

# Physician surveillance of influenza

## *Collaboration between primary care and public health*

David Price MD CCFP FCFP   David Chan MD MSc CCFP FCFP   Nancy Greaves RN MSc

### Abstract

**Problem addressed** Influenza-like illness (ILI) is a global and national concern. The surveillance of ILI requires collaborative efforts from many diverse settings, including primary care clinics.

**Objective of program** To develop a sustainable reporting mechanism that enables primary care practices to provide ILI surveillance information to public health (PH) and addresses the needs of primary care practices and PH.

**Program description** An automated, electronic ILI reporting program that collects information on ILI activity directly from family physicians; the program is integrated with the practice's electronic medical record (EMR) system and therefore does not require physician initiation or disrupt physician workflow. Surveillance information is collected from a random sample of patient encounters using an automated pop-up screen that appears when exiting the patient's EMR. Weekly summary reports are transmitted electronically to PH.

#### EDITOR'S KEY POINTS

- An automated, electronic medical record–integrated physician influenza-like illness (ILI) reporting program is an inexpensive and feasible method to deliver real-time ILI surveillance data to public health departments. This program is not physician initiated, does not interrupt physician workflow, and does not impose unnecessary paperwork on clinicians.
- Benefits related to this program include the following: automation of a pop-up mechanism presenting the ILI surveillance question; integration into the workflow of the practice (no paper-based reports, surveys, etc); strategically placed pop-up screen that does not interfere with patient care; and minimal time requirements for the health care provider, as the ILI pop-up screen does not appear for every patient.
- This program demonstrates an ongoing successful collaboration between local public health and primary care.

**Conclusion** The EMR-integrated physician ILI reporting program is a simple and inexpensive way for family physicians to provide PH with important real-time, community-level disease surveillance information that is both complete and accurate. The program has been used in Hamilton, Ont, since 2004, which clearly demonstrates that it is a feasible and sustainable program in practice.

This article has been peer reviewed.  
*Can Fam Physician* 2014;60:e7–15

# Surveillance de la grippe par les médecins

## Collaboration entre les soins primaires et la santé publique

David Price MD CCFP FCFP   David Chan MD MSc CCFP FCFP   Nancy Greaves RN MSc

### Résumé

**Problème à l'étude** Le syndrome grippal est une préoccupation mondiale et nationale. La surveillance du syndrome grippal exige des efforts de collaboration entre de nombreux intervenants différents, y compris les cliniques de soins primaires.

**Objectif du programme** Élaborer un mécanisme viable de rapports, qui permette aux pratiques de soins primaires de fournir des renseignements sur la surveillance du syndrome grippal à la santé publique (SP) et qui réponde aux besoins des pratiques de soins primaires et de la SP.

**Description du programme** Un programme de signalement automatisé électronique du syndrome grippal, qui recueille directement des renseignements sur l'activité grippale auprès des médecins de famille. Le programme est intégré aux dossiers médicaux électroniques (DME) de la pratique; il ne nécessite donc pas d'action spéciale du médecin et n'interrompt pas le déroulement de son travail. Les renseignements de surveillance sont recueillis à partir d'un échantillon aléatoire de visites des patients à l'aide d'un écran instantané automatisé qui apparaît quand on ferme le DME du patient. Des rapports de synthèse hebdomadaires sont transmis électroniquement à la SP.

**Conclusion** Le programme de signalement du syndrome grippal intégré aux DME est un moyen simple et peu coûteux pour les médecins de famille de fournir à la santé publique des renseignements importants en temps réel sur la surveillance des maladies à l'échelle de la communauté, qui sont à la fois complets et exacts. Le programme est utilisé depuis 2004 à Hamilton, en Ontario, ce qui démontre clairement que c'est un programme applicable et viable dans la pratique.

### POINTS DE REPÈRE DU RÉDACTEUR

- Un programme automatisé électronique de signalement du syndrome grippal, intégré aux dossiers médicaux électroniques, est un moyen peu coûteux et pratique pour les médecins de fournir des données de surveillance de l'activité grippale en temps réel aux services de santé publique. Ce programme n'est pas activé par le médecin, n'interrompt pas le déroulement du travail et n'impose pas de paperasserie inutile aux cliniciens.

- Parmi les avantages que procure ce programme figurent les suivants: automatisation d'un mécanisme instantané présentant une question reliée à la surveillance du syndrome grippal; intégration dans le déroulement normal du travail de la pratique (aucun rapport ou questionnaire sur papier, etc.); écran instantané stratégiquement placé qui ne nuit pas aux soins au patient; exigence minimale de temps pour le professionnel de la santé, puisque l'écran instantané sur le syndrome grippal n'apparaît pas pour chaque patient.

- Ce programme est un exemple de réussite dans la collaboration constante entre la santé publique locale et les soins primaires.

