Concerns and Preparedness for an Avian Influenza Pandemic: A Comparison between Community Hospital and Tertiary Hospital Healthcare Workers

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Abstract: Little is known about differences in levels of concerns or preparedness for an avian influenza (AI) pandemic among healthcare workers (HCWs) in different types of hospitals. We compared these concerns and preparedness between 326 HCWs of two community hospitals (CHs) and 908 HCWs from a tertiary hospital (TH) using a self-administered questionnaire between March–June 2006. Response rates were 84.2% and 80.0% from the CHs and TH. Most HCWs (71.6%) felt prepared for an AI outbreak and had significant concerns. They perceive an AI pandemic having adverse impacts on their personal life and work, such as people avoiding them (57.1%). A greater percentage of TH compared to CH HCWs expressed concerns such as feeling their jobs put them at great AI exposure (78.3% vs 67.5%, $p=0.012$). TH HCWs were more likely to report participating in readiness preparation activities, such as training for infection control (90.0% vs 82.2%, $p=0.014$) and feel that they (74.1% vs 64.7%, $p=0.045$) and their hospital (86.8% vs 71.8%, $p=0.000$) were prepared for an outbreak. Healthcare institutions need to include personal, psychological and family concerns on the agenda and increase participation in readiness preparation activities among HCWs to help prepare for such future crises.

Key words: Avian influenza, Healthcare workers, Community hospital, Tertiary hospital, Preparedness, Concerns

Introduction

Despite significant medical gains of the last century, the danger posed by emerging infectious diseases has become even greater in our increasingly interconnected world¹⁾. Singapore, an island republic with high standards of environmental hygiene, a comprehensive childhood immunization program, and strict control of imported food and livestock, has not been spared either. Since the 1990s,

a number of infectious diseases have emerged and re-emerged in Singapore, such as Nipah Virus infection in 1999²⁾, Severe Acute Respiratory Syndrome (SARS) in 2003, and dengue fever in the last few years. The increasing travel and trade within and beyond the region has been a significant contributing factor in this emergence³⁾.

It has been well documented that healthcare workers (HCWs) suffered from significant stress during the SARS outbreak⁴⁾. As the frontline 'troops', they were, and will be at the forefront of danger in such infectious disease outbreaks. This was seen during the SARS epidemic, where a large

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proportion of outbreaks occurred in hospitals and one-fifth of probable SARS cases involved HCWs⁵). Another reason is that in an infectious outbreak, HCWs are more likely to be on physical and emotional overdrive because of an overstretched healthcare system⁶.

There is scant data on the differences in levels of concerns or preparedness among different types of hospitals. In Singapore, tertiary hospitals (THs) provide multi-disciplinary acute inpatient care, while community hospitals (CHs) provide intermediate healthcare for the convalescent sick and aged who do not require the care of the THs. With the looming threat of a global avian influenza (AI) pandemic, we decided to study and compare the concerns and preparedness for an AI pandemic among HCWs working in two CHs and a TH in Singapore.

Subjects and Methods

We administered an anonymous self-administered questionnaire to 1,524 HCWs working at 2 CHs and a TH in Singapore, from March through June 2006 (Fig. 1). The TH respondents comprised all the staff that participated in the respiratory protection program (respirator and Powered Air Purifying Respirators [PAPR] fitting sessions) and who held a wide range of jobs in the TH ($n=1,137$). At the two CHs, we administered the questionnaire to all HCWs ($n=387$). Questionnaires were rejected if there were incomplete entries in at least two pages of the questionnaire, no demographic data, unreadable entries, or torn or missing pages.

The questionnaire was developed from an earlier survey used in a study of SARS and HCWs¹. Participation was voluntary and ethics approval was provided by each hospital's Institutional Review Board.

The questionnaire included items about concerns regarding AI that were work-related (8 items) and non-work-related (4 items), perceived impact of AI on personal life and work (10 items), and preparedness for AI outbreak at the workplace (16 items). These items were measured on a 6-point Likert scale for responses (strongly disagree, disagree, not sure but probably disagree, not sure but probably agree, agree, and strongly agree). During statistical analyses, we dichotomized this scale into positive response (strongly agree, agree, and probably agree) and negative response (strongly disagree, disagree, and probably disagree). We analyzed the data using SPSS Version 15.0 (SPSS Institute, Chicago, IL). Chi-square analysis was used to compare proportions and test for statistical significance.

