original reports

Understanding the Psychological Impact of COVID-19 Pandemic on Patients With Cancer, Their Caregivers, and Health Care Workers in Singapore

Kennedy Yao Yi Ng, MBBS, MRCP, MMed[1]; Siqin Zhou, MS[2]; Sze Huey Tan, PhD[2,3]; Nur Diana Binte Ishak, BSc[1];
Zack Zhong Sheng Goh, BSocSc[4]; Zi Yang Chua, BSc[4]; Jace Ming Xuan Chia BSocSc[4]; Ee Ling Chew, BSc[1]; Than Shwe, MPH[5];
Jacklyn Kah Yeen Mok, BSc[5]; Shen Si Leong, BSc[1]; Joanne Si Ying Lo, Dip[2]; Zoe Li Ting Ang, BSc[1]; Jo Lene Leow, BSc, PhD[6];
Chanel Wei Jie Lam, BSc[7]; Jin Wei Kwek, MBBS[8]; Rebecca Dent, MD[1]; Jeffrey Tuan, MBBS, MSc[5]; Soon Thye Lim, MBBS, MRCP[1,3];
William Ying Khee Hwang, MBBS, MRCP[1,3]; Konstadina Griva, MSc, PhD[4]; and Joanne Ngeow, MBBS, MPH[1,3,4]

abstract

PURPOSE The coronavirus disease 2019 (COVID-19) pandemic has had a global impact, and Singapore has seen 33,000 confirmed cases. Patients with cancer, their caregivers, and health care workers (HCWs) need to balance the challenges associated with COVID-19 while ensuring that cancer care is not compromised. This study aimed to evaluate the psychological effect of COVID-19 on these groups and the prevalence of burnout among HCWs.

METHODS A cross-sectional survey of patients, caregivers, and HCWs at the National Cancer Centre Singapore was performed over 17 days during the lockdown. The Generalized Anxiety Disorder-7 and Maslach Burnout Inventory were used to assess for anxiety and burnout, respectively. Self-reported fears related to COVID-19 were collected.

RESULTS A total of 624 patients, 408 caregivers, and 421 HCWs participated in the study, with a response rate of 84%, 88%, and 92% respectively. Sixty-six percent of patients, 72.8% of caregivers, and 41.6% of HCWs reported a high level of fear from COVID-19. The top concern of patients was the wide community spread of COVID-19. Caregivers were primarily worried about patients dying alone. HCWs were most worried about the relatively mild symptoms of COVID-19. The prevalence of anxiety was 19.1%, 22.5%, and 14.0% for patients, caregivers, and HCWs, respectively. Patients who were nongraduates and married, and caregivers who were married were more anxious. The prevalence of burnout in HCWs was 43.5%, with more anxious and fearful HCWs reporting higher burnout rates.

CONCLUSION Fears and anxiety related to COVID-19 are high. Burnout among HCWs is similar to rates reported prepandemic. An individualized approach to target the specific fears of each group will be crucial to maintain the well-being of these vulnerable groups and prevent burnout of HCWs.

JCO Global Oncol 6:1494-1509. © 2020 by American Society of Clinical Oncology

INTRODUCTION

As of May 26, 2020, COVID-19 infected more than 5,000,000 individuals and resulted in more than 300,000 deaths occurring in at least 210 countries.[1] In addition to grave public health repercussions, a consideration of the psychological effects of the pandemic is equally important. During the severe acute respiratory syndrome (SARS) outbreak in 2003, its rapid nosocomial transmissions resulted in widespread fear among health care workers (HCWs).[2] Examination of the mental health burden among HCWs during the SARS outbreak indicated that adverse emotional responses were common.[3] The psychological effects of infectious disease outbreaks in the general population, infection survivors, and HCWs are well documented.

However, literature about these psychological impacts on uninfected patient populations is scarce.[4] Patients with cancer are a unique group of patients because they need to access health care regularly for life-sustaining cancer treatment. Delay in cancer treatment is detrimental to patients.[5] Yet, patients with cancer are immunocompromised and may have poorer outcomes from COVID-19 should they get infected while seeking treatment.[6] In view of these competing concerns, patients with cancer are forced to choose between seeking treatment and increasing the risk of contracting COVID-19 or postponing therapy and minimizing the risk of contracting COVID-19.[7]

The pandemic also presents another unique challenge to patients with cancer—the need to practice isolation to

CONTEXT

Key Objectives
The psychological impact of infectious disease outbreaks in the uninfected patient population and their caregivers is not known. This study aimed to evaluate the psychological effects of COVID-19 on patients with cancer, their caregivers, and health care workers (HCWs), and to evaluate the prevalence of burnout among HCWs.

Knowledge Generated
Sixty-six percent of patients, 72.8% of caregivers, and 41.6% of HCWs reported a high level of fear from COVID-19. The prevalence of anxiety was 19.1%, 22.5%, 14.0% for patients, caregivers, and HCWs, respectively. The prevalence of burnout in HCWs was 43.5%, with more anxious and fearful HCWs reporting higher burnout rates.

Relevance
An individualized approach that targets the specific fears and perceived risks of each group will be crucial to maintain the psychological well-being of these vulnerable groups and prevent burnout of HCWs.

stem the spread of the virus while maintaining social connections to ensure psychological well-being.[8] The diagnosis of cancer results in numerous psychological burdens for patients and their caregivers. Social support protects against psychological symptoms[9] and is a protective factor against physical morbidity and mortality.[10] Many patients with cancer fear dying alone, and the meaningful interpersonal relationships and physical presence of family members are essential to patients in their final hours.[11] However, in this pandemic, a key policy to reduce the spread of COVID-19 is to encourage, and in many cases enforce, social distancing.[12] Although the adverse effect of quarantine and social isolation on healthy individuals is well documented,[13] little is known about how patients with cancer and their caregivers cope during social isolation.

