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Inside this supplement: Immunization across the lifespan

Vaccines are not just for children. To mark National Immunization Awareness Week coming up April 25 to May 2, 2015, this supplement explores immunization across the lifespan. Read the case for giving increased attention to adult vaccines, and learn about two key strategies to address vaccine hesitancy. Then see summaries of recent publications from the National Advisory Committee on Immunization and see our ID News section for an update on the recent measles outbreaks that have stimulated discussion of the importance of immunization to everyone. **Dr. Bonnie Henry is our Guest Editor.**

Commentaries

Updates

ID News

Useful link

Immunize Canada. **National Immunization Awareness Week 2015**.
http://www.immunize.ca/en/events/niaw.aspx

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Vaccines for adults: The time has come

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Abstract

The benefits of vaccines for adults have been underappreciated because of the focus on childhood vaccines. However, precisely because of the success of immunization programs for children, most deaths from vaccine-preventable diseases now occur amongst adults. Tetanus boosters will help to maintain Canada's low tetanus rates and pertussis boosters for adults are now available. Human papilloma virus vaccine may be indicated in some older adults. Hepatitis A and B vaccines may be indicated if there is occupational, travel or lifestyle risk. Pneumococcal and zoster vaccines are recommended in those over 65 years of age, and all adults benefit from annual influenza vaccination. A systematic approach to immunizing adults would assist in ensuring that all who are eligible for specific vaccines are offered them. This approach would include promoting routine immunization as a fundamental part of every patient encounter and the use of tools, such as the Adult Immunization Questionnaire and the Adult Immunization Wallet Card. By investing in these strategies, the health of adults can be improved significantly.

Introduction

Vaccines have improved the lives of children immensely, reducing morbidity and mortality from many childhood infections. It is remarkable to think that there were hundreds of thousands of cases of measles in an epidemic year before this safe and effective vaccine was introduced, and that a handful of cases in Canada's largest city is now considered an outbreak of significant proportion. The health of children has benefited hugely from the development of safe and effective vaccines.

In this miraculous story, the benefit of vaccines for adults has been underappreciated. Immunization has benefited the lives and improved the heath of adults as well. This important resource for the heath of adults cannot be overstated, but needs to be stated repeatedly, since so many adults do not see immunization as part of their health care or understand its value. The objective of this article is to review the benefits of various vaccines for adults and to review how they may be promoted more effectively.

The case for vaccines for adults

There are many reasons for adults to be immunized. First, routine immunization of adults seems to be forgotten after they leave the school system, but there are still many benefits from ensuring that routine vaccines are given throughout life. We are lucky that tetanus, which still affects thousands of people globally each year (1), occurs so rarely in Canada, because of a safe and effective vaccine. If this routine immunization is not on the radar screen of individuals and their health care providers, however, its benefits will decrease over time. There is already evidence that serological protection amongst adults in Canada is waning (2). Pertussis vaccine is another routine immunization for children, but only in the last decade have we had a safe and effective vaccine for adults. Getting individuals and health care providers to think about pertussis vaccine, however, is another matter. Pertussis vaccine prevents illness in adults, and its use in some adults, such as pregnant women, has shown promise in reducing pertussis in the most vulnerable, namely, infants (3).

Next, there are vaccines that are recommended for adults with risk factors for certain infections. For example, 1,500 cases of cervical cancer are diagnosed each year, and 400 women die of this now preventable disease.

Vaccine against human papillomavirus (HPV), the primary cause of cervical cancer, has been licensed, not only for adolescents, but for adult women, and for men up to the age of 26. This vaccine prevents 70% or more of cervical cancer, several other anogenital cancers, and may prevent some cancers of the head and neck (4). The licensure and wide-scale use of the nonavalent vaccine, together with appropriate continued screening for cancer of the cervix, has the potential to eliminate this important health threat to women. Other vaccines, such as hepatitis A vaccine (HAV) and hepatitis B vaccine (HBV), reduce or eliminate the risk of these infections when there is an occupational, travel or lifestyle risk.

There are some vaccines that are intended exclusively for adults. Zoster vaccine provides individual protection against a painful and debilitating occurrence of herpes zoster. Influenza vaccine, until recently, has been recommended virtually exclusively for adults, to prevent hospitalizations and deaths in the elderly and medically compromised. Its use is now broader, preventing severe illness in pregnant women and some children, and a very nasty illness in otherwise healthy adults. Polysaccharide pneumococcal vaccine has also been recommended for the elderly for many years, protecting them from the 23 strains of this potentially fatal infection. Conjugated vaccine provides improved protection against 13 strains for high-risk adults.

Despite the significant benefits to health, vaccines are not top of mind for either patients or providers (5,6). Rightly, there are other important priorities for adult health, such as healthy eating, active living, optimum weights, and prevention of diabetes and hypertension. Because of the success of immunization programs for children, however, most deaths from vaccine-preventable diseases now occur amongst adults (7). Immunization of adults deserves to have higher priority. It should be on the mind of every provider during every visit, and, as providers, we should be helping patients to understand the value of immunization for them, and engaging them as partners in optimizing its benefits. Because vaccines are routinely offered to all children, their immunization has been immensely successful in the prevention of diseases. The immunization of adults, however, has often been targeted, and has enjoyed less success as a result. For example, when influenza vaccine became a universal program in Ontario in 2000, some patients for whom this vaccine was indicated medically finally presented for the vaccine—not because they had a medical indication, but because the vaccine was now offered free of charge to all residents of the province.

