The following protocol, on the order of a pediatric renal physician transfers anemia management of HD patients to nonphysician staff (e.g. RN and Pharmacists). It is intended to serve as a guide and cannot replace careful clinical judgment. The recommendations may be inappropriate for specific clinical indications. *when in ANY doubt please contact a renal physician.*

Pediatric CKD/PD/HD Anemia Management Protocol

THE CHILD IS ANEMIC IF THEIR HEMOGLOBIN IS LESS THAN:

AGE	BOYS	
	MEAN HGB (G/L)	ANEMIC IF LESS THAN (G/L)
1 YR AND OVER	147	121
1-2 YR	120	107
3-5 YR	124	112
6-8 YR	129	115
9-11 YR	133	120
12-14 YR	141	124
15-19 YR	151	135
	GIRLS	
	MEAN HGB	ANEMIC IF LESS THAN (G/L)
1 YR AND OVER	132	114
1-2 YR	120	108
3-5 YR	124	111
6-8 YR	128	115
9-11 YR	131	119
12-14 YR	133	117
15-19 YR	132	115

BASED ON NHANES III DATA 1988-1994; SEE TABLE 39 PAGE S88 IN AJKD 47(5) suppl 3, May 2006

AGE	MEAN HGB (G/L)	ANEMIC IF LESS THAN (G/L)
TERM (cord blood)	165	135
1-3 days	185	145
1 week	175	135
2 weeks	165	125
1 month	140	100
2 months	115	90
3-6 months	115	95
6-24 months	120	105

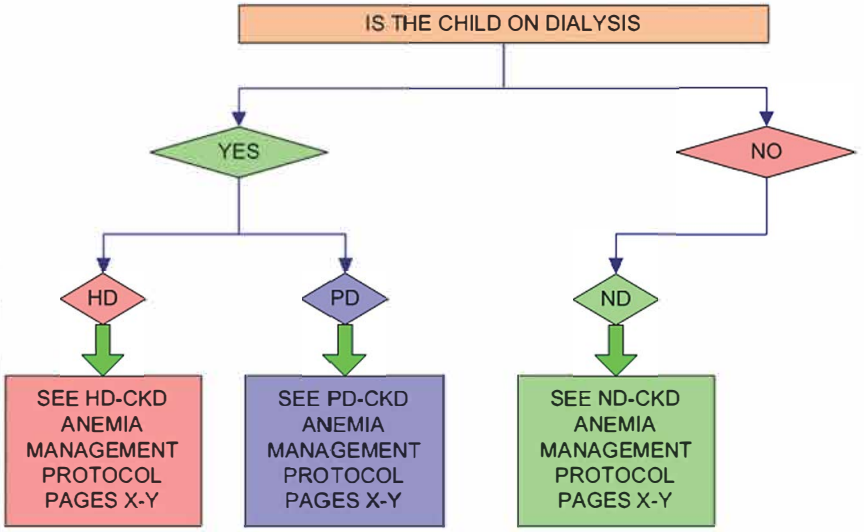
SEE TABLE 40 PAGE S88 IN AJKD 47(5) suppl 3, May 2006

All Patients with CKD STAGES 1-5 (non-dialysis) should have a Hb checked at least yearly.

If Hb is below the anemia threshold then iron status tests, reticulocyte count, vitamin B12 and RBC Folate and an eGFR should be done and a Hb repeated between 2-12 weeks later depending on severity of anemia

Presuming no other cause for anemia is found all patients should initiate Iron Therapy if they have a confirmed Hb below threshold and a TSAT < 20% and or ferritin < 100 (see pages X)

Note that all patients on ESA should be on Iron therapy as well as Folic Acid and Vitamin B12 supplementation



FULL CONSIDERATION OF PATIENT'S CURRENT MEDICAL CONDITION – IRON STATUS – ESA DOSE AND RECENT CHANGES IN HGB NEED TO BE ASSESSED IN CONCERT TO MAKE DECISIONS RE ANEMIA MANAGEMENT

The following protocol, on the order of a pediatric renal physician transfers anemia management of HD patients to nonphysician staff (e.g. RN and Pharmacists). It is intended to serve as a guide and cannot replace careful clinical judgment. The recommendations may be inappropriate for specific clinical indications, *when in ANY doubt please contact a renal physician.*

9/11/2007

Pediatric CKD/ESRD/TRANSPLANT Anemia Management Protocol

Subtitle

IT IS PRESUMED THE PHYSICIAN WILL BE AWARE OF THE CONDITION AND NEED OF THE PATIENT, AND THE CHARACTERISTICS OF THE PRODUCT(S) CHOSEN TO ASSIST IN DETERMINING THE MOST EFFECTIVE DOSE AND FREQUENCY FOR THAT PARTICULAR PATIENT.
THE FOLLOWING SECTION "TIPS FOR USE OF ESA PRODUCTS" HIGHLIGHTS BOTH COMMON PRINCIPLES AS WELL AS SPECIFIC DETAILS INHERENT TO USE OF THE 2 PRODUCTS AVAILABLE AT BCCH.

PLEASE REVIEW 2006 and 2007 KDOQI ANEMIA RECOMMENDATIONS AND STANDARD ADULT AND PEDIATRIC TEXTS FOR USE OF ESA AND IRON PRODUCTS IF NOT FAMILIAR WITH THESE AGENTS

