

*Concerned, yet committed: A tertiary hospital  
healthcare workers' concerns and readiness in the  
face of the COVID-19 pandemic*

Jeevan Raaj Thangayah, MMED, MRCEM  
Aliviya Dutta, PGFEM, MRCEM  
R. Ponampalam, FRCS, FAMS, GDOM

**ABSTRACT**

**Background:** Healthcare workers (HCWs) are a vital resource in every society. The concerns of HCWs during pandemics are unique as they have to consider multiple issues including their health as well as the risks to their loved ones. The coronavirus disease 2019 (COVID-19) pandemic provides no exception in testing HCWs' readiness.

**Purpose:** We aim to study the concerns and preparedness of HCWs at Singapore General Hospital (SGH), a tertiary healthcare institution, during the COVID-19 pandemic. Of interest were the differences between HCWs from the emergency department (ED) compared to other non-ED locations.

**Methods:** A cross-sectional study was carried out in the form of a voluntary survey containing 34 questions. All data were anonymous. Chi-square analysis and Bonferroni correction were carried out to ascertain the significance of the associations between the two groups.

**Results:** A total of 1,249 responses were received. Of all respondents, 57 percent felt that their jobs put them at great risk of exposure to COVID-19 while 67 percent accepted the risk as part of their job and 60 percent were still afraid of falling ill. Among the respondents, 78 percent responded that they would not look for another job while almost half considered it

acceptable if their colleagues resigned. There were significant differences between ED and non-ED staff in terms of feeling that not only they but also those close to them were at high risk of exposure to the disease, people avoiding them and their families due to their job and ED staff feeling that there would be increased workload but inadequate manpower to handle the demands.

**Conclusion:** Despite previous experience with pandemics, this study highlights that there still are issues faced by HCWs that need to be addressed in order for them to function effectively. Although there are differences between ED and non-ED HCWs' concerns, all HCWs need to be recognized as crucial stakeholders and due attention should be given to them.

**Key words:** COVID-19, emergency department, infectious diseases, staff support, psychology

**BACKGROUND AND INTRODUCTION**

The coronavirus disease 2019 (COVID-19) has created a tremendous impact on our lives in several ways. It reflects in the decisions we make, what is important to us, and what we might have otherwise taken for granted. As healthcare workers (HCWs), some of us being frontliners, our daily jobs and responsibilities also changed while having to treat

and care for patients amid the COVID-19 pandemic. We face considerable mental and physical stress every day caring for COVID-19 patients while having to abide by constantly evolving protocols. Singapore's experience with infectious disease outbreaks (DOs) in the past 2 decades includes severe acute respiratory syndrome (SARS) in 2003, H1N1 in 2009, and Middle East respiratory syndrome (MERS). Studies<sup>1,2</sup> regarding the influenza pandemic have noted gaps in hospital employees' willingness to respond and suggest that this could be improved upon with active engagement of employees, empowering them with relevant training, holistic care of their welfare, and enhancing risk communications.

Although lessons have been learnt and positive changes made as a result of previous encounters with DOs, the impact of DOs on every HCW may not be fully understood. The mental, physical, and emotional challenges that HCWs experience during times of crisis can affect their well-being and even their career decisions. Studies done locally in the past decade on the Avian Influenza pandemic<sup>3,4</sup> showed that HCWs in both tertiary and primary care clinics as well as community and tertiary hospitals were prepared and willing to respond despite concerns of threats to personal safety and being ostracized by the public. This contemporary study during the COVID-19 pandemic provides a more contextualized perspective to the concerns of HCWs and its psychological impact could potentially affect their performance. We aim to identify the personal and work-related factors that are important to HCWs at Singapore General Hospital (SGH), their preparedness for an infectious DO, and in particular, compare staff working in the emergency department (ED) with non-ED departments. SGH is the oldest and largest tertiary hospital in Singapore with an inpatient bed capacity of 1,785 beds and an approximate staff strength of 10,000.

#### **METHODS AND MATERIALS**

In this cross-sectional study, we sent out an online anonymous survey using a Google forms link to all SGH staff via key personnel in respective departments

using work email addresses obtained via our hospital's communications department. The survey questions were modelled after a locally conducted survey that was previously carried out on the effect of SARS on HCWs.<sup>5</sup> This tool was selected as it has been utilized and validated in several other settings.<sup>3,4,6,7</sup> Participation was voluntary. Data collection was performed from June 2020 to October 2020. Effort was taken to ensure that only a single response was able to be submitted from each email address. In our survey, there were nine general questions on sociodemographic factors and 25 questions on HCWs' concerns, perceptions, and preparedness with regard to the COVID-19 pandemic. We wanted to identify the concerns and level of preparedness among HCWs and whether there were any differences between ED and non-ED staff. ED and non-ED staff were identified by the question on work location. Chi-square analysis was used to analyze the data, with Bonferroni correction of the threshold p-value to ascertain the statistical significance of the associations (adjusted p-value = 0.00016). The study was approved by the SingHealth Centralised Institutional Review Board (CIRB).

#### *Patient and public involvement statement*

Neither patients nor the public was involved in our study.