Promoting vaccines for adults

How can immunization be made a higher priority in health programs for adults? First, there needs to be recognition of the benefit, both to patients and within the health system. For many years, for example, immunization with polysaccharide pneumococcal vaccine has been assessed to be a cost-effective measure for people over the age of 65 (8, 9, 10). Immunization with zoster vaccine can reduce not only suffering, but also health costs (11). A systematic approach to immunizing adults would assist in ensuring that all who are eligible for specific vaccines are offered them. The first strategy is to change our thinking about vaccines for adults, so that routine immunization is a fundamental part of every encounter, in the same way that it is for children. It would be considered poor practice if immunization were not a part of a well-child visit. Yet no one criticizes a provider for not asking about the immunization status of an adult, in an episodic visit, let alone in a routine checkup.

Promotion of this important part of primary care is essential to ensure that it is a universal part of every practice and that its benefits are realized.

The second initiative is to assist primary care providers with tools to identify and assess patients who may be eligible for immunization on a targeted basis, to ensure that they have full benefit of these vaccines. This strategy would emphasize identification of eligibility as a first step, by asking the right questions to every patient, and assessing the specific eligibility for a targeted immunization program as a second. This approach implies an awareness of all of the various vaccines for which a patient may be eligible, and an ability to determine more specifically which ones are indicated. Tools that provide information at one's fingertips, outlining the routine and high-risk vaccine schedule for adults (12) and the catch-up schedule for adults with no record or unclear immunization history (13) by province and territory are available from the Public Agency of Canada and provincial ministries of health. They need to be used routinely.

Specific strategies can assist providers of primary care. For example, a strategy for each visit by patients that can be implemented in all primary care settings should include an assessment of the immunization status, facilitated by stamped reminders in each patient's chart or automatic reminders in electronic medical records. Improved

record-keeping can be facilitated through the inclusion of adults' records on each province's immunization registry and working towards allowing remote entry to this database in every primary care office. It should be routine that every adult whose immunization status has been reviewed and brought up-to-date by providing the vaccines indicated, receive documentation of their immunization. There are several tools already developed and available to assist providers of primary care, such as the Adult Immunization Wallet Card that is available through Immunize Canada (14). These tools also have the benefits of engaging patients to become more involved in their own care and more knowledgeable about their immunization needs and status (15). Immunize Canada's Adult Immunization Questionnaire, which is completed by patients at scheduled appointments, improves both documentation and patients' awareness their own immunization status.

Also critically important in engaging adults in taking ownership of their own immunization is a strong focus on communications with patients. Taking the time to provide clear explanations of the value of immunization—and of the risks and benefits of the various vaccines—can only help to enhance uptake. Appropriate remuneration for providers needs to be in place to improve their engagement, to realize what we all know about the role of providers in improving immunization rates: that effective communication by health care providers has an important influence on people's decisions about whether or not to proceed with immunization (5).

Conclusion

Immunization of adults has been a neglected part of immunization programs, and a neglected part of health care for adults. Let us all share a vision about a comprehensive immunization program for adults, one in which: immunization of adults is given as much importance as other preventive programs; new, effective vaccines for adults are given priority, like childhood vaccines; safe and effective vaccines that are recommended for adults are made available in all provinces and territories; there is excellent and comprehensive promotion of vaccines for adults; and, finally, these efforts lead to optimum uptake and broad coverage of immunizations for adults, including both needed boosters and new vaccines. With the right emphasis and with the right investment, the health of adults can be improved significantly through attention to their immunization, just as has happened to the health of children.

Conflict of interest

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What do we know about how to improve vaccine uptake?

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Abstract

Over the past 100 years, an increasing array of vaccines has been introduced into the Canadian market and yet optimal use depends on public demand and acceptance of these products. In the 1990s, research focused on key barriers to vaccine uptake, highlighting the importance of barriers to access and "missed opportunities" for vaccination. In this century the focus is on vaccine hesitancy, which is influenced by factors such as complacency, convenience and confidence. This phenomenon is not new but some of its drivers include an increasingly crowded immunization schedule, heightened societal concerns about risk over benefit, and a rise in health consumerism. Understanding and addressing vaccine hesitancy will be critical to preventing it from undermining the success of immunization in the future. While more research is needed, there are both practitioner-based resources to optimize dialogue with vaccine-hesitant parents and program-based resources to address vaccine hesitancy at a population-based and societal level.

Introduction

Parental decisions to not vaccinate their children are recognized as an increasing barrier to the success of immunization programs in Canada. On the heels of successful elimination of measles and rubella in Canada (1) have come the challenges of introduction of HPV vaccine (2), an unflattering report card on vaccine coverage rates for Canada from UNICEF (3), provincial monitoring indicative of a growing trend in vaccine refusal (4), and re-emergence of measles (5). All of these have shed light on an important contributor to vaccine uptake, now termed "vaccine hesitancy." This phenomenon is not new but some of its drivers include an increasingly crowded immunization schedule, heightened societal concerns about risk over benefit, and a rise in health consumerism. Understanding and addressing vaccine hesitancy is critical to prevent it from undermining the success of immunization in the future. The objective of this article is to summarize the available literature on strategies for addressing vaccine hesitancy in an effort to improve public confidence and, correspondingly, vaccine acceptance.

