Yukon-Kuskokwim HEALTH CORPORATION

Treatment Protocol

Pediatric Endocrine Non-emergency Recommendations

Please remember that this is just a list of lab tests often recommended prior to seeing patients. These are not physician orders. However, they are recommended prior to specialty appointments.

Congenital Adrenal Hyperplasia (CAH): meds are often adjusted based on labs/growth/bone age/clinical history
- 17-OH-P (17-OH hydroxyprogesterone) often every 3-6 months Infants/toddlers often ordered q 1-3 months. (Goal: ~300-900 if not on Crenessity, ie on hydrocortisone only)
- Androstenedione: Often every 3-6 months. Infants/toddlers often ordered every 1-3 months. (Goal: w/in normal range)
- Renin Activity: Often every 3-6 months. Renin hard to obtain in villages as must be sent frozen. (Goal: w/in normal range)
- BMP: often every 3-6 months
- Testosterone as indicated
- HbA1c, lipid panel, CMP at puberty or when indicated if BMI over 85th percentile
- Bone age after 2-3 years of age, then annually (or every 6 months if rapidly advancing)
- Testicular ultrasound beginning at adolescence and every 1-2 years if indicated
- Accurate height and weight and BP measurements each visit
- F/u in endo clinic every 3 to 6 months
- Urology evaluation –
    - Females: in infancy and again at 11-12yo
    - Males: if signs of adrenal rest tumors

Newborn with + FH of CAH but no ambiguous genitalia (ie no physical s/s of CAH):
- Newborn screen after 24hrs of life (in all infants).
- Serum 17OHP at day 3 of life (17OHP levels are normally high during the first 1-2 days after birth but by the 3rd day, levels in healthy infants fall and levels in affected infants rise to diagnostic levels).
- Alert state newborn screening program of patient at risk of CAH.
- Measure serum electrolytes prior to hospital discharge and at 5 and 10 days of age (hyponatremia and hyperkalemia are usually not present before 5-7 days of age and salt-losing crisis will typically occur in the second week of life).
- After newborn is sent home, parents should be cautioned to watch for signs of salt-losing crisis including vomiting, diarrhea, lethargy, dehydration, decreased PO intake.
- If positive newborn screen or elevated 17OHP, patient should be seen immediately and consult endocrinologist on call. (University of Iowa manages all initial abnormal newborn screens)
- Consult Genetic Counselor (Anke Kelly) for genetic counseling guidance for future offspring. Add diagnosis of "carrier of genetic mutation" to mother's and father's charts

Congenital Hypothyroid/Hashimoto Thyroiditis/Goiter: meds are usually adjusted based on labs/growth/clinical exam
General Information
- When a med dosage change is made, labs are usually repeated in 4-6 weeks and then again before the next clinic visit.
- Under certain circumstances (ie, large goiter, asymmetry, nodule), a thyroid ultrasound is sometimes ordered – not routine
    - Children with congenital hypothyroidism/goiter due to thyroid dyshormonogenesis get thyroid US every 2-3 years starting at 2 yo
- Growth records on all children with any thyroid condition should be plotted.
- Often other thyroid labs are done as part of initial workup but depends on what the presumptive diagnosis is. (TPO, TSI, TRAB/TBII etc)
- If congenital goiter, send genetic test for "Congenital Hypothyroidism Genetic Panel", test code 630264, to LabCorp

Specific Labs – Goal: normal Free T4 and TSH (if familial thyroid dyshormonogenesis or congenital goiter, goal to keep TSH below 2mcIU/mL)
Congenital Hypothyroidism
- FT4 & TSH 2weeks after dose started.
- 0-6 Months: FT4 & TSH every month
- 6-12 Months: FT4 & TSH every 2 months
- 1-3 Years: FT4 & TSH every 3 months

Acquired Hypothyroidism
- FT4 & TSH 4-6 weeks after starting med or after dose change
- FT4 & TSH every 4-6 months routinely

Central Hypothyroidism (ie, hypopituitarism)
- Free T4 every 4-6 months routinely

Hypopituitarism with Optic nerve hypoplasia (aka septooptic dysplasia): (any combination of deficiencies of GH, TSH, ACTH, LH/FSH, ADH)
- Labs to follow depend on deficiency
- If hypopituitarism/panhypopituitarism
    - IGF-1 every 6-12 months if on GH (see below).
    - Free T4 every 4-6 months (see above).
    - BMP if concerns about inadequate adrenal hormone replacement.
    - Na levels if DI depend on thirst—if intact thirst, Na level every 3-4 months; if non-intact thirst, may need Na every 2-4 weeks.
    - LH/FSH pediatric, estradiol ultrasensitive or total testosterone starting at approximately age 11.
    - Accurate height and weight plotted on growth chart every visit

