



Flu Vaccination for Healthcare Workers

in Newfoundland and Labrador
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This Rapid Evidence Report was prepared by the Newfoundland & Labrador Centre for Applied Health Research (NLCAHR), Memorial University. It was developed through the analysis, interpretation and synthesis of scientific research and/or health technology assessments conducted by other parties. It also incorporates selected information provided by expert consultants in the subject area. This document may not fully reflect all the scientific evidence available at the time this report was prepared. Other relevant scientific findings may have been reported since completion of this synthesis report.

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About This Report

About NLCAHR

The Newfoundland and Labrador Centre for Applied Health Research, established in 1999, contributes to the effectiveness of health and community services in Newfoundland and Labrador and to the physical, social, and psychological wellbeing of its population. NLCAHR accomplishes this mandate by building capacity in applied health research, supporting high-quality research, and fostering the effective use of research evidence by decision makers and policy makers in the provincial healthcare system.

Rapid Evidence Reports

NLCAHR designed *Rapid Evidence Reports* to provide support for evidence-based decision making in the Newfoundland and Labrador healthcare system on an expedited basis as compared to the lengthier '*Evidence in Context*' reports issued through the Contextualized Health Research Synthesis Program. Through these expedited reports, NLCAHR provides a succinct review of recent research evidence on a high-priority research topic selected by decision makers in the province.

Rapid Evidence Reports include:

- a clear statement of the issue and the background to the issue/problem;
- a description of the scope and nature of the pertinent English-language scientific literature from the past five years;
- a summary of the principal features of the available evidence – points of consensus, points of disagreement, areas of uncertainty or silence on some or all of the following issues: effectiveness of interventions, potential benefits and harms, risks, costs, and cost-effectiveness;
- a reference list of scholarly, peer-reviewed research literature from the past five years; and
- a brief analysis of the types of issues that might affect the applicability of the evidence to the local context.

Unlike our '*Evidence in Context*' reports, it is important to note that a *Rapid Evidence Report* is **not** a comprehensive and systematic synthesis of the literature on the topic. The rapid report provides neither critical appraisal of included articles nor a full analysis of the contextual issues involved in applying evidence to the Newfoundland and Labrador healthcare setting. Rather, a *Rapid Evidence Report* provides decision makers with a solid view of the scope and nature of the scientific literature on the topic in question, an initial assessment of the strengths and gaps in this literature, and a review of the key points of agreement and disagreement among researchers.

Researchers and Consultants

For this report, researchers from the Newfoundland and Labrador Centre for Applied Health Research included: Robert Kean, Research Officer, Contextualized Health Research Synthesis Program (CHRSP), Dr. Stephen Bornstein, Director of NLCAHR, and Meagan MacKenzie, Research Assistant. Our team benefited from the advice and expertise of Dr. Allison McGeer, Infectious Disease Consultant at Mount Sinai Hospital in Toronto. Dr. McGeer's comments and credentials are included in Appendix A of this report.

Background

Our stakeholder partners in the Labrador-Grenfell Regional Health Authority have asked us to identify any and all programs, interventions, and/or characteristics of programs and interventions that have been shown to enhance the uptake of flu vaccination among healthcare personnel. In requesting this review, our partners have noted that:

Increasing seasonal flu vaccination rates among healthcare workers would decrease the spread of influenza virus and flu disease among vulnerable populations, as well as reducing associated mortality, co-morbidity and related costs. Increased vaccination rates would also decrease the rates of absenteeism among healthcare workers at a time of expected increased healthcare utilization.

This review covers all categories of healthcare workers, paying particular attention to front-line personnel. We have selected research articles that measure vaccination rates directly, as well as articles that measure outcomes that may affect vaccination rates – such as healthcare workers' knowledge and attitudes concerning vaccination programs. There is a voluminous literature that addresses the behavioral and demographic predictors of healthcare personnel vaccination (e.g., age of worker, occupation, previous vaccination history); however, in order to provide the most practically useful information to our stakeholder partners, we have focused strictly on programs and program elements that increase flu vaccination uptake.

Our research question is as follows:

“What programs or program elements have been shown to enhance the uptake of flu vaccination among healthcare professionals?”

Scope and Nature of the Scientific Literature

For this review, we sought primary studies and systematic reviews published in English since 2008. In total, we identified two systematic reviews and 48 primary studies, including a series published in three parts by the Centers for Disease Control.

Of the 48 primary studies:

- six were randomized controlled trials (RCTs),
- 18 involved non-randomized comparative designs, and
- 24 were single-group before-and-after studies.

