



Editorial

“The Child Is the Father of the Man”—Pediatric Preventive Cardiology

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“The Child is the father of the Man” is a quote from a poem by William Wordsworth (1802) entitled “My Heart Leaps Up.” The reference has previously come up in the context of pediatric preventive cardiology, most recently in an editorial¹ to an article regarding the ability of cardiovascular risk factors (CVRFs) measured in youth to predict the presence of coronary artery calcification in middle age.² The quote has been used in modern times to refer to the concept that the benefits of healthy behaviours and attitudes developed during youth are retained into adulthood and influence disease risk and outcomes. It can also refer to the concept that CVRFs detected and managed during childhood may also have lasting effects.

Evidence to support this concept has most convincingly been made for the early treatment of familial hypercholesterolemia (FH).³ As treatments for lowering low-density lipoprotein (LDL) have become increasingly more effective, the benefit in terms of primary and secondary prevention of cardiovascular disease events is now strongly supported. Clinical trials of statins for treatment of children with FH have shown similar degrees of safety and lipid lowering as in adults.⁴ More recent pediatric trials have included measures of subclinical atherosclerosis, such as assessment of endothelial function and measurement of carotid intima-media thickness, with consistent evidence of benefit. This has led to the concept of the impact of early treatment of FH on cumulative LDL cholesterol, and projections regarding age at first cardiovascular disease event when low-dose statin is started at the age of 10 years and increased to high-dose at the age of 18 years (predicted first event at age 53 years) versus waiting and starting high-dose statin at age 18 years (predicted first event at age 48), compared with untreated patients predicted to have a first event at age 35, and unaffected individuals at age 55.⁵ Evidence of benefit is growing; evidence of risk, not so much. It wasn’t until 2018, however, that the Canadian

Cardiovascular Society in a position statement first supported statin treatment of FH starting in youth.⁶ Evidence to support the early detection and treatment of other CVRFs and risk conditions in youth is often less well developed but rapidly emerging.

Pediatric Preventive Cardiology—An Approach Whose Time Has Come

Given the ongoing burden of adult cardiovascular disease, pediatric preventive cardiology increasingly is a topic whose time has come. A shift is needed from preventing adult cardiovascular disease to preventing atherosclerosis. The atherosclerosis process is not a uniform process across the lifespan, and may be more amenable to less aggressive intervention with greater reversibility at its earliest stages. Clinical trials of statins in children with FH have shown significant slowing and even regression of carotid intima-media thickening despite high residual LDL cholesterol levels and that the benefit has been maintained into adulthood. Treated children are now event free at ages exceeding that of their later-treated affected parents.⁷

The call for action is now, and it will only become more urgent as time progresses. There will never be 50- to 60-year-long clinical trials of detection and management of CVRFs in youth with a primary outcome of reduction of cardiovascular disease events during adulthood. This type of hardcore direct evidence will likely always be lacking, but a chain of indirect and short-term evidence continues to accumulate.^{8,9} Nevertheless, it is time to begin with the end in mind.

Adult guidelines¹⁰⁻¹² have not addressed the issue of cardiovascular risk in childhood (a summary of key elements of recent adult prevention guidelines from major cardiovascular organizations is provided in Table 1). Most such guidelines begin with stratifying patients based on cardiovascular risk scores and their treatment algorithms emanate from these. In pediatric preventive cardiology, such risk scores are not available and never will be, owing to the tremendous lag between the onset of atherosclerosis and the manifestation of clinical events (eg, acute coronary syndrome), the primary outcome of most trials in adults. While the concept of lifetime risk is gradually emerging in adult guidelines, the early stages

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Table 1. Recent adult prevention guidelines and limitations in the context of pediatric prevention