Cet article a fait l'objet d'une révision par des pairs.  
*Can Fam Physician* 2014;60:e7-15

Influenza-like illness (ILI) is a priority concern for public health (PH), given its implications on the health, as well as social and economic well-being, of individuals.<sup>1-3</sup> Globally, influenza causes up to 500 000 deaths in a given year, infecting 10% to 15% of the population<sup>4</sup>; in Canada, between 4000 and 8000 deaths each year are related to influenza.<sup>2</sup> In an effort to minimize serious illness, deaths, and societal disruption among Canadians, the Public Health Agency of Canada has established national surveillance of influenza.<sup>5</sup>

Surveillance of ILI requires collaborative efforts from many diverse settings in order to obtain the required information: laboratories (positive test results), vaccination clinics (rates of vaccinations provided by different health care providers), primary schools (absenteeism), workplaces (absenteeism), hospitals (emergency department visits for ILI), and primary care clinics (visits for ILI). Collaboration between PH and primary care physicians is advantageous, as 85% of Canadians have regular family doctors<sup>6</sup> and patients often visit their family doctors first. Given the benefits of including data from primary care practices in the surveillance of ILI,<sup>7-10</sup> the City of Hamilton Public Health (HPH) in Ontario approached a small number of primary care practice clinics to act as sentinel sites to provide information on influenza activity. This initial request asked family physicians to provide the total number of patients seen with ILI on a designated day each week by completing paper-based surveys. Unfortunately, this proposed reporting system was not feasible for the following reasons: it was a physician-initiated reporting system, which interrupted physician workflow and patient care; manual data entry was required, thus increasing physician workload with additional unnecessary paperwork; and workload of the administrative staff increased, as daily surveys required collation and summary reports had to be faxed weekly to HPH. Also, evidence suggests that clinician-initiated, manual reporting systems produce delayed, inaccurate, and incomplete data.<sup>11-13</sup>

To address the needs of physician practices and HPH, we devised an innovative reporting mechanism. Our program collects information about ILI activity directly from participating family physicians using the current electronic medical record (EMR) system in their practices and does not require physician initiation or disrupt physician workflow. In addition, this electronic reporting program also supports automated, timely reporting of ILI that is complete and accurate, as it minimizes errors from manual entries and reliance on physician recall.

This article introduces and describes the innovative EMR-integrated physician ILI reporting program developed by primary care physicians, and the collaboration

between HPH and primary care clinics as part of the HPH ILI surveillance system.

### The ILI surveillance system

The ILI surveillance system implemented by the HPH Surveillance Unit has a number of objectives (**Box 1**), including the monitoring of weekly ILI activity through data collection from a number of sentinel sites and reporting sources from within Hamilton (**Boxes 2 and 3**). These individual contributions report directly to the HPH Surveillance Unit and provide community-level information about the level of ILI activity and its effect on health services.

Hamilton Public Health has built flexibility into the ILI surveillance system to ensure modifications can be made in an efficient and timely manner to accommodate varying degrees of influenza activity, specifically during nonpandemic and pandemic conditions. In pandemic conditions, the ILI surveillance system is scaled up to meet reporting requirements (**Box 3**).

#### Box 1. Objectives of the City of Hamilton Public Health Services Surveillance Unit ILI surveillance system

Objectives are as follows:

- Monitor weekly ILI activity through data collection from several sentinel sites and reporting sources
- Provide timely analysis of the data for report generation
- Develop strong working relationships with key health care practitioners to support shared goals for the prevention and control of influenza in Hamilton

ILI—influenza-like illness.

#### Box 2. Components of the Hamilton Public Health ILI surveillance system in nonpandemic conditions

Acute Care Enhanced Surveillance system

- Respiratory syndrome alerts
  - ED visits reporting respiratory infections or fever or ILI
- Laboratory testing of respiratory isolates
- Regional Virology and Chlamydiology Laboratory

Case reporting

- Community and institutional cases
- Institutional respiratory outbreak data

School absenteeism

- Hamilton-Wentworth District School Board
- Hamilton-Wentworth Catholic District School Board

Physician ILI

- Random sample of patient appointments at participating primary care practices (20% of all encounters)

Vaccine uptake

- Monthly report of rates of hospital influenza vaccinations provided by health care providers

ED—emergency department, ILI—influenza-like illness.

### Box 3. Components of the Hamilton Public Health ILI surveillance system in pandemic conditions

#### Acute Care Enhanced Surveillance system

- Respiratory syndrome alerts
- Hospital admissions reporting respiratory infections or fever or ILI (ICU and ventilator use)
- ED visits reporting respiratory infections or fever or ILI
- Laboratory testing of respiratory isolates
- Regional Virology and Chlamydiology Laboratory

#### Case reporting

- Community and institutional cases
- Severity of cases including mortality and risk factor information
- Institutional respiratory outbreak data

#### School absenteeism

- Hamilton-Wentworth District School Board
- Hamilton-Wentworth Catholic District School Board

#### Absenteeism

- Health care worker absenteeism

#### Physician ILI

- All patient appointments at participating primary care practices

#### Vaccine uptake

- Reporting of rates of hospital influenza vaccinations provided by health care providers
- Influenza vaccination provided through community clinics
- Vaccine distribution to physicians and other vaccination providers

#### EMS use for patients with ILI symptoms

ED—emergency department, EMS—emergency medical services, ICU—intensive care unit, ILI—influenza-like illness.

