Exploring strategies for implementing a culturally informed caries risk assessment tool used by non-dental primary care providers for young First Nations and Métis children in Manitoba, Canada

By

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Doctor of Philosophy

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DISCLAIMER

This modified sandwich thesis includes several multi-authored manuscripts. The majority of the work presented in these manuscripts represents original contributions by the author of this thesis, as demonstrated by her first authorship. Collaborating colleagues contributed to varying aspects of the research, and their roles are appropriately acknowledged. Detailed individual author contributions are provided in the following section.

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THESIS ABSTRACT

Early childhood caries (ECC) is a pervasive and preventable disease that disproportionately affects Indigenous children in Canada and underserved populations worldwide. Integrating caries risk assessment (CRA) and preventive oral health services (POHS) into pediatric primary care through non-dental primary care providers (NDPCPs), offers a promising strategy to reduce inequities. However, the evidence base, implementation barriers, and training needs for CRA delivery by NDPCPs in Indigenous contexts remain poorly understood. This thesis employed a scoping review and three qualitative studies, to investigate opportunities for CRA integration into Indigenous pediatric primary care in Manitoba.

The scoping review mapped 54 global studies (2009–2024) on CRA and POHS for children under six by NDPCPs. Most interventions such as oral health promotion, fluoride varnish application, and structured CRA were delivered during well-child visits, primarily in the United States. Provider training, electronic medical record (EMR) integration, and reimbursement mechanisms supported uptake, yet no Canadian studies were identified, underscoring an implementation gap.

To address this gap, three qualitative studies were conducted with 50 NDPCPs across ten First Nations and Métis communities in Manitoba. The first study identified multi-level barriers to CRA implementation, including time constraints, unclear referral pathways, limited insurance coverage, community distrust, and provider training gaps. The second study explored facilitators and strategies for CRA integration, highlighting the importance of systemic supports (training, EMR documentation, incentives), culturally safe care, family education, and policy advocacy. The final study examined training needs and preferences, revealing core skill gaps in CRA use, caries screening, fluoride varnish application, and referrals. Participants emphasized the value of culturally appropriate, interactive, and blended (online and in-person) training tailored to urban, rural, and remote practice contexts.

Collectively, this work demonstrates that NDPCPs are well-positioned to deliver CRA and POHS in Indigenous pediatric primary care but require systemic, educational, and policy supports to do so effectively. Findings contribute to the development of culturally responsive training models, interprofessional practice guidelines, and supportive policies to advance oral health equity. In doing so, this research provides an evidence-informed roadmap for integrating CRA into Canadian primary care systems and reducing the burden of ECC among Indigenous children.

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Finally, I dedicate this achievement to all Indigenous and marginalized children. It is my hope that this work contributes, even in a small way, to reducing oral health inequities and ensuring that every child has the opportunity to grow up with a healthy smile.

DEDICATION

I dedicate this work to the Alpha and Omega, the source and sustainer of my strength, who guided me from the beginning of this PhD journey to its completion.

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Finally, I dedicate this research to Indigenous and marginalized children everywhere. May your voices resonate through these pages, and may this work contribute, in some small way, to the reduction of tooth decay. Every child deserves the gift of a healthy smile.

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LIST OF ABBREVIATIONS

AI	American Indian
AAP	American Academy of Pediatrics
CDB	Canada Dental Benefit
CDCP	Canadian Dental Care Plan
CHRIM	Children's Hospital Research Institute of Manitoba
CIHR	Canadian Institute of Health Research
CINAHL	Cumulative Index of Nursing and Allied Health Literature
CPS	Canadian Paediatric Society
CRA	Caries Risk Assessment
DDE	Developmental defects of enamel
ECC	Early childhood caries
EMR	Electronic medical record
FN	First Nations
FNHSSM	First Nations Health and Social Secretariat of Manitoba
FV	Fluoride varnish
GETS	Graduate Enhancement of Tri-Council Stipends
HSHC	Healthy Smile Happy Child
IMB	Into the Mouth of Babes
JBI	Joanna Briggs Institute
LMIC	Low- and Middle-Income Countries
MesH	Medical Subject Headings
MMF	Manitoba Métis Federation
NDPCPs	Non-dental primary care providers
NP	Nurse practitioners
NCAT	Nursing Caries Assessment Tool
PACT	Protecting All Children's Teeth
PhD	Doctor of Philosophy
POHS	Preventive oral health services
PRESS	Peer Review of Electronic Search Strategies
PRISMA	Preferred Reported items in Systematic Reviews and Meta-analysis
SFL	Smiles for Life
USPSTF	US Preventive Services Task Force
WIC	Women, Infants and Children

CHAPTER 1: INTRODUCTION, STUDY RATIONALE AND OBJECTIVES

1.1 Background of the Study

Oral health is a fundamental component of overall health and well-being, yet it has historically been overlooked in broader health policy and primary health care frameworks (*Global Oral Health Status Report : Towards Universal Health Coverage for Oral Health By 2030*, 2022). Among oral diseases, Early Childhood Caries (ECC) remains one of the most common and consequential chronic conditions of childhood. Globally, ECC affects an estimated 48% of preschool-aged children, making it one of the most prevalent diseases of early childhood (Uribe et al., 2021).

The consequences of ECC extend far beyond the oral cavity. Children with untreated caries experience pain, infections, impaired nutrition and growth, sleep disturbances, and reduced quality of life (Finan et al., 2013; Foláyan et al., 2025; So et al., 2017). Severe ECC (S-ECC) often requires comprehensive dental treatment under general anesthesia, which carries significant risks and economic costs for families and health systems (Schroth et al., 2016). Importantly, ECC disproportionately affects children from socioeconomically disadvantaged groups and marginalized communities, reflecting and reinforcing broader social and health inequities (Foláyan et al., 2025; Vargas & Ronzio, 2006).

In Canada, the burden of ECC is particularly pronounced among Indigenous populations. Studies consistently show that First Nations, Inuit, and Métis children experience significantly higher rates of ECC compared to non-Indigenous peers, with prevalence in some northern and remote communities exceeding 80% (Holve et al., 2021; Lee et al., 2022; Pierce et al., 2019). Treatment frequently requires referral to tertiary care hospitals, where Indigenous children represent the majority of pediatric dental day-surgery cases (Schroth et al., 2016). These patterns underscore the inequities rooted in the social

determinants of health including poverty, food insecurity, limited access to fluoridated water, and systemic racism within health care systems (Holve et al., 2021; Irvine et al., 2011; Kyoon-Achan et al., 2021a)

These inequities are also tied to the legacy of colonialism and residential schools, which disrupted traditional practices, undermined trust in mainstream health systems, and contributed to persistent barriers to accessing care (Truth and Reconciliation Commission of Canada, 2015). Indigenous leaders and scholars have repeatedly called for health interventions that are not only effective but also culturally safe, relationship-centered, and responsive to community needs (Kennedy et al., 2022).

This work is further informed by the Truth and Reconciliation Commission of Canada's Calls to Action (18–24), which call for the recognition of Indigenous health inequities, the provision of culturally safe care, and the integration of Indigenous knowledge and perspectives within health systems and health professional education. Calls 18 and 19 emphasize the need to close gaps in health outcomes, while Calls 23 and 24 specifically call for increased Indigenous health workforce capacity and cultural competency training for all health professionals. By focusing on non-dental primary care providers and culturally informed approaches to early oral health prevention, this research responds to these Calls by identifying system-level strategies that support culturally safe, equitable care for Indigenous children (Truth and Reconciliation Commission of Canada, 2015).

Despite growing recognition of oral health as integral to overall health, dental care in Canada has been majorly excluded from universal health coverage, although more recently, there has been efforts made by the Government through the Canada Dental Care Plan (CDCP) to address this by covering costs for eligible individuals, yet challenges remain in ensuring equitable access (Allison, 2023). Access to dental professionals is especially limited in rural and remote Indigenous communities, where care is

often episodic, and crisis driven. In contrast, non-dental primary care providers (NDPCPs) including physicians, nurse practitioners, public health nurses, and physician assistants are often the most accessible providers for families (Levy et al., 2023). These professionals are well-positioned to support oral health promotion, yet their training in this area is minimal, and oral health is rarely integrated into their scope of practice (Olatosi et al., 2025b).

One promising approach is the use of caries risk assessment as part of routine primary care. CRA enables providers to identify risk and protective factors, deliver anticipatory guidance, and link families to appropriate dental services. Evidence suggests that CRA, when combined with preventive strategies such as fluoride varnish application and parental counseling, can significantly reduce ECC incidence (Albino & Tiwari, 2016). In 2019, the Public Health Agency of Canada supported the development of a Canadian CRA tool for preschoolers, designed specifically for use by NDPCPs. The tool emphasizes culturally appropriate anticipatory guidance, preventive interventions, and timely referral pathways (Schroth et al., 2021).

However, the adoption of CRA tools into Indigenous primary care settings remains limited. Barriers include insufficient provider training, lack of supportive policies or reimbursement mechanisms, and the absence of culturally tailored implementation strategies (Da Silva et al., 2019; Elsalhy et al., 2019). At the same time, emerging initiatives demonstrate the feasibility and value of interprofessional collaboration in integrating oral health into primary care (Hachey, 2020; Schroth et al., 2021).

By placing ECC within the broader frameworks of health equity, planetary health, and the One Health approach, this research recognizes that oral health cannot be separated from the biological, social, environmental, and systemic determinants (Kickbusch, 2015; Horton et al., 2014). Addressing ECC among Indigenous children therefore requires more than individual-level interventions; it necessitates

systemic, culturally grounded, and interdisciplinary approaches that position NDPCPs as key partners in prevention and care integration.

1.1.1 Definition of ECC

ECC refers to the presence of at least one decayed (cavitated or non-cavitated), missing (due to caries), or filled tooth surface in any primary tooth of a child aged 72 months or younger (American Academy of Pediatric Dentistry, 2025). According to the American Academy of Pediatric Dentistry (AAPD), ECC in children under 3 years of age is characterized by the presence of any smooth-surface caries. Severe ECC (S-ECC) is defined by a decayed, missing, or filled surfaces (dmfs) score of ≥4 at age 3, ≥5 at age 4, and ≥6 at age 5 (American Academy of Pediatric Dentistry, 2025). Previously described as "nursing bottle caries" or "baby bottle tooth decay," ECC remains one of the most prevalent chronic conditions of early childhood and a persistent public health concern (Zou et al., 2022).

1.1.2 Etiology of dental caries

Dental caries is a multifactorial disease that emerges when three key elements interact: (1) cariogenic microorganisms, (2) fermentable carbohydrates, and (3) a susceptible tooth surface or host environment. Additional risk factors for ECC include low socioeconomic status, minority status, low birth weight, and vertical transmission of cariogenic bacteria from mother to child (Khan et al., 2025). Epidemiological studies estimate that 1–12% of children under six years in developed countries are affected. Risk behaviors such as nighttime bottle-feeding, frequent intake of cariogenic snacks, delayed initiation of toothbrushing, and irregular hygiene practices further increase susceptibility (Foláyan et al., 2025). Since microorganisms play a central role in the caries process, a closer look at their specific contributions is warranted.

Cariogenic Microorganisms

The oral microbiota plays a central role in ECC. *Streptococcus mutans* and *Streptococcus sobrinus* are strongly associated with disease initiation, while *Lactobacillus* species contribute to progression (Zero et al., 1992). Other organisms, including *Actinomyces gerencseriae* and *Bifidobacterium* species, have also been implicated (Zheng et al., 2021). Transmission of S. *mutans* from caregivers, particularly mothers, to children is common during the first two years of life. Children harboring high bacterial loads early in life are at greater risk of developing ECC.

However, microorganisms alone cannot fully account for ECC development. Dietary practices serve as the crucial environmental factor that either accelerates or mitigates the progression of caries.

Diet

Feeding practices significantly influence ECC risk. Diets high in fermentable carbohydrates facilitate acid production by *S. mutans*, leading to enamel demineralization (Loesche, 1986). Prolonged bottle-feeding, especially at night, has been consistently associated with ECC (Khan et al., 2024; Schroth et al., 2021; Twetman et al., 2000). While cow's milk has relatively low cariogenicity due to its mineral content (Iida et al., 2007; Marshall et al., 2003), frequent breastfeeding beyond 12 months, particularly at night, has been linked to increased ECC risk (Valaitis et al., 2000). Other high-risk behaviors include frequent snacking, sugary beverages at bedtime, and sharing utensils or food with adults (Paglia et al., 2016). Beyond diet, host-related and environmental factors such as oral hygiene, socioeconomic conditions, and salivary function play a substantial role in determining disease outcomes.

Environmental Factors

Poor oral hygiene practices, especially delayed initiation of toothbrushing, increase ECC risk (Olmez et al., 2003). Socioeconomic determinants including poverty, limited education, and lack of dental insurance are strongly associated with ECC prevalence and severity (Foláyan et al., 2025; Gaur & Nayak, 2011; Schroth et al., 2023a).

Saliva has a protective role against dental caries development by providing the main defense system. Saliva flow rate, antimicrobial properties, the buffering capacity, and clearance of foods from the oral cavity are factors that are important in reducing the development of caries (Jiang et al., 2016). Feeding of high sugar containing food at night may increase the caries risk for infants and toddlers due to the low salivary flow rate (Silva et al., 2016). Studies have shown that developmental defects of enamel (DDE), often linked to prematurity, malnutrition, or illness, further predispose children to ECC (Pitiphat et al., 2014; Prokocimer et al., 2015). Taken together, these biological, behavioral, and social risk factors intersect to create profound disparities, particularly in populations with systemic barriers to care. Indigenous communities offer a stark example of these inequities.

1.1.3 Epidemiology of ECC in Indigenous Communities

Indigenous children in Canada (First Nations, Inuit, and Métis) and the United States (American Indian and Alaska Native) are disproportionately affected by ECC, often developing the disease at earlier ages than non-Indigenous children (Holve et al., 2021). A key contributing factor is the earlier acquisition of cariogenic microorganisms such as Streptococcus *mutans*. While the typical “window of infectivity” for acquiring S. *mutans* is between 19 and 31 months, studies have reported that 37% of Indigenous children acquire it by 12 months and 60% by 16 months (Lynch et al., 2015; Warren et al., 2012). Earlier eruption of primary teeth among Indigenous children may further increase their vulnerability, as this provides additional surfaces for colonization and accelerates disease progression (Dawson et al., 2018).

Moreover, a microbiome study of Canadian First Nations children revealed that those with severe ECC (S-ECC) had significantly different plaque profiles, including higher levels of S. *mutans*, compared with caries-free counterparts (Agnello et al., 2017).

Prevalence and Severity

The prevalence of ECC among Indigenous children in Canada remains alarmingly high despite several public health interventions. In 2011, 85% of First Nations and Inuit children aged 3 to 5 years had ECC, with S-ECC reported in up to 25% of this group (Schroth et al., 2013). Sixty-one percent of these children had untreated caries in at least one primary tooth, with an average of 7.62 decayed, missing (due to decay), or filled primary teeth (dmft). Treatment needs were substantial, 62% of preschoolers required some form of dental intervention, and of those, 90% required restorations. Epidemiological studies consistently show that Indigenous children aged 3 to 5 years have three to five times more tooth decay than their non-Indigenous peers (Lawrence, 2010; Lawrence et al., 2009; Pacey et al., 2010; Peressini et al., 2004; Schroth et al., 2008; Schroth et al., 2005).

Contributing Factors

The disproportionately high burden of ECC in Indigenous communities is driven by multiple intersecting factors, including poverty, food insecurity, limited access to preventive oral health services, and barriers to culturally safe care (Holve et al., 2021). These determinants are compounded by structural inequities that reduce opportunities for timely preventive interventions. Although general guidelines for oral health promotion, caries prevention, and risk assessment exist, the severity of disease and systemic barriers in Indigenous communities necessitate tailored approaches that reflect local realities.

Consequences and System Burden

The severity of ECC in Indigenous populations has significant clinical and economic consequences. One of the most concerning outcomes is the need for rehabilitative dental surgery under general anesthesia (GA). This treatment is costly and carries inherent risks (Pierce et al., 2019; Schroth et al., 2013; Schroth et al., 2016). National data show that the rate of dental surgery for ECC under GA in Canada is seven times higher among children from communities with large Indigenous populations compared to those with lower proportions. In remote regions, the rate exceeds 200 per 1000 children under five annually 15 times the overall Canadian average (Schroth et al., 2016). This disproportionate burden contributes to substantial healthcare costs, with the federal government spending over $200 million annually on oral health services for Indigenous populations (Office of the Auditor General of Canada, 2017).

These disparities are not unique to Canada. Indigenous populations in the United States, Australia, New Zealand, and other countries face similarly high rates of dental disease, tooth loss, and oral health inequities. The global burden underscores the urgent need for culturally informed, cost-effective interventions that reduce oral health disparities and support timely, community-based dental care for Indigenous children.

1.1.4 ECC Prevention Strategies

Prenatal Oral Health Care

The perinatal period is defined as the time before birth and ending 28 days after birth. The perinatal period is crucial for the well-being of pregnant women and the health and well-being of their newborn children (American Academy of Pediatric Dentistry, 2018). ECC prevention is optimal if initiated prenatally. Given the evidence for transmission of cariogenic bacteria from mother to child, routine dental assessments and preventive dental care, oral hygiene education, optimal prenatal nutrition, and

the use of fluoride toothpaste for pregnant women are strategies that may prevent or delay ECC in their children (American Academy of Pediatric Dentistry, 2018; Holve et al., 2021).

Fluoride

Fluoride is one of the most effective agents for preventing dental caries, supported by extensive evidence. The AAPD recommends using a smear or grain of rice-sized amount of fluoride toothpaste for children under three years and a pea-sized amount for those over three years (Clark et al., 2020). These guidelines aim to balance effective caries prevention while minimizing the risk of enamel fluorosis. In areas without fluoridated water, fluoride supplements, such as tablets or drops, may be prescribed based on individual risk assessments, typically at doses ranging from 0.25 mg to 1.0 mg per day depending on age and water fluoride levels, although the use of supplement is decreasing (Clark et al., 2020). Additionally, topical fluoride varnish is recommended two to four times per year for high-risk populations. Studies, including systematic reviews and meta-analyses, have demonstrated that fluoride varnish reduces caries incidence by approximately 43% in primary teeth and 37% in permanent teeth, emphasizing its significant role in high-risk populations (Ge et al., 2024; Lin et al., 2022). Studies suggest that fluoride varnish should be initiated with the first tooth eruption in Indigenous children to achieve maximal benefit. Although the data on fluoride varnish are mixed for Indigenous populations, fluoride varnish is still recommended because the potential benefits far outweigh any risks (Braun et al., 2016; Ricks et al., 2015). Fluoride varnish applications help to enhance both the mineralization of healthy enamel and the remineralization of early incipient caries lesions in primary and permanent teeth that have not yet progressed to the cavitation stage. The American Dental Association (ADA) still recommends fluoride varnish for all children. However, the challenge is that fluoride varnish is not effective in arresting and remineralizing more advanced lesions that have cavitated through the enamel, which are known to be more prevalent in young Indigenous children. Therefore, early applications of

fluoride varnish to newly erupted teeth, beginning at the eruption of the first primary tooth at the 6-month developmental age milestone, is paramount (Holve et al., 2021).

Oral Health Education

Evidence surrounding the effectiveness of conducting dental examinations and provision of parental counseling to prevent ECC in preschool-aged children is mixed. Studies of oral health education in Indigenous families resulted in increased parental knowledge but rarely demonstrate reduction in caries (Braun et al., 2016; Naidu et al., 2015). One large RCT of motivational interviewing in parents of American Indian preschool-aged children reported increased parent and caregiver knowledge but no reduction in ECC (Braun et al., 2016). A previous Canadian RCT reported that motivational interviewing was associated with a reduction in the degree of severe caries among Cree children in northern Quebec (Harrison et al., 2012). Other studies suggest that oral health education for pregnant women and mothers of infants can reduce S-ECC from 32% to 20% (Bader et al., 2004; Feldens et al., 2010). Like the early receipt of fluoride varnish, evidence suggests that receiving oral health education at the time of first tooth eruption is more beneficial.

Community-Based Strategies

Promising initiatives include encouraging breastfeeding and traditional diets, reducing reliance on processed foods, and culturally tailored oral health promotion (Cidro et al., 2014; Harrison et al., 2006; Kyoon-Achan et al., 2018; Kyoon-Achan et al., 2021b; Kyoon-Achan et al., 2021c; Schroth et al., 2015a; Schroth et al., 2008). However, robust data on their impact on ECC outcomes are limited. Ultimately, these preventive strategies are most effective when paired with systematic approaches that assess risk at both the individual and community levels.

Caries risk assessment

Caries-risk assessment (CRA) is an important part of children's dental health care. It refers to the identification and analysis of certain factors that are considered to be related to dental caries and to propose personalized preventive and therapeutic strategies for individuals to decrease the risk of dental caries (Zero et al., 2001). CRA involves a comprehensive analysis of protective factors, such as fluoride use; risk factors such as the presence of caries lesions, and social, cultural factors such as social status (Featherstone et al., 2021).

Several CRA models related to ECC exist:

- **Caries Risk Assessment Tool (CAT):** Developed by AAPD in 2002, categorizing risk as high, moderate, or low.
- **CAMBRA:** Introduced in 2002, with both qualitative and quantitative components, classifying risk as low to extreme.
- **ADA CRA:** Provides separate forms for children under 6 and older children, focusing on contributing, health, and clinical factors.
- **Cariogram:** A computerized quantitative model predicting future caries probability.
- **Canadian CRA Tool:** Recently developed to integrate oral health into primary care, especially in Indigenous contexts.

The Canadian CRA Tool

The Canadian CRA tool (Appendix A), developed as part of national efforts to reduce ECC, offers a structured way to assess a child's risk for dental caries and recommend appropriate preventive strategies(First Nations Information Governance Centre, 2018; Schroth et al., 2021). While dental providers commonly use CRA tools, NDPCPs such as physicians, nurses, dietitians, and social workers are increasingly recognized for their potential role in delivering early oral health interventions during routine pediatric encounters. NDPCPs often serve as the first point of contact for families with young

children, particularly in Indigenous communities, and are well-positioned to contribute to oral health promotion and early risk identification.

However, integrating CRA into Indigenous pediatric primary care is not straightforward. Effective implementation requires an understanding of the contextual, structural, and cultural factors that influence healthcare delivery in Indigenous settings. Furthermore, it is critical to ensure that CRA tools and training approaches are not only clinically sound but also culturally informed and aligned with the lived realities and preferences of the communities they serve (Olatosi et al., 2025a).

1.2 Problem Statement

Despite significant advances in knowledge about the prevention and management of ECC, it continues to represent a pressing public health challenge, particularly for Indigenous children in Canada. While ECC is largely preventable, Indigenous preschool-aged children experience disproportionately higher rates of disease, with prevalence in some communities reaching 80% or more (Schroth et al., 2013). These inequities are compounded by geographic barriers to accessing dental professionals, the high costs of treatment, and the limited availability of culturally safe services. As a result, many Indigenous children require hospital-based dental surgery under general anesthesia, which not only places strain on families and healthcare systems but also reflects a failure of upstream preventive care (Schroth et al., 2016; Schroth & Smith, 2007).

One critical barrier to reducing the burden of ECC is the lack of integration between oral health and primary health care. In many Indigenous communities, NDPCPs including physicians, nurse practitioners, and public health nurses are often the most accessible providers for young children and families. However, oral health promotion and caries prevention are rarely incorporated into their scope of practice, and most providers receive minimal training in oral health during their professional

education (Ahmed et al., 2018; Caspary et al., 2008). This fragmentation perpetuates missed opportunities for early identification of risk and timely preventive intervention.

The recent development of a Canadian CRA tool for preschoolers represents a promising strategy to bridge this gap (Schroth et al., 2021). Designed for use by NDPCPs, the tool supports systematic risk assessment, anticipatory guidance, fluoride varnish application, and referral to dental professionals. However, evidence on the implementation of CRA tools in Indigenous pediatric primary care is limited. Existing studies highlight multiple barriers to uptake, including provider workload, inadequate training, lack of supportive policies, and concerns about cultural relevance (Da Silva et al., 2020; ElSalhy et al., 2019).

Without a clear understanding of these barriers and facilitators, the integration of CRA into Indigenous primary care will remain limited, and opportunities to advance health equity will be missed. There is an urgent need to explore NDPCPs' perspectives on the feasibility, acceptability, and training needs for implementing the CRA tool. By addressing this gap, this research contributes to the development of culturally informed, sustainable strategies that strengthen the role of primary care in reducing ECC disparities and improving the oral health of Indigenous children.

1.3 Purpose of the Study

The overarching purpose of this thesis is to explore strategies for implementing a culturally informed CRA tool by NDPCPs within Indigenous pediatric primary care settings in Manitoba, Canada. Specifically, this research seeks to identify providers' perceived barriers and facilitators to CRA adoption, their training and support needs, and the contextual factors influencing the feasibility and sustainability of tool integration into routine practice for First Nations and Métis children under six years of age in Manitoba, Canada.

By examining these perspectives, the study aims to generate evidence that informs culturally responsive strategies for oral health promotion and disease prevention in early childhood. The findings are expected to guide the development of training programs, interdisciplinary models of care, and supportive policies that enable NDPCPs to play a stronger role in addressing ECC. Ultimately, this research contributes to the advancement of oral health equity and the reduction of disparities experienced by Indigenous children.

1.4 Research questions and objectives

Research Questions

1. What is the existing evidence of CRA and POHS for young children by NDPCPs?
2. What contextual, organizational, and systemic barriers influence the use of CRA by NDPCPs working with First Nations and Métis children?
3. What strategies do NDPCPs recommend implementing the integration of CRA into Indigenous pediatric primary care?
4. What training and systemic supports do NDPCPs perceive as necessary to deliver CRA and related POHS services effectively?

Research Objectives

1. To appraise available evidence of CRA and preventive oral health services by NDPCPs
2. To explore the barriers to implementing and integrating the Canadian CRA tool into the primary care of First Nations and Métis children in Manitoba by NDPCPs.
3. To identify strategies for implementing and integrating the Canadian CRA tool for preschoolers into the primary care of First Nations and Métis children in Manitoba by NDPCPs.

4. To examine training needs and preferred delivery models for CRA implementation and to propose a training model for NDPCPs to use the CRA tool in Indigenous contexts.

1.5 Organization of the Thesis

This thesis is organized into seven chapters, each of which builds on the preceding one to provide a comprehensive exploration of caries risk assessment and preventive oral health services for Indigenous children in Canada.

Chapter 1: Introduction presents the background, problem statement, purpose of the study, research questions and objectives, significance of the research, and organization of the thesis. This chapter establishes the rationale for the study and frames its contribution.

Chapter 2: Conceptual Framework and Methodology outlines the theoretical perspectives guiding the research and details the qualitative methodology employed. It describes the study design, participant recruitment, data collection and analysis procedures, as well as ethical considerations, researcher positionality, and strategies for ensuring trustworthiness.

Chapter 3: Literature Review provides a scoping review of the global evidence on CRA and POHS delivered by NDPCPs to children under six years of age. It synthesizes findings on the types of services provided, implementation strategies, and existing gaps, highlighting the limited evidence from Canada and the importance of culturally safe approaches for Indigenous populations.

Chapter 4: Healthcare Providers' Perspectives on CRA Tool Implementation in Indigenous Pediatric Primary Care reports the findings from a qualitative study with NDPCPs in Manitoba. It explores providers' experiences, perceptions of feasibility, cultural relevance, and the systemic barriers and enablers of CRA implementation.

Chapter 5: Recommendations for Integrating CRA into Primary Care for Indigenous Children builds on the findings of Chapter 4 to propose evidence-based strategies for supporting CRA implementation. Recommendations emphasize culturally safe care, interprofessional collaboration, provider training, electronic medical record (EMR) integration, and supportive policies.

Chapter 6: Identifying Training Needs of Healthcare Providers to Implement CRA presents a focused analysis of training requirements for NDPCPs. It examines the skills, resources, and delivery models necessary to prepare providers to deliver CRA effectively in Indigenous pediatric primary care settings.

Chapter 7: Conclusion and Future Directions synthesizes the overall findings of the thesis, highlighting their implications for research, practice, and policy. It underscores the contributions of the study to advancing oral health equity for Indigenous children and outlines avenues for future research and program development.

Together, these chapters create a cohesive narrative that integrates global evidence, empirical findings, and applied recommendations to support the integration of CRA into Indigenous pediatric primary care in Canada.

CHAPTER 2: CONCEPTUAL FRAMEWORK AND METHODOLOGICAL CONSIDERATIONS

2.1 Introduction

This chapter outlines the conceptual and methodological underpinnings of the study. It is organized into three sections. The first section presents the conceptual framework, including philosophical assumptions and the researcher's positionality. The second section details the research design, including recruitment, data collection, and analysis. The third section discusses strategies employed to ensure credibility and trustworthiness.

2.2 Conceptual Framework

A conceptual framework justifies the significance and relevance of a study, guiding the design and methodological choices while situating the research within broader scholarly and practical contexts (Ravitch & Riggan, 2016). In this chapter, I build on Chapter 1 to justify the qualitative approach adopted and articulate how the study aligns with my philosophical assumptions and worldview. According to Berman and Smyth (2015), conceptual frameworks allow researchers to articulate the "what" (ontology), "why" (epistemology) and "how" (methodology) of their inquiry.

My doctoral research aims to explore the perspectives and recommendations of non-dental primary care (NDPCPs) on integrating the Canadian CRA tool into the primary care of young children in Manitoba. Several research approaches were considered. Quantitative methods are valuable for testing theories and examining variable relationships, while qualitative approaches are appropriate for exploring lived experiences, perceptions, and social processes (Creswell JW, 2016). Mixed methods can combine both, particularly when multiple data sources are required (Creswell, 2014). Given the exploratory nature of my research questions and the focus on understanding provider perspectives, a qualitative design was deemed most appropriate.

Aspers and Corte (2019) note that qualitative research is an iterative process aimed at gaining deeper understanding by getting closer to the phenomenon being studied. This approach recognizes that knowledge is subjective and shaped by context and experience both of which are central to my inquiry. Given this understanding that qualitative studies provide an opportunity for in-depth study of a topic in its natural setting, it was clear that the knowledge gained from my selected approach was subjective, based on the participant's experiences and that I served as the major research instrument. This implied a need to spend as much time as possible in the research setting to gain an in-depth understanding. A variety of qualitative approaches were available for selection. However, the chosen methods were

mostly shaped by my philosophical assumptions and worldviews. In the next segment, I outline the personal preconceptions and the interpretive lens underpinning this research project.

2.2.1 Philosophical Assumptions

Considering that my study focus was gaining an in-depth understanding of how non-dental primary care providers perceive and experience the integration of oral health care for young children into primary care, the research was situated within a qualitative philosophical tradition. Prior to adopting a social constructivist orientation, alternative research paradigms were carefully considered. An essentialist or positivist paradigm, which assumes a single, objective, and measurable reality and privileges quantifiable data, was not well suited to the aims of this study. Understanding providers' perspectives on caries risk assessment implementation requires attention to lived experiences, contextual variation, and relational processes that cannot be adequately captured through fixed variables or objective measurement alone. Critical realism was also considered due to its emphasis on uncovering underlying social structures and mechanisms that shape observable experiences. While this paradigm offers valuable insights for explanatory research, its focus on identifying causal mechanisms was not fully aligned with the exploratory nature of this study. The primary aim was not to explain causality, but rather to understand how meanings surrounding CRA implementation are constructed, negotiated, and experienced by NDPCPs within specific clinical and community contexts. Ultimately, the study was situated within a social constructivist (also referred to as interpretivist) framework, which provided the most appropriate philosophical foundation. Social constructivism emphasizes that reality is not singular or fixed but is instead shaped through social interactions and influenced by cultural, social, and historical contexts. Knowledge is viewed as co-constructed between the researcher and participants rather than discovered as an objective truth (Charmaz, 2015; Creswell & Poth, 2017). This framework was particularly well suited to the study's purpose, as it supports research focused on exploring views,

perceptions, and experiences, and using these insights to inform the development of processes or frameworks for action. The social constructivist paradigm also aligns with Indigenous health research principles that value relationality, respect for multiple ways of knowing, and attention to context. Accordingly, this philosophical stance supported an interpretive, relational approach to examining how NDPCPs understand and experience CRA implementation within their distinct community and clinical settings. According to Creswell and Poth (2017), the philosophical beliefs underlying the social constructivist framework are:

i. Ontological belief: Reality is multiple and constructed through lived experience and social interaction (Creswell & Poth, 2017). As a researcher, I sought to explore diverse viewpoints rather than narrow interpretations.

ii. Epistemological beliefs: Knowledge is constructed through engagement between researcher and participant. The resulting understanding is shaped by both participants' experiences and my interpretive lens (Charmaz, 2015). Data collection is therefore based on a co-construction between the researcher and the participant. Consequently, the research output was constructed based on my interpretation of participants' views of how oral health (caries risk assessment) can be integrated into the primary care of Indigenous children in Manitoba.

iii. Axiological beliefs: The values of both participants and the researcher are recognized and honored throughout the inquiry (Creswell, 2014; Creswell & Poth, 2017). Therefore, all views encountered in the research was considered important.

iv. **Methodological beliefs:** An emergent, inductive, and flexible approach is used, often involving interviews, observations, and narrative analysis (Creswell, 2014). For this study, semi-structured interviews were the primary method of data collection.