To help patients and caregivers navigate through these challenges, oncology HCWs must deal with constant disruptions to cancer care and make ethically challenging decisions while managing their own fears of personal safety.[14,15] This may lead to an increase in burnout rates.

This study aimed to better understand the psychological impact of COVID-19 on patients with cancer, their caregivers, and HCWs. In addition, it aimed to assess the prevalence of burnout among oncology HCWs during this pandemic.

METHODS

Study Setting and Design

This was a cross-sectional study reported according to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines. The study was conducted in Singapore, a multiethnic country composed of 5,703,569 people, with 3,500,940 of these residents made up of Chinese (76.0%), Malay (15.0%), Asian-Indian (7,5%), and other (1.5%) inhabitants.[16] The National Cancer Centre Singapore (NCCS) is one of the two public cancer specialty centers in Singapore and sees approximately 60%-70% of all public patients with cancer. As of the last day of data collection (April 22, 2020), Singapore had 10,141 confirmed COVID-19 infections, and 12 deaths.[17] To manage the pandemic, the Singapore Government announced a lockdown on April 3 and instituted it on April 7, 2020[18] (Fig 1).
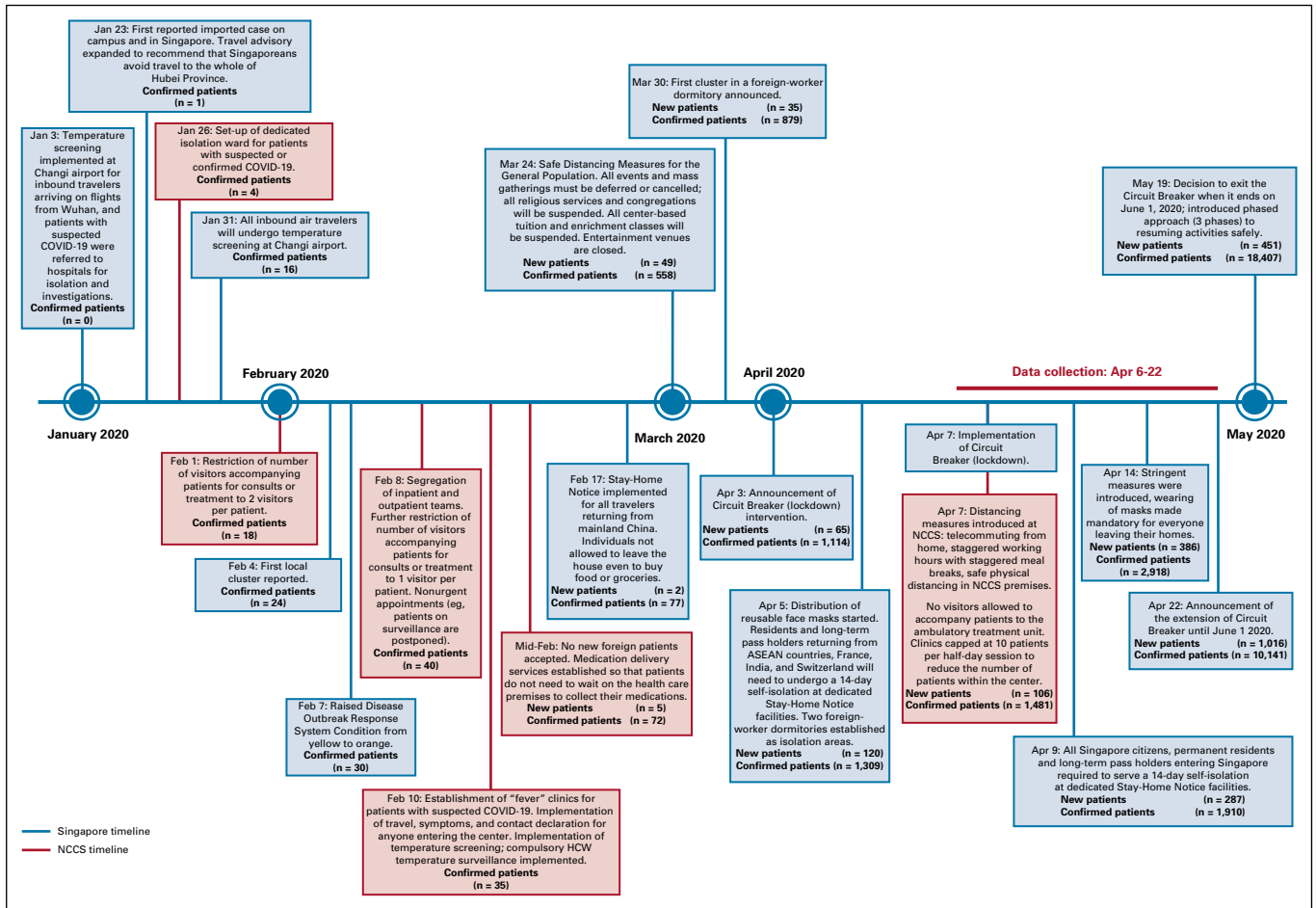
Participants

Patients with cancer, caregivers, and HCWs from the NCCS were recruited to complete the questionnaire. Inclusion criteria were (1) English- or Chinese-speaking, (2) age ≥ 21 years, (3) with cancer or caring for someone with cancer (patients and caregivers). Convenient sampling was conducted over 3 weeks, from April 6-22, 2020. Research assistants were assigned to all clinics and ambulatory treatment units, and they recruited participants by handing out questionnaires. HCWs could complete the questionnaire using the hard copy or the REDCap online platform. Because this study was performed during the lockdown, sample size was dictated by the maximal number of participants who could be recruited within 3 weeks.

