CT Children's CLASP Guideline

Lipid Abnormalities

INTRODUCTION

Abnormal lipid levels are a significant risk factor for atherosclerosis that originates in childhood. This risk factor can be identified and managed early on in childhood to reduce the cardiovascular disease (CVD) burden. The AAP recommends universal lipid screening of all children and adolescents between ages 9-11 and 17-21 years. Targeted screening is not adequate due to the increased prevalence of obesity and dyslipidemia. Using family history of premature CVD alone misses 30-60% of children with dyslipidemia.

Obese children present with dyslipidemia, which consists of elevated triglycerides (TG), low HDL-C, and elevated Non-HDL-C with or without elevated LDL-C levels. Familial hypercholesterolemia is a genetic form of elevated cholesterol levels where the children may or may not be obese and have significantly elevated LDL-C levels. Family history is usually positive in familial hypercholesterolemia (de Ferranti, 2015).

Non HDL-C appears to be more predictive of persistent dyslipidemia and can be accurately calculated in a non-fasting state. Total Cholesterol (TC) and LDL-C falls 10-20% or more during puberty, and hence, universal screening is recommended between ages 9-11 and 17-21 years.

The 2011 Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children & Adolescents full report may be found at: https://www.nhlbi.nih.gov/files/docs/guidelines/peds_guidelines_full.pdf

INITIAL EVALUATION AND MANAGEMENT

See:

- **Appendix A for Target LDL-C**
- **Appendix B for Target TG**

INITIAL SCREENING:

(Units expressed in mg/dL for all lipid levels)
Non-fasting non HDL-C and HDL-C level:

Universal Screening: At ages 9-11 and 17-21 years

Targeted Screening: At ages ≥2 years

- Positive family history[1] **OR**
- Parent with TC ≥240 or known dyslipidemia **OR**
- Patient has established ≥1 moderate or high level risk factors (RFs)[2,3]

Further Evaluation for abnormal screens:

- For <20 years old , non-HDL-C ≥145 or HDL-C < 40 → obtain fasting lipid panel (FLP)
- For ≥20 years old, non-HDL-C ≥190 or HDL-C < 40 → obtain fasting lipid panel (FLP)

INITIAL MANAGEMENT:

Interpretation of fasting LDL Cholesterol Levels:

- LDL-C <110 → ACCEPTABLE
- LDL-C 110-129 → BORDERLINE
  - Implement CHILD-1 Diet **(See Appendix C)**
  - Repeat FLP in 12 months
- LDL-C ≥130 → HIGH **(See Appendix A)**

Interpretation of fasting TG Levels:

- TG < 75 (< 10y) or TG < 90 (≥10 years) → ACCEPTABLE
- TG 75-99 (< 10y) or TG 90-129 (≥10 years) → BORDERLINE
  - Implement CHILD-1 Diet **(See Appendix C)**
  - Repeat FLP in 12 months
- TG ≥100 (<10y) or TG ≥130 (≥10 years) → HIGH **(See Appendix B)**

[1] **POSITIVE FAMILY HISTORY DEFINED AS:**
Myocardial infarction; angina; stroke; coronary artery bypass graft/stent/angioplasty; sudden cardiac death in parent, grandparent, aunt, or uncle, male < 55 y, female < 65 y

[2] **HIGH-LEVEL RISK FACTORS (RF)**

- Diabetes mellitus (Type 1 or Type 2)
- Hypertension requiring drug therapy
- Severe Obesity (BMI ≥99th percentile)
- End stage kidney disease
- Predialysis chronic kidney disease
- Kawasaki disease with persistent coronary aneurysms
- Childhood cancer survivor (stem cell recipient, chest radiation, cardiotoxic chemotherapy)
- Solid organ transplant vasculopathy
- Aortic stenosis or coarctation

