



Case-finding for HPV vaccination eligibility within a dental office with concurrent development of a dialogue tool

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ABSTRACT

Background: Human papillomavirus (HPV) immunization can prevent cancers, but uptake has been incomplete (and worse with the COVID-19 pandemic). Dental clinicians already screen for oral cancers, many of which are caused by HPV, and could identify vaccination candidates, but this requires a case-finding strategy.

Objective: The purpose of this study was (1) to develop and test a case-finding approach to identify patients who were candidates for HPV vaccinations, (2) to test an HPV vaccination intervention by dental professionals on vaccination uptake.

Methods: Design: Prospective, non-randomized feasibility case finding study with a 4-week enrollment period and a 6 week follow up period in general dental offices.

Setting: Two general and non-commercial dentistry offices in Edmonton, Alberta Canada.

Subjects: Consecutive scheduled (non-emergent) patients who met the Health Canada criteria for HPV vaccination: immunocompetent males and females aged 9–45 years and those who are immunocompromised. Consent for the discussion was obtained from each subject or parent.

Intervention: Scheduled dental patients meeting the inclusion criteria were flagged by a research assistant who reviewed the appointment schedule each week for 4 weeks. For these subjects, dental clinicians (dentists and dental hygienists) used our Dental Dialogue Tool to discuss HPV vaccination and answer questions. Participating patients who consented to receive the HPV vaccine were given a prescription by the attending dentist and were directed to follow-up with a local pharmacy to have the vaccine administered. Each participant that was provided with an HPV prescription was contacted after 6 weeks to identify if they received the first dose of vaccine.

Outcomes: Yield of our case-finding strategy and receipt of a patient's first HPV vaccine dose during 6 weeks post vaccine prescription.

Results: Our case-finding strategy assessed 656 scheduled patients over 4 weeks. From this screening, 179 (a case-finding yield of 20.4 %), were candidates for HPV vaccine discussion. Forty-three of these 179 patients (24 %) were already vaccinated. Two patients (1.1 %) did not consent to be spoken with and 134 (74.8 %) consented to the HPV vaccine discussion. Forty-eight of 134 patients (35.8 %) of patients accepted a prescription from the dentist after speaking with the dental clinician. Ultimately, 8/48 (16 %) (patients received their first dose of the HPV vaccine by the 6 week of follow-up call. However, this is only 4.5 % (8/177) of those patients who did consent for the discussion of HPV cancers and vaccination from their dentist.

Conclusion: We demonstrated that case-finding for HPV vaccine candidates in general dental offices was feasible, with a reasonable yield. While the dental dialogue tool was described as a great resource to explain the facts and answer questions, very few patients were vaccinated after 6 weeks of follow-up. Further work is necessary to sharpen the intervention, perhaps including follow-up discussions with the dental clinicians.

Abbreviations: HPV, Human Papilloma Virus; OPC, Oropharyngeal Cancer.

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Introduction

Human Papilloma Virus (HPV) cancers have a global prevalence of ~ 5 % of all cancer cases [1] or 660,000 cases of cancer (cervical, head and neck, anal, vulvar, vaginal, and penile) per year, as well as several million cases of genital warts [2,3]. HPV infection is one of the most common sexually transmitted infections in the world. It impacts more than 75 % of sexually active men and women [3,4]. HPV is commonly known to be associated with cervical cancer. Yet, according to the 2016 Canadian Cancer Statistics Report [5], the number of oropharyngeal cancers in 2012 ($n = 1,335$) surpassed the number of cervical cancers ($n = 1,300$), which now makes oropharyngeal cancer the most common type of cancer caused by HPV in Canada. Research has indicated that this rate of increase in oropharyngeal cancers is alarming [5,6]. Unfortunately, unlike cervical cancer, there is no routine screening program for HPV-related oropharyngeal cancer. Therefore, it is suggested that the best approach to curb the surge of HPV-related oropharyngeal cancer might be through vaccination against HPV strains responsible for oropharyngeal cancer [7]. Recommended vaccination includes two or three dose schedules for those aged 9–45 [8] with further recommendations based on individual risks [8,9]. It is important to increase the awareness of HPV and the need to vaccinate against it in both men and women.

