Pediatric Non-Alcoholic Fatty Liver Disease (NAFLD) Primary Care Pathway

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1. Suspected NAFLD

Incidental finding of:
- abnormal alanine aminotransferase (ALT) persistently >40 or greater than the upper limit of normal (ULN) in local laboratory on minimum 2 sets of blood-work (6 months apart) AND/OR
- hepatic steatosis on ultrasound (US)

No → Routine follow-up with repeat investigations as clinically indicated

Yes

2. Rule out other causes of liver disease in addition to NAFLD through the following steps:

Medication review including:
- Prescription medications
- Herbals and supplements
- Alcohol and illicit drugs

Baseline Investigations:
- Full liver panel:
  - Total bilirubin, conjugated bilrubin, AST, ALT, GGT, ALP, CBC
  - check INR and albumin
- Metabolic profile:
  - HbA1c and lipid profile
- Exclude other etiologies of liver disease:
  - HbsAg, anti-HCV
- ANA, TSH, FT4, antiactin/anti smooth muscle antibody, IgG, total protein, ferritin and iron/TIBC, celiac disease screen, ceruloplasmin, alpha 1 antitrypsin level, CK, urate
- Liver US:
  - completed within the last 12 months

3. Work up indicates alternative cause of elevated liver enzymes → Treat or refer for consultation (See Expanded Details)

Work up normal, but NAFLD diagnosis suspected:
- BMI ≥85th percentile
- Hepatic steatosis on US
- Physical examination finding of insulin resistance
- Family history
- Metabolic syndrome

4 a) Low Risk NAFLD - Manage in Medical Home:
- ALT 36-200
- Normal workup
- US normal except for fatty infiltration

4 b) Indeterminate/High Risk NAFLD or cirrhosis suspected (≥1 of the following):
- ALT >200
- Platelets <150
- INR >1.3
- US: splenomegaly (Note: upper limit of normal still considered normal)
- Calgary Zone - shear wave elastography ≥8k Pa

4 c) Atypical NAFLD:
- Hepatic steatosis on US and BMI <85 percentile or <7 years old

5. Care within the Patient Medical Home
- Monitor yearly: total & direct bilirubin, ALT, AST, GGT, ALP with HbA1c and lipid profile (if heightened concern complete every 6 months)
- Consider: Hep A and B immunizations if not already done
- Lifestyle counselling: nutritional changes, increased physical activity, minimize screen time
- Referral to a dietitian
- Monitor for psychosocial impacts and provide psychosocial supports to patient and family if required

Referral to Pediatric Gastroenterologist

This primary care pathway was co-developed by primary and specialty care and includes input from multidisciplinary teams. It is intended to be used in conjunction with specialty advice services, when required, to support care within the medical home. Wide adoption of primary care pathways can facilitate timely, evidence-based support to physicians and their teams who care for patients with common low-risk gastrointestinal (GI) conditions and improve appropriate access to specialty care, when needed. To learn more about primary care pathways, check out this short video or click here to visit Primary Care Supports webpage.