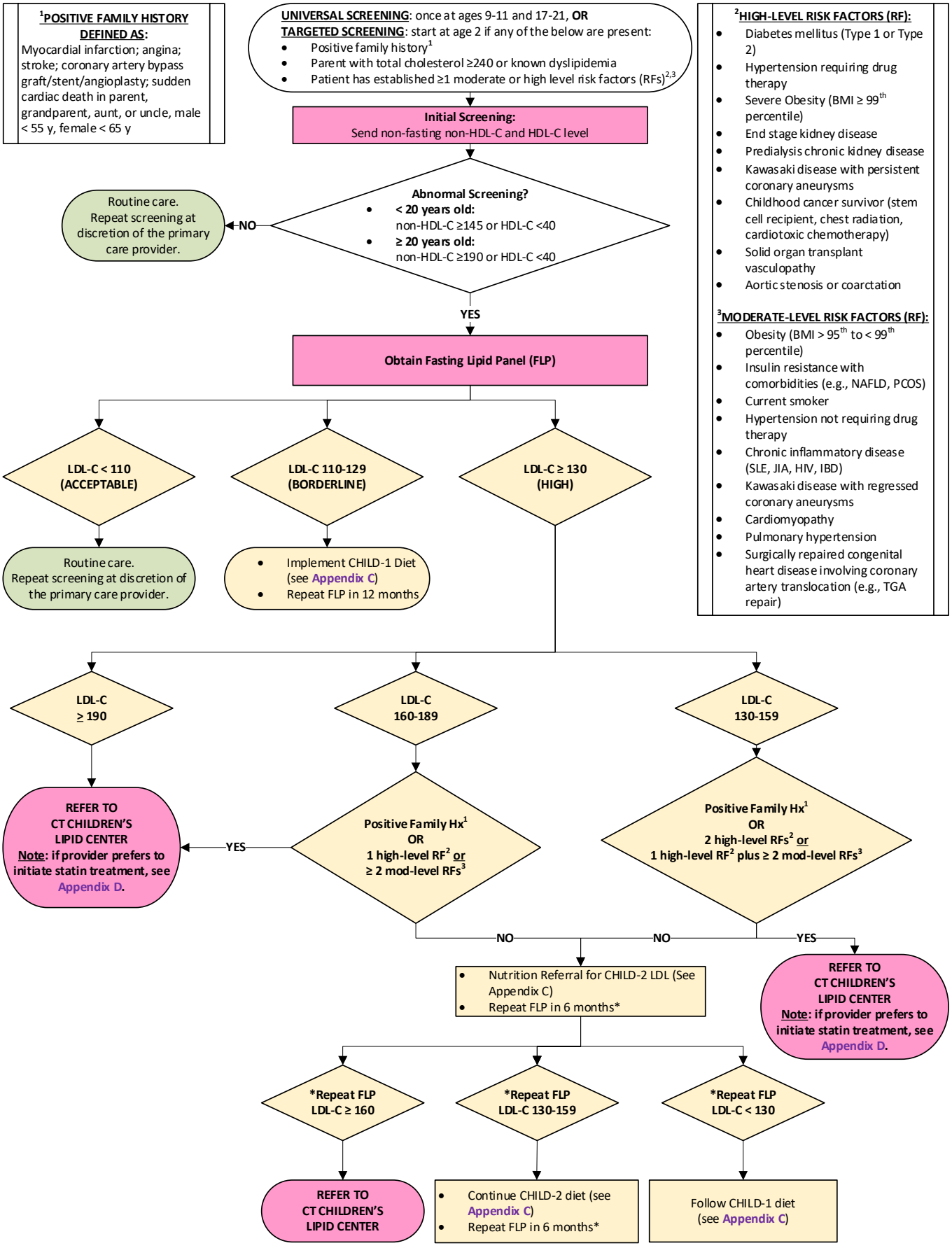
[3] **MODERATE-LEVEL RISK FACTORS (RF)**

- Obesity (BMI > 95th to < 99th percentile)
- Insulin resistance with comorbidities (e.g., NAFLD, PCOS)
- Current smoker
- Hypertension not requiring drug therapy
- Chronic inflammatory disease (SLE, JIA, HIV, IBD)
- Kawasaki disease with regressed coronary aneurysms
- Cardiomyopathy
- Pulmonary hypertension
- Surgically repaired congenital heart disease involving coronary artery translocation (e.g., TGA repair)

