

A. McGeer¹, R. Devlin², J. Downey³, S. Drews⁴, J. Gubbay⁴, K. Green¹, K. Katz⁵, D. Low^{1,4}, C. Ma¹, T. Mazzulli¹, M. Muller², A. Plevneshi¹, J. Powis³, W. Rudnick¹, A. Sarabia⁶, A. Simor⁷, Toronto Invasive Bacterial Diseases Network

Allison McGeer, MD
t: (416) 586-3118
f: (416) 586-8358
e: amcgeer@mtsina.on.ca

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¹Mount Sinai Hospital, Toronto, Canada, ²St. Michael's Hospital, Toronto, Canada, ³Toronto East General Hospital, Toronto, Canada, ⁴Ontario Agency for Health Protection and Promotion, Ontario Public Health Laboratory, Toronto, Canada, ⁵North York General Hospital Toronto, Canada, ⁶Credit Valley Hospital, Toronto, Canada, ⁷Sunnybrook Health Sciences Centre Toronto, Canada

Introduction and Purpose

The 2009 influenza pandemic may have changed both attitudes and practice related to influenza. In Ontario, Canada, recommendations were written for testing and treatment of hospitalized patients, and influenza testing, particularly by PCR, became much more readily available. However, HCV and overall population influenza vaccination rates decreased in 2009/10 and 2010/11 relative to pre-pandemic years. The objective of this analysis was to assess differences in the epidemiology, clinical features and management of adult patients with laboratory-confirmed seasonal influenza requiring hospital admission before and after the 2009 pandemic in our population.

Methods

The Toronto Invasive Bacterial Diseases Network has performed population-based surveillance for laboratory confirmed influenza requiring hospitalization in Metropolitan Toronto and the Regional Municipality of Peel (popn~4M) since December 2004. Cases are defined as an illness requiring hospital admission associated with a positive test for influenza (EIA, PCR and/or culture).

All hospital laboratories serving residents of the population area report any positive test for influenza to the central study office; laboratories receive on-going information about the influenza season, and annual audits are conducted to ensure complete reporting. From the 2006/7 season onward, active surveillance for influenza was conducted in the ICUs of 6 of 19 hospital corporations. All patients admitted to these ICUs with a respiratory or cardiac diagnosis, or unexplained fever/sepsis had a nasopharyngeal (NP) swab ordered for detection of influenza.

Whenever possible, EIA results are confirmed by culture or PCR. Beginning in the 2006/7 season, subtyping of influenza A strains was performed by the Ontario Public Health Laboratory.

Demographic and clinical data are collected by patient and physician interview, and chart review. Data are entered, and analyzed using SAS version 9.1. research ethics board approval for the study was obtained from all participating hospitals.

In this analysis, we compared the epidemiology, clinical features, management and outcomes of seasonal influenza requiring hospital admission before and after the 2009 pandemic.

Results

From December 2004 to April 2009, and in the 2010/11 season, 2375 adults (≥15 yrs) with laboratory confirmed influenza associated with hospitalization were identified. The incidence was 9.3, 2.6, 5.3, 14.3 and 2.9 per 100,000 pop in the 2004/5 to 2008/9 seasons, and 27.1 per 100,000 in the 2010/11 season. Figure 1 shows incidence by age group for the 6 seasons.

Figure 1: Incidence of seasonal laboratory confirmed influenza associated with hospitalization in adults in metro Toronto/Peel region, 2005-2011, by age group

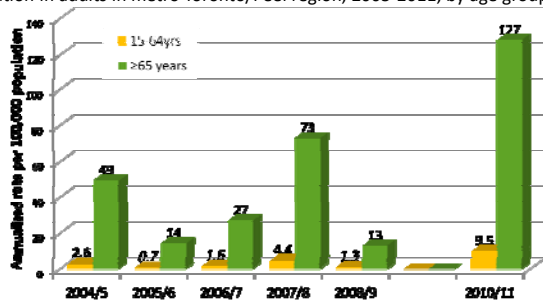
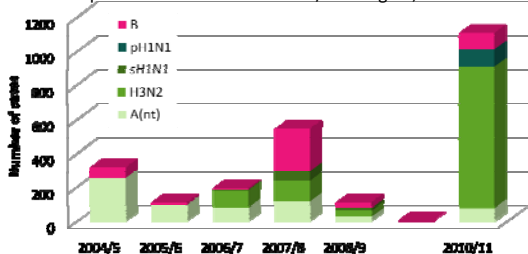


Figure 2: Distribution of influenza types and subtypes in adults with influenza associated with hospitalization in metro Toronto/Peel region, 2005-2011.