The primary outcome measured in most of these studies was the rate of influenza vaccination, either self-reported or collected from hospital records. Other outcomes included: healthcare workers' confidence in their decisions about influenza immunization, impact on immunization intent, and awareness/acceptance of hospital vaccination policy.

Since systematic reviews identify and synthesize primary studies using rigorous methodology, they are especially important in a review such as this one; however, based on our inclusion criteria, only two systematic reviews qualified for this report. The systematic review by Lam and colleagues was conducted to determine which influenza campaigns and campaign components were significantly associated with increases in influenza vaccination among healthcare workers.⁽¹⁾ The authors reviewed 12 studies published between 1993 and 2009 in long-term care facilities, hospitals, and primary healthcare settings in the United States, Canada, the United Kingdom, Germany, and Switzerland, two of which are also included in the present report. ^(2,3) These reviewed studies included six RCTs, four controlled before-and-after studies, and two interrupted time-series designs.

Hollmeyer et al. reviewed 25 studies of interventions aimed to increase the uptake of influenza vaccination among hospital healthcare workers.⁽⁴⁾ These studies were published between 1990 and 2010 and conducted hospital settings in the United States, the United Kingdom, Spain, Brazil, France, Switzerland, South Korea, and Singapore. Hollmeyer et al. employed less stringent methodological inclusion criteria than did Lam et al. Hollmeyer's review included 18 single-group before-and-after studies, five controlled before-and-after studies, and two long-term (\geq ten years) observational studies. Six of the studies included by these authors are also included individually in the present report: the two cited earlier ^(2,3) as well as four others. ⁽⁵⁻⁸⁾

In order to complete this rapid review promptly, we did not critically appraise the included studies for quality but included all results in this report. The majority of the studies we

reviewed are single-group before-and-after and cross-sectional designs. As noted in the systematic review by Lam and colleagues, there are limitations inherent in these types of studies. While single-group before-and-after and cross-sectional designs are often more readily practicable than more rigorously designed studies, they do not control for confounding variables that can affect outcomes. Accordingly, this limitation must be considered when examining the results of the presently reviewed studies.

One final note about the articles under review concerns their geographical setting. The available research literature included primary studies based on data from many countries, including Canada, the United States, the United Kingdom, the Netherlands, France, Spain, Switzerland, Israel and Australia. This mix of countries represents a diverse array of health care systems and, for that reason, the findings generated by these papers may not always be directly generalizable to the local context.

Voluntary vs. Mandatory Flu Vaccination Programs

Perhaps the single most important question this report could address is whether voluntary flu vaccination programs can be as effective as mandatory programs in increasing employee uptake.¹ While we cannot provide a definitive answer to this question, our review of the scientific literature suggests that there is an upper limit to the level of employee uptake that is achievable through voluntary vaccination programs. Of the articles in our review that focused on purely voluntary initiatives, only two reported coverage of over 65% among healthcare workers who had some contact with patients. It should be noted that both were before-and-after program evaluations with no comparison group. As we have noted, this type of research design does not control for factors outside the intervention, and so the results generated by these two papers must be interpreted with caution. Also, notwithstanding their positive findings, both studies ultimately affirmed the notion of a vaccination ‘ceiling’ beyond which voluntary campaigns cannot go:

A [quality improvement] team-based approach increased the rate of voluntary season influenza vaccination to nearly 80%. Although this rate is higher than those currently achieved in most hospitals, even higher rates are desirable to minimize the potential for healthcare-associated influenza transmission. Mandatory influenza

¹ A “mandatory vaccination program” would be defined as a program or policy that requires healthcare workers to receive vaccination and does not allow them to formally decline without a medically compelling reason. “Voluntary vaccination programs,” by contrast, are those that encourage, but do not compel employees to receive vaccination and do not require them to make formal declination statements.

vaccination of healthcare workers is likely needed to achieve rates in the range of 95%.(9)

While nearly two thirds of the [sampled] facilities reached 80% or better, only 3 exceeded 90% despite detailed, iterative efforts. If we hope to reach the 90%... goal, facilities may need to consider exploring mandatory programs.(10)

We would add that all six of the RCTs in our review evaluated purely voluntary initiatives, and rates in these studies ranged from 25% to 53%.

Our review also suggests that mandatory vaccination policies *can* be effective in raising vaccination coverage beyond this ceiling. All primary studies included in this report that addressed mandatory vaccination policies concluded:

- a) that such policies were among the most powerful predictors of employee vaccination, and/or
- b) that they produced employee vaccination coverage of 90% or greater.