BASIC PRINCIPLES FOR USE OF EPREX OR DARBOPOEITIN

ESA PRODUCTS ACT AS TROPHIC HORMONES TO PROLONG THE LIFESPAN OF RBC 'PRECURSORS' IN THE BONE MARROW; THEIR ABSENCE LEADS TO EARLY LOSS OF THESE CELLS WHICH FAIL TO PRODUCE NEW RBC'S AND HENCE LEAD TO AN EVENTUAL DECLINE IN HGB LEVEL. IT IS ALMOST NEVER CORRECT TO STOP ANY ESA PRODUCT SINCE ABSENCE OF THE HORMONE IN THE MARROW WILL LEAD TO LOSS OF RBC PRODUCTION DURING THE ABSENCE OF THE HORMONE. AS THE LIFESPAN OF A RBC IN A STAGE 4/5 OR DIALYSIS PATIENTS IS CLOSER TO 80-90 THAN 120 DAYS THIS MEANS EACH DAY WITHOUT THE HORMONAL EFFECT WILL LEAD TO A 1% DECLINE IN HGB LEVEL WHICH WILL BE MASKED FOR A NUMBER OF WEEKS AS THE CURRENT RBC'S DIE AND ARE NOT REPLACED. SO ALL ESA DOSES SHOULD BE GIVEN AS ORDERED, REPLACED AS EARLY AS THEY ARE DISCOVERED TO HAVE BEEN FORGOTTEN, AND CONTINUED EVEN IN THE SETTING OF AN ILLNESS OR CONDITION MAKING THEIR UTILITY POORER THAN EXPECTED! NOTE THE COROLLARY IS THAT THE INITIATION OF / OR DOSE CHANGE OF ANY ESA WILL REQUIRE WEEKS PRIOR TO ANY CHANGE (OR LACK OF CHANGE) IN THE PATIENTS HGB LEVEL!

TIPS FOR EFFECTIVE AND EFFICIENT USE OF ERYTHROPOIETIN ALFA (EPREX)

- WITH A MUCH SHORTER HALF-LIFE THAN ARANESP THIS PRODUCT NORMALLY DOSED 1-3 X/WEEK; GOOD EVIDENCE TO SUPPORT 1 X/WEEK THERAPY IN MOST PATIENTS (SOME EVEN LONGER)
- THE CHOICE OF AN *INITIAL DOSE* IS DEPENDENT ON AGE, MODE OF DIALYSIS AND INITIAL HGB LEVEL.
    - AGE EFFECTS: < 2 Y/O OFTEN REQUIRE ~350 U/KG/WEEK, 2-5 Y/O ~275 U/KG/WEEK, 6-12 Y/O ~250 U/KG/WK AND THOSE OLDER THAN 12 Y/O 200 U/KG/WEEK (ALL SC) IN ORDER TO ACHIEVE A TARGET HGB.
    - MODE OF DIALYSIS: ON AVERAGE PD PATIENTS REQUIRE 225 U/KG/WEEK VS. HD WHO REQUIRE STARTING DOSES CLOSER TO 300 U/KG/WEEK (IRRESPECTIVE OF MODE OF DELIVERY – SC VS. IV)!
    - INITIAL HGB LEVELS: ONE IS LIKELY TO NEED HIGHER DOSES TO BRING A PATIENT FROM LOW HGB TO TARGET THAN WITH HIGHER INITIAL LEVELS – CAUTION IS VITAL THOUGH AS RATE OF RISE IS LIKELY A MAJOR CONTRIBUTOR TO MAJOR SIDE EFFECTS – NAMELY GRAFT LOSS, STROKE AND HYPERTENSION! HGB LEVELS SHOULD NOT RISE MORE THAN 10-20 G/L PER MONTH, AND AIMING TO BRING A MODERATELY ANEMIC PATIENT INTO THE LOW END OF TARGET HGB WITHIN 2-3 MONTHS SEEMS BOTH REASONABLE AND SAFE!!!!!!
    - NOTWITHSTANDING AGE AND STAGE RELATED DOSING ALL PATIENTS REQUIRE INDIVIDUAL CONSIDERATION OF APPROPRIATE DOSE – NOTE THAT MOST TOLERATE A 30-50% REDUCTION IN DOSE IN ORDER TO MAINTAIN AS OPPOSED TO OBTAIN THE HGB RANGE!
- THERE IS LITTLE VALUE IN CHANGING DOSE OR INTERVAL MORE OFTEN THAN Q 2 WEEKS; EXCEPTION MAY BE IN SITUATION AIMED AT RAPID INCREASE IN HGB LEVEL WHERE 2 OR 3 TIMES PER WEEK EPREX AND WEEKLY MONITORING OF HGB AND RETICULOCYTES MAY ALLOW MORE RAPID RESPONSE [RAPID RATE OF RISE MAY ENGENDER HYPERTENSION, BE A RISK FOR STROKE OR ACCESS LOSS].
- WEEKLY MONITORING OF HGB MAY ALLOW BETTER PREDICTION OF HGB TREND – HENCE EARLIER DOSE CHANGES
- GENERALLY MORE EPREX IS REQUIRED WHEN GIVEN INTRAVENOUSLY VS. SUBCUTANEOUSLY – STUDIES SUGGEST ANYWHERE FROM 10-30% INCREASE REQUIRED OVER SC DOSE
- UNLIKE LONGER ACTING PRODUCTS THIS DRUG IS MANIPULATED MORE ON BASIS OF DOSE CHANGE THAN FREQUENCY (ALTHOUGH THIS IS CHANGING IN RECENT PAST WITH INITIAL DOSING REGIMENS NOW CALLING FOR ONCE PER WEEK EPREX AS OPPOSED TO THE MORE COMMONLY USED 2 OR 3 TIMES PER WEEK SCHEDULE)
- DO NOT USE THE 20 000 U/ML MULTIDOSE VIAL IN NEONATES AS THE PRESERVATIVE CAN BE HARMFUL TO THEM

TIPS FOR EFFECTIVE AND EFFICIENT USE OF DARBOPOIETIN ALFA (ARANESP)

