: a measure of circulating transferrin.

Total Iron Binding Capacity (TIBC): represents the amount of iron that can bind to transferrin to provide 100% saturation at the binding sites.

Erythropoietin (EPO): A glycoprotein hormone, secreted chiefly by the kidney which acts on the bone marrow cells to stimulate erythropoiesis (formation of red blood cells). In the absence of kidney function, the manufactured version of the protein (e.g. Aranesp[®] or Eprex[®]) may be administered to stimulate erythropoiesis.

PERSONNEL PERMITTED TO PERFORM PROCEDURE:

Registered Nurses and Graduate Nurses who have successfully completed the *Self Learning Modules/Exams for Erythropoietic Proteins/Anemia Protocol and Iron*.

GUIDELINES:

1. Target Hemoglobin level is 110 g/L with a range of 100-120 g/L.
2. Target Iron Saturation % (TSat) level is 20% - 50%.
3. Target serum Ferritin level is 100– 1000.

POLICY:

1. Upon admission to SARP, patients who are receiving EPO or Iron Therapy will have the *Anemia Protocol* initiated unless otherwise specified by primary nephrologists. ***A physician's order is required for the initial dose of EPO and/or Iron.***
2. If for any reason the patient is to stop the *Anemia Protocol*, an order is to be written by the physician to discontinue the protocol.
3. All CKD patients require baseline bloodwork completed prior to initiation of the *Anemia Protocol*:
 - a. CBC, Serum Iron, Total Iron Binding Capacity (TIBC), Serum Ferritin, % Iron Saturation(TSat).

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b. Hemoglobin must be within the last 2 weeks and iron bloodwork within the last 90 days.

Note: All iron related bloodwork can be drawn 2 weeks after the last dose of intravenous iron with achievement of reliable results.

4. Hemoglobin levels are drawn every month but no sooner than every two weeks, unless clinically indicated.
5. Iron bloodwork is drawn at least every 3 to 6 months.
6. Assessment of a patient's anemia status utilizing the *Anemia Protocol* algorithms will be completed using the *Anemia Management Log Record*.
7. Dose adjustments will be made and determined by the nurse (refer to Appendices 2, 3, 8 respectively – *Dose Adjustment Schedules for Eprex, Aranesp and Oral Iron*).
8. Hemoglobin and iron bloodwork levels that are not drawn with monthly bloodwork are also to be assessed as per the *Anemia Protocol* and information charted on the *Anemia Management Log*.
9. When a patient becomes an inpatient:
 - a. The *Anemia Protocol* is put on hold until the patient is discharged.
 - b. Upon discharge, the protocol will be re-initiated utilizing the most recent bloodwork and medication dosages.
10. In order to provide the best care for the patient, the physician may write orders to supplement the *Anemia Protocol* for that individual. If this occurs, confirmation with the physician should be made to determine if the *Anemia Protocol* is to be continued or discontinued.

POINTS OF EMPHASIS:

1. EPO dose adjustments are to be made only if no other dose adjustments have occurred in the last 4 weeks with the exception of when EPO is on hold. If the EPO has been on hold, adjustment of the EPO dose can occur within 2 weeks (refer to *Appendix 1*).
2. EPO will be discontinued if patient needs less than 2000 IU/week of Eprex or 10 ug q4weeks of Aranesp. The hemoglobin will continue to be assessed at least monthly and re-initiation of EPO therapy will occur if the patient's hemoglobin level drops below 100 g/L.
3. The percentage of iron saturation (TSat) is obtained by dividing the serum iron by the TIBC.
4. If the patient's TSat is <20% and the Ferritin >1000, iron stores can be replaced and thus, the physician must be contacted for further orders.
5. If the patient has received the maximum dosage of EPO (Eprex 30,000 IU/week or Aranesp 150 ug/week) for 8 weeks or greater and the patient's hemoglobin level has remained at 99 g/L or lower, the registered nurse is to notify the physician of patient's hyporesponsiveness to EPO. It is the physician's responsibility to initiate investigation into the patient's hyporesponsiveness.
6. **A physician must be notified if an anemia situation occurs which falls outside of the anemia protocol guidelines.**

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7.