Questionnaire Instruments

For all participants, demographic and socioeconomic status information was collected. For patients and caregivers, information about the patient's cancer was collected. For HCWs, data were collected on the type of profession, whether the nature of work had changed because of COVID-19, and whether the job involved direct patient contact. The questionnaire was designed on the basis of measures used in previous epidemics to measure fears,[19] anxiety (Generalized Anxiety Disorder-7 [GAD-7]),[20] confidence in HCWs,[21] and risk perceptions.[22] In addition, items based on themes brought up during in-depth interviews with patients and caregivers were included, for example, cancer-specific concerns and condemnation (findings of interviews not reported).

The GAD-7 is a 7-item validated questionnaire used to screen for GAD; a score of ≥ 10 suggests a possible diagnosis of GAD.[20] In addition, the questionnaire for HCWs included the same questions as well as the Maslach Burnout Inventory (MBI).[23] The 22-item MBI is designed to measure the three domains of burnout: emotional exhaustion (EE), depersonalization (DP), and professional

FIG 1. Timeline of events regarding the COVID-19 pandemic in Singapore and National Cancer Centre Singapore (NCCS). ASEAN, Association of Southeast Asian Nations; HCW, health care worker.

accomplishment. Participants were identified as experiencing burnout if they had EE $\geq$ 27 and/or DP $\geq$ 10.[23,24]

Data Analysis

Demographic and survey responses were examined using frequency and percentages for categorical variables, and mean and standard deviation for continuous variables. The 95% CIs for anxiety and burnout rates were estimated using the Clopper-Pearson method. Differences between the three participant groups were examined in bivariable analyses using χ^2 tests. Univariable and multivariable logistic regression analyses were performed to assess the association between participant characteristics and anxiety/burnout/fears. Association of HCWs' survey responses with the presence of burnout were assessed (controlled for the demographic variables). For questions related to fears, exploratory factor analysis was performed for the combined patient and caregiver dataset, and this showed a two-factor structure: general COVID-19 fears and COVID-19 effect on cancer fears. These two factors showed good internal consistency, with a Cronbach α of .92 and .93, respectively. The responses of questions from each factor were summed and divided by the number of questions to reflect the level of

general COVID-19 fears and COVID-19 effects on cancer fears. For HCWs, questions under the factor general COVID-19 fears were analyzed in the same way (α = .92). Point estimates were reported with corresponding CIs, which were not adjusted for multiple comparisons. Proportions of missing data were reported. There was no prespecified statistical analysis plan; however, an a priori hypothesis was specified at the time of questionnaire development. Statistical analyses were performed using *R*, version 3.6.3.[25]

Ethics

The study was approved by the Singapore Health Services Centralized Institutional Review Board (CIRB: 2020/2155). Because no identifiable data were collected, CIRB waived the need for written consent. Informed verbal consent was obtained by all participants who were recruited in person, whereas consent was presumed when participants completed the survey on the REDCap online platform.

RESULTS

A total of 624 patients, 408 caregivers, and 421 HCWs participated in the study, with a response rate of 84%, 88%,

TABLE 1. Participants' Demographic Characteristics

Characteristic	Patients (n = 624)	Caregivers (n = 408)	HCWs (n = 421)
Age, years			
Mean (SD)	57.2 (12.2)	46.5 (13.3)	35.9 (10.6)
Missing	21 (3.4)	11 (2.7)	14 (3.3)
Sex			
Male	239 (38.3)	169 (41.4)	97 (23.0)
Female	349 (55.9)	214 (52.5)	311 (73.9)
Missing	36 (5.8)	25 (6.1)	13 (3.1)
Ethnicity			
Chinese	479 (76.8)	302 (74.0)	312 (74.1)
Non-Chinese	143 (22.9)	105 (25.7)	108 (25.7)
Missing	2 (0.3)	1 (0.2)	1 (0.2)
Employment			
Part time	61 (9.8)	34 (8.3)	13 (3.1)
Full time	235 (37.7)	234 (57.4)	334 (79.3)
Not working	315 (50.5)	139 (34.1)	
Missing	13 (2.1)	1 (0.2)	74 (17.6)
Income, S$			
> 5,000	92 (14.7)	94 (23.0)	148 (35.2)
2,500-5,000	107 (17.1)	112 (27.5)	200 (47.5)
< 2,500	403 (64.6)	196 (48.0)	47 (11.2)
Missing	22 (3.5)	6 (1.5)	26 (6.2)
Education			
Graduate and above	173 (27.7)	166 (40.7)	305 (72.4)
Nongraduates	439 (70.4)	238 (58.3)	109 (25.9)
Missing	12 (1.9)	4 (1.0)	7 (1.7)
Marital status			
Single	107 (17.1)	131 (32.1)	200 (47.5)
Other	511 (81.9)	273 (66.9)	221 (52.5)
Missing	6 (1.0)	4 (1.0)	0 (0.0)
Cancer type			
Breast	176 (28.2)	85 (20.8)	
GI and hepatobiliary tract	152 (24.4)	97 (23.8)	
Lung	58 (9.3)	45 (11.0)	
Ovarian/endometrial/cervix	37 (5.9)	19 (4.7)	
Lymphoma/hematologic	44 (7.1)	23 (5.6)	
Renal/bladder/prostate/urologic	33 (5.3)	16 (3.9)	
Head and neck	35 (5.6)	24 (5.9)	
Brain	11 (1.8)	5 (1.2)	
Sarcoma	7 (1.1)	6 (1.5)	
Multiple cancers	15 (2.4)	11 (2.7)	
Don't know	7 (1.1)	4 (1.0)	
Other	31 (5.0)	15 (3.7)	
Missing	18 (2.9)	58 (14.2)	