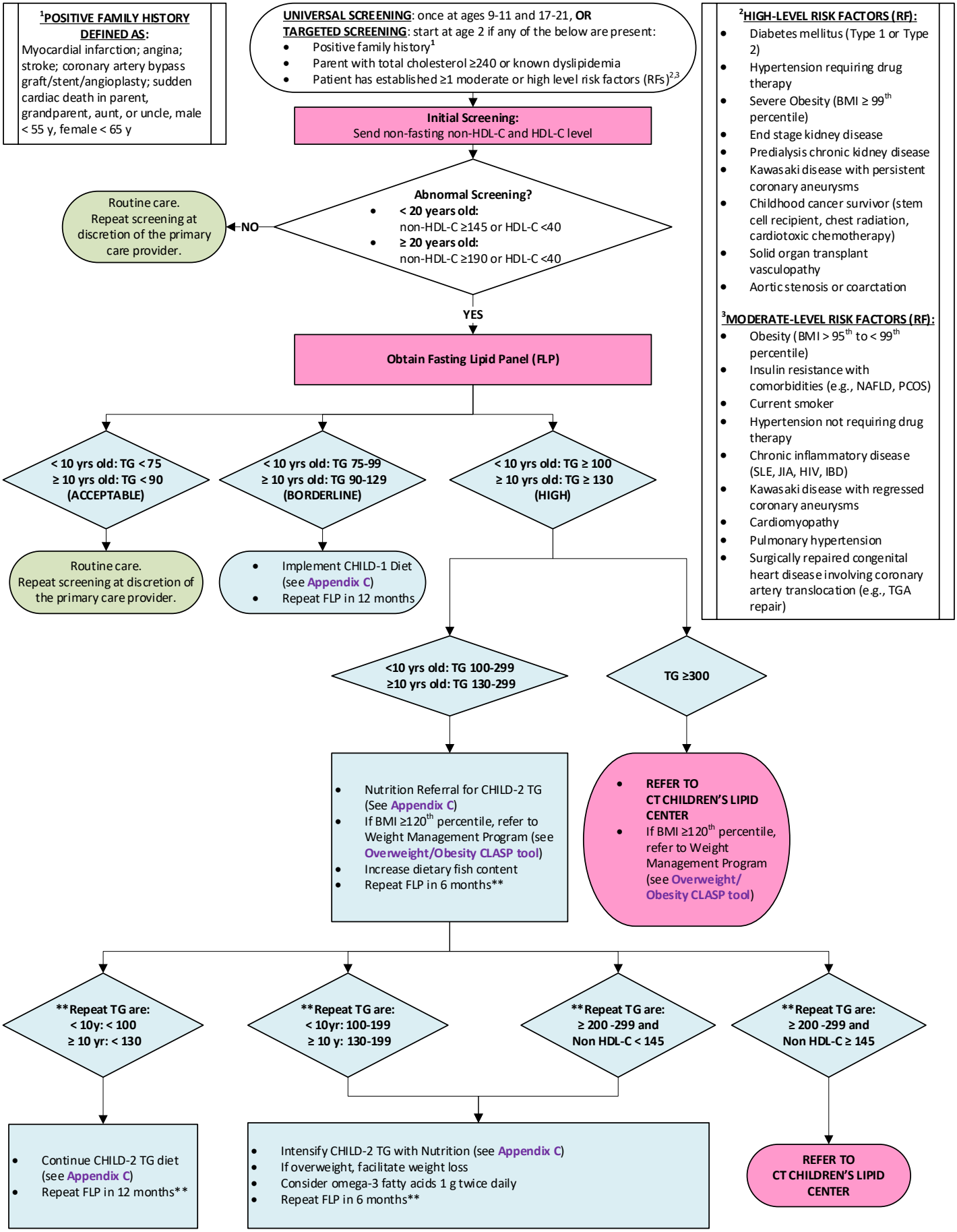
(de Ferranti et al, 2019)

