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Research

Knowledge, attitude, willingness and readiness of primary health care providers to provide oral health services to children in Niagara, Ontario: a cross-sectional survey

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Abstract

Background: Most children are exposed to medical, but not dental, care at an early age, making primary health care providers an important player in the reduction of tooth decay. The goal of this research was to understand the feasibility of using primary health care providers in promoting oral health by assessing their knowledge, attitude, willingness and readiness in this regard.

Methods: Using the Dillman method, a mail-in cross-sectional survey was conducted among all family physicians and pediatricians in the Niagara region of Ontario who have primary contact with children. A descriptive analysis was performed.

Results: Close to 70% (181/265) of providers responded. More than 90% know that untreated tooth decay could affect the general health of a child. More than 80% examine the oral cavity for more than 50% of their child patients. However, more than 50% are not aware that white spots or lines on the tooth surface are the first signs of tooth decay. Lack of clinical time was the top reason for not performing oral disease prevention measures.

Interpretation: Overall, survey responses show a positive attitude and willingness to engage in the oral health of children. To capitalize on this, there is a need to identify mechanisms of providing preventive oral health care services by primary health care providers; including improving their knowledge of oral health and addressing other potential barriers.

Dental caries (tooth decay) among children continues to be a major health problem in most industrialized countries.[1] Poor oral health in children has serious implications for general health, for the health of families and for the health care system. In the Niagara region of Ontario, surveillance conducted by registered dental hygienists in schools for the school years 2011/12, 2012/13 and 2013/14 indicated that the prevalence of decayed, missing and filled teeth for children aged 4–13 years was 40.8%, 44.0% and 47.1%, respectively. The prevalence among all school-age children over the three years had steadily increased, with unacceptably high rates among children who just entered school (junior and senior kindergarten) and those in grade 2; 35.1% and 65.2%, respectively (2013/14 rates).

Every community needs multiple measures to reduce early childhood caries. However, because community water fluoridation is not in place in the Niagara region, other measures become critical. One preventive strategy proven to be effective is fluoride varnish; it is a topical fluoride product that is safe and effective, inexpensive and can reverse early tooth decay and slow enamel destruction in active caries. Evidence has shown that when used at least twice a year, fluoride varnish leads to a reduction in tooth decay of about 38%.[2] Early contact with dental professionals can also help reduce the burden of early childhood caries; however, the first contact with dental professionals is not as early as compared with other primary health care providers. By the age of 3 years, it is reported that children have about 11 well-child visits.[3] A study in the United States, based on the Medical Expenditure Panel Survey, showed that 89% of infants and 1 year olds had physician visits annually, compared with only 1.5% who had dental visits;[4] this rate is even higher in Canada.[5]

Most children are exposed to medical care but not dental care at an early age; thus, primary health care providers can play an important role in reducing the burden of early childhood caries.[6] Nonetheless, to address child oral health issues, primary health care providers must have adequate knowledge of the disease process, associated risk factors, signs and symptoms, prevention

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strategies and fluoride usage.[7] Therefore, we sought to assess the knowledge, attitude, willingness and readiness of primary health care providers of the Niagara region to perform oral health care activities among children in their clinical settings.

Methods

Study design

A self-administered postal survey was conducted between April and Kamong primary health care providers (family physicians and pediatricians) of the Niagara region, one of the 36 public health units in Ontario, who have first-line contact with children. The survey was mailed to all family physicians and pediatricians, a list of which was obtained from the Niagara Region Public Health secure database, which is considered quite comprehensive.

Survey development

To develop the survey questionnaire with relevant items, two investigators (S.S. and R.F.) made a search in the following databases: MEDLINE, PubMed, Embase, Scopus and Cochrane Library. Some of the key words used in the search were "physicians," "primary care providers," "pediatricians," "child (ren)," "infants," "oral health," "knowledge," "attitude," behavior," "practice" and "barriers." Some relevant questionnaires were identified from the existing literature.[6, 8-11] Based on previous surveys, a 22-item questionnaire (Appendix 1, available at www.cmajopen.ca/content/5/1/E249/suppl/DC1) was developed and assessed for content validity, relevance and clarity by 3 authors (S.S., R.F. and C.Q.) who all are dental public health specialists. The survey questionnaire was then piloted for face validity and ease of completion (time and comprehension) in a group of 2 physicians, 2 pediatricians and 4 public health professionals of the Niagara region. Their minor suggestions were incorporated in the final survey.