(Continued on following page)

TABLE 1. Participants' Demographic Characteristics (Continued)

Characteristic	Patients (n = 624)	Caregivers (n = 408)	HCWs (n = 421)
Stage			
1	39 (6.3)	14 (3.4)	
2	55 (8.8)	23 (5.6)	
3	86 (13.8)	48 (11.8)	
4	177 (28.4)	113 (27.7)	
Missing	267 (42.8)	210 (51.5)	
Profession			
Doctor/nurse			240 (57.0)
Other			176 (41.8)
Missing			5 (1.2)

NOTE. Data are No. (%) unless otherwise indicated.
Abbreviation: HCWs, health care workers.

92%, respectively. Participants' demographics are summarized in Table 1.

Perceived Risk

HCWs were more likely to respond affirmatively to the question, "How likely do you think it is that you will encounter someone who contracted COVID-19?" (HCWs, 45.8%; patients, 17.0%; caregivers, 17.9%; $P <$ .001). HCWs reported a higher likelihood of actually contracting COVID-19 (HCWs, 20.0%; patients, 11.7%; caregivers, 7.8%; $P <$ .001). However, patients reported a higher likelihood of experiencing severe complications as a result of COVID-19 infection (patients, 44.7%; caregivers, 23.0%; HCWs, 24.9%; $P <$ .001) and a lower chance of recovery compared with caregivers and HCWs (patients, 47.3%; caregivers, 65.4%; HCWs, 76.2%; $P <$ .001; Table 2)

Anxiety and Other Negative Emotions

The prevalence of anxiety (ie, GAD-7 $\geq$ 10) was 19.1%, 22.5%, and 14.0% for patients, caregivers, and HCWs, respectively ($P =$ .004). In the multivariable analysis, the prevalence of anxiety was significantly higher in patients with education lower than tertiary level compared with those with graduate education (odds ratio [OR], 1.78; 95% CI, 1.04 to 3.15; $P =$ .04) and higher in patients who were married (OR, 2.11; 95% CI, 1.14 to 4.22; $P =$ .025). Caregivers who were married were found to be more anxious in the multivariable analysis (OR, 2.08; 95% CI, 1.19 to 3.78; $P =$ .013). None of the parameters were associated with anxiety in the models for HCWs (Table 3). The top emotion reported was fear, followed by anxiety, among patients, caregivers, and HCWs (Table 2).

Fears

HCWs were less fearful of COVID-19 compared with patients and caregivers, with 66.0% of patients and 72.8% of caregivers feeling very much or extremely fearful about COVID-19 compared with 41.6% of HCWs ($P <$ .001).

Caregivers were more fearful than patients with respect to how COVID-19 may affect the patients' cancer treatment (72.1% v 54.5%; $P <$ .001; Table 4). On multivariable analysis, HCWs who were non-Chinese (OR, 1.76; 95% CI, 1.07 to 2.88; $P =$ .025), with a monthly income of $<$ S\$2,500 (OR, 2.50, 95% CI, 1.07 to 5.94; $P =$ .035 compared with $>$ S\$5,000), and who were nongraduates (OR, 1.98, 95% CI, 1.15 to 3.43; $P =$ .013) were more likely to be fearful about COVID-19. Patients who were non-Chinese (OR, 1.66; 95% CI, 1.05 to 2.69; $P =$ .034) and married (OR, 1.66; 95% CI, 1.04 to 2.63; $P =$ .033) and caregivers who were married (OR, 1.69; 95% CI, 1.03 to 2.78; $P =$ .039) had higher general COVID-19 fears. Older caregivers were less likely to have fears regarding the effect of COVID-19 on cancer management (OR, 0.48; 95% CI, 0.24 to 0.97; $P =$ .039; Table 5). The top COVID-19 fears of patients, caregivers, and HCWs were "COVID-19 may have mass community spread," "I am afraid that the patient's last hours will be spent alone," and "COVID-19 symptoms may be too mild to recognize in time," respectively. Almost all caregivers (94.6%) answered yes to the question, "With appropriate protective measures, I would want to be with the patient (if the patient has COVID-19)" compared with 78.4% of patients who reported yes to a similarly phrased question, "With appropriate protective measures, I would want my family members to be with me"(Table 4).

Confidence

Patients and caregivers reported high confidence in HCWs' ability to recognize the symptoms of COVID-19, with 78.0% of patients and 81.1% of caregivers responding positively when asked, "How confident are you in HCWs' ability to recognize symptoms of COVID-19?" However, only 74.6% of HCWs were confident when asked this question with reference to other HCWs' ability, and only 59.4% felt confident in their own ability to recognize the symptoms of COVID-19. All groups reported high confidence in the level