The COVID-19 pandemic has inflicted significant damage on routine vaccinations particularly HPV vaccinations., [10]. There has been a worldwide downward trend of HPV vaccinations since 2019 [11]. The HPV vaccine in Canada is usually administered within school programs with some differences with each province or territory [12]. School vaccination programs were postponed in Canada due to the pandemic. For example, in the province of Ontario school-based HPV vaccination rates dropped to as low as 5.2 % and 0.8 % for the 2019–2020 and 2020–2021 school years [13]. The COVID –19 pandemic has significantly affected the vaccine uptake of all ages. A modeling study in the United States compared pre-COVID vaccine uptake to three scenarios of reduced coverage with varying recovery speed. This simulated that the missed HPV vaccinations due to COVID-19 may result in excess cases of HPV-related diseases and cancers that would have otherwise been prevented with vaccination. The model predicted that 130,853 to 213,926 additional cases of genital warts; 22,503 to 48,157 cases of CIN (cervical intraepithelial neoplasia) 1; 48,682 to 110,192 cases of CIN 2/3; and 2,882 to 6,487 cases of cervical cancer will occur over the next 100 years, compared to status quo [14]. They concluded that healthcare providers should plan for recovery efforts by seeking to immunize all eligible people to prevent potential long-term consequences. Despite the strong endorsement from public health authorities and medical societies, the current HPV vaccine uptake and recovery rate remains sub-optimal. There are routine opportunities to engage women in discussions regarding HPV cancers and vaccination during their cervical cancer screening appointments, but there are no routine opportunities to engage men. Novel approaches for identifying and engaging adults within the community are needed to increase awareness and opportunities for HPV cancer discussions and vaccinations.

The dental community has regular access to both men and women. Thus, they have a unique opportunity to help prevent oropharyngeal cancers by proactively discussing with their patients about cancer risk and by recommending HPV vaccination [15]. Dental clinicians already screen for oral cancers and contribute to education and prevention. Additionally, dentists have recently been authorized to vaccinate [16]. This provides a new realm of opportunity to prevent HPV-associated oropharyngeal cancer.

There is limited literature on the best way to identify and approach patients for these types of discussions within the context of dental visits. What is needed is a case-finding strategy. Case-finding is defined as the use of demographic and other patient characteristics to efficiently screen according to risk factors for patients who would benefit from a particular intervention [17]. This is different than a generalized screening

technique which applies tests to entire populations to determine prevalence or probability that an individual will have a disease *regardless* of the presence or absence of risk factors. Kassamali et al [18] compares both the generalized and case-specific techniques that could be used by pharmacists for chronic disease management and patient outcomes. This distinction was important because the yield in generalized screening was defined as “very low” when compared to case-finding [18]. The use of dental practices as a platform for case-finding has not been studied.

The primary objective of this study was to develop and test feasibility of a case-finding approach to identify patients who were candidates for HPV vaccination. The secondary objective was to test a patient dialogue tool to communicate the importance of HPV vaccination on uptake of HPV vaccination by subjects.

Methods

Study design and setting

We conducted a prospective, non-randomized feasibility study of case-finding and intervention for HPV vaccination. Two general and non-commercial dental practices participated, including four dentists and 2 dental hygienists.

Population

We included all patients attending the general dentistry offices for non-emergency (scheduled) dental visits meeting the Health Canada Inclusion Criteria for HPV vaccination candidacy [8]. This includes:

- Healthy males and females aged 9—45 years old. Healthy refers to those who are immunocompetent and HIV negative.
- Children ages 9–17 must have consenting adult or legal guardian present for consent and discussion
- Anyone who is immunocompromised and immunocompetent HIV-infected individuals. People are considered to be moderately or severely immunocompromised (have a weakened immune system) due to several types of conditions and treatments. Examples include those patients:
 - o Receiving active cancer treatment
 - o Who have received an organ or stem cell transplant
 - o Primary immunodeficiency
 - o Treated or untreated HIV infection
 - o Receiving high-dose steroids or other immunosuppressant medications

Exclusion criterion

Children under age 9 and adults over age 45. *Case-Finding:* A student research assistant reviewed all scheduled patients during the 4-week enrollment period. Any patients meeting the criteria for vaccination from Health Canada were flagged for a discussion with the dental clinician prior to the appointment and then were provided a consent form and asked if they would like to participate prior to seeing the dental clinician.