PEDIATRIC NAFLD PATHWAY PRIMER

- Metabolic dysfunction associated steatotic liver disease (MASLD) is the finding of hepatic steatosis in the presence of cardiometabolic risk factors. Formerly known as non-alcoholic fatty liver disease (NAFLD), the new nomenclature provides less stigmatizing and more descriptive terminology. However, given its recent implementation in 2023, studies reviewed to generate the present document used NAFLD. Furthermore, healthcare providers may be unfamiliar with the new term MASLD. Therefore, we have retained the term "NAFLD" in the current version document. The working group has every intention of updating the terminology with the next iteration of the document as MASLD becomes more integrated into clinical practice.
- NAFLD in children is a common cause of liver injury caused by excess fat deposition within the liver cells not secondary to genetic/metabolic disorders, infections, use of steatogenic medications, ethanol consumption nor malnutrition[1].
- In most children, NAFLD is associated with features of metabolic syndrome including elevated BMI, insulin resistance, dyslipidemia and hypertension.
- A recent study among Canadian children showed the prevalence of children with elevated BMI increased from 23% in 1978 to 31% in 2017[2]. In North America, the prevalence of NAFLD ranges from 0.7% in pre-school children to 29-38% in school aged children with elevated BMI.
- Screening guidelines for pediatric NAFLD are not well established. Therefore, the focus of this pathway is to help identify patients with NAFLD in the setting where children were found to have elevated alanine transaminase
  (ALT) on serum biochemistry or hepatic steatosis on abdominal ultrasound (US).
- The term NAFLD actually refers to a group of related liver conditions, including simple fatty liver (i.e. steatosis), non-alcoholic steatohepatitis (steatosis with liver damage/NASH), fatty liver with liver fibrosis (i.e. liver scarring), or fatty liver with advanced liver fibrosis/cirrhosis.
    - In general, steatosis is considered to be relatively benign, but can still progress to cirrhosis in 2-3% of adults within 1-2 decades (even when ALT levels are persistently normal). Although rare, children can also develop NAFLD related cirrhosis.
    - In contrast, NASH is considered a potentially progressive disease that can lead to cirrhosis in up to 20%of people within 20 years[3]. The gold standard for NASH diagnosis is a liver biopsy, though this is rarely done in practice.
    - Increasing liver fibrosis in people with NAFLD is associated with an exponential increase in risk of liver-related mortality[4], which appears to be most pronounced in people with NAFLD who have developed moderate to severe liver fibrosis. Adult literature shows that adults are at more risk for adverse cardiac outcomes[5].
    - NAFLD that has progressed to cirrhosis is an increasingly common indication for adult liver transplantation and liver cancer in North America. Therefore, it is critical to identify people with NAFLD who have developed significant liver fibrosis in order to better manage these individuals to try to prevent progressive liver fibrosis.
- Given the prevalence of NAFLD, specialist consultation for all patients with NAFLD is not feasible.
    - This clinical care pathway helps to **identify children with NAFLD who are more likely to have advanced disease**, and, therefore, may benefit from specialist care (Table A).

Table A

	Low Risk NAFLD	Indeterminate/High Risk NAFLD (≥1 of the following)	Atypical NAFLD
Assess risk for significant likelihood of liver disease	• ALT 36-200 • Normal workup • US normal except for fatty infiltration	• ALT >200 • Platelets <150 • INR >1.3 • US: Splenomegaly (upper limit of normal still considered normal) • Calgary Zone –shear wave elastography ≥8 kPa	• Hepatic steatosis but BMI <85%tile • Age <7 years
Action	Manage in patient medical home	Consider referral to pediatric gastroenterology	Consider referral to pediatric gastroenterology

EXPANDED DETAILS

1. Suspected NAFLD

- Risk factors for NAFLD include elevated BMI, type 2 diabetes, hyperlipidemia, metabolic syndrome, hypertension, obstructive sleep apnea and acanthosis nigricans on physical examination[6].
- With the risk factors listed above, NAFLD should be considered for patients with one or more of the following:
    - Abnormal liver tests (persistent elevation of serum alanine aminotransferase (ALT); repeat > 6 months. In patients with NAFLD, ALT is usually < 200 U/L). **Note:** Patients with NAFLD may not necessarily have elevated liver enzymes.
    - Ultrasound finding of fatty liver. **Note:** Patients with NAFLD may not necessarily have fatty liver documented on an ultrasound report (> 20% fat infiltration is required to visualize fatty liver on ultrasound).

2. Rule out other causes of liver disease in addition to NAFLD:

Screening for:	Blood tests:	Next steps:
Viral hepatitis	HBs Antigen Anti-HCV antibody	Consider referral to pediatric gastroenterology for evaluation of chronic viral hepatitis.
Autoimmune Hepatitis	Serum IgG Total Protein ANA (anti-nuclear antibody)* Anti-smooth muscle actin (anti-SMA) Anti-liver-kidney-muscle antibodies (anti-LKM1)	Consider referral to pediatric gastroenterology for the evaluation of autoimmune hepatitis.

* up to 21% of patients with NAFLD will have positive auto-antibodies, even in the absence of histologic evidence of autoimmune liver disease[7]. Therefore in patients with a high suspicion of NAFLD and positive auto-antibodies, referral to pediatric GI should be considered in the setting where liver enzymes do not respond within a few months to typical NAFLD management/lifestyle modifications. Reassess after 3 months of NAFLD therapy, if no improvement in liver enzymes despite appropriate lifestyle modifications, then refer to pediatric gastroenterology.

