International Federation on Ageing

Vaccines 4 Life

A Canadian perspective on pneumonia vaccination among at-risk groups:

Increasing relevance in a pandemic era

Expert Meeting Report

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Background

In light of the COVID-19 pandemic and the alarming frequency of infectious disease outbreaks and epidemics in recent history, there is an immediate and critical need to expand and sustain investments in health promotion and preventive health strategies such as immunization.[1,2] Although vaccines are universally available in Canada for vaccine preventable diseases (VPD) including influenza, pneumococcal pneumonia and pertussis, adult vaccination rates remain shamefully low. Inadequate immunization infrastructure, inconsistent targeted public health messages and limited vaccine gateways are but three impediments to improving rates in those Canadians most at-risk of serious and life-threatening consequences of these infectious diseases.

Burden of Pneumonia in Canada

Pneumonia is a common infectious disease which is largely underestimated in terms of its mortality and propensity for long-term functional decline. In fact, pneumonia ranks as the sixth leading cause of hospitalization and the eighth most common cause of death in Canada, affecting most commonly infants, older people, and those with chronic medical conditions.[3]

In 2017-2018, the Canadian Institute for Health Information (CIHI) noted that pneumonia-related emergency department (ED) visits were up to 135,000, an increase of 13% compared with the previous year.[4] The cost per patient hospitalized with pneumonia is significant, around $15,000 CDN, with an estimated cost to society of $193M CDN in 2001.[5] In current day scenarios this figure is not only likely to be a gross underestimation but also fails to capture the long-term social and financial impact of pneumonia including functional and cognitive decline. Studies have shown that upon hospitalization, pneumonia alongside influenza is a strong predictor of residual disability, functional decline, and among the leading causes of catastrophic disability defined as a loss of independence in at least 3 activities of daily living.[6,7] The exact figures on the subsequent cost for rehabilitation, long-term care and repeat hospitalizations are unknown.

Two pneumonia vaccines, PCV13 and PPSV23, are available for older Canadians and those with chronic medical conditions. Bonten et al. demonstrated effectiveness of PCV13 vaccine against pneumonia among individuals aged 65 years and older for up to 4 years.[8] Further, PCV13 immunization among older and at-risk Canadians could reduce hospitalization, length of hospital stay and mortality.[8,9] Experts reinforce the benefits of administering both vaccines for at-risk individuals, noting the cost-effectiveness of such an approach.[10] However current recommendations of the National Advisory Committee on Immunization (NACI) are not aligned with these findings.

Despite the serious costs and consequences of pneumonia, a recent study reported that just 58% of Canadians aged 65 years and older, and only 25% of adults aged 18 to 64 years with chronic medical conditions were vaccinated in 2019.[11] Even more concerning, pneumonia vaccines are neither uniformly recommended nor universally publicly funded in all Canadian provinces and territories for older people and at-risk populations.[10] For instance, the PPSV23 vaccine is publicly funded and indicated for immunocompromised adults and those 65 years of age and over in most provinces and territories, and for adults 50 years of age and over in one territory.[12] While some experts also recommend sequential vaccination with both the PCV13 then the PPSV23 vaccines, public funding of the PCV13 vaccine varies across Canada: sometimes recommended and funded for at-risk adults of any age, sometimes for those 50 years of age and older, and sometimes not at all.[13,14,15]

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Canadians Are At-Risk

Individuals, communities, and societies benefit from strong public health strategies encompassing health promotion and prevention actions including a life course approach to vaccination. Canada in endorsing the United Nations (UN) Decade of Healthy Ageing 2021-2030 supports actions that help to develop and maintain the functional ability that enables wellbeing in older age.[16] Maintaining and improving functional capacity throughout the life course is an essential benefit of comprehensive adult immunization programs that are fully utilized by the general public and those most at-risk.

Experts agree that preventing infectious diseases with appropriate and effective vaccines must be a priority as the long-term consequences of infections can be significant and debilitating. However, the current immunization landscape is not conducive to effective and equitable pneumonia vaccinations among all Canadians, significantly impacting the growing population of older Canadians and those with chronic medical conditions most severely.