Data collection

A modified Dillman approach was used to conduct the survey, because this method is based on sound research principles and maximizes the chance for high response rates.[12] The first mailing was sent in early April 2014 through registered post and included an introduction letter, questionnaire, return envelope with paid postage and a gift certificate of $25. Two weeks after the first mailing, a second mailing was sent to nonrespondents. It included an introduction letter, questionnaire and return envelope with paid postage, and was sent by regular mail. The same process was repeated 2 weeks after the second mailing. After 1 week from the third mailing, a "thank you" post card was sent to all participants.

Statistical analysis

A descriptive analysis was performed, and responses were tabulated accordingly. Responses (proportions) of family physicians and pediatricians were observed separately; however, no statistical differences were explored between the two groups because the number of pediatricians was much lower than that of family physicians. There was no minimum number of responses required for inclusion in our analysis. Proportions were calculated using the total number of completed answers as the denominator. SPSS version 23 was used for all analyses.

Ethics approval

Ethics approval was obtained for conducting this survey from the Research Ethics Board of the University of Toronto (protocol reference # 29866).

Results

The survey was sent to 245 family physicians and 20 pediatricians registered in the Niagara Region Public Health database.Overall, 68.3% (181/265) of primary health care providers responded (161 in the first, 16 in the second and 4 in the third mailing). Separately, 66.9% (164/245) of family physicians and 85.0% (17/20) of pediatricians responded. Table 1 describes the practice characteristics of participants. eight out of 164 physicians and 1 out of 17 pediatricians did not respond to more than 1 question. Most pediatrician respondents (94.1%) are in solo practice, whereas family

Table 1: Participant characteristics

Practice characteristics	Family physicians, no. (%) *n* = 164	Pediatricians, no. (%) *n* = 17
Years of practice		
< 10	34 (20.8)	3 (17.6)
10–19	37 (22.5)	4 (23.5)
≥ 20	93 (56.7)	10 (58.8)
Type of practice		
Solo	45 (27.6)	16 (94.1)
Group	118 (72.4)	1 (5.9)
Model of primary practice (can be more than 1)*		
Comprehensive care model	5 (3.0)	7 (41.2)
Community health centre	4 (2.4)	0 (0.0)
Family health group	46 (28.0)	1 (5.9)
Family health organization	57 (34.8)	0 (0.0)
Family health network	9 (5.5)	0 (0.0)
Family health team	43 (26.2)	0 (0.0)
Other	15 (9.1)	8 (47.1)
Type of staff in office*		
Nurse	94 (58.0)	4 (25.0)
Nurse practitioner	53 (32.7)	1 (6.3)
Physician assistant	11 (6.8)	0 (0.0)
Office manager	99 (61.1)	5 (31.3)
Administrative staff	153 (94.4)	13 (81.3)
Other	54 (33.3)	3 (18.8)

*Number may add to more than total and percentages may add up to more than 100 because participants were allowed to select more than 1 response.

physician respondents are more (72.4%) involved in group practice within a Family Health Organization or Family Health Group. Most family physician respondents (94.4%) and pediatrician respondents (81.3%) have administrative staff in their practices; however, the proportion of nurses or nurse practitioners is much higher in family physician respondents' offices (90.7%) than in pediatrician respondents' offices (31.3%).