#### **RESULTS**

We received a total of 1,249 responses. Respondents' characteristics are presented in Table 1. The median age range of respondents was 31–40 years and 78 percent were females. Of the respondents, 43 percent were nurses and 15 percent were doctors. Only 38 percent of the respondents were involved in previous pandemics, 23 percent worked in the ED (Figure 1), and 46 percent of the respondents had worked for 10 years or more in the hospital.

#### *Overall respondents*

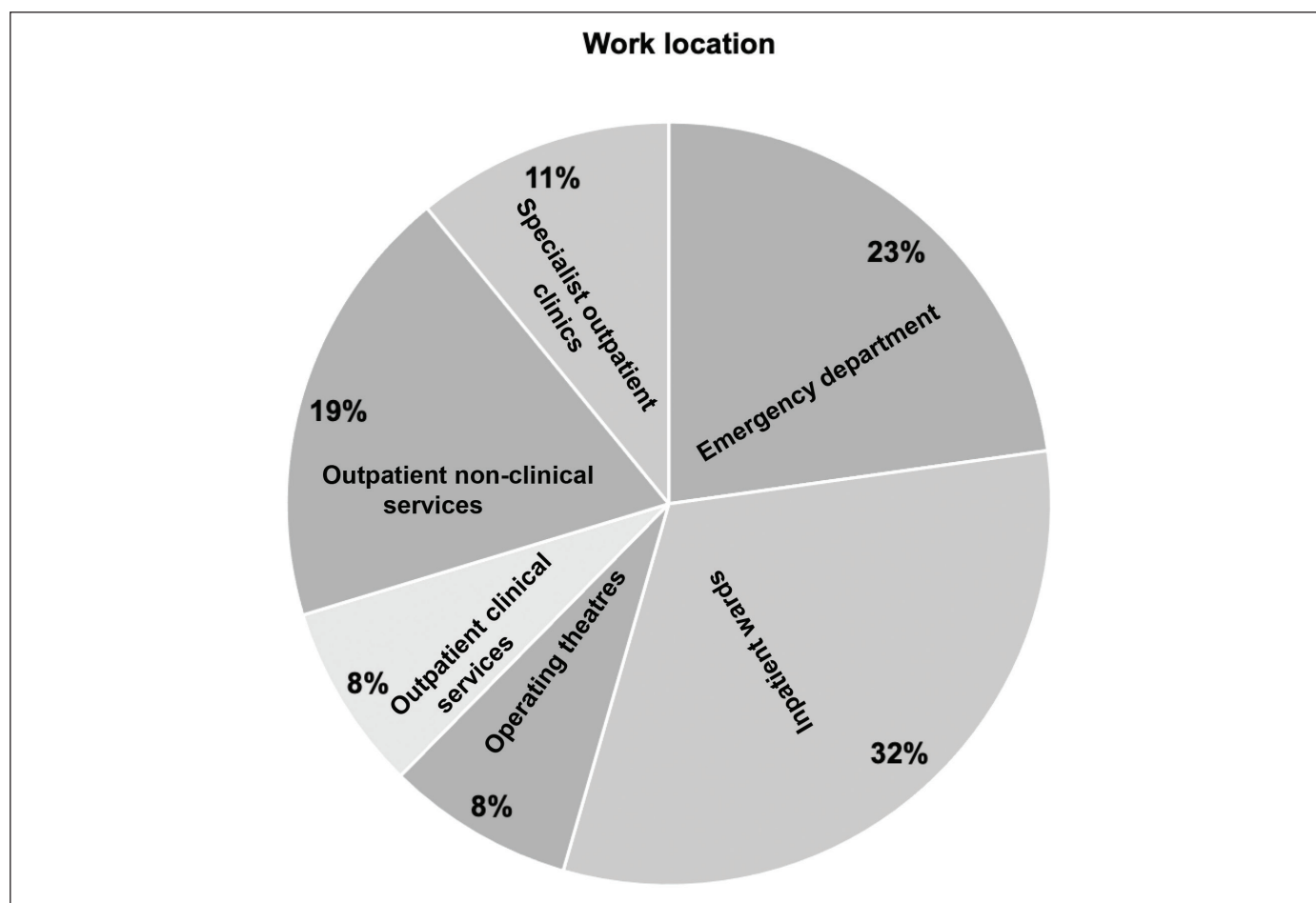
Table 2 presents the summary of the chi-square analysis of HCWs' concerns by ED and non-ED staff. Of the HCWs that participated, 57 percent felt that their jobs would put them at great risk of exposure to COVID-19 and 60 percent were afraid

