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The pandemic influenza planning process in Ontario acute care hospitals

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Background: There will be little time to prepare when an influenza pandemic strikes; hospitals need to develop and test pandemic influenza plans beforehand.
Methods: Acute care hospitals in Ontario were surveyed regarding their pandemic influenza preparedness plans.
Results: The response rate was 78.5%, and 95 of 121 hospitals participated. Three quarters (76.8%, 73 of 95) of hospitals had pandemic influenza plans. Only 16.4% (12 of 73) of hospitals with plans had tested them. Larger ($\chi^2 = 6.7$, $P = .01$) and urban hospitals ($\chi^2 = 5.0$, $P = .03$) were more likely to have tested their plans. 70.4% (50 of 71) Of respondents thought the pandemic influenza planning process was not adequately funded. No respondents were ''very satisfied'' with the completeness of their hospital's pandemic plan, and only 18.3% were ''satisfied.''
Conclusion: Important challenges were identified in pandemic planning: one quarter of hospitals did not have a plan, few plans were tested, key players were not involved, plans were frequently incomplete, funding was inadequate, and small and rural hospitals were especially disadvantaged. If these problems are not addressed, the result may be increased morbidity and mortality when a virulent influenza pandemic hits.
Key Words: Pandemic influenza; pandemic preparedness.

The 2003 outbreak of severe acute respiratory syndrome and threats of avian and pandemic influenza generated considerable interest in preparedness for severe respiratory infectious diseases prior to the 2009 H1N1 influenza pandemic.[1-3] In July 2009, the H1N1 pandemic influenza virus was viewed by the World Health Organization to be of moderate virulence, with similarities to seasonal influenza. Investigation of swine-origin H1N1 influenza viruses, however, found them to be more virulent and pathogenic than seasonal influenza, indicating that the 2009 H1N1 influenza pandemic could become more virulent and pathogenic.[4] It is estimated an influenza pandemic of mild to moderate virulence with a modest attack rate of 15% would tax the Canadian health care system and result in 18,000 deaths, 64,000 hospitalizations, and 2.1 million patients seeking outpatient care.[2] An attack rate of 35% would overwhelm Canadian hospitals.[2] Ontario acute care hospitals currently operate at over 90% capacity, and it is projected that an influenza pandemic will overburden bed, intensive care unit, and ventilator capacity.[3] A survey of Canadian nurses found a perceived shortage of medical equipment and supplies such as ventilators and bedding and a lack of support for health care workers in a large scale respiratory outbreak.[5] American hospitals also operate near capacity and lack the surge capacity necessary to manage an influenza pandemic.[6] Infection control professionals in the United States reported that acute care hospitals were not prepared for large scale infectious outbreaks and that there will be shortages of health care workers and medical equipment and supplies.[7] The suboptimal level of infection prevention and control resources in Canadian, American, and international acute care hospitals will be rate limiting in the face of a significant outbreak or pandemic of a severe respiratory illness.[8-13]

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Table 1. Characteristics of hospitals that developed generic emergency and pandemic influenza plans

	Have generic emergency plan		Have pandemic influenza plan	
Hospital characteristics	**No. of respondents**	**n (%)**	**No. of respondents**	**n (%)**
Hospital size, beds				
<30	21	20 (95.2)	22	14 (63.6)
<100	26	22 (84.6)	26	20 (76.9)
<300	23	21 (91.3)	23	19 (82.6)
>300	24	23 (95.8)	24	20 (83.3)
Nature of catchment area				
Urban	36	33 (91.7)	37	32 (86.5)
Rural	58	53 (91.4)	58	41 (70.7)
Overall	94	86 (91.5)	95	73 (76.8)

Table 2. Characteristics of hospitals that tested generic emergency and pandemic influenza plans