Positionality Statement

As a pediatric dentist and public health researcher with over a decade of clinical, academic, and research experience, I acknowledge that my professional background and personal values shape how I approached this research. My deep-rooted interest in preventive oral health stems not only from my clinical encounters with children suffering from advanced dental disease but also from my belief in the transformative potential of upstream interventions to promote lifelong health. Throughout my academic and professional journey, I have observed persistent inequities in access to oral healthcare, particularly among marginalized populations, including Indigenous communities. These experiences have influenced my commitment to equity-focused research and reinforced my belief in the role of NDPCPs in bridging service gaps, especially during early childhood when prevention is most impactful.

As a Black woman and an immigrant academic, I am attuned to the structural determinants of health and the historical and ongoing impacts of colonization on Indigenous Peoples in Canada. I approached this study with humility, recognizing my outsider status and the importance of relational accountability in conducting research with Indigenous communities. I aimed to listen respectfully, co-create knowledge, and ensure that findings are useful and meaningful to the communities involved.

Guided by a social constructivist paradigm (Charmaz, 2015), I recognized that the perspectives shared by participants are shaped by their lived experiences, professional roles, and community contexts. I also acknowledge that my interpretations are influenced by my own positionality. To mitigate this, I engaged in reflexive practices throughout the research process documenting assumptions, reflecting on power dynamics, and incorporating feedback from Indigenous partners, mentors, and collaborators. My orientation toward pragmatism also influenced my focus on actionable recommendations and system-level changes that can improve access to preventive oral health services.

This research is thus informed by a commitment to equity, a belief in community-engaged approaches, and a desire to support the integration of culturally safe, preventive oral healthcare into Indigenous pediatric primary care.

2.3 Research Design

Having discussed the philosophical assumptions for the study, I now expatiate on the approaches adopted for the inquiry and provide a detailed review of the methods utilized. The study was conducted in three stages. **First**, I conducted a general literature search and review to examine the existing evidence of CRA and POHS for young children by NDPCPs; this search evolved to a scoping review. **Second**, I conducted a qualitative inquiry to explore the views, barriers and recommendations of NDPCPs on implementing and integration the Canadian CRA tool into the primary care of Indigenous children in Manitoba. **Third**, I determined the NDPCPs' training needs and preferred mode of training and then I proposed a logic model for training NDPCPs to implement the CRA tool.

2.3.1 Exploring the views of NDPCPs

Considering I had chosen a social constructivist philosophical stance, I adopted some aspects of Charmaz's approach to grounded theory research for the data collection (Charmaz, 2015). This paradigm was chosen to guide the research as it aligns with the study's focus on understanding diverse provider experiences and the contextual factors influencing the implementation of oral health interventions in Indigenous communities. This paradigm was purposefully chosen as it aligns with the aim of the study to explore the nuanced experiences of healthcare providers working with marginalized populations. It supports an approach that values lived experience, acknowledges power dynamics, and is sensitive to the broader sociopolitical contexts influencing healthcare delivery. These features are

particularly relevant when working with Indigenous communities, whose historical and ongoing experiences with colonization shape both health outcomes and healthcare engagement.

2.4 Participants and Recruitment

Fifty non-dental primary care personnel who provide care to First Nations and Métis children aged <6 years were purposefully selected from ten health and community centers serving Indigenous communities in Manitoba, including Winnipeg (urban), Pine Falls, Swan River, St. Laurent, Pine Creek, Camperville, Thompson, St. Theresa Point, Berens River and Selkirk (urban). NDPCPs (nurses, physicians, dietitians and social workers) were invited to participate in the study by identifying a contact person (clinic administrator/manager) in each center who helped to disseminate the study details. In addition, recruitment fliers that contained QR-code links to information about the study were posted in selected health centers after getting the necessary approvals (Appendix B). Participants were also recruited from University of Manitoba's Ongomiizwin Health Services and the Department of Pediatrics and Child Health member listing. Prospective participants received information about the objectives of the study, informed consent forms (Appendix C) were sent via email ahead of the interviews, and these were signed on the day of the interview.

Initial recruitment of participants included majorly public health nurses with few physicians, subsequently I purposefully sought for other NDPCPs to include their views, on implementing and integrating the CRA tool into primary care of young children.

2.5 Data Collection

A semi-structured interview guide (Appendix D) was developed based on literature searches, and team experiences from previous investigations. Consistent with a social constructivist approach, which emphasizes the co-construction of meaning through dialogue, the guide was designed to encourage

open-ended responses and allow participants to shape the direction of the conversation (Plano Clark & Ivankova, 2016; Tashakkori et al., 2020). The interview guide was iteratively refined to include additional questions and probes based on emerging themes. Once a potential participant was identified, a letter of initial contact was emailed to them presenting the risks and benefits, and once they agreed to be part of the study, the consent form and CRA tool was shared at least one week prior to the proposed data collection date. The CRA tool was sent ahead so that the participants can get familiarized with the tool. While the first interview focused on obtaining the participants' views on the research questions, a follow-up interview further probed on the participants 'training needs and preferred mode of delivery in order to be able to implement the CRA tool. All participants were assured of anonymity and confidentiality. At the beginning of the interview the participants were given a hardcopy of the CRA tool to refresh their memories about the tool.

2.6 Data Management

All recordings were transcribed verbatim, and all data were organized into electronic and paper- based folders. Transcription was done using the MS Word transcription tool on the University of Manitoba's SharePoint system. Electronic folders included the transcripts of interviews, and the paper-based folders comprised signed consent forms and other administrative documents. Identifying details were removed from the data and pseudonyms assigned to each participant. The electronically generated transcripts were read while listening to the audio recording and revised accordingly to ensure accuracy before uploading into NVivo® software version 12.

2.7 Data analysis

Data analysis occurred concomitantly with data collection. I analyzed the interview transcripts both manually and electronically using NVivo® qualitative analysis software version 12 for data

management. An inductive thematic data analytic method was used for data analysis based on a constant comparative method. All transcripts were read and reread several times, first round coding was done in Microsoft word using a sentence by sentence approach (Charmaz, 2015). I color coded sentences that appeared to be fall in the same category. Notes detailing my thought processes during the data analysis were recorded as analytic memos in NVivo®. **Figure 2.1** is an example of the coding done on the transcripts. Further reading and coding of the transcripts was then done using NVivo®. The coding occurred at two levels; first cycle methods comprised initial coding methods and second cycle methods comprised focused coding (Saldana, 2015).

Initial Coding: Also referred to as 'open coding' was used to break down the data into discrete parts to enable me to compare them for similarities and differences. I started the data analysis without a code list, all codes were generated from the data. Questions and ideas generated from each transcript were also recorded in memos attached to the transcript. While reading through the transcripts, if the passages fit the participant's descriptive words, I selected the text as in-vivo code creating a corresponding node on the data analysis software.

Focused coding: During this coding cycle I focused on sorting, synthesizing, integrating and organizing the codes generated from the first cycle. The focus in this phase was to make further analytical sense of the data from the interview transcripts. I sought to identify codes that had theoretical reach, focus and centrality as the focused codes (Charmaz, 2015). It involved studying, assessing and comparing the initial codes to assess what they imply and reveal about the data. I searched for the most frequent or significant codes using these as the nucleus for developing categories, groups of related categories were then coalesced to form the themes.

The data analysis was not a linear streamlined process, rather it was an emergent process. I kept going back and forth from initial coding to focused coding and was constantly analyzing the theoretical

direction of the study findings. I was also continuously comparing statements within an interview as well as with other interviews. Once I completed the first transcript, all subsequent transcripts started with the codes generated from preceding transcripts analysis. Statements fitting existing codes were placed in these and when necessary, new codes were created to represent the new ideas obtained. I continued to refine and recode the categories and themes as more data was obtained. The field-notes and memos also provided me with either supportive or contrasting evidence of each issue. This process continued until no new data was obtained and the categories were theoretically saturated. As much as possible, I reviewed the transcripts rechecking the context of the selected text. I reassessed and reviewed both the label of and the classification of the categories as the data increased. This process continued until no new data was obtained and the categories were theoretically saturated. **Figures 2.2** and **Figure 2.3** show the code tree and word cloud generated from data.

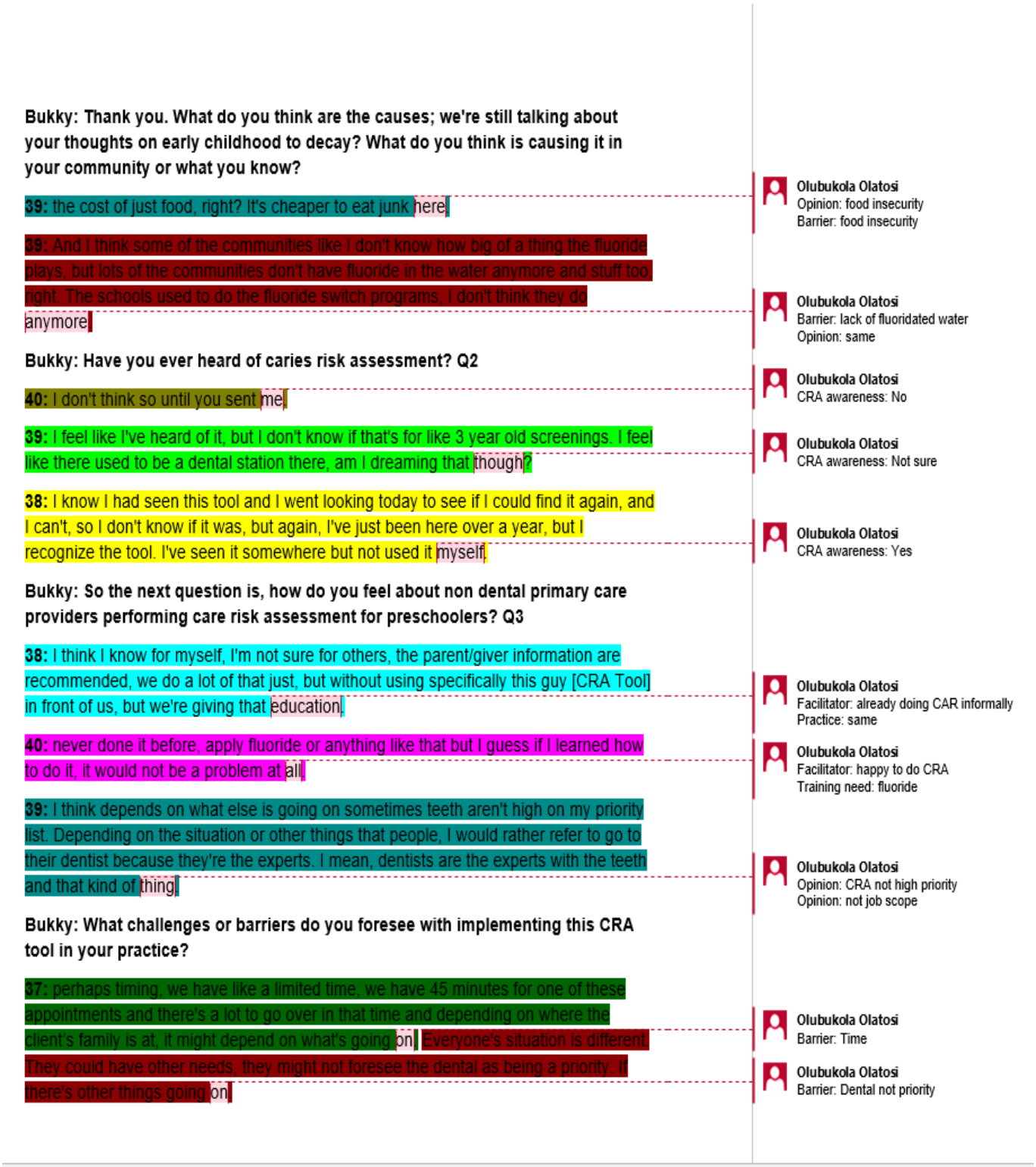

FIGURE 2. 1. SAMPLE OF MANUAL CODING

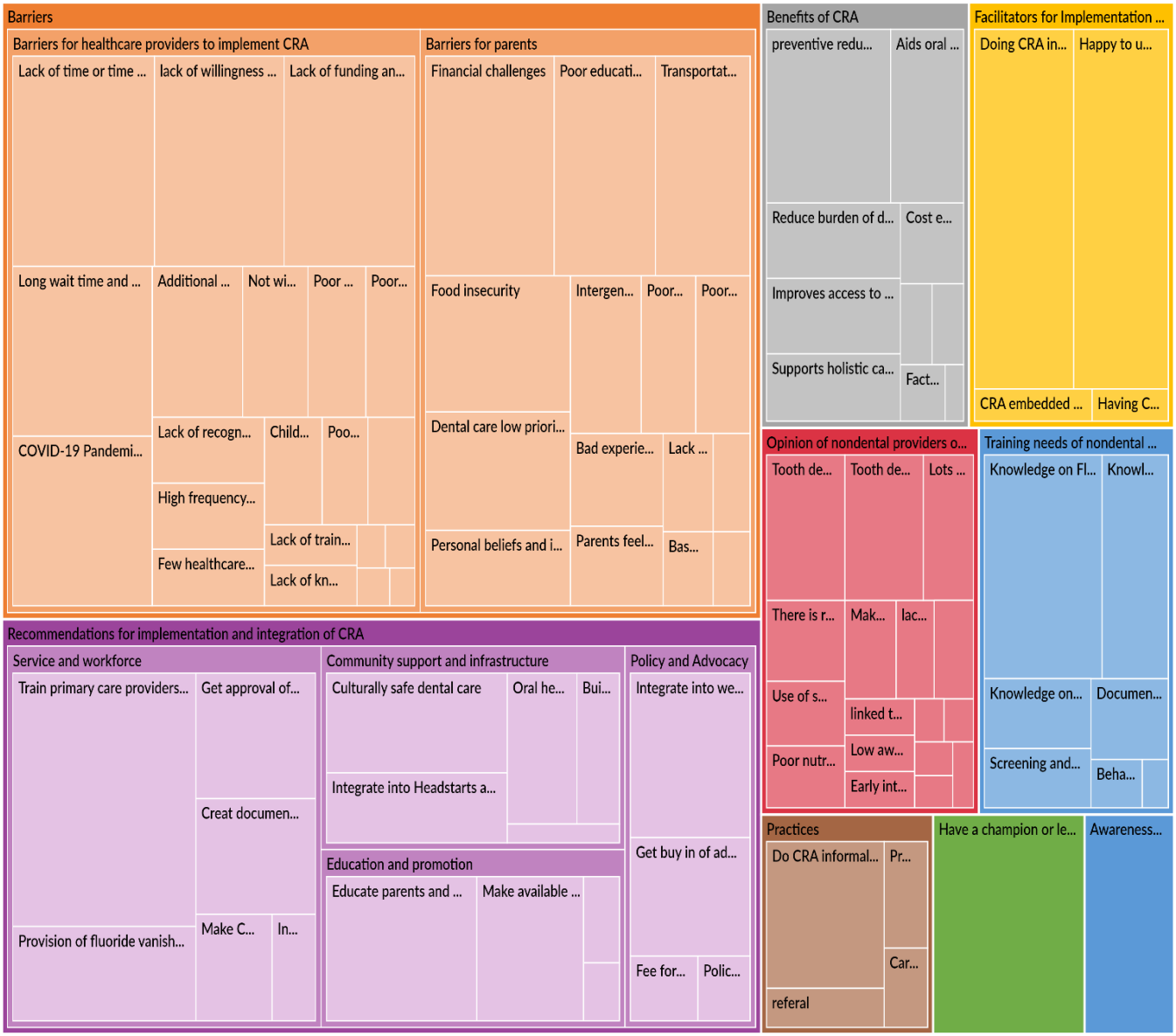

FIGURE 2. 2. CODE TREE SHOWING SOME THEMES AND SUBTHEMES.

FIGURE 2. 3. WORD CLOUD ILLUSTRATING MOST FREQUENTLY USED TERMS IN THE DATA.

2.8 Ensuring Credibility and Trustworthiness

The goal of conducting any research activity is the attainment of the highest quality possible, however there has been a lot of debate about the ability to achieve this when conducting and reporting qualitative research; credibility and trustworthiness have been identified as central criteria (Cope, 2014). Credibility is described as the ability of the research results to reflect the experience of participants or the context in a believable way (Lincoln & Guba, 1985). Trustworthiness or the rigor of a study refers to the degree of confidence in data, interpretation, and methods used to ensure the quality of a study (Connelly, 2016). To achieve quality in the production of this study, a number of criteria suggested for ensuring quality (Charmaz, 2015; Creswell JW, 2016; Lincoln & Guba, 1985) were utilized.

This section focuses on highlighting how the credibility and trustworthiness was achieved for the study. Audio-recording and transcribing the interviews were helpful in ensuring that the data collected was accurate. All interview recordings were transcribed verbatim using the University of Manitoba SharePoint MS Word dictate to transcribe feature. To ensure accuracy, I listened to the recording after initial transcripts were generated to ensure verbatim transcription, reviewed and edited all transcripts for corrections before uploading to Nvivo software. Another researcher (a postdoc student) independently coded and analyzed data. We met regularly to discuss interpretations and refine the coding framework, enhancing analytical rigor and reliability.

Following the initial analysis, I shared the summary of emerging themes with participants for feedback via emails i.e. member checking (Creswell & Poth, 2017), this method provided a chance for participants to give feedbacks. Triangulation of data from different sources (such as field notes, analytic memos and member checking information) was also done to establish credibility of the data obtained (Creswell & Poth, 2017). Prolonged engagement (18 months) collecting and analyzing data helped to deepen understanding of the processes. The use of a constant comparative approach during data analysis

also promoted researcher reflexivity (Creswell & Poth, 2017). In addition, constant reflection on personal knowledge and experiences as an oral health provider, researcher and mother were helpful in contextualizing and understanding the data.

The interpretation of the information were also reviewed by my supervisor, advisory committee and other experts in the early childhood oral health, health promotion, community development, and Indigenous health.

Ethics

Ethics approval for the study was obtained from the University of Manitoba Health Research Ethics Board (HREB) numbers HS25866 (H2023:050), which is linked to the University of Manitoba study funded by the Canadian Institutes of Health Research HS24621 (H2021:043) and HS20926 (Appendix E).

Chapter 3: Literature review: a scoping review of caries risk assessment and preventive oral health services of young children by non-dental primary care providers

3.1 Abstract

Early childhood caries (ECC) remains a significant global public health concern, disproportionately affecting vulnerable and underserved populations. Integrating oral health services into primary care particularly through non-dental primary care providers (NDPCPs) offers a promising strategy for early identification and prevention. However, the extent and characteristics of such integration across global health systems remain unclear.

This scoping review aimed to map the available evidence on caries risk assessment (CRA) and preventive oral health services (POHS) delivered to children under six years of age by NDPCPs. Specifically, it addressed (1) the types and characteristics of CRA and preventive services provided, and (2) how commonly these services are implemented in pediatric primary care settings.

The review followed the Joanna Briggs Institute (JBI) Scoping Review Framework. A comprehensive search of four databases, MEDLINE, EMBASE, CINAHL, and Web of Science was conducted for English-language studies published between 2009 and 2024. Eligible studies included primary research on CRA, fluoride varnish application, dental referrals, or oral health promotion delivered by NDPCPs (e.g., physicians, nurses, dietitians) to children under six. A total of 54 studies met the inclusion criteria and were charted, summarized, and analyzed narratively.

Most studies (83%) were conducted in the United States, with additional representation from Australia, the United Kingdom, Europe, and limited Low- and Middle-Income countries (LMIC) settings. Interventions were delivered by a wide range of NDPCPs including physicians, nurse practitioners, and health visitors, often during well-child visits. Common interventions included oral health education, CRA using structured tools, fluoride varnish application, and dental referrals. Several studies reported improved service uptake following provider training, EMR integration, or Medicaid reimbursement policies. Despite evidence of effectiveness and feasibility, no eligible studies were identified from Canada, highlighting a critical implementation gap.

NDPCPs play an important and increasingly well-supported role in the delivery of preventive oral health services to young children. This review underscores the need for policy frameworks such as reimbursement mechanisms and interprofessional training to support oral health integration into primary care. In particular, Canada may benefit from adopting system-level policies to enable and evaluate CRA and preventive dental services in primary care, especially for underserved and Indigenous populations.

3.2 Introduction

Early childhood caries (ECC) is a highly prevalent, yet preventable, disease that affects millions of children globally, with particularly high rates among socioeconomically disadvantaged and underserved populations. Defined as the presence of one or more decayed, missing, or filled tooth surfaces in any primary tooth of a child under six years of age, ECC has significant health, developmental, and psychosocial consequences (Colak et al., 2013; Tungare & Paranjpe, 2025). These include pain, infection, impaired nutrition and growth, difficulties with speech and learning, and reduced quality of life. ECC also imposes considerable burdens on health systems, often requiring costly treatment under general anesthesia (Schroth et al., 2016).

Timely prevention and early detection are critical to minimizing the impact of ECC. Recognizing this, several professional organizations including the United States Preventive Services Task Force (USPSTF), the American Academy of Pediatrics (AAP), and the Canadian Paediatric Society (CPS) recommend the integration of oral health promotion and caries prevention into routine pediatric care (Davidson et al., 2021; Holve et al., 2021; Krol & Whelan, 2023). These recommendations include the application of fluoride varnish, oral health screening, CRA, anticipatory guidance, and dental referrals during well-child visits. NDPCPs including pediatricians, nurses, family physicians, and nurse practitioners frequently interact with children in early life and are well-positioned to deliver these preventive oral health services (POHS) (Quinonez et al., 2014).

Despite these policy-level endorsements, the uptake and implementation of CRA and related services by NDPCPs remains limited in many settings (Harnagea et al., 2017; Kalhan et al., 2020; Olatosi et al., 2025b). Barriers include lack of training, limited time during office visits, uncertainty about scope of practice, and inadequate referral systems to dental care providers (Gaffar et al., 2023; Olatosi et al.,

2025a; Rabiei et al., 2014). These gaps contribute to continued disparities in oral health outcomes, particularly in communities with limited access to dental professionals. Embedding CRA and oral health services within primary care aligns with calls for integrated, equity-oriented approaches to child health and reflects broader shifts toward interprofessional collaboration in healthcare delivery (Lienhart et al., 2023; Olatosi et al., 2025c).

This scoping review is guided by a health equity lens, recognizing that ECC disproportionately affects children from low-income, Indigenous, and rural communities who face structural barriers to accessing timely dental care (Kyoon-Achan et al., 2021a; Rowan-Legg & Canadian Paediat, 2013). Integrating CRA into primary care settings represents a pragmatic strategy to reduce these inequities by leveraging existing health system touchpoints. Moreover, initiatives such as the "Smiles for Life" curriculum have sought to train NDPCPs in the delivery of POHS (Douglass et al., 2007).

3.3 Objectives

The purpose of this scoping review is to map the available evidence on CRA and POHS provided to children under six years of age by NDPCPs. The review seeks to address the following research questions:

1. What is the evidence of CRA and POHS for young children by NDPCPs?
2. How common is the practice of CRA and POHS for this population?

This review aims to identify the scope, characteristics, and outcomes of such interventions, and highlight gaps in knowledge to inform future research, policy, and implementation strategies for oral health integration into primary care.

3.4 Methods

This scoping review was conducted in accordance with the methodology recommended by the Joanna Briggs Institute (JBI) Scoping Review Framework (Peters et al., 2015). It draws on the original framework developed by Arksey and O'Malley (Arksey & and O'Malley, 2005), later enhanced by Levac et al (Levac et al., 2010). The JBI framework outlines six key stages: (1) identifying the research questions; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; (5) collating, summarizing, and reporting the results; and (6) consulting stakeholders.

3.4.1 Stage 1: Identifying the Research Questions

This review was guided by the following research questions:

This review was guided by the following research questions:

1. What is the evidence of CRA and POHS for young children by NDPCPs?

2. How common is the practice of CRA and POHS for this population?

3.4.2 Stage 2: Identifying relevant studies

Relevant studies were identified through a comprehensive search of four electronic databases: MEDLINE (Ovid), EMBASE (Ovid), CINAHL with Full Text (EBSCO), and Web of Science Core Collection (Clarivate). The search was conducted between April and June 2024. A modified version of the Children Filter (Broad) from MEDLINE was used in combination with subject headings and keyword terms representing concepts of preventive dental care and non-dental health professionals. The search was limited to English-language publications from 2009 onward. The initial MEDLINE strategy was developed in collaboration with a health sciences librarian at the University of Manitoba and peer-

reviewed using the Peer Review of Electronic Search Strategies (PRESS) checklist. The final search strategies for all databases are presented in **Table 3.1**.

3.4.3 Stage 3: Study Selection

Study selection was performed in two phases: title and abstract screening, followed by full-text review. Studies were included if they met the following criteria:

Inclusion criteria:

- Published in English from 2009 onward.
- Primary research studies (e.g., observational or interventional designs) excluding reviews.
- Focused on CRA, dental screening, oral health promotion, fluoride varnish application, dental referral, or other POHS delivered by NDPCPs to children under six years of age.
- Involved NDPCPs, including nurses (e.g., registered nurses, licensed practical nurses, nurse practitioners), physicians (e.g., family physicians, pediatricians), pharmacists, physician assistants, dietitians, nutritionists, physical therapists, speech-language pathologists, and trainees in these professions.

Exclusion criteria:

- Studies focused solely on children older than six years.
- Studies involving only dental professionals.

- Studies involving lay health workers (community members without formal health professional training).

- Studies assessing only knowledge, attitudes, or self-reported practices without evaluating actual service delivery.

- Review articles, editorials, commentaries, opinion pieces, and articles without full-text availability.

A total of 9,757 references were retrieved and imported into EndNote for deduplication. After removing 4,538 duplicates, 5,219 records were screened using Covidence (**Figure 3.1**). Title and abstract screening were conducted by the primary reviewer and six trained researchers. Articles with uncertain eligibility were advanced to full-text review. Four reviewers, including the primary reviewer, conducted the full-text screening. Discrepancies were resolved through consensus discussions. A total of 54 studies met the inclusion criteria. The study selection process is summarized in the Preferred Reported items in Systematic Reviews and Meta-analysis (PRISMA) flow diagram(Moher et al., 2009) (**Figure 3.1**).

3.4.4 Stage 4: Charting the Data

Data extraction was conducted using Covidence, guided by a standardized extraction template. The following data were extracted from each included study:

- Author(s) and year of publication
- Country of study
- Study aim
- Setting
- Study design

- Participant characteristics (e.g., age)
- Type of healthcare provider
- Inclusion and exclusion criteria
- Description of the intervention(s)
- Reported outcomes
- Key findings

3.4.5 Stage 5: Collating, Summarizing, and Reporting the Results

A narrative synthesis of the findings was undertaken. Results were summarized descriptively, highlighting the scope, characteristics, and outcomes of CRA and preventive oral health interventions delivered by NDPCPs. Key themes were identified through content analysis, and research gaps were noted to inform future directions for integrating oral health into pediatric primary care.