Moreover, policies that systematically imposed negative consequences on vaccination decliners appeared to have greater impact than policies that were less rigorously enforced. The effectiveness of mandatory policies is corroborated by the two aforementioned systematic reviews, which represent the highest level of evidence in our report:

In hospital settings, education or promotion resulted in small improvements in coverage... . Similarly, campaigns involving only improved access to the vaccine had minimal impact. Conversely, campaigns involving legislative or regulatory components (e.g., mandatory declination form, mandatory masks for unvaccinated personnel) achieved higher rates than other interventions.(1)

The most effective intervention... appears to be a mandatory vaccination policy for healthcare workers. The three programmes that used this strategy achieved nearly universal coverage.(4)

Requiring decliners to make formal statements and/or wear masks around patients represents a middle ground between rigid employer mandates and purely voluntary programs. The studies in our review that assessed these middle-ground options obtained mixed results: some studies found that they were associated with significant increases in vaccination rates beyond those produced by non-coercive approaches, but others did not. None reported coverage rates as high as those reported by studies of mandatory vaccination.

Characteristics of Effective Vaccination Programs

We noted a number of characteristics that were consistently associated with successful vaccination policies, whether these were mandatory or voluntary. Perhaps the two most pivotal of these characteristics are accessibility and affordability. Multiple studies confirmed the importance of providing on-site vaccinations at no cost to the employee. Zimmerman et al. noted that convenience is especially important for personnel with dedicated duties on a particular unit, as such employees can rarely spare the time required to travel to and from off-site vaccination services (3). The studies in our review also found that uptake was higher when vaccination was made available to healthcare workers on multiple days at their worksite; one study suggested that vaccination provision on weekends may also be worthwhile.(11)

Effective communication is another characteristic associated with success. Though education and promotion by themselves appear to have a limited impact on vaccination uptake, numerous studies in our review found that education and promotion are indispensable components of employee vaccination drives – *especially* those that mandate vaccination. Daugherty et al., for instance, argue compellingly that, though mandatory vaccination improves adherence,

...the perception of unfairness and excessive pressure on the part of the institution is not a trivial concern. Policies that foster trust, rather than mistrust and resentment, are likely to be far more effective in the long run.(12)

In the conclusion to the 2012 iteration of its annual survey of American healthcare workers, the Centers for Disease Control and Prevention recommended that educational programs should emphasize vaccination effectiveness and safety, knowledge of influenza transmission, and the benefits of vaccination for staff, patients, and families.(13)

Numerous studies found that systems for monitoring compliance are a key requirement for the success of employee vaccination programs. The ability to access compliance data in a timely and efficient manner enables supervisors to hold their staff accountable and appears to be critical in securing high rates of participation. Talbot et al. found evidence to suggest that providing vaccination rate data to the board of trustees – the highest level of many healthcare organizations – maximizes the effectiveness of compliance monitoring.(11)

Public reporting emerged as another factor related to successful vaccination uptake among healthcare workers. In a few studies, public reporting of facility vaccination rates seemed to provide a significant boost to employee uptake. Paris et al. found that reporting

contributed to the successful implementation of mandatory vaccination policies by generating positive public recognition for hospitals that achieved sufficiently high coverage.(14)

Likewise, in the Ajenjo et al. study of a thirteen-hospital healthcare organization in the United States, public reporting was one of two measures associated with the largest yearly increase in employee vaccination rates over a ten-year period stretching from 1997 to 2007.(15)² In this program, rates were reported on a 'quality improvement scorecard,' and hospitals were offered financial incentives for reaching pre-established targets. Notwithstanding the relative success of the initiative, employee vaccination rates rose no higher than 72% and vaccinations were made mandatory the following year.

One last general finding from the studies in this review concerns the importance of visible buy-in at senior executive levels. This theme emerged repeatedly in the studies under review. As mentioned, in 2008, the healthcare organization studied by Ajenjo et al. made influenza vaccination a condition of employment in an effort to raise the vaccination rate above 80%, and a follow-up study by Babcock et al. found that leadership support – including a public statement by the organization's CEO – was a critical factor supporting the success of the new mandatory vaccination policy.(8) Multiple other studies also cited the active and visible commitment of senior leadership as a key factor in the success of mandatory programs in their study settings. Quan et al. found that "e-mail reminders of the mandatory nature of vaccination from the chief medical officer and chief executive officers instilled the gravity of the mandatory vaccination policy."(16) Likewise, Rakita et al. observed numerous objections to mandatory vaccination and suggested that "without a strong endorsement from the CEO, president, and governing board, it is unlikely that the program would have been successful."(6)

In conclusion, there appears to be an upper limit to the level of employee coverage that is achievable through voluntary programs. Raising vaccination coverage beyond this level seems to require mandatory vaccination. Whatever type of policy health organizations choose to implement, a series of program elements appear to enhance program effectiveness, including provision of free, onsite vaccinations; promotion and education that emphasizes the benefits to patient and staff alike; systems for compliance monitoring; public reporting of vaccination uptake; and visible buy-in at senior executive levels.