## Program description

One of the 7 system components comprising the HPH ILI surveillance system is ILI surveillance from sentinel physicians working in primary care. In 2004, 2 large interdisciplinary academic primary care clinics—Stonechurch Family Health Centre and McMaster Family Practice—in Hamilton (a city with a population of 500 000) began collaborating with HPH. These 2 clinics provide primary care to approximately 5% of the Hamilton population (30 000 rostered patients). In September 2009, Shelter Health Network joined the collaboration. At Shelter Health Network there is an interdisciplinary team working together to provide primary health care to homeless or near-homeless individuals who do not have primary care providers, many of whom have complex social and health needs (approximately 10 000 patient visits per year). The 3 participating practices together provide health care services to a diverse patient population and cover a broad segment of the city's population, both geographically and socioeconomically. The patient population is of a large urban centre with a mix of demographic characteristics,

including variation in age, sex, and ethnicity, as well as a substantial recent immigrant and refugee population.

The program integrates ILI surveillance into the EMR system used by the 3 participating clinics: Open Source Clinical Application Resource (OSCAR).<sup>14</sup> Using a randomization program that operates within the EMR, surveillance information is obtained by a random selection of 20% of all patient encounters. The randomization is both client based and visit based, such that, while it is based on a visit, a patient can only be randomly selected once per day.

## Random selection process

The random selection process occurs when the health care provider selects a patient record (**Figure 1**). The program determines whether the patient has been randomly selected that day; if the patient has not yet been selected, the randomization algorithm is run by the program. If the patient is not selected to the group that is part of the ILI surveillance, the program moves forward by marking the patient record to ensure it is not included in the random selection process again that day. If the patient is randomly selected for the ILI surveillance group and the ILI question has not been answered by the health care provider, the program moves forward to the ILI question screen. Under pandemic conditions, the process of random selection of patients is removed and physicians are asked to report ILI for every patient seen in clinic.

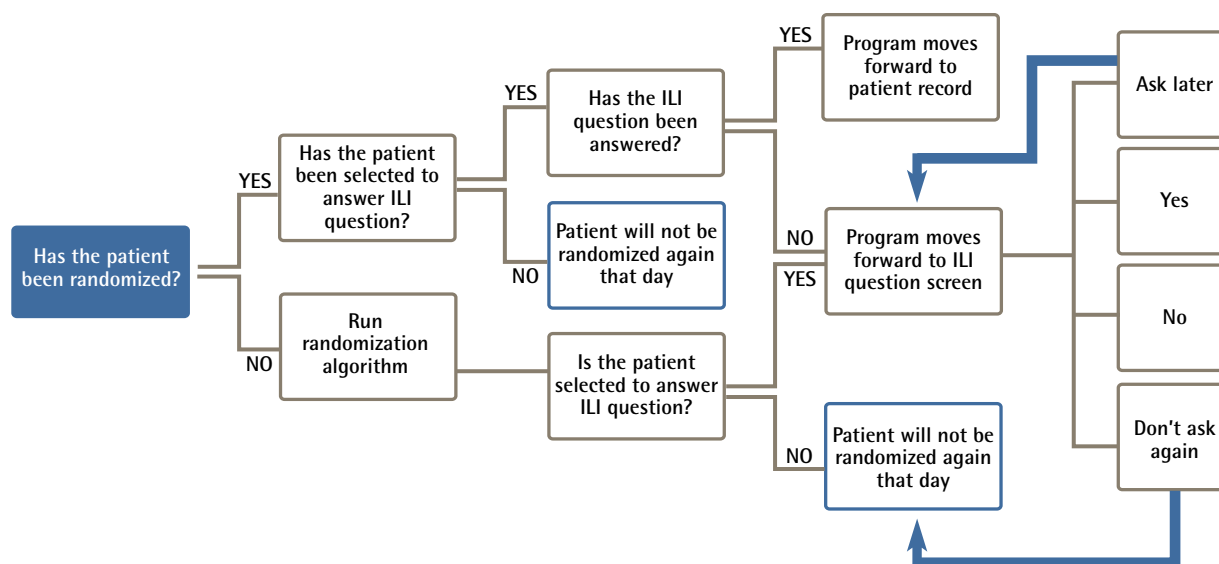
## Data collection

For patients randomly assigned to the ILI surveillance group, a pop-up screen with the ILI question (**Figure 2**) will appear automatically within their EMRs. This screen asks the health care provider to answer the question “Does this patient meet case definition for ILI?” and also provides the national case definition for ILI. There are 4 response options: ask later; yes; no; and don't ask again. A response is required before the health care provider can proceed. To ensure the least amount of interference during the patient encounter, the pop-up screen appears when exiting the patient's EMR.

