

Prior influenza vaccination effects on vaccine effectiveness: a point of consideration for health care workers

Justin Sorge RRT FCSRT MPH

This quarter's issue of the *Canadian Journal of Respiratory Therapy* is a dedicated special issue to primary care in respiratory care. For this issue we have curated a rich variety of research articles and commentary concerning primary care in Canada and globally. The Canadian Medical Association describes primary care as "consist(ing) of first-contact assessment of a patient and the provision of continuing care for a wide range of health concerns. The scope of primary care includes the diagnosis, treatment and management of health problems; prevention and health promotion; and ongoing support, with family and community intervention where needed" [1]. Increasingly, the importance of primary care, in terms of quality of life improvements and cost-effectiveness, has been noted by all health professions. And respiratory therapists and other respiratory care practitioners are no exception.



Justin Sorge

Vaccination is one particularly effective intervention of primary care to prevent the spread of communicable diseases, fulfilling two tenets of primary care: disease prevention and health promotion. Increasingly, however, vaccine hesitancy is threatening to erode the massive public health achievements these programs have realized. Health care workers (HCW) are positioned to act as effective influencers in combatting this phenomenon [2]. Another opportunity that HCWs may contribute towards disease prevention and health promotion is through influenza vaccination, particularly relevant this time of year.

Public Health Agency of Canada's Respiratory Virus Report is a useful surveillance system of respiratory virus detections by province/territory, updated weekly [3]. In Canada, influenza circulates during the late winter and fall. Populations at high-risk for influenza-related complications are pregnant women; those with cardiac or pulmonary disorders, diabetes, cancer or the immunocompromised; renal disease; neurologic/neurodevelopment conditions; children 18 years old or younger undergoing long-term treatment with acetylsalicylic acid; residents of long-term care facilities, age 65 years old and greater; and Aboriginal peoples. Estimates for Canada suggest 12,200 hospitalizations and 3500 deaths related to influenza, annually [4]. These high-risk populations have a high probability of exposure to HCWs, whether in primary, secondary, or tertiary care environments; as such, HCWs are obligated to limit the risk of influenza transmission during exposure to high-risk groups.

The National Advisory Committee on Immunization and the Public Health Agency of Canada recommend, in the absence of contraindications, influenza vaccination for any individuals capable of transmitting the illness to high-risk populations, regardless of immunization status of the high-risk individual [5]. Of course, this recommendation concerns HCWs, either working in a facility or in the community, and the

benefits, in terms of reduced morbidity and mortality of high-risk populations, are well documented [6–9]. But these recommendations, when imposed as a requirement of employment, have been a contentious point. This is the case across British Columbian health authorities and areas of New Brunswick and Ontario, where annual influenza vaccination is a condition-to-work policy [10]. Despite these policies leading to discontent surrounding the imposition, surveys of HCWs in North America show a high degree of favourability of influenza vaccination, whether imposed through condition-to-work policy or not [11–17].

One question surrounding mandatory influenza vaccination of HCWs regards the effects of serial vaccination on vaccine effectiveness (VE).

Influenza vaccination is unique due to the virus's high rate of antigenic drift, necessitating annual vaccination. In the 1970s, studies indicated prior vaccination may modify the protection of vaccination in the current season [18, 19]. The proposed mechanisms of the relationship of current year VE and previous vaccination are complex, poorly understood, and confounded by methodological challenges of VE studies, variability of findings, limited time course studies, vaccine mismatch and antigenic distance between subsequent years' vaccines, differences in vaccine preparation, antigenic drift, heterogeneity of study subjects, and poor understanding of immunologic response to repeated vaccination; therefore, a focused exploration is beyond the scope of this discussion. For interested readers, Belongia et al. provided a rich review of such, and I encourage the readership to review this document [20].

In brief, studies examining these effects suggest prior influenza vaccination may negatively affect VE in the current season, particularly for influenza A(H3N2) vaccines as well as A(H1N1)pdm09 (although to a lesser extent)—see Belongia et al. and the studies cited within [20]. Furthermore, there may be a negative dose (number of previous vaccinations)—response (VE) relationship [21, 22]. One Canadian study revealed a negative VE against A(H3N2) in groups that received repeated vaccination when compared with a group that were never vaccinated, suggesting an increased risk of A(H3N2) infection among the repeated vaccine group. However, these findings must be interpreted with caution as confounding cannot be ruled out, the study was limited sample-size to detect a change, misclassification of previous vaccination due to recall bias was a risk as vaccine history was self-reported [21]; additional studies are needed to support these findings. As noted, individual studies and meta-analyses of this health issue are not without limitations, and resultantly, scientific consensus has not been reached.

The choice to vaccinate should be an informed decision. Autonomous individuals weigh the risks and benefits (hopefully in consultation with their chosen healthcare provider), balancing a complex network of personal beliefs and social responsibility. Influenza vaccinations are a

Correspondence: Justin Sorge, Research Associate, Canadian Institute of Substance Use Research, University of Victoria, Victoria, BC, Canada. Email: editorinchief@csrt.com



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relatively safe preventative measure (oculo-respiratory syndrome and Guillian-Barré Syndrome (GBS) are rare, more serious adverse events associated with vaccination—although the risk of GBS associated with influenza-like illness is greater than for vaccination) when not contraindicated. The current evidence base of modified VE among populations repeatedly exposed to the influenza vaccine must be compared against evidence of significant decreased morbidity and mortality since recommendations to vaccinate individuals capable of transmitting to high-risk groups. Further research is warranted to understand the mechanisms of this effect to inform policy and maintain public confidence in vaccination programs. Until that time, I encourage our readers to turn to the most comprehensive, reliable, and up to date information on how primary care interventions, such as influenza vaccination, may prevent disease and promote health in themselves and their patients and clients.

I really hope you enjoy this special issue we have put together on primary care!



Justin Sorge RRT, FCSRT, MPH, Editor-in-Chief

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