Knowledge of early childhood caries, community water fluoridation and topical fluoride

Results from our analysis show that most respondents know the importance of baby teeth, brushing children's teeth and the implications of untreated dental decay; however, a large proportion (66.5% of family physician respondents and 50.0% pediatrician respondents) are not aware that white spots or lines on the surface of teeth are the first signs of tooth decay (Table 2). In comparison to family physician respondents, pediatrician respondents are more confident in identifying tooth decay among children and discussing with parents their child's oral health (81.3% v. 57.9%). A large proportion of respondents understand the importance of community water fluoridation; however, many (52.8% family physicians and 35.3% pediatricians) are not aware that the water supply in the Niagara region is not fluoridated. Most family physician respondents (77.6%) and pediatrician respondents (93.8%) appreciated the importance of topical fluoride therapies for preventing tooth decay among children.

Readiness and willingness for dental screening, risk assessment and dental referral

Most respondents visually examine the oral cavity and teeth of pediatric patients (Table 3). However, a lower proportion of physician respondents advise parents regarding tooth-cleaning methods or use of fluoridated toothpaste for their children. Most (77.6% family physician and 68.8% pediatrician) of the respondents never prescribe fluoride supplements. A greater proportion of pediatrician respondents determine a child's risk for developing tooth decay as compared with family physician respondents.

Assessment of the willingness of respondents to perform preventive oral health measures shows that most are willing to lift the child's lip to check for tooth decay and advise parents regarding prevention measures for tooth decay (Table 4), and are willing to formally refer suspected cases of tooth decay to dental professionals. Regarding prevention measures such as fluoride varnish, both pediatrician and family physician respondents showed a willingness to obtain more education on these topics; however, pediatricians were less willing than family physicians to actually implement fluoride varnish for tooth decay.

To understand what respondents do if they suspect tooth decay, specific questions were asked (Table 5). A large proportion (89.0% family physicians and 100.0% pediatricians) advises parents to take their child to a dentist. A higher proportion of pediatrician respondents (68.8%) than family physician respondents (44.8%) make a note in the medical chart; however, no pediatrician respondent reported making formal referrals to a dentist.

Table 2: Knowledge about early childhood caries*, community water fluoridation, and topical fluorides

Knowledge item	Family physicians agree or strongly agree, no. (%)† *n* = 164	Pediatricians agree or strongly agree, no. (%)† *n* = 17
Knowledge about early childhood caries		
Untreated tooth decay could affect the general health of a child	163/163 (100.0)	15/16 (93.8)
Parents should brush their young children's teeth twice a day	161/164 (98.2)	16/16 (100.0)
The first signs of tooth decay are white spots or lines on the tooth surfaces	54/161 (33.5)	8/16 (50.0)
Baby teeth are important even though they fall out	155/161 (96.3)	16/16 (100.0)
Children should have 3 meals and 2–3 snacks per day	149/162 (92.0)	14/16 (87.5)
Parents should limit juice to 4–6 oz/d	143/162 (88.3)	14/16 (87.5)
I feel confident enough to identify tooth decay in children	95/164 (57.9)	13/16 (81.3)
I feel knowledgeable enough to discuss and counsel parents and caregivers regarding their children's dental hygiene	115 /161 (71.4)	13/16 (81.3)
Knowledge about community water fluoridation and topical fluorides		
Community water fluoridation is important for preventing tooth decay	145/164 (88.4)	15/16 (93.8)
Topical fluoride therapies are important for preventing tooth decay	125/161 (77.6)	15/16 (93.8)
Awareness of community water fluoridation		
Water supplies in the Niagara region are not fluoridated	76/161 (47.2)	11/17 (64.7)

*Defined as the presence of 1 or more decayed, missing (due to caries) or filled tooth surfaces in any primary tooth in a child between birth and 71 months of age.
†Nonrespondents are not included in denominator when calculating percentages.
‡For each question, number of nonrespondents (physicians and pediatricians) vary.