Weekly reports are generated by the clinic's administrative staff. The reports are sent to HPH in CSV (comma separated values) file format every Monday via e-mail. Reports include 4 variables: date seen (year-month-day); health care provider response to the ILI question (yes [Y], no [N], or refused to answer [R]); patient's year of birth; and the first 3 characters of the patient's postal code. The following is an example of a report entry: “2004-10-12, Y, 1958, V0N.”

The surveillance period is from October 1 through April 30; however, the program can quickly adapt to fluctuating influenza seasonal requirements by changing the reporting frequency. For example, in the event of an unusually late influenza season or an actual pandemic, the program could continue to function beyond these dates.

**Figure 1.** Flowchart illustrating the random selection of patients and the health care provider response to the ILI surveillance question



ILI—influenza-like illness.

## Results

When influenza is actively circulating in the community, HPH produces a Weekly Influenza Activity Report, which is disseminated to key contacts related to infection prevention and control in the health care sector. During pandemic conditions, summary reports about rates of ILI are provided weekly to the sentinel physicians.

Hamilton Public Health has also produced summary reports for each of the 3 participating primary care clinics, which provide information on the rates and trends of ILI during the preceding influenza season. Examples of graphs provided by HPH to each clinic are shown in **Figures 3 to 5**. **Figure 3** shows physician reporting of the number of ILI responses at one of the participating clinics from October 2010 through April 2011, while **Figure 4** presents the weekly rate of ILI for the same clinic during that same time period. Rates of ILI can also

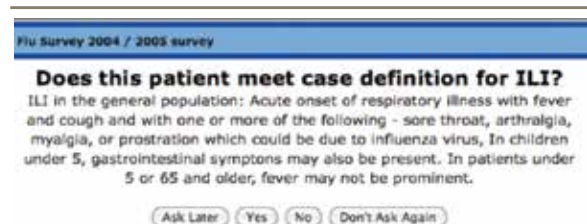
be presented demographically, allowing clinicians to identify patterns among ILI rates with respect to patient age and sex (**Figure 5**), as well as geographically (using the first 3 characters of the patient's postal code for use by HPH).

## Discussion

The benefits of including information from family physicians in the surveillance of disease, including ILI, by PH units are well known<sup>7-10</sup>; however, a paper-based reporting mechanism creates workflow burden and is not feasible for most primary care clinics. Therefore, we developed an innovative and inexpensive physician ILI reporting program, which was integrated into our existing EMR system. In doing so, we were able to ensure that our needs and those of HPH were met by delivering real-time ILI surveillance data electronically to HPH with minimal disruption to our practice workflow, while minimizing the risk of a manual transcription error.

In contrast, the sentinel physician surveillance programs currently being used across Canada are typically physician initiated, and thus often interrupt physician workflow and impose unnecessary paperwork on clinicians. FluWatch, the national influenza surveillance system developed by the Public Health Agency of Canada, includes a sentinel physician component in which information is collected via fax from participating physicians for patients seen during 1 clinic day each week.<sup>15</sup> The sentinel physician component in Alberta's TARRANT (The Alberta Recording and ReseArch NeTwork) program produces a weekly

**Figure 2.** Screenshot of the pop-up with the ILI surveillance question, which appears in the EMR of randomly selected patients



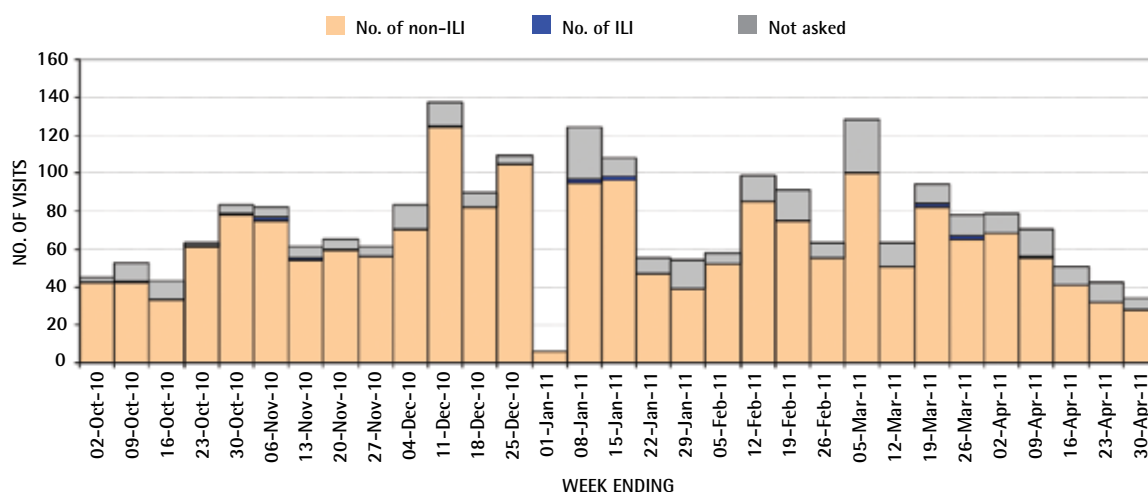
EMR—electronic medical record, ILI—influenza-like illness.