Results

Response rate and socio-demographic characteristics (Table 1)

Overall, we obtained 1,234 valid responses. 326 HCWs were from the CHs and 908 HCWs were from the TH. The response rate was 84.2% for the CHs, and 80.0% for the TH. The mean age of HCWs was 31.3 yr (standard deviation: 10.7 yr) and the median work experience was 2 yr (interquartile range: 1–7 yr). Females formed the majority in both CHs (83.4%) and the TH surveyed (85.2%). A total of 37.4% of the HCWs were married, and 59.2% were single.

Work-related and non-work concerns (Table 2)

Compared to CH HCWs, TH HCWs were likelier to feel that their jobs put them at great risk of exposure to AI (78.3% vs 67.5%, $p=0.012$). More TH workers felt that they should not be looking after patients with AI (26.3% vs 16.0%, $p=0.001$) and reported that they might look for another job or consider resigning because of the risk of contracting AI (16.5% vs 10.7%, $p=0.027$).

TH HCWs were also more concerned that people close to them were at high risk due to their occupation (68.5% vs 56.1%, $p=0.001$); that people close to them would be worried for their health (92.7% vs 81.9%, $p=0.000$) and that people close to them would be worried about getting infected by them (85.4% vs 73.6%, $p=0.001$).

Perceived impact on personal life and work (Table 2)

In the event of a widespread AI outbreak, a higher proportion of TH HCWs reported that they would be afraid of informing their family about their exposure risk (29.8% vs 19.0%, $p=0.001$) and avoid telling others about the nature of their work (27.0% vs 16.6%, $p=0.000$). A higher proportion of TH HCWs also reported that they feel that people would avoid them (60.1% vs 48.5%, $p=0.002$) and their family members (48.7% vs 40.2%, $p=0.034$) because of their occupation.

At work, TH HCWs were less likely to feel that there would be adequate staff to handle any increase in demand (53.6% vs 59.5%, $p=0.002$) but more likely to feel that there could be more conflict amongst colleagues at work (38.2% vs 30.1%, $p=0.040$) and that they would have to work overtime (72.8% vs 59.8%, $p=0.001$).

There were no differences in both groups regarding feeling more stressed at work, perceived increase in workload and doing work not normally done by themselves.

Concerns Regarding Bird Flu Outbreak

Please rate (by Shading) the following statements to which you agree or disagree with it, on a scale of '1' to '6', '1' being 'Strongly Disagree' and '6' being 'Strongly Agree'.

Work-Related Concerns

	In the event of a widespread bird flu outbreak with an increased risk of contracting bird flu myself:	Strongly Disagree	Disagree	Not sure, but Probably Disagree	Not sure, but Probably Agree	Agree	Strongly Agree	Not Applicable
1.	I feel that my job would put me at great risk of exposure to bird flu.	☐	☐	☐	☐	☐	☐	
2.	I would be afraid of falling ill with bird flu.	☐	☐	☐	☐	☐	☐	
3.	I feel that I should not be looking after patients with bird flu.	☐	☐	☐	☐	☐	☐	☐
4.	The risk I would be exposed to at work is not acceptable.	☐	☐	☐	☐	☐	☐	
5.	I would accept that the risk of contracting bird flu is part of my job.	☐	☐	☐	☐	☐	☐	
6.	I might look for another job or consider resigning because of the risk of contracting bird flu.	☐	☐	☐	☐	☐	☐	
7.	I would consider it acceptable if my colleagues resign because of their fear of bird flu.	☐	☐	☐	☐	☐	☐	
8.	I am confident that my employer would look after my medical needs if I were to fall ill with bird flu.	☐	☐	☐	☐	☐	☐	

Non-Work Concerns

	With regard to the possibility of passing bird flu to those closest to me (spouse/partner, family members, friends etc):	Strongly Disagree	Disagree	Not sure, but Probably Disagree	Not sure, but Probably Agree	Agree	Strongly Agree	Not Applicable
9.	People close to me would be at high risk of getting bird flu because of my job.	☐	☐	☐	☐	☐	☐	
10.	I would be most concerned for my:							
a.	Spouse/partner.	☐	☐	☐	☐	☐	☐	☐
b.	Parents.	☐	☐	☐	☐	☐	☐	☐
c.	Children.	☐	☐	☐	☐	☐	☐	☐
d.	Close friends.	☐	☐	☐	☐	☐	☐	☐
e.	Work Colleagues.	☐	☐	☐	☐	☐	☐	☐
f.	Others _____	☐	☐	☐	☐	☐	☐	☐
11.	People close to me would be worried for my health.	☐	☐	☐	☐	☐	☐	
12.	People close to me would be worried as they may get infected by me.	☐	☐	☐	☐	☐	☐	

Fig. 1. Sections of the Questionnaire on Attitudes, Concerns, and Preparedness of Healthcare Workers with regard to a Bird Flu Outbreak.

