Correlates of influenza vaccine uptake in persons with dementia in Canada

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ABSTRACT   As the Canadian population ages and rates of aging-related disorders increase, it is important to find medical interventions that promote health. Dementia is becoming an increasing concern among Canadians, accompanying an increased risk of all infections and a greater chance of adverse health effects following infection. This makes it incredibly important to ensure that persons with dementia are receiving a seasonal influenza vaccination. However, influenza vaccine uptake in persons with dementia remains below the recommended rate of vaccination. The current study examined how the presence of comorbidities may impact the rate of influenza vaccination among persons with dementia. Key comorbidities relating to dementia include Chronic Obstructive Pulmonary Disease (COPD), heart disease, diabetes, and high blood pressure. As influenza vaccination for dementia patients is an important protective factor, it is important to implement routine care that may increase vaccination rates. Data was drawn from the Canadian Community Health Survey (CCHS) 2015-2016 and the indirect measure of Cognitive status scored 4-6 was used to represent the dementia population. Information from 130 000 Canadians was available; however, only 418 Canadians met the cognitive status restrictions and were included in the study. Chi-squared tests were used to test variable relationships. The presence of heart disease and COPD were both associated with a significantly higher vaccination rate. However, the relation to routine care was insignificant. These findings are interesting, as it raises the question of why heart disease and COPD raised vaccination rates if not due to routine care. Continuing research with the dementia population is needed to find ways to promote protective vaccination such as the seasonal flu shot.

INTRODUCTION

Dementia is of growing concern in Canada and worldwide. By 2031, it is expected that the number of Canadians living with dementia will exceed 1.4 million (Boscart et al., 2019). This represents a significant burden not only on the healthcare system, but on social support systems and the caregivers they depend upon (Boscart et al., 2019). It is important to find ways to reduce the impact of dementia on the healthcare system and caregivers by promoting the wellbeing of persons living with dementia, particularly older adults that are more likely to have fragile health.

Influenza is a common seasonal illness that causes over 12 000 hospitalizations and 3500 deaths each year. It is ranked among the top ten leading causes of death in Canada (Government of Canada [GOC], 2019). Globally, the number of influenza infections can exceed 1 billion cases a year (GOC, 2019). With the high prevalence of this infection, it is important to focus on preventative measures. While most individuals can recover easily from this virus, there are certain populations at high risk for serious complications. An influenza infection is much more likely to result in mortality and morbidity in older adults compared to younger adults, especially when there are comorbid illnesses present (Andrew et al., 2004). Increased severity of influenza infection is compounded when other illnesses or comorbidities are present. Older adults affected by dementia are at an even greater risk. Dementia is a factor in contracting the influenza virus and increasing the prevalence of associative illnesses (Gallini et al., 2017). This is due both to aging, which itself reduces immune function and increases the occurrence of comorbidities, as well as dementia, which likely can lead to inflammation that may impact the immune system (Kipnis et al., 2008). It has recently been acknowledged that neither the cognitive nor the immune system can function optimally without the other (Kipnis et al., 2008). This explains the risk that influenza infections pose to not only older adults with comorbidities, but especially to persons with dementia. However, there is one major preventative intervention: vaccination.

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The seasonal influenza vaccine is the first line of defense against influenza. Current Canadian guidelines recommend that all people over 65 years old, and all residents in Long Term Care Facilities, receive the vaccination yearly (Andrew et al., 2004). Further recommendations strongly advise that those with dementia receive the vaccination yearly (Gallini et al., 2017). Due to the low risk of adverse health effects following vaccination, it is a low burden intervention that can dramatically reduce the possibility of morbidity and mortality caused by influenza. (Gallini et al., 2017). Rates of vaccination are even used to assess the accessibility of primary care prevention services (Shah et al., 2011). This is because receipt of the yearly vaccines imply access to primary care, as primary care facilities are likely where the vaccine is being received or recommended to patients.