- IN DIALYSIS PATIENTS MOST COMMON INITIATING DOSES ARE ~0.45 UG/KG/WEEK OR EQUIVALENT (LESS IF NON-DIALYSIS CKD – QUERY 0.2-0.3 UG/KG/WEEK)
- NEVER USE MORE FREQUENTLY THAN ONCE PER WEEK (NON-HD CKD PATIENTS OFTEN TOLERATE LESS FREQUENT DOSING)
- LITTLE VALUE IN CHANGING DOSE OR INTERVAL MORE OFTEN THAN Q 2 WEEKS; NORMALLY CHANGE MONTHLY UNLESS WAY BELOW OR ABOVE TARGET
- SAME DOSE REQUIRED WHEN PRODUCT GIVEN INTRAVENOUSLY VS. SUBCUTANEOUSLY
- THE SMALLEST PRELOAD DOSE IS 10 UG THEREFORE EXTREME CAUTION MUST BE USED IN CHILDREN LESS THAN 20 KG – AND CAREFUL CONSIDERATION OF DOSING INTERVAL SHOULD OCCUR!
- UNLIKE SHORTER ACTING PRODUCTS THIS DRUG IS MANIPULATED AS MUCH ON FREQUENCY OF DOSE AS ON THE ACTUAL DOSE USED – FOR EXAMPLE:
    - A 40 KG PATIENT STARTS HD WITH A HB OF 105 G/L. FROM TABLE ON PAGES 11 OR 16 YOU START ARANESP 20 UG/ WEEK WHICH IS EQUIVALENT TO 20/40 OR 0.5 UG/KG/WEEK
    - AFTER 2 MONTHS THE HB IS 130 G/L AND STABLE AND YOU WISH TO CHANGE THE DOSE BUT MAINTAIN THE HB IN TARGET RANGE OF 110-129. THE FIRST OPTION WOULD BE TO LEAVE THE PATIENT ON WEEKLY SHOTS BUT DECREASE TO 10 UG FROM 20 UG SHOTS (NOW GETS 0.25 UG/KG/WEEK); THE SECOND OPTION IS TO USE THE SAME AMOUNT OF ARANESP (20 UG) BUT DELIVER IT LESS FREQUENTLY.
    - **CHANGING FREQUENCY IS NORMALLY THE PREFERRED METHOD AND OFFERS BETTER TITRATION.** IF WE TOOK 20 UG AND GAVE EVERY 10 DAYS THEN GETS 14 UG EVERY WEEK {[20 UG/ 10 DAYS] X 7 DAYS/ WEEK = 2 UG/DAY X 7 DAYS OR 14 UG/WEEK} OR 14/40 = 0.35 UG/KG/WEEK WHICH IS MORE REASONABLE DROP IN DOSE
- NOTE THESE TECHNIQUES ARE COMBINABLE, SO IF I WISH THIS PATIENT TO GO TO Q 2WEEKS THEN BY INCREASING FROM 20 UG SHOT TO 30 UG SHOT BUT GOING TO 14 DAYS I ACHIEVE SIMILAR RESULT – 30 UG/ 2 WEEKS IS 15 UG/WEEK AND WILL MEAN 0.375 UG/KG/WEEK INSTEAD OF 0.35 UG/KG/WEEK

FULL CONSIDERATION OF PATIENT'S CURRENT MEDICAL CONDITION – IRON STATUS – ESA DOSE AND RECENT CHANGES IN HGB NEED TO BE ASSESSED IN CONCERT TO MAKE DECISIONS RE ANEMIA MANAGEMENT

The following protocol, on the order of a pediatric renal physician transfers anemia management of HD patients to nonphysician staff (e.g. RN and Pharmacists). It is intended to serve as a guide and cannot replace careful clinical judgment. The recommendations may be inappropriate for specific clinical indications, *when in ANY doubt please contact a renal physician.*

Pediatric HD Anemia Management Protocol

ASSESS HGB STATUS
TARGET = 110-129 g/L

ASSESS IRON STATUS – SEE PAGE 5
THEN IF:

HGB > 130 and/or increase > 20 g/L /month or Retic > 80

Notify Dr. if Hgb increases more than 20 g/L from last blood work and follow new orders.

Receiving ESA

- **NO** → No ESA required. Continue routine monitoring of Hgb and Retics every 4 weeks
- **YES** → Hgb > 130 g/L → Reduce dose by 25% per week provided there have been no dose reductions in the prior 4 weeks. **Recheck Hgb and Retics in 2 weeks** **See EPREX DOSING Adjustment Schedule PAGE 6**
- **YES** → Hgb > 140 g/L → Reduce dose by 50% per week provided there have been no dose reductions in the prior 4 weeks. **Recheck Hgb and Retics in 2 weeks** **See EPREX DOSING Adjustment Schedule PAGE 6**
- **YES** → Hgb > 150 g/L → Reduce dose by 75% per week provided there have been no dose reductions in the prior 4 weeks. **Recheck Hgb and Retics in 2 weeks** **See EPREX DOSING Adjustment Schedule PAGE 6**

If dose reduced within the last 4 weeks and Hgb has fallen > 10 g/L from that value - **do not change dose** but recheck **Hgb and Retic in 2 weeks**

HGB 110–129 and stable (No change of +/- 20 g/L /month and Retic 20–120

Receiving ESA

- **NO** → No ESA required. Continue routine monitoring of Hgb and Retics every 4 weeks
- **YES** → Maintain dose of ESA and **Recheck Hgb and Retics in 4 weeks**
- **YES** → **Prior reduction 25-75%** → Continue ESA at reduced dose. **See EPREX Dosing Adjustment Schedule PAGE 6** Notify Dr. if fall in Hgb > 20 g/L since last blood work. **Recheck Hgb and Retics in 4 weeks**

Hgb 109 or lower AND/OR drop in Hgb > 20 g/L or Retic <80

SEE ALGORITHM ON PAGE 4

STANDARD HD ANEMIA BLOOD WORK

Q1 - MONTHLY
- CBC with DIFF
- RBC INDICES – MCV, MCH, MCHC
- ABSOLUTE RETICULOCYTES
- SERUM FERRITIN AND TSAT
- C-REACTIVE PROTEIN (CRP)
- PTH

Q3 – MONTHLY
- MONTHLY and
- RBC FOLATE
- VITAMIN B12

Q6 – MONTHLY
- Q3 – MONTHLY and
- COPPER
- ZINC
- ALUMINUM

FULL CONSIDERATION OF PATIENT'S CURRENT MEDICAL CONDITION – IRON STATUS – ESA DOSE AND RECENT CHANGES IN HGB NEED TO BE ASSESSED IN CONCERT TO MAKE DECISIONS RE ANEMIA MANAGEMENT

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9/11/2007

Pediatric HD Anemia Management Protocol

Subtitle

NOTIFY PHYSICIAN IF HGB < 109 OR DROP OF > 20 g/L SINCE LAST BLOOD WORK

ASSESS IRON STATUS – SEE PAGE 5 THEN IF:

Hgb 109 or lower AND/OR drop in Hgb > 20 g/L or Retic <80

NO

Notify Physician for initiation of ESA therapy.