report from sentinel sites and the provincial laboratory, which is either faxed or submitted online to Tarrant Viral Watch.<sup>16</sup> In British Columbia, sentinel physicians identify and record medical visits, as well as collect specimens from patients presenting with ILI.<sup>17</sup> In Ontario, Public Health Ontario produces the Ontario Influenza Bulletin, which includes ILI consultation rate

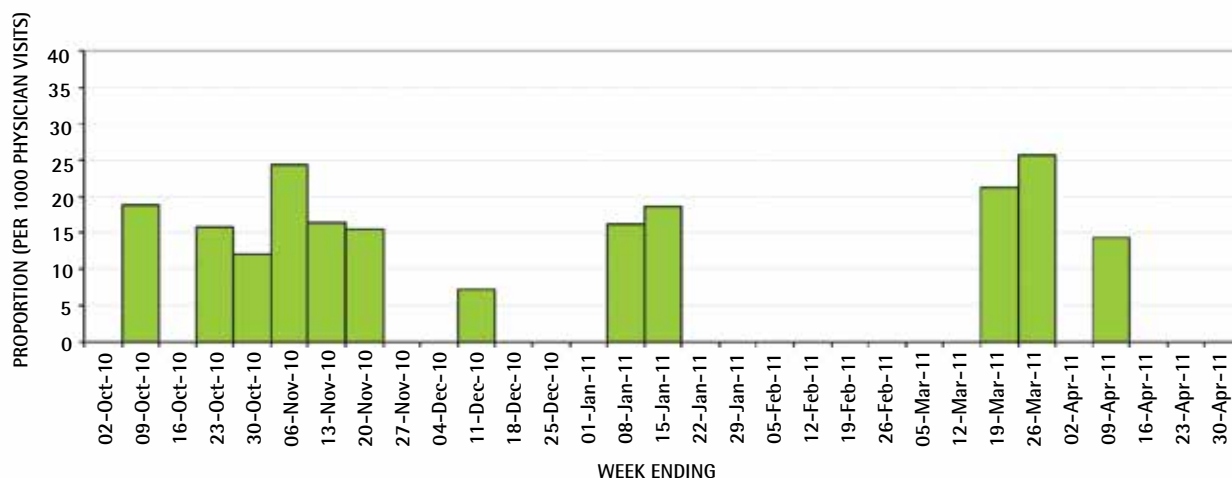
information generated from FluWatch sentinel physicians located in Ontario.<sup>18</sup> Also, individual municipalities within Ontario, such as Toronto, Peel, Halton, and Niagara, have developed various methods to monitor seasonal influenza. To our knowledge, ours is the only EMR-integrated physician ILI reporting program used in Canada.

**Figure 3. Number of weekly ILI responses among randomly selected patients visiting McMaster Family Practice from September 26, 2010, through April 30, 2011**



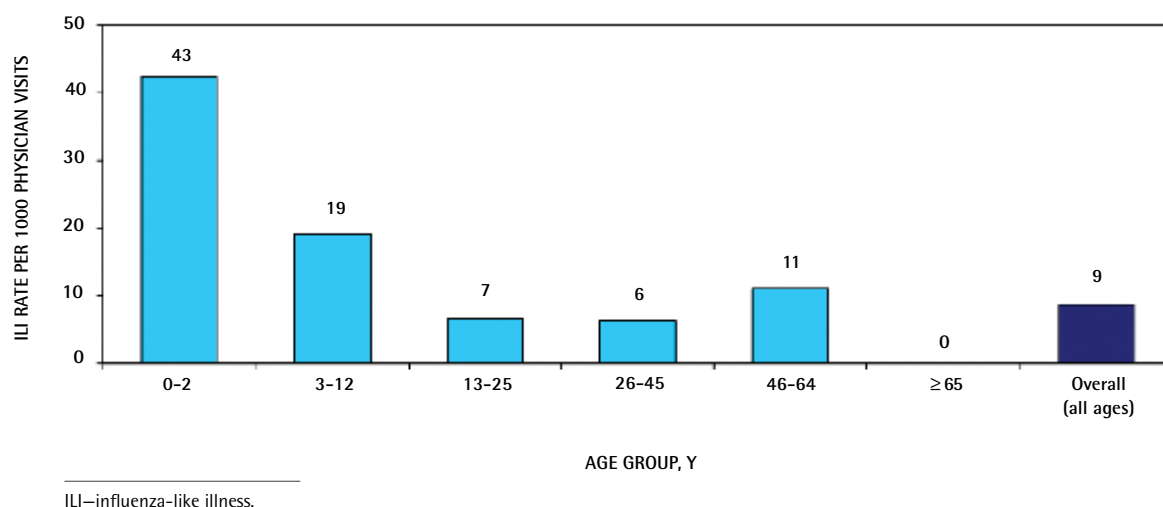
ILI—influenza-like illness.