<b>Table 1. Sociodemographic characteristics of HCWs by ED and non-ED staff</b>				
	<b>All participants n = 1,249 (percent)</b>	<b>ED staff n (percent)</b>	<b>Non-ED staff n (percent)</b>	$\chi^2$
<b>Age range</b>				<b>6.61</b>
<30 years	361 (29)	93 (33)	268 (27)	
31–40 years	433 (35)	106 (37)	327 (34)	
41–50 years	213 (17)	42 (15)	171 (18)	
51–60 years	152 (12)	27 (9)	125 (13)	
>61 years	90 (7)	17 (6)	73 (8)	
<b>Gender</b>				<b>48.58**</b>
Female	969 (78)	178 (62)	791 (82)	
Male	280 (23)	107 (38)	173 (18)	
<b>Highest education</b>				<b>15.96*</b>
Less than bachelor's degree	339 (27)	67 (24)	272 (28)	
Degree	601 (48)	166 (58)	435 (45)	
Postgraduate degree	309 (25)	52 (18)	257 (27)	
<b>Marital status</b>				<b>0.20</b>
Single	562 (45)	125 (44)	437 (45)	
Married	687 (55)	160 (56)	527 (55)	
<b>Dependents</b>				<b>1.37</b>
No	450 (36)	111 (39)	339 (35)	
Yes	799 (64)	174 (61)	625 (65)	
<b>Duration of service</b>				<b>16.86*</b>
<5 years	303 (24)	57 (20)	246 (26)	
5–10 years	373 (30)	97 (34)	276 (29)	
10–20 years	341 (27)	95 (33)	246 (26)	
>20 years	232 (19)	36 (13)	196 (20)	
<b>Past pandemic experience</b>				<b>0.01</b>
No	778 (63)	178 (62)	600 (62)	
Yes	471 (38)	107 (38)	364 (38)	
<b>Work location</b>				<b>1249**</b>
ED	285 (23)	285 (100)	-	
Inpatient wards	398 (32)	-	398 (41)	
Operating theatres	99 (8)	-	99 (10)	
Outpatient clinical services	98 (8)	-	98 (10)	
Outpatient nonclinical services	231 (19)	-	231 (24)	
Specialist outpatient clinics	138 (11)	-	138 (14)	
<b>Occupation</b>				<b>164.75**</b>
Admin	198 (16)	5 (2)	193 (20)	
Allied health	302 (24)	18 (6)	284 (29)	
Ancillary	34 (3)	8 (3)	26 (3)	
Medical	184 (15)	75 (26)	108 (11)	
Nurse	532 (43)	179 (63)	353 (37)	

**Table 1. Sociodemographic characteristics of HCWs by ED and non-ED staff (continued)**

	All participants n = 1,249 (percent)	ED staff n (percent)	Non-ED staff n (percent)	$\chi^2$
Doctor designation				73.65**
Medical officer	52 (4)	30 (11)	22 (2)	
Registrars	35 (3)	22 (8)	13 (1)	
Specialists	97 (8)	23 (8)	74 (8)	
Not applicable	1,065 (86)	210 (74)	855 (89)	
Nurse designation				91.67**
Enrolled nurse and principal enrolled nurse	58 (5)	11 (4)	47 (5)	
Staff nurse and senior staff nurse	341 (28)	140 (49)	201 (21)	
Resident nurse and above	131 (11)	28 (10)	103 (11)	
Not applicable	719 (58)	106 (37)	613 (64)	

\*p value <.05.  
\*\*Adjusted p value after Bonferroni correction <.0001.



**Figure 1. Work location. Majority of HCWs enrolled in the survey were from inpatient wards (32 percent) followed by the outpatient clinics or services (30 percent) and the ED (23 percent).**

**Table 2. Summary of chi-square analysis for ED staff and non-ED staff concerns regarding the COVID-19 pandemic**

		All participants n = 1,249 (percent)	ED staff n (percent)	Non-ED staff n (percent)	$\chi^2$
1	I feel my job would put me at great risk of exposure to COVID-19				76.57**
	Strongly agree/agree	715 (57)	226 (79)	489 (51)	
	Neutral	361 (29)	48 (17)	313 (32)	
	Strongly disagree/disagree	173 (14)	11 (4)	162 (17)	
2	I am afraid of falling ill with COVID-19 virus				11.75*
	Strongly agree/agree	745 (60)	167 (59)	578 (60)	
	Neutral	323 (26)	91 (32)	232 (24)	
	Strongly disagree/disagree	181 (15)	27 (9)	154 (16)	
3	I should not be looking after COVID-19 patients				13.13*
	Strongly agree/agree	116 (10)	15 (5)	101 (10)	
	Neutral	388 (31)	76 (27)	312 (32)	
	Strongly disagree/disagree	745 (60)	194 (68)	551 (57)	
4	The risk I am exposed to is not acceptable				13.10*
	Strongly agree/agree	82 (7)	32 (11)	50 (5)	
	Neutral	468 (38)	102 (36)	366 (38)	
	Strongly disagree/disagree	699 (56)	151 (53)	548 (57)	
5	I accept that the risk of contracting COVID-19 is part of my job				11.36*
	Strongly agree/agree	837 (67)	214 (75)	623 (65)	
	Neutral	260 (21)	42 (15)	218 (23)	
	Strongly disagree/disagree	152 (12)	29 (10)	123 (13)	
6	I might look for another job as my current job is too risky				2.67
	Strongly agree/agree	47 (4)	9 (3)	38 (4)	
	Neutral	228 (19)	61 (21)	167 (17)	
	Strongly disagree/disagree	974 (78)	215 (75)	759 (79)	
7	It is acceptable if my colleagues resign because of fear				9.78*
	Strongly agree/agree	591 (48)	129 (45)	462 (48)	
	Neutral	428 (35)	117 (41)	311 (32)	
	Strongly disagree/disagree	230 (19)	39 (14)	191 (20)	
8	I am confident my employer will look after my needs if I fall ill with COVID-19				2.68
	Strongly agree/agree	898 (72)	194 (68)	704 (73)	
	Neutral	267 (22)	69 (24)	198 (21)	
	Strongly disagree/disagree	84 (7)	22 (8)	62 (6)	
9	People close to me would be at high risk of contracting COVID-19				38.71**
	Strongly agree/agree	637 (51)	189 (66)	448 (46)	
	Neutral	355 (29)	66 (23)	289 (30)	
	Strongly disagree/disagree	257 (21)	30 (11)	227 (24)	