Preparedness for a bird flu pandemic (Table 3)

The overall prevalence of perceived preparedness in both groups was high. 71.6% of the HCWs who responded felt that they were personally prepared while 82.8% felt that their institutions were prepared. Nevertheless, TH HCWs were more likely to feel personally prepared (74.1% vs 64.7%, $p=0.045$) and more likely to report that their hospital was prepared (86.8% vs 71.8%, $p=0.000$).

The majority of HCWs had received training for infection control (87.9%); knew the hospital had an outbreak preparedness plan (87.2%) and have been informed of that plan (77.8%). A greater percentage of TH HCWs reported having had training (90.0% vs 82.2%, $p=0.014$), knew that their institution has a preparedness plan (91.4% vs 75.5%, $p=0.000$) and were informed of the plan (82.3% vs 65.3%, $p=0.000$).

In the six months prior to our survey, TH HCWs were likelier to have attended infection control related meetings (59.8% vs 50.6%, $p=0.039$), received influenza vaccination (82.5% vs 63.8%, $p=0.000$) and received adequate training in use of personal protective equipment (81.5% vs 71.8%, $p=0.032$).

Discussion

Demographic factors

Females formed the majority of respondents in both CHs and TH surveyed due to the large proportion of nurses, who are predominantly female in Singapore.

Concerns

As a combined group, CH and TH HCWs perceived a great risk of personal exposure to the bird flu virus from their job and feared falling ill with the disease. This is consistent with a study which found that danger to personal health was one of the most prevalent fears among HCWs who experienced significant psychological stress during the SARS crisis⁴.

HCWs are likely to be as, if not more, concerned than the average citizen because they probably have a greater understanding of the associated risks. Fatalities related to SARS among HCWs who were exposed and infected occupationally also contribute to employees' fears regarding potentially fatal infectious diseases⁷. 38.7% of HCWs surveyed had at least 4 yr of work experience in healthcare which suggests that many participants had past experience working during the SARS outbreak in 2003. Moreover, SARS affected all Singaporeans and most HCWs would likely remember and be affected by it as there was much

Table 1. Demographic characteristics of study participants

Characteristics	TH N=908 n (%)	CH N=326 n (%)	Total N=1,234 n (%)
Ethnicity*			
Chinese	494 (54.4)	142 (43.6)	636 (51.5)
Malay	175 (19.3)	21 (6.4)	196 (15.9)
Indian	122 (13.4)	23 (7.1)	145 (11.8)
Others	110 (12.1)	104 (31.9)	214 (17.3)
Age (yr)*			
<20	21 (2.3)	0 (0.0)	21 (1.7)
20–29	579 (63.8)	66 (20.2)	645 (52.3)
30–39	150 (16.5)	134 (41.1)	284 (23.0)
40–49	66 (7.3)	53 (16.3)	119 (9.6)
50 and older	57 (6.3)	46 (14.1)	103 (8.3)
Sex*			
Male	131 (14.4)	42 (12.9)	173 (14.0)
Female	774 (85.2)	272 (83.4)	1,046 (84.8)
Job Title*			
Doctor	51 (5.6)	7 (2.1)	58 (4.7)
Nurse	569 (62.7)	197 (60.4)	766 (62.1)
Others (e.g. clerks, allied health)	288 (31.7)	104 (32.0)	392 (31.8)
Marital Status*			
Married	297 (32.7)	164 (50.3)	461 (37.4)
Single	583 (64.2)	148 (45.4)	731 (59.2)
Divorced/Separated /Widowed	25 (2.8)	2 (0.6)	27 (2.2)
Experience as a healthcare worker (Years)			
<4	640 (70.5)	116 (35.6)	756 (61.3)
≥4	268 (29.5)	210 (64.4)	478 (38.7)

* Numbers for each item may not add up to the total number of HCWs in the CH or TH because of missing values.

publicity during that period.