**Figure 4. Proportion of weekly ILI visits among patients visiting McMaster Family Practice from September 26, 2010, through April 30, 2011**



ILI—influenza-like illness.

**Figure 5.** The ILI rate in patients visiting McMaster Family Practice from September 26, 2010, through April 30, 2011, by age.



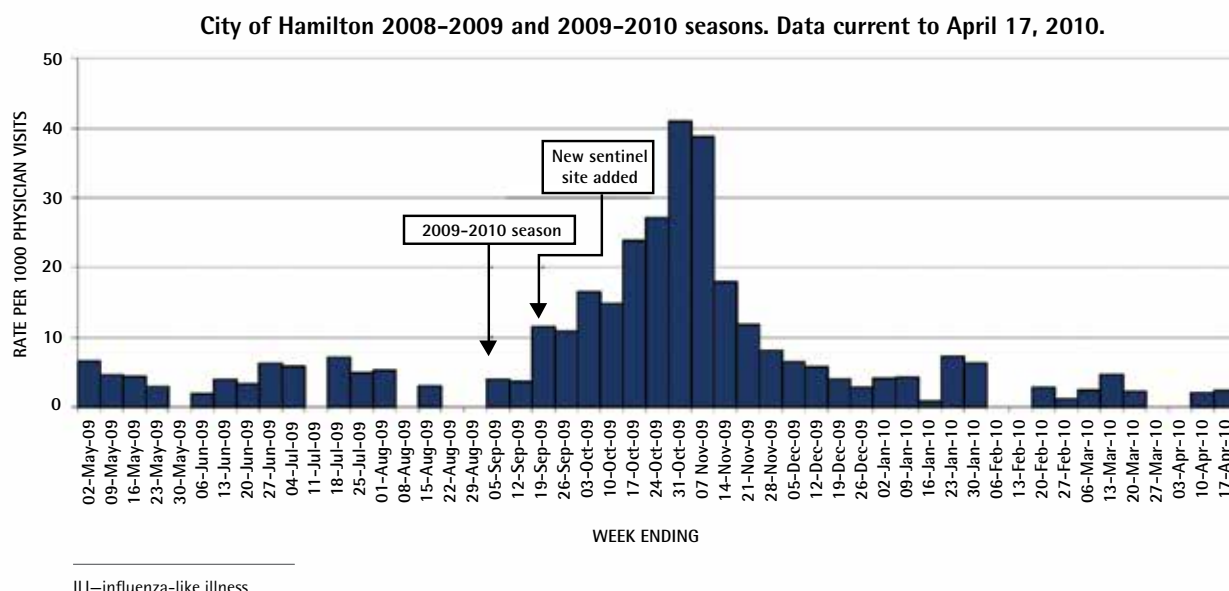
Compared with the physician ILI reporting programs being used across Canada and Ontario, our program provides numerous advantages for participating physicians and primary care clinics. Importantly, family physicians benefit by learning what illnesses are in the community in a more timely fashion. If they know that influenza is more prevalent, they are more likely to consider this as part of the differential diagnosis, and will also be more attuned of atypical presentations of the illness. Benefits related to the program itself include automation of the pop-up mechanism that presents the ILI surveillance question; therefore, physicians do not need to initiate the program. Second, the program is integrated directly into the workflow of the practice, requiring no additional work from health care providers (ie, no paperwork, reports, or surveys). Third, the ILI pop-up screen is strategically placed to appear when exiting the patient's EMR; thus, while still appearing during the patient encounter, it does not interfere with patient care. In addition, this placement of the ILI pop-up screen eliminates recall bias (and thus error), which can occur with reporting programs using an end-of-day or end-of-week survey, as well as error introduced through manual entry of data. Fourth, time requirements placed onto the health care provider are minimal, as the ILI pop-up screen does not appear for every patient; and when it does appear, it is a single-click-of-the-mouse system requiring less than 5 seconds for the provider to enter his or her response. The single-click-of-the-mouse system also minimizes error introduced through manual entry of

information. Last, this program is inexpensive and sustainable. The resources required for development and implementation of the ILI pop-up screen were nominal: less than 1 day of a programmer's time was needed to write the syntax for the randomization algorithm and pop-up itself. In addition, minimal human resources are needed to maintain the program at the clinic level. Generation and submission of the weekly electronic reports to PH each require only a single click of the mouse by administrative staff.