² The other intervention noted by Ajenjo et al. was mandatory declination statements for healthcare workers who refused to be vaccinated. Because the two policies were implemented in the same year, the authors were unable to measure the particular effect of each intervention.

Potentially Relevant Contextual Issues

Throughout the course of this project, we have tried to identify contextual factors unique to Newfoundland and Labrador – and the Labrador-Grenfell Regional Health Authority in particular – that may influence the relevance and applicability of the research-based evidence. This section of the report addresses those factors in brief. It should be noted here that the province's four regional health authorities may have achieved different levels of progress with respect to employee vaccination. The Central Regional Health Authority, for instance, has already implemented a program involving delivery of staff education to all sites in the region, provision of on-site vaccinations, and yearly compliance monitoring.

Geography and Service Landscape

Perhaps the most salient contextual issue confronting Newfoundland and Labrador is the dispersal of its healthcare facilities over a vast terrain. The Labrador-Grenfell health region, for instance, encompasses not only Labrador but also communities north of Bartlett's Harbour on the Northern Peninsula of Newfoundland. Providing education to staff in Labrador's coastal communities and at the region's three hospital sites requires extensive use of communications technologies. The province's other regional health authorities face similar challenges. Given that education and promotion are key components of successful employee vaccination programs, these authorities would have to employ innovative solutions to the problem of delivering staff education across a vast and challenging geography. Here, it should be noted that Newfoundland and Labrador has developed a comprehensive telehealth infrastructure that includes communication channels, technical support services, and an established network of remote telehealth sites. In a number of instances, these and other technologies have already been adapted for educating staff on a range of health system issues.

Financial, Administrative, and Human Resources

The studies under review made it clear that successful vaccination programs require an infrastructure capable of educating staff, delivering an appropriate quantity of vaccine, and monitoring employees on an ongoing basis to ensure compliance. Front-line workers in particular often find it difficult to free themselves from current work responsibilities in order to attend educational sessions. This constraint constitutes a significant barrier to staff education. Furthermore, vaccinating and tracking employees could likely be accomplished only at the cost of additional work hours for existing staff. Before proceeding with any program, administrators within the province's regional health authorities would be well-advised to carefully assess the inputs required to mount an effective campaign and the financial and human resources at their disposal.

Organizational Strengths

One of the more interesting indications that emerged from the review was that, in terms of flu vaccination uptake, larger hospitals located in more urban locations appear to be at a *disadvantage* when compared with smaller hospitals. Multiple studies found that vaccination rates tended to be higher in smaller, less internally specialized, rural or community hospitals with limited numbers of employees (<3,000).^(11, 15, 40, 51) Study authors suggested that the smaller size of the staff in rural hospitals actually facilitates vaccination efforts, whereas the process tends to take on added complexity in larger, more internally specialized hospitals. This may be a particularly auspicious finding for Newfoundland and Labrador, given that most of its facilities are significantly smaller than the facilities included in the articles under review.

Summary of Key Points

The following key points were found in the evidence under review in this *Rapid Evidence Report*:

- The literature suggests there is an upper limit to the level of employee coverage that is achievable through voluntary programs and that mandatory vaccination policies can be effective in raising vaccination coverage beyond this ceiling.
- Multiple studies supported the importance of providing on-site vaccinations at no cost to the employee.
- Numerous studies found that education and promotion are indispensable components of employee vaccination drives – *especially* those that mandate vaccination.
- The ability to access compliance data in a timely and efficient manner enables supervisors to hold their staff accountable and appears to be critical in securing high rates of participation.

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Appendix A

About our consultant:

Allison McGeer, M.D., FRCPC
Microbiologist, Infectious Disease Consultant
Mount Sinai Hospital, Toronto Ontario

Dr. McGeer completed an undergraduate and Master's degree in biochemistry, then her medical degree at the University of Toronto. She specialized in internal medicine and infectious diseases followed by a fellowship in hospital epidemiology at Yale New Haven Hospital.

