Original Article

High Coverage of Influenza Vaccination Among Healthcare Workers Can Be Achieved During Heightened Awareness of Impending Threat

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Abstract

Introduction: As preparation against a possible avian flu pandemic, international and local health authorities have recommended seasonal influenza vaccination for all healthcare workers at geographical risk. This strategy not only reduces "background noise", but also chance of genetic shifts in avian influenza viruses when co-infection occurs. We evaluate the response of healthcare workers, stratified by professional groups, to a non-compulsory annual vaccination call, and make international comparisons with countries not at geographical risk. Materials and Methods: A cross-sectional study was performed over the window period for vaccination for the 2004 to 2005 influenza season (northern hemisphere winter). The study population included all adult healthcare workers (aged ≤21 years) employed by a large acute care tertiary hospital. Results: The uptake rates among frontline caregivers – doctors >50%, nurses >65% and ancillary staff >70% – markedly exceeded many of our international counterparts' results. Conclusion: Given its close proximity in time and space to the avian flu pandemic threat, Singapore healthcare workers responded seriously and positively to calls for preventive measures. Other factors, such as the removal of financial, physical and mental barriers, may have played important facilitative roles as well.

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Introduction

Experts have warned that Asia may be the next influenza pandemic epicentre.[1] In order to reduce the risks of genetic shifts in the avian influenza virus, the World Health Organisation (WHO) has recommended seasonal influenza vaccination for healthcare workers who may be exposed to both human and avian strains of influenza virus.[2]

Another compelling reason to vaccinate healthcare workers when facing a potential pandemic is to minimise "background noise". When Singapore was hit by the severe acute respiratory syndrome (SARS) in 2003, against a background of high alert was a concomitant outbreak of a febrile respiratory tract illness of unknown cause, affecting 44 staff and inpatients from Singapore's main mental health hospital. It caused several major services at the mental health hospital to be suspended, and 1600 hospital employees were urgently quarantined. Fortunately, it turned out to be a false alarm, with the culprit eventually identified as influenza B. After this expensive experience, local health authorities identified influenza as a source of "background noise" needing effective management and recommended that all healthcare staff be routinely vaccinated against it.

Influenza vaccination experience in the United States, Europe and Australia shows that efforts to raise coverage among healthcare workers have been dismal, invariably producing less than 40% coverage despite longstanding guidelines and recommendations, yearly recalls and even innovative vaccination programmes.[3-6]

This paper reports the relative success of our influenza vaccination programme for more than 5000 staff working in a tertiary hospital – achieving better than 55% in overall coverage and close to 70% coverage for the 2 biggest groups of frontline staff – ancillary and nursing.

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We also examine the reasons and possible associated factors among those who declined having the vaccination.

Materials and Methods

Singapore is a tropical country located in Southeast Asia and does not have marked seasonal variations in influenza infections. A mass influenza vaccination exercise for staff was conducted in Singapore's largest tertiary hospital in October 2004. Advance notices were sent to all department heads, nursing managers and administrators to inform them of the upcoming vaccination exercise. This was explained as part of the precautionary measures taken by the hospital in view of the approaching northern hemisphere winter, and in the context of recent SARS experience and the looming avian influenza threat.

To cope with the large number of staff, 3 temporary booths were set up for 2 weeks at the lift lobbies of the 3 main blocks of the hospital. Nurse managers were also allowed to make special arrangements for the vaccines to be brought to their respective workplaces, e.g, wards and specialist outpatient clinics, so that they could vaccinate their own staff. All staff were requested to complete a vaccine questionnaire and return it through their supervisors, regardless of whether they were vaccinated or not. The cost of the vaccination was absorbed by the hospital. After the initial 2 weeks, employees could still obtain their vaccination at the staff clinic for free. All vaccination records were captured and tabulated from October to December 2004. Staff who declined initially but subsequently received vaccination would have their status updated and analysed according to their latest status as of end December 2004.

Ethical approval was obtained from the hospital Institutional Review Board for the cross-sectional, self-administered questionnaire survey to be administered. The study population included all healthcare workers who are hospital employees (permanent/contract) above the age of 21 years. The details pertaining to staff vaccination were captured in an electronic database populated from the human resource department database, which provided the relevant basic demographic details and job category. All healthcare workers were broadly classified into 5 big categories by the human resource department:

1) Ancillary – e.g., healthcare attendants, patient service assistants, housekeepers, admission office assistants;
2) Nursing – e.g., staff nurses, enrolled nurses, midwives;
3) Medical – e.g., clinicians with recognised medical degrees;
4) Paramedical – e.g., therapists, technologists, medical social workers, radiographers, pharmacists, research scientists; and
5) Administrative/clerical – e.g., managers, executives, secretaries, clerks, coordinators.