Page 2

Monitor Hgb and Retics every 2 weeks until Hgb 110-129 g/L on 2 successive readings no more than 10 g/L apart.

Return to Standard ESA Algorithm

See Page 3

YES

Increase dose by 25% per week provided there have been no dose increases in the prior 4 weeks.

SEE ESA PROTOCOLS PAGE 6

Recheck Hgb and Retics in 2 weeks

Notify Physician if Hgb is NOT between 110-129 g/L after 3 dose increases

Continue monitoring Hgb & Retics every 2 weeks until 2 consecutive readings are > 110 g/L and within 10 g/L of each other then

Return to Standard ESA Algorithm

See Page 3

Note: If there has been a dose increase in the previous 4 weeks and Retics > 80 maintain current dose

Target Hgb should be achieved within 2-3 months of initiating ESA/ Iron

Minimum Hgb increase is 5-10 g/L / month

Maximum Hgb increase is 20 g/L / month

If Hgb increase > 10 g/L in 2 weeks reduce ESA dose by 25%

If Hgb increase > 20 g/L in 2 weeks then reduce ESA dose by 50% and notify physician

FULL CONSIDERATION OF PATIENT'S CURRENT MEDICAL CONDITION – IRON STATUS – ESA DOSE AND RECENT CHANGES IN HGB NEED TO BE ASSESSED IN CONCERT TO MAKE DECISIONS RE ANEMIA MANAGEMENT

The following protocol, on the order of a pediatric renal physician transfers anemia management of HD patients to nonphysician staff (e.g. RN and Pharmacists). It is intended to serve as a guide and cannot replace careful clinical judgment. The recommendations may be inappropriate for specific clinical indications, *when in ANY doubt please contact a renal physician.*

9/11/2007

Pediatric HD-CKD Anemia Management Protocol

Subtitle

HD FERRLECIT PROTOCOL

ASSESS IRON STATUS *

NOTE: If TSAT and Ferritin values indicate BOTH iron overload and need for replacement (TSAT < 20% AND Ferritin > 500) **or** values are not within ranges below then contact physician for further orders

Note: Patient should not require more than 2 consecutive courses of Iron Replacement.

Notify Physician if TSAT < 20% AND/OR Ferritin < 100

Note: If TSAT > 20% **BUT** Ferritin < 100 then **Notify Physician**

Sodium Ferric Gluconate (Ferrlecit)

NO TEST DOSE

Maximum 125 mg/dose

Dilute in 25 cc of NS

Administer over 1 hour between hour 2-3 on dialysis

Suggestion:

If unable to maintain TSAT > 20% on 1 mg/kg per week of IV Iron consider increasing dose to 1.5 mg/kg per week

AND Consider Ordering

- CRP
- Stool for Occult blood
- Evaluate for other sites of blood loss

Iron Replacement

TSAT < 20%

AND/OR

Ferritin < 100

Initiate IV Iron at a dose of 1.5 mg/kg to a maximum of 125 mg per dose.

8 Sequential doses to be given over 1 hour in 25 ml of NS and initiated between 1st and 2nd hour of run

Check TSAT and Ferritin and assess **Iron Status** **ONE** week after last dose of IV Iron

Iron Maintenance

TSAT > 20% but < 40%

AND/OR

Ferritin > 100 but < 500

Give IV Iron at a dose of 1 mg/kg to a maximum of 125 mg per dose.

Once weekly doses to be given over 1 hour in 25 ml of NS and initiated between 1st and 2nd hour of run

Check TSAT and Ferritin and assess **Iron Status** every 4 weeks

TSAT > 40% but < 50%

AND

Ferritin < 500

Give IV Iron at a dose of 0.75 mg/kg to a maximum of 125 mg per dose.

Once weekly doses to be given over 1 hour in 25 ml of NS and initiated between 1st and 2nd hour of run

Check TSAT and Ferritin and assess **Iron Status** every 4 weeks

Iron Overload

TSAT > 50%

AND/OR

Ferritin > 500

Notify Physician

Hold IV Iron

Check TSAT and Ferritin and assess **Iron Status** in 4 weeks

Once TSAT < 50% AND/OR Ferritin < 500 restart IV Iron at 0.75 mg/kg to a maximum of 125 mg per dose every 2 weeks

Check TSAT and Ferritin and assess **Iron Status** every 4 weeks

The following protocol, on the order of a pediatric renal physician transfers anemia management of HD patients to nonphysician staff (e.g. RN and Pharmacists). It is intended to serve as a guide and cannot replace careful clinical judgment. The recommendations may be inappropriate for specific clinical indications, *when in ANY doubt please contact a renal physician.*

9/11/2007

Pediatric HD Anemia Management Protocol

Subtitle

EPREX DOSING ADJUSTMENT PROTOCOL

The following chart provides the necessary changes for most dose increments or reductions.