WHEN TO REFER	• See Appendix A for Target LDL-C • See Appendix B for Target TG
HOW TO REFER	**Referral to Endocrinology LIPID CENTER via CT Children's One Call Access Center** **Phone:** 833.733.7669 **Fax:** 833.226.2329 For more information on how to place referrals to Connecticut Children's, click **here**. **Referral to WEIGHT MANAGEMENT PROGRAM for any patient with BMI ≥ 120th percentile via CT Children's One Call Access Center** **Phone:** 833.733.7669 **Fax:** 833.226.2329 For more information on how to place referrals to Connecticut Children's, click **here**. ***Information to be included with the referral:*** ▪ Growth charts (height, weight, BMI) ▪ Copies of relevant laboratory studies ▪ Notes from recent visit
WHAT TO EXPECT	**What to expect from CT Children's Visit:** ▪ Comprehensive history and physical ▪ Review of systems ▪ Additional laboratory studies and genetic testing, as indicated ▪ Nutritional counseling with a Registered Dietician (no separate Nutrition referral needed) ▪ Patient and family education on the diagnosis and management of lipid disorders ▪ Initiation of statin or other lipid-lowering drug therapy as needed

APPENDIX A: Target LDL Cholesterol Screening, Evaluation & Management



APPENDIX B: Target Triglyceride Screening, Evaluation & Management



APPENDIX C: CHILD-1 and CHILD-2 Diets (Cardiovascular Health Integrated Lifestyle Diet (CHILD))

CHILD-1 DIET (for implementation in Primary Care)

- Limit total fat intake to < 30% of total calories
- Limit saturated fat intake to 7-10% of calories
- Remaining made up from mono-unsaturated & poly-unsaturated fats
- Limit dietary cholesterol < 300 mg/day
- **See Family Handouts:** (1) CT Children's Shopping Guide, and (2) Dyslipidemia Heart Healthy Tips

CHILD-2 LDL DIET (for implementation by Nutritionist)

- Limit total fats to 25-30% of total calories
- Limit saturated fat intake to ≤7% of calories and 10% MUFA
- Limit dietary cholesterol to <200 mg/day
- Fiber recommendations:
  - >2 years of age: 14 grams of fiber per 1000 calories consumed
  - Soluble Fiber:
    - 2-12 years old: 6 grams/day
    - >12 years old: 12 grams/day
    - Good sources of soluble fiber: flaxseed, beans, avocados, asparagus, broccoli, pears, oats, kale, apples
  - If unable to consume goals with diet, use a fiber supplement (gummy, powder, psyllum fiber)
- **See Family Handouts** (1) High Cholesterol Nutrition Therapy, and (2) High Fiber Diet Handout
  - Instruct family to bring these handouts to their first Nutrition appointment