In the past 100 years, scientists and academics, the vaccine industry, and regulatory agencies have brought an array of vaccines for primary prevention of serious diseases to the Canadian market. Since the 1960s, the National Advisory Committee on Immunization (NACI) has made recommendations for their use (6). Provincial/ territorial ministries of health adopt these into publicly-funded immunization programs. Thereafter it is the primary objective of public health immunization programs to achieve high targeted levels of vaccine uptake in the population in order to maximize the benefits of this preventive measure (7).

In the 1990s, the large outbreaks of measles which occurred prior to introduction of the second dose of measles vaccine into routine childhood immunization led to program-based research focusing on key barriers to vaccine uptake. Emerging especially from the U.S.-based studies was a body of work addressing the importance of "missed opportunities" for vaccination. This highlighted that a significant contribution to ongoing outbreaks was under-vaccination among children who had encountered a health care provider who failed to use the visit as an opportunity to offer vaccine. Recommendations to improve provider-driven interventions were developed, and several systematic reviews were conducted in the United States and Canada to guide incorporation of strategies with demonstrated effectiveness into guidelines for provider practice (8, 9, 10, 11). These are well summarized by the Community Preventive Services Task Force and include reminder/recall systems, vaccination requirements and programs for day care centres and schools/colleges, home visits, immunization information systems, client and family incentives, and provider assessment and feedback (12). In a more recent development, evidence-

based pain reduction techniques have been incorporated into immunization practice guidelines to reduce reasons why people may choose not to immunize (13).

Analysis

The literature on parental factors associated with vaccine uptake contains many studies of immunization-related knowledge, attitudes and behaviours, and attempts have been made to identify characteristics of individuals and populations objecting to vaccination (14). The term "vaccine hesitancy" has come into use to describe attitudes and beliefs that may interfere with acceptance of one or more vaccines, including parental requests for alternate immunization schedules. Vaccine hesitancy is associated with a spectrum of vaccine uptake, from acceptance of vaccines despite doubts, to selective vaccination, delayed vaccination, and outright refusal of all vaccines. It has been defined by the Strategic Advisory Group of Experts (SAGE) on Immunization as "…delay in acceptance or refusal of vaccines despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence." (15)

Vaccine hesitancy is recognized as a problem globally and has reached the attention of the World Health Organization to stimulate a more organized approach to this phenomenon (16, 17). Hesitancy is closely aligned with public trust in vaccines. It is not solely related to scientific issues but influenced by psychological factors, the sociocultural milieu, philosophical inclination such as preference for "natural" alternatives, and religious and political factors, including distrust of government and the pharmaceutical industry. While new immunization program introduction is traditionally concerned with the science of the vaccine and the infrastructure for its delivery, there has been insufficient attention to the many factors that influence public acceptance of vaccines (18).

Several reviews of the vaccine hesitancy literature have been published and a report outlining an evidence-based strategy was issued by SAGE following its October 2014 meeting (15, 19, 20, 21, 22). While the literature contains a heterogeneous group of approaches, populations and results, SAGE supports delivery of multi-component but integrated interventions that include mass media, social mobilization at multiple levels and dialogue-based interventions, in addition to previously identified effective strategies (e.g., reminder/recall). SAGE also concluded that more research is needed that is formative in nature and designed to obtain evidence rather than test pre-formed assumptions.

Practitioner-based strategies

Resources are available to help practitioners with the difficult dialogue with vaccine-hesitant parents. Emerging evidence supports starting the conversation with a statement assuming that the child will be immunized (an "opt-in" approach), which recognizes that parents perceive the decision as complex and emotional, and based on "choice architecture" observations that in such situations humans will choose a decision that has already been made by the majority (23). Available guidance advises listening to the parent's perspective and concerns in a non-judgmental manner, and the importance of establishing trust. Motivational interviewing with open questions and a guiding style is recommended to identify whether the parent is responsive to change and their motivations, and to establish where they sit in the five-stage spectrum based on the transtheoretical model of behaviour change (pre-contemplation, contemplation, preparation, action, maintenance) (24).

Clinical practice guidelines from experts in the field advise that the dialogue should also elicit specific worries about information the parent has read or been told (25, 26, 27). The literature suggests that standard written vaccine information and refuting misconceptions may further entrench parents most strongly opposed to vaccination (28). Evidence supports emphasizing the benefit to the child of being vaccinated instead of emphasizing benefits to society as a whole (29). Illustration through use of stories about cases of vaccine-preventable disease is more helpful than providing statistics, but it is important to define numerically terminology (e.g., "common" or "rare") that may be used to describe both the risk of disease and its complications and frequency of an adverse event.

The encounter is more effective when the information provided to the parent is tailored to their concerns. Providers should be well informed to address parents' questions, as research indicates that vague responses do

not engender confidence; an excellent series of public domain articles is available in *Pediatrics* (30, 31, 32, 33). Providers should also be careful not to "oversell" immunization, to outline expectations and management of common adverse events, including local injection site reactions and fever in infants and young children, and to address parents' fear of their child's pain associated with injectable vaccines and to offer methods to reduce it (13). However, the provider should provide a clear recommendation, as this has been repeatedly recognized as highly associated with parental acceptance of vaccines. Much of this information has been summarized into online resources that can be readily accessed and also provided to parents (34, 35, 36).

Program strategies

On a broader scale, other strategies are also worth exploring. These include use of trained lay people alongside a trained provider in group sessions with parents prior to commencing an immunization series (37), and timely public health response to negative media reports or shoddy science (38,39). Engagement of the larger community supportive of vaccination in advocacy is also an emerging strategy that lends promise and will require evaluation (40, 41).