Table 3: Preventive oral health care practices in medical settings

As part of your well child visits for children 5 years of age or younger, do you:	No. (%)* Never	1%–50% patients	> 50% patients
Family physicians			
Visually examine the oral cavity? (*n* = 158)	5 (3.2)	26 (16.5)	127 (80.3)
Visually examine the teeth? (*n* = 159)	9 (5.7)	51 (32.1)	99 (62.3)
Determine the child's risk for developing tooth decay? (*n* = 156)	37 (23.7)	63 (40.3)	56 (35.9)
Advise parents or caregivers on tooth cleaning methods? (*n* = 156)	32 (20.5)	62 (39.8)	62 (39.8)
Advise parents or caregivers on the use of bottles or sippy cups? (*n* = 158)	15 (9.5)	38 (24.1)	105 (66.5)
Advise parents or caregivers on the use of fluoride toothpaste? (*n* = 157)	41 (26.1)	37 (23.6)	79 (50.3)
Prescribe fluoride supplements? (*n* = 156)	121 (77.6)	25 (16.0)	10 (6.4)
Pediatricians			
Visually examine the oral cavity? (*n* = 16)	2 (12.5)	1 (6.3)	13 (81.3)
Visually examine the teeth? (*n* = 16)	3 (18.8)	2 (12.5)	11 (68.8)
Determine the child's risk for developing tooth decay? (*n* = 16)	4 (25.0)	0 (0.0)	12 (75.0)
Advise parents or caregivers on tooth cleaning methods? (*n* = 16)	3 (18.8)	7 (43.7)	6 (37.5)
Advise parents or caregivers on the use of bottles or sippy cups? (*n* = 16)	3 (18.8)	1 (6.3)	12 (75.0)
Advise parents or caregivers on the use of fluoride toothpaste? (*n* = 16)	3 (18.8)	5 (31.2)	8 (50.0)
Prescribe fluoride supplements? (*n* = 16)	11 (68.8)	4 (25.0)	1 (6.2)

*Nonrespondents are not included in denominator when calculating percentages.

Table 4: Willingness to preform preventive oral health care activities

Health measure	Willingness to preform, no. (%) 1 (most willing)	2	3	4	5 (least willing)
Physicians					
Lift the child's top lip to check for tooth decay (*n* =162)	112 (69.1)	27 (16.7)	16 (9.9)	6 (3.7)	1 (0.6)
Advise parents or caregivers regarding prevention measures for tooth decay (e.g. tooth brushing) (*n* = 162)	120 (74.1)	23 (14.2)	14 (8.6)	4 (2.5)	1 (0.6)
Formally refer suspected cases of tooth decay to dental professionals (*n* = 156)	72 (46.2)	35 (22.4)	30 (19.2)	10 (6.4)	9 (5.8)
Obtain more education about prevention measures for tooth decay (e.g. fluoride varnish) (*n* = 160)	66 (41.3)	43 (26.9)	27 (16.9)	11 (6.9)	13 (8.1)
Implement prevention measures for tooth decay (e.g., fluoride varnish) (*n* = 160)	48 (30.0)	26 (16.3)	30 (18.8)	23 (14.4)	33 (20.6)
Pediatricians					
Lift the child's top lip to check for tooth decay (*n* = 15)	13 (81.3)	1 (6.3)	0 (0.0)	0 (0.0)	1 (12.5)
Advise parents or caregivers regarding prevention measures for tooth decay (e.g. tooth brushing) (*n* = 16)	14 (87.5)	0 (0.0)	0 (0.0)	0 (0.0)	2 (12.5)
Formally refer suspected cases of tooth decay to dental professionals (*n* = 16)	9 (56.3)	1 (6.3)	2 (12.5)	0 (0.0)	4 (25.0)
Obtain more education about prevention measures for tooth decay (e.g., fluoride varnish) (*n* = 16)	6 (37.5)	5 (31.3)	1 (6.3)	2 (12.5)	2 (12.5)
Implement prevention measures for tooth decay (e.g., fluoride varnish) (*n* = 16)	3 (18.8)	2 (12.5)	3 (18.8)	1 (6.3)	7 (43.8)

Perceived barriers in performing prevention measures aimed at dental problems

Lack of clinical time was the top reason for family physician respondents (66%) and pediatrician respondents (63%) to not perform oral disease prevention measures in their clinical settings (Table 6). In addition, a large number of respondents assume that the oral health care of children is the responsibility of dentists (42.2% family physicians and 50.0% pediatricians). A higher proportion of family physician respondents (52.2%) than pediatrician respondents (25.0%) identified lack of knowledge regarding dental problems as a barrier to care.

