CONCISE COMMUNICATION

Pandemic Influenza A(H1N1)2009 in Hospital Healthcare Workers in New Zealand

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We evaluated A/H1N1 influenza in healthcare workers (HCWs) and in a flu room during the 2009 pandemic. The flu room aided HCW care and management by facilitating rapid diagnosis and treatment. Absence of fever was common, and symptoms were nonspecific. A higher rate of H1N1 occurred in HCWs deployed in acute services.

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Caring for healthcare workers (HCWs) during an influenza pandemic is important for their own health and for the healthcare institutions needing to sustain services at a time of increased demands. When the A/H1N1 influenza pandemic reached New Zealand in the winter of 2009, knowledge about the clinical and epidemiologic characteristics of the new strain was limited, the population was largely nonimmune, and a specific vaccine was not available.[1,2] A hospital "flu room" was established to rapidly diagnose and care for HCWs and thereby minimize potential impacts on patient care. We conducted a detailed questionnaire of HCWs who were tested for H1N1 infection. The objective of this report is to document the impact of H1N1 in HCWs and to assess the utility of the flu room.

METHODS

We studied H1N1 infections that occurred in HCWs during 2009 at Capital and Coast District Health Board (CCHDB), which provides secondary and tertiary care to the Wellington region. There was a highly active hospital infection control response that included intensive use of barrier precautions for patients suspected of H1N1, rapid polymerase chain reaction (PCR) diagnosis, and a coordinated regional approach.

A flu room was established and widely promoted for CCDHB HCWs with influenza-like illness (ILI). This was a standalone clinic area at Wellington Regional Hospital, staffed with nurses employed by occupational health and using contact and respiratory precautions. HCWs self-presented either directly or following telephone advice from flu room staff. A basic clinical assessment, electronic temperature recording, and advice were recorded for each HCW. Treatment with oseltamivir was provided to those with ILI after influenza testing. HCWs with confirmed H1N1 and treated with oseltamivir were instructed not to come to work for 3 days and while sick.

Testing for pandemic (H1N1) was performed at the single hospital laboratory, and results were telephoned to HCWs. Nasopharyngeal swabs were tested for the influenza A hemagglutinin (H) gene (SwH1) and influenza A matrix gene for universal detection of influenza A viruses by real-time reverse-transcriptase PCR, using the capillary-based LightCycler instrument (ver 1.2; Roche Diagnostics) and following protocols provided by the World Health Organization Collaborating Centre for Influenza at the Centers for Disease Control and Prevention.[3]

All HCWs who were tested for H1N1 were encouraged to participate in the study by retrospectively completing a questionnaire in either paper form or electronic form. Information collected included exposure risk factors, use of infection control measures, symptoms, complications, oseltamivir use, vaccination, and work absenteeism.[4] Workplace was grouped as acute services (emergency, internal medicine, and pediatric departments), other clinical services, and administrative services. Seven symptoms of ILI were self-rated as absent, mild, moderate, or severe and were subsequently scored as 0–3, respectively. Ethical approval for the collection of survey data was granted by the Central Regional Ethics Committee (REF CEN/09/08/059).

The χ^2 test for independence was used to compare groups, and the Fisher exact test was used for probabilities with 2-by-2 tables. A value of P less than .05 was set as indicating a statistically significant difference.

RESULTS

Overall

A total of 559 HCWs with suspected influenza infection were tested, of whom 103 were positive for H1N1 and 4 were positive for seasonal influenza. This comprised 2.2% of all CCDHB HCWs (103/4,727). Two HCWs (2%) with H1N1 complicating severe asthma were hospitalized.

A temperature recording was available for 444/559 (79%) of HCWs who were tested for H1N1. The median temperature was 36.7°C for those testing positive for H1N1 and 36.3°C for those testing negative. A temperature of at least 38°C was present in 13/85 (15%) of those testing positive for H1N1 and in 9/359 (2.5%) of those testing negative (specificity, 0.975; sensitivity, 0.153; $P < .001$). Of those testing positive for H1N1, 58/85 (68%) were afebrile (temperature, ≤37°C).