Conclusion

Despite the fact that vaccines are second only to clean water in saving lives across the globe, there is no magic bullet to address their acceptance (42). To ensure continued success of these programs, it is important to focus on population, community and individual concerns, to better understand where these lie on the continuum from acceptance to rejection. This knowledge and evidence-based multi-component approaches tailored to specific communities and vaccines are required to improve public acceptance of vaccines and achieve not only improved uptake but also increased trust and confidence.

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Summary of the National Advisory Committee on Immunization's Update on the recommended human papillomavirus (HPV) vaccine immunization schedule

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Abstract

Background: Human papillomavirus (HPV) infections are the most common sexually transmitted infections. In the absence of vaccination, it is estimated that 75% of sexually active Canadians will have a sexually transmitted HPV infection at some point in their lives. Canada's National Advisory Committee on Immunization (NACI) has recommended a three-dose immunization schedule with HPV vaccine for females 9 years of age and older and for males between 9 and 26 years of age, since 2007 and 2012, respectively.

Objective: To outline the evidence on a two-dose HPV vaccine schedule and to make recommendations for the optimal HPV immunization schedule in Canada.

Methods: NACI reviewed the evidence used by the World Health Organization's (WHO's) Strategic Advisory Group of Experts (SAGE) on Immunization for the two-dose HPV immunization schedule recommended for immunocompetent girls 9 to 14 years of age and conducted an additional review of literature for studies not included in, or published after, the SAGE review. A knowledge synthesis was performed then NACI approved specific recommendations and elucidated the rationale and relevant considerations.

Results: Based on the evidence available to date, a two-dose HPV immunization schedule among immunocompetent 9- to 14-year-olds is expected to provide similar protective efficacy compared to a three-dose schedule in immunocompetent individuals aged 9 to 26 years. While all studies reviewed included only females, there is no reason to believe that the data would be different in males, given that data from three-dose trials demonstrates similar immune responses. Administration of two doses of HPV vaccine rather than three may increase acceptability by students, parents and health care professionals alike, and may lead to improved HPV immunization coverage and efficiencies by public health agencies. The duration of protection of either two doses or three doses of HPV vaccine is not yet known; research is encouraged to determine whether there is need for a booster dose.

Conclusion: Based on the evidence available to date, a two-dose HPV immunization schedule (given at least six months apart) among immunocompetent 9- to 14-year-olds may be considered by individuals and jurisdictions to allow for potential cost savings and other individual and programmatic advantages. A three-dose schedule should be used in individuals 15 years of age and older, as well as immunocompromised individuals and immunocompetent HIV-infected individuals. The new and complete set of current recommendations for HPV vaccines will be published in the updated HPV chapter in the *Canadian Immunization Guide* in the near future.

Updated NACI recommendations on HPV vaccine (1)

Recommendation #1

Healthy females (9 to 14 years of age)—NACI Grade A Recommendation

Either a two-dose or three-dose schedule of the HPV vaccine (Gardasil® or Cervarix®) is recommended for immunocompetent, non-HIV infected females 9 to 14 years of age. For a two-dose schedule, at least six months between the first and second dose is recommended. If the interval between doses is shorter than five months, a third dose should be given at least six months after the first dose.

Recommendation #2

Healthy females (15 years of age and over)—NACI Grade A Recommendation

A three-dose schedule of the HPV vaccine (0, 2 and 6 months for Gardasil® and 0, 1, and 6 months for Cervarix®) is recommended for females 15 years of age and older, unless the first dose of HPV vaccine was administered before the age of 15 years. If the first dose was administered between 9 and 14 years of age, a two-dose schedule is sufficient for females 15 years of age and older, with the second dose administered at least six months after the first dose.

Recommendation #3

Healthy males (9 to 14 years of age)—NACI Grade B Recommendation

Either a two-dose or three-dose schedule of the HPV4 vaccine (Gardasil®) is recommended for immunocompetent, non-HIV infected males 9 to 14 years of age. For a two-dose schedule, at least six months between the first and second dose is recommended. If the interval between doses is shorter than five months, a third dose should be given at least six months after the first dose.

Recommendation #4

Healthy males (15 years of age and over)—NACI Grade B Recommendation

A three-dose schedule of the HPV4 vaccine (Gardasil®; 0, 2 and 6 months) is recommended for males 15 years of age and older, unless the first dose of HPV vaccine was administered before the age of 15 years. If the first dose was administered between 9 and 14 years of age, a two-dose schedule is likely to be sufficient for males 15 years of age and older, with the second dose administered at least six months after the first dose.

Recommendation #5

Immunocompromised individuals[1] and immunocompetent HIV-infected individuals—NACI Grade I[2] Recommendation

A three-dose schedule of the HPV vaccine (Gardasil® for males and females—0, 2, 6 months; or Cervarix® for females—0, 1, 6 months) is recommended for individuals who are immunocompromised and immunocompetent HIV-infected individuals. There is insufficient evidence to recommend a two-dose schedule in these populations; therefore, a three-dose schedule continues to be recommended for individuals who are immunocompromised and for immunocompetent HIV-infected individuals. Further study in these populations is required.

[1]For details on populations considered to be "immunocompromised," please refer to the chapter "Immunization in Immunocompromised Persons" in the *Canadian Immunization Guide* (2).