	Tested generic plan		Tested pandemic plan	
	No. of respondents	**n (%)**	**No. of respondents**	**n (%)**
Hospital size, beds				
<30	19	13 (68.4)	14	1 (7.1)
<100	22	19 (86.4)	20	2 (10.0)
<300	20	18 (90.0)	19	1 (5.3)
>300	23	21 (91.3)	20	8 (40.0)
Nature of catchment area				
Urban	33	31 (93.9)	32	9 (28.1)
Rural	51	40 (78.4)	41	3 (7.3)
Overall	84	71 (84.5)	73	12 (16.4)

Hospitals will be expected to play a leadership role in the management of a virulent influenza pandemic. When a pandemic of moderate to high severity strikes, there will be little time to prepare, and hospitals need to develop and test pandemic plans for respiratory infections and stockpile resources. This paper examines the pandemic influenza planning process in acute care hospitals in Ontario, Canada. The ultimate goal of the project was to develop a pandemic preparedness learning portal for acute care hospital staff involved in pandemic planning and health care workers.

METHODS

In early 2007, the chief executive officers of all acute care hospitals with inpatient beds in Ontario were contacted by e-mail and standard mail. The cover letter was signed by representatives of the 3 parties involved in the study: Queen's University, The Change Foundation, and the Ontario Hospital Association. The project had an advisory committee, which comprised infection control, emergency management, and public health experts. The survey was to be directed to and completed by the person most responsible for developing their hospital's pandemic influenza plan. The needs assessment survey was based on the core components of the Canadian Pandemic Influenza Plan[2] and the Ontario Health Plan for Pandemic Influenza.[3] The domains evaluated included the following: pandemic influenza plan development, command and control roles and responsibilities, human resources, equipment and supplies, infection control and occupational health, triage and clinical care, security, transportation, mortuary issues, business continuity, training and educational strategies, communications, cooperation with local and regional agencies, and opinion regarding pandemic preparedness learning portal development. An analysis of the content of the pandemic influenza plans of Ontario acute care hospitals is presented in a separate paper (Zoutman DE, Ford BD, Melinyshyn M, Schwartz B. Content of pandemic influenza plans in Ontario acute care hospitals. Submitted for publication, 2009.).

Respondents had the option of completing the survey on-line or by downloading a paper copy and returning it by mail. The Ontario Hospital Association circulated reminder notices to all hospitals on behalf of the investigators.

Data were analyzed with StatView version 5.0 (SAS Institute, Cary, NC). Descriptive statistics were primarily used to present the data. Hospitals with missing values for a survey item were not included in analyses involving the item. Chi-square analysis was used to test for

differences between respondent and nonrespondent hospitals. Univariate logistic regression analysis was used to test the association of the number of acute care beds and rural location with whether hospitals had and had tested pandemic influenza plans; adequacy of funding for pandemic planning and satisfaction with the completeness of pandemic plans; and the association of adequacy of funding for pandemic planning and satisfaction with completeness of pandemic plans.

RESULTS

The response rate was 78.5%; 95 of 121 acute care hospitals with inpatient beds completed the needs assessment survey. Nonresponding hospitals were not significantly different from respondent hospitals for number of beds ($F = 1.2$, $P = .3$) or rural location ($\chi^2 = 2.2$, $P = .1$). Mean hospital size was 195.8 (standard deviation [SD], 226.8) beds with a median of 94.0. One quarter (23.2%, 22 of 95) of hospitals had less than 30 beds, and one quarter (25.3%, 24 of 95) of hospitals had more than 300 beds. Hospitals from towns and rural areas with populations less than 100,000 accounted for 61.1% (58 of 95) of respondents.

Most hospitals (91.5%, 86 of 94) had generic emergency plans, and 84.5% (71 of 84) of these hospitals had formally tested their generic emergency plans (Tables 1 and 2). Three quarters (76.8%, 73 of 95) of hospitals had pandemic influenza plans (Table 1). There was a trend for larger hospitals ($\chi^2 = 3.0$, $P = .08$) and urban hospitals ($\chi^2 = 3.0$, $P = .08$) to be more likely to have pandemic influenza plans. Only 16.4% (12 of 73) of hospitals with pandemic plans had formally tested their plans (Table 2). Larger ($\chi^2 = 6.7$, $P = .01$) and urban hospitals ($\chi^2 = 5.0$, $P = .03$) were more likely to have tested their pandemic influenza plans.