Questionnaire

Of HCWs who completed the questionnaire, 71/303 (23%) had H1N1 infection. The proportion of HCWs from acute

TABLE 1. Service Area of Healthcare Workers Tested for H1N1 Infection Who Answered the Questionnaire

Service area	H1N1(+)	H1N1(−)	Total tested
Acute services	22 (42)	30 (58)	52
Other clinical services	31 (19)	135 (81)	166
Administrative	18 (21)	66 (79)	84
Total	71 (23)	232[a] (77)	303[a]

NOTE. Data are no. (%). Healthcare workers from acute services had H1N1 more often than did those from other services (χ^2 test, $P = .02$). Acute services include emergency, internal medicine, and pediatric departments.

[a] The service area was unknown for 1 HCW with no H1N1.

services testing positive for H1N1 (22/52, 42%) was higher than that of those from other clinical services (31/166, 19%) or administrative services (18/84, 21%; Table 1). The estimated incidence of H1N1 in all HCWs then employed was 22/381 (5.8%) in acute services, 31/2,835 (1.1%) in other clinical services, and 18/1,117 (1.6%) in administrative services. Self-ratings indicated a higher number of patients cared for with a respiratory tract infection, more mask use, and similar hand hygiene adherence in those working in acute services compared with those working in other clinical services. H1N1 positivity was not significantly associated with any self-reported exposure at work or in the home/community or use of individual respiratory or contact barrier precautions.

Individual symptoms had a low specificity (range, 0.14–0.25) and positive predictive value (range, 0.23–0.31) for H1N1 in HCWs with suspected influenza infection (Table 2). Myalgia and fatigue were most sensitive and were reported significantly more often in those with H1N1. The severity scores for symptoms by HCWs were higher in those with H1N1 for fever/rigors, myalgia, fatigue, and combined symptoms but with considerable overlap (Table 3). Of HCWs with H1N1, 29 (41%) rated fever as mild or absent, and fever was not stated by 10 (14%). HCWs reported receiving the PCR test result for H1N1 a median (range) of 1.25 days (1 hour to 28 days) after being swabbed. A total of 220 HCWs were given oseltamivir. Of the 71 HCWs with H1N1, 63 (89%) reported taking oseltamivir, and 54 (76%) took it for 5 days. The median (range) work absence for HCWs was 5 days (0 to >5 days) with H1N1 and 3 days (0 to >5 days) without H1N1.

DISCUSSION

We considered that the flu room would be effective if it facilitated provision of an accurate diagnosis and appropriate treatment to those with ILI in a timely manner; that would be regarded as a high standard of clinical care to HCWs and

TABLE 2. Symptoms in Healthcare Workers with and without H1N1 Influenza and Statistical Performance of Each Symptom in Predicting H1N1

	H1N1 ($N = 61$)	No H1N1 ($N = 223$)	Sensitivity	Specificity	PPV	NPV
Fever						
(+)	51	168	0.836	0.247	0.233	0.846
(−)	10	55				
Headache						
(+)	57	180	0.919	0.126	0.241	0.837
(−)	5	26				
Runny nose						
(+)	46	155	0.807	0.129	0.229	0.676
(−)	11	23				
Sore throat						
(+)	49	162	0.845	0.129	0.232	0.727
(−)	9	24				
Cough						
(+)	51	138	0.823	0.221	0.27	0.771
(−)	11	37				
Myalgia*						
(+)	56	126	0.949	0.232	0.308	0.927
(−)	3	38				
Fatigue*						
(+)	58	151	0.983	0.137	0.278	0.96
(−)	1	24				

NOTE. Only myalgia and fatigue were more frequent in those with H1N1, and their absence was predictive of no H1N1. All symptoms showed a low specificity for H1N1. PPV, positive predictive value; NPV, negative predictive value.

* $P < .01$.