Vaccination Intervention

Dental Clinicians used our Dental Dialogue Tool (Appendix) to facilitate a conversation with consented patients about the HPV vaccination. The discussion included HPV facts and commonly asked questions. While the conversation started with the dental clinician speaking to the talking points, there was opportunity for a 2-sided conversation with questions and concerns raised directly by the participants. Participants who consented to receive the HPV vaccine were given a prescription by the attending dentist and were directed to to a local pharmacy to have the vaccine administered.

Follow-up

Each participant who was provided a prescription was contacted 6 weeks after their visit by the research assistant to determine if the vaccine was received.

Outcomes

Primary outcome: The primary outcome was the yield of our case-finding tool. We defined this as the number of patients who are HPV

vaccine candidates divided by the total number of patients screened from dental records as per the inclusion criteria.

Secondary outcomes

1. The proportion of subjects who accepted an HPV vaccination prescription from the dentist. We defined this as the number of candidates who receive a vaccine prescription from the dentists divided by the total number of unvaccinated candidates.

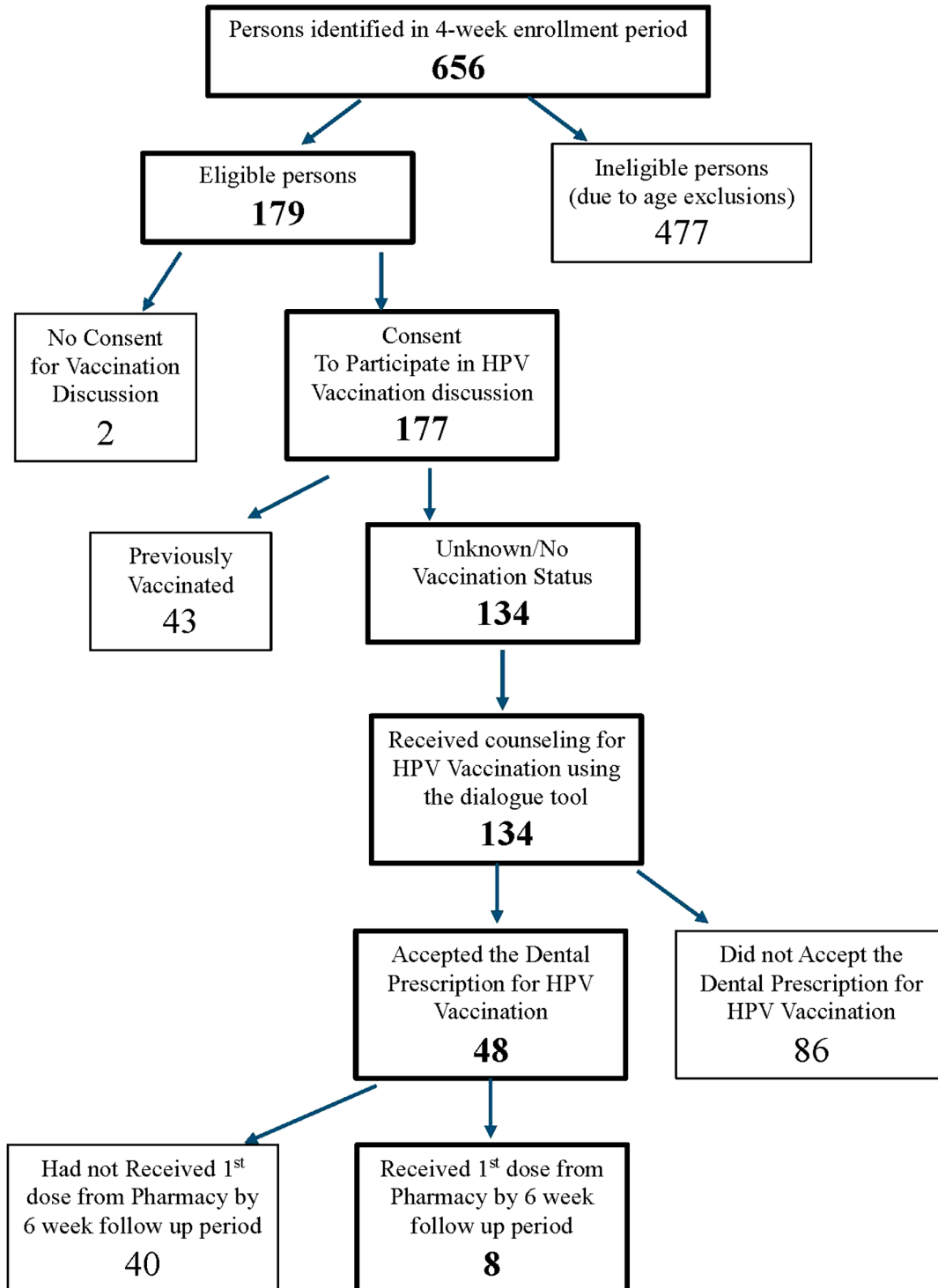


Fig. 1. Study Flow Diagram.

2. The proportion of subjects who received their first dose of the HPV vaccine at time of the 6 week follow up.
3. The acceptability of the Dental Dialogue Tool was explored through qualitative focus groups. The dental clinicians and pharmacists participated in a focus group interview session to determine the acceptability and useability (from the Dental Clinician's point of view) of the Dental Dialogue Tool and explore possible reasons why subjects did not complete the vaccination as prescribed.

Sample Size

We estimated sample size by calculating the number of subjects needed for a survey. We assumed a rate of HPV vaccine eligibility of 50 %, a margin of error of 5 %, and a confidence level of 95 %, which resulted in a sample size of 384 patients (Stat Calc, Epi Info 7.0, CDC, Atlanta, GA, USA).

We received approval from the University of Alberta Health Research Ethics Board – Health Panel. 2022 (Pro00119289).

Results

Case-finding strategy

We enrolled consecutive scheduled patients at two general dentistry offices over 4 weeks in July 2022 (Fig. 1).

From the two general and non-commercial dental practices, a total of 656 scheduled patients (non-emergency general dentistry procedures) were identified and assessed by our case-finding strategy.

Primary outcome