**Table 2. Summary of chi-square analysis for ED staff and non-ED staff concerns regarding the COVID-19 pandemic (continued)**

		All participants n = 1,249 (percent)	ED staff n (percent)	Non-ED staff n (percent)	$\chi^2$
10	I would be concerned for my family				10.11*
	Strongly agree/agree	1077 (86)	262 (92)	815 (85)	
	Neutral	126 (10)	17 (6)	109 (11)	
	Strongly disagree/disagree	46 (4)	6 (2)	40 (4)	
11	I would be concerned for my pet(s)				12.44*
	Strongly agree/agree	224 (18)	53 (19)	171 (18)	
	Neutral	187 (15)	60 (21)	127 (13)	
	Strongly disagree/disagree	78 (6)	13 (5)	65 (7)	
	Unsure/not applicable	760 (61)	159 (56)	601 (62)	
12	People would avoid me because of my job				19.03**
	Strongly agree/agree	457 (37)	128 (45)	329 (34)	
	Neutral	360 (29)	88 (31)	272 (28)	
	Strongly disagree/disagree	432 (35)	69 (24)	363 (38)	
13	People would avoid my family members because of my job				27.44**
	Strongly agree/agree	290 (23)	97 (34)	193 (20)	
	Neutral	346 (28)	79 (28)	267 (28)	
	Strongly disagree/disagree	613 (49)	109 (38)	504 (52)	
14	I would avoid telling people about my job				3.20
	Strongly agree/agree	195 (16)	43 (15)	152 (16)	
	Neutral	268 (22)	72 (25)	196 (20)	
	Strongly disagree/disagree	786 (63)	170 (60)	616 (64)	
15	I believe there are adequate staff at my workplace to handle the increased demands				31.34**
	Strongly agree/agree	347 (28)	47 (16)	300 (31)	
	Neutral	314 (25)	66 (23)	248 (26)	
	Strongly disagree/disagree	588 (47)	172 (60)	416 (43)	
16	I would be more stressed at work				0.84
	Strongly agree/agree	667 (54)	149 (52)	518 (54)	
	Neutral	377 (30)	92 (32)	285 (30)	
	Strongly disagree/disagree	205 (17)	44 (15)	161 (17)	
17	There would be more conflict among staff at work				2.02
	Strongly agree/agree	454 (37)	96 (34)	358 (37)	
	Neutral	393 (32)	99 (35)	294 (30)	
	Strongly disagree/disagree	402 (32)	90 (32)	312 (32)	
18	I would have an increased workload				17.57**
	Strongly agree/agree	857 (69)	222 (78)	635 (66)	
	Neutral	285 (23)	52 (18)	233 (24)	
	Strongly disagree/disagree	107 (9)	11 (4)	96 (10)	

Table 2. Summary of chi-square analysis for ED staff and non-ED staff concerns regarding the COVID-19 pandemic (continued)					
		All participants n = 1,249 (percent)	ED staff n (percent)	Non-ED staff n (percent)	$\chi^2$
19	There is an infection control committee at SGH				3.61
	Yes	1,210 (97)	281 (99)	929 (96)	
	No/unsure	39 (3)	4 (1)	35 (4)	
20	I have received training on infection control				9.74*
	Yes	1,129 (91)	266 (94)	863 (90)	
	No	59 (5)	15 (5)	44 (5)	
	Unsure	61 (5)	4 (1)	57 (6)	
21	I have received adequate training on PPE				29.01**
	Strongly agree/agree	1,078 (87)	273 (96)	805 (84)	
	Neutral	123 (10)	11 (4)	112 (12)	
	Strongly disagree/disagree	48 (4)	1 (0)	47 (5)	
22	I am aware that my hospital has an infectious DO preparedness plan				8.01*
	Yes	1,163 (94)	276 (97)	887 (92)	
	No/unsure	86 (7)	9 (3)	77 (8)	
23	My hospital has informed me of its infectious DO preparedness plan				17.98**
	Strongly agree/agree	973 (78)	248 (87)	725 (75)	
	Neutral	210 (17)	27 (9)	183 (19)	
	Strongly disagree/disagree	66 (6)	10 (4)	56 (6)	
24	My hospital is prepared to handle an infectious DO				4.37
	Strongly agree/agree	1,121 (90)	258 (91)	863 (90)	
	Neutral	107 (9)	19 (7)	88 (9)	
	Strongly disagree/disagree	21 (2)	8 (3)	13 (1)	
25	I am personally prepared for an infectious DO				35.39**
	Strongly agree/agree	937 (75)	252 (88)	685 (71)	
	Neutral	255 (21)	27 (9)	228 (24)	
	Strongly disagree/disagree	57 (5)	6 (2)	51 (5)	

\*p value <.05.  
\*\*Adjusted p value after Bonferroni correction <.00016.

of falling ill with the COVID-19 virus. While 67 percent of HCWs accepted the risk of contracting COVID-19 as a “part of the job,” 78 percent of respondents would not consider looking for another job, and 48 percent would consider it acceptable if their colleagues resigned out of fear of contracting the disease.