A greater proportion of TH HCWs as compared to CH HCWs were concerned of the risk to themselves and those close to them because of their job as a HCW in an AI pandemic. One reason why CH HCWs may be less likely to be concerned is because patients in CHs are likely to have less acute medical conditions. CHs serve as intermediate care facilities which cater to patients who are fit for discharge from acute hospitals (including THs), but require inpatient convalescent and rehabilitative care⁸. They provide the transitional interface between acute hospitals and the community for patients who no longer require the intensive and specialized care provided by acute hospitals, yet are not ready to be returned to the community for medical or social reasons. These are commonly post-stroke or post-fracture patients who require rehabilitation and elderly patients who need longer convalescence after

Table 2. HCW concerns and perceived impact on personal life and work regarding a bird flu pandemic

Concerns Regarding a Bird Flu Pandemic	TH n=908	CH n=326	Total n=1,234	<i>p</i> value
	Agree %	Agree %	Agree %	
Work-Related Concerns				
My job would put me at great exposure risk	711 (78.3%)	220 (67.5%)	931 (75.4%)	0.012
I am afraid of falling ill with bird flu	659 (72.6%)	232 (71.2%)	891 (72.2%)	0.359
I should not be looking after bird flu patients	239 (26.3%)	52 (16.0%)	291 (23.6%)	0.001
Risk is not acceptable	245 (27.0%)	67 (20.6%)	312 (25.3%)	0.074
Accept that risk is part of job	656 (72.2%)	217 (66.6%)	873 (70.7%)	0.410
Might look for another job because of risk	150 (16.5%)	35 (10.7%)	185 (15.0%)	0.027
Acceptable if colleagues resign because of their fear	437 (48.1%)	152 (46.6%)	589 (47.7%)	0.925
Confident employer would look after my needs if I fall ill with bird flu	803 (88.4%)	289 (88.7%)	1,092 (88.5%)	0.036
Non-Work Concerns				
People close to me would be at high risk of getting bird flu because of my job	622 (68.5%)	183 (56.1%)	805 (65.2%)	0.001
I would be most concerned for my: Spouse/partner	627 (69.1%)	213 (65.3%)	840 (68.1%)	0.303
Parents	766 (84.4%)	239 (73.3%)	1,005 (81.4%)	0.024
Children	452 (49.8%)	178 (54.6%)	630 (51.1%)	0.211
Close friends	809 (89.1%)	254 (77.9%)	1,063 (86.1%)	0.000
Work Colleagues	846 (93.2%)	273 (83.7%)	1,119 (90.7%)	0.000
Others	306 (33.7%)	102 (31.3%)	1,119 (90.7%)	0.221
People close to me would be worried for my health	842 (92.7%)	267 (81.9%)	1,109 (89.9%)	0.000
People close to me would be worried as they may get infected by me	775 (85.4%)	240 (73.6%)	1,015 (82.3%)	0.001
Perceived Impact Regarding a Bird Flu Pandemic on Personal Life and Work				
	TH n=908	CH n=326	Total n=1,234	<i>p</i> value
	Agree %	Agree %	Agree %	
I would be afraid of telling my family about the risk I am exposed to	271 (29.8%)	62 (19.0%)	333 (27.0%)	0.001
People would avoid me because of my job	546 (60.1%)	158 (48.5%)	704 (57.1%)	0.002
People would avoid my family members because of my job	442 (48.7%)	131 (40.2%)	573 (46.4%)	0.034
I would avoid telling other people about the nature of my job	245 (27.0%)	54 (16.6%)	299 (24.2%)	0.000
There would be adequate staff at my workplace to handle the increased demand	487 (53.6%)	194 (59.5%)	681 (55.2%)	0.002
There would be more conflict amongst colleagues at work	347 (38.2%)	98 (30.1%)	445 (36.1%)	0.040
I would feel more stressed at work	594 (65.4%)	199 (61.0%)	793 (64.3%)	0.517
I would have an increase in workload	676 (74.4%)	232 (71.2%)	908 (73.6%)	0.782
I would have to work overtime	661 (72.8%)	195 (59.8%)	856 (69.4%)	0.001
I would have to do work not normally done by me	664 (73.1%)	211 (64.7%)	875 (70.9%)	0.101

* Numbers for each item may not add up to the total number of HCWs in the CH or TH because of missing values.