The yield of our case-finding was 179 out of 656 subjects, however, 2 did not provide consent (no interest in vaccine) and 43 were already vaccinated, leading to an overall yield of 134 (of 656 assessed), or 20.4 %. All 134 subjects proceeded to receive the intervention. Four hundred and seventy-seven patients were ineligible, either out of age range (younger than 9 or older than 45) or if a child (ages 9–17) had no adult present for consent and discussion at time of dental appointment.

Secondary outcomes

From the 134 patients that received the intervention, 48 accepted a prescription for HPV vaccine from the dentist. At 6 weeks of follow-up, 8 patients had received their first dose of HPV vaccine (6 % of those receiving the intervention). Although no case forms were kept two of the most frequent answers for not getting the vaccine were cost and time. The vaccine is an out-of-pocket expense due to lack of Alberta Health Coverage for adults over age 26. Secondly, there are a series of 3 vaccinations over a six-month period and convenience of setting up those appointments at their local pharmacy.

Acceptability of the dental dialogue tool

Interviews were conducted with 5 of the participating dentists, hygienists, and pharmacists to explore the acceptability of the Dental Dialogue Tool and the perceived barriers. The tool was described as a great resource to explain the facts and answer questions from patients.

“It was excellent. It's a concise way to have HPV related conversations with your patients.” [DDS2]

“I felt it was easy to understand. It did bring up a lot of questions for the patients. A lot of patients wanted additional information. Especially if it was covered. It kept the dialogue going. If I had trouble going further, I had further information.” [RDH 1]

The participants suggested some improvements to the tool which included using analogies (e.g., the vaccine is like an insurance policy), structure the tool in a flowchart format, include patient handouts, and provide different dialogues for different patient groups (e.g., ages, genders, etc.).

“It would be helpful if there's a different tool to use if talking to a mom with a child. [how to respond to comments like] “What are you insinuating”. It would help to frame the conversation to a guardian.” [RDH1]

The participants discussed perceived barriers to clinicians and their patients. The most mentioned barrier was stigma and was compounded with clinicians being afraid of offending their patients.

“How prepared are dentists in these environments to talk about a potential STD to their patients without losing them as patients?” [DDS1]

The participants hypothesized that the cost and time required to receive all three doses of the vaccine could be a barrier for their patients as the vaccine is not covered by public health or private insurance. Additionally, some postulated there is still a knowledge gap in the community about this being solely a female or sexually transmitted infection problem.