Public health surveillance of infectious diseases supports effective prevention and control for increases in seasonal disease activity and for emergency management of large-scale outbreaks. This innovative physician ILI reporting program provides HPH with data in a format useful for analysis and reporting. These complete and accurate physician ILI data are also available in near real time. It contributes to the information available to HPH about community influenza activity and the burden of influenza on the health sector so that informed and timely decisions are made for prevention and control. For example, during the 2009 H1N1 influenza virus pandemic, the information obtained from the 3 participating practices (**Figure 6**), in conjunction with information provided by other reporting sources that were part of the HPH ILI surveillance system, was used by HPH for the planning and management of the Hamilton flu assessment centres in the fall of 2009 during the pandemic.

Future efforts should focus on expansion of this physician ILI reporting program. The program was

**Figure 6.** Weekly rate of ILI visits among all primary care clinics participating in the physician ILI reporting program (N=3) during the 2009 H1N1 influenza virus pandemic: Wave 1 peak occurred in June 2009 and wave 2 peak occurred in October and November 2009. During the pandemic, the random selection of patients was removed and physicians were asked to report ILI for every patient seen in clinic until April 2010—at which time, the random selection process was turned on and reporting continued over the summer.




developed for use in OSCAR, which is free open-source software. This allows all user-developed software to be shared and distributed free of charge with other OSCAR users. Currently, there are approximately more than 2500 clinicians using OSCAR across Canada, with confirmed users in 6 provinces.<sup>14</sup> Using a conservative estimate of 1500 patients per clinician, there is potential to acquire ILI surveillance data from more than 3.75 million Canadians. Given the simple programming requirements of the ILI pop-up, it can be easily modified for use in other EMR systems to allow for widespread adoption by other primary care practices and PH departments. Moreover, given the number of different infectious diseases monitored by PH units, the surveillance could be easily modified for other disease syndromes (eg, enteric illness) in order to describe community conditions for each distinct syndrome.

## Limitations

Although the program's long-term use has demonstrated its feasibility and sustainability, there are only 3 primary care clinics in Ontario and 1 in Quebec currently using this EMR-integrated physician ILI reporting program. The program necessitates use of an EMR system; unfortunately, less than 50% of family physicians use EMR systems (alone or in combination with paper

records) within their practices.<sup>19</sup> This program was also developed specifically for 1 EMR system, OSCAR, and conservative estimates suggest that there are at least 20 different EMR systems currently in use across Canada.<sup>20</sup> Despite the relative ease with which this program could be integrated into these different EMR systems (owing to its simple programming requirements), it is possible that this diversity of EMR systems could hinder widespread adoption of this program by other PH departments across the country.

## Conclusion

The EMR-integrated physician ILI reporting program has been used in Hamilton since 2004, which clearly demonstrates it is a feasible and sustainable program in practice. The program is a simple and inexpensive way for family physicians to provide PH with important real-time, community-level disease surveillance information that is complete and accurate. This innovative and efficient model of disease surveillance can be easily adopted by other primary care practices and PH units across Canada, regardless of the EMR system in use. 

**Dr Price** is Professor and Chair of the Department of Family Medicine at McMaster University in Hamilton, Ont, and is Chief of Family Medicine for Hamilton Health Sciences. **Dr Chan** is Professor and Director of Information Technology in the Department of Family Medicine at McMaster University. **Ms Greaves** is Surveillance Unit Manager for the City of Hamilton Public Health Services.



## Contributors

All authors made substantial contributions to the conception and design of the study; acquisition of data, or analysis and interpretation of data; drafted the article and revised it critically for important intellectual content; and provided final approval of the version submitted.

## Competing interests

**Dr Price** is Chair of the Board for OSCAR EMR, the not-for-profit organization responsible for the electronic medical record Open Source Clinical Application Resource.

## Correspondence

**Dr David Price**, Department of Family Medicine, McMaster University, McMaster Innovation Park, 175 Longwood Rd S, Suite 201A, Hamilton, ON L8P 0A1; telephone 905 525-9140, extension 21253; fax 905 521-5594; e-mail [priced@mcmaster.ca](mailto:priced@mcmaster.ca)