TABLE 3. 1. MESH TERMS AND SEARCH STRATEGY WITH RESULTS FROM OVID MEDLINE(R) DATABASE

Ovid MEDLINE(R) Epub Ahead of Print and In-Process, In-Data-Review & Other Non-Indexed Citations and Daily <May 16, 2024>		
1	exp child/ or exp infant/ or exp pediatrics/ or exp pediatricians/ or pediatric nurse practitioners/ or exp pediatric nursing/ or pediatric assistants/ or hospitals, pediatric/ or exp nurses, pediatric/ or neonatal intensive care/ or exp intensive care units, pediatric/ or nurseries, infant/ or schools, nursery/ or nurseries, hospital/ or child health services/ or child health/ or infant health/	2876194
2	(infan* or newborn* or new* born* or neonat* or baby or babies or toddler* or boy or boys or girl or girls or kid or kids or child* or p?ediatric* or kindergarten* or preschool* or pre-school* or nursery or nurseries).ti,ab,kf. or (pediatric* or paediatric* or infan* or child*).jn,jw.	2948461
3	or/1-2	3883742
4	exp tooth diseases/pc or exp diagnosis, oral/ or dental caries susceptibility/ or ((exp tooth diseases/ or oral health/ or dental care/) and (risk assessment/ or preventive health services/ or mass screening/ or diagnostic screening programs/ or exp health education/ or primary prevention/ or preventive medicine/ or "referral and consultation"/))	62424
5	health education, dental/ or school dentistry/ or exp preventive dentistry/ or dental care for children/ or exp cariostatic agents/ or exp dental health surveys/	94434
6	((caries or carious* or cariogen* or microcavit* or cavitat* or cavity or cavities or dental* or dentin* or enamel or dentition* or oral health or tooth or teeth) adj3 (diagnos* or exam* or survey* or index* or indices or radiograph* or prophyla* or prevent* or screen* or surveil* or detect* or assess* or risk analy* or management* or evaluat* or teach* or educat* or literac* or guidance or promot* or outreach or awareness or referral*)).ti,ab,kf.	88802
7	(fluorid* or fluoristat* or cariostat* or toothbrush* or ((tooth or teeth or dental) adj2 (brush* or scaling or clean*)) or oral screen* or mouth screen* or oral hygiene or dental hygiene).ti,ab,kf.	85035
8	or/4-7	232830
9	allied health personnel/ or health personnel/ or exp nurses/ or exp pediatric nursing/ or primary care nursing/ or nursing staff/ or counselors/ or exp anesthetists/ or community health workers/ or emergency medical technicians/ or licensed practical nurses/ or paramedics/ or physical therapy assistants/ or physician assistants/ or pediatric assistants/ or health educators/ or nursing assistants/ or nutritionists/ or dietetics/ or occupational therapists/ or pharmacists/ or pharmacy technicians/ or physical therapists/ or traditional medicine practitioners/ or exp physicians/ or exp pediatrics/ or family practice/ or physician's role/ or nurse's role/ or practice patterns, physicians'/ or students, health occupations/ or students, medical/ or students, nursing/ or students, pharmacy/ or students, public health/ or primary health care/	801649
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11	(child life specialist* or support worker* or emergency medic* or paramedic* or medic or medics or nurse$1 or pharmacy technician* or (pediatric adj2 (assistant* or resident or clinician*)) or extender* or feldsher* or health* educator* or health visitor* or nutritionist* or dietician* or dietitian* or dietetic* or therapist* or logopedist* or pharmacist* or physiotherapist* or kinesiotherapist* or healer* or phytotherapist* or medicine man or medicine men or medicine woman or medicine women or herbalist* or counselor* or health activist* or officer* or primary health* or primary care or family practice*).ti,ab,kf.	706203

12	(registrar* or intern or interns or consultant* or physician* or doctor* or anesthesiologist* or anesthetist* or general practitioner* or internist* or osteopath* or naturopath* or homeopath* or otolaryngologist* or otorhinolaryngologist* or pathologist* or pediatrician* or neonatologist* or physiatrist* or surgeon*).ti,ab,kf.	1043954
13	or/9-12	2266893
14	3 and 8 and 13	4261
15	(biography or autobiography or study guide or news or newspaper article or case reports).pt.	2832446
16	14 not 15	3988
17	limit 16 to (English language and yr="2009 -Current")	2373

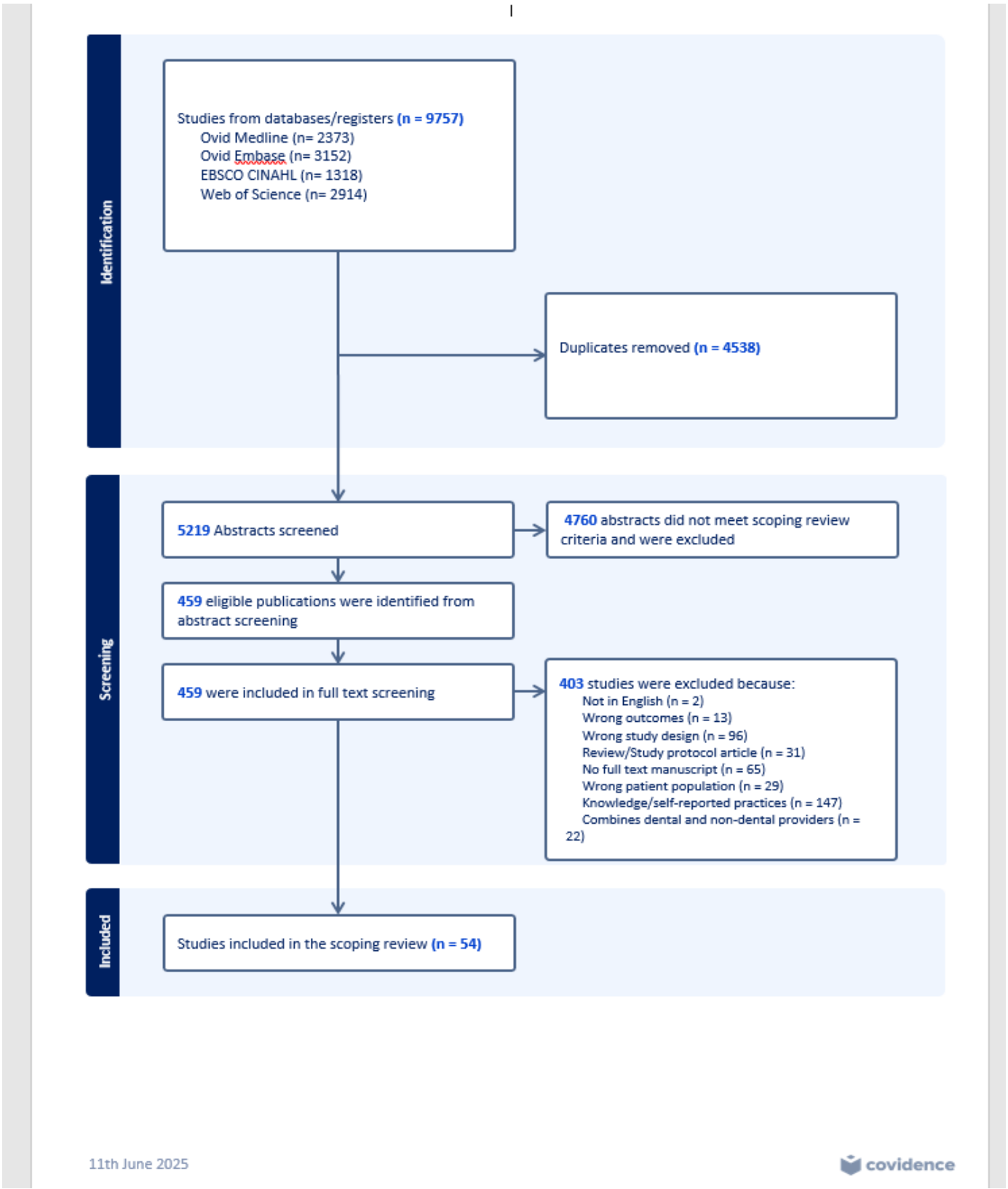

FIGURE 3. 1. PRISMA FLOW CHART FOR SCOPING REVIEW

3.5 Descriptive analysis

3.5.1 Overview of included studies

This scoping review identified 54 studies published between 2009 and 2024 that met the inclusion criteria. Most of the studies (n = 45, 83%) were conducted in the United States, with the remaining studies originating from Australia (n = 2) (Maher et al., 2012; Neumann et al., 2011), the Netherlands (n=1) (Verlinden et al., 2024), Sweden (n=1) (Brännemo et al., 2021), Scotland (n=1) (Turner et al., 2010), Cambodia (n=1) (Turton et al., 2021), the Dominican Republic (n=1) (Abreu-Placeres et al., 2023), Norway (n=1) (Wigen & Wang, 2017), and Peru (n=1) (Melgar et al., 2024) (**Figure 3.2**). Study designs varied and included retrospective cohort analyses, cross-sectional surveys, quasi-experimental and randomized controlled trials, quality improvement initiatives, and observational studies. Sample sizes ranged from fewer than 50 participants to more than 2 million children in large administrative datasets (**Table 3.2**).

3.5.2 Target Population and Settings

All studies focused on children under six years of age, with a majority targeting infants and toddlers under three years (Abreu-Placeres et al., 2023; Brännemo et al., 2021; Pahel et al., 2010; Turton et al., 2021). Interventions were commonly implemented in primary care clinics, community health centres, well-child visit settings, and maternal-child health programs. Many of the studies specifically targeted Medicaid-enrolled populations, underserved communities, and Indigenous or rural populations. Additional settings included home visitation programs, school-based initiatives, and community outreach through child health nurses and health visitors (**Table 3.2**).

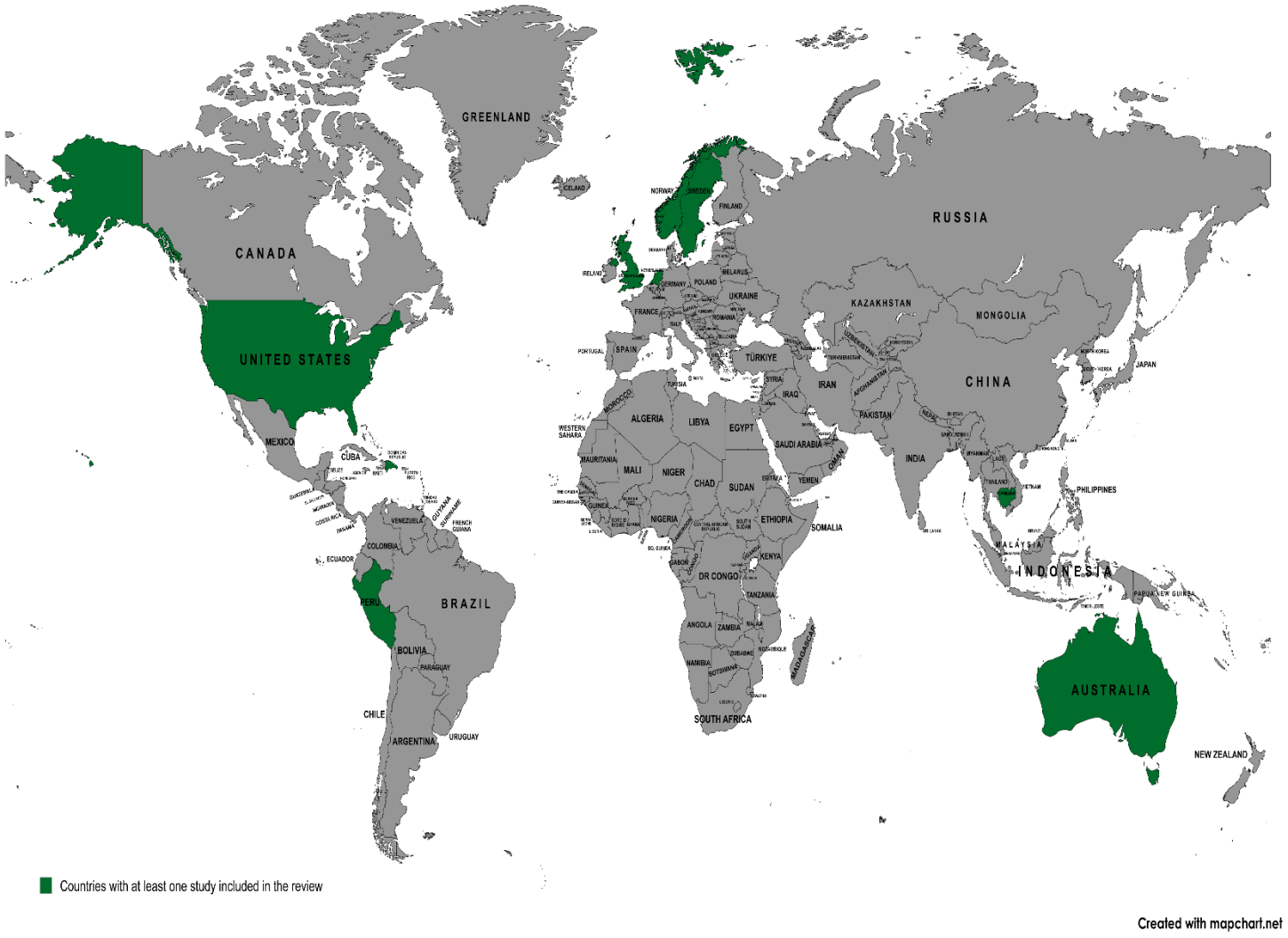

FIGURE 3. 2. COUNTRIES WITH AT LEAST ONE STUDY INCLUDED IN THE REVIEW

3.5.3 Non-Dental Provider Types and Training

NDPCPs engaged in oral health service delivery included physicians (pediatricians and family physicians), nurse practitioners (NPs), registered nurses, physician assistants, medical assistants, health visitors, dietitians, and trainees. Physicians (n = 33) and nurse practitioners (n = 14) were most frequently involved (**Figure 3.3**). Interprofessional approaches were often described, with teams that integrated nurses, community health workers, and dietitians.

Training programs were a key enabler of successful implementation. Training formats ranged from brief online modules and recorded videos to multi-hour workshops and structured curricula like the “Smiles for Life” program (Cheng et al., 2019; Dahlberg et al., 2019; McCulley et al., 2022; Murphy & Larsson, 2017; Silk et al., 2018). Programs included didactic instruction, role-play, clinical photos, (Biordi et al., 2015; Kressin et al., 2009; Long et al., 2012) visual aids such as posters, brochures and handouts were also used to facilitate training (Braun et al., 2015; Neumann et al., 2011) and competency assessments (Taylor et al., 2014). Training was context-specific, as seen in Turton et al. (2021), where community nurses and midwives received an initial 8-hour training followed by periodic refreshers. Tailoring to practice setting was also important: for example, (Turner et al., 2010) trained health visitors for home-based CRA and referral, while Maher et al. (2012) used motivational interviewing techniques and culturally adapted educational tools in Australia’s Aboriginal communities (**Table 3.2**).

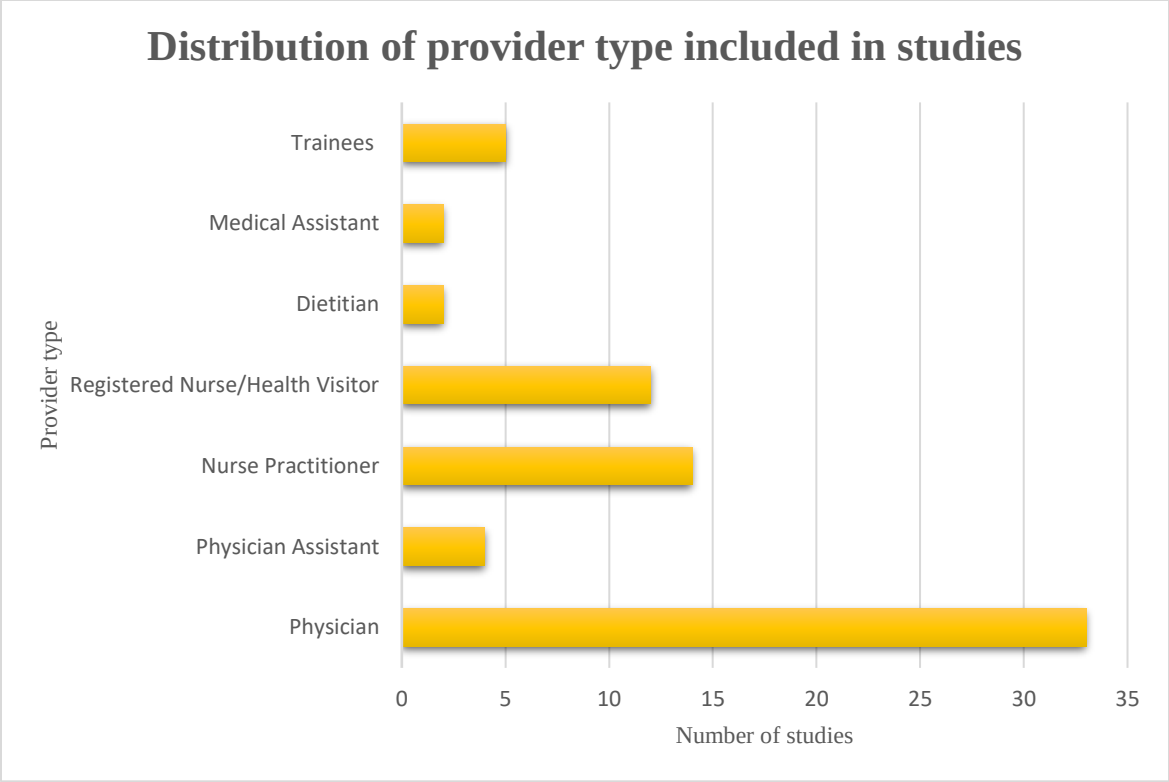

FIGURE 3. 3. DISTRIBUTION OF PROVIDER TYPE INCLUDED IN STUDIES

3.5.4 Interventions Delivered by Non-Dental Providers

NDPCPs provided a variety of oral health interventions, including oral health education, CRA, fluoride varnish application, dental referrals, and EMR-integrated care (**Table 3.3**). Their delivery varied based on the clinical setting, provider type, population served, and training received.

3.5.4.1 Oral Health Education

Educational interventions were widely reported and typically delivered during well-child visits or home/community encounters. These interventions aimed to improve caregiver knowledge and promote early preventive behaviors such as daily brushing, fluoride toothpaste use, and avoidance of sugary snacks. Tools included pictorial flipcharts (Cheng et al., 2019), brochures (Kressin et al., 2009), posters (Maher et al., 2012), handouts (Gnaedinger, 2018), quiz and factsheets (Berger et al., 2014). Educational

content was often culturally tailored and age-appropriate (Roth et al., 2020), with messages integrated into existing child health records or reinforced through in-room reminders (Okah et al., 2018). Community-based delivery was observed in home visits (Brännemo et al., 2021; Giles et al., 2022; Turner et al., 2010) and through outreach services distributing toothbrushes and toothpaste (Turton et al., 2021).

3.5.4.2 Caries Risk Assessment

CRA was increasingly adopted by NDPCPs as a core preventive strategy, often facilitated through structured tools or checklists. These tools were either adapted from existing dental frameworks or specifically designed for medical settings. For instance, multiple studies used variations of the AAP Oral Health Risk Assessment Tool (Jackson, 2015; McCulley et al., 2022; Okah et al., 2018), or the CAMBRA model (Biordi et al., 2015). Berger et al. (2014) implemented the AAPD CRA Tool, while Cheng et al. (2019) employed the Nursing Caries Assessment Tool (N-CAT), a self-administered tool completed by families within 5 to 10 minutes. Gnaedinger (2018) also described use of a dental CRA tool that helped guide provider decision.

CRA was often integrated into routine well-child or primary care visits. Braun et al. (2017) described CRA performed by physicians, NPs, and PAs as part of a broader *Cavity Free at Three* program. Similarly, Pahel et al. (2010) reported the use of structured encounter forms to document CRA alongside preventive oral health services. In some interventions, CRA was supported by EMR modifications and prompts, facilitating documentation and follow-up. For example, Okah et al. (2018) included EMR templates that prompted documentation of CRA, fluoride varnish, and referrals, while Sudhanthar et al. (2019) embedded automatic CRA-related reminders and fluoride orders into the EMR system.

Overall, CRA served as a pivotal step in identifying children at elevated risk for dental disease, enabling providers to deliver tailored anticipatory guidance, apply fluoride varnish, and refer to dental services as needed.

3.5.4.3 Fluoride Varnish Application

Fluoride varnish application was the most commonly reported clinical intervention delivered by NDPCPs. Providers applied fluoride varnish during well-child visits, Women, Infants and Children (WIC) appointments, and community outreach activities. Studies overwhelmingly reported that fluoride varnish application was feasible, acceptable, and effective in reducing ECC incidence when applied consistently. Programs such as *Into the Mouths of Babes* in North Carolina (Pahel et al., 2011; Rozier et al., 2010) demonstrated that multiple fluoride varnish applications delivered by physicians significantly reduced caries-related treatment needs. Braun et al. (2017) found that receiving at least four fluoride varnish applications by age three was associated with a significant reduction in ECC.

Several studies reported increases in fluoride varnish uptake following provider training and implementation of quality improvement initiatives (Cheng et al., 2019; Murphy & Larsson, 2017; Sudhanthar et al., 2019). For example, in a resident-led intervention, Roth et al. observed a substantial increase in fluoride varnish application and dental referrals (Roth et al., 2020). Policy and reimbursement incentives also played a role; Okunseri et al. (2009), Okunseri et al. (2010), Herndon et al. (2015), and Kranz et al. (2022) found that Medicaid reimbursement policies increased fluoride varnish claims by medical providers.

Barriers to implementation, such as time constraints, lack of supplies, and billing challenges, were noted by providers in some studies (Dahlberg et al., 2019; Kim et al., 2020). Nevertheless, the broad adoption of fluoride varnish by NDPCPs suggests strong potential for sustainability and scalability.

3.5.4.4 Dental Referrals

Dental referrals by NDPCPs were instrumental in ensuring continuity of care for children identified as being at risk for ECC. Referral decisions were typically based on CRA findings, screening outcomes, or parental concern.

Several studies reported improvements in referral practices following training or the introduction of structured tools. McCulley et al. (2022) observed a 100% improvement in dental referrals after integrating CRA into well-child visits. Okah et al. (2018) improved referral rates to 54% for high-risk patients following EMR and workflow enhancements. Jackson (2015) similarly demonstrated increased identification and referral of high-risk children with the use of a structured risk assessment tool.

In community-based models, referral pathways were integrated into routine care. Turner et al. (2010) described how Scottish health visitors used CRA to refer children to Childsmile dental services, while Wigen and Wang (2017) found that referrals from well-baby clinics effectively identified high-risk children. In Peru, Melgar et al. (2024) highlighted the effectiveness of embedding referrals into the CRED program to improve utilization of dental services.

Importantly, the mode of referral impacted its effectiveness. Verlinden et al. (2024) found that active referral, where the provider directly facilitated the dental visit was significantly more effective than passive referral methods in promoting early dental visits.

Despite these successes, low baseline referral rates and under-identification of at-risk children in some settings underscored the need for ongoing provider support and system-level reinforcement (Long et al., 2012).

3.5.4.5 Integration into EMRs

Integration of oral health interventions into EMRs was a critical enabler for sustainable service delivery. EMR prompts, structured documentation templates, and decision support tools helped embed oral health practices into routine care and facilitated consistent follow-up. Okah et al. (2018) implemented a multifaceted EMR strategy that included prompts for CRA, FV application, and referrals, leading to improved documentation and service uptake. Similarly, Lukac et al. (2023) found that adding FV-specific order sets and note templates in the EMR significantly increased the likelihood of FV being ordered and applied.

EMRs were also used to support quality improvement efforts. Johnson and French (2020) utilized task-based prompts to improve FV documentation and application rates among pediatric residents, while Roth et al. (2020) sent monthly reminders and personalized performance feedback to improve provider adherence. McCulley et al. (2022) and Gnaedinger (2018) highlighted how EMR integration enhanced the documentation of CRA and preventive care. These findings underscore the value of health information systems in promoting oral health equity by standardizing care delivery and closing service gaps.

Many interventions were embedded into existing clinical workflows. Jackson (2015) and Okah et al. (2018) included EMR prompts and clinical decision tools to standardize oral health documentation and support application of fluoride varnish. Other studies leveraged interprofessional collaboration, with dental professionals often serving as trainers for medical providers (Berger et al., 2014; Cheng et al., 2019; Okah et al., 2018).

Overall, the evidence indicates that targeted, practice-integrated training particularly when reinforced by EMR prompts and supported by dental professionals can build capacity among non-dental providers to deliver effective oral health risk assessment and preventive care in primary care settings.

3.6 Discussion

This scoping review identified and synthesized evidence from 54 studies examining the role of NDPCPs in delivering CRA and preventive oral health services (POHS) to children under six years of age. The findings highlight growing international efforts to integrate oral health into primary care settings and underscore the feasibility, acceptability, and potential effectiveness of this interprofessional approach in ECC prevention.

3.6.1 Expanding Roles of Non-Dental Providers in Oral Health

Across the included studies, physicians, nurse practitioners, registered nurses, physician assistants, health visitors, and allied professionals such as dietitians played key roles in delivering POHS including oral health education, CRA, fluoride varnish (FV) application, and dental referrals. The involvement of NDPCPs addresses oral health workforce gaps and increases access for vulnerable populations, especially in rural, Indigenous, and Medicaid-enrolled communities (Cheng et al., 2019; Kranz et al., 2014a; Turner et al., 2010).

These findings support earlier assertions that NDPCPs are well positioned to deliver oral health interventions during routine child health visits (McCulley et al., 2022; Rozier et al., 2010). Studies also demonstrate that targeted oral health training builds provider competence and improves service delivery (Braun et al., 2017; Silk et al., 2018).

3.6.2 Training Improves Confidence, Uptake, and Outcomes

The review confirms that NDPCP training is foundational to successful integration of POHS. Structured educational interventions ranging from brief modules to full-day workshops significantly improved knowledge, CRA documentation, FV application, and referral practices (Biordi et al., 2015; Cheng et al., 2019; Maher et al., 2012). The “Smiles for Life” curriculum and role-play techniques enhanced practical skills and provider confidence (Kressin et al., 2009; Silk et al., 2018).

Competency-based approaches further ensured skill retention and performance, with some programs embedding training into WIC services (Taylor et al., 2014) or offering refresher sessions for sustained impact (Turton et al., 2021).

However, persistent barriers such as limited time, insufficient supplies, and unclear billing mechanisms were noted (Braun et al., 2015; Dahlberg et al., 2019). These challenges highlight the importance of system-level supports to complement provider training and encourage sustained practice change. Similar barriers have been reported among NDPCPs in Manitoba, Canada, where limited appointment time, inadequate supplies, and billing ambiguity constrained the integration of CRA and preventive oral health services into primary care (Olatosi et al., 2025b).

3.6.3 Effectiveness of Interventions in Preventing ECC

NDPCPs delivered a range of effective interventions that contributed to improved oral health behaviors and outcomes. Oral health education, especially when culturally tailored, promoted early toothbrushing, fluoride toothpaste use, and dietary changes (Brännemo et al., 2021; Giles et al., 2022; Maher et al., 2012). Some studies integrated education into existing health records or provided take-home materials to reinforce learning (Cheng et al., 2019; Murphy & Larsson, 2017).

CRA emerged as a pivotal practice for risk identification and guided follow-up actions such as FV and referrals. Tools like the AAP Oral Health Risk Assessment and Nursing Caries Assessment Tool facilitated structured screening (Cheng et al., 2019; McCulley et al., 2022). When CRA was embedded in clinical workflows, providers were better able to tailor preventive services to high-risk children (Jackson, 2015; Okah et al., 2018).

Fluoride varnish application, reported in most studies, was consistently linked with reductions in ECC incidence when delivered at recommended intervals (Braun et al., 2017; Rozier et al., 2010). Multiple studies reported significant increases in FV rates following quality improvement interventions and Medicaid reimbursement policy changes (Herndon et al., 2015; Kranz et al., 2022; Pahel et al., 2011).

3.6.4 Referral Practices and Early Dental Visits

Referrals by NDPCPs played a critical role in bridging children to dental care, particularly those at high risk. Studies such as McCulley et al. (2022) and Okah et al. (2018) demonstrated improved referral rates following EMR enhancements and provider training. Programs that incorporated CRA into home visits or maternal-child programs such as Childsmile in Scotland (Turner et al., 2010) or the Peruvian CRED model (Melgar et al., 2024) showed promise in increasing early dental visits.

Importantly, the method of referral influenced outcomes. Verlinden et al. (2024) found that active referrals, where providers directly facilitated the dental appointment, were significantly more effective than passive strategies. However, persistently low referral rates in some studies (Long et al., 2012; Patton & Severe, 2020) indicate ongoing challenges in linking at-risk children to appropriate dental care, especially in underserved areas.

3.6.5 Integration into EMRs Supports Sustainability

EMR integration emerged as a key enabler for sustained oral health service delivery. Studies consistently found that EMR prompts, templates, and decision support tools improved documentation and uptake of CRA, FV, and referrals (Lukac et al., 2023; Okah et al., 2018). Quality improvement projects further leveraged EMR systems to provide feedback and monitor provider performance (Johnson & French, 2020; Roth et al., 2020).

Embedding oral health into EMRs also facilitated adherence to guidelines and allowed providers to manage time more efficiently. This approach supports the broader call for health system reforms that institutionalize preventive oral health services within routine primary care (Kranz et al., 2015; Zea & Henshaw, 2022). While there is limited published data on EMR integration of oral health in Canadian primary care settings, emerging implementation efforts in Manitoba highlight provider interest in digital tools to support CRA documentation and referral pathways (Olatosi et al., 2025b). As such, integrating CRA and POHS into EMRs should be considered a priority in Canada to enable workflow efficiency, documentation fidelity, and long-term sustainability.

3.6.6 Implications for Policy and Practice

The findings of this review align with recommendations from organizations such as the United States Preventive Services Task Force (USPSTF), which endorses FV application for all children under five and emphasizes the role of medical providers in ECC prevention (Davidson et al., 2021). Evidence from this review also supports policy strategies such as Medicaid reimbursement for medical providers, mandatory oral health training, and the use of EMR systems to scale up delivery of POHS in medical settings (Kranz et al., 2020; Okunseri et al., 2009).

Furthermore, interprofessional collaboration, stakeholder engagement, and culturally sensitive approaches were integral to successful implementation. Future efforts should continue to prioritize training, streamline referral pathways, strengthen EMR infrastructure, and address systemic barriers that limit access and uptake, particularly in rural and marginalized communities.

Notably, the vast majority of studies included in this review originated from the United States, with a small number from other countries such as Australia, Sweden, Scotland, and Peru. These findings suggest that the integration of oral health into primary care by NDPCPs is a growing global trend, particularly in settings where health systems support interprofessional collaboration and reimbursement for preventive services. However, no studies meeting the inclusion criteria were identified from Canada. This gap is significant given the country's universal healthcare aspirations and increasing awareness of the oral-systemic health connection.

The absence of Canadian studies meeting our inclusion criteria may reflect systemic gaps, including the lack of national policies, provider training requirements, and reimbursement frameworks to support oral health service delivery by NDPCPs. Nevertheless, several emerging initiatives in Canada are beginning to address these challenges. For instance, ElSalhy et al. (2019) explored pediatric residents' perspectives on the feasibility of integrating preventive dental care into a general pediatric outreach clinic serving a First Nations community, highlighting interest and potential in expanding provider roles.

In Ontario, Da Silva et al. (2020) examined the views of key stakeholders on incorporating fluoride varnish application into routine primary care, identifying both enablers and barriers to implementation. More recently, Hachey et al. (2020) advocated for interprofessional collaboration and the integration of core oral health services such as screening, parental counseling, fluoride varnish application, and referrals into routine primary care for Canadian children. Notably, in December 2019, the Public Health

Agency of Canada supported the development of a novel Canadian CRA tool for preschool-aged children (Schroth et al., 2021). Designed for use by NDPCPs, this tool facilitates the identification of caries risk, delivery of anticipatory guidance, application of fluoride varnish, and referral of high-risk children to dental providers. These foundational efforts signal growing recognition of the need to embed oral health into early childhood care and reinforce the case for coordinated policy, funding, and training strategies to promote oral health equity, particularly for Indigenous and rural populations.