While 86 percent of HCWs felt concerned for their family, only slightly more than half of our

respondents, 51 percent, felt that people close to them would be at high risk of contracting COVID-19. Also, 69 percent felt that they would have an increased workload and 54 percent felt that they would be more stressed during the pandemic.

Among the participants, 97 percent were aware that there was an infection control committee in SGH; over 90 percent had received training in infection control measures and 90 percent felt that the hospital is



prepared to handle an infectious DO while 75 percent felt that they were personally prepared.

about the present job being too risky and experiencing more stress at work.

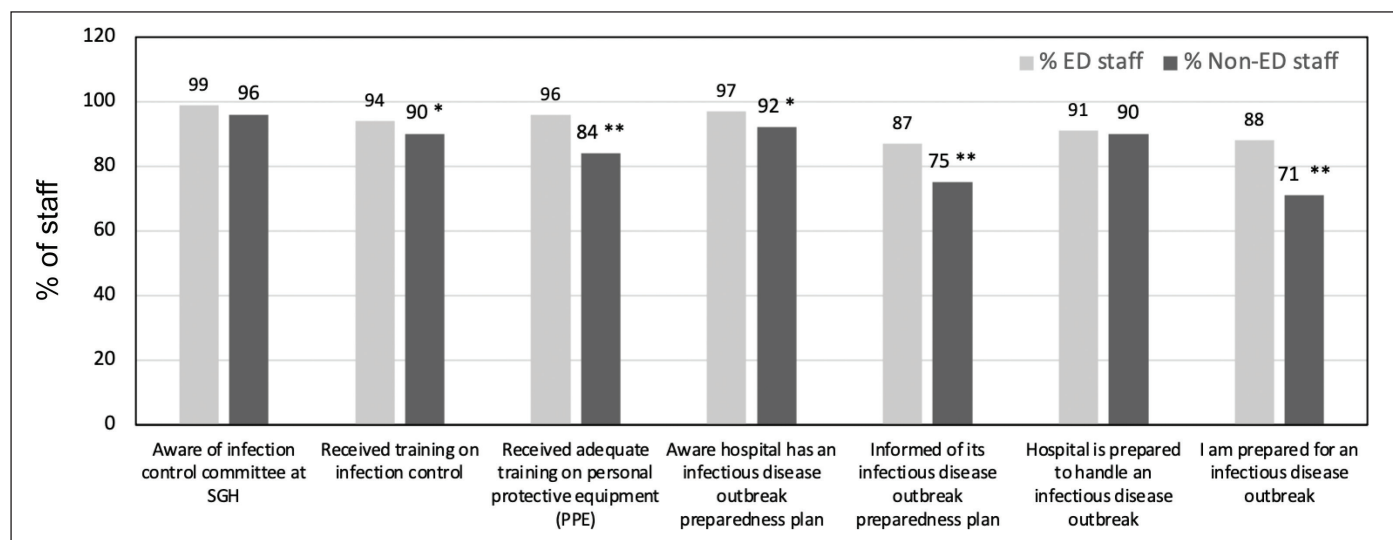
### ED and non-ED staff

There were significant differences between ED and non-ED staff concerns in terms of the perceived risk of exposure to COVID-19 due to the job, people close to them being at high risk of contracting COVID-19, people avoiding them and their family due to their job, adequate staffing at the workplace to handle the increased demands, and having an increased workload. In addition, significant differences between the two groups were also found for concerns regarding adequate training on personal protective equipment (PPE), hospital informing their staff of their infectious DO preparedness plan, and concerns for whether one was personally prepared for an infectious DO (Figure 2).

Notably, there were significant differences between ED and non-ED staff concerns for being afraid of falling ill with COVID-19, the acceptance of COVID-19 risk exposure, concerns for family and pets, and colleagues resigning due to fear. However, after Bonferroni adjustment, the differences in these concerns between ED and non-ED staff were no longer significant. There were also nonsignificant differences between ED and non-ED staff for concerns

### DISCUSSION

During emerging infectious DOs, due to the influx of information, HCWs have to adapt and keep abreast with continually changing information as the situation evolves globally. As a result, there exists much concern, uncertainty, and fear among HCWs, which can adversely affect their well-being.<sup>8</sup> Many studies have been done to identify the factors that affect HCWs during pandemics which include their concerns, level of awareness and preparedness to respond.<sup>1-15</sup> This study found that despite more than half of HCWs being concerned about themselves and their families being put at risk of COVID-19 and not having adequate staffing while expecting an increased workload, a great proportion of them were willing to continue with their current job. This is consistent with some literature that found similar results among HCWs,<sup>3,4,9-11</sup> however, we did not find a significant difference between ED and non-ED staff for concerns with continuing the current job. The higher proportion of ED staff feeling at risk of exposure to the virus in our study is similar to another study comparing the worries and concerns of frontliners versus nonfrontliners in Japan.<sup>12</sup> This is expected as undifferentiated