## References

- Menec VH, Black C, McWilliam L, Aoki FY. The impact of influenza-associated respiratory illnesses on hospitalizations, physician visits, emergency room visits, and mortality. *Can J Public Health* 2003;94(1):59-63.
- Public Health Agency of Canada [website]. *Statement on seasonal influenza vaccine for 2011-2012*. Ottawa, ON: Public Health Agency of Canada; 2011. Available from: [www.phac-aspc.gc.ca/publicat/ccdr-rmtc/11vol37/acs-dcc-5/index-eng.php](http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/11vol37/acs-dcc-5/index-eng.php). Accessed 2013 Dec 16.
- Sebastian R, Skowronski DM, Chong M, Dhaliwal J, Brownstein JS. Age-related trends in the timeliness and prediction of medical visits, hospitalizations and deaths due to pneumonia and influenza, British Columbia, Canada, 1998-2004. *Vaccine* 2008;26(10):1397-403. Epub 2007 Dec 26.
- World Health Organization [website]. *Influenza (seasonal)*. Geneva, Switz: World Health Organization; 2009. Available from: [www.who.int/mediacentre/factsheets/fs211/en](http://www.who.int/mediacentre/factsheets/fs211/en). Accessed 2012 Apr 3.
- Public Health Agency of Canada. *Lessons learned review: Public Health Agency of Canada and Health Canada response to the 2009 H1N1 pandemic*. Ottawa, ON: Public Health Agency of Canada; 2010. Available from: [www.phac-aspc.gc.ca/about\\_apropos/evaluation/reports-rapports/2010-2011/h1n1/pdf/h1n1-eng.pdf](http://www.phac-aspc.gc.ca/about_apropos/evaluation/reports-rapports/2010-2011/h1n1/pdf/h1n1-eng.pdf). Accessed 2012 Apr 3.
- Statistics Canada [website]. *Canadian community health survey*. Ottawa, ON: Statistics Canada; 2010. Available from: [www.statcan.gc.ca/daily-quotidien/110621/dq110621b-eng.htm](http://www.statcan.gc.ca/daily-quotidien/110621/dq110621b-eng.htm). Accessed 2012 Apr 3.
- Chan EH, Tamblin R, Charland KM, Buckeridge DL. Outpatient physician billing data for age and setting specific syndromic surveillance of influenza-like illnesses. *J Biomed Inform* 2011;44(2):221-8. Epub 2010 Oct 15.
- Page J, Marquet R, Meijer A, van der Velden K. Influenza activity in Europe during eight seasons (1999-2007): an evaluation of the indicators used to measure activity and an assessment of the timing, length and course of peak activity (spread) across Europe. *BMC Infect Dis* 2007;7:141.
- Quénel P, Dab W. Influenza A and B epidemic criteria based on time-series analysis of health services surveillance data. *Eur J Epidemiol* 1998;14(3):275-85.
- Sloane PD, MacFarquhar JK, Sickbert-Bennett E, Mitchell CM, Akers R, Weber DJ, et al. Syndromic surveillance for emerging infections in office practice using billing data. *Ann Fam Med* 2006;4(4):351-8.
- Effler P, Ching-Lee M, Bogard A, Ieong MC, Nekomoto T, Jernigan D. Statewide system of electronic notifiable disease reporting from clinical laboratories: comparing automated reporting with conventional methods. *JAMA* 1999;282(19):1845-50.
- Standaert SM, Lefkowitz LB Jr, Horan JM, Hutcheson RH, Schaffner W. The reporting of communicable diseases: a controlled study of *Neisseria meningitidis* and *Haemophilus influenzae* infections. *Clin Infect Dis* 1995;20(1):30-6.
- Ward M, Brandsema P, van Straten E, Bosman A. Electronic reporting improves timeliness and completeness of infectious disease notification, The Netherlands, 2003. *Euro Surveill* 2005;10(1):27-30.
- OSCAR Canada Users Society [website]. *OSCAR: connecting care, creating community*. Vancouver, BC: OSCAR Canada Users Society; 2013. Available from: <http://oscarcanada.org/>. Accessed 2013 Dec 16.
- Reyes F, Macey JF, Aziz S, Li Y, Watkins K, Winchester B, et al. Influenza in Canada: 2005-2006 season. *Can Commun Dis Rep* 2007;33(3):21-41.
- Tarrant Viral Watch [website]. *Participate*. Calgary, AB: University of Calgary; 2009. Available from: [www.tarrantviralwatch.ca/index.php/page/participate](http://www.tarrantviralwatch.ca/index.php/page/participate). Accessed 2012 Apr 3.
- Skowronski DM, Masaro C, Kwindt TL, Mak A, Petric M, Li Y, et al. Estimating vaccine effectiveness against laboratory-confirmed influenza using a sentinel physician network: results from the 2005-2006 season of dual A and B vaccine mismatch in Canada. *Vaccine* 2007;25(15):2842-51.
- Public Health Ontario [website]. *Ontario influenza bulletin*. 2011. Toronto, ON: Ontario Agency for Health Protection and Promotion; 2013. Available from: [www.oahpp.ca/resources/flubulletin.html](http://www.oahpp.ca/resources/flubulletin.html). Accessed 2012 Apr 3.
- College of Family Physicians Canada, Canadian Medical Association, Royal College of Physicians and Surgeons of Canada. *2010 National Physician Survey*. Mississauga, ON: College of Family Physicians of Canada; 2010. Available from: [www.nationalphysiciansurvey.ca](http://www.nationalphysiciansurvey.ca). Accessed 2012 Apr 3.
- CanadianEMR [website]. *EMR vendors*. Vancouver, BC: CanadianEMR; 2012. Available from: [www.canadianemr.ca/index.aspx?PID=13](http://www.canadianemr.ca/index.aspx?PID=13). Accessed 2012 Apr 3.

— \* \* \* —