Vaccination Questionnaire

Six core questions assessed one's suitability for vaccination:

1) Recent vaccination against influenza (past 3 months): Yes/No
2) Bad reaction to previous vaccination(s) (flu and others): Yes/No
3) Allergy to egg and chicken products: Yes/No
4) Presence of febrile or acute illness: Yes/No
5) First trimester of pregnancy (for females only): Yes/No
6) Allergy to any antibiotic or drug: Yes/No

Decliners were requested to state their reasons. Many of the reasons cited were very similar and could be categorised as follows:

1) Fear of pain or side effects – "afraid of pain", "afraid of side effect", "fear of needle", "fear", etc.
2) Not seeing any value in the vaccinations – "not useful", "not necessary", "not effective", "I seldom get flu", "in good health", " no patient contact", "rely on natural immunity", "strong immunity", "don't believe", etc.
3) Pregnancy or breastfeeding – all positive responses for Q5 (first trimester of pregnancy) and all reasons pertaining to "pregnancy", "breastfeeding", "planning for pregnancy" were included.
4) Illnesses – all reasons pertaining to diseases were included, e.g., "flu", "headache", "not feeling well", "cough".
5) Had been recently vaccinated – all staff who reported to have been vaccinated in the previous year, including all positive responses for Q1.
6) Bad reaction(s) to previous vaccinations – all positive responses for Q2 were included, as well as all perceived or real post-vaccination unpleasant experiences.
7) Others – miscellaneous reasons which could not be classified under any of the above.

Results

The overall proportion of staff vaccinated was 56.8% (2981/5252). Figure 1 shows the schematic flow of the vaccination exercise while Table 1 presents the breakdown of reporting and vaccination rate by professional categories. The mean age of the population surveyed was 36.6 years [standard deviation (SD), 11.3 years], and the female-to-male ratio was 4:1.

Among the 3615 healthcare workers who reported for the exercise and completed the vaccination forms, healthcare workers aged above 35 years and non-ancillary staff were more likely to decline vaccination. From the 746 responses

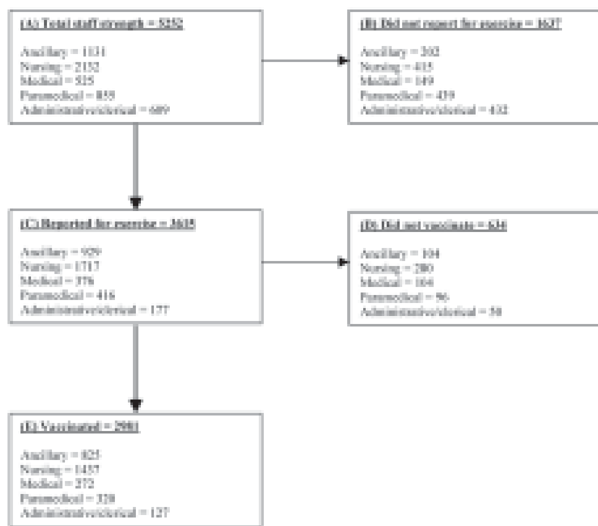

Fig. 1. Schematic flow of staff during the vaccination exercise.

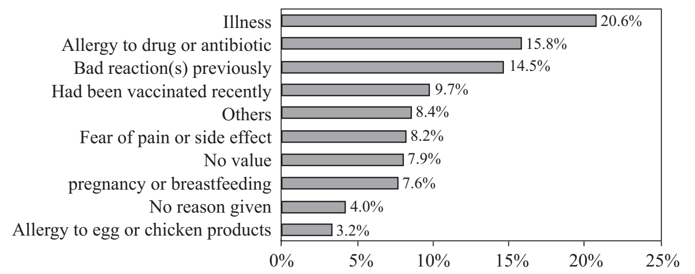

Fig. 2. Reasons cited for declining influenza vaccination (in descending order of frequency)

Table 1. Proportion of Staff Reporting for Vaccination

Category	% reported for exercise (C/A)	Vaccinated (E/A)	Staff strength, 2004 (A)
Ancillary	82.1%	72.9%	1131
Nursing	80.5%	67.4%	2132
Medical	71.6%	51.8%	525
Paramedical	48.7%	37.4%	855
Administrative/clerical	29.1%	20.9%	609
Total	68.8%	56.8%	5252

Table 2. Profile of Healthcare Workers who Declined Vaccination

	Healthcare workers who reported for exercise but declined vaccinatione		* Adjusted OR (95% CI)
	n	%	
Age group (y)			
<35	291	16.1	1
≥35	343	19.0	1.30 (1.09 - 1.56)
Gender			
Female	501	17.9	1.27 (0.99 - 1.62)
Male	133	18.9	1
Job categories			
Ancillary	104	11.2	1
Nursing	280	16.3	1.38 (1.07 - 1.77)
Medical	104	27.7	3.10 (2.24 - 4.28)
Paramedical	96	23.1	2.24 (1.64 - 3.05)
Admin/clerical	50	28.2	2.69 (1.83 - 3.96)

95% CI: 95% confidence interval; Admin: administrative; OR: odds ratio
* OR adjusted for age group, gender and job categories

obtained from 634 staff who reported but declined vaccination, their reasons for declining vaccination are categorised and shown in Figure 2, and their profile analysed, as shown in Table 2.