Discussion

HPV is a major cause of cancer, including head and neck cancers. These are largely preventable with vaccination; however, vaccination rates have been declining. Like all interventions, vaccination starts with case-finding. We tested a case-finding approach in general dental office and found that about a 20 % of patients who presented to general dentistry offices for scheduled (non-emergent) appointments during a 4 week period were potential HPV vaccine candidates (of whom, three quarters were unvaccinated. Actively finding 75 %, most of the eligible patients, of an easily accessible unvaccinated population to speak directly to about the increasing tidal wave of head and neck cancer and reinforce that there is a preventative vaccine represents a reasonable case-finding strategy. In terms of the vaccination intervention, we were disappointed that only about a third of patients accepted the HPV vaccine prescription and of those who did, only about a sixth of those received a first dose of vaccine. Overall, only 8 patients of the original cohort of 134 vaccine candidates were vaccinated (overall, only 6 %). This likely means that a single discussion with a dental professional is insufficient to convince patients of the value of HPV vaccination or increased and longer follow-up is necessary. With a reasonable case-finding strategy, the development of a stronger intervention is a worthwhile next step.

We noted that of 177 HPV vaccine candidates that we reviewed, only 43 (24.3 %) had been previously vaccinated, demonstrating the continued low uptake of HPV vaccination. Comparison with national and local immunization rates show our measured outcomes are representative of actual immunization rates. Canadian immunization uptake data for 2020 final dose ranges from 57.1 % to 91.3 % in girls and 57.5 % and 91.3 % in boys [19]. In Alberta, the range of HPV second dose for males by age 13 received in 2022 was from 12.6 % to 80.7 %, dependent on region, with an average of 59.9 %. At age 17, the same measure for males ranged from 29.1 % to 94.1 %, with an average of 74.3 %. The same measure for females at age 13 ranged from 4.9 % to 73.0 % with an average of 50.9 % while those at age 17 measured at 34.2 % to 93.4 % with an average of 75.1 %. [20]. It is concerning to observe such a wide range of vaccination rates, which justifies the need for case-finding and interventions to improve vaccination rates for HPV.

While there are strong national and international advocacy groups for dentists to recommend vaccination and provide vaccinations to their patients, to our knowledge, no specific case identification tools are available in the literature. A US National HPV Round Table in 2019 established by a multidisciplinary group of physicians and oral healthcare providers [21] identified the critical role oral healthcare professionals play in combating the growing rate of oropharyngeal cancers. Action steps are provided to engage the dental team on a larger education platform. Guadiana et al [22] found that the majority of dentists

(51 %), hygienists (63 %), dental students (82 %) and dental hygiene students (71 %) surveyed were willing to administer the HPV vaccine if allowed by law. They identified the roles of advocacy, educating, recommending the vaccine, and administering with licensure. A survey of British Columbia dentists [23] indicates that although a significant proportion of respondents were willing to educate patients on HPV, they were unwilling to discuss sexual history in a dental setting. Although the perception is the uncomfortable conversation is about a sexually transmitted infection, rather the conversation needs to be focused on a cancer-causing virus.

In our qualitative analysis of the dental dialogue tool and intervention, some of the clinicians postulated there is still a knowledge gap in the community about this being solely a female or sexually transmitted infection problem. Education to patients and clinicians is still necessary. Global barriers to vaccination [24] can be complex and regionally specific. Drivers of negative sentiment need to be monitored and addressed with appropriate interventions to prevent adverse public health outcomes. Consistent language and messages are essential for behavioural change.

Strengths of this study include utilization of long-term stable relationships between patients and general dentistry offices. The American Dental Association recommends that patients see their dentist at least once a year [25]. This environment is ideal for implementation of a case-finding strategy to identify patients missing the HPV vaccine. The generalizability of this study is limited by the inclusion of only two dental offices in an urban location and with seasonal slowdown of patient flow during the summer. Participant self-identified vaccination status may be a limiting factor based on memory or perceived stigma. Only one follow up at 6 weeks was completed for each participant to see if the vaccination had been successfully administered. Due to lack of non-student dedicated staff and the 10-week research funding a 4-week enrollment and one time 6 week follow up were used for this feasibility study.

Future studies could utilize government health vaccination records to confirm successful completion of the vaccine series and longer follow-up to provide time for all HPV vaccine doses to be administered. Additionally, this study was only conducted in English and the Dental Dialogue Tool was only provided in English. Implementation efforts should consider language barriers in some communities.