[2] Grade I recommendation= Insufficient evidence

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Summary of the National Advisory Committee on Immunization's Statement on the re-immunization with polysaccharide 23-valent pneumococcal vaccine

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Abstract

Background: Individuals who are 2 years of age and over and at high risk for invasive pneumococcal disease (IPD) (defined as those with functional or anatomic asplenia or sickle cell disease; hepatic cirrhosis; chronic renal failure or nephrotic syndrome; HIV infection; and immunosuppression related to disease or therapy) are recommended to receive one lifetime booster dose of polysaccharide 23-valent pneumococcal vaccine (Pneu-P-23) vaccine, in addition to age- and risk-specific recommendations for the conjugate 13-valent pneumococcal vaccine (Pneu-C-13). Adults aged 65 years and over are also considered at high risk for invasive pneumococcal disease (IPD).

Objective: To determine the optimal time between initial vaccination with Pneu-P-23 and subsequent booster doses to protect against IPD in those at high risk for IPD.

Methods: The National Advisory Committee on Immunization (NACI) conducted a systematic review of the literature on booster doses of pneumococcal vaccine for individuals at high risk for IPD disease. NACI reviewed the evidence considering the target population, safety, immunogenicity, efficacy, effectiveness of the vaccines, vaccine schedules, and other aspects of the overall immunization strategy, and then approved three specific recommendations.

Results: For all individuals aged 2 years and over who are at high risk for IPD and who have received a dose of Pneu-P-23, re-vaccination with a second dose of Pneu-P-23 should be provided five years after the initial dose of Pneu-P-23. They should also have previously received age-appropriate doses of 13-valent conjugate pneumococcal vaccine. There is currently insufficient evidence to determine the optimal timing and number of Pneu-P-23 boosters in high-risk adults. One lifetime booster of Pneu-P-23 is currently recommended for individuals at high risk for IPD, five years after the previous dose. Given the increased risk of IPD in adults aged 65 years and older and the rapid decline in antibodies following Pneu-P-23, all individuals should receive one dose of Pneu-P-23 at age 65 years—as long as five years have passed since the previous Pneu-P-23 dose. No additional booster dose is currently recommended for this age group, if they have no medical conditions that put them at high risk for IPD.

Conclusion: The new and complete set of current recommendations for pneumococcal vaccines will be published in the updated "Pneumococcal" chapter in the *Canadian Immunization Guide* in the near future.

Introduction

Individuals who are 2 years of age and over and at high risk for invasive pneumococcal disease (IPD) (defined as those with functional or anatomic asplenia or sickle cell disease; hepatic cirrhosis; chronic renal failure or nephrotic syndrome; HIV infection; and immunosuppression related to disease or therapy) should receive one lifetime booster dose of polysaccharide 23-valent pneumococcal (Pneu-P-23) vaccine, in addition to age- and risk-specific recommendations for the conjugate 13-valent pneumococcal vaccine (Pneu-C-13). Adults over 65 years of age are also considered at high risk for IPD, regardless of any medical condition.

The National Advisory Committee on Immunization (NACI) provides the Public Health Agency of Canada (the Agency) with ongoing and timely medical, scientific, and public health advice relating to immunization. NACI has undertaken a systematic review to determine the optimal time between initial vaccination with Pneu-P-23 vaccine and subsequent booster doses in those at high risk for IPD.

Methods

NACI conducted a systematic review of evidence considering the target population, safety, immunogenicity, efficacy, effectiveness of the vaccines, vaccine schedules, as well as other aspects of the overall immunization strategy, and then developed and approved three specific recommendations.

Results

A total of 10 studies were reviewed for immunogenicity data. Safety of re-vaccination with Pneu-P-23 was assessed in eight of these studies. In all reviewed studies, re-vaccination of those at high risk for IPD five years following initial Pneu-P-23 vaccination demonstrated a boost in immune response and an acceptable safety profile. Individuals who had received one or two doses of Pneu-P-23 before age 65 years demonstrated a good immune response to a repeated dose of Pneu-P-23, when administered at 65 years of age or over. There is little evidence to suggest that hyporesponsiveness occurs with one additional booster of Pneu-P-23. A complete report of the systematic review is available (1).

The following recommendations were developed and approved by NACI.

Updated NACI recommendations on Pneu-P-23 vaccine (2)

Recommendation #1

For all individuals aged 2 years and over who are at high risk for IPD (functional or anatomic asplenia or sickle cell disease; hepatic cirrhosis; chronic renal failure or nephrotic syndrome; HIV infection; and immunosuppression related to disease or therapy) and who have received a dose of Pneu-P-23, re-vaccination with a second dose of Pneu-P-23 should be provided five years after the initial dose of Pneu-P-23. This is a change from the previous recommendation that children aged 10 years or younger at their first dose of Pneu-P-23 should receive the second dose three years later. This change is based on the absence of evidence to support the three-year timing of the booster dose in children and on the universal use of Pneu-C-13 in children that has contributed to the marked decrease in the incidence of IPD. The single re-vaccination at five years after the initial vaccination harmonizes the pediatric and adult schedules for those at high risk for IPD. High-risk individuals should also have received age-appropriate doses of 13-valent conjugate pneumococcal vaccine; 13-valent conjugate pneumococcal vaccine should be administered first, followed eight weeks later by Pneu-P-23.