Age and Frailty

Pneumonia symptoms in older adults can be subtle, potentially delaying diagnosis and treatment. With diagnosis however a high rate of severe outcomes including hospitalization is experienced among older adults.[10] Hospitalization due to pneumococcal pneumonia increases with age, with patients over the age of 60 years accounting for 80% of hospitalizations in Canada.[5] Even though the Ontario Burden of Infectious Disease Study is almost a decade old, the findings are unnerving and likely remain relatively unchanged. In 2010 among the most common infectious disease syndromes, pneumonia had the highest disease burden among older people in terms of year-equivalents of reduced functioning (YERF), health-adjusted life years (HALY) and years of life lost due to premature mortality (YYL).[17]

Frailty, a syndrome characterized by reduced physical reserves and immunity, is commonly associated with chronic inflammation and increased susceptibility to severe infections like pneumonia.[18] It is usually associated with noticeable losses in a person's physical, mental or social functioning such as walking speed, weight and muscle loss, fatigue, grip strength, level of physical activity and memory loss.[19]

Despite common misconceptions, the development of frailty is not an inevitable consequence of ageing, however infectious diseases can cause catastrophic health outcomes and the development of frailty in older age.[20] Frailty is currently reported among almost one-quarter of Canadians over the age of 65 years, and one-half of 85 years over, a proportion that is expected to dramatically increase.[21] A larger senior population will be susceptible to severe pneumonia requiring hospitalization and intensive care.[18]

Chronic Medical Conditions

The risk factors for pneumonia go beyond chronological age, as a multitude of chronic medical conditions affect susceptibility to infectious diseases across the life course. A recent study reported 90% of adults aged 50–64 years with at least one comorbidity contributed significantly to the burden of pneumonia in Canada.[22] Within this age group, 30.8% of pneumonia cases resulted in hospitalizations, 37.0% required intensive care unit (ICU) admission and 22.8% resulted in deaths.[22] Among the 50-64 years of age cohort, about 25% reported a chronic medical condition such as asthma, diabetes, heart disease, or behavioural risk factors such as smoking, putting them at-risk for severe outcomes associated with pneumonia.[23] Increased risk was also observed among individuals with autoimmune diseases such as rheumatoid arthritis, Crohn's disease or neurological disorders.[24]

Chronic medical conditions contribute to severe complications in around 10-27% of pneumonia hospitalizations, with data varying by study region.[25] Furthermore, pneumonia hospitalization is associated with a higher short-term and long-term risk of cardiovascular complications even after resolution of the acute infection.[25] Additionally, cardiovascular diseases such as congenital heart diseases (CHD) previously thought to affect only young individuals and increasingly common in older adults, now require significantly more investigation around the impact of pneumonia given the well established link between cardiovascular and pulmonary diseases.[26]

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Challenges Facing At-Risk Canadians

In 2015 the World Health Organization (WHO) World Report on Ageing and Health explored the importance of an effective public health framework that supports healthy ageing by developing and maintaining functional ability and intrinsic capacity throughout the life course.[27] Adult immunization programs are an essential component of such a framework, however there are a number barriers in the Canadian immunization system that impact certain populations.

Canadians at-risk for pneumonia and its serious potential health outcomes comprise a considerable and diverse proportion of the country, including children, youth, older people, those with underlying conditions and those with behavioral risk factors such as smoking and drinking or those experiencing homelessness. Equitable access to the most appropriate and effective pneumococcal vaccines without barriers is a primary objective of Canadian health care policy according to the *Canada Health Act*.[28] Barriers to accessing pneumonia vaccines across provinces and territories may introduce significant risks to the health and wellbeing of all at-risk Canadians and compound added safety and reliability issues in public health care systems, particularly in an environment currently disrupted by the COVID-19 pandemic.

Given the low adult vaccination rate among older and at-risk Canadians, significant challenges to executing an effective national immunization program that provides protection against the devastating impacts of infectious diseases like pneumonia must be considered and addressed.

Immunization Infrastructure

Despite recent expansion in the use of diagnostic tools, there are barriers to effectively establish pneumonia in older people and those with chronic conditions, which significantly affects data collection and reporting around incidence and long-term health outcomes. Diagnosis of pneumonia relies on blood, sputum, and other serological tests to ensure accuracy, and there are barriers to determining etiology in some at-risk populations.[29] Although several studies show that conducting a combination of diagnostic tests for suspected community acquired pneumonia increases accuracy of diagnosis, one study reported only 14% of patients had all four tests performed.[9,22] As a result, pneumonia incidence may be significantly underreported, thereby underestimating the fulsome burden on individuals and the national health system.

Moreover, while Canadian provinces and territories currently track coverage of pediatric vaccination there are no such data registries for adults.[30] Similarly, a central vaccine registry across provinces and territories does not exist.[30] This lack of information and harmonization is a barrier to population planning toward achieving healthier Canadian populations. Nearly a decade ago MacDonald and Bortolussi called for harmonization in the pediatric immunization infrastructure, yet sadly a non-harmonized approach continues to impact Canadians across the life course.[31]

Surveillance of the impact of infectious diseases by means of vaccine registries across the life course is especially pertinent to the rapidly evolving COVID-19 pandemic landscape.