2. Rule out other causes of liver disease in addition to NAFLD (continued):

Screening for:	Blood tests:	Next steps:
Wilson's Disease	Ceruloplasmin level	Consider referral to pediatric gastroenterology if serum ceruloplasmin <0.20 g/L for the evaluation of Wilson's disease.
Celiac Disease	Antibodies to tissue transglutaminase (Anti-TTG) IgA	Consider referral to pediatric gastroenterology for assessment of Celiac disease.
Alpha-1-Antitrypsin Deficiency	Alpha-1-Antitrypsin level	Consider referral to pediatric gastroenterology for evaluation of Alpha-1-Antitrypsin Deficiency.
Hemochromatosis	Ferritin**, Total iron binding capacity (TIBC), and transferrin saturation	If transferrin saturation >45% and ferritin ≥300 in males and ≥200 in females, consider referral pediatric gastroenterology for evaluation of hemochromatosis.
Muscle disorders	Creatinine Kinase	If CK persistently elevated, consider referral to a general pediatrician to evaluate for muscle disorder.
Hypothyroidism	TSH and Free T4	If abnormal, consider referral to pediatric endocrinology.
Exogenous	Thorough review of medications, herbal supplements, alcohol, and illicit drug use	Complete a medication review. Stop or modify offending agent, if possible, then repeat liver function tests after 3-6 months. For medications, consider timeline for starting medication and noted elevation of liver enzymes. If drug induced liver injury suspected, consider holding suspected drug and repeat liver enzymes in 2 – 4 weeks.

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** Ferritin is often significantly elevated in NAFLD (as an acute phase reactant related to liver inflammation), but transferrin saturation is typically < 50%. These patients do not have iron overload.

3. Work up indicates alternative cause of elevated liver enzymes

- Treat or refer for consultation to pediatric gastroenterologist
- Referrals are reviewed on an individual basis. If the referral is not accepted, guidance will be provided on routine follow-up.

Work up normal, but NAFLD diagnosis suspected:

Assess whether patient needs management in medical home or referral to pediatric gastroenterology.

4. a) Low Risk NAFLD – Manage in Medical Home:

Lifestyle interventions are the only proven therapies in NAFLD. Multidisciplinary clinics designed to treat elevated BMI have reported improved liver enzymes and histology in children with NAFLD, however there are currently no pediatric studies to guide the degree of weight loss needed to correlate with resolution of inflammation or regression of fibrosis. In adult trials, weight loss of 5% body weight can result in improved steatosis and inflammation[8].

Given that pediatric patients are still growing, the treatment of NAFLD and cardio-metabolic co-morbidities should be focused on multi-pronged process goals related to all aspects of lifestyle and diet versus a specific weight loss target. There is emerging evidence that targeting weight goals in children and youth is harmful and does not lead to long-term health outcomes.

Patients with low risk NAFLD can benefit from continued follow up in their medical home. Additional recommendations are on the following pages.

Action: Manage in Medical Home (i.e., primary care network) and reassess as needed.

4. b) Indeterminate/High Risk NAFLD (≥1 of the following):

Patients with indeterminate/high risk NAFLD can benefit from continued follow up in their medical home. Additional recommendations are on the following pages.

- ALT >200
- Platelets <150
- INR >1.3
- US: Splenomegaly
- Calgary Zone –shear wave elastography ≥8 kPa

Action: Consider referral to pediatric gastroenterology.

4. c) Atypical NAFLD:

- Criteria:
- Hepatic steatosis identified in abdominal US:
- BMI <85% percentile or
- Age <7 years

Action: Consider referral to pediatric gastroenterology.

5. Care within the Patient Medical Home	
Healthy Lifestyle Recommendations	• Avoidance of sugar-sweetened beverages • Consumption of healthy, well-balanced diet • Moderate- to high-intensity exercise daily • Less than 2 hour/day of screen time
Monitoring	• Bloodwork q 1-2 years: liver enzymes including ALT, AST, Total and Direct bilirubin, ALP and GGT and HbA1c and lipid panel (metabolic profile) • Abdominal ultrasound 1-3 years as per clinical judgment • If either meet high risk criteria, refer as per algorithm
Long Term Care for Patients with NAFLD	• Minimize exposure to liver toxins • Minimization in high-risk behaviors. • Heavy/binge drinking • Cigarette smoking • Consider baseline liver enzymes prior to initiation of any potentially hepatotoxic
Psychosocial	Monitor for psychosocial impacts and provide psychosocial supports to patient and family if required. The Alberta Health Services Mental Health Help Line, 1-877-303-2642 is a 24-hour, 7 day a week, 365 days a year, confidential service that provides support, information and referrals to Albertans experiencing mental health concerns. The line is staffed by a multidisciplinary team comprised of nurses, psychiatric nurses, social workers, occupational therapists, and psychologists. The service provides: • crisis support • mental health or addiction screening and assessment over the phone • general information about a mental health or addiction topic • information about local service options for addiction or mental health and how to access them • strategies people can use at home to support their emotional well-being
Immunizations	Hepatitis A and B immunizations
Medications	Currently, there are no effective medications available for the treatment of pediatric NAFLD. This is an active area of research. In patients with elevated BMI and metabolic co-morbidities, consider referral to pediatric endocrinology.