TABLE 3. 2. CHARACTERISTICS OF INCLUDED STUDIES EXAMINING CRA AND POHS DELIVERED BY NDPCPS TO CHILDREN UNDER SIX YEARS OF AGE (N=54). THIS TABLE SUMMARIZES STUDY DESIGN, PROVIDER TYPE, INTERVENTIONS, AND KEY FINDINGS.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Meyer and Danesh (2021):USA	To compare FV utilization rates at dental visits and WCV using data from the Medicaid programs in Ohio and North Carolina	Retrospective	1–5 yrs	Physician	FV	During the pandemic, the quarterly fluoride utilization rate significantly ↓ both at medical WCV and dental visits.
McCulley et al. (2022):USA	To further develop and psychometrically test a de novo instrument on academic social bullying with health sciences educators for content and construct validation	Retrospective + Ed.	6 mo – 5 yrs 129 children	Physician, NP, MA	Education, Screening, CRA, FV, referrals	There was 94.6% improvement in oral health risk assessments, 14.7% ↑ in children identified as high caries-risk, 30.2% ↑ in oral health anticipatory guidance, and 100% ↑ in dental referrals.
Kranz et al. (2022):USA	The study examined the association between Medicaid payment and receipt of FV during pediatric medical visits	Retrospective	6 mo – 5 yrs 3,393,638 medical visits	Pediatric Medical Visits	FV	Fewer than one in 10 visits included FV. ↑Medicaid payment was positively associated with receipt of FV during pediatric medical visits. Attention should be paid to the effects of provider payment on access to pediatric oral health services.
Okunseri et al. (2009):USA	To determine the extent by which a state-level policy change impacted access to FVT for Medicaid enrolled children	Claims Analysis	1–6 yrs 3,631 children	Medical Care Provider	FV	Following the policy change, claims for FVT ↑. FVT rates ↑ for children of both sexes and all ages. Overall, 48.6% of the ↑ in FVT was attributable to medical care providers. The largest ↑ was seen in children 1 to 2 yrs, among whom medical care providers were responsible for 83.5% of the ↑.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Pahel et al. (2011):USA	To estimate the effectiveness of a medical office–based preventive dental program IMB, which included FV application, in reducing treatments related to dental caries.	Population-based cohort study	6 mo – 6 yrs	Physician	Education, Screening, CRA, FV, Referral	The IMB program ↓ caries-related treatments for children with 4 IMB visits. Multiple applications of FV at the time of primary tooth emergence was most beneficial. Referrals to dentists for treatment of existing during IMB implementation limited the cumulative ↓ in caries-related treatments but also contributed to improved oral health.
Rozier et al. (2010):USA	To examine the (1) delivery of POHS in NC medical offices, in total and in relation to dentist visits; (2) factors associated with use of medical oral health and dentist visits; and (3) the effect of the medical office-based program on use of dentist services for children up to 3years of age during the first seven years of the program	Retrospective	6 mo – 3 yrs 11 million child-month records for 629,005 Medicaid-enrolled children	Physician	POHS	Medicaid claims from 2000 to 2006 shows the program substantially ↑ POHS. By 2006 approximately 30% of WCV for 6- to 36-month-old children included these services. Additional strategies are needed to ensure preventive oral health care for more low-income children.
Berger et al. (2014):USA	The article describes an oral health preventive pilot program, including the application of FV, in a Missouri rural health clinic and presents findings related to oral health screenings, epidemiology, and risk factors.	Cross-sectional	0–5 yrs 36 children	NP	Education, Screening, CRA, FV, referral	NPs implemented Oral screening and FV on children 0-5 years in rural health clinic. 75% were in the high-risk category. Most of the children 97.2% had never been to the dentist. 27.8% had ECC, 25% needed urgent referral for extensive caries.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Kranz et al. (2014b):USA	The study examined the association between who (PCP, dentist, or both) provides these services to Medicaid enrollees before age 3 years and oral health at age 5 years.	Retrospective	<3 yrs 5,235 children	PCP, Dentist	POHS	Most children (75%) received POHS during only IMB visits, 13% received the recommended 4 or more IMB visits before 3rd birthday. Children with multiple PCP or dentist visits had a similar number of mean dmf primary teeth in kindergarten, children with only PCP visits had a ↑ proportion of untreated decayed teeth.
Sudhanthar et al. (2019):USA	To increase oral FV application for children starting at 6 months or the time of tooth eruption up to 3 years of age by at least 50% over 18 months	Cohort	6 mo – 3 yrs 50 children	Physician, Nurse, Medical Assistant	Education, CRA, FV	FV rate ↑ from 14% to 55%, 18 months after the intervention was implemented. There was 5x ↑ in FV rate in PDSA cycle 3. FV did not affect the flow of the patients in busy primary care practice. The rate of improvement was across all the age groups, providers and in both clinical sites.
Cheng et al. (2019):USA	To describe changes in oral health behaviors following implementation of a nursing intervention targeting children at risk for ECC at an urban 2-site primary care practice.	Retrospective	9 mo – 5 yrs 2,097 children	Nurse	Education, CRA, Examination, Referrals, FV	Brushing teeth ≥ 2x daily ↑ from 42.5% to 60.8%, using fluoride toothpaste ↑ from 50.7% to 83.4%. Improvements were noted across the 3 oral health behaviors (brushing 2x daily, use of FL toothpaste, and adult help with brushing among children <18 months). Nursing interventions show promise for promoting POHS in primary care settings.
Patton and Severe (2020):USA	To evaluate the relationship between children's tooth decay risk score and a dental examination and parent reports of oral health practices	Cross-sectional	456 Preschoolers	Nursing Student	CRA, Screening	The children received an oral health assessment, 21% were referred for further evaluation and dental treatment. There was low tooth brushing adherence as reported by parents.
Okunseri et al. (2010):USA	To examine the association of rates of FVT for children enrolled in Wisconsin Medicaid with	Retrospective	1–6 yrs	Physician	FV	↑Access and utilization of FVT, substantial racial/ ethnic and geographic variation in the provision of FVT for children enrolled in

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
	race/ethnicity, urban influence codes (UIC), and dental health professional shortage area (DHPSA) designation based on county of residence.					Medicaid. Post-policy, the largest ↑ were observed for Native Americans residing in non-DHPSA counties, enrollees living in rural counties, and for Hispanics living in partial and entire DHPSA counties. African Americans residing in partial DHPSA and metropolitan counties displayed the lowest rates of FVT claims.
Pahel et al. (2010):USA	To assess (1) the feasibility of matching Physician-completed encounter forms (EFs) to Medicaid claims (2) the agreement on the frequency of preventive dental visits in these two data sources and identify child and medical practice characteristics that are associated with agreement in the two data sources.	Retrospective	<3 yrs 41,252 EFs for 30,606 children and 40,909 claims for 27,607 children being available to be matched.	Physician	Education, screening, CRA, FV, referral	Increasing age of child and residence in same county as the medical practice increased the likelihood of a match. Pediatric practices provided most visits (82.4%) and matches.
Taylor et al. (2014):USA	Describes the Kellogg Ohio WIC Oral Health Model which provides one solution to the critical need for pediatric oral health preventative services by utilizing allied health professionals to bridge the gap	Cross-sectional	0–5 yrs 4,091	Dietitian	Education, Screening, CRA, FV, referral	4091 children received oral health services, mean age of children served was 2.3years, 6,655 oral health visits, and 90% of caregivers reported satisfaction with health care services.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Biordi et al. (2015):USA	The study provided oral health care services at 2 sites using a nurse practitioner–dietitian team to increase dental workforce capacity and improve access to care for low-income preschool children.	Cross-sectional	<5 yrs 4,360 children	NP, Dietitian	Education, Screening, FV	Children received FV in 7195 total visits. The number of caries ↓ with ↑ program visits, which coincided with an increase in the proportion of participants visiting a dentist.
Jackson (2015):USA	To (a) increase the identification of primary care pediatric patients at high-risk for development of ECC and (b) effectively refer those patients to a dental provider. This process improvement project involved implementation of a risk assessment tool at the 9-, 12-, and 18-month well child visit.	QI Project	9–18 months 106 children	Physician, NP	CRA, Referral	↑in the identification of patients at high risk for ECC. Practice improvement intervention such as this may succeed better in sites where practitioners are motivated to implement universal screening tool to improve management of patients at-risk for ECC.
Murphy and Larsson (2017):USA	To integrate and evaluate a pediatric oral health project in an AI, pediatric primary care setting	Descriptive	0–5 yrs 47 children	NP	Education, CRA, Referral	In less than 5 min per appointment, the primary care provider integrated oral health screening, education, and referral into WCVs. Oral health is part of total health and thus should be incorporated into routine WCVs.
Braun et al. (2017):USA	To assess an oral health promotion (OHP) intervention for medical providers' impact on ECC	Quasi-experimental	<3 yrs 4,855 children	Physician, NP, Physician Assistant	Screening, CRA, FV, referral	OHP intervention targeting medical providers ↓ ECC when children received ≥ 4 FVAs at a medical visit by age 3 y. There was ↑children < 3 years who received FVA at WCV.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Maher et al. (2012):Australia	The study evaluated the degree to which child health professionals were incorporating oral health promotion and prevention into their routine care through the New South-Wales (NSW) ECOH program.	Mixed methods	<5 yrs 3440 children	Child and Family Health Nurse	Education, screening, Referral	Parents received oral health information, education and support through written resources and contact with child health professionals. Child and family health nurses reported routinely incorporating oral health promotion and early identification for ECC into their practices. ↑ Referral 5x over 2 years.
Goldstein et al. (2022):USA	Study examined whether state-level policies requiring pediatric medical providers to obtain oral health training prior to delivering POHS in medical offices increased receipt of POHS in medical offices and overall receipt of POHS in both medical and dental offices	Observational study	Children <6 years 2,973,171 unique children	Physician, NP	POHS	Medicaid policies ↑ young children's receipt of POHS and at higher rates in states that required POHS training. These results suggest that oral health training for nondental practitioners is a key component of policy success.
Kressin et al. (2009):USA	To assess the effects of this intervention on provider ECC counseling practices, on children's subsequent development of ECC	Multifaceted practice-based intervention	6 months to 5 years 1045 children	Pediatrician, NP, Nurse	Education	Provider knowledge about ECC ↑ after the intervention training. Providers used more counseling strategies. Children at the intervention site had a 77% reduction in risk for developing ECC at follow up.
Neumann et al. (2011):Australia	To evaluate the effectiveness of a community-based intervention to improve the oral health of children in non-fluoridated rural Victoria, Australia	Quasi-experimental longitudinal study	12- < 24 months 1013 infant	Maternal and Child Health Nurse (MCHN)	Education	Oral health promotion intervention delivered via local MCHNs promoting early exposure to fluoride may be successful in reducing caries in the 2nd year of life but less so in older children when participants have less contact with MCHNs.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Long (2012; USA)	This study identifies pediatrician-assessed risk factors for ECC and their association with the need for a dentist's evaluation	Cross sectional study	< 3years	Physician	CRA	Caries risk was the strongest predictor of the need for an evaluation. Few patients (6.3%) were classified as high risk. Low referral rates for children with disease and prior to disease onset but at elevated risk, indicate interventions are needed to help improve the dental referral rates of physicians.
Herndon et al. (2015):USA	To examine receipt of ECC caries preventive services (ECCPS) in two states' Medicaid programs before and after the implementation of reimbursement to medical primary care providers (M-PCPs)	NA	6-42 months	Medical Primary Care Provider	PHOS	Reimbursement to M-PCPs was associated with a ↑ likelihood of ECCPS receipt in general and FV application. Reimbursement to M-PCPs can ↑ access to ECCPS. However, ECCPS receipt continues to fall short of recommended care, presenting opportunities for performance improvement.
Rolnick et al. (2015):USA	To examine how an intervention to apply FV in a primary health setting to all young, low-income children was implemented and sustained and 2. To assess the feasibility of tracking medical care utilization in this population	NA	>6years 12,067 children	Physician, Pediatrician, NP, Physician Assistant	FV	Of 12,067 children, 85% received FV. Differences were found by age (youngest had highest rates). Small differences by race (81%-88%, highest in Blacks).
Veschusio et al. (2016):USA	To examine the effectiveness of South Carolina's Medicaid FV policy on children's receipt of FV from both medical and dental providers	Retrospective	12-27 months 52,841 children	Physician	FV	The FV rates per child-year were 1 percent for physicians and 23 percent for dentists, respectively. The child-year rate for receipt of FV from both a physician and a dentist was less than one-third of one percent. A policy designed to increase access to FV treatments from physicians and dentists for children up to forty-seven months of age was not successful for physicians.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Wigen and Wang (2017):Norway	to evaluate established routines for referral of children by primary care nurses to the dental services and to study whether referred children younger than 3 years required contact with dental personnel	Cross sectional study	<3years 181 children	Nurse	Referrals	Majority of children referred were <3 years. Frequent reasons for referral of children <3 years were caries or dental plaque. The referral reasons given by nurses correlated partly with findings at dental examination. Using established referral routines, all children referred from WCV were caries risk children who required early contact with dental personnel.
Blackburn et al. (2017):USA	To investigate the effectiveness of preventive dental care in reducing caries-related treatment visits among Medicaid enrollees	Retrospective cohort study	< 2years 5095	Oral health providers (ie, dentists) vs all other providers (i.e., PCPs)	POHS	5095 children received preventive dental care before their second birthday, including 3878 from dentists and 1217 from PCPs. Compared with matched children without early preventive dental care, children with dentist-delivered preventive dental care more frequently had a subsequent caries-related treatment, higher rate of visits, and greater dental expenditures.
Silk et al. (2018):USA	To implement and study the effect of improving pediatric oral health by training primary care practices and training programs.	NA	NA	NA	NA	415 practices across six states were trained, this resulted in 136,963 POHS. Thirty-five of 52 health education programs established pediatric oral health curricula. The average cost of recruitment, training, and follow-up for an office or an educational program was approximately $1,000/site.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Okah et al. (2018):USA	To incorporate OHRAs, including documentation of the oral screening examination, into well-child visits for patients aged 12 to 47 months to drive (1) improved rates of preventive FV application and (2) improved dental referrals for children at high risk for caries	Clinic-based quality improvement study	12 to 47 months 6100	Pediatrician, NP, Pediatric residents	Screening, FV, Referrals	After multiple Plan-Do-Study-Act cycles, documentation of OHRAs and oral screening examinations improved to 45% and 73%, respectively. The primary outcome measure, FV rates, improved to 86%. Referral of high-risk patients to a dentist improved to 54%.
Gnaedinger (2018):USA	The purpose of this QI project was to demonstrate cost-effective implementation of a FV application program at a medium-sized, rural pediatric practice	Cross sectional study	The sample comprised patients aged 9, 18, 24, and 30 months 48 children	Pediatrician, Nurse	CRA, FV	56% of the patients received FV at their WCCs. Economical, FV application program can be readily implemented by nurse practitioners and nurses in pediatric practices where children have inadequate dental care. 20% of children were low risk, 45% medium risk, and 35% high risk.
Sibley (2018):USA	To analyze barriers to the implementation of a FV program with a specific focus on cost and reimbursement, as well as assess the costs and benefits of such a program in a pediatric primary care office located in an east central Florida county	Cost benefit analysis	6 months to 2 years 630	Pediatric primary care office	FV	The data from this cost benefit analysis show a positive financial benefit as an incentive to implement a FV program in this primary care pediatric office and serve as a solid foundation for a future quality improvement project to implement such a program.
Dahlberg et al. (2019):USA	To determine if the application of FV to children 5 years and under was acceptable and practical for health care providers in a rural primary care office.	Non-randomized experimental study	0-5 years 94	Family physician, NP	FV	Total direct variable cost of providing FV was $4.35 per procedure there was an increase from 0% to 9.57% of FV application by providers. Barriers, Potential barriers were lack of proper supplies, lack of adequate support staff, and lack of additional financial compensation for providers.
Geiger et al. (2019):USA	To examine a child's odds of receiving POHS in a medical office by county rurality.	Retrospective	< 6 years 6,275,456	Medical providers	POHS	OHS in medical offices were received by 7.8% of children. Rates of POHS in medical offices were higher in metropolitan (metro) counties (8.4%) than nonmetro adjacent to metro (5.8%) and nonmetro not adjacent to metro (4.3%).

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Kim et al. (2020):USA	to (1) assess use and reimbursement of Current Dental Terminology (CDT) D1206 and Current Procedural Terminology (CPT) 99188 codes, which are the billing codes for FV application; (2) determine when and by whom each FV code was used; and (3) summarize the associated clinical notes	Retrospective	6- 68 months 39 children	Physician, NP, Physician assistant	FV	During the 10-year time period, CDT D1206 was used 5x and CPT 99188 was used 35x. FV was applied exclusively during WCVs. Only pediatricians applied FV in this setting. FV application has been underutilized in this Midwestern tertiary teaching hospital and its affiliated clinics. Advocacy is needed for successful implementation of FV application at WCVs.
Johnson and French (2020):USA	The authors sought to utilize quality improvement (QI) methods to increase FV application to reach 85% of eligible well checks at the clinic	Cross sectional study	6 months to 5 years 603 children	Pediatric and psychiatric residents	FV	↑FV application to 77.7% after cycle 1, and 74% in cycle 2. Documentation increased after prompt. Brief educational interventions may result in ↑ use of FV in resident-based clinics. Task based prompts or stop measures in EMR templates can improve documentation, which can inform efforts to improve FV application.
Roth et al. (2020):USA	Through a resident-led quality improvement (QI) project, we aimed to provide FV to 50% of patients ages 1 through 5 who did not have a dental visit in the preceding 6 months or receive FV elsewhere in the past month.	NA	1year to 5years 323 children	Residents	FV	The resident-led QI project ↑ rates of FV application, dental referrals, and dental visits while meeting ACGME guidelines for experiential learning in QI. By adapting to state-specific guidelines and workflows of each clinic, this QI project could be nationally reproduced to improve adherence to AAP and USPSTF guidelines.
Zea and Henshaw (2022):USA	The study assessed the level of medical-dental integration achieved by the pilot and maintained over 2 years after program implementation	Retrospective	72 months of age or younger 1,456 children	Pediatrician	Screening, FV	The proportion of WCVs during which pediatricians integrated oral health preventive measures ↑ by 25% to 50% from baseline (2014) to the end of the pilot (2016) and by at least 5% from 2016 to 2018.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Melgar et al. (2024):Peru	To explore the association between CRED and oral health services utilization (OHSU), throughout the heterogeneous Peruvian territory	Cross sectional study	12 to 59 months 15,836 children	Primary health care professionals	Referral	Integrating oral health into Peruvian Child PHC seems to be a promising public health intervention to ↑ children's OHSU.
Verlinden et al. (2024):Netherlands	To evaluate whether active or passive referral by a well-childcare (WCC) physician of babies for a first preventive dental visit leads to earlier initiation of dental care.	Quasi-experimental study	children ages 4-11 months 1347 children	Physicians	Referrals	Of the active referral intervention group, 59.3% had their first preventive dental visit in their first year, for the passive referral group, 46.9%. Referral of babies by WCC for their first preventive dental visit led to earlier initiation of dental care. An active referral had a larger effect than passive referral
Ahmed et al. (2021):USA	To longitudinally assess the association between age at first oral health examination and provider type at first oral health examination on dental treatment for children under 6 y of age	Retrospective	6 to < 6 years 2,419,026 Children	Family physician; General dentists, paediatric dentists	Screening	Dental caries for children whose first oral health examination at 4yrs was 5x higher than those before 1 y of age. Dental caries for children seen by pediatric dentists and physicians was ↑ than those seen by a general dentist. Study highlights the importance of first oral health examination no later than 12 months of age and referrals from physicians to prevent the need for invasive treatment.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Braun et al. (2015):USA	To understand the impact of Colorado's interprofessional OHE program on health care professionals and practice behaviors around the provision of OHPS to children, and to identify factors that facilitated or created barriers to its diffusion	Quasi-experimental OHP intervention	children <5years	Sampling medical, dental, and nontraditional	Education, Screening, CRA, FV	From 2009 to 2012, the proportion of young, low-income children receiving OHPS from a medical professional ↑16-fold. Many practices had initiated practice-level changes to support program implementation. Factors facilitating program diffusion -quality materials, community need, and reimbursement; barriers included lack of time to provide services, resources to purchase supplies, and referral dentists.
Gracner et al. (2023):USA	To examine monthly changes in FV applications among pediatric clinicians following the ACA mandate	Observational cohort study	2405 clinicians, with 107 841 clinician-months	Physician, Pediatrician, Clinicians	FV	Premandate, 10.48% of the visits included FV applications. Two years postmandate, the likelihood of applying FV was 13.64% points higher. For clinicians providing FV premandate, the share of visits with FV ↑ by 9.22% points. This ↑ was observed in clinicians who treated children with insurance that was mostly mixed and mostly private, no substantial change with public insurance.
Abreu-Placeres et al. (2023):Dominican Republic	To test the effectiveness in the prevention of ECC through an educational intervention program with the use of a printed guide for pediatricians and parents both designed by pediatric dentists	Two-arm RCT	10 to 12 months 309 children	Pediatrician	Education	The RCT showed no effectiveness in caries-progression control. Despite this result, the study managed to identify barriers that do not allow pediatricians from offering parents adequate oral health recommendations.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Lukac et al. (2023):USA	To increase the application of FV in children while analyzing the effect of two passive CDS tools—an order set and a note template	Retrospective cohort	6 months to 5 years 3049 well-child visits	Resident physicians and Attending physicians?	FV	The addition of a fluoride order to a "Well Child Check" order set led to a 10.6% ↑ in ordering over physician education alone. The insertion of fluoride-specific text to drop-down lists in clinical notes led to a 6.2% ↑. The targeted use of order sets and note templates was positively associated with the ordering of topical FL by physicians. Added revenue totaled $15,084.
Danesh et al. (2023):USA	To evaluate child-level dental utilization and expenditure outcomes based on if and where children received FV at quality improvement (QI) medical practices, at non-QI medical practices, at dental practices, or those who never received FV from any practice.	Retrospective claims-based analysis cohort study.	1-5 years 98,001 children	Participating practices Medical and dental	FV	Children who received FV at QI medical practices had a significantly higher incidence rate of preventive dental visits than children who received FV at dental practices or non-QI medical practices. Children who received FV only at dental practices were significantly more likely to have a dental GA visit than children who received FV at QI medical practices.
Giles et al. (2022):USA	To conduct an early-phase feasibility study of an oral health intervention, Health visitors delivering Advice on Britain on Infant Toothbrushing, delivered by Health Visitors to parents of children aged 9–12 months old.	Mixed-methods, early-phase, non-controlled, feasibility study.	9-12 months 35 children	Health visitors	Tooth brushing	Total compliance with toothbrushing guidelines at baseline was low (30%) but significantly improved and was maintained 3 months after the intervention (68%). Plaque scores improved post intervention and participants found video recording of toothbrushing acceptable. Dietary habits remained largely unchanged.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Ko et al. (2022):USA	To examine physician and dentist FL prescription patterns and identify the factors associated with FL prescriptions for Medicaid-enrolled children.	secondary analysis of administrative Medicaid enrollment and claims data	200,169 children	Physician, Pediatrician, NP; Physician assistant	FV	Of 200,169 Medicaid-enrolled children, 6.7% received FL prescriptions. A larger proportion of children aged <6 years received FL. Physicians were >3 times as likely to prescribe FL as dentists. Children with a history of FL prescriptions and any restorative dental treatment were significantly more likely to receive a FL prescription, whereas children living in areas with water fluoridation were significantly less likely. Physicians play an important role in prescribing fluoride to Medicaid-enrolled children, especially those at increased dental caries risk.
Brännemo et al. (2021):Sweden	To evaluate oral health outcomes and early oral health promotion of children in a Swedish, parental support program conducted in a collaboration between Child Health Services and Social Services.	Non-randomized experimental study	0 to 15 months recruitment follow-up at 18 and 36 months 201 children 101 intervention-100 in control	Child Health Care nurse and a parental advisor from Social Services	Education	↓Caries prevalence and tooth brushing habits more consistent in the intervention group. Parents in the intervention group introduced tooth brushing twice daily more often when their child was 18 months. The proportion of children with cavitated caries lesions (ICDAS 3-6) at 18 months was significantly ↓ in the intervention group. The extended postnatal home visiting program had a positive impact on oral health.
Turton et al. (2021):Asia-Cambodia)	To critically review the feasibility of the Cambodia Smile intervention by considering clinical outcomes, acceptability and stakeholder perceptions	Mixed method	6 to 24 months intervention group 392 children	nurses and midwives	Education, FV	OHE and FV interventions provided by NDPCPs were feasible and acceptable for stakeholders in a Cambodian setting. The intervention group had lower ECC experience and better OHRQoL at 2 years of age. Surveyed parents had favorable views of the FV placement by medical professionals.

Author (Year): Country	Study Aim	Study Design	Population Age/Sample size	Provider Type	Intervention(s)	Main findings
Kranz et al. (2020):USA	To test the hypothesis that widespread adoption of state Medicaid policies supporting medical POHS may have unintentionally reduced dental visits	Cross sectional	6mo to <6y 45.1million child-years	Medical and Dental preventive POHS	POHS	The study failed to find evidence that medical POHS replaced dental visits for young children enrolled in Medicaid and, offers evidence that increased medical POHS was associated with increased utilization of dental care. Given lower-than-desired rates of dental visits for this population, delivery of medical POHS should be expanded.
Kranz et al. (2014a):USA	To examine the distribution of dental and medical Medicaid providers of pediatric oral health services throughout North Carolina to determine if these services have improved access to care for Medicaid enrollees <3 yrs old.	Retrospective	< 3 years	Physician	POHS	The study underscores how physician-based POHS can help increase the geographic availability of oral health services for young Medicaid enrollees, enabling the delivery of oral health services in areas not served by a dental provider.
Kranz et al. (2015):USA	To evaluate the impact of comprehensive POHS, provided in medical offices by NDPCPs, on the dental caries experience of children enrolled in North Carolina's (NC's) Medicaid program	Retrospective	29 173 kindergarten students	Non dental providers	POHS	POHS provided by NDPCPs in medical settings were associated with a ↓ in caries experience in young children but were not associated with improvement in subsequent use of treatment services in dental settings.
Turner et al. (2010):Scotland	The study describes monitoring arrangements and summarizes data covering the period 2006-2009 of the Childsmile program.	Observational		Health Visitors	POHS	By mid-2009, around 28,000 infants in deprived areas of the West of Scotland had been given CRA by Health Visitors; 14,000 were enrolled with 142 Childsmile practices or clinics; and over 10,000 had begun making practice visits. The Childsmile Nursery and School programs had provided 28,000 FV treatments to nursery and primary school children.

TABLE 3. 3. INTERVENTION TYPE AND NUMBER OF STUDIES

Intervention Type	*Number of Studies*
Fluoride varnish (FV) application	30
Caries risk assessment (CRA)	18
Oral health education for parents/caregivers	21
Dental referrals	15
Oral health screening or examinations	16
*Preventive Oral Health Services (POHS)**	10

*Note: POHS refers to bundled services such as screening, CRA, fluoride varnish, anticipatory guidance, and referral as a unified intervention.

Conclusion

This scoping review provides a comprehensive synthesis of the growing body of evidence supporting the integration of CRA and preventive oral health services into primary care for children under six years of age. NDPCPs, including physicians, nurses, and allied health professionals, are increasingly recognized as valuable contributors to ECC prevention. Through training, interprofessional collaboration, and supportive system-level structures such as EMR integration and reimbursement policies, NDPCPs have successfully delivered CRA, fluoride varnish, and oral health education in a variety of settings. These efforts have demonstrated positive impacts on early dental visits, ECC prevention, and caregiver engagement particularly in underserved, rural, and Indigenous populations. The findings of this review

reinforce the importance of embedding oral health into early childhood preventive care and offer practical insights to guide program development, policy implementation, and future research.

Limitations

Several limitations must be considered when interpreting the findings of this review. First, although the review included a diverse range of study designs and international contexts, the majority of studies were conducted in the United States, potentially limiting generalizability to other healthcare systems. Second, many studies used retrospective designs and administrative data, which may underreport outcomes such as fluoride varnish application or referrals due to incomplete documentation. Third, variability in study quality and intervention fidelity was noted, with some lacking detailed descriptions of training content, implementation processes, or outcomes measured. Additionally, while this review captured a wide range of interventions, few studies explicitly assessed long-term sustainability or the cost-effectiveness of NDPCP-led oral health programs. Finally, this review did not conduct a formal quality appraisal of included studies, consistent with scoping review methodology, but this limits the ability to assess the strength of the evidence base.

Future Directions

Building on the promising evidence identified, future research should explore the long-term impact and sustainability of oral health integration into primary care, particularly in non-U.S. contexts and in collaboration with Indigenous communities. Mixed-method and implementation science approaches can help uncover the mechanisms, facilitators, and barriers to scale-up across different health system levels. Economic evaluations would also be valuable in understanding cost-effectiveness, particularly for training programs, EMR integration, and reimbursement models. Additionally, more studies are needed

that center the perspectives of caregivers, community members, and front-line providers to ensure interventions are culturally responsive and contextually appropriate. Policymakers and health system leaders should consider advancing oral health equity by supporting interprofessional education, enhancing access to EMR infrastructure, and aligning incentives to promote the routine inclusion of oral health services in well-childcare.

Bridge to chapter 4: Bridging the Global Evidence with Local Insights on CRA Integration into Indigenous Pediatric Primary Care

The preceding chapter (Chapter 3) provided a comprehensive scoping review of the global landscape of caries risk assessment (CRA) and preventive oral health services (POHS) delivered by non-dental primary health care providers (NDPCPs) to children under six years of age. This review identified a growing body of international evidence demonstrating the feasibility, acceptability, and effectiveness of integrating oral health into pediatric primary care through various provider-led interventions such as CRA, fluoride varnish application, anticipatory guidance, and dental referrals. Notably, the review found that such integration is often facilitated by provider training, electronic medical record (EMR) prompts, and supportive reimbursement models.

Despite the promising global trends, a significant gap emerged: there is limited research from Canada particularly studies grounded in the context of Indigenous health services. This gap is especially concerning given the well-documented oral health disparities among First Nations and Métis children in Canada and the urgent calls for equitable, culturally safe models of care. As Chapter 3 concluded, there is a pressing need to move beyond the global evidence base and explore context-specific barriers, facilitators, and implementation strategies that reflect the lived realities of Indigenous communities and the NDPCPs who serve them.

To address this critical knowledge gap, Chapter 4 presents findings from a qualitative study that explored the perspectives of NDPCPs in Manitoba on the integration of a Canadian CRA tool into the primary care of Indigenous children. While the scoping review highlighted structural and policy-level enablers in other jurisdictions, the qualitative study captured the granular, ground-level insights of healthcare providers working in urban, rural, and remote Indigenous communities across Manitoba. These insights shed light on how broader systemic barriers such as time constraints, limited training,

scope-of-practice ambiguities, and healthcare fragmentation manifest in local practice and shape provider readiness and capacity to deliver preventive oral health services.

Together, Chapters 3 and 4 illustrate the dynamic interplay between global implementation frameworks and localized experiences. The scoping review offers a macro-level synthesis of what is possible and effective in integrating oral health into primary care, while the qualitative study offers a micro-level understanding of what is feasible, appropriate, and needed within the specific context of Indigenous child health in Manitoba. This bridging chapter underscores that while international models provide valuable guidance, successful CRA implementation in Indigenous contexts must be rooted in cultural safety, community trust, and the practical realities of the local healthcare system.

In summary, this transition from the global literature (Chapter 3) to a place-based qualitative inquiry (Chapter 4) supports a more nuanced and grounded approach to policy and program development.

Chapter 4: Healthcare Providers' Perspectives on CRA Tool Implementation in Indigenous Pediatric Primary Care: A Qualitative Study

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4.1 Abstract

This qualitative study explored the barriers to implementing and integrating the Canadian caries risk assessment (CRA) tool into the primary care of First Nations and Métis children in Manitoba, based on the perspectives of non-dental primary care providers (NDPCPs).

Fifty NDPCPs providing care to Indigenous children under six years of age were purposefully selected from ten Indigenous communities in Manitoba, including Winnipeg, Selkirk, St. Laurent, Swan River, Pine Creek, Camperville, and Pine Falls. The study employed an exploratory design, with data collected through eight focus groups and twelve in-depth key informant interviews conducted between April 2023 and September 2024. All interviews were audio-recorded, transcribed verbatim, and analyzed using inductive thematic analysis with NVivo software.

Participants included pediatricians, family physicians, public health nurses, nurse practitioners, physician assistants, dietitians, and child development workers, with an average age of 41 years (range: 24–61) and 13 years of practice experience (range: 1–40). Thematic analysis identified four major barriers to integrating the CRA tool: (1) Service provider level – time constraint, scope of practice, documentation/referral pathways, and funding; (2) Community level – oral care not priority, separation of dental and general health, lack of transportation, and health care distrust; (3) Caregiver and child level – lack of dental insurance, parental willingness, substituting CRA for dental visit; and (4) Provider training and skills – lack of training on fluoride varnish application and dental screening. Despite these challenges, participants expressed a positive attitude toward receiving training on ECC prevention, fluoride application, and the use of the Canadian CRA tool.

This study highlights that NDPCPs in Manitoba recognize the Canadian CRA tool as a valuable resource for improving access to early preventive dental care for First Nations and Métis children. The identified

barriers provide critical insights for dental, medical, and allied healthcare providers, offering a foundation for developing strategies, guidelines, and policies to enhance preventive oral health services for Indigenous children in Manitoba.

4.2 Introduction

Oral health is an essential component of overall health, yet dental caries remains one of the most prevalent chronic conditions among children globally (Kassebaum et al., 2015). Early childhood caries (ECC) is caries experienced in the primary dentition of children under six years of age affecting 1.76 billion children worldwide (Zou et al., 2022). In Canada, Indigenous children (First Nations, Inuit, and Métis) experience disproportionately higher rates of ECC compared to their non-Indigenous peers (Holve et al., 2021; Schroth et al., 2015b). This disparity is influenced by a complex interplay of social determinants of health, including food insecurity, limited access to dental care, historical trauma, and cultural factors (Poirier et al., 2023c). Addressing these inequities requires integrating preventive oral health measures into primary care settings where Indigenous children are more likely to receive care (Shrivastava et al., 2020). CRA is a crucial component of pediatric dental care. It involves identifying and analyzing factors associated with the development of dental caries and developing patient-centered preventive and therapeutic care to reduce the risk of caries (Zero et al., 2001; Zou et al., 2022). In December 2019, the Public Health Agency of Canada sponsored the development of a novel Canadian CRA tool for preschoolers. This CRA tool was designed based on a systematic review of the literature and Canadian evidence on risk factors to identify children at high risk for dental caries, enabling early interventions such as fluoride varnish application, dietary counseling, and timely referrals to dental care providers (Schroth et al., 2021).

NDPCPs, including family physicians, pediatricians, nurse practitioners, and public health nurses, are ideally suited to deliver early preventive oral health care to children, as they typically see children for approximately seven well-child visits by the age of one (Golinveaux et al., 2013; Section on Pedaiatric Dentistry and Oral Health, 2008). By embedding this tool into primary care workflows, healthcare providers can play a critical role in mitigating the burden of ECC in underserved populations, including

First Nations and Métis children (Schroth et al., 2023b). NDPCPs are encouraged to deliver preventive oral health care for infants and toddlers (Davidson et al., 2021). However, systemic challenges such as limited resources, insufficient cultural appropriateness, and gaps in provider training often impede the integration of oral health into primary care practices (ElSalhy et al., 2019; Harnagea et al., 2017).

