



INFLUENZA BURDEN OF DISEASE AND 2018/19 END-OF-SEASON INFLUENZA VACCINE EFFECTIVENESS ESTIMATES FOR PREVENTING INFLUENZA-ASSOCIATED HOSPITALIZATION AMONG CANADIAN ADULTS: AN UPDATE FROM THE CIRN SERIOUS OUTCOMES SURVEILLANCE (SOS) NETWORK

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Background

- The Canadian Immunization Research Network's (CIRN) Serious Outcomes Surveillance (SOS) Network conducts hospital-based laboratory-confirmed influenza surveillance, enrolling adults (≥16 years), in Canada, and participates in the Global Influenza Hospital Surveillance Network (GIHSN)
- The 2018/19 season included adult academic and community hospital sites in Canadian Provinces (Nova Scotia, Ontario, and Quebec) representing ~5000 acute care beds
- Unique focus on measures of health relevant for older adults



Methods

- Active surveillance for influenza infection in adults (≥16 years of age) was conducted October 28th, 2018 to June 1st, 2019
- Nasopharyngeal (NP) swab obtained from all patients with an admitting diagnosis of pneumonia, exacerbation of Chronic Obstructive Pulmonary Disease, asthma, unexplained sepsis, any respiratory diagnosis or symptom
- All NP swabs tested on-site for influenza A & B by PCR
- Influenza typing and B lineage characterization performed at CIRN SOS Network Central Laboratory at the Canadian Center for Vaccinology in Halifax, NS
- Other clinical and demographic information was also collected, including frailty (*clinical frailty scale)

Clinical Frailty Scale*

1 Very Fit - People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2 Well - People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally, e.g. seasonally.

3 Managing Well - People whose medical problems are well controlled, but are not regularly active beyond routine walking.

4 Vulnerable - While not dependent on others for daily help, often symptoms limit activities. A common complaint is being "slowed up", and/or being tired during the day.

5 Mildly Frail - These people often have more evident slowing, and need help in high order IADLs (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6 Moderately Frail - People need help with all outside activities and with keeping house. Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) with dressing.

7 Severely Frail - Completely dependent for personal care, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

8 Very Severely Frail - Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9 Terminally Ill - Approaching the end of life. This category applies to people with a life expectancy <6 months, who are not otherwise evidently frail.

Scoring frailty in people with dementia: The degree of frailty corresponds to the degree of dementia. Common symptoms in mild dementia include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal. In moderate dementia, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting. In severe dementia, they cannot do personal care without help.

* 1. Canadian Study on Health & Aging, Revised 2008. 2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.

VE = 1-OR x 100%, with 95% CI

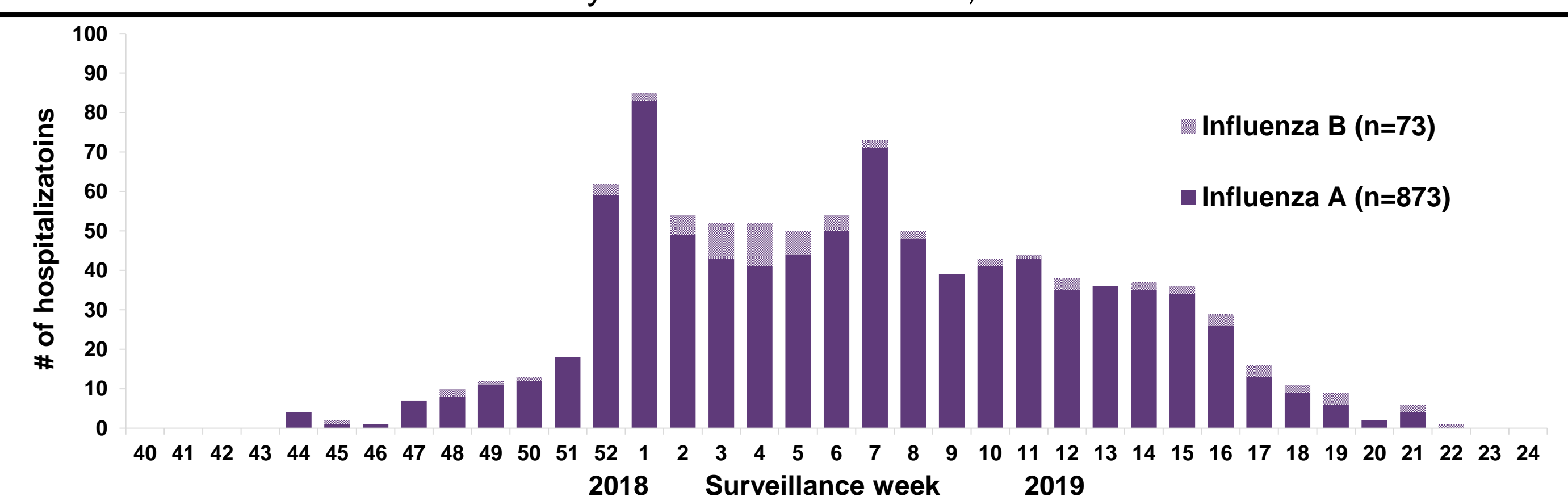
Results

Table 1: Clinical characteristics of influenza positive cases enrolled in the SOS Network, 2018-2019 influenza season Burden of Disease (BOD) Cohort