5. Care within the Patient Medical Home (continued)	
Referrals	• Consider a referral to a dietitian within the patient's medical home. • If a referral to a dietitian within the patient's medical home is not possible, consider a referral to: Nutrition Counselling - Pediatric Weight Management - visit Alberta Referral Directory • Available to children ages 2-17 years with a BMI over the 85th percentile • Families work one-on-one with a registered dietitian trained in pediatric weight management. The dietitian will help the family work on healthy eating and active living habits and set realistic goals that focus on creating a healthy lifestyle. Areas of focus include nutrition, physical activity, sedentary time and sleep. Pediatric Centre for Wellness and Health (PCWH) – visit Alberta Referral Directory • Available to children ages 2 to 16.5 years with a BMI above the 85th percentile. • Ideal for patients and families requiring additional resources and longer-term support. • Multidisciplinary team includes dietitians, exercise specialists, pediatricians, registered nurses, psychologists, and social workers. • Families attend an information session and complete clinic questionnaires prior to being booked into the clinic. Additional Resources: • Visit ahs.ca/NutritionWorkshops (check for future updates re: available pediatric NAFLD workshops). • Health Link has Registered Dietitians available to answer general nutrition questions. If a patient has a nutrition question, they can complete a self-referral at ahs.ca/811 or call 811 and ask to talk to a dietitian. • To learn more about programs and services offered in your zone, visit ahs.ca/Nutrition.

PROVIDER RESOURCES

Still concerned about your patient?

- Childhood Growth Monitoring
- Nutrition Guidelines Pediatric Weight Management
- HealthChange® Methodology

Advice/Counselling Options

Talking about weight/lifestyle is sensitive and brings up many tough emotions for youth and their parents/caregivers. Here are suggested tips and recommendations when talking to families about healthy lifestyle behaviours[9]:

Tips	Rationale	Phrasing
Starting the conversation		
Tell families that you would like to talk about health behaviours. Acknowledge these can be sensitive topics. Then, ask for permission before starting the conversation.	Sets the stage and creates buy in.	"Health behaviours and family routines are the frontline treatment for low-risk NAFLD, regardless of weight/height/current lifestyle. These can be sensitive topics for families. Is it okay if we talk about this?"
Validate that families are likely already implementing a lot of these behaviours.	Families will be more open to listening to recommendations and willing to discuss behaviours/behaviour change.	"Can you tell me what you already know about managing …" "There are some other things that people with NAFLD have found success with. Do you mind if we discuss these as well..."
Assessing current healthy lifestyle behaviours		
Frame questions and conversations so they are about the behaviour, not the person.	This shifts the focus and possible feelings of guilt away from the person.	"What behaviours are you currently implementing?" "What behaviours are easier/harder for your family to try/maintain?"
Frame behaviours as a list of approaches to a healthy lifestyle.	People are more likely to try new behaviours or modify current behaviours when they have autonomy and freedom to select what to try.	"It often helps to have a number of different ideas of how you can tackle an issue, so that if one strategy doesn't work, you can try one of the others." "I can offer some suggestion if you like, based on what has worked for other people? However, ultimately you will be the best judge of what will work for you and what won't." "Would you like to hear my ideas or are you confident you already have your own solutions?"
Adopt a "helpful/more helpful" framework when discussing what healthy lifestyle behaviours they might want to try/do differently.	Reduces pressure from clinician to change behaviour, builds internal motivation, and identifies concerns/barriers to trying and/or modifying behaviours.	"What are the benefits of what you are currently doing?" "What the downside of what you are currently doing?" "Why might you consider doing things differently?" "What benefits could you expect from this?"