Despite strong recommendations and guidelines for annual influenza vaccination, coverage remains inconsistent. Older adults with a dementia diagnosis are among one of the greatest at-risk populations, yet have some of the lowest vaccination rates (Gallini et al, 2017). Older adults with dementia living outside of care facilities have significantly lower rates of vaccination when compared to both older adults that are fully mentally capable as well as dementia patients living in care facilities (Gallini et al., 2017). This may reflect difficulty accessing vaccination in the community as well as the much easier access in care homes. It has even been suggested that older adults following a serious diagnosis, such as dementia, may lose interest in preventative measures, knowing their health will deteriorate regardless of prevention methods (Martinez-Baz et al., 2012). This was reflected in a study by Martinez-Baz et al. (2012) that showed that dementia patients had lower adherence to vaccination following their diagnosis compared to prior their diagnosis.

Other trends among older adults also presented themselves in the study. Older adults that had more frequent visits to their primary care physician were more likely to have received the vaccine (Martinez-Baz et al., 2012). This could be due to several factors such as increased awareness, greater access to the vaccine while at the clinic, and more opportunities for physicians to recommend vaccination (Martinez-Baz et al., 2012).

An increase in vaccination has also been seen with the presence of comorbidities in other studies. On average, persons with dementia have an additional 2-8 comorbidities that complicate dementia treatment and reduce overall health and quality of life (Ting-Bin, 2017). People, especially older adults with low perceived health, that have diagnosed comorbidities and chronic diseases have been found to require more consistent and frequent healthcare visits (Zhang et al., 2019). When contact with healthcare professionals is higher, there is greater opportunity to receive a vaccination.

Self-perceived health has been shown to be a major indicator of vaccination. Those with lower self-perceived health have been more likely to get vaccinated (Chen et al., 2007). A decrease in self-perceived health could be linked to a greater number or severity of comorbidities (Chen et al., 2007). People that receive the vaccination are more likely to have more significant health problems and more diagnosed comorbidities (Andrew et al., 2004). Patients with comorbidities such as chronic respiratory disease, heart disease, diabetes, and stroke, as well as patients with more medication prescriptions and a greater number of visits to both

nurses and physicians all had higher vaccination coverage (Gallini et al., 2017).

While a dementia diagnosis is most often associated with lower influenza vaccination rates, dementia patients with more comorbidities were more likely to receive the vaccine. This interaction is interesting because it is conceivable that treating dementia like other comorbidities, in requirement of medical checkups, may help to increase overall vaccination rates. The influenza vaccine is a vital tool in the preservation of health and quality of life among both persons living with dementia and those with comorbidities; as such, it is important to understand the trends in vaccination rates.

For the current study, we used data from the Canadian Community Health Survey. The Health Utility Index for cognition was used to determine the presence of dementia. Dementia has one of the greatest effects on cognitive scores (Guertin et al., 2018). A cognitive classification of 4, wherein a patient reports a little difficulty with daily tasks, to 6, wherein a patient is unable to think or solve daily problems, were considered within the range of dementia (Horsman, 2003).

The main research question explored if the presence of comorbidities impacted the rate of influenza vaccination among persons with dementia. Specifically, comorbidity with Chronic Obstructive Pulmonary Disease (COPD), heart disease, diabetes, or high blood pressure was investigated. These comorbidities were selected as they are associated with increased rate of influenza vaccination (Gallini et al., 2017; Chen et al., 2007). The second research focus tested if required routine medical care impacted the rate of influenza vaccination. The final question was if comorbidities increased the likelihood of routine medical care.

It was hypothesized that persons with dementia and a comorbidity, particularly COPD, heart disease, diabetes, or high blood pressure, would show a greater likelihood of vaccination due to increased contact with the healthcare system when compared to persons with dementia that do not have a comorbidity. Furthermore, it was hypothesized that the presence of COPD, heart disease, diabetes, or high blood pressure in persons with dementia would increase the likelihood of requiring routine medical care when compared to persons with dementia that do not have a comorbidity. The final hypothesis was that the requirement for routine medical care would increase influenza vaccination rates for persons with dementia when compared to persons with dementia that do not require routine medical care.

METHODS

Data Source: Canadian Community Health Survey 2015-2016

This study used secondary data collected from the Canadian Community Health Survey 2015-2016 (CCHS). The CCHS takes a sample of 130 000 Canadians from all provinces and territories every 2 years. Data collection occurred via in-person interviews with members of randomly selected households. Phone interviews were also conducted with randomly generated phone numbers. Both methods used banked data as well as stratification to ensure selection was random but representative of each province and territory, as well as the different regions within them. The CCHS was chosen for this study as it had accessible secondary

information; this project had a limited time frame that did not allow for primary data collection.

