

# Algorithm for Dyslipidemia in the Pediatric Population

Universal non-fasting lipid screening is recommended for all patients between ages 9-11 and 17-21. Selective lipid screening recommended for patients based on risk factors.

## SCREENING LIPID PANEL STARTING AT AGE 2 FOR HIGH RISK FAMILY HISTORY

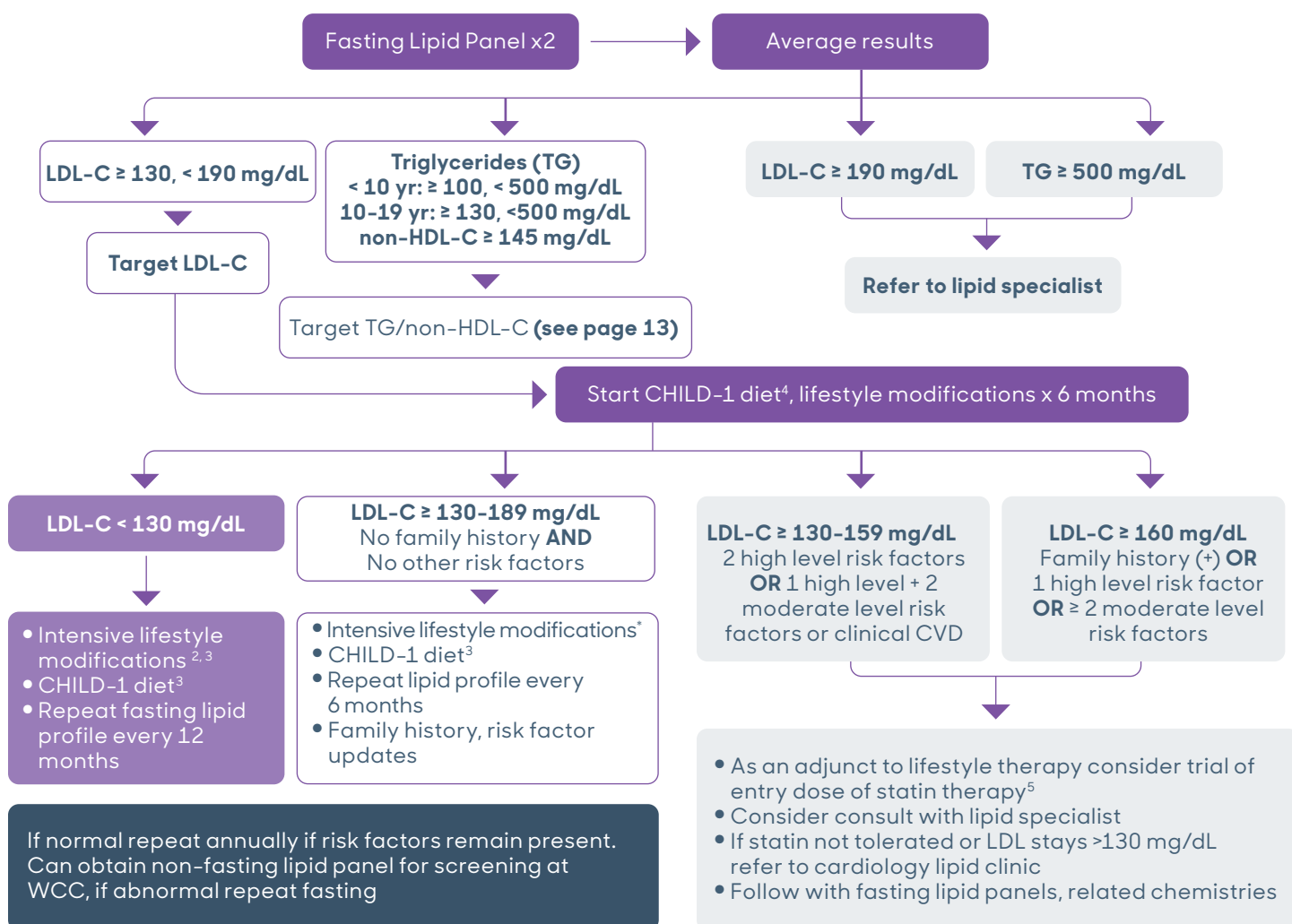
<sup>1</sup> Positive family history of **myocardial infarction, angina, coronary artery bypass graft/stent/angioplasty, sudden cardiac death** in parent, grandparent, aunt, or uncle at <55 yo for males, <65 yo for females