Attitude towards oral health care in children

Despite respondents' assumption that providing oral health care is the responsibility of dentists, they have a positive attitude (87.3%) when asked if their practice plays an important role in promoting the oral health of children.

Interpretation

This cross-sectional survey conducted among family physicians and pediatricians of the Niagara region provides an understanding of what challenges and opportunities may be present in a primary care setting in improving the oral health status of children.

The results show that family physicians and pediatricians are knowledgeable about the importance of oral health in general, such as the health implications of untreated decay and importance of baby teeth. In addition, they understand the importance of good oral health practices, such as tooth brushing and healthy eating. However, they are less informed about visible decay, identifying it and counseling parents, which are all normal practices for a dentist.

These findings are consistent with earlier studies, conducted in the United States, which have shown that primary health care providers lack oral health knowledge in regard to the signs, symptoms and causes of dental diseases.[13-15] A previous Canadian study among primary health care providers showed that physicians and pediatricians have some knowledge of early childhood caries, but are uncertain about identifying caries, and very few recommend the first dental visit by the child's first birthday.[9]

Although a lack of formal referrals of suspected cases of tooth decay to dentists was observed in our study, most physicians were willing to refer. They were also willing to obtain

Table 5: Steps family physicians and pediatricians take if they suspect a child has tooth decay

Steps taken (can be more than 1)*	Family physicians, no. (%) *n* = 163	Pediatricians, no. (%) *n* = 16
Advise the parent or caregiver to take the child to a dentist	145 (89.0)	16 (100.0)
Make a note in the medical chart	73 (44.8)	11 (68.8)
Give the parent or caregiver the name(s) of a dentist	39 (23.9)	8 (50.0)
Do not formally refer children to dentists	14 (8.6)	2 (12.5)
Have never seen a child with tooth decay	10 (6.1)	1 (6.3)
Make a formal referral to a dentist	10 (6.1)	0 (0.0)
Other	9 (5.5)	3 (18.8)

*Number for each category may add to more than total and percentages may add up to more than 100 because participants were allowed to select more than 1 response.

Table 6: Reasons for not performing prevention measures aimed at dental problems

Perceived barriers to carry prevention measures (can be more than 1)*	Family physicians, no. (%) *n* = 161	Pediatricians, no. (%) *n* = 16
Lack of clinical time	106 (65.8)	10 (62.5)
Dentists should perform these activities	68 (42.2)	8 (50.0)
Lack of knowledge in identifying dental problems	84 (52.2)	4 (25.0)
Lack of office staff to assist in prevention measures	60 (37.3)	7 (43.8)
Lack of reimbursement	59 (36.6)	6 (37.5)
Lack of parent's or caregiver's perceived need for dental care	61 (37.9)	5 (31.3)
Infants and toddlers are too young and uncooperative for oral examinations	37 (23.0)	2 (12.5)
Other	16 (9.9)	2 (12.5)

*Number for each category may add to more than total and percentages may add up to more than 100 because participants were allowed to select more than 1 response.

more education about preventive measures, such as fluoride varnish. Importantly, the existing literature suggests that primary health care providers generally have a positive attitude towards the importance of oral health in children and are willing to perform oral health care activities.[6,9] Regarding fluoride usage, this study's responses suggest that primary health care providers are not advising parents to use fluoridated toothpaste for their children. In addition, most physicians never prescribe fluoride supplements. This finding is consistent with the existing literature,[13-15] and could reflect adherence to current Canadian toothpaste guidelines, a lack of knowledge about absent water fluoridation or a lack of awareness of the importance of recommending fluoride sources to parents.

Overall, our survey responses show a positive attitude and willingness among family physicians and pediatricians in the Niagara region to provide oral health services to children. To capitalize on this willingness, there is a need to identify mechanisms for providing preventive oral health care services in the offices of primary health care providers, including improving their knowledge about oral health and addressing other potential barriers for facilitating the provision of such services. This can include, for example, engaging local public health units to work with primary health care providers to determine readiness and feasibility in implementing a fluoride varnish strategy. In addition, it is important to advance the provision of continuing medical education credits to participate in oral health education.