Work-up of Short Stature
- X-ray: bone age XR left hand/wrist after age 2yo; may need skeletal survey if disproportionate short stature or signs of skeletal dysplasia
- bloodwork: TSH, free T4, TTG IgA, IgA, CMP, CBC, IGF-1, IGFBP-3, ESR. Also do chromosome microarray in every female or dysmorphic features
- urine: urinalysis (looking for RTA)
- FSH/LH and testosterone or estradiol if pubertal age; prolactin if signs of delayed puberty
- Consider "comprehensive short stature genetic panel" test code 630520 sent to LabCorp, or WES at Invitae

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Children on Growth Hormone Injections: (GH deficiency/Turners/Noonan's/Prader-Willi Syn/SGA/Hypopituitarism/CRF)

- Free T4, TSH and IGF-1
  - Usually obtained q 6-12 months. Other labs including these may be done for initial diagnosis which may include GH stimulation tests.
  - GH dose will be adjusted based on IGF-1, growth pattern and weight.
- Bone age: includes left hand and wrist – please have radiology send via PACS to ANMC.
  - Initially and approximately every year.
- Accurate height and weight
  - Crucial to have correct plotting on growth record. (Lengths are done on infants and toddlers less than 2 years of age or if not able to stand well; plotted on 0-24mo WHO growth chart; heights are done when the child is over age 2 and plotted on the CDC 2-20 growth chart.)

Insulin Resistance/Obesity: goal is to prevent these children from developing diabetes; not usually managed in endocrine clinic unless there is an endocrine condition (diabetes, prediabetes, PCOS, dyslipidemia); hypertension is managed by PCP or nephrology; fatty liver disease managed by PCP or hepatology.
** Refer to publications in *Pediatrics 2023*.

- Screening fasting plasma glucose, HbA1c every 2 yrs. OGTT if needed (Fasting Insulin **not** routine).
  - Fasting plasma glucose <100 is normal; 100-125 = prediabetes, >125 = diabetes.
  - OGTT-fasting plasma glucose, then drink 1.75 g/kg (max 75 g) of Glucola (within 10-15 min) and repeat plasma glucose in 2 hours.
    - Fasting 101-125 = impaired fasting glucose; over 125 = diabetes
    - 2 hour 141-199 = impaired glucose tolerance; over 199 = diabetes
  - HbA1c: 5.7% to 6.4% = prediabetes; >6.4%, diabetes
  - If prediabetes, send "Diabetes Autoimmune Profile" test code 504050 to LabCorp, even in the case of insulin resistance
- Fasting lipids initially and then per recommendation, usually every 2 years
  - If abnormal, repeat after 2 weeks but before 3 months (see below).
  - If still abnormal, dietitian referral.
- Liver function tests-AST/ALT every 2 years.
- Growth records with accurate height & weight plotted-also calculate and plot BMI.
  - Only obtain TSH & Free T4 initially if patient is showing growth deceleration, goiter, s/s of thyroid dysfunction
- All patients should have initial evaluation and then monthly appointments with a dietitian whenever possible.
  - Daily activity, one hour/day with lifestyle change.
  - The more they see their primary provider and dietitian, the more likely they are to achieve changes in dietary and activity levels.

Type 2 Diabetes

- At diagnosis: HgbA1C and "Diabetes Autoimmune Profile" test code 504050, insulin, c-peptide, BMP. Other labs depend on the individual case.
  - Criteria for dx of diabetes (per ADA):
    - FPG > 125 (no caloric intake for 8 hrs)
    - OR 2-hr glucose >199 during an OGTT
    - OR HbA1c >6.4%
    - **the above 3 criteria require repeat testing in the absence of unequivocal hyperglycemia
    - OR classic symptoms of hyperglycemia or hyperglycemic crisis and a random plasma glucose >199
- HbA1c every 3 months: Goal A1c <7%
- Fasting lipid panel soon after diagnosis and every 5 years if normal.
  - If abnormal, repeat after 2 weeks but before 3 months (see below).
  - If still abnormal, dietitian referral.
- Random urine microalbumin/creatinine soon after diagnosis and annually.
  - If abnormal, repeat with first morning urine MA/Cr or overnight collection; if still abnormal, referral to nephrology.
- AST and ALT (screen for NAFLD) at diagnosis and then annually, referral to Hepatology clinic for FibroScan when indicated
- Eye exam soon after diagnosis (after glycemic control achieved) and annually.
- Blood pressure, height, weight, BMI at diagnosis and every visit
- Foot exam at diagnosis and annually
- Dental exam every 6 months
- Endocrinology/diabetes clinic follow-up every 3 months
- Dietitian visit q 3-6 months.
- RN/CDCES for education.
- BHC/depression screening at diagnosis, annually, and as needed
- Preconception counseling routinely beginning at puberty
- Flu shot annually; COVID and routine immunizations per CDC
- Everyone with diabetes should receive one dose of Pneumococcal Vaccine (PCV20 or PPSV23) between ages 6-18yo (at least 8 weeks after the most Recent pneumococcal vaccine dose)
- Clinical screening for OSA and PCOS at every visit

Table 9–1. Acceptable, Borderline-High, and High Plasma Lipid, Lipoprotein and Apolipoprotein Concentrations (mg/dL) For Children and Adolescents*

NOTE: Values given are in mg/dL; to convert to SI units, divide the results for TC, LDL-C, HDL-C and non-HDL-C by 38.6; for TG, divide by 88.6.