Recommendation #2

There is currently insufficient evidence to determine the optimal timing and number of Pneu-P-23 boosters in high-risk adults (i.e., functional or anatomic asplenia or sickle cell disease; hepatic cirrhosis; chronic renal failure or nephrotic syndrome; HIV infection; and immunosuppression related to disease or therapy). One lifetime booster of Pneu-P-23 is currently recommended for individuals at high risk for IPD, five years after the previous dose.

Recommendation #3

Given the increased risk of IPD in adults aged 65 years and older and the rapid decline in antibodies following Pneu-P-23, all individuals should receive one dose of Pneu-P-23 at age 65 years—as long as five years have passed since any previous Pneu-P-23 dose. Studies reviewed for this updated statement have all administered a dose of Pneu-P-23 to individuals aged 65 years and over, regardless of their prior vaccination history. No additional booster dose is currently recommended for those over the age of 65 years who do not have other underlying medical conditions that would put them at high risk for IPD.

Conclusion

The new and complete set of current recommendations for pneumococcal vaccines will be published in the updated "Pneumococcal" chapter in the *Canadian Immunization Guide* in the near future (3). The top surveillance and research priorities are: enhanced surveillance that includes high-risk individuals and can provide incidence of IPD stratified by risk factors and serotypes for individuals in the over 65 years of age group; vaccine effectiveness and coverage studies of Pneu-P-23 in high-risk patients and in those over 65 years of age; and epidemiological studies of non-invasive disease such as community-acquired pneumonia in all age groups or acute otitis media in children caused by *S. pneumoniae*. To guide recommendations for additional doses (i.e., more than one booster dose), further studies are needed to understand how the immune system responds to additional doses of Pneu-P-23.

Acknowledgements

The author would like to thank the extremely dedicated members of NACI and the NACI Pneumococcal Working Group.

Conflict of interest

None

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Summary of the National Advisory Committee on Immunization's Update on quadrivalent meningococcal vaccines available in Canada

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Abstract

Background: Invasive meningococcal disease (IMD) has an overall mortality of approximately 10% and up to 35% of survivors may experience long term sequelae. Canada's National Advisory Committee on Immunization (NACI) recommends immunization with a quadrivalent conjugate meningococcal vaccine of individuals who are at increased risk of IMD due to an underlying medical condition or have a high risk of exposure to *N. meningitidis*. Use of a conjugate vaccine, either monovalent or quadrivalent, is recommended for a routine adolescent booster dose at around 12 years of age.

Objective: To review and update the evidence on the use of quadrivalent (serogroups A, C, Y and W-135) conjugate meningococcal vaccines and vaccination schedules used in Canada following the approval of a new quadrivalent meningococcal vaccine conjugated to the tetanus toxoid (Men-C-ACYW-TT, Nimenrix™).

Methods: NACI reviewed the knowledge synthesis performed by the Meningococcal Working Group, including information on the IMD burden of disease; safety, immunogenicity, efficacy and effectiveness of the new vaccine; currently used vaccine schedules; and other aspects of the overall immunization strategy. Following the review of evidence, NACI voted on specific recommendations.

Results: A total of 21 studies were reviewed for immunogenicity and 12 studies for safety data relating to Men-C-ACYW-TT. Information from two additional studies assessing immunogenicity and safety of a quadrivalent meningococcal vaccine conjugated to the diphtheria toxoid (Men-C-ACYW-DT, Menactra®) in children 9 and 12 months of age was also reviewed. A good immune response and an acceptable safety profile when compared to the monovalent conjugate meningococcal vaccines (Men-C-C) were demonstrated by both vaccines in all the reviewed studies. For children less than 2 years of age, NACI continues to recommend the use of Men-C-ACYW-CRM (Menveo™) vaccine.

Conclusion: The new and complete set of current recommendations for conjugate meningococcal vaccines will be published in the updated "Meningococcal" chapter in the *Canadian Immunization Guide* in the near future. The top surveillance and research priorities are: determining the coverage and impact of immunization (including carriage and herd immunity) on IMD in Canada; determining the duration of protection/immunity to allow the assessment of recommendations for booster doses of conjugate quadrivalent vaccines; comparative studies of the three available quadrivalent conjugate vaccines in the general population and high-risk groups; and the immunogenicity and safety of co-administration of quadrivalent vaccines with routine age appropriate vaccines, including the newly authorized meningococcal B vaccine.

Updated NACI recommendations on quadrivalent meningococcal vaccine (1)

Recommendation #1
For routine immunization of adolescents, any of the quadrivalent or monovalent C conjugate meningococcal vaccines registered in Canada may be used. The choice between quadrivalent and monovalent C conjugate vaccines is dependent on local epidemiology and other programmatic considerations. (NACI Recommendation Grade B)

Recommendation #2
For the immunization of high-risk individuals 2 years of age and older, any of the quadrivalent conjugate meningococcal vaccines registered in Canada may be used. (NACI Recommendation Grade B)

Recommendation #3
For the immunization of high-risk individuals between 8 weeks and less than 2 years of age, Men-C-ACYW-135 (Menveo™) is the recommended product. Schedules are provided in Table 3 of the "Meningococcal" chapter of the *Canadian Immunization Guide* (2). (NACI Recommendation Grade B)

Recommendation #4
For immunization of individuals 2 years of age and older travelling to areas where meningococcal vaccine is recommended, any of the quadrivalent conjugate meningococcal vaccines may be used. (NACI Recommendation Grade B)

Conflict of interest
None

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Updates to the *Canadian Immunization Guide*: March 2014 to March 2015