**Figure 2. Awareness that the hospital is prepared to handle an infectious disease outbreak, comparing ED and non-ED staff.**



---

cases come through the doors of the ED before a diagnosis or disposition is made and ED staff are not always privy to the epidemiological risk until further questioning or investigations are carried out. During the 2003 SARS outbreak in Singapore, HCWs had contributed to 40 percent of the total SARS cases and healthcare institutions were the source of infection in 73.5 percent of cases.<sup>16</sup> Although SARS occurred nearly 2 decades ago, given the indelible impact it had on HCWs, the perceived risk for getting infected with COVID-19 is understandably high. Our survey was, however, conducted at a time when low numbers of new COVID-19 cases were being detected in the local community and there were no clusters within healthcare institutions. Given the subsequent discovery of a cluster of COVID-19 cases at another government restructured hospital in April 2021, the degree of concern, perceived risk, and response among HCWs could have been vastly different compared to our current findings.

However, some other studies have reported large numbers of HCWs who are unwilling to report to work, especially for infectious DOs as compared to other types of disasters such as environmental and mass casualty events.<sup>13</sup> The reasons reported were likely due to fear and concerns for themselves and their family and personal health reasons. In Singapore, we hardly are exposed to mass casualty and environmental disasters with one of the most recent events being the Hotel New World collapse in 1986 with 33 fatalities. However, infectious DOs are no exception to us with at least 18 fatalities during H1N1 and 33 during SARS.<sup>17</sup> Hence, our HCWs are likely more psychologically prepared for pandemics than other types of disasters.

Furthermore, the willingness of our HCWs to report for duty during a pandemic could be attributed to the dedicated roles prescribed to them. It has been reported that HCWs would be more willing to report to work during a pandemic when they have clear duties and understand the importance of their role.<sup>14</sup> Also, it is suggested that targeting HCWs' perceived risks and addressing them mitigates uncertainty and instills confidence.<sup>18</sup> At SGH, we have contingency plans for surges during infectious DOs. For example, in 2020,

we converted a multi-storey carpark to a "flu screening area" (FSA) to prepare for the COVID-19 surge. This major task had been in the planning since as early as 2013. During its operational period as an FSA, there were several teams from various disciplines with each team comprising between three and 10 doctors and between 13 and 15 nurses, all given clearly defined roles.<sup>19</sup> Some staff were attending to patients, others were the designated swabbers or screeners while ancillary personnel such as porters, drivers, and security also had their specific roles. In addition, daily emails containing information on the global and local COVID-19 situation were sent to all staff and frequent bulletins were tailored for ED personnel. Positive cases among healthcare staff were also shared by hospital administration to all other staff, which kept everyone updated and aware. This could also have had a positive psychological impact on HCWs that while isolated cases are picked up amongst staff, adequate measures and actions were undertaken by the institution to contain the situation. This reflects on organisational transparency, which has also been reported to be another key element in mitigating HCWs' stress and concerns during a pandemic.<sup>8</sup>

Our results are consistent with other studies in that while HCWs themselves personally would not look for another job during a pandemic, they are more willing to accept if their colleagues resigned out of fear.<sup>3,4,6</sup> This phenomenon has been attributed to a sense of "duty of care," which is believed to be high among HCWs, owing to the nature of our jobs. This sense of duty, however, appears not to extend to their colleagues as it is laden with expectations and possible risks to one's health.<sup>20</sup> This disconnect paradigm can have a negative psychological impact on HCWs leading to burnout and increased stress levels.

Interestingly, our study shows a lower rate of HCWs thinking of looking for another job as compared to other studies.<sup>3,4,6,15</sup> This is likely due to their belief that the hospital is prepared to handle an infectious DO as SGH's experience with previous pandemics has led to a myriad of improvements including, but not limited to, ensuring adequate stockpiling of equipment including PPE for all HCWs, increase in the number of isolation wards, development of a fever area in ED, and

---

streamlining of processes such as screening of patients and visitors at entry points. As a response to the 2003 SARS outbreak, in SGH Department of Emergency Medicine a dedicated fever area was created to see patients suspected of having infectious diseases. This area comprises negative pressure rooms that provide an additional layer of protection for HCWs attending to these patients. Furthermore, as part of building a stronger healthcare system, the number of specialists in infectious diseases and emergency medicine in Singapore has risen significantly to provide expertise in these areas of concern.<sup>19</sup> Evidently, much effort, meticulous thought, and planning have been put in by the hospital and the healthcare sector as a whole, which are likely the reasons a large number of our respondents were confident that the hospital is prepared to manage the pandemic. These numbers are comparatively larger than the locally published data that were issued previously.<sup>3,4</sup> Steadfast command and control from hospital administrators and at the government level is also important to instill confidence in HCWs.<sup>21</sup> The lack of which became apparent as some public health systems reported being on the verge of collapse due to shortage of PPE, equipment, and lack of safe working environments for HCWs that expectedly would have a negative impact on the preparedness and willingness of HCWs to work during pandemics.<sup>12,22</sup>

Despite reports and studies of HCWs being shunned and ostracized as they may be seen as a risk to other people, our study shows a lower proportion feeling in that way.<sup>3,4,6,23</sup> This could be due to the increased awareness among the public and the recognition of HCWs' efforts during the pandemic, ranging from the local government's announcement of salary increments for certain groups of HCWs to overt cheering and applause.<sup>24,25</sup> These factors could have had an indelible impact on them, leading to a more positive perception of their role as HCWs.