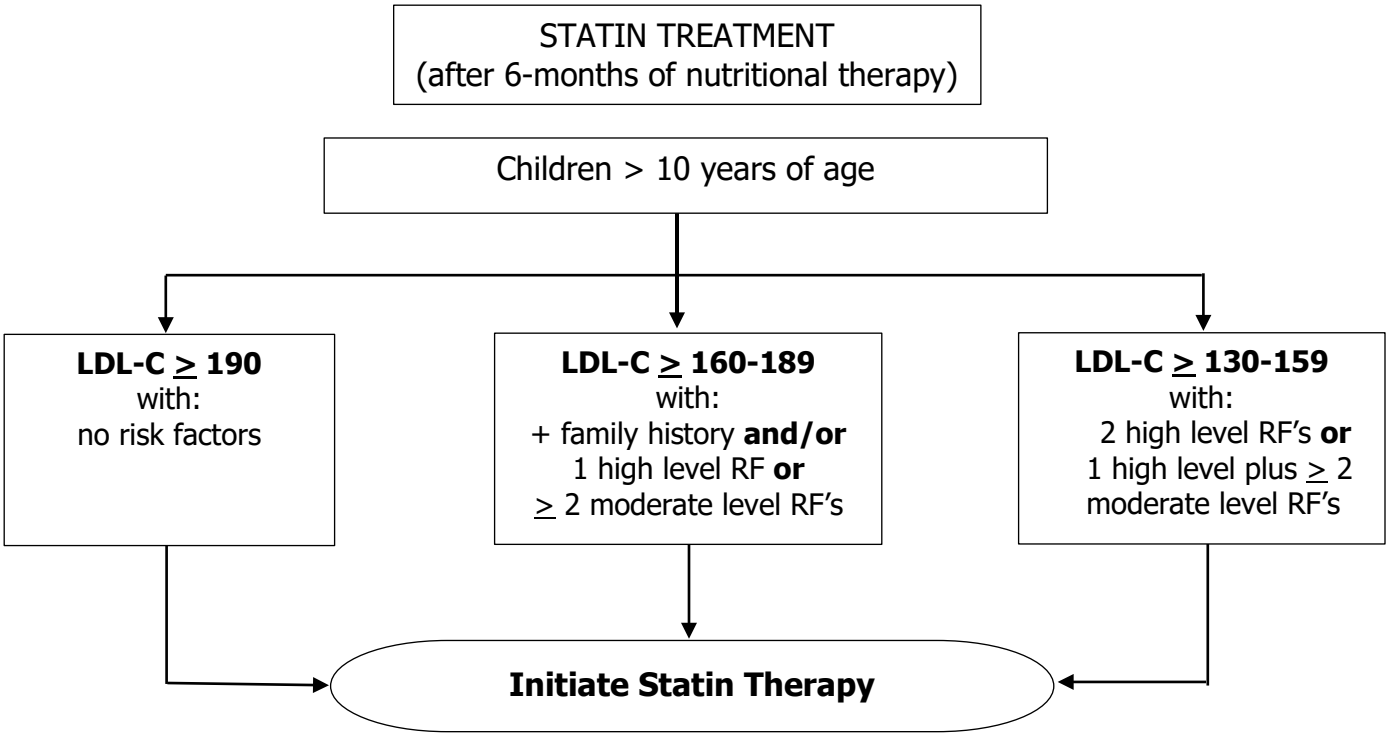
CHILD-2 TG DIET (for implementation by Nutritionist)

- In **addition** to CHILD-2 LDL diet:
  - Eat foods high in Omega 3's (fish 2-3x/week, salmon, tuna, trout, flounder, avocados, walnuts, tofu, flax seed, chia seeds)
  - Decrease sugar and simple carbohydrates:
    - Avoid sugary beverages
    - Replace white flours with whole grains
    - Avoid foods with high fructose corn syrup, maltodextran, cane sugar, brown rice syrup, agave
- **See Family Handouts:** (1) High Triglycerides Nutrition Therapy, and (2) High Cholesterol Nutrition Therapy, and (3) Nutritional Tips to Lower Triglycerides in Children, and (4) High Fiber Diet Handout
  - Instruct family to bring these handouts to their first Nutrition appointment

CT Children's Clinical Nutrition

860-837-6294

https://www.connecticutchildrens.org/search-specialties/nutrition/



- **Initiate treatment with Atorvastatin 10 mg or Rosuvastatin 5 mg and repeat FLP and AST/ALT in 6-8 weeks**
- **Take medication daily at bedtime**
- **Discuss risk of muscle cramps, weakness, myopathy, and elevated AST/ALT**
- **Monitor CK if muscle symptoms**
- **Goal LDL-C < 130 mg/dl. If not achieved, recommend referral to CT Children's Lipid Center**

STATIN INTENSITY

HIGH INTENSITY	MODERATE INTENSITY	LOW INTENSITY
Daily dose lowers LDL-C on average by ~ 50%	Daily dose lowers LDL-C on average by ~ 30-50%	Daily dose lowers LDL-C on average by ~ 30%
Atorvastatin: 40-80 mg Rosuvastatin: 20-40 mg	Atorvastatin: 10-20 mg Rosuvastatin: 5-10 mg Simvastatin: 20-40 mg Pravastatin: 40-80 mg Lovastatin: 40 mg Fluvastatin: 40 mg BID	Simvastatin: 10 mg Pravastatin: 10-20 mg Lovastatin: 20 mg

(Stone, et al. 2014)