Table 3. Preparedness for a bird flu pandemic

	TH n=908	CH n=326	Total n=1,234	<i>p</i> value
	Agree %	Agree %	Agree %	
There is an infection control committee in my clinic	850 (93.6%)	293 (89.9%)	1,143 (92.6%)	0.569
I have received training for infection control by my clinic	817 (90.0%)	268 (82.2%)	1,085 (87.9%)	0.014
I have been recommended by my clinic to receive flu vaccination	858 (94.5%)	266 (81.6%)	1,124 (91.1%)	0.000
There is infection control staff in my clinic	871 (95.9%)	300 (92.0%)	1,171 (94.9%)	0.789
My clinic has a preparedness plan for a bird flu outbreak	830 (91.4%)	246 (75.5%)	1,076 (87.2%)	0.000
My clinic has informed me of their bird flu outbreak preparedness plan	747 (82.3%)	213 (65.3%)	960 (77.8%)	0.000
My clinic is prepared for a bird flu outbreak	788 (86.8%)	234 (71.8%)	1,022 (82.8%)	0.000
I am personally prepared for a bird flu outbreak	673 (74.1%)	211 (64.7%)	884 (71.6%)	0.045
I have attended infection control training sessions	703 (77.4%)	239 (73.3%)	942 (76.3%)	0.759
I have participated in infection control audits	574 (63.2%)	181 (55.5%)	755 (61.2%)	0.122
I have attended infection control related meetings	543 (59.8%)	165 (50.6%)	708 (57.4%)	0.039
I have received flu vaccination	749 (82.5%)	208 (63.8%)	957 (77.6%)	0.000
Bought anti-bird flu medication	58 (6.4%)	8 (2.5%)	66 (5.3%)	0.011
Bought masks	105 (11.6%)	41 (12.6%)	146 (11.8%)	0.393
Received adequate personal protective equipment training	740 (81.5%)	234 (71.8%)	974 (78.9%)	0.032
Have someone to turn to if unsure of use of personal protective equipment	810 (89.2%)	262 (80.4%)	1,072 (86.9%)	0.106

*Numbers for each item may not add up to the total number of HCWs in the CH or TH because of missing values.

acute illness⁹). Thus, patients who are admitted to CHs are 'screened', coming from THs, whereas those admitted to THs come 'unscreened' from the community. Another reason may be that as criteria for admission to CHs, patients who are medically unstable or have medical problems which are inadequately worked up are not discharged to the CHs but remain at the THs. This essentially screens out potential patients ill with AI in an outbreak. Thus CH HCWs perceive themselves to be at less exposure risk compared to TH HCWs.

Despite HCWs' concerns, it is heartening to note that the majority (83.5% of TH HCWs and 89.3% of CH HCWs) would not consider leaving their job but would continue to look after patients during an AI outbreak. This is similar to

a study of 60 general practitioners in Australia, in which all of them expressed willingness to provide professional services in an influenza pandemic, citing as reasons strong personal work ethic, a sense of personal responsibility for their patients' welfare, and viewing not working as an abandonment of their responsibilities to their patients and colleagues¹⁰.

However, not all studies have found that HCWs were willing to continue working in an infectious disease outbreak. Qureshi *et al.* reported that HCWs were less willing to report for duty during infectious diseases epidemics (e.g. SARS, smallpox) than for most other forms of catastrophic disasters (e.g. environmental disasters, mass casualty incidents)¹¹. In another study on public health workers, Balicer *et al.*

found that almost half of HCWs were unlikely to report to duty during an influenza pandemic¹². In a study by Ruderman *et al.* after the SARS outbreak, healthcare professionals questioned their choice of career and decided to leave their profession and pursue new ventures, showing an unwillingness or inability to care for patients in the face of risk¹³. Reasons for such behavior probably reflect the complexity of the issue of caring for others under conditions of great personal risk. HCWs express conflict between their roles as health care provider and parent, feeling on one hand altruism and professional responsibility and, on the other hand, fear and guilt about potentially exposing their families to infection¹⁴.

Although the majority felt that they should stay, almost half of our respondents (48.1% of TH HCWs and 46.6% of CH HCWs) felt it acceptable if their colleagues resigned out of fear. A possible reason is that these respondents placed the anxiety of their colleagues above their own. Although perceived employer support was a protective factor against stress in other studies⁴, we did not find a significant association in our study. A possible reason is that most HCWs (88.5%) were already confident that their employer will look after their needs if they fell ill with AI.

Perceived impact on personal life and work

Another area of concern we found was characteristic of HCWs dealing with infectious diseases: many respondents felt that they would experience social stigmatization and ostracism, which was also reported in other studies⁶. This was more obvious in TH HCWs who were more likely to fear telling their family about their risk of exposure, feel that people would avoid them or their family due to their job, and avoid telling others about their job nature.

Studies have also found that concern for personal or family health among HCWs was significantly associated with personal or family lifestyles being affected by SARS and being treated differently by people because of working in a SARS-affected hospital¹⁵. Our results are also consistent with other studies that found that most HCWs have greater stress and workload, work overtime and do work normally done by others during an infectious disease outbreak^{1,4}.