Compared to non-ED, staff working in ED bear the brunt of the COVID-19 pandemic with heightened fears and apprehension as shown in our study. This is demonstrated by the high degree of dedication and commitment to caring for patients even though they anticipated higher workloads and lack of manpower. Despite these factors, they reported being less

stressed. The factors that contribute to this steadfastness in responding to the COVID-19 pandemic are difficult to fathom but could be attributed to the "duty of care" discussed earlier. Interestingly and contrary to some studies,<sup>26</sup> the majority of these individuals were females, nurses, and having not been through previous outbreaks, understandably might not have been expected to stand up to the challenges posed. The findings suggest that support from higher management and transparency in risk communications may be vital in empowering HCWs in times of adversity.

#### **LIMITATIONS**

Due to the method of dissemination of the survey, we were not able to identify the base number of participants, therefore limiting the response rate calculation. Given the cross-sectional nature of the study, there could have been sampling bias with a volunteer effect as there might have been differences between those who responded and those who did not. Lastly, the generalizability of our results could be increased if we had surveyed HCWs across various other healthcare institutions in Singapore with different leadership and encounters. Despite these limitations, we believe that our study has provided insights into the concerns and perceptions of HCWs with a special focus on comparing ED versus non-ED staff.

#### **CONCLUSION**

HCWs are a vital and precious resource that needs to be given due attention. While there may be subtle differences in perceptions, concerns, and readiness between ED and non-ED HCWs, they need to be given equal importance as one cannot function without the other. Assessing their level of readiness in pandemics and other types of disasters is also crucial to identify weaknesses and rectify them. We also highlight the importance of good leadership and foresight as the overarching pillars to support and prepare HCWs for future crises.

#### **ACKNOWLEDGMENTS**

*We would like to express our deepest gratitude to Ms. Xin Xiaohui, Senior Research Manager and Ms. Lim Shu Rong,*

Research Associate from Health Services Research Unit (HSRU), Singapore General Hospital (SGH), for assisting us with the statistical analysis and their unwavering support and Ms. Permeen A.M. Yusoff from Research Office, SGH, for her invaluable assistance in manuscript editing.

**Author contributions:** Jeevan Raaj Thangayah contributed to the literature research, information collation, and manuscript writing; Aliviya Dutta contributed to data collection and survey dissemination; and R. Ponampalam provided general oversight and revision of the manuscript.

Jeevan Raaj Thangayah, MMed (EM), MRCEM, Department of Emergency Medicine, Singapore General Hospital, Singapore. ORCID: <https://orcid.org/0000-0002-6272-187X>.

Aliviya Dutta, PGFEM, MRCEM, Department of Emergency Medicine, Singapore General Hospital, Singapore. ORCID: <https://orcid.org/0000-0001-7837-5425>.

R. Ponampalam, FRCS (A&E), FAMS, GDOM, Department of Emergency Medicine, Singapore General Hospital, Singapore. ORCID: <https://orcid.org/0000-0002-5813-2044>.