Case Definition

This study focused on persons with dementia. For this study, the Health Utility Index's category of cognitive health with a score of 4-6 was used to represent persons with dementia. Scoring in this range results in experiencing a little difficulty to a total inability to solve daily problems and complete daily tasks. The health utilities index was chosen as there was no option for self-reported dementia in the 2015-2016 CCHS, and cognitive status was most likely to accurately represent persons with dementia.

Variables

Several variables were included in the analysis. The presence of comorbidities was measured by asking respondents if they have the diagnosis in question, with a yes or no answer. The first question asked if respondents had COPD, which is used as an umbrella diagnosis including chronic bronchitis, emphysema, or chronic obstructive pulmonary disease. Participants were asked if they had heart disease, diabetes, or high blood pressure. Another measure under investigation is the requirement for routine care. Respondents were asked if they had required routine or ongoing care within the last 12 months. Routine care includes physicals, check-ups, bloodwork, and routine care for ongoing conditions (Clarke, 2016). The main variable was the receipt of a seasonal flu shot. Respondents were asked when they had last received a flu shot. Possible answers included less than one year ago, one year to less than two years ago, and over two years ago. A yes response was indicated if a flu shot had been received within one year (less than one year ago), and a no response was indicated if the response was one year to less than two years ago or over two years ago.

Analysis

SPSS Statistics 26 was used for data management and analysis. The Chi-squared test of independence was used to test for a relationship between the presence of comorbidities and flu vaccination, between required routine care and flu vaccination, and between comorbidities and required routine medical care.

RESULTS

The Canadian Community Health Survey reports on cognitive health status from level 1 to 6. A total of 418 respondents had a cognitive health status between 4 and 6. Survey responses were drawn from these 418 respondents. Limited socio-demographic data was available through the CCHS; however, 72% of respondents identified as aboriginal or first nations, 95% of respondents were born in Canada, and 64% had been in Canada for at least 10 years.

Cognitive Health Score, Comorbidities, and Influenza Vaccine

Table 1 displays the data of those who received the seasonal influenza vaccine within the last 12 months and their comorbidities. The chi-square test for COPD had a p value = 0.02 and, for heart disease, p=0.045. This suggests that there is a significant relationship between the presence of COPD and heart disease and receiving the influenza vaccination. Diabetes and high blood pressure had a p value > 0.05. For COPD, 90% of persons with dementia and COPD received the flu shot within the last year, and only 53% of those without COPD received the vaccine. 80% of

Table 1 Presence of COPD, heart disease, diabetes, and high blood pressure with seasonal influenza vaccine within the last 12 months. Starred variables were statistically significant.

	Received seasonal influenza vaccine within the last 12 months		
Has COPD*	Yes	No	Total
Yes	9 (90%)	1	10
No	53 (53%)	47	100
Total	62	48	110
Has heart disease*	Yes	No	Total
Yes	8 (80%)	2	10
No	113 (48%)	124	237
Total	121	126	262
Has diabetes	Yes	No	Total
Yes	11 (65%)	6	17
No	110 (48%)	121	231
Total	121	127	248
Has high blood pressure	Yes	No	Total
Yes	23 (50%)	23	46
No	95 (48%)	102	197
Total	118	125	243

Table 2 Requirement of routine medical care and reception of seasonal influenza vaccine within the last 12 months.

	Received routine medical care within 12 months		
Received seasonal influenza vaccine within 12 months	Yes	No	Total
Yes	18 (50%)	18	36 (54%)
No	15 (50%)	15	30
Total	33	33	66

participants with heart disease had received the vaccine within the year, with only 47.8% of those who reported not having heart disease did. While statistically insignificant, diabetes followed a similar trend, with 65% of participants with diabetes having received the shot within the year, while 48% of those without diabetes did. 50% of participants that reported having high blood pressure had also received the flu shot within the year, compared to 48% without high blood pressure.

Required Routine Care and Influenza Vaccine Last Time

The relationship between required routine care within the last 12 months and influenza vaccination within the last 12 months was also statistically insignificant, with a p value > 0.05, regardless of the requirement for routine care. 54% of those with dementia had received the vaccination within 12 months (Table 2).