Barriers in both reporting and surveillance contribute significantly to the incomplete information of the disaggregated burden of pneumonia on at-risk populations within Canada and consequently the suboptimal access to effective and appropriate vaccines. This includes not only older people but also potentially racialized, rural and remote communities.

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Awareness and Promotion

Awareness of adult vaccination in Canada appears patchy at best across age groups as well as socio-economic status. Public health campaigns around immunization do not appear to adequately reflect the needs of those with underlying health conditions and older adults, which may impact the value of current messages and resources.[32] Neither do campaigns account for varying levels of risk, health literacy and the differences in internet access throughout Canada. Furthermore, the attention given to adult immunizations other than the annual influenza vaccination, such as pneumonia vaccination, is strikingly minimal or absent.

An important consideration in this context is the access to information and services within primary care settings, pharmacies, long-term care facilities, prisons, and other locations where vaccines are administered. In a recent survey of patient perspectives towards influenza and pneumonia vaccination, reported barriers included: fear of injections, inability to access a provider, difficulty to make the time, and lack of transportation.[33] Only 26% of those surveyed received vaccinations from their family doctor, compared with 43% and 41% at either pharmacies or community clinics, respectively.[33]

In general, the narratives that shape the tone of immunization campaigns do not integrate the values of older and at-risk Canadians, nor are solutions to citizen concerns adequately promoted across vaccination gateways. This acts as a considerable barrier to equip Canadians with the most up-to-date knowledge about the recommended vaccine schedules throughout their life course, and the variety of locations where vaccines may be available.

Vaccination Gateways

The WHO Immunization Agenda 2030: A Global Strategy to Leave No One Behind identifies as a strategic priority the need to integrate age-appropriate and catch-up vaccination into public and private health services, beyond primary care.[34] An important consideration in the Canadian context is the limited availability of vaccination information and services alongside other health interventions, particularly for individuals with chronic comorbidities who often engage with multiple specialist and auxiliary health providers.

The value of pharmacy-based vaccination has been well documented, particularly within smaller communities for example in Nova Scotia, where 40.3% of residents live within walking distance of a pharmacy.[35] Pharmacists are encouraged to recommend and facilitate administration of vaccines. In recent studies, 87% of Canadians reported trusting the recommendations made by their pharmacist, and 99% of people vaccinated by this health professional would recommend the service to their friends and family.[36,37] Despite this, only 9 provinces have legislation in place for the appropriate training of pharmacists to provide adult vaccinations, with considerable variation regarding eligibility (i.e. age limit) and which vaccines can be provided.[39]

Additionally, Canadians living in long-term care (LTC) facilities are exceptionally at-risk due to multiple comorbidities impacting susceptibility to VPDs while at the same time limited access to vaccination services which are subject to individual facility policies. The incidence of pneumonia among older adults living in the facilities is double that of adults living in the community, with a well-documented risk of VPD outbreaks in closed settings. Despite the good practice of hosting influenza vaccination mobile clinics in facilities or other residential settings, pneumonia vaccination services may or may not be available and/or promoted – a significant missed opportunity for vaccinating vulnerable Canadians.

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Opportunities to Address Barriers and Inform Interventions

In the current pandemic environment there is significant voice to the importance of vaccination and this is aligned to a global phenomenon outlined in the WHO Immunization Agenda 2030: A Global Strategy to Leave No One Behind and in the context of the UN Decade of Healthy Ageing.

There are emerging opportunities for cross-sectoral approaches to prioritize vaccination against respiratory diseases to reduce functional decline, hospitalizations, morbidity, mortality and healthcare costs, especially for older and at-risk Canadians. This will require a multifaceted strategy and framework, from improving diagnosis and surveillance of the disease to strengthening the health infrastructure around vaccine promotion and delivery in order to protect those most at-risk for pneumonia.

Vaccine Registries

Robust provincial and territorial vaccine registries could capture not only diagnosis and outcomes of vaccine-preventable diseases, but also collect information on coverage in locations vaccines are provided, including pharmacies, long-term care homes and prisons.[30] Such data could in the future form a National Vaccine Registry, which has long been a goal of public health for its immeasurable value to Canada's immunization landscape.