PROCEDURE:

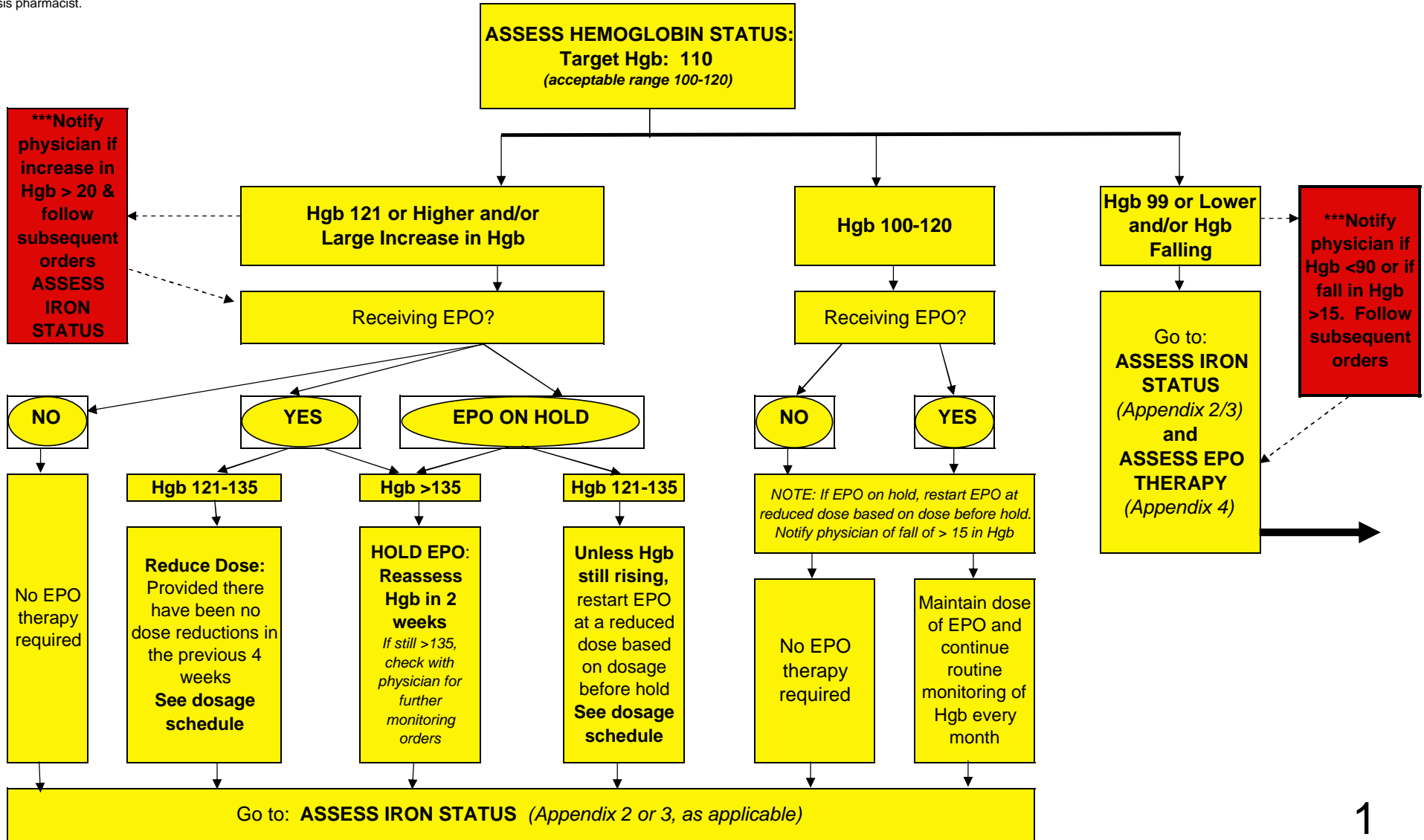
1. Retrieve monthly bloodwork results (hemoglobin, TSat, Ferritin) and record on the *Anemia Management Log*.
2. Record current EPO and iron dosages on the *Anemia Management Log*.
3. Assess the patient's Hgb status and Iron status as per the *Anemia Protocol*.
4. Record changes in medication (dosage and schedule) and follow-up bloodwork needed, based on the *Anemia Protocol*, on the *Anemia Management Log*.
5. Update PARIS with medication dose changes, as applicable. Inform the patient and the patient's pharmacy of changes.
6. Chart supplemental information (e.g. orders, blood transfusions, antibiotic therapy) in the *Other Comments* section as needed.
7. Sign the *Anemia Management Log* and obtain signature from second nurse to verify assessment information.