PROVIDER RESOURCES (continued)

Navigating tough emotions		
When a family has a tough emotion (e.g., defensive, anger, sadness, guilt), validate how they are feeling, then move into problem solving or addressing the other parts of their comment.	Families need to feel understood and supported first before moving to change.	"It's normal to feel guilty/upset/etc. as a caregiver because you care about your child's health." "A lot of parents feel overwhelmed by these recommendations. It's a lot and it's hard to do." "I apologize, I didn't mean to offend you or imply that you are not doing these things already/suggest you need to change your behaviours. We share this information as a starting point with all families because research shows it has the most meaningful impact on low-risk NAFLD."
Discussing challenges to implement healthy lifestyle behaviours.	Externalize concerns, reduce guilt, and help problem solve.	"What's getting in the way of…?" "What are the barriers that come up for you when…?" "If for some reason you are unable to do these things in the time frame that we discussed, don't worry. Take note of the things that got in the way for you. We can discuss these at our next appointment and potentially come up with some solutions for you. How does that sound?"
Ending the Conversation		
Check in with families after discussing sensitive topics, like lifestyle management or modifications, to see how the conversation felt from their perspective.	What message they received, how it landed, how much of the conversation they absorbed. Pick up on hesitation/concerns.	"I know we talked about some personal and sensitive topics. How was it talking about this? Was it tough or easy?" "Is there anything you'd change about how we talk about lifestyle behaviours if/when we revisit this in the future?"

If in Edmonton, option to use the Alberta Netcare eReferral eConsult (responses are received within five calendar days). View the eReferral Learning Centre document for more information.

Services Available

Description	Website
Health Link has Registered Dietitians available to answer nutrition questions. Call 8-1-1 and ask to talk to a Dietitian.	Visit Health Link
Alberta Health Services has a variety of programs available across Alberta. To learn more about programs and services offered in your area, visit AHS Nutrition Services.	www.ahs.ca/nutrition

BACKGROUND

About this Pathway

- Digestive health primary care pathways were originally developed in 2015 as part of the Calgary Zone's Specialist LINK initiative. They were co-developed by the Department of Gastroenterology and the Calgary Zone's specialty integration group, which includes medical leadership and staff from Calgary and area Primary Care Networks, the Department of Family Medicine, and Alberta Health Services.
- The pathways were intended to provide evidence-based guidance to support primary care providers in caring for patients with common digestive health conditions within the patient medical home.
- Based on the successful adoption of the primary care pathways within the Calgary Zone, and their impact on timely access to quality care, in 2017 the Digestive Health Strategic Clinical Network (DHSCN) led an initiative to validate the applicability of the pathways for Alberta and to spread availability and foster adoption of the pathways across the province.

Authors & Conflict of Interest Declaration

This pathway was reviewed and revised under the auspices of the DHSCN in 2024, by a multi-disciplinary team led by family physicians and gastroenterologists.

Pathway Feedback and Review Process

Primary care pathways undergo scheduled review every three years, or earlier if there is a clinically significant change in knowledge or practice. The next scheduled review is Spring 2027 however, we welcome feedback at any time. Please email comments to AlbertaPathways@primarycarealberta.ca.

Copyright Information

Disclaimer

This pathway represents evidence-based best practice but does not override the individual responsibility of healthcare professionals to make decisions appropriate to their patients using their own clinical judgment given their patients' specific clinical conditions, in consultation with patients/alternate decision makers. The pathway is not a substitute for clinical judgment or advice of a qualified healthcare professional. It is expected that all users will seek advice of other appropriately qualified and regulated healthcare providers with any issues transcending their specific knowledge, scope of regulated practice or professional competence.

PATIENT RESOURCES

Description	Website
Canadian Liver Foundation	www.liver.ca/patients-caregivers/liver-diseases/fatty-liver-disease/#NAFLDkids
North American Society for Pediatric Gastroenterology, Hepatology and Nutrition	https://gikids.org/files/documents/digestive%20topics/english/NASPGHAN%20Fatty%20Liver%20Fact%20Sheet%2011.2011%20(1).pdf
Physical Activity	https://csepguidelines.ca/guidelines/early-years/
AHS Nutrition Education	Nutrition Education | Alberta Health Services
Healthy Parents Healthy Children	Homepage - Healthy Parents Healthy Children
Conversation Guide for Parents & Adult Caregivers of Children	Having body-positive conversations with children: A parent guide for confident conversations about weight (hollandbloorview.ca)
How to Talk to Kids About Weight	How to Talk to Kids about Weight (eatright.org)

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