This study aims to explore the perspectives of NDPCPs on the challenges and barriers to implementing and integrating the Canadian CRA tool in the primary care of Indigenous children in Manitoba. By understanding these perspectives, this research seeks to identify actionable insights that can guide the development of strategies, policies, and training programs to improve oral health outcomes among Indigenous children. This is particularly critical in Manitoba, where Indigenous communities face significant health disparities and where systemic and culturally informed interventions are urgently needed.

4.3 Methods

4.3.1 Study Design

This exploratory qualitative study used semi-structured interviews to explore the perspectives of NDPCPs in Manitoba on the challenges and barriers to implementing and integrating the Canadian CRA tool (Appendix A) into the primary care for Indigenous children. Guided by a social constructivist research paradigm, the study employed purposeful sampling to ensure critical representation. To accurately interpret participants' responses, researchers utilized a constant comparative method of analysis, enabling the development of authentic conceptual descriptions.

4.3.2 *Ethics*

Ethics approval for this study was granted by the University of Manitoba Health Research Ethics Board (HREB) under approval numbers HS25866 (H2023:050). This approval is associated with a University

of Manitoba study funded by the Canadian Institutes of Health Research, partnership with First Nations Health and Social Secretariat of Manitoba (FNHSSM) and Manitoba Métis Federation (MMF); ethics approvals HS24621 (H2021:043) and HS20926.

Research team and reflexivity.

Given the qualitative nature of the study, it was essential to emphasize the researchers' identity, subjectivity, marginality, and perspectives as part of reflexivity and transparency in the research process (Poirier et al., 2023a). The research team was led by RJS, a dental public health specialist and researcher with extensive experience working with First Nations and Métis communities in Manitoba. The primary researcher and first author, OOO, a non-Indigenous Black female pediatric dentist conducted the interviews. Her lived experiences navigating gender, racial and oral health disparities have deepened her understanding of systemic inequities and their impact on health outcomes, particularly for marginalized populations. This perspective informed her research approach and to fostering inclusive, community-driven solutions. The research team also included three Indigenous researchers, whose insider positionality facilitated trust-building and access to communities while ensuring that the study was conducted in a culturally respectful manner. To mitigate potential biases in interpreting participants' responses, several steps were taken. These included ongoing team meetings to critically reflect on positionality, seeking guidance from Indigenous Knowledge Holders, and incorporating feedback from participants in the research process. By integrating diverse perspectives within the team and actively engaging in reflexive practices, we aimed to uphold cultural integrity and minimize interpretive bias in our findings.

4.3.3 Participants and Recruitment

Fifty NDPCPs providing care to First Nations (FN) and Métis children under six years old were purposefully selected from ten health and community centers serving Indigenous communities in Manitoba. These communities included both urban (Winnipeg, Selkirk) and rural/remote locations such as Pine Falls, Swan River, St. Laurent, Pine Creek, Camperville, Thompson, St. Theresa Point, and Berens River. We used purposeful sampling to assure the attainment of critical representation of experiences and ideas by seeking maximum variation of the study participants to include nurses, physicians, physician assistants, dieticians and social workers. Eligibility criteria included being a NDPCP whose client population included Indigenous children aged 6 years below and worked in Indigenous community. NDPCPs were invited to participate through designated contact persons (clinic administrators/managers) at each center, who assisted in disseminating study details. Additionally, recruitment fliers with QR codes linking to detailed information about the study were posted in selected health centers after obtaining the necessary approvals. Participants were also recruited from the University of Manitoba's Ongomiizwin Health Services and the Department of Pediatrics and Child Health member listings. Prospective participants were provided with information about the study's objectives, and informed consent forms were emailed to them in advance. These forms were signed and collected on the day of the interview.

4.3.4 Data Collection

A semi-structured interview guide was developed by the study team based on literature reviews and insights from previous investigations (Schroth et al., 2023b; Schroth et al., 2021; Sheth, 2021). The guide was refined to include additional questions and probes, with the final version reviewed by an interdisciplinary team of experienced researchers specializing in early childhood oral health, health promotion, community development, and Indigenous health (Appendix D). Data were collected through

eight focus groups and twelve in-depth key informant interviews conducted between April 2023 and September 2024.

Each focus group included five to eight NDPCPs experienced in caring for Indigenous children. At the start of each session, informed consent and demographic information were obtained. Focus group sessions, lasting 45 to 75 minutes, were held at community health centers and audio-recorded by OOO, with MM and DD taking field notes. These notes included observations of nonverbal responses and facial expressions to capture participants' emotions during the discussions.

Key informant interviews lasted 15 to 30 minutes and were designed to delve deeper into individual perspectives. The interview guide was adjusted during the data collection process to incorporate emerging themes, allowing for a deeper exploration of new ideas. Our All interviews were transcribed verbatim and analyzed using an inductive thematic approach with NVivo© software. Data collection continued until saturation was reached setting the sample size of participants of participants included in the study. To ensure the study's validity, member checking, expert reviews, field notes, and memos were utilized throughout the process.

4.3.5 Data analysis

Data analysis was conducted concurrently with data collection, utilizing both inductive and deductive thematic approaches. Transcripts were read and re-read line by line, applying a constant comparative method to deepen the understanding of emerging ideas and concepts. An open coding strategy was used for the initial analysis, with text analyzed line by line and labeled with descriptive words or short phrases that encapsulated the core meaning of the content (Creswell & Poth, 2017). Themes were developed by grouping related codes into subthemes and primary themes. Data collection continued until no new information emerged. Initially, we conducted five focus groups and nine key informant interviews, followed by an additional three focus groups and three key informant interviews. Data

saturation was determined when no new codes or emerging themes relevant to the study concept were identified in three consecutive interviews. Code frequency counts were used to assess and confirm saturation (Hennink & Kaiser, 2022). To ensure rigor, OOO and another member of the research team independently analyzed the data, then convened to compare codes, themes, subthemes, and their relationships, ensuring inter-coder reliability. The analysis was iterative, with the data and codes revisited and refined as new insights emerged. Results and interpretations were also shared with field experts for validation, and member checking was conducted by providing participants with fact sheets to gather their feedback.

4.4 Results

Fifty NDPCPs participated in eight focus groups and twelve key-informant in-depth interviews. The participants consisted of 8 physicians, 31 public health nurses, 4 nurse practitioners, 2 physician assistants, 1 dietitian, and 4 child development workers. The mean age of the participants was 41 years (range: 24-61), while the mean years of practice was 13 years (range: 1-40). Thematic analysis of barriers to implementation and integration of the Canadian CRA tool into primary care revealed 4 major themes: service provider level, community level, caregiver and child level, and provider training and skills level barriers (**Figure 4.1**). Quotes from interviews represent points raised by participants along with pseudonyms and professional designations **(Table 4.1).**

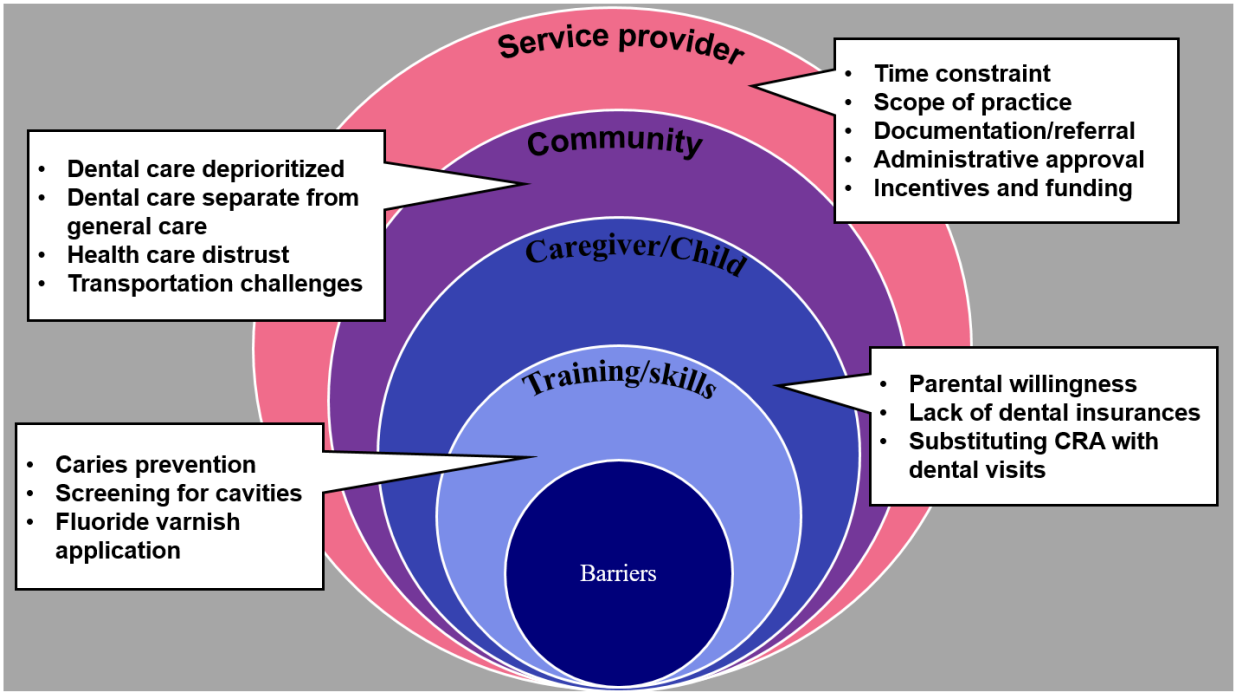

FIGURE 4. 1. THEMES AND SUBTHEMES ON BARRIERS

4.4.1 Theme 1: Service provider barriers

Service providers faced multiple challenges in implementing the CRA tool, both in their own workflows and in addressing parental barriers. While acknowledging its potential of the CRA tool to improve oral healthcare for Indigenous communities, participants cited time constraints, scope of practice concerns, and documentation and referral difficulties. Balancing CRA with other medical priorities was a common struggle. As one participant noted, *"Just time because we do have at the well child, other forms to fill out … if there's a time pressure, it would just look like challenge" (Betty, nurse).* Another added, *"If I'm seeing them coming in with cough, or different things … doing something like this would totally not be the main thing I need to deal with" (Mary, nurse practitioner).*

A key concern was the application of fluoride by non-dental providers. While some saw its benefits, others questioned whether it was within their role. One participant remarked, *"I don't know if that's our*

role [fluoride application] … is there a reason why whoever does it now can't continue doing that process?" (Sophia, nurse).

Referral challenges also emerged, with poor communication from dental offices and a lack of clear referral pathways. *"That's another thing … where, who are [we] referring them to, where are they going … I never really know" (Glory, nurse). Another added, "dentists don't share information with us like other healthcare [providers] … we do not get those [reports] from dental offices" (Peter, physician).*

Limited funding was another major barrier, restricting access to fluoride application. One participant emphasized, *"If we had more funding … this is just something that could be easily made available to primary care clinics" (Josh, nurse practitioner).* Additionally, some providers felt unrecognized for the extra workload. As one explained*, "A lot of times we have add-ons to our work with no recognition" (Lola, nurse).*

4.4.2 Theme 2: Community level barriers

Participants identified several community-level barriers that may hinder the implementation and integration of the Canadian CRA tool in Indigenous pediatric primary care. These barriers include the perception of dental care as a low priority, the historical separation of dental and general healthcare, transportation challenges, and the impact of intergenerational trauma on healthcare trust and access.

A recurring challenge noted by participants was that dental care is often deprioritized in communities. Families struggling to meet basic needs may find it difficult to prioritize oral health, leading to lower engagement with dental care services. As one nurse described, *"Mine would be like what's the priority for the parents of these children, sometimes they're having a hard enough time just figuring out where they're going to get their next meal, is dentistry really a priority for them to go get their child's teeth*

checked or finances to fund going to the dentist as well" (Fiona, nurse). This highlights the reality that dental care often takes a backseat when families are dealing with food insecurity and financial strain. Limited transportation options further exacerbate barriers to accessing dental care. Participants noted that logistical challenges, such as traveling with multiple children and the lack of reliable transportation, may create significant obstacles for families. This may hinder referrals to the dental provider for comprehensive dental treatment following initial CRA by NDPCPs. As one nurse explained, *"We also have to think like how do the family get there…the family may have 3-4 kids. How do you drag all these kids to the dental appointment? So that's some transportation…sometimes it seems like it's a simple thing, but it's a big barrier for some families" (Nancy, nurse).*

Another key barrier identified was the traditional separation of dental care from primary healthcare services. Participants noted that many parents do not perceive NDPCPs as suitable for delivering dental-related interventions. This systemic divide may create challenges in integrating the CRA tool into routine primary care visits. As one nurse practitioner highlighted, *"…a real challenge is that medicine and healthcare culturally and historically have been separate from our dentistry colleagues. So it can be difficult to integrate that into primary care because a lot of people like you know … [say] I care for this, we need the teeth … they go to the dentist, right?" (Josh, nurse practitioner).* This perception reinforces the idea that dental care is distinct from general health, complicating efforts to implement the CRA tool effectively.

Participants also pointed to the lingering effects of intergenerational trauma, which contribute to a deep-rooted distrust in the healthcare system. This mistrust affects health-seeking behaviors, including accessing dental care. Families who have experienced systemic discrimination and historical injustices may be reluctant to engage with healthcare providers, further limiting opportunities to provide preventive dental care.

4.4.3 Theme 3: Caregiver and child-level barriers

Participants identified several barriers at the caregiver and child level that impact the implementation of the CRA tool in Indigenous pediatric primary care. These barriers, as perceived by NDPCPs, include parental willingness to engage with the CRA tool during primary care visits, financial limitations due to lack of dental insurance, and misconceptions about the CRA tool serving as a substitute for actual dental visits.

One key barrier perceived by participants was parents' hesitancy to engage with the CRA tool due to concerns about being judged on their parenting practices. The CRA tool includes questions about feeding habits, such as the use of bottles at bedtime and the consumption of sugary snacks and drinks. Some caregivers may feel scrutinized when discussing these topics, making them reluctant to participate. As one nurse explained, *"Some people get defensive when you're talking about sugar intake or bottles or sippy cups so people tend to get pretty offended easily with those practices" (Edna, nurse).* Another participant highlighted the broader impact of this perception, stating, *"A lot of our families share that they feel very judged when they go to the dentist, especially if the caries was delayed or children are older or there's significant decay when they go. They feel very bad…and the care they receive that day can affect the care their child will receive for the rest of their life if they feel judged or not feel like they were treated respectfully or well" (Lola, nurse).* This underscores the need for a culturally sensitive and non-judgmental approach when discussing oral health with caregivers.

Participants also expressed concerns that financial constraints, particularly the lack of dental coverage, could prevent caregivers from following through on referrals prompted by the CRA tool. The tool is designed to identify children at risk for dental issues and refer them to a dental provider for comprehensive care if needed. However, without dental insurance or financial resources, families may

not be able to access the recommended care. As one physician explained, *"I feel like I would be encountering a lot of problems in referral if they don't have insurance or they've got limited finances, I've got limited places that are going to accept payment plans so they don't really get to be autonomous in where they want to be referred to if their resources are limited because they don't have insurance" (Bayo, physician).* These financial barriers can limit access to follow-up care and reduce the effectiveness of the CRA tool in connecting children with necessary dental services.

Some participants raised concerns that parents might misunderstand the role of the CRA tool and preventive measures such as fluoride application, seeing them as substitutes for routine dental visits. This misconception could lead to reduced follow-through with dental referrals. One nurse highlighted this concern, stating, *"I would worry that if we did apply fluoride varnish, they [parents] would think they're done and don't need to go to the dentist, right? Because they'd say 'you fixed it, I got the varnish so I'm good now and it's not a priority anymore.' I know that sounds silly, but that does happen" (Alice, nurse).* Addressing these misunderstandings is essential to ensuring that caregivers recognize fluoride varnish and CRA screening as complementary rather than replacement strategies for regular dental care

4.4.4 Theme 4: Provider training and skills barriers

Participants identified significant gaps in their knowledge regarding the causes, prevention, and screening for caries in children. Few had received formal training in early childhood oral health. A recurring concern was the need for education on fluoride application. As one participant explained, *"I think we could implement [Canadian CRA tool], but there's some things that need to happen first, right? We need to know about the [fluoride] varnish, and we need to figure out that, otherwise, we would only be partially implementing" (Jane, nurse)*. Some participants expressed uncertainty about whether fluoride application was within their scope of practice but indicated a willingness to perform the

procedure if authorized and adequately trained. One participant noted, "*I would feel if that was something that they wanted to put in our scope of practice, I would definitely want proper training" (Becky, nurse*). The desire for further education on fluoride use was expressed by all. Several participants suggested including guidance on aftercare instructions for parents regarding fluoride varnish. They also emphasized the need for training in child management techniques during screenings and fluoride application, particularly for young children. One participant reflected, *"but I think part of it too is even like, I don't know, are there specific techniques to help calm a child specifically while you're looking in their mouth, like behavioral techniques as well" (Surat, nurse)*.

TABLE 4. 1. EXAMPLES OF QUOTES FROM PARTICIPANTS

Themes	Sub-themes	Examples
Service provider level barriers		
	Time constraint	*"I would say as always, time is a constraint, time to get the product, to educate the client, to do the screening assessment that I think is an issue"* ***(Edna, nurse)***
	Scope of practice	*"I think having support from the program to use it because I don't want to get in trouble and have people saying I'm working outside of my scope or I'm doing something that I shouldn't be doing"* ***(Allice, nurse)***
	Documentation and referral pathways	*"I don't know of a formal process you have referring to specific dentists. Some of the nurse practitioners or doctors have referral forms that they would use, but other people outside of that aren't necessarily going to have a referral form other than a verbal like you need to go see the dentist here's where they are."* ***(Edna, nurse)***
	Administrative approval	*"I'm not sure about the varnish … how was that provided? Somebody has to pay for it, obviously. And how expensive is it and how do we go about getting it like those are just things I don't know"* ***(Peter, Physician)***
	Incentives and funding	*"Unfortunately, in our program right now we're a little low on evaluation. There's a lot of things we do and our evaluation component is lacking and that's concerning"* ***(Lola, nurse)***
Community level barriers		
	Dental care deprioritized	*""a lot of times the family or the client is directing the priority of care and sometimes, if they're fixated on specific issues that are high priority to them, it's very difficult to bring in something that they don't visualize as a priority and so it it's meeting the person where they're at and they might not be at this point." (Nancy, nurse)"* ***(Lola, nurse).***
	Separation of dental and general health	*"A lot of people don't think the doctor or the nurse are the people to bring up the dental caries, right"* ***(Becky, nurse).***
	Lack of transportation	*"I think also transportation can be an issue for this so. I'm hoping it's something we can incorporate into our outreach and become more available"* ***(Surat, nurse).***
	Healthcare distrust	*'Some families may have not had great experiences with the healthcare system and maybe a little bit hesitant to take their children to get the help they need."* ***(Judy, nurse)***
Caregiver and child level barriers		
	Parental willingness	*"It's not going to be any problem applying the varnish. I mean I swabbed noses, which is probably worse than applying [fluoride] varnish but it also depends on the parent's engagement, willingness."* ***(Edna, nurse)***
	Lack of dental insurance	*For the kids without treaty numbers, there's no [dental coverage], I think the biggest barrier is cost, it's not publicly funded. Its money out of parents' pocket, most*

		families are having to cough up some money and that is a barrier for some people ***(Sam, physician).***
	Substituting of CRA with actual dental visit	*"And also feel like this would be in place of going to see the dentist, right? Their perception of okay 'I don't have to go to the Dentist because I got this right now" (M****ary, nurse practitioner).***
Provider training/skills barriers		
	Caries prevention	*"Well, personally getting some additional training on recognition of pediatric dental caries, maybe some education on what the dentists do and what they offer and when they … What kind of interventions they do, and some more education on the consequences of childhood dental caries just for education purposes for the parents would be helpful"* ***(Peter, physician)***
	Screening of tooth decay	*"We need a lot of education how to screen for that [caries] we also want…better access to professional screeners or to the appropriate dentist, or dental hygienist because we've run into barriers where we could screen but then the follow-up or to refer them to another professional could take a little longer. So that's where the barrier is"* ***(Anna, nurse)***
	Fluoride varnish application	*"I would probably need more education on the actual process [fluoride vanish application] so that I could talk to the parents about why we would want to do it and the reasons behind so that I could promote it"* ***(Precious, nurse).***

4.5 Discussion

This qualitative study provides valuable insights into the multifaceted barriers to implementing the Canadian CRA tool for preschoolers in Indigenous communities. These barriers span across service provider limitations, community-level challenges, caregiver engagement, and training needs. Addressing these issues is crucial for improving oral health outcomes and ensuring equitable access to care.

4.5.1 Service Provider Barriers

Participants reported that integrating additional responsibilities such as fluoride varnish application into already busy primary care environments posed significant challenges. Key concerns included time

constraints, unclear professional boundaries, documentation burdens, and limited funding. These findings align with prior studies that identified similar challenges, including staff shortages, inadequate infrastructure, and a lack of administrative support (Alkhtib et al., 2023; ElSalhy et al., 2019; Harnagea et al., 2017; Lienhart et al., 2023). Time constraints, in particular, are consistently noted as a major barrier to delivering oral health services in primary care (Lienhart et al., 2023).

Interestingly, studies outside the Indigenous context have shown promising outcomes for CRA integration. For example, a pilot study by the American Academy of Pediatrics (AAP) found that 80% of clinics reported the CRA tool was easy to use and required minimal workflow adjustments. Clinicians completed oral health assessments in under two minutes, and referrals for high-risk children increased significantly from 11% to 87% (American Academy of Pediatrics, 2009). Similarly, a separate case study reported that oral health assessments added only 2–3 minutes to routine well-child visits, with time barriers successfully addressed through workflow optimization and staff training (Hummel J, June 2015).

While these findings suggest CRA tools can be seamlessly incorporated into primary care, it is essential to consider the contextual differences. The AAP studies involved non-Indigenous clinics in the United States, where provider shortages, geographic isolation, and the need for culturally safe care may not be as prevalent. In contrast, Indigenous communities in Manitoba face unique systemic barriers, including limited access to dental services, historical mistrust in healthcare systems, and different healthcare priorities (Hussain, 2022).

These contextual distinctions highlight the need for localized evaluation. It remains unclear whether the streamlined integration observed elsewhere would translate effectively to Indigenous primary care settings. Future studies measuring the time and effort required for NDPCPs to complete the Canadian

CRA tool in Indigenous contexts would be particularly valuable. Such research could inform tailored workflow adaptations and implementation strategies.

Participants also identified documentation and referral challenges stemming from the lack of integrated electronic medical records (EMRs). Evidence suggests that embedding oral health tools into EMRs can enhance documentation, increase screening rates, and improve follow-up care for high-risk children (Okah et al., 2018). Addressing provider concerns such as workload and compensation through policy initiatives like value-based payment models could further support oral care integration (Jivraj et al., 2022). To mitigate provider barriers, strategies such as ensuring fluoride varnish availability, listing local dentists who accept publicly funded patients, creating clear CRA tool workflows, integrating the tool into EMRs, and appointing oral health champions within each clinic should be implemented (Johnson & French, 2020; Okah et al., 2018; Reno, 2024).

4.5.2 *Community-Level Barriers*

Participants highlighted that oral health is often a low priority for families facing socioeconomic challenges. This aligns with literature showing that food insecurity, housing instability, and poverty can reduce engagement with preventive dental care (Amin et al., 2014; Northridge et al., 2020). Effective CRA implementation should be paired with broader supports such as food security programs and dental financial assistance to address families' immediate needs alongside oral health education (Cheung & Singhal, 2023; Goubran et al., 2024; Kyoon-Achan et al., 2021a). Transportation barriers were also cited, reflecting wider challenges in rural and Indigenous communities where distance and cost impede healthcare access (Hussain, 2022; Murphy et al., 2024). Community-driven solutions, such as mobile dental units, tele-dentistry, and transportation support programs, could help mitigate these barriers and facilitate follow-through on dental referrals (Kyoon-Achan et al., 2021b). The longstanding separation

of dental and general healthcare also poses a significant challenge to CRA tool integration. Research shows that interprofessional collaboration, particularly co-location of dental and primary care services can lead to improved oral health outcomes (Prasad et al., 2019).

Encouraging a paradigm shift where NDPCPs are seen as integral to early oral health intervention requires systemic efforts, including cross-disciplinary training, policy support, and community engagement to redefine expectations around primary care responsibilities in oral health.

Historical and ongoing experiences of colonization, including the legacy of residential schools and systemic discrimination, continue to shape Indigenous peoples' relationships with healthcare. Participants emphasized the importance of culturally safe approaches, those that honor Indigenous values, knowledge, and autonomy as essential to rebuilding trust (Kennedy et al., 2022; Kyoon-Achan et al., 2021c). Strategies like involving Indigenous health workers, supporting community-led oral health initiatives, and promoting trauma-informed care are vital to improving CRA adoption and healthcare equity (Holve et al., 2021; Kennedy et al., 2022).

4.5.3 Caregiver and Child-Level Barriers

Beyond community-level barriers, caregiver and child-specific factors also play a crucial role in the implementation of the CRA tool. Participants expressed concerns that some caregivers may be hesitant to engage with the CRA tool due to fears of judgment related to parenting practices. Questions related to feeding routines, bottle use, and sugary snacks can feel intrusive or stigmatizing, leading to reluctance of caregivers to engage. Prior research supports that perceived judgment from healthcare providers can lead to defensiveness and decreased engagement (Akera et al., 2022; Kyoon-Achan et al., 2021b; McKinnon et al., 2022). A respectful, culturally sensitive communication style is essential to building trust and promoting participation.

Financial constraints further limit caregivers' ability to follow through with dental referrals generated by the CRA tool. Many Indigenous families face challenges due to a lack of dental insurance or limited financial resources. Participants highlighted difficulties in referring patients when only a few dental providers accept publicly funded coverage or offer flexible payment plans. These financial limitations are consistent with existing literature, which notes that economic barriers significantly hinder dental care access in Indigenous communities (Hussain, 2022; Poirier et al., 2023c). Strengthening and expanding public programs such as the interim Canada Dental Benefit and the Canadian Dental Care Plan alongside targeted outreach to connect families with available resources, could significantly improve referral follow-through (Goubran et al., 2024; Schroth et al., 2023a).

Another critical concern was the misconception that the CRA tool and preventive measures, such as fluoride application, could replace routine dental visits. Some caregivers may assume that once fluoride varnish is applied, no further action is necessary. Literature on oral health interventions suggests that effective patient education is key to preventing such misunderstandings (Kaushik & Sood, 2023). Providers should emphasize that CRA screening and fluoride application serve as complementary strategies rather than replacements for professional dental care, reinforcing the importance of routine checkups.

4.5.4 Provider Training and Skills Barriers

Participants frequently cited limited training in caries screening and fluoride application as a barrier to effective implementation. This is consistent with literature indicating that non-dental providers often receive minimal instruction in pediatric oral health despite their frontline role in early intervention (Lienhart et al., 2023). Nonetheless, many providers demonstrated a commitment to oral health by offering parent education, even without formal training. This speaks to the potential of NDPCPs to play a meaningful role in early childhood oral care (Love et al., 2024; Schroth et al., 2023b). Strengthening

this potential requires integrating oral health into medical and nursing education, supported by refresher training during onboarding. Hands-on training was particularly emphasized, especially for fluoride application and child behavior management techniques. Such training has been shown to increase provider confidence and uptake of preventive services (Gomez et al., 2023). Uncertainty about scope of practice emerged as a key barrier, with providers willing to apply fluoride if authorized. Clear policies and guidelines are needed to support role expansion and clarify responsibilities.

Strategic leadership is crucial for CRA integration (Hummel J, June 2015). Engaging champions such as public health nurses, dental hygienists, and clinic managers can drive adoption through staff training, ongoing education, and workflow integration (Dooley et al., 2016; Okah et al., 2018). Structured support, clear policies, and leadership engagement will enhance provider confidence and promote sustainable implementation. Prioritizing these elements will facilitate CRA tool adoption in primary care, improving early childhood oral health outcomes.

4.6 Strengths and Limitations

A key strength of this study is its qualitative design, which allowed for rich, in-depth exploration of healthcare providers' perspectives across multiple levels. These insights offer a comprehensive understanding of both the practical and systemic challenges to CRA implementation. The inclusion of diverse provider roles from different care settings adds to the depth of the findings. However, the study has limitations. The small sample size may restrict generalizability, and Indigenous communities in Manitoba may not fully represent broader Indigenous populations. Participant responses may have been influenced by social desirability bias, and no triangulation with secondary data sources such as policy documents was conducted. Future studies may consider incorporating such data to reinforce the findings. Additionally, the study focused on provider perspectives and may not fully capture the

experiences of Indigenous families and communities. Regional differences in healthcare delivery systems may also affect applicability.

4.7 Conclusion

The successful implementation of the Canadian CRA tool in Indigenous communities requires a holistic, context-sensitive approach that addresses provider, community, caregiver, and systemic barriers. Collaborative leadership, targeted training, culturally safe care, and integration of oral health into broader support systems are key to improving uptake and outcomes. By prioritizing equity and honoring Indigenous perspectives, these efforts can contribute meaningfully to reducing health disparities. Future research and pilot initiatives are needed to assess feasibility, inform best practices, and guide broader implementation.

Bridge to Chapter 5- From Understanding Barriers to Building Solutions: Bridging Insights to Action for Caries Risk Assessment (CRA) Integration

The preceding chapter explored the perspectives of non-dental primary care providers (NDPCPs) on the challenges of implementing the Canadian CRA tool within Indigenous pediatric primary care settings in Manitoba. While the findings highlighted systemic, community, and provider-level barriers, they also revealed providers' openness to capacity-building and systemic change. This bridging chapter synthesizes those insights and lays the conceptual groundwork for the implementation-focused recommendations presented in Chapter 5.

Reframing Barriers as Opportunities

Barriers identified in Chapter 4 including time constraints, lack of CRA-specific training, fragmented referral systems, and limited caregiver engagement are not fixed impediments. Rather, they represent modifiable conditions within broader structural, institutional, and policy contexts. For example, documentation and referral issues signal a need for standardized protocols, while challenges with fluoride varnish application highlight the absence of practical, hands-on training for NDPCPs. Reframing these findings positions them as focal areas for targeted intervention and collaboration.

Provider Willingness as a Lever for Change

An encouraging and recurring theme was NDPCPs’ positive attitudes toward the CRA tool and their willingness to expand their roles in ECC prevention provided they receive adequate training and institutional support. This finding represents a powerful leverage point: when frontline providers are motivated and engaged, systems-level change becomes more feasible. Their insights serve not only as diagnostic tools but also as catalysts for solution generation.

Core Principles Guiding CRA Implementation

Based on Chapter 4 findings, four cross-cutting principles emerged to inform the development of actionable recommendations:

1. System Readiness - Addressing infrastructural and workflow barriers (e.g., EMR integration, documentation, time management).

2. Cultural Safety Embedding CRA within trusted, culturally appropriate care pathways in Indigenous communities.

3. Interdisciplinary Collaboration- Encouraging coordination among dental, medical, and allied professionals to promote oral health.

4. Policy Alignment - Advocating for systemic supports such as billing codes, training incentives, and integration into existing programs.

These principles provide a framework for the strategic recommendations explored in Chapter 5.

Building the Bridge: From Barriers to Recommendations

The transition from Chapter 4 to Chapter 5 reflects a shift from identifying "what is" to envisioning "what could be." Whereas Chapter 4 focused on the challenges that limit CRA implementation, Chapter 5 turns to the strategies proposed by NDPCPs themselves. These include:

- Embedding CRA into existing primary care workflows
- Strengthening provider training and mentorship
- Developing culturally tailored educational resources for families
- Addressing systemic barriers through oral health policy reforms

The participatory nature of this research ensures that these solutions are grounded in practical realities and community contexts.