### HIGH LEVEL RISK FACTORS (1 risk factor + age >10)

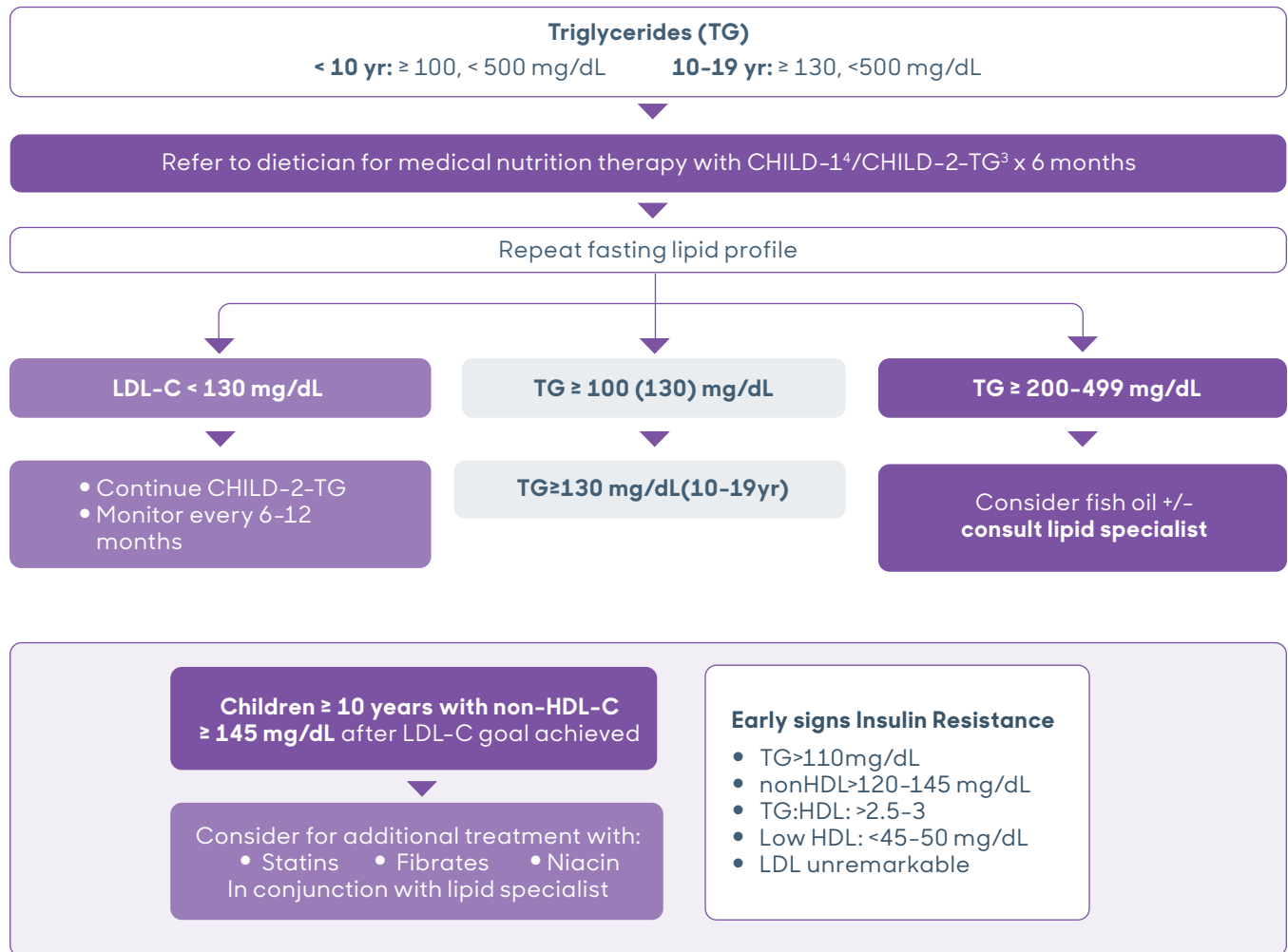
- Hypertension requiring therapy (>99% + 5mmHg)
- Current cigarette smoker
- Body mass index (BMI) greater than 97%
- High risk conditions:
  - Diabetes mellitus, type 1 or 2
  - After heart transplant
  - Chronic kidney disease
  - End-stage renal disease
  - After renal transplant
  - Kawasaki disease with coronary aneurysms

### MODERATE LEVEL RISK FACTORS (2 risk factors + age >10)

- Hypertension not requiring medication
- Body mass index (BMI) greater than 95% but less than equal to 97%
- HDL-C < 40 mg/dL
- Moderate risk conditions:
  - Chronic inflammatory disease
  - Human immunodeficiency virus infection
  - Nephrotic syndrome
  - Kawasaki disease without coronary aneurysm