TABLE 2. Perceived Risks, Confidence, Emotions Reported by Participants

Risk Perceptions[a] (perceived severity and vulnerability)	Patients (n = 624)	Caregivers (n = 408)	HCWs (n = 421)
Contacting COVID-19	Participants Who Rated Their Risk as ≥ 60%		
How likely do you think it is that you will encounter someone who contracted COVID-19?	106 (17.0)	73 (17.9)	193 (45.8)
How likely do you think it is that you will contract COVID-19?	73 (11.7)	32 (7.8)	84 (20.0)
If you were to contract COVID-19, what do you think are your chances of experiencing severe complications?	279 (44.7)	94 (23.0)	105 (24.9)
If you were to contract COVID-19, how would you rate your chances of recovery?	295 (47.3)	267 (65.4)	321 (76.2)
Missing data for each question (%)	< 7	< 4	< 2
Confidence[b]	Participants Who Rated Confidence Level as ≥ 6		
In the health care professionals' ability to recognize symptoms of COVID-19?	487 (78.0)	331 (81.1)	314 (74.6)
In taking care of your personal hygiene to prevent contracting COVID-19?	535 (85.7)	380 (93.1)	393 (93.3)
In the level of preparedness of health care facilities in Singapore to manage the COVID-19 outbreak?	533 (85.4)	365 (89.5)	376 (89.3)
In other people's ability to engage in socially responsible behaviors related to COVID-19?	407 (65.2)	244 (60.8)	170 (40.4)
That you can share your concerns about COVID-19 with your health care team?	492 (78.8)	344 (86.0)	NA
In your own ability to recognize symptoms of COVID-19?	NA	NA	250 (59.4)
That your infection control training can help prevent contracting COVID-19?	NA	NA	371 (88.1)
In the effectiveness of your personal protective equipment to prevent contracting COVID-19?	NA	NA	382 (90.7)
In the training you received to manage your current job scope during the COVID-19 outbreak?	NA	NA	363 (86.2)
In managing a suspected COVID-19 case during your work duties?	NA	NA	320 (76.0)
Do you consider current measures taken at hospitals to be adequate?			
Yes	516 (82.7)	368 (90.2)	364 (86.5)
Missing	59 (9.5)	27 (6.6)	10 (2.4)
Missing data for each question except question with missing data reported (%)	< 5	< 2	< 1
Emotions[c]	Participants Who Rated Emotions as ≥ 4		
Fear	244 (39.1)	171 (41.9)	95 (22.6)
Anxiety	217 (34.8)	152 (37.3)	94 (22.3)
Anger	123 (19.7)	71 (17.4)	55 (13.1)
Disgust	128 (20.5)	81 (19.9)	55 (13.1)
Helplessness	182 (29.2)	149 (36.5)	66 (15.7)
Missing data for each question (%)	< 7	< 3	0

NOTE. Data are No. (%) unless otherwise indicated.

Abbreviations: HCWs, health care workers; NA, not applicable because question was not asked.

[a]On a scale of 0% to 100% (0%, no risk; 100%, high risk).

[b]On a scale of 1 to 10 (1, not confident; 10, extremely confident).

[c]On a scale of 1 to 5 (1, not at all; 5, extremely).

of preparedness of health care facilities in Singapore to manage the COVID-19 outbreak (patients, 85.4%; caregivers, 89.5%; and HCWs, 89.3%). These responses are summarized in Table 2.

Burnout in HCWs

The prevalence of burnout in HCWs was 43.5%. In the univariable analysis, those who were more likely to experience burnout were: HCWs ≥ 40 years of age with

TABLE 3. Multivariable Model Examining Factors Associated With Anxiety

Variable	Patients (n = 584)			Caregivers (n = 398)			HCWs (n = 417)		
	With Anxiety, No. (%)	OR (95% CI)	P	With Anxiety, No. (%)	OR (95% CI)	P	With Anxiety, No. (%)	OR (95% CI)	P
Sex									
Male	43 (19.4)	1		41 (24.7)	1		13 (13.4)	1	
Female	71 (21.5)	1.18 (0.77 to 1.84)	.45	48 (23.1)	1.01 (0.61 to 1.68)	.98	45 (14.7)	1.05 (0.53 to 2.16)	.90
Missing	5 (16.1)	0.78 (0.24 to 2.08)	.64	3 (12.5)	0.42 (0.09 to 1.33)	.18	1 (7.7)	0.40 (0.02 to 2.57)	.42
Ethnicity									
Chinese	86 (19.2)	1		61 (20.6)	1		38 (12.3)	1	
Non-Chinese	32 (23.5)	1.22 (0.75 to 1.95)	.41	31 (30.4)	1.61 (0.95 to 2.70)	.075	21 (19.8)	1.54 (0.79 to 2.92)	.19
Missing	1 (100.0)	—		0 (0.0)	—		0 (0.0)	—	
Income, S$									
> 5,000	12 (13.3)	1		18 (19.6)	1		19 (12.9)	1	
2,500-5,000	19 (18.4)	0.99 (0.42 to 2.36)	.98	22 (20.0)	1.06 (0.52 to 2.21)	.87	24 (12.2)	0.74 (0.35 to 1.61)	.45
< 2,500	86 (23.0)	1.33 (0.66 to 2.81)	.44	50 (26.3)	1.30 (0.66 to 2.62)	.46	13 (27.7)	2.14 (0.76 to 5.94)	.14
Missing	2 (11.8)	0.51 (0.07 to 2.27)	.43	2 (33.3)	1.88 (0.23 to 11.33)	.50	3 (11.5)	0.86 (0.18 to 2.95)	.82
Education									
Graduate and above	22 (13.3)	1		32 (19.4)	1		41 (13.5)	1	
Nongraduate	93 (22.7)	1.80 (1.04 to 3.23)	.041	59 (25.7)	1.17 (0.68 to 2.03)	.58	18 (17.0)	0.91 (0.43 to 1.86)	.80
Missing	4 (50.0)	6.73 (1.40 to 33.22)	.015	1 (33.3)	1.82 (0.08 to 22.58)	.65	0 (0.0)	—	
Marital status									
Single	12 (11.4)	1		19 (14.5)	1		26 (13.0)	1	
Married	107 (22.5)	2.11 (1.14 to 4.22)	.025	72 (27.4)	2.08 (1.19 to 3.78)	.013	33 (15.2)	1.25 (0.68 to 2.33)	.47
Missing	0 (0.0)	—		1 (25.0)	1.57 (0.07 to 14.19)	.71	0 (0.0)	—	
Profession									
Doctor/nurse							28 (11.7)	1	
Other							30 (17.3)	1.72 (0.94 to 3.17)	.08
Missing							1 (20.0)	2.52 (0.12 to 19.85)	.43

Abbreviations: HCWs, health care workers; OR, odds ratio.