One fifth (22.5%, 16 of 71) of hospitals with pandemic influenza plans made them available to staff on their intranets. Only a single hospital had their pandemic influenza plan available to the general public on its Web site.

Internal and external partners in hospital pandemic influenza plan development

Most hospitals (93.1%, 67 of 72) with pandemic influenza plans had pandemic influenza planning committees. Committees had a mean of 14.5 (SD, 9.2) members. Infection control (97.3%, 71 of 73) and occupational health (90.4%, 66 of 73) staff were the internal participants most often involved in developing pandemic influenza plans, and union representatives (19.2%, 14 of 73) and board directors (12.3%, 9 of 73) were the least often involved (Table 3). The external partners most often involved in the development of hospital pandemic influenza plans were local public health units (94.2%, 65 of 69) and emergency medical services (52.2%, 36 of 69), whereas long-term care facilities were involved in only 30.4% (21 of 69) of plans (Table 3).

Table 3. Participants involved in the development of hospital pandemic influenza plans

Participants	n (%)
Internal participants (n = 73)	
Infection control	71 (97.3)
Occupational health	66 (90.4)
Housekeeping	62 (84.9)
Purchasing	62 (84.9)
Human resources	60 (82.2)
Pharmacy	59 (80.8)
Clinical services	58 (79.5)
Core laboratory	54 (74.0)
Senior nurse manager	54 (74.0)
Chief nursing officer	50 (68.5)
Emergency department	47 (64.4)
Security	45 (61.6)
Information technology	44 (60.3)
Vice president/assistant executive director	41 (56.2)
Ethics	39 (53.4)
Public affairs/communications	38 (52.1)
Microbiology	37 (50.7)
Chief of staff	35 (47.9)
CEO/executive director	24 (32.9)
Finance	23 (31.5)
Medical director	22 (30.1)
Medical advisory committee	21 (28.8)
Social work	15 (20.5)
Union representatives and executives	14 (19.2)
Board of directors	9 (12.3)
External participants (n = 69)	
Local public health unit(s)	65 (94.2)
Emergency medical services (paramedics, ambulance)	36 (52.2)
Fire department	23 (33.3)
Municipal government(s)	22 (31.9)
Police forces	21 (30.4)
Long-term care facilities	21 (30.4)
Local health integration networks	11 (15.9)
Ministry of health and long-term care regional office	7 (10.1)

CEO, chief executive officer.

A minority (38.0%, 27 of 71) of hospitals participated to a moderate degree or more in the development of the local public health unit's pandemic plan (Table 4). Half (49.3%, 35 of 71) of hospitals collaborated to a moderate degree or more with other local facilities in pandemic planning (Table 4). Only one fifth of hospitals (21.4%, 15 of 70) coordinated their clinical care and health services plans with bordering jurisdictions and their facilities to a moderate degree or better (Table 4). The Ontario Health Plan for Pandemic Influenza[3] (98.6%, 72 of 73) and the Canadian Pandemic Influenza Plan[2] (89.0%, 65 of 73) were the documents most frequently consulted in developing hospital pandemic influenza plans (Table 5).

Table 4. Hospital collaboration with local and bordering health organizations in pandemic plan development

Participated in public health unit's pandemic plan development (n = 71)	Did not participate, n = 23 (32.4%)	Participated somewhat, n = 21 (29.6%)	Participated moderately, n = 13 (18.3%)	Great deal of participation, n = 14 (19.7%)
Collaborated with other local facilities in pandemic planning (n = 71)	Did not collaborate, n = 3 (4.2%)	Collaborated somewhat, n = 33 (46.5%)	Collaborated moderately, n = 14 (19.7%)	Great deal of collaboration, n = 21 (29.6%)
Coordinated clinical and health services with bordering jurisdictions and facilities (n = 70)	Did not coordinate, n = 29 (41.4%)	Coordinated somewhat, n = 26 (37.1%)	Coordinated moderately, n = 9 (12.9%)	Great deal of coordination, n = 6 (8.6%)