Results (Contd.)

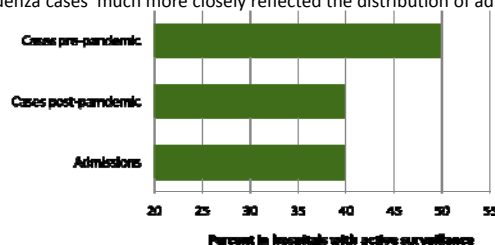
As shown in Table 1, there were few differences in the demographics or clinical features of patients with seasonal influenza before and after the pandemic. In the first post-pandemic season, patients diagnosed with influenza had somewhat higher Charlson co-morbidity scores, but the difference was small, and patients otherwise appeared similar. However, post-pandemic patients were significantly less likely to be vaccinated against seasonal influenza. (54 v 62%, P<.001).

Table 1: Comparison of seasonal influenza pre- and post-pandemic

Characteristics	Pre-Pandemic (N=1271)* n/ (%)	Post-Pandemic (N=1105)* n (%)	p value
Male	610 (48%)	581 (48%)	1.0
Median age (range)	77 years (15-100)	76 years (15-102)	0.80
Resident of long term care facility	181 (14%)	139(13%)	0.24
Underlying health condition associated with risk of influenza complications	991 (78%)	881 (80%)	0.40
Median Charlson score (range)	5 (0-16)	5 (0-16)	0.004
Vaccinated against influenza	682 (62%)	533 (54%)	<.001
Median APACHE II score (range)	12 (0-41)	12 (0-42)	0.86
Concomitant bacterial infection	64 (5.0%)	43 (3.9%)	0.18
Diagnosis of flu/pneumonia	494 (37%)	406 (37%)	.28
Treated with antibiotics	918(82%)	794 (84%)	0.21
Treated with antivirals	487 (39%)	795 (72%)	<.001
Required ICU admission	239 (19%)	207 (19%)	0.89
Required mechanical ventilation	117 (11%)	117 (9.4%)	.30
Died within 15 days of admission	107 (8.6%)	80 (7.4%)	.29

*Denominators vary due to missing data

Some changes have, however, occurred. As shown below, prior to the pandemic, hospitals with active surveillance for influenza in their ICU accounted for 40% of overall admissions in the network, but 60% of the influenza cases. Post pandemic, the number of influenza cases much more closely reflected the distribution of admissions.



Changes have also occurred in influenza management. In the first post-pandemic season, the proportion of patients treated with antivirals was 73%, compared to 39% for pooled pre-pandemic seasons. Factors associated with survival pre- and post-pandemic were however, similar (see Table below)

Characteristics	Multivariable Odds Ratio (95% CI) for Survival	
	Prepandemic	Post Pandemic
Lower Charlson score (per point)	1.2(1.1-1.3)	1.2 (1.1-1.3)
Lower admission Apache II score (per point)	1.1 (1.1-1.2)	1.1 (1.1-1.2)
Community resident (v. nursing home)	2.6 (1.5-4.4)	2.8 (1.5-5.2)
Received effective antiviral	2.4 (1.5-4.0)	1.8 (1.1- 3.1)

Conclusion

The first post-pandemic season in Toronto was predominantly due to A(H3N2) influenza. It is not possible to be certain how much of the increase in seasonal activity in this season was due to increased testing as opposed to natural fluctuation in influenza activity. The decreased proportion of vaccinated patients suggests that overall seasonal vaccine rates in the at risk population may have decreased post-pandemic. The proportion of patients treated with antivirals increased compared to pre-pandemic seasons. Antiviral therapy was associated with reduced mortality both pre and post – pandemic.

Acknowledgement

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