TABLE 4. Fears Reported by Participants

Questions	Very Much or Extremely Worried or Fearful			P (between patients and caregivers)	P (among the 3 groups)
	Patients (n = 624)	Caregivers (n = 408)	HCWs (n = 421)		
I am worried about contracting COVID-19	331 (53.0)	200 (49.0)	119 (28.3)	.164	< .001
I am afraid as COVID-19 is very contagious	369 (59.1)	239 (58.6)	144 (34.2)	.741	< .001
I am worried because COVID-19 symptoms may be too mild to recognize in time	376 (60.3)	266 (65.2)	198 (47.0)	.185	< .001
I am afraid because COVID-19 may have mass community spreading (patients, caregivers)/I am afraid because COVID-19 is hard to contain in the community (HCWs)	442 (70.8)	281 (68.9)	169 (40.1)	.368	< .001
I am worried about having to come to hospitals/I am worried about having to come to work	244 (39.1)	145 (35.5)	49 (11.6)	.174	< .001
I am worried that there is currently no targeted treatment or vaccination for COVID-19	385 (61.7)	282 (69.1)	138 (32.8)	.039	< .001
I worry that treatment of COVID-19 may not work for people with cancer	320 (51.3)	238 (58.3)	NA	.053	
I worry that cancer treatment makes patients less resistant to COVID-19	350 (56.1)	269 (65.9)	NA	.004	
I worry about disruptions to cancer treatment due to the COVID-19 outbreak	343 (55.0)	273 (66.9)	NA	< .001	
I worry the availability of cancer treatment supplies would be affected by COVID-19	236 (37.8)	179 (43.9)	NA	.078	
I worry about not being able to afford medical costs due to the economic implications of COVID-19	290 (46.5)	228 (55.9)	NA	.006	
Missing data for each question	< 4%	< 2%	0%		
If I were to contract COVID-19 (patients and HCWs)/if the patient I am caring for were to contract COVID-19 (caregivers)					
I worry that my last hours will be spent alone (patients)/I worry that the patient's last hours will be spent alone (caregivers)	301 (48.2)	310 (76.0)	NA	< .001	
I worry that COVID-19 may aggravate my cancer (patients)/I worry that COVID-19 may aggravate the patient's cancer (caregivers)	323 (51.8)	277 (67.9)	NA	< .001	
I am afraid that I will not be prioritized for treatment in intensive care units (patients and HCWs)/I am afraid that the patient will not be prioritized for treatment in intensive care units (caregivers)	280 (44.9)	239 (58.6)	64 (15.2)	< .001	< .001
I am afraid of having to be isolated (patients and HCWs)/I am afraid that the patient will need to be isolated (caregivers)	293 (47.0)	266 (65.2)	103 (24.5)	< .001	< .001
With appropriate protective measures, I would want my family members to be with me (patients and HCWs)/with appropriate protective measures, I would want to be with the patient (caregivers)	489 (78.4)	386 (94.6)	179 (42.5)	< .001	< .001
Missing	37 (5.9)	15 (3.7)	6 (1.4)		
Summary scores (fears and worries)					
General COVID-19 worries (summation of first 6 questions)	412 (66.0)	297 (72.8)	175 (41.6)	.106	< .001
Missing	33 (5.3)	9 (2.2)	0 (0.0)		
Impact of COVID-19 on cancer and cancer treatment worries (summation of subsequent 9 questions)	340 (54.5)	294 (72.1)	NA	< .001	
Missing	58 (9.3)	20 (4.9)	NA		
Missing data for each question except question with missing data reported (%)	< 5	< 2	1		

NOTE. Data are No. (%) unless otherwise indicated.
Abbreviation: NA, not applicable because HCWs were not asked these questions.