She returned to Mount Sinai Hospital in 1989 as microbiologist and director of infection control. Her major research interests are in the prevention of infection in hospitals and nursing homes and in the use of surveillance to advance the prevention, diagnosis and treatment of infectious diseases. She is the principal investigator of the Toronto Invasive Bacterial Diseases Network and the Ontario Group A Streptococcal Study, two collaborative surveillance networks studying the epidemiology of severe community-acquired infections.

Dr. McGeer is a Professor in the Departments of Laboratory Medicine and Pathobiology and Public Health Sciences at the University of Toronto. In addition to her position as director of infection control at Mount Sinai Hospital, Dr. McGeer is an infection control consultant to The Scarborough Hospital and The Baycrest Centre for Geriatric Care. She currently serves on Canada's National Advisory Committee on Immunization and on the infection control subcommittee of the Ontario Provincial Infectious Diseases Advisory Committee. She is also a member of several local, provincial and national pandemic influenza committees. She is an expert reviewer for many research funding agencies, including the Canadian Institute of Health Research and US National Institutes of Health, and has served on the editorial boards of several journals, including *The Canadian Medical Association Journal* and *Infection Control and Hospital Epidemiology*.

Dr. McGeer's comments:

March 6, 2013

In my view, this rapid evidence report effectively summarizes the knowledge base regarding program factors associated with increasing staff influenza vaccination rates in healthcare organizations, and the particular question of the extent to which "mandatory" programs achieve higher rates of vaccination than voluntary programs.

There are a few issues arising from this review where some additional information may be helpful to stakeholders.

The question of whether there is a number attached to the upper limit of vaccination in voluntary staff vaccination programs is (wisely) left unanswered. However, two studies were

quoted in which vaccination rates of 80% were achieved with voluntary programs. Readers of the review should be cautioned that rates of greater than 60% have been very difficult to achieve with voluntary programs in acute care facilities (1-3), particularly large acute care facilities. As noted in this review, smaller facilities, and facilities with lower complexity (4) have been able to achieve higher vaccination rates than larger, more complex facilities. In Ontario, worker vaccination rates in long-term care facilities also substantially exceed vaccination rates in acute care (5). This may be because of differences in size and complexity; it may also be because workers in long term care facilities are more aware of the burden of influenza because of more frequent outbreaks.

The use of the quote from Daugherty et al. is important in highlighting the critical continuing need for communication and education with any vaccination program. It may, however, leave readers with the impression that mandatory programs foster an environment of distrust. While union grievances have occurred, the published experience from organizations which have implemented mandatory programs is that healthcare workers strongly value the patient safety achieved and that very few (<0.5%) choose to leave employment rather than be vaccinated (6, 7). Daugherty's own institution, the Johns Hopkins Hospital, implemented a condition-of-service policy for the 2012/13 season: workers with patient contact are required either to be vaccinated, or to have a valid medical contraindication or religious exemption.

http://www.hopkinsmedicine.org/hse/occupational_health/flu_campaign.html

One additional consideration is that the definition of "mandatory" in vaccination programs is variable. Two recently published surveys of US hospitals demonstrate considerable variation in what hospitals considered to be mandatory staff vaccination programs. Some hospitals reported "mandatory" programs in which, although the policy required vaccination, there was no consequence for not being vaccinated. Others required that unvaccinated staff wear a mask when providing patient care (a policy for which enforcement may be variable). Some terminated unvaccinated employees without a valid medical (or, in some circumstances, religious) contraindication. Of note, the greater the consequence for not being vaccinated, the greater the associated increase in vaccination rate when the program was implemented (8,9). While early data suggested that a requirement for signed declination forms was one factor associated with some increase in vaccination rates, subsequent literature has suggested that this approach has very little effect (the apparent effect may have been an epi-phenomenon: that is, programs requiring signed declination forms have other strengths which were what actually resulted in an increase in vaccination rates) (10).

As noted in the report, staff vaccination programs require commitment: *"Administrators within Labrador-Grenfell Health would be well-advised to weigh carefully the inputs required to mount an effective campaign and the financial and human resources at their disposal before proceeding."* Voluntary programs also require significant continued commitment,

and vaccination rates may decrease substantially in any year in which this commitment wavers (4). However, in addition to the patient safety value associated with staff vaccination, these programs are also usually cost saving to healthcare organizations because of reduced staff absenteeism (11,12).

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