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TABLE 3. Symptom Severity Ratings

Symptom of ILI	Score mean (SD)		P value
	H1N1	No H1N1	
Fever/rigors	1.50 (1.00)	1.00 (0.91)	.01
Headache	1.78 (0.82)	1.56 (0.89)	.27 (NS)
Runny nose	1.35 (0.88)	1.58 (0.91)	.27 (NS)
Sore throat	1.55 (0.90)	1.67 (0.92)	.76 (NS)
Cough	1.65 (0.96)	1.43 (0.98)	.14 (NS)
Myalgia	1.83 (0.83)	1.41 (1.00)	.02
Fatigue	2.15 (0.76)	1.70 (0.99)	.01
Combined symptom score	1.38 (0.70)	1.13 (0.78)	.002

NOTE. Symptoms as rated by the healthcare worker: absent (0), mild (1), moderate (2), severe (3). The combined symptom score was the combination of the scores for the 7 symptoms. *P* values for a χ^2 test for total numbers with each score are shown. ILI, influenza-like illness; NS, not significant.

allow for clear infection control guidance of those tested.[5-7] Overall, our observations confirmed that a flu room can be effective in this context. There was good acceptance of the flu room, with 11% (557/4,987) of all HCWs attending for ILI over the period. The laboratory method used for diagnosis of H1N1 infection was a gold standard test with a high sensitivity and specificity. The median of 1.25 days from flu room assessment until HCWs received their result demonstrated that an accurate diagnosis could be provided in a timely manner. There was a high completion of oseltamivir treatment (76%) in HCWs confirmed to have H1N1. While symptom severity scores were similar, testing was associated with earlier return to work in those without H1N1 (median, 3 days vs 5 days).

A key finding was that patients with pandemic H1N1 infection often had low-grade or no fever and lower-grade symptoms. The symptom of fever was rated as mild or absent by almost half of HCWs and had a low specificity (0.247) for confirmed H1N1. While a fever of at least 38°C was relatively specific for H1N1 (specificity, 0.975), it was insensitive, being present in only 15% of those testing positive. In HCWs with H1N1, we observed a median temperature of 36.7°C, and two-thirds were afebrile. While the peak temperature prior to assessment could have been higher in some, the median duration of symptoms of 2 days indicates that there was not a substantial delay to assessment overall. In general, individual symptoms were nonspecific in distinguishing those with and without H1N1 among those assessed for ILI. While there were some differences in the frequency and severity of symptoms, differences were small, with considerable overlap.

A New Zealand study following the 2009 winter showed a seroprevalence to H1N1 of 25.3% in HCWs and 26.7% in the general community.[8,9] It is therefore likely that the 2.1% of all HCWs diagnosed in this study were at the more symptomatic end of a larger proportion that actually acquired H1N1 infection. The relatively mild nonspecific symptoms and frequent absence of fever help to explain why most H1N1 infections in HCWs may have gone unrecognized. Viral shedding by undiagnosed H1N1 cases with mild symptoms may be an important contributor to transmission.[11]

A higher proportion of H1N1 was observed in HCWs working in acute services compared with HCWs in other services (Table 2).[11] This could reflect a higher exposure risk in these HCWs, better recognition of ILI symptoms, or lower threshold to present for testing. There were 150 inpatients diagnosed with H1N1 infection at CCDHB hospitals during 2009, almost all of whom were cared for during acute admission by HCWs in acute services. The observation of only 17 symptomatic HCWs with confirmed H1N1 from these areas suggests that personal protective equipment did offer some protection for HCWs. The similar rate of H1N1 in combined clinical services (1.6%, 53/3,216) and administrative services (1.6%) is consistent with other observations.[12] Study limitations include likely underdiagnosis, suggested by serological studies elsewhere, possibly due to HCWs who had mild symptoms or were asymptomatic. The questionnaire was limited by the 54% response rate, retrospective unblinded design, and recall bias.

We conclude that a flu room can facilitate accurate diagnosis and prompt treatment of HCWs with ILI during a pandemic. Absent or low-grade fever and nonspecific symptoms were common in HCWs with H1N1 infection.

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