TABLE 5. Multivariable Model Examining Factor Associated With Fears

	General COVID-19 Fears									COVID-19 Impact on Cancer Fears					
	Patients (n = 591)			Caregivers (n = 399)			HCWs (n = 421)			Patients (n = 566)			Caregivers (n = 388)		
Variable	No. Fearful (%)	OR (95% CI)	P	No. Fearful (%)	OR (95% CI)	P	No. Fearful (%)	OR (95% CI)	P	No. Fearful (%)	OR (95% CI)	P	No. Fearful (%)	OR (95% CI)	P
Age, years															
< 40	210 (69.1)	1		235 (73.9)	1		120 (41.4)	1		174 (59.6)	1		239 (76.6)	1	
40-59															
≥ 60	188 (70.4)	0.93 (0.62 to 1.38)	0.72	55 (78.6)	1.07 (0.54 to 2.20)	0.72	50 (42.7)	0.99 (0.58 to 1.68)	0.98	155 (60.3)	1.02 (0.70 to 1.49)	0.91	46 (70.8)	0.48 (0.24 to 0.97)	0.039
Missing	14 (70.0)	1.11 (0.41 to 3.34)	0.84	7 (63.6)	0.72 (0.20 to 3.01)	0.84	5 (35.7)	0.50 (0.11 to 1.87)	0.32	11 (64.7)	1.40 (0.49 to 4.30)	0.54	9 (81.8)	1.33 (0.31 to 9.30)	0.73
Sex															
Male	160 (69.9)	1		133 (79.6)	1		35 (36.1)	1		129 (58.4)	1		126 (76.4)	1	
Female	228 (69.5)	0.98 (0.66 to 1.43)	0.91	152 (73.4)	0.77 (0.46 to 1.29)	0.33	135 (43.4)	0.97 (0.58 to 1.62)	0.90	192 (61.5)	1.14 (0.79 to 1.64)	0.49	153 (77.3)	0.95 (0.56 to 1.59)	0.83
Missing	24 (70.6)	0.93 (0.42 to 2.21)	0.87	12 (48.0)	0.24 (0.10 to 0.58)	0.002	5 (38.5)	1.06 (0.28 to 3.73)	0.93	19 (57.6)	0.81 (0.37 to 1.77)	0.59	15 (60.0)	0.43 (0.17 to 1.12)	0.077
Ethnicity															
Chinese	304 (67.0)	1		216 (73.0)	1		113 (36.2)	1		250 (57.6)	1		215 (74.9)	1	
Non-Chinese	106 (78.5)	1.66 (1.05 to 2.69)	0.034	80 (78.4)	1.41 (0.80 to 2.53)	0.244	61 (56.5)	1.76 (1.07 to 2.88)	0.025	88 (67.7)	1.49 (0.98 to 2.30)	0.067	79 (78.2)	1.13 (0.64 to 2.04)	0.677
Missing	2 (100.0)	—	—	1 (100.0)	—	—	1 (100.0)	—	—	2 (100.0)	—	—	0 (0.0)	—	—
Income, $															
> 5,000	58 (64.4)	1		68 (72.3)	1		41 (27.7)	1		46 (55.4)	1		67 (71.3)	1	
2,500-5,000	64 (61.0)	0.92 (0.48 to 1.75)	0.8	81 (74.3)	1.16 (0.60 to 2.25)	0.8	89 (44.5)	1.51 (0.86 to 2.68)	0.153	54 (55.7)	0.99 (0.52 to 1.89)	0.99	76 (70.4)	0.95 (0.50 to 1.80)	0.87
< 2,500	279 (73.6)	1.66 (0.94 to 2.90)	0.076	142 (74.7)	1.11 (0.57 to 2.12)	0.076	30 (63.8)	2.50 (1.07 to 5.94)	0.035	229 (61.7)	1.25 (0.72 to 2.14)	0.42	145 (80.6)	1.92 (0.97 to 3.79)	0.061
Missing	11 (64.7)	1.15 (0.38 to 3.85)	0.81	6 (100.0)	—	—	15 (57.7)	3.33 (1.31 to 8.76)	0.012	11 (73.3)	2.05 (0.62 to 8.11)	0.26	6 (100.0)	—	—
Education															
Graduate and above	120 (70.6)	1		120 (72.7)	1		107 (35.1)	1		94 (59.1)	1		121 (74.2)	1	
Nongraduate	286 (69.6)	0.82 (0.52 to 1.28)	0.39	175 (75.8)	1.03 (0.60 to 1.75)	0.39	65 (59.6)	1.98 (1.15 to 3.43)	0.013	240 (60.2)	0.96 (0.63 to 1.46)	0.85	172 (77.5)	1.03 (0.59 to 1.79)	0.92
Missing	6 (60.0)	0.53 (0.13 to 2.32)	0.37	2 (66.7)	0.86 (0.07 to 21.43)	0.37	3 (42.9)	1.10 (0.20 to 5.47)	0.907	6 (75.0)	1.83 (0.38 to 13.29)	0.48	1 (33.3)	0.15 (0.01 to 1.84)	0.15
Marital															
Single	61 (59.8)	1		85 (66.9)	1		82 (41.0)	1		50 (52.1)	1		89 (72.4)	1	
Married	348 (71.8)	1.66 (1.04 to 2.63)	0.033	210 (78.4)	1.69 (1.03 to 2.78)	0.033	93 (42.1)	1.07 (0.67 to 1.69)	0.78	288 (61.7)	1.42 (0.89 to 2.25)	0.14	203 (77.8)	1.45 (0.85 to 2.45)	0.17
Missing	3 (75.0)	2.05 (0.24 to 43.19)	0.55	2 (50.0)	0.22 (0.01 to 2.46)	0.55	0 (0.0)	—	—	2 (66.7)	1.93 (0.18 to 42.88)	0.60	2 (50.0)	0.14 (0.01 to 1.56)	0.12
Profession															
Doctor/nurse							89 (37.1)	1							
Other							85 (48.3)	1.33 (0.85 to 2.07)	0.21						
Missing							1 (20.0)	0.29 (0.01 to 2.33)	0.30						

Abbreviations: HCWs, health care workers; OR, odds ratio.

a monthly income of S$2,500-S$5,000 (compared with > S$5,000), who were single, were anxious, were fearful, perceived support from family, perceived a lack of support from their social circle, perceived a lack of support from the general public, perceived condemnation by the general public, perceived a risk of contracting COVID-19, and had low confidence in the level of preparedness of health care facilities. In the multivariable analysis, younger HCWs (OR, 1.83; 95% CI, 1.09 to 3.12; $P = .024$) and HCWs who were anxious (OR, 5.92; 95% CI, 3.06 to 12.18; $P < .1$) and fearful (OR, 1.89; 95% CI, 1.23 to 2.93; $P = .004$) were more likely to experience burnout. In addition, HCWs with perceived lack of support from their social circle, perceived lack of support, perceived condemnation by the public, high perceived risk of contracting COVID-19, and low confidence in the level of preparedness of health care facilities were associated with higher rates of burnout in the multivariable analysis (Table 6).