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Abstract

The National Advisory Committee on Immunization (NACI) develops recommendations for the use of vaccines for Canadians, which are summarized in the *Canadian Immunization Guide* (the Guide) and which is updated on a regular basis. Between March 2014 and February 2015 recommendations on five vaccines have been issued. Updates to the Guide include recommendations made for the alternative dosing administration of the human papillomavirus (HPV) vaccine in adolescents, timing of varicella zoster immune globulin (VarIg) following exposure to varicella, and the meningococcal and quadrivalent influenza vaccines, recently authorized for use in Canada. A change in recommendations for the use of pneumococcal vaccines in adults and individuals with asthma has also been made. The chapter on tick-borne encephalitis vaccine has now been removed from the Guide as this vaccine is no longer available in Canada.

Introduction

The National Advisory Committee on Immunization (NACI) develops recommendations for the use of vaccines for Canadians and is the scientific advisory body on immunization for the Public Health Agency of Canada (PHAC) (1). These recommendations and other immunization information are published in the *Canadian Immunization Guide* (the Guide) (2).

Since 1979, the Guide has been a trusted, reader-friendly summary of information that has been used by health care providers to give advice on immunization to their patients, and by policy makers for the delivery of immunization programs. The document consists of five parts, covering key immunization information, vaccine safety, special populations, active vaccines, and passive immunization agents. Since the 2006 edition, the Guide has undergone extensive revisions. In 2012, it began to be published online in an evergreen electronic format (2). The objective of this article is to highlight updates to the Guide, which have been made between March 1, 2014, and March 31, 2015.

Approach

When developing its statements, NACI conducts comprehensive knowledge syntheses and analyses incorporating scientific reviews, evolving practices, and national and international recommendations. NACI then reflects its recommendations in a summarized format in the corresponding chapters of the Guide. Detailed recommendations concerning immunization and the use of vaccines available in Canada can be found in the NACI Statements and Statement Updates, which are available on the PHAC website (1).

Summary of updates

Table 1 provides a summary of recent changes and additions to the Guide.

Table 1: Highlights of key changes to active vaccine recommendations in the *Canadian Immunization Guide*, March 2014 to March 2015

Human papillomavirus	For immunocompetent, non-HIV infected, adolescents 9 to 14 years of age, NACI now recommends either a two- (HPV2 or HPV4 at months 0 and 6−12) or three- (HPV2 vaccine at months 0, 1, and 6 or HPV4 vaccine at months 0, 2, and 6) dose schedule.
	A three-dose schedule of the HPV vaccine (HPV4 for males and females—0, 2, 6 months; or HPV2 for females—0, 1, 6 months) is recommended for individuals who are immunocompromised and immunocompetent HIV-infected individuals.
Influenza	Two quadrivalent inactivated influenza vaccines (QIV) have been authorized for use in Canada (Flulaval™ Tetra and Fluzone® Quadrivalent).
	Egg-allergic individuals may be vaccinated against influenza in any settings where vaccines are routinely administered using trivalent inactivated influenza (TIV) or QIV without a prior influenza vaccine skin test and with the full dose.
	NACI recommends preferential use of live attenuated influenza vaccine (LAIV), where available, in children younger than 6 years of age based on evidence of superior efficacy of LAIV compared to TIV in these children, with weaker evidence of superior efficacy in older children. Although it is anticipated that the superior efficacy for LAIV over TIV extends beyond age 6 years, the evidence does not indicate at which specific age the efficacies of LAIV and TIV become equivalent. If LAIV is not available for those for whom it is considered superior, TIV should be used.
Meningococcal	Two new meningococcal inactivated vaccines have been authorized for use in Canada: multicomponent meningococcal serogroup B (4CMenB, Bexsero™) and meningococcal A, C, Y, and W-135 conjugate (Nimenrix™) vaccine.
	NACI recommends immunization with 4CMenB vaccine for individuals 2 months of age and older who are: • at high risk of invasive meningococcal disease (IMD) caused by serogroup B *Neisseria meningitidis* • in close contact with a case of IMD caused by serogroup B *Neisseria meningitidis* • at risk during IMD outbreaks caused by serogroup B *Neisseria meningitidis*
	For high-risk individuals 2 years of age and older or for travellers 2 years of age and older going to areas where the meningococcal vaccine is recommended, any of the conjugate quadrivalent (A, C, Y, and W-135) products can be used.
Pneumococcal	NACI recommends vaccination with an age-appropriate pneumococcal vaccine for individuals who required medical attention for asthma in the past 12 months.
	Individuals with medical conditions putting them at high risk of IPD should receive one lifetime booster dose of Pneu-P-23 5 years after the previous one, regardless of age at first dose.

	One dose of pneumococcal polysaccharide (Pneu-P-23) vaccine is recommended for all adults 65 years of age and older as long as 5 years has passed since any previous Pneu-P-23 dose, and for immunocompetent adults less than 65 years of age in long-term care facilities, or who have conditions putting them at increased risk of pneumococcal disease.
	All individuals who have previously received Pneu-P-23 vaccine and require re-immunization with pneumococcal conjugate (Pneu-C-13) vaccine should receive Pneu-C-13 vaccine no sooner than five years after the most recent dose of Pneu-P-23.
	Pneu-C-13 should be administered to adults with immunocompromising conditions, followed by Pneu-P-23 at least eight weeks after—if not already administered.
Tick-borne encephalitis	Tick-borne encephalitis vaccine is no longer available in Canada.
Varicella	For maximal benefit, varicella zoster immune globulin (VarIg) should be administered as soon as possible after exposure, ideally within 96 hours after first exposure, but can be administered up to 10 days after last exposure.