REFERENCES:

1. SARP Self Learning Modules: *Erythropoietic Proteins/Anemia Protocol and Iron*.
2. *KDOQI Clinical Practice Guidelines and Clinical Practice Recommendations for Anemia in Chronic Kidney Disease*, May 2006.
3. *Clinical Practice Guidelines of the Canadian Society of Nephrology for Treatment of Patients with Chronic Renal Failure*, 2006.
4. FDA Public Health Advisory, *Erythropoiesis-Stimulating Agents*, March 16, 2007.
5. Singh et al, *Anemia of CKD – The CHOIR Study Revisited*, April 9, 2007.

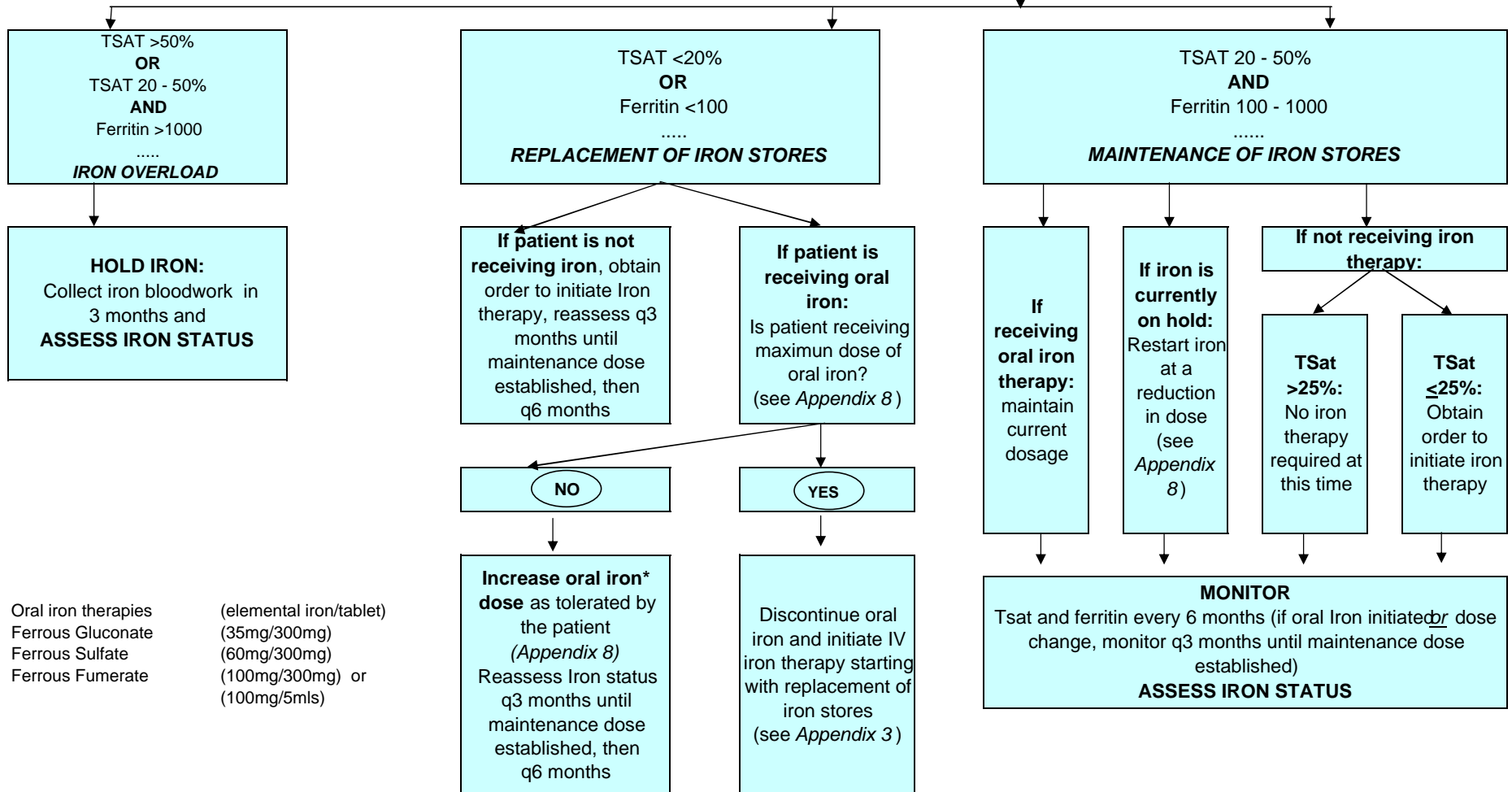
Appendix 1 Assess Hemoglobin Status

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. When in doubt, please ask a physician or dialysis pharmacist.