EPREX is 20 000 Units/ml

Round calculated dose to the **nearest 0.01 ml** (200 Units per Week)

REDUCE BY 75%	REDUCE BY 50%	REDUCE BY 25%	INCREASE BY 25%
CURRENT EPREX DOSE _____ Units / Kg/ Week	CURRENT EPREX DOSE _____ Units / Kg/ Week	CURRENT EPREX DOSE _____ Units / Kg/ Week	CURRENT EPREX DOSE _____ Units / Kg/ Week
MULTIPLY BY 0.25	MULTIPLY BY 0.50	MULTIPLY BY 0.75	MULTIPLY BY 1.25
NEW EPREX DOSE _____ Units / Kg/ Week	NEW EPREX DOSE _____ Units / Kg/ Week	NEW EPREX DOSE _____ Units / Kg/ Week	NEW EPREX DOSE _____ Units / Kg/ Week

x CURRENT DRY WEIGHT _____Kg

NEW EPREX DOSE _____UNITS PER WEEK

FULL CONSIDERATION OF PATIENT'S CURRENT MEDICAL CONDITION – IRON STATUS – ESA DOSE AND RECENT CHANGES IN HGB NEED TO BE ASSESSED IN CONCERT TO MAKE DECISIONS RE ANEMIA MANAGEMENT

The following protocol, on the order of a pediatric renal physician transfers anemia management of PD patients to nonphysician staff (e.g. RN and Pharmacists). It is intended to serve as a guide and cannot replace careful clinical judgment. The recommendations may be inappropriate for specific clinical indications, *when in ANY doubt please contact a renal physician.*

9/11/2007

Pediatric PD Anemia Management Protocol

Subtitle

ASSESS HGB STATUS
TARGET = 110-129 g/L

ASSESS IRON STATUS – SEE PAGE X
THEN IF:

HGB > 130 and/or increase > 20 g/L /month or Retic > 80

Notify Dr. if Hgb increases more than 20 g/L from last blood work and follow new orders.

Receiving ESA

- NO → No ESA required. Continue routine monitoring of Hgb and Retics every 4 weeks
- YES, Hgb > 130 g/L → Reduce dose by 25% per week provided there have been no dose reductions in the prior 4 weeks. **Recheck Hgb and Retics in 2 weeks** **SEE ESA PROTOCOLS PAGES 10 OR 11**
- YES, Hgb > 140 g/L → Reduce dose by 50% per week provided there have been no dose reductions in the prior 4 weeks. **Recheck Hgb and Retics in 2 weeks** **SEE ESA PROTOCOLS PAGES 10 OR 11**
- YES, Hgb > 150 g/L → Reduce dose by 75% per week provided there have been no dose reductions in the prior 4 weeks. **Recheck Hgb and Retics in 2 weeks** **SEE ESA PROTOCOLS PAGES 10 OR 11**

If dose reduced within the last 4 weeks **and** Hgb has fallen > 10 g/L from that value - **do not change dose** but recheck **Hgb and Retic in 2 weeks**

HGB 110–129 and stable (No change of +/- 20 g/L /month and Retic 20–120

Receiving ESA

- NO → No ESA required. Continue routine monitoring of Hgb and Retics every 4 weeks
- YES → Maintain dose of ESA and **Recheck Hgb and Retics in 4 weeks**
- YES, **Prior reduction 25-75%** → Continue ESA at reduced dose. **SEE ESA PROTOCOLS PAGES 10 OR 11** Notify Dr. if fall in Hgb > 20 g/L since last blood work. **Recheck Hgb and Retics in 4 weeks**

Hgb 109 or lower AND/OR drop in Hgb > 20 g/L per month or Retic <80

SEE ALGORITHM ON PAGE 8

STANDARD PD ANEMIA BLOOD WORK

Q1 - MONTHLY
- CBC with DIFF
- RBC INDICES – MCV, MCH, MCHC
- ABSOLUTE RETICULOCYTES
- SERUM FERRITIN AND TSAT
- C-REACTIVE PROTEIN (CRP)
- PTH

Q3 – MONTHLY
- MONTHLY and
- RBC FOLATE
- VITAMIN B12

Q6 – MONTHLY
- Q3 – MONTHLY and
- COPPER, ZINC, ALUMINUM, SELENIUM
- TSH

FULL CONSIDERATION OF PATIENT'S CURRENT MEDICAL CONDITION – IRON STATUS – ESA DOSE AND RECENT CHANGES IN HGB NEED TO BE ASSESSED IN CONCERT TO MAKE DECISIONS RE ANEMIA MANAGEMENT

The following protocol, on the order of a pediatric renal physician transfers anemia management of PD patients to nonphysician staff (e.g. RN and Pharmacists). It is intended to serve as a guide and cannot replace careful clinical judgment. The recommendations may be inappropriate for specific clinical indications, *when in ANY doubt please contact a renal physician.*

9/11/2007

Pediatric PD Anemia Management Protocol

Subtitle

NOTIFY PHYSICIAN IF HGB < 109 OR DROP OF > 20 g/L SINCE LAST BLOOD WORK

ASSESS IRON STATUS – SEE PAGE 3 THEN IF:

Hgb 109 or lower AND/OR drop in Hgb > 20 g/L or Retic <80

On ESA

NO

Notify Physician for initiation of ESA therapy.

Page 2

Monitor Hgb and Retics every 2 weeks until Hgb 110-129 g/L on 2 successive readings no more than 10 g/L apart.

Return to Standard PD ESA Algorithm

See Page 7

Target Hgb should be achieved within 2-3 months of initiating ESA/ Iron

Minimum Hgb increase is 5-10 g/L / month

Maximum Hgb increase is 20 g/L / month

If Hgb increase > 10 g/L in 2 weeks reduce ESA dose by 25%

If Hgb increase > 20 g/L in 2 weeks then reduce ESA dose by 50% and notify physician

YES

Increase dose by 25% per week provided there have been no dose increases in the prior 4 weeks.

SEE ESA PROTOCOLS PAGES XX OR YY

Recheck Hgb and Retics in 2 weeks

Notify Physician if Hgb is NOT between 110-129 g/L after 3 dose increases

Note: If there has been a dose increase in the previous 4 weeks and Retics > 80 maintain current dose

Continue monitoring Hgb & Retics every 2 weeks until 2 consecutive readings are > 110 g/L and within 10 g/L of each other then

Return to Standard ESA Algorithm

See Page XX

FULL CONSIDERATION OF PATIENT'S CURRENT MEDICAL CONDITION – IRON STATUS – ESA DOSE AND RECENT CHANGES IN HGB NEED TO BE ASSESSED IN CONCERT TO MAKE DECISIONS RE ANEMIA MANAGEMENT

The following protocol, on the order of a pediatric renal physician transfers anemia management of PD patients to nonphysician staff (e.g. RN and Pharmacists). It is intended to serve as a guide and cannot replace careful clinical judgment. The recommendations may be inappropriate for specific clinical indications, *when in ANY doubt please contact a renal physician.*

Pediatric PD Anemia Management Protocol

ORAL IRON PROTOCOL

ASSESS IRON STATUS *

TSAT more value than Ferritin in predicting response to iron

NOTE: If TSAT and Ferritin values indicate BOTH iron overload and need for replacement (TSAT < 20% AND Ferritin > 500) **or** values are not within ranges below then contact physician for further orders

PATIENT IS ANEMIC OR ON ESA THERAPY?