## Algorithm for Dyslipidemia in the Pediatric Population (Continued)



## Elevated Triglyceride, non-HDL-C Treatment Guidelines

Age	Treatment
All ages (birth to 18 years)	Take detailed family history of CVD at initial encounter and/or at 3 years, 9-11 years and 18 years Review family history of CVD with young adult patients
Birth - 10 years	Pharmacologic treatment is limited to children <10, <b>refer to care of a lipid specialist</b> , with: <ul style="list-style-type: none"> <li>• Severe primary hyperlipidemia (homozygous familial hypercholesterolemia, primary hypertriglyceridemia with TG ≥ 500 mg/dL)</li> <li>• High risk conditions (see above)</li> <li>• Evident cardiovascular disease</li> </ul>
11-21 years	Take a detailed family history of CVD and risk factor assessment required before initiation of drug therapy <b>under care of lipid specialist</b> . See TG and non-HDL-c specific algorithms above.

## <sup>1</sup> Family History

Family history of early CVD is the highest level risk factor for future risk and patients need annual lipid screening starting at age 2

When there is hyperlipidemia with a family history of early CVD adult guidelines recommend screening for Lipoprotein a - Lp(a)- which is indicative of lifelong risk. Lipid specialists recommend a one time screening for Lp(a) however this is not incorporated into the pediatric guidelines at this time.

Levels are largely determined by genetics and there is minimal change with modifiable lifestyle factors. An elevated level should be considered an independent risk factor within the treatment algorithm.

## <sup>2</sup> Exercise Recommendations by Age

Age	Recommendation
Infants	Active several times throughout the day via interactive floor play
Toddlers	Engage in at least 180 minutes per day in free play (walking, playing outside)
3-5 years	At least 180 minutes of physical activity throughout the day (approximately 15 min of every hour awake)
6-17 years	60 minutes of vigorous physical activity every day as well as muscle and bone strengthening activities at least 3 days per week

## <sup>3</sup> CHILD-2 Diet (LDL-lowering, TG-lowering)

CHILD-2 LDL-lowering	CHILD-2 TG-lowering
Total fat 25-30% of daily kcal intake	Total fat 25-30% of daily kcal intake
Saturated fat $\leq$ 7% daily kcal intake	Saturated fat $\leq$ 7% daily kcal intake
Avoid trans fat	Avoid trans fat
Monounsaturated fat $\sim$ 10% daily kcal intake	Monounsaturated fat $\sim$ 10% daily kcal intake
Cholesterol $<$ 200 mg/day	Cholesterol $<$ 200 mg/day
Encourage at least 1 hour of moderate-to-vigorous physical activity daily while limiting sedentary screen time to $<$ 2 hr/day	<ul style="list-style-type: none"><li>• Reduce sugar intake</li><li>• Replace simple carbohydrates with complex carbohydrates.</li><li>• Avoid sugar-sweetened beverages</li></ul>
	Increase dietary fish to increase omega-3 fatty acid intake
<b>Translation:</b> Keep saturated fats low and continue to encourage physical activity every day. Emphasize the importance of a heart healthy lifestyle.	<b>Translation:</b> Emphasize being more aggressive in decreasing intake of sugar and sugar-sweetened beverages. Focus on complex carbohydrates such as whole grains (brown rice, oatmeal), quinoa, and starchy vegetables (sweet potatoes, corn). Consider increased fish intake.