Appendix 2 - ASSESS IRON STATUS
Oral Iron* Therapy

NOTE: If T_{sat} < 20% and Ferritin > 1000, iron stores can be replaced but contact the physician for orders



Oral iron therapies (elemental iron/tablet)
 Ferrous Gluconate (35mg/300mg)
 Ferrous Sulfate (60mg/300mg)
 Ferrous Fumarate (100mg/300mg) or (100mg/5mls)

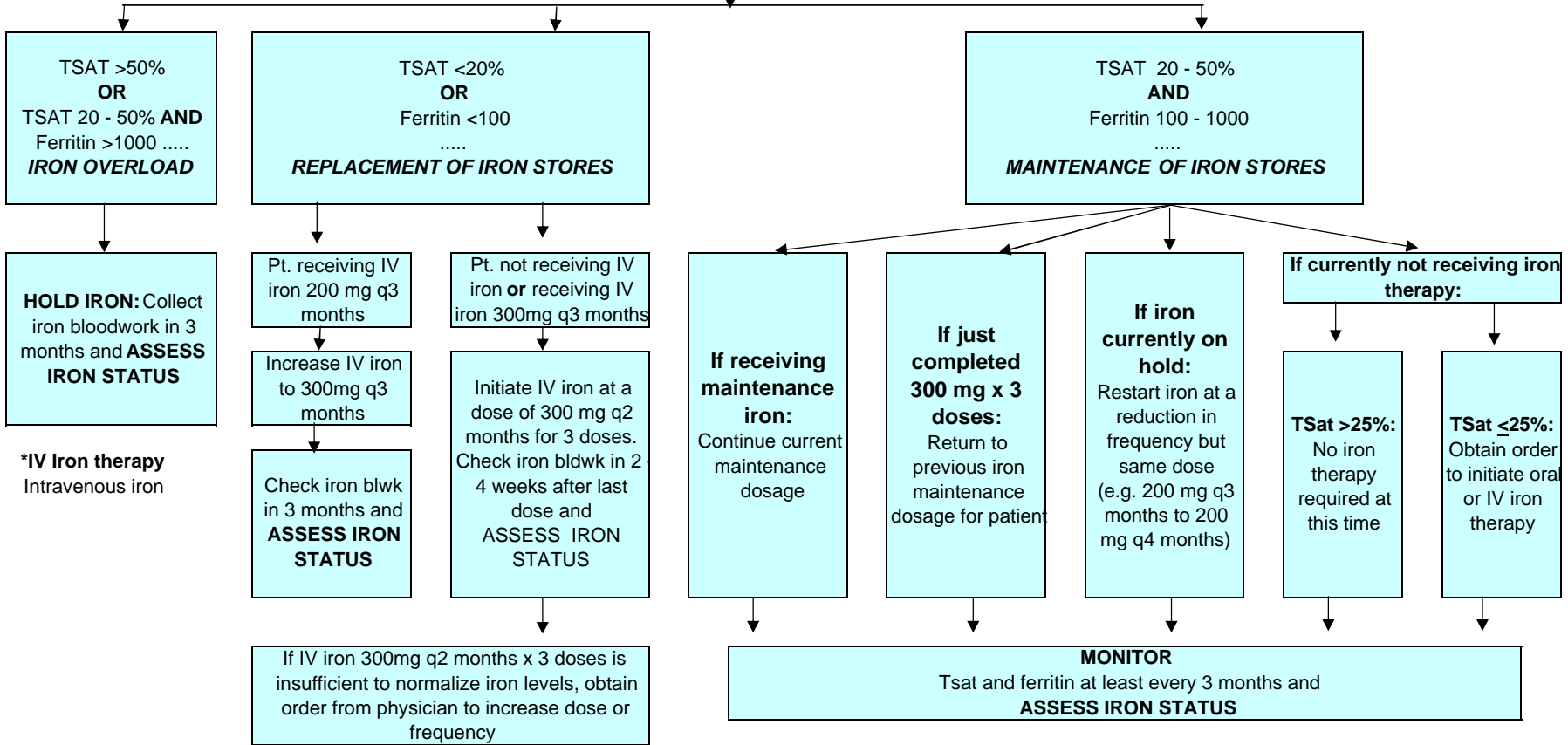
T_{sat} - transferrin saturation is an indicator of circulating serum iron available to the bone marrow for erythropoiesis

$$T_{sat} = \frac{\text{Serum Fe}}{TIBC} \times 100\%$$

Ferritin - an indicator to quantify iron stores. Serum ferritin levels may also be elevated as an acute phase reactant, in patients with liver disease, malignancy or inflammation