Table 5. Documents consulted in developing hospital pandemic influenza plans

Documents	n (%)
Ontario Health Plan for Pandemic Influenza	72 (98.6)
Canadian Pandemic Influenza Plan	65 (89.0)
World Health Organization Influenza Preparedness Plan	53 (72.6)
Pandemic plan from another Ontario hospital	53 (72.6)
Municipal Emergency Plan	49 (67.1)
Local public health pandemic plan	48 (65.8)
World Health Organization (WHO) Checklist for Influenza Pandemic Preparedness Planning	44 (60.3)
Pandemic plan from another province or country	22 (30.1)

NOTE. n = 73.

Funding of pandemic plans and satisfaction with plan completeness

The majority (70.4%, 50 of 71) of respondents thought that the pandemic planning process in their hospital was not adequately funded (Table 6). No respondents were ''very satisfied'' with the completeness of their hospital's pandemic plan, and only 18.3% (13 of 71) were ''satisfied'' (Table 6). When planning was perceived as adequately funded, respondents were more satisfied with the completeness of the plan ($\chi^2 = 6.9$, $P = .01$). Respondents from larger ($\chi^2 = 3.8$, $P = .05$) and urban hospitals ($\chi^2 = 3.9$, $P = .05$) were more likely than respondents from smaller and rural hospitals to perceive the funding of pandemic planning as adequate. Respondents from larger ($\chi^2 = 6.2$, $P = .01$) and urban hospitals ($\chi^2 = 3.9$, $P = .05$) were also more likely to be satisfied with the completeness of their pandemic influenza plans than respondents from smaller and rural hospitals.

Pandemic preparedness learning portal

The top 3 priority areas identified by respondents for a proposed pandemic preparedness learning portal were challenges of smaller and rural hospitals (55.6%, 50 of 90), human resources (54.4%, 49 of 90), and training (44.4%, 40 of 90) (Table 7). Examples of other hospital and district plans (92.6%, 75 of 81) and pandemic planning templates from other facilities (89.0%, 81 of 91) were the resources respondents were most interested in having available on a pandemic preparedness learning portal (Table 7). PowerPoint (Microsoft Corp, Redmond, WA) presentations (83.5%, 76 of 91), checklists (83.5%, 76 of 91), and Web links to other relevant Web sites were also of considerable interest (81.5%, 66 of 81).

DISCUSSION

The vast majority of Ontario acute care hospitals have generic emergency plans for localized, single-event disasters. Generic emergency plans are not designed to manage an influenza pandemic, which may have multiple waves each lasting months. One quarter of Ontario's hospitals did not have a specific pandemic influenza plan. Although most generic emergency plans have been formally tested, less than one fifth of pandemic influenza plans had been tested in the hospitals that had them. The testing of plans is an integral component of effective planning that allows for the determination of what works and what needs to be modified.[1,2] The lack of testing of pandemic influenza plans means that, if H1N1 virulence increases, Ontario's hospitals might not be optimally prepared to manage the 2009 H1N1 influenza pandemic.

The high response rate means that the results of this study can be extrapolated to all acute care hospitals in Ontario. An examination of nonresponding hospitals indicated that they were not significantly different from respondent hospitals with regard to number of beds or rural location.

Small and rural hospitals were even less likely than large and urban hospitals to have tested their pandemic plans. Additional resources for developing and testing pandemic influenza plans need to be made available

Table 6. Funding and satisfaction with hospital pandemic influenza plans

	Disagree strongly, n (%)	Disagree, n (%)	Agree, n (%)	Agree strongly, n (%)
Pandemic planning adequately resourced	15 (21.1)	35 (49.3)	19 (26.8)	2 (2.8)
Planning process has realistic time frames	2 (2.8)	23 (32.4)	44 (62.0)	2 (2.8)
Completeness of pandemic influenza plan	Not at all satisfied, 9 (12.7)	Somewhat satisfied, 49 (69.0)	Satisfied, 13 (18.3)	Very satisfied, 0

NOTE. Respondents, n = 71.