The self-reported prevalence of egg or chicken product allergy in the adult population surveyed was close to 1% (31/3615), while the prevalence of drug or antibiotic allergy was 11.6% (421/3615). Proportion of population who fell into either category was about 12.2% (441/3615). The implications of this are discussed later.

Discussion

Nursing and ancillary staff have the highest reporting and vaccination rates relative to the other groups. This preferential vaccination uptake may possibly reflect differences in socio-organisational values and behaviour within the complex healthcare environment. Younger aged staff (below 35 years) were associated with increased vaccine uptake as well. Reasons such as fear, or not seeing any value in vaccination were frequently cited (16.1%) for declining. Pregnancy (other than first trimester), breastfeeding and miscellaneous chronic ailments (such as asthma, migraine, hypertension) were frequently cited as reasons, although most are in fact clinical indications for vaccination. It goes to show that there is in fact much room for improvement, by clearing up misconceptions, garnering adequate peer support or even offering of small incentives; may help to remove some of these psychological and perceptual barriers.[7-9]

The 12.2% prevalence of a self-declared potential contraindication to vaccination due to allergy to egg, chicken protein, formaldehyde, gentamicin sulphate, sodium deoxycholate, or any of the excipients, gives cause for concern. These staff were advised to attend the staff clinic for detailed medical consult and to proceed with vaccination only if deemed safe by the doctor. The staff clinic was also better equipped to observe and manage patients for potential allergic complications. The prevalence of such allergies in

the general population in Singapore has not been established, and we believe this estimate may be helpful in planning logistics of a community-based vaccination programme for the pandemic strain should the need ever arises.

The overall vaccine uptake rate of 56.8% achieved in a tertiary acute-care hospital stands out prominently when compared against some rates published in the medical literature. In the United States, it ranged from less than 10% to below 40%; despite some states having legislations requiring annual influenza vaccination of healthcare workers or the signing of informed declination, while other states have regulations regarding vaccination of healthcare workers in long-term care facilities.[3-5] Murray et al[6] had reported that a tertiary hospital in Australia had only 18% of its healthcare workers vaccinated despite having available guidelines in Victoria since 1998. It is likely that the recency of the SARS outbreak and the impending threat of avian influenza pandemic have led Singapore healthcare workers to respond seriously and positively to the vaccination drive against influenza.

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REFERENCES

1. World Health Organisation, Communicable Disease Surveillance & Response. Avian Influenza: assessing the pandemic threat, January 2005. Available at: http://www.who.int/csr/disease/influenza/H5N1-9reduit.pdf. Accessed 25 August 2006.
2. World Health Organisation – Western Pacific Region. Influenza A (H5N1): WHO Interim Infection Control Guidelines for Health Care Facilities. 10 Mar 2004. Available at: http://www.wpro.who.int/NR/rdonlyres/B045DC3C-A776-4455-8A6A-B70F5269454F/0/Guidelines_for_health_care_facilities_10Mar.pdf. Accessed 25 August 2006.
3. Harper SA, Fukuda K, Uyeki TM, Cox NJ, Bridges CB; Advisory Committee on Immunization Practices (ACIP), Centers for Disease Control and Prevention (CDC). Prevention and control of influenza. Recommendations of the Advisory Committee on Immunization Practices (ACIP). Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5408a1.htm. Accessed 25 August 2006. MMWR Recomm Rep 2005;54:1-40.
4. Sartor C, Tissot-Dupont H, Zandotti C, Martin F, Roques P, Drancourt M. Use of a mobile cart influenza program for vaccination of hospital employees. Infect Control Hosp Epidemiol 2004;25:918-22.
5. Harbarth S, Siegrist CA, Schira JC, Wunderli W, Pittet D. Influenza immunization: improving compliance of healthcare workers. Infect Control Hosp Epidemiol 1998;19:337-42.
6. Murray SB, Skull SA. Poor health care worker vaccination coverage and knowledge of vaccination recommendations in a tertiary Australia hospital. Aust N Z J Public Health 2002;26:65-8.
7. Goldstein AO, Kincade JE, Gamble G, Bearman RS. Policies and practices for improving influenza immunization rates among healthcare workers. Infect Control Hosp Epidemiol 2004;25:908-11.
8. Manuel DG, Henry B, Hockin J, Naus M. Health behavior associated with influenza vaccination among healthcare workers in long-term care facilities. Infect Control Hosp Epidemiol 2002;23:609-14.
9. LaVela SL, Smith B, Weaver FM, Legro MW, Goldstein B, Nichol K. Attitudes and practices regarding influenza vaccination among healthcare workers providing services to individuals with spinal cord injuries and disorders. Infect Control Hosp Epidemiol 2004;25:933-40.