TSAT <20% AND/ OR FERRITIN < 100

YES

ENSURE ON ELEMENTAL ORAL IRON DOSE OF 3 MG/ KG/DAY

REASSESS HB, RETICS AND IRON STATUS IN ONE MONTH

See below for preferred iron products

IS THE **TSAT STILL <20%** AND/ OR FERRITIN < 100

NO

MAINTAIN ELEMENTAL ORAL IRON DOSE AT 3 MG/KG/DAY

REASSESS HB, RETICS AND IRON IN ONE MONTH

HB IS INCREASING > 5G/L OR RETICULOCYTES ABOVE 80

NO

INCREASE ELEMENTAL ORAL IRON DOSE TO 6 MG/KG/DAY

REASSESS HB, RETICS AND IRON IN ONE MONTH

HB IS INCREASING > 5G/L OR RETICULOCYTES ABOVE 80

NO

IF IRON REPLETE START ESA - SEE PAGE 2

OR

CONSIDER IV IRON

OR

INCREASE ESA DOSE AS PER PAGES 10 OR 11

YES

YES

CONTINUE IRON AND REASSESS HB, RETICS AND IRON MONTHLY

TSAT 20-50% AND/ OR FERRITIN 100-500

YES

START OR MAINTAIN IRON AT MINIMUM OF 3 MG/KG/DAY
INCREASE TO 6 MG/KG/DAY AS NEEDED TO ACHIEVE HGB LEVEL *BUT MAINTAIN TSAT <50%*

AND

START ESA - SEE PAGE 2

OR

INCREASE ESA DOSE AS PER PAGES 10 OR 11

TSAT >50% AND/ OR FERRITIN >500

YES

HOLD/ STOP IRON

AND

START ESA - SEE PAGE 2

OR

INCREASE ESA DOSE AS PER PAGES 10 OR 11

REASSESS HB, RETICS, IRON STATUS IN ONE MONTH

AND FOLLOW ND-CKD ESA PROTOCOLS ON PAGES 10-11

NOTE: FAILURE TO MAINTAIN IRON PARAMETERS, PATIENT INTOLERANCE TO OR USE OF EXTRAORDINARY ESA DOSES WHILE ON ORAL IRON MAY JUSTIFY CONSIDERING IV IRON PREPARATIONS – SEE DOCTOR FOR FURTHER ORDERS

ORDER ALL IRON AS PRODUCT NAME – TABLET OR SOLUTION - AND ELEMENTAL DOSE OF IRON TO BE GIVEN!

PRODUCT	ELEMENTAL IRON (MG/UNIT)	PREFERRED PRODUCT	AVAILABLE AT BCCH	AVAILABLE AT MACDONALD'S	COST ($/ 100 MG ELEMENTAL IRON)
FERROUS FUMARATE 300 MG	100 MG PER TABLET	YES – HIGH DOSE PER TAB	NON-FORMULARY BUT OFTEN HAVE	YES	0.04
FERROUS FUMARATE SUSP. (PALAFER)	20 MG/ ML	YES – HIGHEST DOSE PER ML	NON-FORMULARY BUT OFTEN HAVE	YES	?
FERROUS SULFATE 300 MG	60 MG PER TABLET		YES	YES	0.032
FERROUS SULFATE DROPS 75 MG/ ML	15 MG/ ML	YES – 6 MG/ ML PRODUCT HALF COST BUT 2.5 X VOLUME	YES	YES	1.33

FULL CONSIDERATION OF PATIENT'S CURRENT MEDICAL CONDITION – IRON STATUS – ESA DOSE AND RECENT CHANGES IN HGB NEED TO BE ASSESSED IN CONCERT TO MAKE DECISIONS RE ANEMIA MANAGEMENT

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Pediatric PD Anemia Management Protocol

PD-CKD EPREX DOSING ADJUSTMENT PROTOCOL

The following chart provides the necessary changes for most dose increments or reductions.

EPREX Multi-dose are 20 000 Units/ml

Round calculated dose to the **nearest 0.01 ml** (200 Units per Week)

EPREX Pre-Loads Available

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2000 Units in 0.5 ml syringe
3000 Units in 0.3 ml syringe
4000 Units in 0.4 ml syringe
5000 Units in 0.5 ml syringe[a]
6000 Units in 0.6 ml syringe[a]
10 000 Units in 1 ml syringe
(a) Pharmacy will bring in on request basis

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3000 Units in 0.3 ml syringe
4000 Units in 0.4 ml syringe
5000 Units in 0.5 ml syringe
6000 Units in 0.6 ml syringe
8000 Units in 0.8 ml syringe
10000 Units in 1.0 ml syringe

REDUCE BY 75%	REDUCE BY 50%	REDUCE BY 25%	INCREASE BY 25%
CURRENT EPREX DOSE _____ Units / Kg/ Week	CURRENT EPREX DOSE _____ Units / Kg/ Week	CURRENT EPREX DOSE _____ Units / Kg/ Week	CURRENT EPREX DOSE _____ Units / Kg/ Week
MULTIPLY BY 0.25	MULTIPLY BY 0.50	MULTIPLY BY 0.75	MULTIPLY BY 1.25
NEW EPREX DOSE _____ Units / Kg/ Week	NEW EPREX DOSE _____ Units / Kg/ Week	NEW EPREX DOSE _____ Units / Kg/ Week	NEW EPREX DOSE _____ Units / Kg/ Week

x CURRENT DRY WEIGHT _____Kg

NEW EPREX DOSE _____UNITS PER WEEK

Has received dose divided:
- Once /wk __
- Twice/wk __
- Three/wk __
- ____/wk __