Appendix 3 - ASSESS IRON STATUS
IV Iron* Therapy
 (ORAL IRON IS PREFERRED IN NON DIALYSIS PATIENTS)

NOTE: If T_{sat} <20% and Ferritin >1000, iron stores can be replaced but contact the physician for orders.



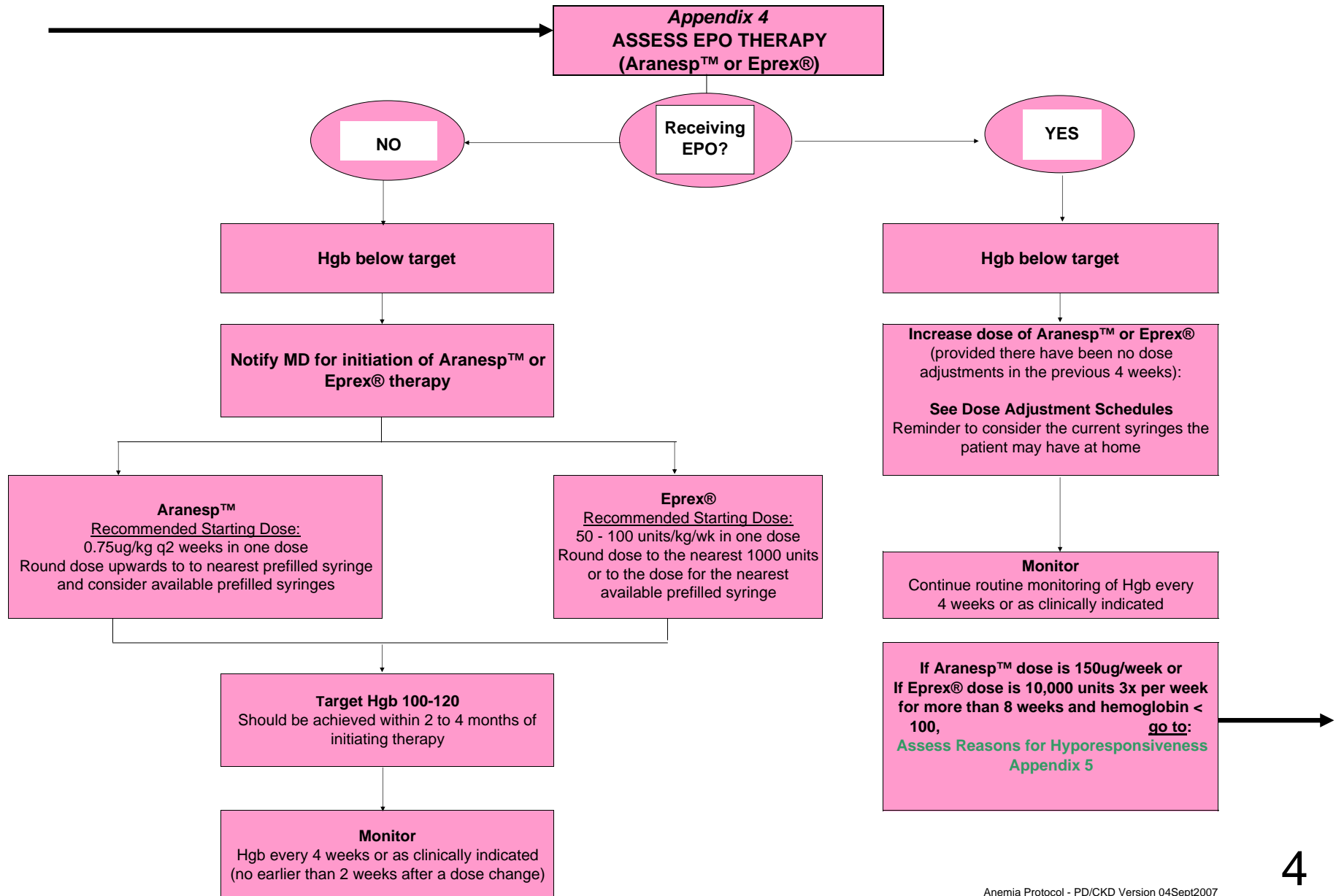
*IV Iron therapy
Intravenous iron

*****If iron bloodwork ever appears very unusual compared to previous results (e.g. replacement of iron stores, T_{sat} goes from <20% to >50%), repeat the bloodwork before initiating next action**