Canadians would benefit from receiving official, evidence-based information about vaccination schedules, a history of their vaccinations and recommended vaccines based on their health status throughout the life course. In addition, information regarding availability of vaccines in their proximity, and scheduling options such as MyFluShot.ca would empower Canadians to access personal information and manage their health independently and conveniently.

A central registry would also assist health care providers in the more effective management of vaccine supply and the standard of care. As inventory control and storage of vaccines is of primary concern for many health care providers a central registry could automate supplies to clinics thereby reducing administrative burden for orders and reducing vaccine wastage by tracking quantities delivered to those administered. The current standard of care may also be improved with a central registry that includes up-to-date vaccination histories.[40]

In this scenario Ministries of Health could in real-time track vaccine supply and coverage and divert potentially limited vaccines to those areas and populations in greatest need in response to outbreaks in a coordinated manner. A central registry is essential to collect data on vaccine effectiveness and the potential herd immunity it may confer. Furthermore, it could serve to simplify documentation and reduce transcription errors contributing to bureaucratic delays in outbreak responses, sometimes a criticism of current systems.

Robust provincial and territorial vaccine registries are a critical key to optimizing vaccine coverage and working toward achieving herd immunity against COVID-19. The use of vaccine barcodes to track vaccinations in a national registry is also an important consideration for the implementation of a safe, effective, equitable and accessible immunization strategy for COVID-19, and for improving uptake of currently available adult pneumonia vaccines.

Harmonizing Policies and Practices

Provinces and territories should strive to learn from one another aligning good practices that optimize adult vaccination rates. Expanding vaccinator gateways to uniformly include pharmacists as part of a primary care immunization strategy across all provinces and territories is a critical strategy to improve access to adult pneumonia vaccines. Pharmacy vaccination services are particularly beneficial for older Canadians and those with chronic medical conditions who frequent pharmacies regularly for medication management.

The normalization that pneumonia is a routine ordinary health concern must be urgently addressed and remedied. A national public campaign on vaccination should emphasize that preventing illness and functional decline in older age is achievable and is a public health priority.

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Curating messages that encourage positive behaviours rather than incite fear is a worthy initiative to relay the positive impact of adult immunization for all Canadians. There are opportunities to bundle public health messages to include influenza and pneumonia vaccines, while tailoring the communications to the target audiences – in particular older and at-risk Canadians.

Furthermore, settings other than medical clinics and pharmacies must be considered part of a comprehensive national strategy to improve immunization rates. In British Columbia, for example, over 80% of long-term care facilities provide immunization screening upon admission, with the possibility to provide immunizations on-site. Standardization of such practices across provinces and territories could be proposed through existing localized frameworks such as the WHO's Global Network for Age-friendly Cities and Communities.

Conclusion and Recommendations

There is a strong social and economic rationale for building a robust immunization infrastructure across the life course. With the rapidly ageing population of Canada there is a real and urgent need to undertake known effective public health measures such as immunization to not only save lives but minimize the functional decline associated with vaccine-preventable diseases such as pneumonia. There is a significant and growing proportion of Canadians susceptible to the potentially devastating outcomes of this highly infectious disease. The relatively poor uptake rates of pneumonia vaccination by those most at-risk has and will continue to place increasing pressure on the health care systems especially in the coronavirus pandemic.

> *If not now in the midst of a pandemic then when will federal and provincial governments value the contribution of healthy Canadian seniors and invest in immunization infrastructure and vaccination portals beyond the paediatric landscape – now is the time to demonstrate that no one will be left behind.*

Significant disparities across provinces and territories in adult immunization policies and practices are historical and ongoing. Existing infrastructure must be reviewed so as to mitigate the potential for future outbreaks affecting millions of Canadians. To this end, several recommendations in alignment with the WHO Immunization Agenda 2030: A Global Strategy to Leave No One Behind and the UN Decade of Healthy Ageing are proposed as immediate next steps:

1. Harmonize public funding and recommendation of PCV13 and PPSV23 vaccines across provinces and territories to ensure equitable access to both vaccines for all Canadians.

2. Set national standards to optimize and streamline provincial and territorial monitoring and surveillance of vaccine-preventable diseases through vaccine registries to accurately capture the burden of pneumonia on older and at-risk Canadians and inform adult immunization policies accordingly.

3. Expand and harmonize pharmacist vaccination policies across all provinces and territories to increase access to vaccines for older adults, those with chronic medical conditions, and Canadians living in closed settings, rural and remote communities.

4. Launch a pneumococcal vaccination campaign targeting older Canadians and those with chronic medical conditions to ensure messages are appropriately crafted to relay the importance of adult pneumococcal vaccination and availability of two vaccines in plain language.

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