Guideline	Target population	Key points and recommend approaches to treatment	Screening for RFs	Important comorbidities and risk enhancers	Addresses primordial prevention	Limitations regarding pediatric prevention
2019 AHA/ACC guideline on the primary prevention of cardiovascular disease (https://www.onlinejacc.org/content/74/10/1376)	<ul style="list-style-type: none"> • Scope includes adults ≥ 18 years old, although the document is primarily focused on adults > 40 years old 	<ul style="list-style-type: none"> • Healthy lifestyle is the most important prevention strategy • ASCVD 10-year risk estimation guides clinician management • Diet emphasizing vegetable, fruit, nuts, whole grain, lean vegetable and animal protein, fish, and avoidance of trans fat, red and processed meats, refined carbohydrates, and SSBs • Promote physical activity in keeping with adult guidelines • Use a team-based approach to improve the quality and maintenance of prevention strategies 	<ul style="list-style-type: none"> • Routine assessment beginning at 40 years of age • In younger adults it is reasonable to consider RF screening every 4-6 years • Focus on 10-year risk estimation with limited discussion of lifetime risk estimation 	<ul style="list-style-type: none"> • T2DM • CKD • Inflammatory conditions • High-risk ethnicity • Premature menopause • Pregnancy-associated RFs • Lipids/biomarkers • FH • FHx of premature CVD 	<ul style="list-style-type: none"> • Limited discussion stating that the value of primordial prevention is difficult to evaluate due to the gradual evolution of ASCVD over decades 	<ul style="list-style-type: none"> • The basis for management is often focused on quantitative risk scores that are not available for children • Do not recognize important childhood comorbidities that are associated with future CV risk (eg. CHD, KD, psychiatric disorders) • Dietary recommendations may not be appropriate for children to support healthy growth and development • Physical activity guidelines are different for children than for adults • Blood pressure norms are different for children than for adults • Approaches to treatment of hypertension differ for children and adults • Medical therapy recommendations for dyslipidemia in guidelines do not apply to children, owing to the absence of quantitative risk stratification in pediatrics
2016 CCS guideline for the management of dyslipidemia for the prevention of cardiovascular disease in the adult (https://www.onlincejacc.ca/action/showPdf?pii=S0828-282X%2816%2930732-2)	<ul style="list-style-type: none"> • Adults ≥ 40 years old • High-risk adults regardless of age 	<ul style="list-style-type: none"> • Statin therapy guided by risk estimation for primary prevention • Promote smoking cessation • Promote a healthy diet • Promote physical activity in keeping with adult guidelines 	<ul style="list-style-type: none"> • Recommend CV risk assessment every 5 years from ages 40 to 75 years, using a modified Framingham Heart Risk Score or Cardiovascular Life Expectancy Model 	<ul style="list-style-type: none"> • DM • Cigarette smoking • FH • FHx of premature CVD • CKD • Obesity • IBD • COPD • Hypertensive disease of pregnancy • HIV infection 	<ul style="list-style-type: none"> • No 	<ul style="list-style-type: none"> • Medical therapy recommendations for dyslipidemia in guidelines do not apply to children, owing to the absence of quantitative risk stratification in pediatrics
2016 European guidelines on cardiovascular disease prevention (https://academic.oup.com/eurheartj/article/37/29/2315/1748952)	<ul style="list-style-type: none"> • Men ≥ 40 years old • Women ≥ 50 years old 	<ul style="list-style-type: none"> • Risk estimation underpins the approach to management • Promote a healthy diet • Maintain a healthy weight • Promote physical activity in keeping with adult guidelines • Treat hypertension with treatment goal based on age and comorbid DM • Use lipid-lowering medical therapy targeting LDL-C goal based on CV risk category 	<ul style="list-style-type: none"> • Recommend use of SCORE risk stratification • Risk assessment is limited to men ≥ 40 years old and women ≥ 50 years old 	<ul style="list-style-type: none"> • FHx of premature CVD • FH • Obesity • CT coronary calcium score • Socioeconomic status • DM 	<ul style="list-style-type: none"> • No • The guideline states that systematic risk assessment in men ≤ 40 years old and women ≤ 50 years old with no known CVRFs is not recommended 	

ACC, American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; CCS, Canadian Cardiovascular Society; CHD, congenital heart disease; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; CV, cardiovascular; CVD, cardiovascular disease; CVRFs, cardiovascular risk factors; DM, diabetes mellitus; FH, familial hypercholesterolemia; FHx, family history; HIV, human immunodeficiency virus; IBD, inflammatory bowel disease; KD, Kawasaki disease; LDL-C, low-density lipoprotein cholesterol; RF, risk factor; SSBs, sugar-sweetened beverages; T2DM, type 2 diabetes mellitus.

of atherosclerosis remain largely ignored by clinicians who focus on patients who are much further along the disease pathway. Unfortunately, in primary care and specialty pediatrics, primordial prevention is still not a broadly recognized concept despite the clear chain of evidence that atherosclerosis begins in childhood.

A CJC Theme Issue Focused on Heart Disease Prevention in Children

In this theme issue of the *Canadian Journal of Cardiology*, we begin with a detailed review from Drs Sonali and Daniels of the evidence connecting childhood CVRF to adult cardiovascular disease.¹³ This is followed by a series of papers which delve into particular risk factors and our current state of knowledge. Drs Khoury and McCrindle review the body of evidence on statin therapy in children, which is now substantial and demonstrates both safety and clinical impact in children.¹⁴ Dr Dionne describes the challenges in identifying and treating hypertension in children, and the need to improve the quality of our evidence base.¹⁵ In addition to traditional CVRFs, there are new risks to consider for the current generation. Ms Aglipay et al. describe how the digital media environment poses a growing threat to cardiovascular health in youth and identify priority research areas.¹⁶ Dr Kavey reviews multiple domains of cardiovascular prevention, providing examples of how public policy has positively influenced health behaviour at a population level.¹⁷ There is a compelling need for forward-thinking health policy development in the current era to support optimized cardiovascular health behaviours in children and youth. Divergent public and social health approaches in different countries have manifest impact on CVRFs, including childhood obesity. Drs Tran and Urbina discuss the importance and structure of robust training programs to nurture the next generation of physicians who will be instrumental in further developing the field of pediatric preventive cardiology.¹⁸

There are several special populations in pediatrics that warrant heightened awareness and preventive efforts. Dr Bigras describes the particular vulnerability of children with congenital heart disease.¹⁹ Dr Caterini et al. reflect on the importance of physical activity promotion that is of added importance in children with congenital heart disease.²⁰ Drs Goldstein and Korczak review our emerging understanding of the link between psychiatric disorders and cardiovascular risk in children, and identify important knowledge gaps.²¹ Dr McPhee et al. review the mechanisms that contribute to cardiovascular risk in childhood obesity as well as the evidence-based interventions that affect this important group of children.²² Ms Lazerte and Dr Hegele provide a comprehensive summary of dyslipidemias beyond familial hypercholesterolemia.²³ Dr Khoury et al. provide readers with a practical framework for risk stratification and an approach to management.²⁴ Dr Chung et al. discuss the importance of cardiovascular risk management during the transition from pediatrics, and steps that clinicians can take to improve preparedness and successful transfer into the adult health care system.²⁵

This special focus issue on pediatric preventive cardiology is a call to arms in the fight against atherosclerosis that must begin with youth, who are particularly vulnerable to the

effects of their current “obesogenic” environment. If we are ultimately to achieve further reductions in cardiovascular disease events in adults, we must remember that “the child is the father of the man.”

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