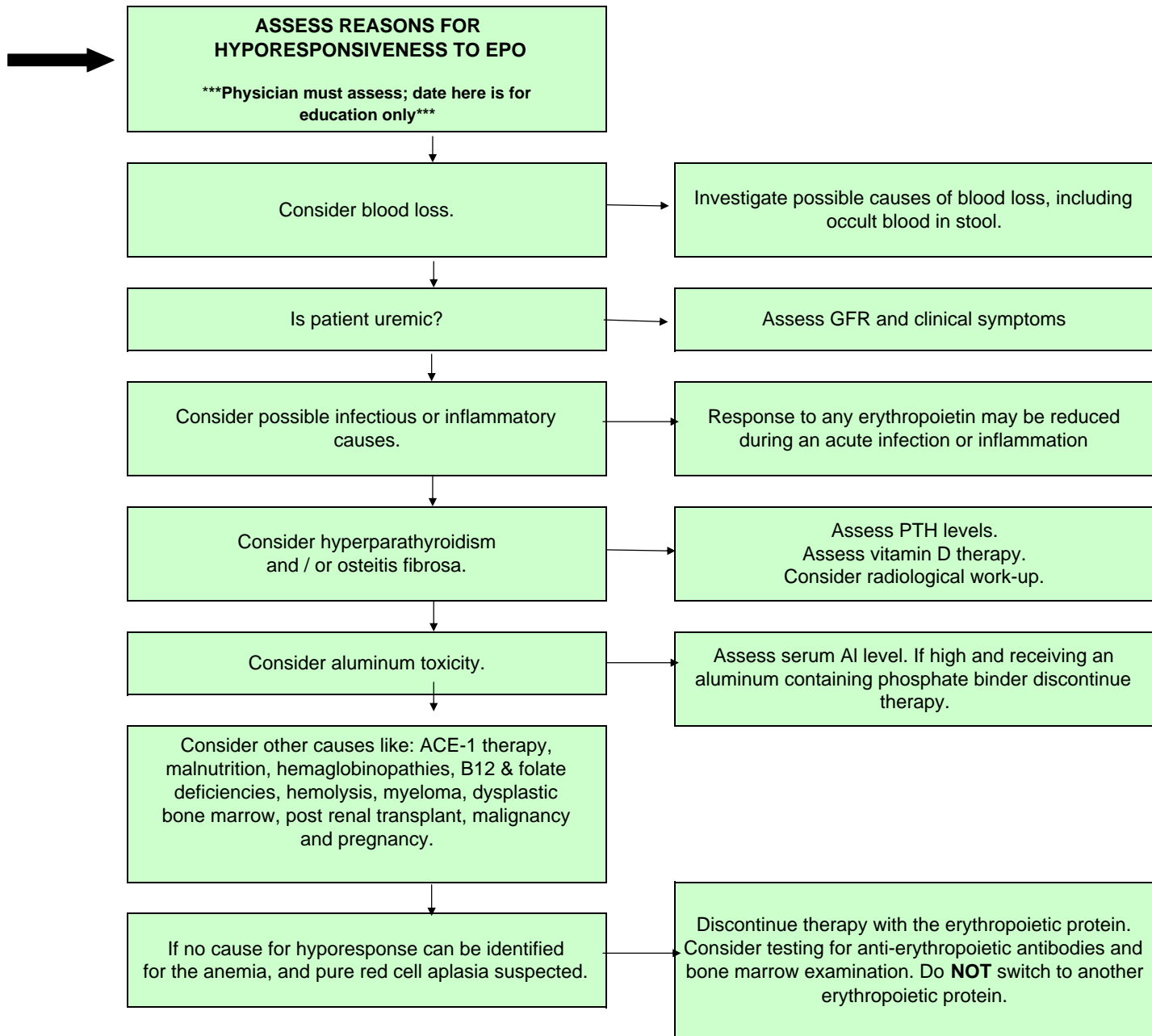
TSat - transferrin saturation is an indicator of circulating serum iron available to the bone marrow for erythropoiesis

$$TSat = \frac{\text{Serum Fe}}{TIBC} \times 100\%$$

Ferritin - an indicator to quantify iron stores. Serum ferritin levels may also be elevated as an acute phase reactant, in patients with liver disease, malignancy or inflammation.