While other research has demonstrated willingness of clinicians to educate and provide vaccinations, no research to date provides a case-finding tool to target communication and identification strategies. This is the starting point of any vaccination communication strategy. Further study is indicated to build capacity of dental clinicians as vaccination promoters, supporting multidisciplinary community-based vaccine education, promotion, and outreach. Development of better dialogue tools and educational materials to facilitate conversation by the clinicians as well as the patients is strongly indicated. It is likely that a single point intervention is insufficient for vaccine uptake – multiple interventions and follow-up are likely necessary. We must address gaps in knowledge, attitudes, and beliefs, and with a focus on marginalized communities. Vaccine confidence must come from health care providers

Appendix

Dental Dialogue Tool

Dental Clinician Dialogue Prompts for HPV Head and Neck Cancer Discussion with Patients

Background:

Human papillomavirus (HPV) has been associated with six cancers including head and neck cancers (such as tonsils and base of tongue).

HPV-associated cancers are often diagnosed at a relatively advanced stage due to lack of screening opportunities. This situation is worsening due to the COVID-19 pandemic effects on regular care. With reduced physical examinations, cancer screenings, and HPV immunizations due to the COVID-19 pandemic, it is anticipated that Canadian health care providers could see a significant increase in these cancers in the coming decade. HPV-associated cancers are

(continued on next page)

using common language and education based on evidence-based vaccination communication. This requires consistent, coordinated education amongst health faculties.

Conclusions

We found that a systematic case-finding approach in general dental practices can identify patients who would benefit from HPV vaccination. What is needed next is to develop a more robust intervention for use by dental professionals to improve vaccine uptake.

Disclosures

CEC has been a consultant for Merck Canada.

RTT has been a consultant for Shoppers Drug Mart, Emergent Biosolutions, and Novo Nordisk.

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CRediT authorship contribution statement

Cheryl E. Cable: Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Kaitlyn E. Watson:** Writing – review & editing, Methodology, Formal analysis. **Ross T. Tsuyuki:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Data curation, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Dr Ross Tsuyuki reports financial support was provided by Merck Canada. Dr Cheryl Cable reports a relationship with Merck & Co Inc that includes: consulting or advisory and speaking and lecture fees. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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(continued)

Dental Dialogue Tool

preventable. However, current HPV vaccine uptake remains relatively low (under 70 %) even with publicly funded programs in most of Canada. This conversation with your patient will allow the patient to choose if they wish to receive a vaccine for HPV. You will be able to write that prescription and direct them to a pharmacist who can provide the vaccine series appropriate for them.

Talking Points to Drive Patient Discussion:

1. In our office we always do an exam on every patient that includes an oral cancer screening. I would like to talk to you today about head and neck cancer caused by the human papillomavirus or HPV.
2. Are you aware that the HPV can increase your risk of 6 different kinds of cancer including head and neck cancer?
3. You are probably aware that there is a scheduled screening program for women with PAP tests for cervical cancer caused by HPV – but there is no screening program for head and neck cancer.
4. Recent studies tell us that over 75 % of sexually active adults will have at least 1 HPV infection in their lifetime. Most of us can shed this off with no problems. Unfortunately, a portion of the population will have the HPV infect the mouth and throat and cause cancers of the oropharynx (back of the throat, including base of the tongue and tonsils). This virus can stay in our bodies more than 30 years after exposure.
5. This virus can be spread from mother to child, from saliva and any body fluid transmission.
6. What do you need to look for as a patient?
Long lasting sore-throat, Earaches, hoarseness, swollen lymph nodes, pain when swallowing, unexplained weight loss. Sores in the mouth that do not go away. Any asymmetry. White or red lesions.
7. Fortunately, if we catch this kind of cancer early – it is very responsive to treatment. The **best** thing is if we can prevent this from occurring at all. I can help you with that today with a vaccine.
8. I strongly recommend you receive the 9v-HPV vaccine to prevent head and neck cancer as well as many other types of cancer – I can give you a prescription today to take to the Shoppers Drug Mart to receive this vaccine immediately. The pharmacist can help you with any specific insurance coverage questions or any other questions you may have regarding this specific vaccine.
9. Do you have any additional questions for me today?

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