Limitations

Although the survey response rate was high, some primary health care providers did not respond, and they might have had different perspectives and practices about children's oral health. In addition, some participants did not respond to all questions. Maximum nonresponse was seen among physicians for questions related to oral health practices performed by them. Nonresponse potentially indicates that such procedures are not conducted; however, this assumption cannot be verified.

This is a cross-sectional study reflecting responses at a single point in time, which may be misrepresentative of response in general. In addition, attitudes towards unknown and previously unseen preventive services will likely be different compared with those concerning services about which respondents are familiar owing to their previous experiences. Finally, the behaviours described are based on self-report and may not reflect the actual behaviour.

Conclusion

The oral health of children is important. Because primary health care providers have frequent contact with children, they are in an advantageous position to provide preventive oral health care services and education to children and families. Across Ontario, public health units can work closely with local primary health care providers to equip them with education around the importance of oral health and support them in implementing a preventive approach. For a pediatric oral health strategy to be successful, it needs to be cross-disciplinary to address both preventive and clinical aspects to benefit the pediatric patient. Primary health care providers are willing to learn more about oral health and recognize its value and importance, and this should be capitalized on.

References

1. Petersen PE. The World Oral Health Report 2003, Continuous improvement of oral health in the 21st century — the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol* 2003; 31 (Suppl 1):3-23.
2. Helfenstein U, Steiner M. Fluoride varnishes (Duraphat): a meta-analysis. *Community Dent Oral Epidemiol* 1994;22:1-5.
3. American Academy of Pediatrics schedule of well-child care visits. Elk Grove Village (IL): American Academy of Pediatrics. Available: www.healthychildren.org/English/family-life/health-management/Pages/Well-Child-Care-A-Check-Up-for-Success.aspx (accessed 2016 Jan. 17).
4. Profile of pediatric visits: Tables 9–10 [based on 2000–2005 Medical Expenditure Panel Survey and 2000–2004 National Ambulatory Medical Care Survey]. Elk Grove Village (IL): American Academy of Pediatrics; [updated 2008]. Available: http://practice.aap.org/public/ProfileOfPediatricVisits.pdf. (accessed 2017 Mar. 8).
5. Lekesová I. Fluorine in the prevention of dental caries [article in Czech]. *Cas Lek Cesk* 1998;137:201-6.
6. dela Cruz GG, Rozier RG, Slade G. Dental screening and referral of young children by pediatric primary care providers. *Pediatrics* 2004;114:e642-52.
7. Krol DM. Educating pediatricians on children's oral health: past, present, and future. *Pediatrics* 2004;113:e487-92.
8. Rabiei S, Mohebbi SZ, Patja K, et al. Physicians' knowledge of and adherence to improving oral health. *BMC Public Health* 2012;12:855.
9. Prakash P, Lawrence HP, Harvey BJ, et al. Early childhood caries and infant oral health: Paediatricians' and family physicians' knowledge, practices and training. *Paediatr Child Health* 2006;11:151-7.
10. Lewis CW, Boulter S, Keels MA, et al. Oral health and pediatricians: results of a national survey. *Acad Pediatr* 2009;9:457-61.
11. Di Giuseppe G, Nobile CG, Marinelli A, et al. Knowledge, attitude and practices of pediatricians regarding the prevention of oral diseases in Italy. *BMC Public Health* 2006;6:176.
12. Hoddinott SN, Bass MJ. The dillman total design survey method. *Can Fam Physician* 1986;32:2366-8.
13. Lewis CW, Grossman DC, Domoto PK, et al. The role of the pediatrician in the oral health of children: A national survey. *Pediatrics* 2000;106:E84.
14. Gift HC, Milton B, Walsh V. Physician and caries prevention. Results of a physician survey on preventive dental services. *JAMA* 1984;252:1447-8.
15. Sánchez OM, Childers NK, Fox L, et al. Physicians' views on pediatric preventive dental care. *Pediatr Dent* 1997;19:377-83.

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