#### 4 CHILD-1 (Cardiovascular Health Integrated Lifestyle) Diet

Age	Recommendations
Birth to 6 months	Exclusive breastfeeding until 6 months of age. Donor breast milk or iron-fortified infant formula if maternal breastmilk is unavailable or contraindicated. Supplemental food is not recommended.
6 to 12 months	Breastfeeding continued until at least 12 months of age. Gradual addition of solids; transition to iron-fortified formula until 12 months if maternal breastmilk is unavailable or contraindicated. Fat intake should not be restricted unless medically indicated. No sweetened beverages should be offered; if juice given limit to $\leq 4\text{oz/day}$ ; encourage water instead of juice.
12 to 24 months	<p>Transition to unflavored, reduced-fat cow's milk. Fat content (2% to fat free) should be based on child's growth, intake of other nutrient-dense foods, total fat intake, and family history of obesity or cardiovascular disease. Avoid sugar sweetened beverage; limit 100% fruit juice to <math>\leq 4\text{oz/day}</math>; encourage water. Offer table foods with:</p> <ul style="list-style-type: none"> <li>• Total fat 30% of daily kcal intake</li> <li>• Saturated fat 8-10% daily kcal intake</li> <li>• Avoid trans fat</li> <li>• Mono- and polyunsaturated fat up to 20% daily kcal intake</li> <li>• Cholesterol <math>&lt; 300\text{ mg/day}</math></li> </ul> <p>Limit sodium intake</p>
2 to 10 years	<p>Primary beverage should be unflavored, fat-free milk and water. Limit/avoid sugar sweetened beverage; limit 100% fruit juice to <math>\leq 4\text{oz/day}</math>. Encourage water.</p> <p>Dietary fat:</p> <ul style="list-style-type: none"> <li>• Total fat 25-30% of daily kcal intake</li> <li>• Saturated fat 8-10% daily kcal intake</li> <li>• Avoid trans fat</li> <li>• Mono- and polyunsaturated fat up to 20% daily kcal intake</li> </ul> <p>Cholesterol <math>&lt; 300\text{ mg/day}</math></p> <p>Encourage high dietary fiber intake</p> <p>Encourage at least 1 hour of moderate-to-vigorous physical activity daily for children <math>&gt; 5</math> years</p>
11 to 21 years	<p>Primary beverages should be fat-free unflavored milk and water. Limit/avoid sugar-sweetened beverage; limit 100% fruit juice to <math>\leq 4\text{oz/day}</math>.</p> <p>Dietary fat:</p> <ul style="list-style-type: none"> <li>• Total fat 25-30% of daily kcal intake</li> <li>• Saturated fat 8-10% daily kcal intake</li> <li>• Avoid trans fat</li> <li>• Mono- and polyunsaturated fat up to 20% daily kcal intake</li> </ul> <p>Cholesterol <math>&lt; 300\text{ mg/day}</math></p> <p>Encourage high dietary fiber intake</p> <p>Encourage at least 1 hour of moderate-to-vigorous physical activity daily.</p> <p>Encourage healthy eating habits such as daily breakfast, limiting fast-foods, and eating meals as a family.</p>
<b>Translation</b>	<p><i>Decrease overall saturated fats within the diet (fatty meats, dark chicken, whole milk, butter, cheese, sour cream) and avoid trans fats (often found in baked goods, shortening, frozen and refrigerated dough, fried foods) as well as added/processed sugars, especially sugar-sweetened beverages. Decrease sodium intake (frozen meals, fast foods, canned beans). Increase dietary fiber in children <math>&gt; 2</math> years. Encourage at least 1 hour of physical activity daily.</i></p>

## Here are some practical ways to counsel parents on incorporating the CHILD diet recommendations into their families:

- 1** Encourage a diet high in fruits and vegetables, majority of which should be whole, few from juice or concentrate.
  - Low in calories and high in dietary fiber making them great snack options.
  - Frequent exposure is the key to success in effectively increasing your child's overall consumption.
- 2** Encourage a diet that favors whole grain foods rather than refined/white grain products. Choose wheat breads, wheat tortillas, brown rice and whole wheat pasta.
  - Increased nutritional value compared to refined grain products (i.e. white rice, white bread).
  - Whole grains are higher in fiber and help with satiety and improved vitamin and mineral intake.
- 3** Beverage choices for your child should include water and white milk only. It is important to minimize your child's intake of fruit juices, sodas, sports drinks, and other sugar-sweetened beverages. Save for special occasions.
  - Sugary beverages contribute to empty calories and can promote weight gain and other poor dietary habits.
  - Dairy recommendation: 2-3 servings per day of fat-free dairy products to meet nutrient needs (i.e. yogurt, cheese, milk).
- 4** Limit the intake of high fat foods (i.e. fried, fast food) and avoid trans fats.
  - How to limit fat?
    - Choose lean proteins like chicken, fish, turkey or lean cuts of beef/pork.
    - Bake, broil, steam or grill foods instead of frying.
    - Limit intake of fast food.

### **5** Statin Therapy

- Pravastatin approved for children >8yo with LDL >130 + 2 high level risk factors **OR** 1 high level + 2 moderate level risk factors
- Baseline lipid panel and LFTs prior to starting therapy
- Initial dose 10mg
- Check lipid panel and LFTs 6-8 weeks after starting therapy or making any dose adjustments
  - Monitor lipids every 4-6 months
  - Monitor LFTs annually or as clinically indicated
  - CK only needed if patient having muscle soreness or tenderness
- If LDL remains >130 refer to cardiology lipid clinic for further management

#### Sources:

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- *Pediatric lipid management: an earlier approach*, Zachariah et al., *Endocrinol Metab Clin North America*, doi: 10.1016/j.ecl.2014.08.004