Now Divide and Give:
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REDUCE BY 75%	REDUCE BY 50%	REDUCE BY 25%	INCREASE BY 25%
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MULTIPLY BY 0.25	MULTIPLY BY 0.50	MULTIPLY BY 0.75	MULTIPLY BY 1.25
NEW EPREX DOSE _____ Units / Kg/ Week	NEW EPREX DOSE _____ Units / Kg/ Week	NEW EPREX DOSE _____ Units / Kg/ Week	NEW EPREX DOSE _____ Units / Kg/ Week

x CURRENT DRY WEIGHT _____Kg

NEW EPREX DOSE _____UNITS PER WEEK

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9/11/2007

Pediatric PD Anemia Management Protocol

Subtitle

THIS TABLE REPRESENTS A STARTING ALGORITHM – SEE BELOW FOR INSTRUCTIONS ON MODIFYING DOSE AND FREQUENCY TO MAINTAIN PATIENT IN TARGET RANGE USING ARANESP

Darbepoetin alfa (Aranesp™)

Initial Dosing[1] and Adjustments*

Weight (kg)	Dose[2]: Prefilled Syringe (mcg)	Interval	Low Hb[3] (<100 g/L), Increase Dose (25-50%)	High Hb[3] (>130 g/L), Decrease Dose (25-50%)
56 - 75	30	Q 1 week	40 µg Q 1 week	30 µg Q 10 days
46 - 55	30	Q 10 days	30 µg Q 1 week	30 µg Q 2 weeks
38 - 45	20	Q 1 week	30 µg Q 1 week	20 µg Q 10 days
26 - 37	20	Q 10 days	20 µg Q 1 week	20 µg Q 2 weeks
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14 - 19	10	Q 10 days	10 µg Q 1 week	10 µg Q 2 weeks
10 - 13	10	Q 2 weeks	10 µg Q 10 days	10 µg Q 3 weeks
8 - 9	10	Q 3 weeks	10 µg Q 2 weeks	10 µg Q 4 weeks

* Modified from HSC protocol – *Geary et al KI 2005: 68; 1759-1765*
[1] Usual initial dose = 0.45 µg/kg/week
[2] Double-check dose before administration to patient
[3] Target Hb range = 110-130 g/L
Note: Patients previously receiving <100 units/kg/wk of Eprex will receive the 25-50% reduced dose by weight

The following chart provides the necessary changes for most dose increments or reductions.

ARANESP Pre-Loads Available

@BCCH
10 mcg in 0.4 ml syringe
20 mcg in 0.5 ml syringe
30 mcg in 0.3 ml syringe
40 mcg in 0.4 ml syringe

@MACDONALD'S
10 mcg in 0.4 ml syringe
20 mcg in 0.5 ml syringe
30 mcg in 0.3 ml syringe
40 mcg in 0.4 ml syringe
50 mcg in 0.5 ml syringe
60 mcg in 0.3 ml syringe
80 mcg in 0.4 ml syringe
100 mcg in 0.5 ml syringe
130 mcg in 0.4 ml syringe
150 mcg in 0.3 ml syringe

FULL CONSIDERATION OF PATIENT'S CURRENT MEDICAL CONDITION – IRON STATUS – ESA DOSE AND RECENT CHANGES IN HGB NEED TO BE ASSESSED IN CONCERT TO MAKE DECISIONS RE ANEMIA MANAGEMENT

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9/11/2007

Pediatric ND-CKD Anemia Management Protocol

Subtitle

ASSESS HGB STATUS
TARGET = 110-129 g/L

ASSESS IRON STATUS – SEE PAGE X
THEN IF:

HGB > 130 and/or increase > 20 g/L /month or Retic > 80

Notify Dr. if Hgb increases more than 20 g/L from last blood work and follow new orders.

Receiving ESA

NO	YES	YES	YES
	Hgb > 130 g/L	Hgb > 140 g/L	Hgb > 150 g/L
No ESA required. Continue routine monitoring of Hgb and Retics as per CKD Stage	Reduce dose by 25% per week provided there have been no dose reductions in the prior 4 weeks. **Recheck Hgb and Retics in 2 weeks** **SEE ESA PROTOCOLS PAGES 15 OR 16**	Reduce dose by 50% per week provided there have been no dose reductions in the prior 4 weeks. **Recheck Hgb and Retics in 2 weeks** **SEE ESA PROTOCOLS PAGES 15 OR 16**	Reduce dose by 75% per week provided there have been no dose reductions in the prior 4 weeks. **Recheck Hgb and Retics in 2 weeks** **SEE ESA PROTOCOLS PAGES 15 OR 16**

If dose reduced within the last 4 weeks **and** Hgb has fallen > 10 g/L from that value - **do not change dose** but recheck **Hgb and Retic in 2 weeks**

HGB 110–129 and stable (No change of +/- 20 g/L /month and Retic 20–120

Receiving ESA

NO	YES	YES
		Prior reduction 25-75%
No ESA required. Continue routine monitoring of Hgb and Retics every 4 weeks	Maintain dose of ESA and **Recheck Hgb and Retics in 4 weeks**	Continue ESA at reduced dose. **SEE ESA PROTOCOLS PAGES 15 OR 16** Notify Dr. if fall in Hgb > 20 g/L since last blood work. **Recheck Hgb and Retics in 4 weeks**

Hgb 109 or lower AND/OR drop in Hgb > 20 g/L per month or Retic <80

SEE ALGORITHM ON PAGE 13

STANDARD ND-CKD ANEMIA BLOOD WORK IF ON ESA

Q1 - MONTHLY
- CBC with DIFF
- RBC INDICES – MCV, MCH, MCHC
- ABSOLUTE RETICULOCYTES

Q3 – MONTHLY
- MONTHLY and
- SERUM FERRITIN AND TSAT
- C-REACTIVE PROTEIN (CRP)
- PTH
- RBC FOLATE
- VITAMIN B12

Q12 – MONTHLY
- Q3 – MONTHLY and
- COPPER, ZINC, ALUMINUM, SELENIUM
- TSH

FULL CONSIDERATION OF PATIENT'S CURRENT MEDICAL CONDITION – IRON STATUS – ESA DOSE AND RECENT CHANGES IN HGB NEED TO BE ASSESSED IN CONCERT TO MAKE DECISIONS RE ANEMIA MANAGEMENT

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9/11/2007

Pediatric ND-CKD Anemia Management Protocol

Subtitle

NOTIFY PHYSICIAN IF HGB < 109 OR DROP OF > 20 g/L SINCE LAST BLOOD WORK

ASSESS IRON STATUS – SEE PAGE 14 THEN IF:

Hgb 109 or lower AND/OR drop in Hgb > 20 g/L or Retic <80

On ESA

NO

Notify Physician for initiation of ESA therapy.