Characteristics	Cases (n=946) n (%)
Age	
16-49y	176 (18.6)
50-64y	203 (21.5)
65-74y	207 (21.9)
75+ y	360 (38.1)
Male	424 (44.8)
Clinical Frailty Scale (prior to illness)	
1-3 non-frail	117 (12.4)
4 pre-frail	175 (18.5)
5 mildly frail	183 (19.3)
6-9 moderately to severely frail	17 (1.8)
Missing	454 (48.0)
Subtype	
A	873 (92.3)
B	73 (7.7)
Unknown	(0.0)
Strain/lineage	
A/H1N1	439 (46.4)
A/H3N2	336 (35.5)
A/Unknown subtype	98 (10.4)
B/Victoria	20 (2.1)
B/Yamagata	43 (4.5)
B unknown lineage	10 (1.1)

*Proportions are among patients with known information for that variable, missing values were excluded

Figure 1. Epidemiologic curve of influenza A/B during the 2018/2019 season in Canada. *Surveillance was officially started on October 28, 2018



Results

Table 2: Clinical characteristics of influenza positive cases and test-negative controls enrolled in the SOS Network, 2018-2019 season (Vaccine Effectiveness Cohort)

Characteristics	Cases (n=683) n (%)	Controls (n=821) n (%)	p value
Age			<0.001
16-49y	130 (19.0)	93 (11.3)	
50-64y	130 (19.0)	204 (24.8)	
65-75y	152 (22.3)	208 (25.3)	
>75 y	271 (39.7)	316 (38.5)	
Frailty (only ≥65y)			0.024
non-frail (CFS 1-3)	95 (22.5)	80 (15.3)	
pre-frail (CFS 4)	141 (33.3)	187 (35.7)	
mild frailty (CFS 5)	148 (35.0)	215 (41.0)	
mod-severe frailty (CFS 6-9)	13 (6.1)	20 (3.8)	
Male	304 (44.5)	386 (47.0)	0.35
≥1 comorbidity	625 (91.5)	778 (94.8)	0.013
Pregnant	32 (4.7)	4 (0.5)	<0.001
Smoker (past or current)	337 (49.3)	500 (60.9)	<0.001
Antiviral use prior to admission	6 (0.9)	0 (0.0)	0.009
Received 2018/19 influenza vaccine	310 (45.4)	480 (58.5)	<0.001
Admitted from long-term care facility	22 (3.2)	38 (4.6)	0.186
≥4 medications	457 (66.9)	625 (76.1)	<0.001

*Proportions are among patients with known information for that variable, missing values were excluded

Table 3: Outcomes of all influenza, influenza A, influenza B, controls, 2018/2019 season

Outcome	Controls %, N N = 821	All Influenza %, N N = 946	Influenza A %, N	Influenza B %, N
Admitted to ICU	11.4%, 94	14.5%, 137	15%, 131/873	8.2%, 6/73
Mechanically Ventilated	4.8%, 39	8.7%, 82	6.6%, 41/618	1.5%, 1/65
Died during this admission	6.3%, 52	6.9%, 65	4.4%, 27/618	6.2%, 4/65

Table 4: Outcomes of influenza positive cases by frailty, 2018/2019 season

Outcome	FRAILTY CATEGORY					p value
	CFS 1-3 Non-Frail N=117	CFS 4 Pre-Frail N=175	CFS 5 Mildly Frail N=183	CFS 6-9 Mod-Severe Frail N=17		
Length of stay, mean (SD)	7.4 (7.3)	9.4 (9.4)	12.2 (9.9)	12.9 (12.5)	<0.001	
Admitted to ICU, N (%)	11 (9.4%)	18 (10.3%)	12 (6.6%)	1 (5.9%)	0.609	
30 day mortality, N (%)	1 (0.9%)	6 (3.4%)	21 (11.5%)	3 (17.6%)	<0.001	

Influenza Vaccine Effectiveness (VE) against influenza hospitalization, VE % (95% CI):

- 42.9 (27.8 – 54.8) overall
- 50.2 (21.1 – 68.6) for ages <65
- 30.6 (6.9 – 48.3) for ages 65+
- 57.6 (43.0 – 68.5) for Influenza A
- 12.1 (-131.8 – 45.8) for Influenza B
- 68.1 (51.6 – 79.0) for A/H1N1
- 19.0 (-34.6 – 51.3) for A/H3N2

*All ages, Inf A, A/H1N1, & A/H3N2 estimates adjusted for: age, pregnancy & current/past smoker.

Age <65 estimate adjusted for age, body mass index categories, pregnancy, and medications use prior to admission. Age ≥65 estimate adjusted for age, frailty score, & current/past smoker.

** Inf B is unadjusted VE due to small numbers

Conclusions

- The 2018/2019 influenza season in Canada was a predominantly influenza A season. Among influenza cases, 439 (46.4%) were A/H1N1 and 336 (35.5%) were A/H3N2
- Influenza activity this season started earlier than usual
- Most patients were 50 years or older; over a third were 75+
- Rates of ICU admission and mechanical ventilation were higher among Influenza A vs. B patients
- Outcomes worsened with increasing frailty
- VE was better against Influenza A vs. B, and for those aged <65 vs. older adults

Discussion

- Due to the lack of immunization registries across Canada, the SOS Network actively verifies influenza immunization status for calculation of influenza VE.
- Vaccine registries would contribute to our ability to generate product-specific VE estimates.
- Reinstating subtype/lineage testing allows better description of circulating strains and strain-specific VE.
- The SOS Network continues to investigate key risk factors (e.g. frailty) for serious outcomes among older adults hospitalized with acute respiratory illnesses.
- The Public Health Agency of Canada utilizes SOS data for monitoring influenza activity, including burden of disease evaluation, serious outcomes, and influenza VE in hospitalized adults.
- The SOS Network recognizes the ongoing importance of contributing results to the GIHSN.

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