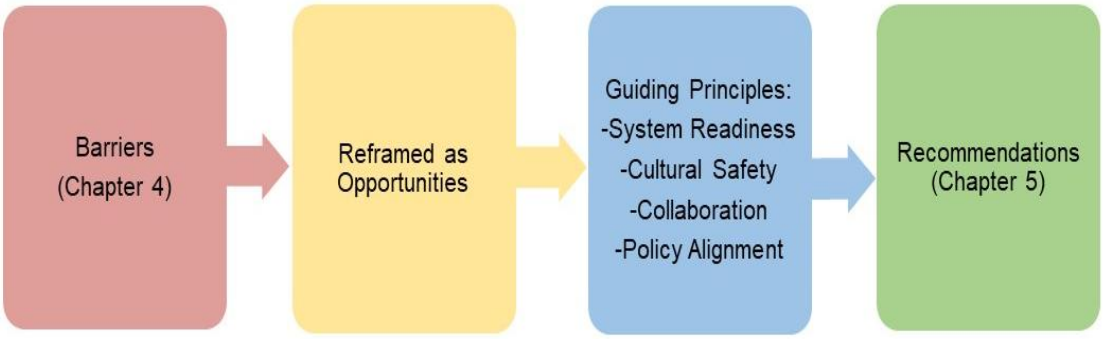

FIGURE 4. 2. BRIDGING BARRIERS AND SOLUTIONS FOR CRA TOOL INTEGRATION

This figure illustrates the conceptual transition from Chapter 4 to Chapter 5. Barriers identified by NDPCPs to implementing the Canadian CRA tool are reframed as opportunities for intervention. Four guiding principles system readiness, cultural safety, interdisciplinary collaboration, and policy alignment emerge from the qualitative findings and serve as the foundation for the provider-informed

In summary, this bridging chapter marks a pivotal transition in the thesis. It positions the insights from Chapter 4 not as endpoints, but as foundations for action. By centering provider perspectives, recognizing their commitment, and applying a framework rooted in equity and systems thinking, we prepare for the roadmap offered in Chapter 5. The next chapter will translate this foundation into a set of actionable, culturally informed, and system-sensitive recommendations for CRA tool integration in Indigenous pediatric primary care.

Chapter 5: Recommendations for integrating caries risk assessment into primary care for Indigenous children

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5.1 Abstract

This study aimed to identify strategies for implementing and integrating the Canadian caries risk assessment (CRA) tool for preschoolers into the primary care of First Nations and Métis children in Manitoba, based on the perspectives of non-dental primary care providers (NDPCPs).

An exploratory qualitative design was employed to gather insights from NDPCPs who provide care to Indigenous children under six years of age. Fifty participants were purposefully recruited from ten urban, rural, and remote communities across Manitoba. Data were collected through eight focus groups and twelve in-depth key informant interviews conducted between April 2023 and September 2024. Interviews were transcribed verbatim and analyzed thematically using an inductive approach informed by a social constructivist framework. Four interrelated themes emerged as central to CRA implementation and integration. Strengthening primary care systems involved training in fluoride varnish application, management endorsement, EMR integration, standardized documentation, and incentives such as fee-for-service models. Building trust and culturally safe connections with Indigenous communities included establishing respectful relationships, embedding CRA into trusted programs, and addressing access barriers such as transportation and oral health supplies. Educating and engaging families focused on developing accessible educational materials and using trusted communication channels like Facebook and local radio to improve oral health literacy. Advocating for policy changes involved calls for billing codes, sugar reduction policies, and CRA integration into existing Well Child programs.

NDPCPs in Manitoba are supportive of integrating the CRA tool into Indigenous pediatric primary care. Their recommendations offer a practical roadmap for CRA implementation, emphasizing systemic support, culturally responsive care, education, and policy alignment. These findings contribute to

broader efforts to reduce oral health disparities and improve ECC prevention in underserved populations.

5.2 Introduction

First Nations, Métis, and Inuit Canadians experience notable oral health disparities, particularly among children (Hussain, 2022; Kyoon-Achan et al., 2021a). Evidence indicates that Indigenous populations face poorer oral health outcomes compared to other Canadian counterparts (Hussain, 2022). These disparities stem from a complex interplay of factors, including limited oral health literacy, low income, inadequate health infrastructure, a shortage of oral health providers, cultural disconnection, and intergenerational trauma (Poirier et al., 2023c).

Early childhood caries (ECC) defined as caries in the primary dentition of children under six years of age is one of the most common chronic conditions seen in children, affecting more than 600 million children worldwide (Pitts et al., 2019). In Canada, ECC is disproportionately prevalent among children living in equity-denied conditions, including those from low-income families, newcomers/immigrants, rural and remote regions, and First Nations, Métis, and Inuit populations (Schroth et al., 2013). Despite the implementation of various public health initiatives, caries prevalence remains high among Indigenous children (Holve et al., 2021). Addressing these inequities requires upstream, community-driven approaches that expand beyond traditional dental settings and foster interdisciplinary strategies (Poirier et al., 2023c; Schroth et al., 2021).

A promising response has been the development of a Canadian CRA tool for preschoolers, designed to support early identification of caries risk and guide preventive care (Schroth et al., 2021). This tool, developed through a systematic review and stakeholder consultation process, is intended for use by both dental and NDPCPs. It is designed to facilitate early risk identification, oral health education, fluoride varnish application, and referrals to establish a ‘dental home http://www.cda-adc.ca/en/oral_health/cfyt/dental_care_children/risk_assessment.asp.

NDPCPs including nurses, physicians, and allied health professionals often serve as the initial point of contact for families and are uniquely positioned to promote oral health, particularly in regions where access to dental care is limited or unavailable. To enhance the delivery of preventive oral health services to young children, the U.S. Preventive Services Task Force (USPSTF) recommends that medical providers apply fluoride varnish to the teeth of children during well-child visits through age five (Davidson et al., 2021). The Canadian CRA tool supports this recommendation by prompting providers to apply fluoride varnish to preschool-aged children following oral health screening. However, there is limited evidence on how to effectively implement the CRA tool in primary care settings, and even less is known about the perspectives of NDPCPs who play a vital role in its integration and success. Understanding their experiences, perceived roles, and recommendations is crucial for developing realistic and community-informed implementation strategies that are responsive to the needs of Indigenous communities (Schroth et al., 2023b).

Given that successful implementation of the CRA tool in primary care requires an understanding of frontline provider perspectives, this study employed a qualitative approach to explore the experiences, insights, and recommendations of NDPCPs. Qualitative methods are well-suited for examining complex social and contextual factors that influence clinical practice, especially in culturally and geographically diverse settings (Creswell & Poth, 2017; Renjith et al., 2021).

Building on prior research that identified key barriers to CRA implementation in Indigenous primary care (Olatosi et al., 2025b), the present study shifts the focus toward provider-recommended strategies for effectively implementing and integrating the Canadian CRA tool into the primary care of First Nations and Métis preschoolers in Manitoba. This study addressed the following research questions:

1. What strategies do NDPCs recommend for effectively implementing and integrating the Canadian CRA tool into First Nations and Métis children's primary care services in Manitoba?
2. How can these recommendations inform approaches to improve ECC prevention in underserved Indigenous communities?

5.3 Methods

5.3.1 Study Design

This exploratory qualitative study utilized semi-structured interviews to examine the perspectives of NDPCPs in Manitoba on strategies for implementing and integrating the Canadian CRA tool into primary care for Indigenous children. The study was guided by a social constructivist research paradigm, which emphasizes the co-construction of knowledge through interactions between researchers and participants, recognizing that multiple realities are shaped by cultural, social, and historical contexts (Burns et al., 2022; Charmaz, 2015). This paradigm was chosen to guide the research as it aligns with the study's focus on understanding diverse provider experiences and the contextual factors influencing the implementation of oral health interventions in Indigenous communities. This paradigm was purposefully chosen as it aligns with the aim of the study to explore the nuanced experiences of healthcare providers working with marginalized populations. It supports an approach that values lived experience, acknowledges power dynamics, and is sensitive to the broader sociopolitical contexts influencing healthcare delivery. These features are particularly relevant when working with Indigenous communities, whose historical and ongoing experiences with colonization shape both health outcomes and healthcare engagement.

Purposeful sampling was employed to achieve critical representation. To ensure the participants' responses were accurately interpreted, the researchers applied a constant comparative method of analysis, facilitating the generation of authentic conceptual descriptions.

5.3.2 Ethics

Ethics approval for the study was obtained from the University of Manitoba Health Research Ethics Board (HREB) numbers HS25866 (H2023:050), which is linked to the University of Manitoba study funded by the Canadian Institutes of Health Research HS24621 (H2021:043) and HS20926.

5.3.3 Research team and reflexivity

Considering that the study adopted a qualitative approach, there was a need to highlight the researchers' identity, subjectivity marginality and perspectives brought into the research as part of reflexivity and transparency in the research process (Poirier et al., 2023a). The authorship team is led by RJS, a dental public health specialist and researcher who has worked with First Nations and Métis communities in Manitoba for many years. The first author OOO, a non-Indigenous female researcher and pediatric dentist conducted the interviews with experience working with underserved communities. The team also consist of three Indigenous researchers all other authors are experienced researchers in child oral health, public health and Indigenous health.

5.3.4 Participants and Recruitment

Fifty non-dental primary care personnel who provide care to First Nations and Métis children aged <6 years were purposefully selected from ten health and community centers serving Indigenous

communities in Manitoba, including Winnipeg (urban), Pine Falls, Swan River, St. Laurent, Pine Creek, Camperville, Thompson, St. Theresa Point, Berens River and Selkirk (urban). NDPCPs (nurses, physicians, dietitians and social workers) were invited to participate in the study by identifying a contact person (clinic administrator/manager) in each center who helped to disseminate the study details. In addition, recruitment fliers that contained QR-code links to information about the study were posted in selected health centers after getting the necessary approvals. Participants were also recruited from University of Manitoba's Ongomiizwin Health Services and the Department of Pediatrics and Child Health member listing. Prospective participants received information about the objectives of the study, informed consent forms were sent via email ahead of the interviews, and these were signed on the day of the interview.

5.3.5 Data Collection

A semi-structured interview guide (Appendix D) was developed by the study team, based on literature searches, and team experiences from previous investigations. Consistent with a social constructivist approach, which emphasizes the co-construction of meaning through dialogue, the guide was designed to encourage open-ended responses and allow participants to shape the direction of the conversation (Plano Clark & Ivankova, 2016; Tashakkori et al., 2020). The interview guide was iteratively refined to include additional questions and probes based on emerging themes. The final version was reviewed by the interdisciplinary study team, including researchers with expertise in early childhood oral health, health promotion, community development, and Indigenous health.

Data were generated from eight focus groups and twelve in-depth key informant interviews held between April 2023 and September 2024. Each focus group consisted of five to eight NDPCPs who had experience providing care to Indigenous children. Informed consent and demographic information were obtained at the beginning of each session. Focus groups lasted between forty-five to seventy-five

minutes and were conducted at community health centers. Sessions were audio-recorded by (OOO), while two other researchers (MM and DD) took fieldnotes, including observations of nonverbal responses and facial expressions to help contextualize participants' emotional responses (Patton, 2014). Key informant interviews lasted between fifteen to thirty minutes. In keeping with qualitative traditions, the interview guide was modified throughout the data collection process to explore new ideas and themes as they emerged (Guest et al., 2020). Data collection continued until thematic saturation was reached Data were transcribed verbatim and analyzed using an inductive thematic analysis with NVivo© software. The study's validity was ensured by using member checking, sharing data with experts, field notes and memos.

5.3.6 Data analysis

Data analysis occurred concurrently with data collection and was informed by an inductive thematic analysis (Braun & and Clarke, 2006) guided by a social constructivist paradigm. This paradigm influenced the analytical process by centering participants' perspectives, embracing subjectivity, and interpreting meaning within the broader sociocultural context. Transcripts were read and re-read line by line using an open coding strategy, in which segments of text were labelled with descriptive words or short phrases that captured key ideas. A constant comparative method was employed to iteratively compare codes across transcripts, allowing for deeper understanding and refinement of concepts as data collection progressed (Creswell & Poth, 2017). Both inductive and deductive strategies were used while inductive coding allowed new ideas to emerge from the data, deductive codes based on existing literature and the interview guide were also applied where appropriate.

Themes were developed through the clustering of related codes into subthemes and overarching themes. The primary researcher and another researchers independently coded the data and met regularly to

discuss interpretations and refine the coding framework, enhancing analytical rigor and reliability. To enhance trustworthiness, strategies such as member checking by sharing summary of emerging themes with participants for feedback, peer debriefing with experts, and detailed analytic memos were employed (Birt et al., 2016).

5.4 Results

Fifty NDPCPs participated in eight focus groups and twelve key-informant in-depth interviews. The participants consisted of physicians, public health nurses, nurse practitioners, physician assistants, dietitian, and child development workers (**Table 5.1**). The median age of the participants was 41 years, and the median years of practice was 13 years. In response to the research questions, what strategies NDPCPs recommend for implementing the CRA tool in Indigenous primary care, and how these can inform broader ECC prevention efforts, we identified four interrelated themes. These themes reflect system-level, community-driven, educational, and policy-oriented strategies NDPCPs considered essential to implementing the CRA tool in a way that is feasible, culturally appropriate, and sustainable. They are presented in order of the number of participants contributing to each theme. Quotes from interviews represent points raised by participants along with pseudonyms and professional designations.

5.4.1 Strengthening Primary Care Systems to Support CRA Integration

This theme captures participants' practical recommendations for embedding CRA into the daily workflows of non-dental primary care. NDPCPs emphasized six key areas of system-level support: provider training (especially fluoride varnish), management endorsement, streamlined documentation and referral pathways, integration into electronic medical records (EMRs), provision of fluoride and related supplies, and incentives for uptake. These system-focused strategies were seen as foundational for enabling consistent and sustainable CRA use within primary care practices (**Table 5.2**).

Nearly all participants described the CRA tool as user-friendly but highlighted the need for hands-on training particularly in fluoride varnish application as a prerequisite for implementation. Additional training needs included anticipatory guidance and managing young children during oral health procedures:

"And regarding the fluoride about applying it, I would definitely say we would want some training and maybe tips on how to get a kid to keep their mouth open long enough for me to put fluoride." **(Tina, nurse)**

Participants emphasized that formal support from healthcare managers, along with designated CRA champions in each clinic, would help staff feel confident and authorized to use the tool:

"I think having support from the program to use it because I don't want to get in trouble and have people saying I'm working outside of my scope ... I would want the support of the program to go ahead … nurses are a big part of getting these families dental care..." **(Alice, nurse)**

"I'm sure our case manager probably would. She would be the one that would have the final say and final answer. Right." **(Eli, child development worker)**

"Having a lead person in the office that sort of leads it and is kind of a resource... so this would be your responsibility for the contact for whoever is leading it from outside of the office." **(Becky, nurse)**

Participants also recommended integrating CRA into EMR systems to make documentation more efficient and user-friendly. Standardized fields, auto-calculations, and dropdown options were viewed as helpful for routine use:

"Just making sure that it's there and that you can check the boxes. And then it would tally it for you would be really nice." **(Edna, nurse)**

In addition to EMR integration, referral systems and access to lists of local dentists accepting publicly funded patients were seen as necessary to connect families to care:

"Knowing which centers are going to be available for patients, particularly of low socioeconomic class, where they can go and get affordable treatment... that sort of information will be useful." **(Bayo, physician)**

Incentives such as fee-for-service models, staff recognition, and additional support for new responsibilities were also recommended. Some participants expressed concern that the added workload would require funding or formal adjustment of duties:

"The only factors I see to that is the funding... is our program going to fund us to have that extra time to go out? Be there for the registrations and check the kid's teeth at the same time?" **(Nancy, nurse)**

The availability of fluoride varnish was also a concern for those already using the CRA tool:

"I don't think we have any more fluoride. So it's probably not the greatest idea to use the risk assessment and not be able to apply the fluoride... it's a little bit problematic." **(Josh, nurse practitioner)**

5.4.2 Building Trust and Culturally Safe Connections with Indigenous Communities

Participants emphasized that successful implementation of the CRA tool requires trust-building, cultural humility, and an understanding of the lived experiences of Indigenous families. Many providers noted that historical trauma, socioeconomic barriers, and past negative experiences with healthcare have

created distrust in new systems and tools. As such, CRA implementation must be rooted in relationship-centered care and cultural safety.

This theme included five subthemes: building trust through respectful engagement; providing culturally safe and non-judgmental care; distributing oral health supplies to support daily hygiene; embedding CRA into existing trusted programs (e.g., Head Start); and addressing transportation as a key barrier to follow-up dental care.

Participants described how effective oral health conversations required a deep understanding of families' realities and values. They noted that questions about feeding or hygiene habits from the CRA tool could be perceived as judgmental, especially when compounded by challenges like food insecurity or unstable housing:

"And in those circumstances, there can be a different level of trust and relationship. For those types of conversations as well, right? Like that relationship and power differential can be a challenging piece as well that contributes to this." **(Tina, nurse)**

"I think the preamble for using this tool would be very important, right? Because there are a lot of things that can be perceived as judgment of their parenting... it gets a little bit touchy with food as well, right? Different families have different values." **(Fiona, nurse)**

Providers highlighted the need for culturally safe interactions, especially when working with families affected by trauma, addiction, or systemic racism:

"Experienced, well-trained providers working with that demographic... their approach is such that people don't tend to feel judged, or they try to comfort people and provide care in a way that makes them comfortable to get care." **(Alice, nurse)**

Practical support measures like giving families toothbrushes and childcare items were seen as simple but effective strategies to build rapport and reinforce oral hygiene messages:

"If it was something that we were looking to be able to offer and have stock here and say 'Hey! Here is a new toothbrush, here is some childcare,' I think that would be exceptionally helpful because then people are more likely to be able to actually implement." **(Tina, nurse)**

Participants also flagged transportation as a major structural barrier to oral health follow-up, suggesting that CRA efforts should be supported by tangible logistics solutions:

"And to provide them with transportation to go home after. So let's say, 'Okay, you know what? They made it there, let's give them bus tokens to get home.' Let's think things that we can do to sit next to them and say 'Hey! You know what? I got this done, this doesn't suck and they help me get there and they help me get home." **(Nina, nurse practitioner)**

Together, these strategies reflect a relational, community-informed approach to CRA implementation that goes beyond technical delivery to address trust, comfort, and social realities in Indigenous communities.

5.4.3 Educating and Engaging Families in Oral Health Prevention

NDPCPs highlighted that empowering families through accessible and culturally relevant education is central to the success of CRA implementation. This theme includes four key strategies: educating

parents and caregivers about child oral health; providing take-home dental resources; promoting oral health messages through trusted community channels; and using communication methods that are engaging and appropriate to varying literacy levels.

Many participants observed that caregivers lacked awareness of the importance of primary teeth, preventive dental care, and appropriate nutrition for young children. Misconceptions such as viewing juice in bottles or certain sugary drinks as healthy were seen as widespread. Participants emphasized that low engagement was often due to limited knowledge rather than willful neglect.

"But you know, education for the parents will be very key and important to help with oral hygiene care. So brushing your teeth twice a day and obviously watching what the kids eat and ensuring that they look after their dentition just to prevent complications later on. But yes, it can be prevented if its primary care is taken seriously." **(Bayo, family physician)**

To reinforce learning beyond clinical encounters, participants recommended distributing simple, visually engaging educational materials. These resources such as pamphlets or visual guides could support at-home oral health practices and serve as helpful reminders for caregivers.

"So when we're doing our education, it's helpful to have like a really nice pamphlet that we can leave with them because, you know, everyone learns different ways... and then they might not take it all in when they were there at the visit. So having something to refer to later on is nice too." **(Sophia, nurse)**

Participants also emphasized the importance of community-based communication strategies. Several highlighted that Indigenous communities are already using platforms like Facebook and local radio to spread health-related information. These channels were seen as effective tools for normalizing CRA and educating families on the role of non-dental providers in oral health promotion.

"They often in Garden Hill use Facebook in order to get some of the patients and say that, okay, the dentist did show up for this visit and a mass Facebook thing goes out and then lots of people that have been told that they should see the dentist come in for that visit." **(Sam, pediatrician)**

Together, these strategies reflect participants' recognition that oral health education must be ongoing, tailored, and accessible delivered in ways that resonate with families' realities and communication preferences. By building understanding and confidence among caregivers, NDPCPs saw education and engagement as powerful levers for improving ECC prevention.

5.4.4 Advocating for Policy Changes that Enable and Sustain CRA Use

NDPCPs noted that supportive policies are necessary to institutionalize CRA as part of routine child health care. This theme highlights four key areas of advocacy: establishing fee-for-service models for NDPCPs; formally incorporating CRA into existing Well Child programs; engaging healthcare administrators to support implementation at the system level and introducing upstream strategies to reduce sugar consumption.

Participants consistently noted that without financial incentives or protected time, providers may be unable to sustain CRA activities in already overstretched clinical settings. Introducing billing codes and compensation models for activities such as CRA assessments and fluoride varnish application was viewed as critical.

"Maybe it's a fee-for-service billing code, so if a physician is doing this as part of their assessment for a well-child, they can be remunerated for their time, you know, providing service." **(Josh, nurse practitioner)**

Beyond clinical delivery, participants also pointed to the need for broader public health measures that support oral health prevention such as reducing the sugar content in commonly consumed foods and beverages.

"If things can be done to reduce the sugar content before they're even on the shelves that will go a long way." **(Bayo, family physician)**

Several participants saw opportunities to embed CRA into already-existing touchpoints with families, particularly during routine well-child visits. These visits were viewed as ideal moments for CRA, given the preventative focus and reduced stress compared to acute care encounters.

"Yeah, so like I said, I really think this is like a well-child thing that you're coming in there, there's no stresses or anything like they're coming in there for that. I think that's the mindset." **(Betty, nurse)**

Finally, participants noted that policy-level decisions such as enabling CRA through management directives, training supports, and institutional buy-in must come from leadership and be embedded in health system processes.

"That would definitely be coming from much higher up for that part... we do the education pieces, but yeah, applying the fluoride varnish, I would want training in that if it was implemented through management." **(Fabeha, nurse)**

Together, these insights reflect NDPCPs' understanding that policy support from funding to leadership engagement is necessary to implement the CRA tool and embed oral health into the everyday structure of child health care.

TABLE 5. 1. SOCIODEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS

No.	Pseudonym	Age years	Sex	Years in practice	Profession	Years of experience caring for Indigenous children
1	Florence	27	Female	3	Nurse	3
2	Anna	46	Female	19	Nurse	19
3	Glory	50	Female	24	Nurse	24
4	Nancy	52	Female	24	Nurse	24
5	Sarah	38	Female	5	Nurse	5
6	Lola	52	Female	30	Nurse	20
7	Alice	36	Female	12	Nurse	7
8	Sofia	39	Female	18	Nurse	1
9	Becky	48	Female	21	Nurse	7
10	Fiona	40	Female	13	Nurse	13
11	Josh	35	Male	11	Nurse Practitioner	6
12	Helen	32	Female	8	Dietitian	8
13	Edna	35	Female	13	Nurse	1
14	Mary	42	Female	19	Nurse practitioner	16
15	Surat	28	Female	5	Nurse	5
16	Precious	42	Female	1	Nurse	1
17	Peter	55	Male	29	Family physician	28
18	Chris	33	Male	6	Program manager	1
19	Jane	49	Female	12	Nurse	6
20	John	29	Male	7	Nurse	1
21	Judy	54	Female	23	Nurse	10
22	Janice	33	Female	8	Nurse	4
23	Melisa	38	Female	8	Nurse	1
24	Nelly	61	Female	40	Nurse	40
25	Crystal	54	Female	20	Nurse	10
26	Jo-Anne	43	Female	14	Nurse	14
27	Sharon	50	Female	4	Nurse support	4
28	Melissa	43	Female	1	Child development worker	1
29	Hope	29	Female	1	Child development worker	1
30	Eunice	40	Female	1	Child development worker	1
31	Eli	50	Female	1	Child development worker	1
32	Mindy	35	Female	12	Nurse	10
33	Natalie	33	Female	3	Physician assistant	3
34	Queen	46	Female	25	Nurse practitioner	25
35	Tina	49	Female	29	Nurse	4.5
36	Nina	43	Female	22	Nurse practitioner	19
37	Ocean	40	Female	15	Nurse	15
38	Fabeha	45	Female	19	Nurse	1

39	Jasmine	39	Female	18	Nurse	18
40	Emma	24	Female	1	Nurse	1
41	Carol	33	Female	10	Nurse	10
42	Betty	52	Female	20	Nurse	20
43	Bayo	43	Male	15	Family Physician	2
44	Rose	37	Female	7	Pediatrician	11
45	Dan	44	Male	18	Family physician	4
46	Sam	55	Male	30	Pediatrician	18
47	Athena	53	Female	15	Physician	5
48	Joan	32	Female	1	Pediatrician	1
49	Maria	30	Female	1	Physician assistant	1
50	Daniella	49	Female	35	Nurse practitioner	35

TABLE 5. 2. KEY THEMES AND SUBTHEMES FOR CRA IMPLEMENTATION

S/N	Themes	Subthemes
1	Strengthening Primary Care Systems to Support CRA Integration	• Train primary care providers on CRA • Management approval and leadership support • Standardized documentation, referral, and follow-up pathways • Incentives for providers (e.g., additional staff, fee-for-service, recognition for work done) • Provision of fluoride varnish and educational resources • Integrate CRA into EMR
2	Building Trust and Culturally Safe Connections with Indigenous Communities	• Build trust through respectful engagement • Culturally safe oral care • Provision of oral health supplies to support hygiene practices • Transportation support • Integrate CRA into Head Start and community events
3	Educating and Engaging Families in Oral Health Prevention	• Educate parents and caregivers on child oral health • Distribute take-home dental care resources • Promote oral health education in primary care settings • Effective communication via social media and local radio
4	Advocating for Policy Changes that Enable and Sustain CRA Use	• Define CRA responsibilities in provider job descriptions • Fee-for-service support for NDPCPs and funding • Secure support from healthcare administrators • Integrate CRA into well-child programs • Policies for sugar reduction in products and fluoride use

5.5 Discussion

This qualitative study explored the perspectives of NDPCPs on the implementation and integration of the Canadian CRA tool into primary care for First Nations and Métis children in Manitoba. The study findings provide actionable strategies that can inform culturally responsive oral health integration in underserved communities. These are organized under four thematic areas that reflect provider recommendations: strengthening primary care systems, building trust and culturally safe connections, educating and engaging families, and advocating for policy change.

5.5.1 Strengthening Primary Care Systems to Support CRA Integration

While NDPCPs described the CRA tool as user-friendly, they emphasized that successful implementation requires foundational system-level support. The most pressing need identified was training particularly in fluoride varnish application, which many providers lacked experience with. Participants also expressed the need for training in anticipatory guidance and behavior management. These findings reflect broader literature emphasizing the importance of comprehensive training both technical and relational for effective preventive dental care (Atchison & Weintraub, 2017; Lienhart et al., 2023).

Institutional support was also viewed as essential. Endorsement from clinic managers and the presence of local CRA “champions” were seen as enablers of sustained implementation, especially among providers concerned about operating outside their scope. This aligns with research showing that leadership and organizational buy-in are critical to integrating new clinical practices (Christian et al., 2023).

The need for standardized and straightforward documentation was also emphasized. Effective ways to document the CRA visit and referral pathway to dental providers are essential for ensuring consistent

application of the CRA tool and for streamlining its use across different settings (Christian et al., 2023). Participants recommended integrating CRA into electronic medical records (EMRs) to streamline documentation and support referrals. EMR integration was seen as a way to standardize practice, improve data flow, and enhance interdisciplinary care. Literature supports these benefits, noting EMRs improve efficiency, reduce errors, and support coordinated care (Uslu & Stausberg, 2021). Additionally, access to up-to-date directories of dental providers who accept children with public insurance was considered crucial to ensure continuity of care. Participants noted that assessing a child's caries risk is pointless if there are no available dentists to provide treatment. Recently, the Canadian Government launched the expansion of public coverage for dental services for children through the interim Canada Dental Benefit (CDB) (October 2022 to June 30, 2024) and the Canadian Dental Care Plan (CDCP) (enrollment began June 27, 2024, for children < 18 years). The purpose of the interim CDB was to provide low-income families in Canada with financial assistance in accessing oral health care services for eligible children 12 years of age and younger (Goubran et al., 2024). With the successful implementation of the CDCP there is optimism that more children will access needed oral health care. Still, access to dental providers will remain a challenge in many rural and remote communities, underscoring the need to improve prevention. Integrating CRA into primary care may facilitate the uptake of the CDCP especially in Indigenous communities where there is shortage of dental providers.

Beyond logistical integration, participants highlighted that workplace incentives could promote CRA uptake. These included fee-for-service billing, staffing support, and formal recognition of new responsibilities. In the U.S., similar incentive models through Medicaid have improved preventive dental service delivery by medical providers (Goldstein et al., 2022; Herndon et al., 2015; Kim et al., 2020; Kranz et al., 2020). Currently, such mechanisms are lacking in Canada. Policies that support medical

providers to provide preventive oral health services for infants and toddlers should be implemented in Canada.

5.5.2 Building Trust and Culturally Safe Connections with Indigenous Communities

NDPCPs emphasized that fostering trust and providing culturally safe care are critical for successfully implementing the CRA tool in Indigenous communities. Participants acknowledged that First Nations and Métis families have experienced longstanding systemic inequities in oral health care, which have led to skepticism and reduced engagement with health services (Kyoon-Achan et al., 2021a). To address this, they recommended relationship-based approaches rooted in respect, consistency, and cultural humility.

Embedding CRA into trusted, community-led programs such as the Families First home visiting program was seen as a promising strategy. These programs are already well-integrated into family routines and offer a foundation for delivering preventive oral health guidance in a supportive and familiar environment (Healthy Child, 2010). Leveraging existing relationships with public health nurses could increase community acceptance of CRA and improve access to dental referrals.

The participants stressed the need for culturally safe dental care within Indigenous communities. They recommended meeting patients where they are, recognizing that many have experienced racism and intergenerational trauma. Challenges such as houselessness and lack of phones often prevent patients from keeping dental appointments, as they may not receive reminder calls. To address this, some participants proposed implementing flexible walk-in clinics, allowing patients to receive care when they are ready, especially those struggling with addiction.

Creating a safe space for children's oral health was also highlighted. Participants noted that parents might avoid dental visits due to fear of judgment for delayed dental visits or having advanced caries.

Dental personnel should be trained in trauma informed care. The CRA tool, for example, requires guidance on feeding practices and dietary habits, but many communities face food insecurity where healthy options are costly or unavailable. Cultural safety and appropriateness is particularly important for First Nations and Métis peoples in light of the history of the colonial health care system in Canada (Auger et al., 2019). Oral health advice should be delivered in a culturally safe manner to be effective (Kyoon-Achan et al., 2021c).

Participants identified that transportation was a major barrier to accessing dental care, along with the challenge of making alternative arrangements to travel outside the community. This is due to the frequent lack of publicly funded or private transportation in remote areas, and when transportation is available, it is often very expensive (Hussain, 2022). Commuting to care and not having transportation to get there is a challenge faced by First Nations and Métis parents in northern, remote, rural and urban communities. Many missed dental appointments are linked to inadequate transportation options (Kyoon-Achan et al., 2021a). In Indigenous communities, the scarcity of local dental providers often necessitates travel to other communities or cities for care. Single parents, in particular, often depend on other community members for transportation. Referring children to the dentist after a CRA will require additional support for parents, including transportation. Missed appointments result in no-show bills, which further discourages families from seeking necessary dental care for their children. Policies should be geared towards availability of affordable transportation for these communities.