Conclusion

Since 2012, the Guide has been continuously updated to incorporate new science and practices as reflected in the most recent NACI Statements and NACI Statement Updates. NACI and the Public Health Agency of Canada are committed to providing information on immunization and vaccines available for use in Canada in an easily accessible, reader-friendly format, through timely and ongoing updates of the Guide.

Acknowledgements

The authors would like to thank the extremely dedicated members of National Advisory Committee on Immunization and the Public Health Agency of Canada staff who are supporting the *Canadian Immunization Guide* update process.

Conflict of interest

None

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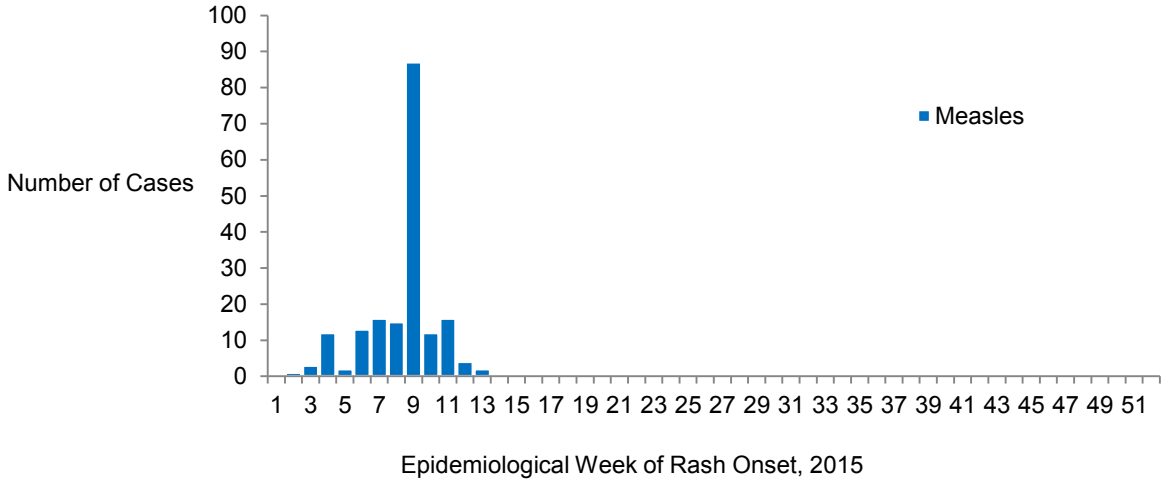
ID News: The recent measles outbreak

Public Health Agency of Canada. **Measles and Rubella Weekly Monitoring Report. Week 13, 2015: March 29 to April 4, 2015.**

http://www.phac-aspc.gc.ca/mrwr-rhrr/2015/w08/index-eng.php

- In Canada, 3 new cases of measles were reported by British Columbia during week 13.
- Two provinces (Quebec and British Columbia) have reported recent measles activity. These events are not linked, as they are different genotypes and resulted from separate importation events (B3 from USA, and H1 from China, respectively)
- A total of 183 cases of measles have been reported in Canada for 2015.

Figure 1: Number of cases of measles (n=183) by week of rash onset, as reported to the Canadian Measles/ Rubella Surveillance System (CMRSS) and Measles and Rubella Surveillance system (MARS), for the period ending April 04 2015 .



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On January 5, 2015, the California Department of Public Health was notified about a suspected measles case. As of February 11, a total of 125 measles cases with rash occurring during the period December 28, 2014, to February 8, 2015, had been confirmed in U.S. residents connected with this outbreak. Of these, 110 patients were California residents. Thirty-nine (35%) of the California patients visited one or both of the two Disney theme parks during December 17 to 20, where they are thought to have been exposed to measles. Among the 110 California patients, 49 (45%) were unvaccinated, five (5%) had one dose of measles-containing vaccine, seven (6%) had two doses, one (1%) had three doses, and 47 (43%) had unknown or undocumented vaccination status.

Annual attendance at Disney theme parks in California is estimated at 24 million, including many international visitors from countries where measles is endemic. This outbreak illustrates the continued importance of ensuring high measles vaccination coverage in the United States.

NACI survey invitation

Your participation is requested in an important survey being conducted by the Public Health Agency of Canada (PHAC) to assess the views and suggestions of key immunization stakeholders on resources developed by the National Advisory Committee on Immunization (NACI).

It is very important that NACI's advice and information products are meeting the needs of those who provide vaccinations, make vaccine policy recommendations or are working in other ways in the area of vaccines or immunization. **CCDR readers have been identified as a stakeholder for NACI, and your input to improve NACI products on immunization recommendations is being requested by means of a survey which will take about 10 minutes to complete**. Your feedback is critical to ensure that your needs as a stakeholder are met. Please take this opportunity to have your voice heard by clicking on the link below to respond to the survey before May 12, 2015. Your responses will be treated in complete confidence; no individuals will be identified in any way. If you have any questions about this survey, please contact naci-ccni@phac-aspc.gc.ca.

The survey can be found at this link: http://surveys-sondages.hc-sc.gc.ca/s/NACI-CCNI/langeng/

Thank you for your support!