Comorbidities and Required Routine Care

The relationship between the presence of comorbidities and routine care was insignificant for all four comorbidities (p>0.05). 83% of people that reported having COPD had also required routine care, compared to 54% who did not have COPD. Of the people that reported having heart disease, 67% required routine care, and only 51% of those that reported not having heart disease required routine care. 38% of those that reported having diabetes also reported having required routine care, and 53% of those that reported not having diabetes had required routine care. 43% of

Table 3 Presence of COPD, heart disease, diabetes, and high blood pressure with requirement for routine medical care within the last 12 months.

	Required routine medical care within the last 12 months		
Has COPD	**Yes**	**No**	**Total**
Yes	5 (83%)	1	6
No	25 (54%)	21	46
Total	30	22	52
Has heart disease	**Yes**	**No**	**Total**
Yes	4 (67%)	2	6
No	48 (51%)	46	94
Total	52	48	100
Has diabetes	**Yes**	**No**	**Total**
Yes	3 (38%)	5	8
No	49 (53%)	43	92
Total	52	48	100
Has high blood pressure	**Yes**	**No**	**Total**
Yes	10 (43%)	13	23
No	42 (57%)	32	74
Total	52	45	97

people that reported high blood pressure had required routine care in the last year, compared to the 57% of people that reported not having high blood pressure but requiring routine care within the year (Table 3).

DISCUSSION

It was found that some comorbidities correlated with the rate of seasonal flu shot receipt more than others. COPD and heart disease both had a significant impact on the uptake of flu shots among persons with dementia. This is consistent with other research that has found a relationship between the presence of comorbidities, including heart disease and chronic respiratory diseases, and increased vaccination (Gallini et al., 2017). This suggests that not only can the presence of comorbidities impact vaccination rates, but that some comorbidities may have more of an impact than others.

However, there was no significant impact of required routine care on vaccination rates or of comorbidities on the requirement for routine care. In previous research, there was a positive correlation between routine care and vaccination as well as the presence of comorbidities and the requirement for routine care (Martinez-Baz et al., 2012; Zhang et al., 2019). The difference in findings may be due to data collection methods, as this research was not conducted in a clinic; however, further exploration is required. It is important to explore why routine care is not a factor, as clinics are an important site for vaccination and vaccine encouragement. Overall, while some comorbidities impact vaccination rates, it is not clear why this pattern emerged. This suggests a need to further investigate why comorbidities may impact vaccination rates among persons with dementia, if not due to increased contact with the healthcare system.

Only 418 of 130 000 respondents reported a cognitive health score of 4 to 6, representing a significant drop in respondents. It is not clear if there is a lack of support for people with lower cognitive

function to participate in community surveys or possibly if people are unaware of their cognitive health score. The CCHS cognitive health status was an indirect measure of the impact of dementia, rather than a diagnosis. However, it was the closest measure available that would capture persons with dementia. This indirect measure would likely result in underreporting of dementia if people were unsure of their cognitive status score. It could have also included individuals without dementia that had other cognitive impairments. It would likely be beneficial to consider reporting dementia and other cognitive diseases by their diagnosis in order to improve ease of use. Self-reported data such as the CCHS is important, although it may be inaccessible for persons with dementia, especially those with more severe cognitive scores. Individuals with low cognitive scores still possess perspectives that are valuable for understanding health within this population. Furthermore, they may experience increased health-related issues and require more care. Promoting the participation of those with cognitive diseases and dementia can help to better understand their health situation and what can be done to ensure that they are able to access influenza vaccination. The chi-square test of independence was used, and since this was an exploratory investigation into associations, no further data analysis was completed. Multivariant analysis was not completed as the goal was to identify differences between access to the medical system and different comorbidities.

The implication of these findings is important. Further research into this is needed to determine not only what factors are impacting vaccination rates among the comorbid, but why some comorbidities impact vaccination rates more and what can be done to ensure that those at risk are receiving the influenza vaccination. Since those with dementia and old age, in general, are major targets for vaccination due to the increased likelihood of adverse health effects following infection, it is vital to understand why their rates remain so low.

CONFLICTS OF INTERESTS

The authors declare no conflicts of interest.

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