## REFERENCES

1. Barnett DJ, Balicer RD, Thompson CB, et al.: Assessment of local public health workers' willingness to respond to pandemic influenza through application of the extended parallel process model. *PLoS One*. 2009; 4(7): e6365. DOI:10.1371/journal.pone.0006365. PMID: 19629188; PMCID: PMC2711331.
2. Balicer RD, Barnett DJ, Thompson CB, et al.: Characterizing hospital workers' willingness to report to duty in an influenza pandemic through threat- and efficacy-based assessment. *BMC Public Health*. 2010; 10: 436. DOI:10.1186/1471-2458-10-436. PMID: 20659340; PMCID: PMC2918559.
3. Wong TY, Koh GC, Cheong SK, et al.: Concerns, perceived impact and preparedness in an avian influenza pandemic—A comparative study between healthcare workers in primary and tertiary care. *Ann Acad Med Singap*. 2008; 37(2): 96.
4. Cheong SK, Wong TY, Lee HY, et al.: Concerns and preparedness for an avian influenza pandemic: A comparison between community hospital and tertiary hospital healthcare workers. *Ind Health*. 2007; 45: 653-661. DOI:10.2486/indhealth.45.653.
5. Koh D, Lim MK, Chia SE, et al.: Risk perception and impact of Severe Acute Respiratory Syndrome (SARS) on work and personal lives of healthcare workers in Singapore: What can we learn? *Med Care*. 2005; 43(7): 676-682. DOI:10.1097/01.mlr.0000167181.36730.cc. PMID: 15970782.
6. Chaudhary FA, Ahmad B, Ahmad P, et al.: Concerns, perceived impact, and preparedness of oral healthcare workers in their working environment during COVID-19 pandemic. *J Occup Health*. 2020; 62(1): e12168. DOI:10.1002/1348-9585.12168.
7. Galletta M, Piras I, Finco G, et al.: Worries, preparedness, and perceived impact of COVID-19 pandemic on nurses' mental health. *Front Public Health*. 2021; 9: 566700. DOI:10.3389/fpubh.2021.566700. PMID: 34123979; PMCID: PMC8187773.
8. Norful AA, Rosenfeld A, Schroeder K, et al.: Primary drivers and psychological manifestations of stress in frontline healthcare workforce during the initial COVID-19 outbreak in the United States. *Gen Hosp Psychiatry*. 2021; 69: 20-26. DOI:10.1016/j.genhosppsych.2021.01.001. Epub January 10, 2021. PMID: 33485091; PMCID: PMC7836752.
9. Shaw KA, Chilcott A, Hansen E, et al.: The GP's response to pandemic influenza: A qualitative study. *Fam Pract*. 2006; 23: 267-272. DOI:10.1093/fampra/cml014.
10. Hogg W, Huston P, Martin C, et al.: Enhancing public health response to respiratory epidemics: Are family physicians ready and willing to help? *Can Fam Physician*. 2006; 52: 1254-1260.
11. Ehrenstein BP, Hanses F, Salzberger B: Influenza pandemic and professional duty: Family or patients first? A survey of hospital employees. *BMC Public Health*. 2006; 6: 311. DOI:10.1186/1471-2458-6-311.
12. Sahashi Y, Endo H, Sugimoto T, et al.: Worries and concerns among healthcare workers during the coronavirus 2019 pandemic: A web-based cross-sectional survey. *Humanit Soc Sci Commun*. 20121; 8: 41. DOI:10.1057/s41599-021-00716-x.
13. Qureshi K, Gershon RRM, Sherman MF, et al.: Health care workers' ability and willingness to report to duty during catastrophic disasters. *J Urban Health*. 2005; 82(3): 378-388. DOI:10.1093/jurban/jti086.
14. Balicer RD, Omer SB, Barnett DJ, et al.: Local public health workers' perceptions toward responding to an influenza pandemic. *BMC Public Health*. 2006; 6: 99. DOI:10.1186/1471-2458-6-99.
15. Shiao JS, Koh D, Lo LH, et al.: Factors predicting nurses' consideration of leaving their job during the SARS outbreak. *Nurs Ethics*. 2007; 14(1): 5-17. DOI:10.1177/0969733007071350. PMID: 17334166.
16. Goh KT, Cutter J, Heng BH: Epidemiology and control of SARS in Singapore. *Ann Acad Med Singap*. 2006; 35: 301.
17. Allen Yu-Hung LAI, Seck L Tan: *Impact of Disasters and Disaster Risk Management in Singapore: A Case Study of Singapore's Experience in Fighting the SARS Epidemic*. Working Papers DP-2013-14. Economic Research Institute for ASEAN and East Asia (ERIA), 2013.
18. Barnett DJ, Balicer RD, Blodgett DW, et al.: Applying risk perception theory to public health workforce preparedness training. *J Public Health Manag Pract*. 2005; 11 (6 Suppl): S33-S37. DOI:10.1097/00124784-200511001-00006.
19. Thangayah JR, Kiat KTB, Han LS: COVID-19 in Singapore: Our experience as a country, and at Singapore General Hospital's Department of Emergency Medicine. *J Acute Med*. 2021; 11(1): 1-11. DOI:10.6705/j.jacme.202103\_11(1).0001. PMID: 33928010; PMCID: PMC8075969.
20. Sokol DK: Virulent epidemics and scope of healthcare workers' duty of care. *Emerg Infect Dis*. 2006; 12(8): 1238-41. DOI:10.3201/eid1208.060360. PMID: 16965703; PMCID: PMC3291234.
21. Obrien N, Flott K, Durkin M: COVID-19: leadership on the frontline is what matters when we support healthcare workers. *Int J Qual Health Care*. 2021 Feb 20;33(1):mzaa153. DOI:10.1093/intqhc/mzaa153. PMID: 33227137; PMCID: PMC7717247.
22. Ranney ML, Griffith V, Jha AK: Critical supply shortages—The need for ventilators and personal protective equipment during the Covid-19 pandemic. *N Engl J Med*. 2020; 382: e41. DOI:10.1056/NEJMp2006141.
23. World Health Organization (WHO): Attacks on Health Care in the Context of COVID-19. 2020a. Available at <https://www.who.int/news-room/feature-stories/detail/attacks-onhealth-care-in-the-context-of-covid-19>. Accessed June 10, 2021.
24. Available at <https://www.straitstimes.com/singapore/singapore-gives-coronavirus-frontliners-a-round-of-applause>. Accessed June 10, 2021.

---

25. Available at <https://www.straitstimes.com/singapore/higher-salaries-for-more-than-56000-public-healthcare-workers-from-july>. Accessed June 10, 2021.

26. Aoyagi Y, Beck CR, Dingwall R, et al.: Healthcare workers' willingness to work during an influenza pandemic: A systematic

review and meta-analysis. *Influenza Other Respir Viruses*. 2015; 9(3): 120-30. DOI:10.1111/irv.12310. PMID: 25807865; PMCID: PMC4415696.