See Page 2

Target Hgb should be achieved within 2-3 months of initiating ESA/ Iron

Minimum Hgb increase is 5-10 g/L / month

Maximum Hgb increase is 20 g/L / month

If Hgb increase > 10 g/L in 2 weeks reduce ESA dose by 25%

If Hgb increase > 20 g/L in 2 weeks then reduce ESA dose by 50% and notify physician

Monitor Hgb and Retics every 2 weeks until Hgb 110-129 g/L on 2 successive readings no more than 10 g/L apart.

Return to Standard ND-CKD ESA Algorithm

See Pages 15 OR 16

YES

Increase dose by 25% per week provided there have been no dose increases in the prior 4 weeks.

SEE ESA PROTOCOLS PAGES 15 OR 16

Recheck Hgb and Retics in 2 weeks

Notify Physician if Hgb is NOT between 110-129 g/L after 3 dose increases

Note: If there has been a dose increase in the previous 4 weeks and Retics > 80 maintain current dose

Continue monitoring Hgb & Retics every 2 weeks until 2 consecutive readings are > 110 g/L and within 10 g/L of each other then

Return to Standard ESA Algorithm

See Pages 15 OR 16

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9/11/2007

Pediatric ND-CKD Anemia Management Protocol

Subtitle

ORAL IRON PROTOCOL

ASSESS IRON STATUS *

TSAT more value than Ferritin in predicting response to iron

NOTE: If TSAT and Ferritin values indicate BOTH iron overload and need for replacement (TSAT < 20% AND Ferritin > 500) **or** values are not within ranges below then contact physician for further orders

PATIENT IS ANEMIC OR ON ESA THERAPY?

TSAT <20% AND/ OR FERRITIN < 100

YES

ENSURE ON ELEMENTAL ORAL IRON DOSE OF 3 MG/ KG/DAY

REASSESS HB, RETICS AND IRON STATUS IN ONE MONTH

See below for preferred iron products

IS THE **TSAT STILL <20%** AND/ OR FERRITIN < 100

NO

MAINTAIN ELEMENTAL ORAL IRON DOSE AT 3 MG/KG/DAY

REASSESS HB, RETICS AND IRON IN ONE MONTH

HB IS INCREASING > 5G/L OR RETICULOCYTES ABOVE 80

YES

CONTINUE IRON AND REASSESS HB, RETICS AND IRON MONTHLY

NO

YES

INCREASE ELEMENTAL ORAL IRON DOSE TO 6 MG/KG/DAY

REASSESS HB, RETICS AND IRON IN ONE MONTH

HB IS INCREASING > 5G/L OR RETICULOCYTES ABOVE 80

YES

CONTINUE IRON AND REASSESS HB, RETICS AND IRON MONTHLY

NO

IF IRON REPLETE START ESA - SEE PAGE 2

OR

CONSIDER IV IRON

OR

INCREASE ESA DOSE AS PER PAGES 15 OR 16

TSAT 20-50% AND/ OR FERRITIN 100-500

YES

START OR MAINTAIN IRON AT MINIMUM OF 3 MG/KG/DAY

INCREASE TO 6 MG/KG/DAY AS NEEDED TO ACHIEVE HGB LEVEL *BUT MAINTAIN TSAT <50%*

AND

START ESA - SEE PAGE 2

OR

INCREASE ESA DOSE AS PER PAGES 15 OR 16

TSAT >50% AND/ OR FERRITIN >500

YES

HOLD/ STOP IRON

AND

START ESA - SEE PAGE 2

OR

INCREASE ESA DOSE AS PER PAGES 15 OR 16

REASSESS HB, RETICS, IRON STATUS IN ONE MONTH

AND FOLLOW ND-CKD ESA PROTOCOLS ON PAGES 15-16

NOTE: FAILURE TO MAINTAIN IRON PARAMETERS, PATIENT INTOLERANCE TO OR USE OF EXTRAORDINARY ESA DOSES WHILE ON ORAL IRON MAY JUSTIFY CONSIDERING IV IRON PREPARATIONS – SEE DOCTOR FOR FURTHER ORDERS

ORDER ALL IRON AS PRODUCT NAME – TABLET OR SOLUTION - AND ELEMENTAL DOSE OF IRON TO BE GIVEN!

PRODUCT	ELEMENTAL IRON (MG/UNIT)	PREFERRED PRODUCT	AVAILABLE AT BCCH	AVAILABLE AT MACDONALD'S	COST ($/ 100 MG ELEMENTAL IRON)
FERROUS FUMARATE 300 MG	100 MG PER TABLET	YES – HIGH DOSE PER TAB	NON-FORMULARY BUT OFTEN HAVE	YES	0.04
FERROUS FUMARATE SUSP. (PALAFER)	20 MG/ ML	YES – HIGHEST DOSE PER ML	NON-FORMULARY BUT OFTEN HAVE	YES	?
FERROUS SULFATE 300 MG	60 MG PER TABLET		YES	YES	0.032
FERROUS SULFATE DROPS 75 MG/ ML	15 MG/ ML	YES – 6 MG/ ML PRODUCT HALF COST BUT 2.5 X VOLUME	YES	YES	1.33

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