Appendix 5



Appendix 6

Dose Adjustment Schedule for PD and CKD Patients Using Aranesp

Current Dose	Dose INCREASE Required		Dose DECREASE Required	
	Until Current Rx Used Up	<i>Then</i> Change Dose To	Until Current Rx Used Up	<i>then</i> Change Dose To
10 ug q4 wks		10 ug q3 wks		D/C Aranesp
10 ug q3 wks		10 ug q2 wks		10 ug q4 wks
10 ug q2 wks		10 ug qwk		10 ug q3 wks
10 ug qwk	Double current 10's	20 ug qwk (new Rx)		10 ug q2 wks
20 ug q4 wks		20 ug q3 wks	20 ug q 6wks	10 ug q4 wks (new Rx)
20 ug q3 wks		20 ug q2 wks		20 ug q4 wks
20 ug q2 wks		20 ug qwk		20 ug q3 wks
20 ug qwk	20 ug q5 days	30 ug qwk (new Rx)		20 ug q2 wks
30 ug q4wks		30 ug q3 wks	30 ug q 6wks	20 ug q4 wks (new Rx)
30 ug q3 wks		30 ug q2 wks		30 ug q4 wks
30 ug q2 wks		30 ug qwk		30 ug q3 wks
30 ug qwk	30 ug q5 days	40 ug qwk (new Rx)		30 ug q2 wks
40 ug q4 wks		40 ug q3 wks	40 ug q6 wks	30 ug q4 wks (new Rx)
40 ug q3 wks		40 ug q2 wks		40 ug q4 wks
40 ug q2 wks		40 ug qwk		40 ug q3 wks
40 ug qwk	40 ug q6 days	50 ug qwk (new Rx)		40 ug q2 wks
50 ug q4 wks		50 ug q3 wks	50 ug q6 wks	40 ug q4 wks (new Rx)
50 ug q3 wks		50 ug q2 wks		50 ug q4 wks
50 ug q2 wks		50 ug qwk		50 ug q3 wks
50 ug qwk	50 ug q6 days	60 ug qwk (new Rx)		50 ug q2 wks
60 ug q4 wks		60 ug q3 wks	60 ug q6 wks	50 ug q4 wks (new Rx)
60 ug q3 wks		60 ug q2 wks		60 ug q4 wks
60 ug q2 wks		60 ug qwk		60 ug q3 wks
60 ug qwk	60 ug q5 days	80 ug qwk (new Rx)		60 ug q2 wks
80 ug q4 wks		80 ug q3 wks	80 ug q6 wks	60 ug q4 wks (new Rx)
80 ug q3 wks		80 ug q2 wks		80 ug q4 wks
80 ug q2 wks		80 ug qwk		80 ug q3 wks
80 ug qwk	80 ug q6 days	100 ug qwk (new Rx)		80 ug q2 wks
100 ug q4 wks		100 ug q3 wks	100 ug q6 wks	80 ug q4 wks (new Rx)
100 ug q3 wks		100 ug q2 wks		100 ug q4 wks
100 ug q2 wks		100 ug qwk		100 ug q3 wks
100 ug qwk	100 ug q5 days	130 ug qwk (new Rx)		100 ug q2 wks
130 ug q4 wks		130 ug q3 wks	130 ug q6 wks	100 ug q4 wks (new Rx)
130 ug q3 wks		130 ug q2 wks		130 ug q4 wks
130 ug q2 wks		130 ug qwk		130 ug q3 wks
130 ug qwk	130 ug q6 days	150 ug qwk (new Rx)		130 ug q2 wks
150 ug q4 wks		150 ug q3 wks	150 ug q6 wks	130 ug q4 wks (new Rx)
150 ug q3 wks		150 ug q2 wks		150 ug q4 wks
150 ug q2 wks		150 ug qwk		150 ug q3 wks
150 ug qwk		Assess for hyporesponsiveness		150 ug q2 wks

Appendix 7 - Dose Adjustment Schedule for Patients Using Eprex

Eprex should not be increased or decreased by any more than 20-30% at one time. The following chart provides dosage changes *generally* with a 20 to 30% increase or decrease.