Table 7. Respondent preferences for information on the pandemic learning portal

Respondent preferences	n (%)
Respondent identified priority areas (n = 90)*	
Challenges of smaller and rural hospitals	50 (55.6)
Human resources	49 (54.4)
Training	40 (44.4)
Clinical care	29 (32.2)
Planning	28 (31.1)
Ethics	25 (27.8)
Infection control	17 (18.9)
Personal protective equipment	14 (15.6)
Surveillance	12 (13.3)
Antivirals for influenza	2 (2.2)
Influenza vaccines	2 (2.2)
Self-care	2 (2.2)
Web-based education approaches that would be beneficial (n = 91)	
Example pandemic templates from other facilities	81 (89.0)
PowerPoint presentations	76 (83.5)
Checklists	76 (83.5)
Interactive sessions	66 (72.5)
Full-motion video presentations	56 (61.5)
Text-based learning modules	38 (41.8)
Questionnaires/feedback	31 (34.1)
Quizzes	30 (33.0)
Other information that would be beneficial (n = 81)	
Examples of other hospital and district plans	75 (92.6)
Web links to other relevant Web sites	66 (81.5)
Referenced documentation	63 (77.8)
Newsletter	56 (69.1)

*Respondents identified their top 3 priority areas for pandemic learning portal.

to small and rural hospitals. Staff in small and rural hospitals often have multiple roles and responsibilities and may lack expertise in pandemic planning. Staff responsible for pandemic influenza planning in all hospitals and especially small and rural hospitals would benefit from ready access to education and training in pandemic planning. Respondents in the present study identified the challenges of small and rural hospitals as a top priority for a pandemic influenza preparedness learning portal. The authors in conjunction with an advisory panel and expert contributors used the results of this project to guide the development of an open access pandemic preparedness learning portal to educate staff responsible for pandemic influenza planning in acute care hospitals (www.pandemicportal.ca). Special attention was paid to the needs of small and rural hospitals.

Hospitals cannot manage influenza pandemics in isolation; they should be involved in the formulation of community pandemic plans and initiate liaisons with facilities and organizations in their catchment areas to become part of an overall management plan.[1] Whereas local public health units were involved in the development of most hospitals' pandemic plans, only 40% of hospitals were involved in the development of public health unit pandemic plans. Less than 40% of hospitals collaborated with other local facilities, and only one fifth coordinated clinical services during a pandemic with facilities in bordering jurisdictions. In the event of a pandemic, acute care hospitals will need to coordinate activities with municipal governments and local long-term care facilities, yet less than one third of hospitals had involved these parties in the development of hospital pandemic influenza plans. Even key internal hospital participants such as union representatives and board directors were involved in the development of less than one fifth of hospital pandemic plans. Hospitals need to place greater emphasis on collaborating with key regional, external, and internal stakeholders in the pandemic influenza planning process.

Over two thirds of respondents reported that the pandemic influenza planning process in their hospital was not adequately resourced, and over 80% were not satisfied with the completeness of their hospital's pandemic influenza plan. Respondents from small and rural hospitals were even more likely to report that the planning process was under funded and were more dissatisfied with the completeness of their hospital's plan than those from large and urban hospitals. Lack of funding and dissatisfaction with hospital pandemic plan completeness were associated. There is a need for increased funding for the development of pandemic influenza plans, and funding is especially a problem for small and rural hospitals.

Whereas many acute care hospitals in Ontario have developed pandemic influenza plans, challenges

have been identified in the pandemic planning process: only a fraction of plans were tested, not all key players were involved in the development process, plans were frequently incomplete, funding was inadequate, and small and rural hospitals were especially disadvantaged. To improve the pandemic influenza planning process in Ontario's acute care hospitals will necessitate funding for plan development and testing and the fostering of planning expertise in hospital staff charged with the task of developing pandemic influenza plans. In our current environment and if this is not addressed, the result may be increased morbidity and mortality when a virulent influenza pandemic hits.

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