A higher percentage of TH HCWs felt that there would be more conflict amongst colleagues at work and the need to work overtime. On the other hand, a higher percentage of CH HCWs felt that there would be adequate staff at the workplace to handle the increased demand. Again, the greater intensity of work and severity of disease of patients in THs probably account for this difference.

Preparedness for a bird flu pandemic

Singapore, together with many other countries, has been developing preparedness plans¹⁶ due to increasing concern of an imminent influenza pandemic worldwide. As a result of the lessons learnt from SARS, Singapore has further strengthened its operational readiness and laboratory safety to respond to SARS, AI and other emerging diseases³. Control measures used for SARS have been adapted for use to mitigate the spread of influenza, including infection control measures instituted at healthcare institutions, border health and community-wide measures and quarantine measures¹⁷.

Many health measures are already in place, such as enhanced disease surveillance capability, increased isolation facilities in hospitals and, stockpiles of anti-viral drugs and increasing isolation facilities in hospitals. If required, the Singapore authorities will complement these with border control measures in order to help reduce the spread of influenza to Singapore. Singapore also works closely with other countries and with the relevant world health authorities to monitor and share outbreak information.

These comprehensive preparatory measures are probably the reasons why a high proportion of our HCWs reported themselves and their hospitals being prepared for an AI pandemic.

At the hospital level, infection control activities are in place, including training sessions and related meetings, having a hospital AI outbreak preparedness plan, and informing HCWs of such plans, and training in use of personal protective equipment (PPE). These activities were found to be positively associated with HCWs' personal preparedness for an AI outbreak. This is expected as any activity that imparts knowledge and skills about a disease and its prevention naturally prepares one to better deal with it. TH HCWs compared to CH HCWs were likelier to report having participated in such activities. This may be a reason why they were also likelier to report that they and their hospital were prepared for an AI outbreak.

In contrast, a Canadian study of Ottawa family physicians' preparedness for public health emergencies found that only about a quarter of respondents felt prepared for a respiratory epidemic, with almost half feeling unprepared for an emergency¹⁸. A possible reason is that respondents in Ottawa have had no first-hand experience of a respiratory infectious disease outbreak as the SARS epidemic in Canada mainly affected the city of Toronto. Singapore, on the other hand, has had first-hand experience of SARS in 2003, with our country having 238 cases and 33 deaths, out of which 5 were HCWs¹.

Greater psychosocial support of HCWs may be required,

as suggested by other studies which have concluded that more appropriate psychosocial support is needed to prevent HCWs burning out from overwork and high stress during an infectious disease outbreak^{6, 15}. As pointed out by Qureshi *et al.*, the most effective methods to allay fears and concerns for personal safety are probably HCW education, provision of appropriate PPE, and assurance of effective environmental controls¹¹. There is a need to put psychological concerns and stresses of HCWs on the agenda when preparing for an AI pandemic because there is a tendency to neglect this area with resources being directed only at alleviating physical morbidity⁴.

There were several limitations in this study. There was a lack of qualitative design such as a focus group discussion in designing the questionnaire. We adopted a cross-sectional survey design with self-administered questionnaires. Thus we were unable to comment on any causal relationship between variables studied. Reliance on self-report data has its limitations such as rating bias. However, as stress is an experience based on the perception of a mismatch between demands and resources to meet those demands, subjective self-reporting has its value in such studies. Since we only surveyed one TH and two CHs, our findings may not be generalized to all hospital HCWs in Singapore or to other countries. Nevertheless, it can be expected that HCWs in other parts of the world would share these concerns and stresses.

In conclusion, this study shows that despite the majority of HCWs feeling prepared for an AI outbreak, the majority also have significant concerns such as great personal risk of exposure to the bird flu virus from their job and falling ill with the disease. TH HCWs compared to CH HCWs were more likely to have these concerns and perceive adverse impact of an AI pandemic on their personal life and work, possibly because of the types of patients they are caring for, as compared to CH HCWs. Healthcare institutions need to put these psychological concerns on the agenda and provide effective interventions and greater support for HCWs and their families in such future crises. TH HCWs were also found to be likelier to have participated in readiness preparation activities and this was associated with a greater proportion reporting that they and their hospital were prepared for an AI outbreak. Healthcare institutions should thus organize and provide such activities and ensure that their HCWs participate in such activities where indicated. In the allocation of resources for an AI pandemic, the different levels of preparedness of the type of hospital should be taken into consideration.

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