5.5.3 Educating and Engaging Families in Oral Health Prevention

Participants identified caregiver education as a critical component of CRA implementation. Many parents were perceived to lack foundational knowledge about early childhood oral health, including the importance of primary teeth, appropriate feeding practices, and early hygiene routines. NDPCPs frequently encountered misconceptions such as the belief that apple juice is a healthy bottle option or

that baby teeth do not require regular care. These findings reflect previous literature documenting gaps in oral health literacy among caregivers in underserved communities (Kyoon-Achan et al., 2021c; Poirier et al., 2021). Some of these recommendations include, using culturally appropriate information in local languages, home visits for hands-on teaching, promoting oral health during community health fairs, in schools and daycares, placing information sheets with visual teaching aids at community centers (Kyoon-Achan et al., 2021a; Kyoon-Achan et al., 2021c). It is interesting to note that there are existing educational resources for parents through our Healthy Smile Happy Child (HSHC) initiative, but perhaps NDPCPs aren't aware. To make CRA integration easier, HSHC needs to reach out to NDPCPs to provide their offices with these resources to distribute to families (Kyoon-Achan et al., 2021b). In addition to traditional materials, participants highlighted the importance of effective information dissemination through trusted community channels. Social media platforms like Facebook, local radio stations, and posters in community centers were seen as valuable tools for promoting oral health messages and raising awareness about CRA. These channels are already widely used in many Indigenous communities to share health information, preserve cultural identity, and promote engagement across generations across all generations (Intahchomphoo C. Vellino A, 2021). Several NDPCPs also noted that integrating oral health messaging into routine medical visits could help normalize dental care as part of holistic child health. However, participants believed that both caregivers and clinic staff may need further orientation to understand and accept the role of NDPCPs in delivering preventive oral health services. Ensuring that families recognize CRA as a credible and beneficial tool was seen as important to fostering uptake and follow-through.

5.5.4 Advocating for Policy Changes that Enable and Sustain CRA Use

NDPCPs emphasized that meaningful integration of CRA into Indigenous pediatric primary care requires policy-level support. Participants advocated for system-wide changes that would embed CRA into routine child health services, backed by clear funding mechanisms, organizational endorsement, and public health alignment.

A central recommendation was the introduction of fee-for-service billing codes to compensate NDPCPs for conducting CRA, applying fluoride varnish, and delivering oral health education. Without financial incentives or formal recognition, participants feared CRA would remain a low priority in busy primary care settings. This aligns with evidence from U.S. programs where fee-for-service billing models have been successfully implemented in many states. Involving and reimbursing NDPCPs for delivering preventive oral health services (POHS) has been linked to increased uptake and delivery of these services in medical settings for children (American Academy of Pediatrics, 2024; Kranz et al., 2021; Kranz et al., 2022; Okunseri et al., 2009). Participants also recommended integrating CRA into existing well-child clinics and services, positioning oral health as a routine part of early developmental care. By embedding CRA within familiar child health check-ups, NDPCPs believed uptake could improve without the need for creating entirely new service streams.

Several participants raised concerns about sugar consumption in early childhood, suggesting that policies aimed at reducing sugar in marketed foods and beverages could complement CRA efforts. While fluoride varnish plays a protective role, reducing dietary sugar remains a cornerstone of ECC prevention (van Loveren, 2019).

Public health strategies that target both prevention and broader determinants of oral health were seen as necessary.

Finally, participants stressed the importance of leadership and advocacy from regional and provincial health authorities. Engaging Manitoba Health, Shared Health, and regional health managers will be critical to developing implementation frameworks, coordinating training, and ensuring CRA-related services are equitably supported across communities.

While NDPCPs play a critical role in integrating oral health into primary care, participants also emphasized the need for greater collaboration with dental professionals. In many rural and Indigenous communities, however, limited availability of dental providers presents a challenge to sustained interdisciplinary care. Strengthening pathways for communication and shared care between NDPCPs and dental professionals may enhance the implementation of CRA and improve continuity of care. Future research should explore models of interdisciplinary collaboration that support oral health integration in primary care, particularly in under-resourced settings.

5.6 Strengths and Limitations

To our knowledge, this is the first qualitative study to explore NDPCPs perspectives on implementing the Canadian CRA tool for preschool-aged children. Although focused on First Nations and Métis communities in Manitoba, the findings have broader relevance. Globally, Indigenous and marginalized populations face similar barriers to accessing preventive oral health care, including systemic inequities, workforce shortages, and concerns about cultural safety. This study contributes to the international discourse on integrating oral health into primary care through interdisciplinary, community-based approaches. By illustrating how a CRA tool can be integrated into non-dental primary care workflows, our study provides practical insights that may inform similar efforts in other countries working to address disparities in early childhood oral health.

As with most qualitative research, our findings are shaped by the researcher's role as the primary instrument of data collection and analysis, which introduces the potential for interpretive bias. We

mitigated this risk through triangulation and member checking. While the contextual specificity of the Canadian healthcare system and CRA tool may limit transferability, the broader principles such as culturally safe care, provider training, interprofessional collaboration, and policy support are applicable to other international settings aiming to improve early childhood oral health in underserved populations.

Finally, this study focused solely on healthcare providers' views. Future research should engage parents and caregivers the end-users to understand their perspectives on integrating the CRA tool into primary care. This will support the design of culturally appropriate, acceptable, and effective interventions.

5.7 Conclusion

NDPCPs in Manitoba are supportive of integrating oral health care into primary care of Indigenous children. Key recommendations include training on how to perform CRA, deliver anticipatory guidance and apply fluoride varnish; secure funding; addressing staffing shortages; improving access to dental resources; and establishing clear referral pathways for children in need of dental care. NDPCPs' recommendations can inform the implementation of the Canadian CRA tool, and the development of policies aimed at improving access to preventive oral health care services for Indigenous children. Integrating the CRA into primary care, supported by relationship-based, culturally responsive approaches, will help promote the uptake of the CDCP especially in Indigenous communities.

Bridge to Chapter 6- From Recommendations to Capacity Building, Preparing Providers for Caries Risk Assessment (CRA) Implementation

The successful implementation of the Canadian CRA tool in Indigenous pediatric primary care depends not only on systemic readiness and policy alignment, as outlined in Chapter 5, but also on the preparedness and capacity of frontline healthcare providers. While non-dental primary care providers (NDPCPs) articulated support for CRA integration, their ability to operationalize these recommendations is inherently tied to their clinical confidence, skills, and contextual knowledge.

This chapter serves as a conceptual and practical bridge between the system-level recommendations discussed in Chapter 5 and the detailed exploration of provider training needs that follows in Chapter 6. It positions training not merely as a supportive intervention but as a core enabler of CRA implementation.

Training as an Enabler of Practice Change

While Chapter 5 identified four central domains for CRA integration system support, community trust, caregiver engagement, and policy change each domain implicitly assumes provider competency. For example, embedding CRA into electronic medical records or well-child visit protocols presumes a basic familiarity with the CRA tool, as well as an understanding of fluoride varnish application, caries risk identification, and referral documentation.

However, insights from previous chapters underscore that such competencies cannot be assumed. Many NDPCPs reported minimal formal training in preventive oral health, limited exposure to pediatric oral screening techniques, and little confidence in applying fluoride varnish. Thus, provider training emerges as both a barrier and a prerequisite to implementing the recommendations set out in Chapter 5.

The Role of Context-Specific Training

Provider feedback emphasized the importance of training approaches that are not only clinically rigorous but also contextually relevant. Differences in geographic location, service structure, and available resources across Manitoba necessitate tailored training strategies. Urban providers preferred blended models combining in-person and online learning, while rural and remote providers expressed a need for flexible, accessible formats that address travel and staffing constraints.

These training preferences mirror the logistical and cultural complexity of CRA implementation across Indigenous communities. Moreover, NDPCPs emphasized the importance of culturally safe content that reflects the oral health priorities, experiences, and histories of First Nations and Métis families. Therefore, training design must consider not only "what" is taught but also "how," "where," and "by whom" it is delivered.

Bridging Strategy and Capacity

Chapter 5 established a comprehensive implementation framework for the CRA tool. However, the utility of that framework relies on whether NDPCPs are adequately equipped to act on it. Chapter 6 responds directly to this implementation gap by detailing the core competencies NDPCPs require and examining preferred methods of training delivery.

This transition from macro-level planning to micro-level preparedness reflects a necessary continuum in implementation science. Bridging systemic strategy with provider capacity ensures that CRA integration is both technically feasible and human-centered. Furthermore, it aligns with the principles of equity, cultural responsiveness, and workforce development that underpin this thesis.

FIGURE 5. 1 BRIDGING CRA RECOMMENDATIONS TO TRAINING IMPLEMENTATION

This figure illustrates the logical flow between Chapters 5 and 6. Chapter 5 presents system-level recommendations for CRA tool integration. This bridging chapter identifies provider training as a necessary enabler to operationalize those recommendations. Chapter 6 explores in depth the specific training needs and delivery preferences of NDPCPs working with Indigenous children. Together, these chapters support a cohesive, implementation-focused roadmap for CRA integration in Indigenous pediatric primary care.

In sum, the recommendations outlined in Chapter 5 cannot be realized without a deliberate investment in provider training. This bridging chapter emphasizes the importance of aligning strategic goals with the realities of clinical practice and service delivery. The next chapter explores this alignment in detail, offering evidence-based insights into the specific training content and formats required to support CRA integration in Indigenous pediatric care.

Chapter 6: Identifying Training Needs of Healthcare Providers to Implement Caries Risk Assessment

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6.1 Abstract

Early childhood caries (ECC) remains a pressing concern among Indigenous children in Canada, driven by systemic inequities, limited access to care, and fragmented service delivery. Integrating caries risk assessment (CRA) into primary care presents an opportunity to improve early detection and prevention. This study explored the training needs and preferred delivery methods of non-dental primary care providers (NDPCPs) to support CRA implementation in Indigenous pediatric settings.

This qualitative exploratory study involved 50 NDPCPs serving First Nations and Métis children under six years of age across 10 communities in Manitoba. Data were collected between April 2023 and February 2025 through eight focus groups and 12 key informant interviews, followed by brief individual interviews to assess preferred training modalities. Transcripts were analyzed using thematic analysis to identify key training needs and preferences.

Participants included physicians, nurse practitioners, public health nurses, physician assistants, dietitians, and child development workers. Four core training areas were identified: dental caries screening, CRA tool usage, fluoride varnish application, and documentation/referral processes. Despite recognizing the CRA tool's value and ease of use, participants reported limited formal training in preventive oral health and stressed the need for hands-on, culturally appropriate instruction. Preferred training modalities varied by geography: urban providers favored blended in-person and online approaches, while rural providers preferred online formats due to travel constraints. Overall, in-person and interactive training was most preferred.

NDPCPs require structured, context-specific training to effectively integrate CRA into routine care. A hybrid training model combining online modules with locally delivered, hands-on learning may best address geographic and resource-based disparities. Training content should be simple, skill-focused, and culturally responsive to support NDPCPs in delivering equitable oral healthcare to Indigenous children.

6.2 Introduction

Dental caries, commonly known as tooth decay, remains a pressing public health issue that disproportionately affects Indigenous communities in Canada (Kyoon-Achan et al., 2021a; Kyoon-Achan et al., 2021c). Despite advancements in preventive care and education, Indigenous populations continue to experience higher rates of dental caries compared to the general population. Contributing factors include limited access to oral health services, socio-economic challenges, cultural barriers, provision of culturally inappropriate services and the lasting impact of colonization (Ashworth, 2018; Hussain, 2022; Poirier et al., 2023c). For those residing in rural and remote areas, additional barriers such as a shortage of dental professionals, geographic remoteness, financial constraints, travel difficulties, inadequate infrastructure, and limited dental insurance coverage further exacerbate oral health disparities (Alhozgi et al., 2021; Shrivastava et al., 2020). Moreover, the fragmentation of healthcare services and the separation of dental and medical care have intensified the burden of oral disease among Indigenous populations (Harnagea et al., 2017; Stange, 2009). Addressing this inequity requires innovative strategies that integrate oral healthcare into existing primary care frameworks.

Non-dental primary care providers (NDPCPs) play a crucial role in delivering comprehensive health services within Indigenous communities. As frontline healthcare professionals, they are well-positioned to identify and address oral health risks (Barnett et al., 2015; Schroth et al., 2021). Collaborative efforts between medical and dental professionals can enhance service delivery, ensuring that underserved populations receive timely oral health assessments and interventions (Glick & Williams, 2021). Several professional organizations advocate for medical providers to conduct oral health assessments for children as young as six months and address ECC risk factors (American Academy of Pediatric Dentistry. Clinical Affairs Committee--Infant Oral Health, 2012; Holve et al., 2021; "Prevention of dental caries in children from birth through five years of age: recommendation

statement," 2015). Additionally, the US Preventive Services Task Force (USPSTF) recommends that primary care clinicians apply fluoride varnish to the primary teeth of all infants and children starting at the age of primary tooth eruption (Grade B) (Moyer, 2014). The Canadian CRA tool for children below age 6 years is a standardized tool designed to assess an individual's risk for developing dental caries and guide preventive strategies (Schroth et al., 2021). However, successful implementation of this tool within Indigenous communities requires targeted training for NDPCPs to ensure effective utilization while maintaining cultural appropriateness.

This paper explores (1) the training needs of NDPCPs and (2) their preferred training delivery method for the implementation of the CRA tool in Indigenous communities. By identifying knowledge gaps, skill requirements, and cultural safety needed, this research aims to provide actionable recommendations to strengthen the capacity of primary care providers in addressing oral health disparities. It further emphasizes the importance of a collaborative, community-centered approach to ensure that training programs are aligned with the unique needs, preferences, and values of Indigenous populations.

6.3 Methods

6.3.1 Ethical Approval

This study received ethics approval from the University of Manitoba Health Research Ethics Board (HREB) under approval number HS25866 (H2023:050). The study is part of a broader research initiative funded by the Canadian Institutes of Health Research (CIHR) in partnership with the First Nations Health and Social Secretariat of Manitoba (FNHSSM) and the Manitoba Métis Federation (MMF), with additional ethics approvals HS24621 (H2021:043) and HS20926.

6.3.2 Study Design and Setting

This qualitative exploratory study aimed to identify the training needs and preferred training delivery methods for NDPCPs working with First Nations and Métis children in Manitoba to implement and integrate the Canadian CRA tool (Appendix A) into primary care. The study builds upon previous research that identified barriers to implementing the CRA tool for preschool-aged children (Olatosi et al., 2025b).

6.3.3 Participant Recruitment and Selection

Participants were purposefully recruited based on predefined eligibility criteria. Inclusion criteria required that participants be NDPCPs serving First Nations and Métis children under six years old. Recruitment took place across 10 Indigenous communities in Manitoba, and details of the recruitment process have been previously reported (Olatosi et al., 2025b).

6.3.4 Data Collection

Between April 2023 and September 2024, 50 NDPCPs participated in the study through eight focus groups and 12 in-depth key informant interviews. A semi-structured interview guide, informed by a literature review and previous research, was iteratively refined by an interdisciplinary team specializing in early childhood oral health, health promotion, community development, and Indigenous health. Focus group sessions, conducted at community health centers, lasted between 45 to 75 minutes, while key informant interviews lasted 15 to 30 minutes. Sessions were audio-recorded and supplemented with field notes. A follow-up interview phase, conducted between December 2024 and February 2025, sought to determine participants' preferred training delivery methods. Participants were asked to indicate their preferred format among the following three training modalities (Sams et al., 2016):

1. Online Training – Internet-based learning, including slide presentations, written modules, online videos, or webinars.

2. In-Person Training – Face-to-face lectures, often including Q&A sessions.

3. Either 1 or 2 inclusive of Interactive Training – A supplementary component involving hands-on demonstrations (e.g., patient positioning for oral screenings or fluoride varnish application).

The follow-up interviews averaged five minutes, and all interviews were transcribed verbatim.

6.3.5 Data Analysis

Data analysis was conducted concurrently with data collection, employing both inductive and deductive thematic approaches. We used the constant comparative method to iteratively refine emerging themes and concepts. Open coding was done by analyzing transcript line by line, with codes assigned to capture key meanings. Thematic development was done by grouping related codes to form themes, ensuring a structured interpretation of the data.

6.3.6 Rigor and Trustworthiness

To ensure methodological rigor, the study adhered to qualitative research standards emphasizing dependability, confirmability, credibility, and transferability (Richards & Morse, 2013). Measures such as audio recordings, verbatim transcriptions, and participant verification enhanced data reliability. Detailed methodological descriptions and direct quotes were included to support transferability (Krefting, 1991).

6.4 Results

Interviews were conducted between April 2023 and February 2025, with a total of 50 NDPCPs participating in the baseline interviews. The participants represented a diverse range of healthcare

professionals, including physicians (n=8), public health nurses (n=31), nurse practitioners (n=4), physician assistants (n=2), dietitian (n=1), and child development workers (n=4). Through thematic analysis, four key themes emerged regarding the training needs of participants: screening for caries, CRA screening tool, fluoride varnish application, and documentation and referral pathways.

At follow-up, 28 NDPCPs participated, with 60% practicing in urban centers. Geographic location was considered a potential factor influencing preferred training delivery methods. Most participants (64%) preferred an in-person plus interactive training approach, followed by online plus interactive training (60%). The least preferred method among participants was the online-only format. Notably, among NDPCPs in rural centers, 71% preferred online-only training, highlighting the impact of geographic constraints on training preferences **(Figure 6.1).**

6.4.1 Screening for Dental Caries

Participants emphasized the need for training on identifying and screening for dental caries. They highlighted the importance of understanding the different stages of caries progression, with some suggesting that visual aids such as pictures or opportunities to observe and shadow dental providers would be beneficial. Additionally, they expressed interest in training on the causes and prevention of dental caries. Given time constraints, they recommended that the training be kept simple to facilitate quick identification and screening.

*"If you can get … experienced dental colleague to do very quick [training] because people don't really have time for anything that takes too long. And done in such a way to improve comfort of primary care providers when dealing with oral health. So we need to keep it super and drill it down to the basics" (*Nurse Practitioner, 2).

One family physician, in particular, noted a lack of specific training in pediatric dental exams and expressed a need for additional education on the subject:

"As a family doc, we don't have any information specific about the kid at that age about how to do the exam or what we are looking for. If we can have actual training or something like that will be beneficial for sure." (Physician, 1)

Some participants stressed the importance of understanding not just how to screen for caries but also what interventions dentists provide and the potential consequences of untreated childhood dental caries:

"Getting some additional training on recognition of pediatric dental caries, some education on what the dentists do, what they offer and what kind of interventions they do, and some more education on the consequences of childhood dental caries just for education purposes for the parents would be helpful." (Physician, 2)

Others suggested that training should be tailored to varying levels of confidence and comfort among healthcare providers. A mix of visual materials and hands-on demonstrations could be effective in ensuring competency:

"Everybody's practice is different and everybody's confident and comfort level is different. So I think even a visual like these [referring to the CRA tool] are great. So maybe more in detail would be helpful." (Nurse Practitioner, 1)

Finally, participants underscored the importance of making training concise and accessible, with a focus on building confidence among primary care providers in addressing oral health:

"I think really need to be able to observe or shadow the dental hygienist or dentist when they screen preschoolers, that would be a good training to see the actual team person do it." (Nurse, 1)

6.4.2 Caries Risk Assessment (CRA) Tool

Participants generally found the CRA tool easy to use and well-structured. One nurse described it as straightforward:

"I would say a quick review, right? Like, this is very nicely laid out. I feel this is very straightforward" (Nurse, 2).

However, while the tool itself was considered user-friendly, participants highlighted the need for initial training to familiarize themselves with its content, particularly regarding anticipatory guidance and answering related questions from parents. As one nurse explained:

"Just the confidence, right? Like getting familiar with the tool, getting comfortable using it, and then the varnish…remembering to do it as part of our regular assessment" (Nurse, 3).

Some participants sought clarification on the tool's practical application, including its frequency of use and expected outcomes:

"How do we navigate through this form? How often do you want us to fill this form and what is the outcome of this form? How do we appreciate there is outcome of this work" (Physician, 3).

Sustaining and maintaining training for new staff was also identified as a key factor in successful implementation. Participants emphasized the importance of ongoing education, particularly in ensuring cultural competence when using the tool:

"We'd have to get a good overview education for whoever's providing it. And then keeping on top of that, for all the new staff that come in as part of the implementation process. How to use the tool and how to talk to them about it? So it's about making sure that they're just making an informed decision, not being judgmental" (Nurse Practitioner, 3).

Finally, participants acknowledged that proper training over time builds confidence in using the CRA tool effectively:

"Just like with the appropriate training, I think, you know, having that training builds the confidence and with time, over time" (Dietitian).

Overall, while the CRA tool was seen as an accessible and valuable resource, participants emphasized the importance of initial and ongoing training to enhance confidence, ensure accurate risk assessment, and maintain cultural sensitivity in its application.

6.4.3 Fluoride Varnish Application

Participants discussed their knowledge of fluoride and fluoride varnish application as a crucial skill necessary for implementing the CRA tool. While many recognized the need for training in fluoride varnish application, some questioned whether it fell within their job responsibilities. However, they expressed willingness to undergo training if it were clearly outlined in their job descriptions and supported by management. As one participant stated:

"Like you said, it's within our scope, but we're nurses and nowhere in nursing school that I learned to apply varnish and even for public health. So we would need training, even if it's very like simple. And told by our up above that it is what we are doing" (Nurse, 4).

Another important concern identified by participants was the behavioral management of children during fluoride varnish application. Some expressed the need for strategies to ensure children's cooperation, as it can be challenging to keep their mouths open long enough for application. One nurse highlighted this challenge:

"And regarding the fluoride [varnish] about applying it, I would definitely say we would want some training and maybe tips on how to get a kid to keep their mouth open long enough for me to put fluoride. I would like some tips and tricks on how you guys manage that" (Nurse, 5).

Beyond the technical aspect of fluoride varnish application, participants also noted gaps in their knowledge regarding the benefits of fluoride and how to effectively communicate these benefits to parents. Some emphasized the importance of having clear post-application instructions available in the

form of flyers or leaflets for parents and caregivers. One participant expressed a need for more detailed guidance:

"If we were to apply fluoride, I guess I would need some more information about how to do that. If they're [children] supposed to spit it out, swallow it and leave it on like I don't know anything about what's supposed to be done with that" (Nurse, 6).

Additionally, some participants believed that training and implementation should be driven by higher-level management decisions. They indicated that while they are involved in patient education, direct application of fluoride varnish would require structured training and support from leadership:

"That would definitely be coming from much higher up for that part, because we do the education pieces but yeah, applying the fluoride varnish, I would want training if it was implemented through management." (Nurse, 7)

Overall, the discussion highlighted the need for structured training in fluoride varnish application, behavioral management strategies for children, improved knowledge on the benefits of fluoride, and clear communication tools for parents. Participants emphasized the importance of management support in successfully integrating fluoride varnish application into their practice.

6.4.4 Documentation and Referral

Participants discussed the challenges and training needs associated with documentation and referral for dental care, particularly for their patients who are predominantly from low socioeconomic backgrounds. They emphasized the need for structured training on how to document referrals effectively and clear information on available and affordable treatment centers to ensure that patients receive appropriate dental care.

"Just knowing which centers are going to be available for patients, particularly of low socioeconomic class, where they can go and get affordable treatment, just that sort of information will be useful." (Physician, 4)

Many participants expressed uncertainty about the referral process, including where to send patients and the affordability of services. They highlighted the need for training on referral pathways, eligibility criteria, and financial assistance programs:

"Oh, refer to dental office for treatment. You know what? That's another thing, sometimes I'm like who are we referring them to, where are they going? Is it free? Is there low budget friendly, low income ….That's always the issue, I never really know" (Nurse, 8).

Participants also pointed out challenges in ensuring timely follow-up after an initial screening, often resulting in delays in care. Training in effective coordination with dental professionals and streamlining referrals was identified as a key need:

"We need better access to the professional screeners or to the appropriate dentist, or dental hygienist because we've run into barriers where we could screen but then the follow-up or to refer them to another professional could take a little longer" (Nurse, 1).

Ensuring a positive experience for referred families was another concern. Participants emphasized the need for training on how to identify and refer patients to trusted and culturally safe dental providers who understand the unique challenges faced by low-income families and provide a welcoming, nonjudgmental environment:

"I would want to make sure that this family is going to have a good experience and without knowing certain dentists, how do I pick one over another? If there is a list of dentists who were aware of this and who praise families for coming in, instead of why did you wait so long? I think that would be helpful" (Nurse, 9).

Overall, participants highlighted the need for structured training on documentation and referral processes as part of the implementation of the CRA tool. This includes knowledge of available dental resources, referral pathways, and strategies to ensure timely and effective follow-up. Addressing these training needs would enhance the efficiency of the referral process and improve access to dental care for vulnerable populations.

6.4.5 Preferred delivery method for CRA training

6.4.5.1 Online-Only Training

Online-only training was the least preferred method, selected by 25% of participants. However, among those who chose this method, 71% were located in rural areas of Manitoba. Distance and accessibility were key considerations for these participants:

"Online because of where we live. For fluoride varnish application, it depends if they can drive out to us. If we have to drive to them, I would prefer all of the training to be online" (Child Development Worker, 4).

6.4.5.2 In-Person Training

Thirty-six percent of participants preferred in-person training, citing benefits such as a more engaging learning environment and greater interaction:

"Personally, in person is a better learning environment because the information is right in front of your face" (Nurse, 12).

"I'm more of an interactive learner, so I would prefer training to be in-person. For fluoride varnish, I would prefer that to be demonstrated in person" (Physician, 5).

Some participants suggested structuring in-person training around their work schedules:

"In our clinic, it's very busy, but it's best to have this training in person. Nurses have a protected lunchtime, but I think this should be done over lunch and stagger the training sessions. I would suggest talking to the clinic manager" (Nurse, 13).

6.4.5.3 Online and In-Person Training

Half of the participants preferred a blended approach, integrating both online and in-person training. Among these, 70% were from urban centers. Participants recommended using online training for didactic instruction and content review, while in-person sessions could focus on hands-on experience and case discussions:

"I think online would be great to review the information, and in-person would be good for hands-on experience mixed with case studies" (Nurse, 11).

"Online didactic training should be one hour max. Practical training should be in person" (Physician, 6).

6.4.5.4 In-Person plus Interactive Training

This was the most preferred training method, chosen by 64% of participants. Many emphasized the importance of hands-on learning for skill development:

"I'm more of an interactive learner, so I would prefer training to be in-person. For fluoride varnish, I would prefer that to be demonstrated in person" (Physician, 5).

"A lot of people need hands-on training. A lot of people are visual learners and need that in-person training" (Nurse Practitioner, 4).

"Hands-on would allow me to get a feel for what's expected of me. For fluoride varnish, I would like in-person demonstrations with practice" (Nurse, 8).

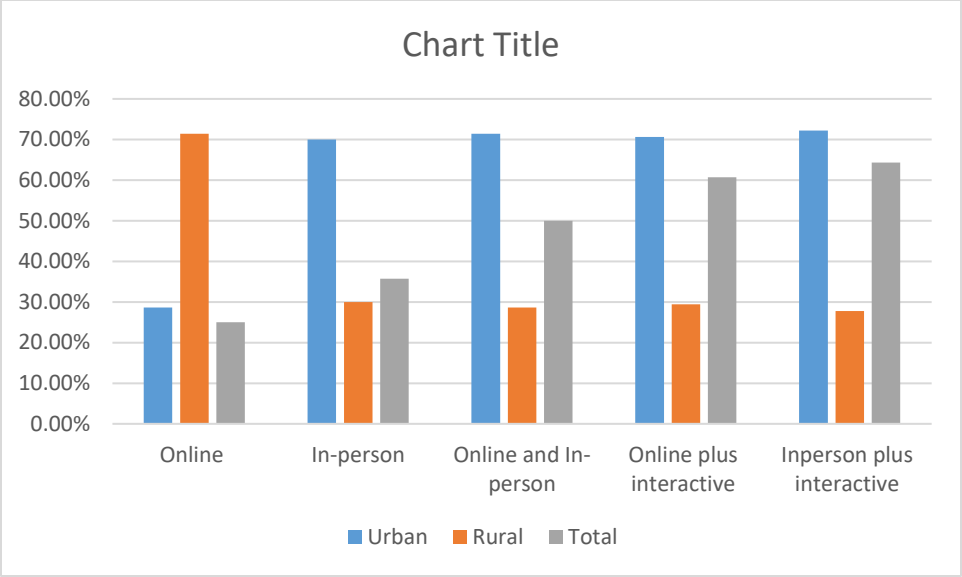


FIGURE 6. 1. GEOGRAPHIC CLASSIFICATION AND PREFERRED CRA TRAINING DELIVERY METHOD

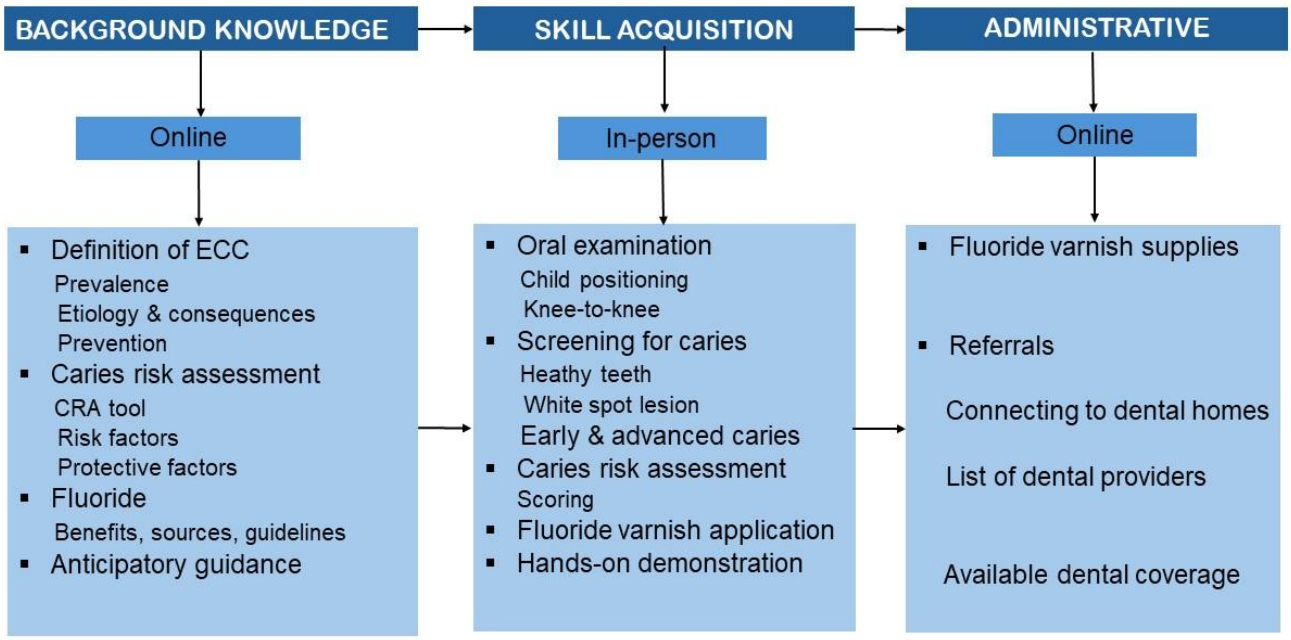


FIGURE 6. 2. CRA TRAINING MODEL

6.5 Discussion

This study explored the training needs and preferred delivery methods for implementing CRA tool among NDPCPs in Indigenous pediatric primary care settings. Key findings from this present study include strong endorsement of the CRA tool's usability and value, significant training gaps in preventive oral health skills, a preference for culturally relevant and hands-on learning, and the need for a hybrid training model that accommodates geographic and resource differences. These findings will be useful in informing the next steps of integrating CRA into primary care settings in Manitoba.

In the current study, participants described the CRA tool as beneficial for children, easy to use, and visually accessible due to its clear instructions and use of pictures. This is encouraging feedback as our CRA tool's design was shaped by feedback from 63 NDPCPs and stakeholders. Key suggestions from that earlier study emphasized the importance of a tool that is quick to complete, easy to score, seamlessly integrated into clinical workflows, and inclusive of anticipatory guidance for parents and caregivers (Schroth et al., 2023b). While NDPCPs in this study had positive feedback on the CRA tool, they also identified significant training gaps that need to be addressed for CRA to become part of their daily practices. These included limited knowledge and skills related to dental caries screening, the use of the CRA tool itself, fluoride varnish application, and documentation and referral procedures. These findings are consistent with earlier studies showing that NDPCPs often lack sufficient training in preventive oral health services (POHS), which restricts integration into routine care (Harnagea et al., 2017; Lienhart et al., 2023). Participants in this study specifically noted the absence of formal training in POHS as a barrier that undermines their confidence and ability to conduct CRA effectively. Evidence suggests that incorporating oral health into the training curricula of NDPCPs can enhance providers' confidence in delivering preventive oral health services, including anticipatory guidance, caries screening, and oral health risk assessments (Caspary et al., 2008). Moreover, inter-professional

collaboration and structured training programs have been shown to enhance the role of NDPCPs in oral health promotion (Niranjan et al., 2019; Ramos-Gomez et al., 2017; Ramos-Gomez et al., 2021).