This chart is only a guide. If the patient's scenario does not fall into one of the examples, contact the nephrologist.

CKD patients can utilize either the multidose vial with 20,000 IU or the prefilled syringes (available in 1000, 2000, 3000, 4000, 5000, 6000, 8000 and 10,000 units).

Current Dose	Current Syringe	Increase Dose To	Reduce Dose To
1,000 IU/wk	2,000 IU q2 wks	2,000 IU/wk	Discontinue Eprex
2,000 IU/wk	2,000 IU/wk	3,000 IU/wk	2,000 IU q2 wks
3,000 IU/wk	3,000 IU/wk	4,000 IU/wk	2,000 IU/wk
4,000 IU/wk	4,000 IU/wk	6,000 IU/wk	3,000 IU/wk
6,000 IU/wk	6,000 IU/wk	8,000 IU/wk or 4,000 IU 2x/wk	4,000 IU/wk
8,000 IU/wk	4,000 IU 2x/wk or 8,000 IU/wk	10,000 IU/wk	6,000 IU/wk
10,000 IU/wk	10,000 IU/wk	4,000 IU 3x/wk or 6,000 IU 2x/wk	8,000 IU/wk
12,000 IU/wk	4,000 IU 3x/wk or 6,000 IU 2x/wk	8,000 IU 2x/wk	4,000 IU 2x/wk or 8,000 IU/wk
16,000 IU/wk	8,000 IU 2x/wk	10,000 2x/wk	4,000 IU 3x /wk or 6,000 IU 2x /wk
18,000 IU/wk	6,000 IU 3x/wk	8,000 IU 3x/wk	6,000 IU 2x/wk or 4,000 IU 3x/wk
20,000 IU/wk	10,000 IU 2x/wk	8,000 IU 3x/wk	8,000 IU 2x /wk
24,000 IU /wk	8,000 IU 3x /wk	10,000 IU 3x/wk	8,000 IU 2x/wk or 6,000 IU 3x/wk or 10,000 IU 2x/wk
30,000 IU/wk	10,000 IU 3x/wk	Assess reasons for hyporesponsiveness as per algorithm	8,000 IU 3x/wk or 10,000 IU 2x/wk

Appendix 8 - Oral Iron Dose Adjustment Schedule

There are different iron preparations available for us in patients with CKD. Maximum doses (unless otherwise specified) are based on the KDOQI guidelines which suggest a maximum of 200 mg of elemental iron per day.

This chart is only a guide. If the patient's scenario does not fall into one of the examples in the schedule, contact the

Drug	Elemental Iron / Tab	Dose Adjustment Increment (Increase or Decrease By)	Maximum Dose
Ferrous Gluconate	35 mg / 300 mg	300 mg tablet	900 mg/day
Ferrous Sulfate	60 mg / 300 mg	300 mg tablet	900 mg/day
Ferrous Fumarate	100 mg / 300 mg	300 mg tablet	600 mg/day
Ferrous Fumarate (liquid)	100 mg / 5 mLs	5 mL	10 mL/day

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Administration Considerations:

Oral Absorption : Large interpatient variability affected by salt form, amount administered, dosing regimen, size of iron stores, and diet.

Absorption enhancers: Ascorbic acid (eg. Fruit juice, vitamin C), presence of dietary heme iron (eg. red meat, poultry, fish).

Absorption inhibitors: Calcium, some proteins (soy, egg albumin, casein) tannins (tea, coffee, red wine) phytates (bran, unrefined grains, soy). polyphenols (some vegetables, cereals, herbal tea, cocoa)

Drug Interactions: Calcium, H2 blockers (famotidine, ranitidine), Quinolone (Levaquin, Cipro) Tetracyclines (Doxycycline), Sinemet.

Recommend: Take between meals (1 hr before or 2 hrs after meals) or at bedtime, but may be taken with or after meals to decrease GI effects. Patients with intolerances may benefit from smaller, more frequent doses, starting with a lower dose and slowly increasing, or bedtime dose. If dose is 1-2 tablets/day, may take QD or BID. If dose is 3-4 tablets/day, take BID, TID, or QID, taking above info. into consideration.