Category	Acceptable	Borderline	High†
TC	< 170	170-199	≥ 200
LDL-C	< 110	110-129	≥ 130
Non-HDL-C	< 120	120-144	≥ 145
ApoB	< 90	90-109	≥ 110
TG			
0-9 years	< 75	75-99	≥ 100
10-19 years	< 90	90-129	≥ 130

Category	Acceptable	Borderline	Low†
HDL-C	> 45	40-45	< 40
ApoA-I	>120	115-120	<115

*Values for plasma lipid and lipoprotein levels are from the National Cholesterol Education Program (NCEP) Expert Panel on Cholesterol Levels in Children. Non-HDL-C values from the Bogalusa Heart Study are equivalent to the NCEP Pediatric Panel cut points for LDL-C. Values for plasma apoB and apoA-I are from the National Health and Nutrition Examination Survey III.

†The cut points for high and borderline-high represent approximately the 95th and 75th percentiles, respectively. Low cut points for HDL-C and apoA-I represent approximately the 10th percentile.

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Type 1 Diabetes Mellitus

New Diagnosis: HbA1c, BMP, c-peptide, insulin level, diabetes autoantibodies, other labs depending on patient and presentation (for diagnostic criteria, see above; type 1 distinguished from type 2 based on presentation, physical exam, labs incl. diabetes antibodies, c-peptide, insulin level)

- Hemoglobin A1C: Every 3 months (2026 ADA guidelines suggest that A1c can be every 6 months in stable children)
  - This lab helps determine the average of blood glucose readings over a 3 month period
  - A1c goal is less than 7%.
- Lipid Panel (nonfasting acceptable initially)
  - Initial check soon after diagnosis, once blood sugars stabilized, if over 2 years old.
  - Repeat fasting lipid panel every 3 years if initial LDL <100 (starting at 9 years old).
  - If abnormal, fasting lipid panel should be repeated at least 2 weeks later but less than 3 months later to confirm.
  - If confirmed abnormal, referral to dietitian for lifestyle/diet modification; statin if over age 10yo+
- Thyroid and Thyroid Auto Antibodies
  - Obtain Free T4 & TSH at diagnosis (after acute DKA resolved) and every 1-2 years
  - Obtain anti-thyroid peroxidase (TPO) antibodies at diagnosis.
- Celiac screening
  - TTG IgA and total serum IgA soon after diagnosis.
  - 2 years and 5 years after diagnosis, sooner if symptoms/+FH
- Eye exam
  - Initial eye exam soon after diagnosis to detect cataracts or major refractive errors
  - Eye exam every 1-2 years should start at: Puberty or 11yo (whichever is earlier) and diabetes duration of 3 years)
- Urine microalbumin/creatinine screen
  - Spot urine microalbumin/creatinine annually starting at puberty or age 10 years (whichever is first) and diabetes duration of 5 years
  - If abnormal, repeat with first morning void or an overnight urine collection with 2 of 3 samples over 6 months
- Blood pressure monitoring at diagnosis, and every visit
- Annual Foot exam: foot pulses, pinprick, monofilament, vibration starting at puberty or 10yo (whichever is earlier) and diabetes duration of 5 years
- Screening for psychosocial distress annually beginning at age 7-8yo and as needed and as needed based on symptoms/signs
- Screening for eating disorders annually beginning at age 10-12yo and as needed based on symptoms/signs
- Preconception counseling routinely beginning at puberty
- Screening for substance use (esp tobacco, marijuana, vaping) and alcohol use at diagnosis (or at 10yo whichever is sooner) and regularly thereafter
- Flu Vaccine recommended yearly. COVID vaccine and other routine childhood immunizations per CDC guidelines
- Everyone with diabetes should receive one dose of Pneumococcal Vaccine (PCV20 or PPSV23) between ages 6-18yo (at least 8 weeks after the most recent pneumococcal vaccine dose)
- Dental evaluation recommended every 6 months.
- Pediatric Endocrinologist every 3 months
- RN CDCES referral for all aspects of Diabetes education.
- Dietitian CDCES for dietary/CHO counting/activity/insulin
- BHC visit at diagnosis, annually, and as needed

- Screening recommended for 1st and 2nd degree relatives of patients with type 1 diabetes: “diabetes autoimmune profile” test code 504050 to LabCorp