Importantly, many participants noted that their willingness to participate in training depended on support from clinic leadership and alignment with their professional responsibilities. Leadership buy-in can support the necessary support, resources, authority and commitment to sustain change in practice (Hubbart, 2023). Also shared vision between management and staff is essential for managing practice change (Bleser et al., 2014). A recurring concern was managing children's behavior during fluoride varnish application, underscoring the need for training in child-centered communication strategies. Participants also called for clear guidance for parents' post-application, including accessible educational materials, this aligns with previous studies (Robert J Schroth, 2014; Sams et al., 2016). Identifying these perceived training needs is a crucial first step towards implementing the CRA tool effectively.

Providers highlighted the need for culturally grounded strategies, practical demonstrations, and strong leadership support. These findings echo previous studies emphasizing that collaborative, culturally responsive approaches are critical for the successful implementation of oral health interventions in Indigenous contexts (Kyoon-Achan et al., 2018; Poirier et al., 2023b). Sustained and tailored training, particularly for new staff members, was considered essential to ensure continuity of care.

Training needs extended beyond clinical competencies to include navigating local dental systems, understanding eligibility for publicly funded programs, and clarifying referral processes. These concerns reflect systemic barriers frequently cited in the literature, including poor access to dental providers and ambiguous referral pathways (Jones et al., 2024; Levy et al., 2023).

The present study also identified distinct preferences for training delivery methods among the NDPCPs. Training delivery preferences varied based on geography and resource availability. Overall, participants

preferred in-person and interactive training methods, citing the value of hands-on learning, real-time interaction, and opportunities to practice new skills. NDPCPs in urban areas favored blended training models, combining online theory with in-person skill development an approach supported by earlier research (Cappi et al., 2019).

In contrast, rural providers leaned toward online-only formats due to travel and staffing constraints. Interestingly, these preferences diverge from trends in broader healthcare training. A study by Sams et al, found that online training was the most predominant method used in 32 U.S. States to educate NDPCPs in oral health, with blended approaches being the least utilized (Mukurunge et al., 2021).

Online programs such as *Smiles for Life* (SFL) and *Protecting All Children's Teeth* (PACT) are widely endorsed for their accessibility and flexibility. However, participants in our study emphasized the greater value of experiential learning, hands-on learning over passive didactic methods.

Interactive modalities such as role-playing, case discussions, and skill demonstrations have been shown to significantly improve provider confidence and performance (Elendu et al., 2024; Mukurunge et al., 2021). While online training was the least preferred option overall, it was endorsed by rural participants for its flexibility and accessibility. The convenience of asynchronous, self-paced online learning is particularly beneficial in remote areas where staffing and travel barriers are more pronounced (Ruggeri et al., 2013).

The growing popularity of online learning, accelerated by the COVID-19 pandemic, has ushered in new technological innovations, including simulations, digital teaching aids, and virtual learning platforms (Naciri et al., 2021; Wyres & Taylor, 2020). A recent systematic review concluded that blended or online training approaches can achieve comparable, if not superior, outcomes in clinical skills development compared to traditional methods (McCutcheon et al., 2015).

Drawing on insights from this study, we recommend a geographically sensitive and needs-based approach to training NDPCPs for effective implementation of the Canadian CRA tool. A hybrid training model that combines established online modules such as SFL with locally accessible, in-person mentorship or practical demonstrations may offer the most feasible and impactful solution. This blended approach addresses both the flexibility required by providers in remote areas and the hands-on learning preferences expressed by many participants. To support efficient and sustainable integration of CRA into routine practice, training content should remain simple and focused. Core topics should include (**Figure 6.2**):

- An overview of ECC and prevention strategies
- Purpose and application of the CRA tool
- Child oral health screening and caries detection techniques
- Fluoride varnish application
- Communication with families and anticipatory guidance
- Guidance on establishing a dental home and navigating referral pathways

These targeted areas reflect both the learning needs identified by NDPCPs and broader best practices in preventive oral health care. Streamlined, practical training tailored to real-world clinical workflows can empower providers to confidently deliver oral health services and improve outcomes for Indigenous children.

6.6 Strengths and Limitations

A strength of this study is its focus on the voices of NDPCPs working directly with Indigenous children and families. The inclusion of various professional roles and settings provides a rich, practice-based understanding of training needs. However, the study is limited by its focus on one province, which may

limit generalizability. Additionally, while the logic model was developed with participant input, future work is needed to test its effectiveness in guiding CRA training implementation and evaluating outcomes.

6.7 Conclusion

This study provides critical insights into the training needs and delivery preferences of NDPCPs for integrating the CRA tool into Indigenous pediatric primary care. Despite recognizing the tool's value, providers expressed low confidence in performing preventive oral health tasks, pointing to the need for structured, context-specific training. A hybrid approach that combines online flexibility with in-person, hands-on learning tailored to both urban and rural settings is essential to build provider competence and confidence. Training must be simple, culturally grounded, and aligned with real-world workflows to support the successful integration of CRA into routine care. Empowering NDPCPs through targeted training and leadership support is a foundational step toward promoting oral health equity for Indigenous children across Canada.

Chapter 7: Conclusion and Future Directions

7.1 Overview of the Study

This thesis examined how caries risk assessment (CRA) can be integrated into Indigenous pediatric primary care in Manitoba to address the disproportionate burden of early childhood caries (ECC) among First Nations and Métis children. Guided by social constructivism, the research included a scoping review and three qualitative studies to identify barriers, develop provider-driven recommendations, and assess training needs. In doing so, this work contributes an evidence-informed roadmap for CRA implementation that is culturally safe, contextually relevant, and systemically supported.

7.2 Summary of Key Findings

7.2.1 Study objective 1 (Chapter 3): Literature review of caries risk assessment (CRA) and preventive oral health services (POHS) of young children by non-dental primary care providers (NDPCPs)

The first study objective is related to identifying existing CRA and POHS by NDPCPs. The review demonstrated that NDPCPs across various global contexts are increasingly engaged in CRA and preventive oral health services, including fluoride varnish application and referrals. However, integration into primary care remains uneven, and no Canadian studies were identified underscoring a critical implementation gap. System-level supports such as reimbursement policies, electronic medical record (EMR) integration, and interprofessional training were found to facilitate successful uptake elsewhere, providing important lessons that can be adapted for the Canadian context.

7.2.2 Study objective 2 (Chapter 4): To explore the perceived barriers to implementing the Canadian CRA tool among NDPCPs serving Indigenous children in Manitoba

The qualitative exploration highlighted barriers at multiple levels. Provider-level challenges included time constraints, lack of training, and unclear documentation of CRA. Community-level factors reflected

the separation of oral and general health systems, lack of transportation, and community distrust of health services of care providers. Caregiver-level barriers include a lack of insurance and competing priorities. Despite these challenges, NDPCPs perceived CRA as a valuable practice and expressed willingness to engage in oral health promotion if adequately trained and supported.

7.2.3 Study Objective 3 (Chapter 5): To identify provider-informed strategies for integrating CRA into Indigenous pediatric primary care

Building on the barriers identified, providers offered actionable strategies. These included EMR integration, standardized documentation, managerial endorsement and support in the operation of CRA in the clinics, and financial incentives. Community engagement strategies emphasized cultural safety, trust-building, and embedding CRA within established programs. Family education strategies involved accessible, culturally appropriate resources and the use of trusted communication channels. Policy advocacy focused on new billing codes for CRA into Government health insurance by NDPCPs, sugar reduction initiatives, and embedding CRA within Well Child visits.

7.2.4 Study Objective 4 (Chapter 6): To examine training needs and preferred delivery models for CRA implementation and to propose a training model for NDPCPs to use the CRA tool in Indigenous contexts.

Providers identified four essential areas for training: How to 1) perform caries screening, 2) use the CRA tool, 3) apply fluoride varnish, and 4) navigate the documentation and referral processes. For training to be effective, it was recommended that it should be interactive, hands-on, and culturally responsive. Preferences for hybrid models emerged, with urban providers favoring blended online/in-person approaches and rural providers highlighting the practicality of online formats.

7.3 Contributions to Knowledge and Practice

This thesis makes several key contributions that can shape knowledge translation of clinical practice. These include:

1. **Knowledge generation:** It fills a gap by offering the first Canadian evidence on NDPCPs' perspectives on CRA integration in Indigenous pediatric primary care.
2. **Implementation framework:** It provides a provider-informed roadmap for CRA adoption, grounded in real-world barriers and solutions.
3. **Equity lens:** It emphasizes culturally-safe, community-engaged approaches essential for addressing systemic inequities in Indigenous oral health.
4. **Training innovation:** It proposes hybrid training models tailored to geographic and resource constraints, that advance workforce capacity.

7.4 Strengths and Limitations

A strength of this thesis is its multi-method design, combining global evidence synthesis with in-depth provider perspectives across diverse Manitoba communities. The inclusion of multiple primary care providers of different disciplines enhances the breadth of perspectives. However, findings are limited to Manitoba and may not fully capture experiences in other provinces or Indigenous contexts. Self-selection bias may also have favored providers with greater interest in oral health to engage more. Additionally, caregiver/community voices were not directly included in this phase of research.

7.5 Future Directions

7.5.1 Research

Future community based participatory research should focus on:

- Evaluating the effectiveness of CRA implementation models proposed by this thesis through pilot projects and longitudinal studies.
- Including Indigenous caregivers, Elders, and community leaders to co-create culturally grounded approaches, which is part of a larger Canadian Institute of Health Research (CIHR) funded project that this thesis arises from.
- Assessing outcomes of CRA integration, including changes in ECC prevalence, service uptake, and caregiver oral health literacy.
- Exploring interjurisdictional policy comparisons to identify scalable models across Canada.

7.5.2 Training and Workforce Development

- Developing and evaluating hybrid CRA training curricula tailored to urban, rural, and remote contexts, which is part of a larger Canadian Institute of Health Research (CIHR) funded project that this thesis arises from.
- Embedding oral health competencies within medical and nursing curricula to sustain knowledge transfer.
- Leveraging technology (e.g., telehealth, e-learning) to overcome geographic barriers.

7.5.3 Policy and Systems Change

- Advocating Government for billing codes for NDPCPs to perform CRA, reimbursement mechanisms, and EMR integration to institutionalize CRA.
- Aligning CRA implementation with existing Indigenous health programs to ensure sustainability.
- Promoting interprofessional collaboration between dental and medical providers, ensuring continuity of care.

Roadmap for CRA Integration in Indigenous Pediatric Primary care

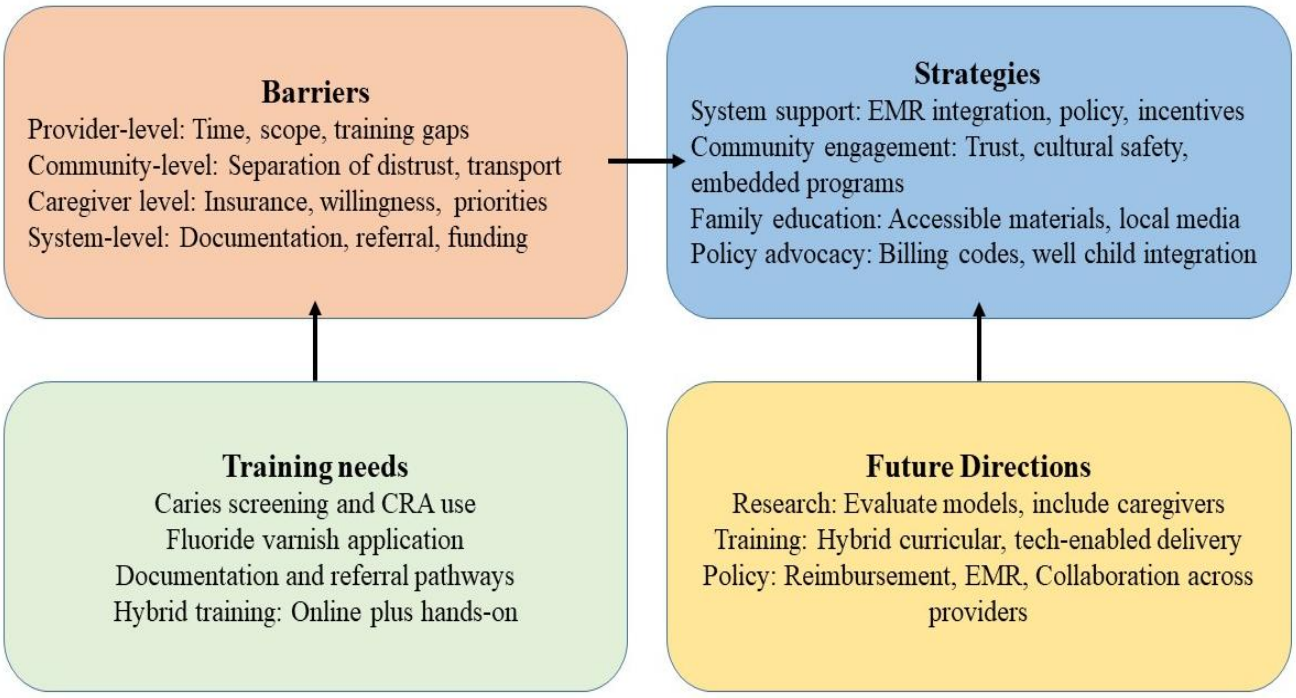


FIGURE 7. 1. ROADMAP FOR CRA INTEGRATION IN INDIGENOUS PEDIATRIC PRIMARY CARE. THIS CONCEPTUAL ROADMAP SYNTHESIZES FINDINGS FROM THE THESIS, ILLUSTRATING HOW MULTILEVEL BARRIERS IDENTIFIED BY NDPCPS INFORM PROVIDER-DRIVEN STRATEGIES, TRAINING NEEDS, AND FUTURE DIRECTIONS FOR CRA IMPLEMENTATION. THE MODEL HIGHLIGHTS THE IMPORTANCE OF SYSTEM-LEVEL SUPPORT (E.G., EMR INTEGRATION, REIMBURSEMENT POLICIES), CULTURALLY SAFE COMMUNITY ENGAGEMENT, FAMILY EDUCATION, AND POLICY ALIGNMENT FOR SUSTAINABLE INTEGRATION OF THE CANADIAN CRA TOOL IN INDIGENOUS PEDIATRIC PRIMARY CARE.

7.6 Conclusion

This work suggests that addressing oral health disparities among Indigenous children requires efforts beyond individual-level clinical interventions. Rather than directly measuring or reducing disparities, this thesis focused on identifying and strengthening the upstream systems, processes and provider capacities necessary to support the implementation of CRA within Indigenous pediatric primary care.

By examining barriers to CRA use, co-identifying implementation strategies, and outlining training needs for non-dental primary care providers, this research provides an evidence-informed roadmap for integrating CRA into routine primary care practice. While improved CRA implementation alone cannot eliminate oral health disparities, it represents a critical foundational step toward earlier prevention, improve access to care, and more equitable oral health pathways for Indigenous children.

The findings from this thesis are intended to inform future implementation, policy development and evaluation efforts, including larger team-based and CHIR-funded initiatives, which may assess the longer-term impact of CRA integration on oral-health outcomes and inequities over time.

This thesis also aligns with the Truth and Reconciliation Commission of Canada's Calls to Action (18–24), which call for the recognition of Indigenous health inequities, the provision of culturally safe care, and the integration of Indigenous knowledge and perspectives within health systems and health professional education (Truth and Reconciliation Commission of Canada, 2015). In particular, Calls 23 and 24 emphasize the responsibility of health systems to equip health professionals with the skills, knowledge, and cultural humility required to work effectively with Indigenous Peoples. By focusing on the readiness, training needs, and system-level supports required for non-dental primary care providers to implement caries risk assessment, this research contributes to these Calls by addressing upstream workforce and system conditions necessary for advancing equity and reconciliation in oral health care.

While this thesis does not directly measure reductions in health disparities, it identifies foundational strategies that support culturally safe, prevention-oriented primary care for Indigenous children.

7.7 Significance of the Study

This study is significant for several reasons. First, it aims to addresses a critical gap in the Canadian oral health literature. While international evidence demonstrates that NDPCPs can effectively deliver caries risk assessment and preventive oral health services to young children in Indigenous communities, there are limited studies to date that have examined these practices in Canada. By exploring the perspectives of NDPCPs in Manitoba, this research aims to identify context-specific insights that respond to this evidence gap.

Second, the study has practical implications for improving the oral health of Indigenous children, who continue to experience disproportionately high rates of ECC. Integrating CRA into Indigenous pediatric primary care represents a promising strategy for early prevention, but successful implementation requires understanding providers' training needs, systemic barriers, and culturally safe approaches to care. The findings will therefore inform the design of interventions and supports that are aligned with both provider realities and community priorities.

Third, this research aims to contribute to policy and program development. By identifying enablers to implement and integrate CRA into primary care of children, this study will generate evidence that can guide national and provincial policies. Such policies are essential for sustainable integration of oral health into primary care and for addressing longstanding inequities in access to dental services.

Finally, the study holds broader significance for the fields of public health, pediatric dentistry, and Indigenous health. It contributes to the growing body of knowledge on interprofessional models of care and highlights the importance of cultural safety and relational approaches in oral health service delivery.

By situating oral health within the broader determinants of health, the study will help to advance both scholarly understanding and practical strategies for achieving oral health equity.

Appendix A – Canadian CRA Tool

Canadian Caries Risk Assessment Tool (< 6 years)

Child's Name:

Child's Date of Birth:

Date of Assessment:

Factors	Yes	No
Teeth cleaned with brush (or cloth if infant) at least twice daily by parent or caregiver	☐ (0)	☐ (1)
Daily exposure to fluoride (e.g. fluoridated toothpaste, fluoridated water)	☐ (0)	☐ (1)
Feeding practices (one or more – please check all that apply): ☐ Bottle-feeding > 12 months of age; ☐ use of bottle or sippy cup between meals with liquid other than water (e.g. pop, fruit juices, milk, chocolate milk) ☐ Bedtime/naptime bottle or sippy cup use ☐ No oral hygiene routine established after solid foods have been introduced while still breastfeeding or bottle-feeding after 12 months ☐ Sugary snacks and drinks between meals (e.g. cookies, candy, sugary cereal, chips, pop, fruit juices, chocolate milk)	☐ (1)	☐ (0)
Family is low income (e.g. "has difficulty making ends meet at the end of the month")	☐ (1)	☐ (0)
Visible plaque and/or food debris on teeth	☐ (1)	☐ (0)
Visible caries (including white spot lesions) and/or past evidence of dental treatment for caries (e.g. fillings, stainless steel crowns, extracted teeth)	☐ (3)	☐ (0)
Total Score (please add up points from each row)		

Overall caries risk status: ☐ **High Risk** (score ≥ 3) ☐ **Low Risk** (score < 3)

RECOMMENDATIONS **(Please check all that have been reviewed with parent/caregiver)**

HIGH RISK:

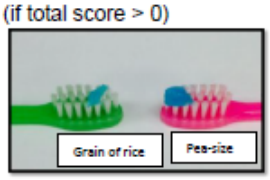
If **overall caries risk status is high**, recommend the following *in addition* to the below:
☐ Refer to dental office for treatment if there is caries present.
☐ Apply fluoride varnish *today*.

FOR ALL CHILDREN:

☐ Refer to dental office (if child has not yet been to a dental office in the last year).

Caregiver Information – Recommend:
☐ That adult brushes child's teeth (< 8 years old) at least twice daily for 2 minutes with:
- Water or non-fluoridated toothpaste only for 0-3 years of age if total score = 0
- Smear (grain of rice size) of fluoridated toothpaste for 0-3 years of age (if total score > 0)
- Green pea size of fluoridated toothpaste for 3-6 years of age

☐ Lowering sugar consumption or limiting sugary drinks/snacks
☐ Avoiding overnight bottle and sippy cup use with liquids other than water
☐ Initiate weaning off bottle by 12 months of age
☐ Initiate switching to an open cup/lidless sippy cup by 12 months of age
☐ Other: _____



ADDITIONAL COMMENTS:

Dental referral made to: _____ ☐ **Not required (child has already been to dental office)**
Provider signature: _____

University of Manitoba | Canadian Paediatric Society / Société canadienne de pédiatrie | CAPD ACPD | CAPHD ACSDP | Canadian Association of Public Health Dentistry / Association canadienne de la santé dentaire publique | Public Health Agency of Canada / Agence de la santé publique du Canada

December 20, 2019

Canadian Caries Risk Assessment Tool (< 6 years)
Signs of Plaque and Caries Lesions

Visible Plaque and/or Food Debris	
Early Caries (White Spot Lesions)	
Advanced Caries	  

Images courtesy of Dr. Robert Schroth

Appendix B


Attention Primary Healthcare Providers!
We need your feedback
We're looking for:
Nurses, physicians, dieticians, social workers, physician assistants who directly provide care for Indigenous children 6 years and below.
What?
I am conducting a study to determine the opinion of non-dental primary care providers on the implementation of the Canadian caries risk assessment tool for children 6 years and under.
CONTACT:
Olubukola Olatosi
olatosio@myumanitoba.ca
ALL PARTICIPANTS GET A GIFT CARD!
Scan here to see more information about the tool
If interested in participating or if you would like more information, please contact
University of Manitoba
June 2023
Version 3

Appendix C

University of Manitoba
Dr. Gerald Niznick College of Dentistry

Department of Preventive Dental Science, College of Dentistry
P131Pathology Building 790
Bannatyne Avenue
Winnipeg, Manitoba
Canada R3E 0W2

RESEARCH PARTICIPANT INFORMATION and CONSENT FORM
for Focus Groups (CRA) and/or In-depth Individual Interviews

Title of Study: Exploring strategies for implementing a culturally informed caries risk assessment tool used by non-dental primary care providers for young First Nations and Métis children in Manitoba, Canada.

Student Principal Investigator:

Olubukola O. Olatosi

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Department of Pediatrics and Child Health, Max Rady College of Medicine
University of Manitoba
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Winnipeg, MB R3E 3P4
robert.schroth@umanitoba.ca
Tel:

Funding Source: Canadian Institutes of Health Research

You are being asked to take part in our research study which involves a focus group and/or in-depth individual interview. Please read this consent form and ask the study staff about any questions you have. You may talk with your family and friends before deciding to take part. This form may have words that you do not know. Make sure you ask the study staff to explain any words or information that you do not clearly understand.

Purpose of Study

I am doing this study as part of the fulfilment for my PhD thesis. The goal of this study is to promote early childhood oral health and prevent early childhood tooth decay in First Nations and Métis communities in Manitoba. The aims of this study are to: i)To identify non-dental primary care providers' perceived barriers, training needs and facilitators to include Caries Risk Assessment (CRA) in primary care of First Nations (FN) and Métis preschoolers in Manitoba, ii) to train non-dental primary care providers in the use of the CRA tool and determine acceptability, to increase familiarity and clinical use of the tool, iii) to develop a guideline for training, implementation, and integration of CRA in primary care of FN and Métis children based on the recommendations of the non-dental primary care providers in Manitoba. The overarching project goal is to address the oral health disparity of Early Childhood Caries (ECC) experienced by FN and Métis children in Manitoba.

Focus Group/Interview Procedures

You will be part of a focus group with primary healthcare providers and stakeholders or will take part in a one-on- one interview. You will be asked a series of questions about your knowledge and implementation of CRA. The information you share will not be linked to you so we keep you anonymous. The focus group/interview will take about 1 hour to 1 and ½ hours to finish.
A second part of this study will involve training in the use of the CRA tool. After this interview, if you are willing to take part in the CRA training, you can leave your phone number or email address and you will be contacted by the PI. Note that the CRA training is voluntary and will take place on a separate day from the interviews. This training will take place for approximately 1 hour to 1 and ½ hours to finish. The key findings from this study are going to help increase awareness of CRA tools and their use by non-dental healthcare professionals, identify barriers to the implementation of such a tool, and identify training needs.
If participating in a focus group, out of respect for others, everything you hear in this session is to be held in confidence and not to be repeated outside of the group.
At the end of the study, aggregate results will be shared through tailored community reports/letters sent to each participant.

Risks and Discomforts

There are no real risks in taking part in this study. There may be some interview questions that make you feel uncomfortable. There is a chance that what you share in the focus group will be repeated outside of the group.

Benefits

There may not be a direct benefit to you from participating in this study. However, we hope the information learned from this study will benefit you and others in the future. We also hope that these focus groups/interviews will tell us more about the role primary healthcare providers play in young children's oral health. The information you share will help guide the implementation of a CRA tool in non-dental settings and will help foster early childhood tooth decay prevention in your community. We also hope that in the future, the implementation of CRA by non-dental primary healthcare providers will serve as a pathway of referral for children who do not yet have a dental home.

Costs

There is no cost to you for taking part in this study.

Payment/Compensation for participants
You will be given a $25 Tim Horton's gift card per activity i.e. focus group interview, training and post-training interview) in this study, completed to a maximum of $75 gift cards depending on the activity you decide to participate in. Gift cards are given for incomplete, modified and withdrawn data collected.

Confidentiality

We keep information about you confidential. Although we will do everything to keep information about you private, we cannot promise this. Personal information we collect about you might be revealed if required by law. We will protect your identity by following the Personal Health Informative Act (PHIA) of Manitoba. The University of Manitoba Research Ethics Board might look over our study records for quality assurance reasons.

You will not be revealed in any reports, papers, presentations, or community gatherings where the findings of this study are talked about.

Information collected in this research study including full or partial quotes of what you say may be published or presented in public gatherings. Your name and other identifying information will not be used or revealed. If you participate in any focus groups or meetings, participants will be reminded that anything said within that forum is to remain confidential.

The focus group will be **audio-**recorded. All recordings and consent forms will be kept in a locked filing cabinet, within a locked office, until the information is type-written. Once the project has been completed, the audio recordings will be destroyed. Electronic documents will be purged following 5 years of storage (2028).

Out of respect for the others in the group, everything you hear in the session should not be repeated outside of the group.

Voluntary Participation/Withdrawal from the Study

Your decision to take part in this study is voluntary. You may say no to taking part, or you may leave the study at any time. However, if you decide to stop taking part in the study, we encourage you to talk to us first. Your decision not to take part or leave the study will not affect you or your family. Your decision not to take part in the study will not affect your child's current or future dental care. If the study staff feel that it is in your best interest to remove you from the study, they can do so without your consent.

Questions

You are free to ask any questions that you may have about your participation. If any questions come up during or after the study or if you have a research-related problem, contact the principal investigator:

Olubukola Olatosi at olatosio@myumanitoba.ca.

For questions about your rights as a research participant, you may contact the University of Manitoba, Bannatyne Research Office at: shelly.rempel-rossum@umanitoba.ca
Do not sign this consent form unless you have had a chance to ask questions and have received satisfactory answers to all your questions.

Do not sign this consent form unless you have had a chance to ask questions and have received satisfactory answers to all of your question

Statement of Consent

I have read this consent form. I have had the chance to discuss this research study with Dr. Olubukola Olatosi. I have had my questions answered by them in a language I understand. I understand the risks and benefits. I know that I will get a copy of this consent form after I sign it. I know that my participation in this study is voluntary and that I can decide to leave the study at any time. I freely agree to take part in this study.

I understand that information about my personal identity will be kept confidential, but that confidentiality

is not guaranteed. I allow the University of Manitoba's Research Ethics Board to look at my records that relate to this study for quality assurance reasons.

I agree that my interview may be audio-recorded. I agree that direct quotes from my interview may be used without identifying me. I understand that everything mentioned during the session should not be repeated outside of the focus group.

By signing this consent form, I (*the research participant*) have not given up any of the legal rights that I have as a participant of a research study.

Participant Signature: _____ **Date:** _____
(dd/mm/yyyy)

Participant Printed Name: _____
(Please print clearly)

I, the (Research Staff) undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has knowingly given their consent.

Printed Name: _____ **Date:** _____
(Please print clearly) *(dd/mm/yyyy)*

Signature: _____

Role in study: _____

Appendix D

Study Title: Exploring strategies for implementing a culturally informed caries risk assessment tool used by non-dental primary care providers for young First Nations and Métis children in Manitoba, Canada

FOCUS GROUP AND IN-DEPTH INTERVIEW GUIDE

1. What are your thoughts on early childhood tooth decay?
    - What comes to mind? What do you know about it?
    - Do you think dental decay in children is preventable?
2. Tell me what you know about caries risk assessment (CRA)
    - Have you used it or seen it being used?
3. How do you feel about non-dental primary care providers (nurses, physicians, dieticians, etc.) doing CRA for preschoolers?
4. Looking at CRA tool developed for use in Canada for preschool children, how do you foresee integrating it into your practice?
5. What are some benefits of integrating CRA for preschoolers into your practice?
    - For you, for your patient, for your clinic?
6. What challenges/barriers do you anticipate?
    - For you, for your patient, for your clinic?
7. Have you already implemented any form of CRA into your practice?
    - If yes, please describe your experience.
    - If not, what will help you successfully implement CRA in your practice?
8. What training do you like or think you need to implement CRA successfully?
    - What will be the best way to implement the training?
9. The CRA tool may prompt you to apply fluoride vanish. How do you feel about it?
    - What challenges/barriers do you anticipate in your practice?
10. In your opinion who do you see as an ideal person(s) within your practice to champion CRA implementation
11. What challenges do you anticipate encountering when connecting/referring to dental providers?
12. What challenges do you anticipate encountering when giving preventive advice?
13. Will you be using the CRA tool in your practice?
    - If not, why?
14. Please share any other thoughts or comments on using the tool itself.

Appendix E

University of Manitoba | Research Ethics and Compliance

Research Ethics Bannatyne
P125 770 Bannatyne Avenue
Winnipeg, MB R3E 0W3
T: 204 789 3211
F: 204 789 3414
bannreb@umanitoba.ca

HEALTH RESEARCH ETHICS BOARD (HREB)
CERTIFICATE OF FINAL APPROVAL FOR NEW STUDIES
Delegated Review

PRINCIPAL INVESTIGATOR:	INSTITUTION/DEPARTMENT:	ETHICS #:
Olubukola Olatosi	University of Manitoba/Dentistry-Department of Oral Biology	HS25866 (H2023:050)
APPROVAL DATE: April 27, 2023	**EXPIRY DATE:** April 27, 2024	
STUDENT PRINCIPAL INVESTIGATOR SUPERVISOR (If applicable): Dr Robert Schroth		

PROTOCOL NUMBER:	PROJECT OR PROTOCOL TITLE:
NA	Exploring strategies for implementing a culturally informed caries risk assessment tool used by non-dental primary care providers for young First Nations and Metis children in Manitoba, Canada (Linked to H2021:043)
SPONSORING AGENCIES AND/OR COORDINATING GROUPS: Canadian Institutes of Health Research (CIHR)- Funder University of Manitoba(Dr Robert Schroth) - Sponsor	

Submission Date of Investigator Documents:	HREB Receipt Date of Documents:
February 2, 2023 and April 14, 2023	February 6, 2023 and April 18, 2023

THE FOLLOWING ARE APPROVED FOR USE:

Document Name	Version (If applicable)	Date
Protocol: Protocol along with the proposal as outlined in the revised University of Manitoba Bannatyne Campus Research Ethics Board Submission Form and Letter of Response dated April 14, 2023	V. 2	April 11, 2023
Consent and Assent Form(s): RESEARCH PARTICIPANT INFORMATION and CONSENT FORM for Focus Groups (CRA) and/or In-depth Individual Interviews	V. 2	April 11, 2023
Other: Questionnaires/Scales/Instruments Appendix		April 11, 2023
Canadian Caries Risk Assessment Tool (< 6 years)		December 20, 2019

CERTIFICATION

The above-named research study/project has been reviewed in a ***delegated manner*** by the University of Manitoba (UM) Health Research Board (HREB) and was found to be acceptable on ethical grounds for research involving human participants. The study/project and documents listed above was granted final approval by the Chair or Acting Chair, UM HREB.

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