DISCUSSION

In this cross-sectional survey of patients with cancer, their caregivers, and HCWs, we found elevated levels of perceived risk, anxiety, and fears. Despite this, confidence in HCWs and health care facilities was high, and burnout among HCWs was not increased from pre-COVID-19 rates.

Perceived risk of encountering patients with COVID-19 and of contracting COVID-19 were high in all groups but lower among patients and caregivers compared with HCWs. Many patients with cancer and their caregivers already took precautionary measures even before the COVID-19 outbreak because of the immunocompromised status of the patients. This may contribute to the relatively lower perceived risk as well, compared with the population of patients with chronic disease described by Wolf et al.[26] Patients, however, felt that they had a higher risk of having severe complications if they contracted COVID-19 and lower chances of recovery, again reflecting their understanding of their immunocompromised state.

Given the high levels of perceived risk, it is not surprising that the prevalence of anxiety among patients, caregivers, and HCWs is high. This is concerning because it is many times higher than the prevalence of GAD in Singapore, which was at 1.6% in 2016.[27] This epidemiologic study used the WHO Composite International Diagnostic Interview,[28] an established instrument used in psychiatric epidemiologic studies. Despite the differences in instruments used, which precludes direct comparison, juxtaposing our results with the results by Chang et al[27] provides an approximation of the impact of COVID-19 on anxiety levels in our participants. Lai et al [29] found that 12.3% of HCWs treating patients with COVID-19 in China were at least moderately anxious (GAD-7 ≥ 10). In another study of Italian HCWs, 19.8% of participants reported high levels of anxiety (GAD-7 ≥ 15) compared with 4.8% in our study. Thomaier et al[30] found that 62.0% of oncology HCWs

in the United States were anxious, with perceptions of inadequate personal protective equipment (PPE) and practicing in a state with more patients with COVID-19 increasing anxiousness. The prevalence rates of anxiety among our HCWs were similar to levels found in China and lower than those found in the Western countries. There may be a possible role of ethnicity, given that both Singapore and China have a predominance of Chinese HCWs. Our study also showed that non-Chinese HCWs were more likely to report higher COVID-19 fears; however, this was not observed for burnout or anxiety. In addition, the lower rates of anxiety among HCWs in Singapore and China could be a result of the adequate supply of PPE provided to HCWs and the effective public health interventions implemented by these countries to manage the pandemics (Singapore and China have a lower number of confirmed patients with COVID-19 compared with the United States and Italy[31]). Furthermore, Singapore has a particularly low COVID-19 death rate of 0.05% (total deaths of 27 as of August 6, 2020), further reassuring the population.[31]

In addition to anxiety, participants also reported high levels of fear. To address these negative emotions, it will be helpful to understand the underlying reasons for fears. The top concern by caregivers was that their loved ones would die alone should they contract COVID-19, and many would sacrifice their own safety and be willing to be with their loved ones in these moments, with appropriate protective measures. Although there is a need to limit visitors to patients with COVID-19 to minimize the risk of transmission, this concern must be balanced against the distress caused by separation of caregivers from patients in such situations. As reports of asymptomatic carriers who are infectious are emerging,[32] it is no surprise that HCWs' top concern is that of COVID-19 symptoms being too mild to be recognized in time. This results in a lack of confidence in their own ability and other HCWs' ability to diagnose COVID-19.

Despite the high level of perceived risks, anxiety, and fears, confidence in HCWs and facilities remained high at NCCS. This was achieved at two levels: institutional and national. At the institutional level, strict temperature screening and travel/contact declarations were required of all patients, caregivers, and HCWs as soon as the first few patients with COVID-19 were reported in Singapore (Fig 1). Adequate PPE was issued to all HCWs and refresher training provided. On the national level, constant updates through mobile phones, the Internet, and traditional media were provided. In addition, border restrictions and contact tracing were used to contain the spread of COVID-19 in the community. This finding is in contrast with the low confidence that patients in one US study had of their federal government response,[26] and emphasizes the important role that HCWs and authorities play in allaying the fears that many patients and caregivers have.

TABLE 6. Univariable and Multivariable Models Examining Factors Associated With Burnout

		Univariable		Multivariable	
Variable/Question	Burnout,[a] No. (%)	OR (95% CI)	P	OR (95% CI)	P
Age[b], years					
≥ 40	37 (32.7)	1		1	
< 40	140 (49.6)	2.03 (1.29 to 3.22)	.002	1.83 (1.09 to 3.12)	.024
Missing	6 (54.5)	2.46 (0.70 to 9.06)	.157	2.30 (0.53 to 9.97)	.254
Sex					
Male	42 (44.7)	1		1	
Female	136 (45.3)	1.03 (0.65 to 1.64)	.912	0.96 (0.58 to 1.58)	.87
Missing	5 (41.7)	0.88 (0.25 to 2.97)	.843	0.65 (0.17 to 2.33)	.518
Ethnicity					
Chinese	130 (43.3)	1		1	
Non-Chinese	52 (49.5)	1.28 (0.82 to 2.01)	.273	1.27 (0.77 to 2.09)	.345
Missing	1 (100.0)	—		—	
Income, $[c]					
> 5,000	56 (38.6)	1		1	
2,500-5,000	97 (50.3)	1.61 (1.04 to 2.49)	.034	1.08 (0.62 to 1.86)	.79
< 2,500	23 (52.3)	1.74 (0.88 to 3.45)	.11	1.03 (0.44 to 2.40)	.945
Missing	7 (29.2)	0.65 (0.24 to 1.62)	.377	0.49 (0.16 to 1.33)	.181
Education					
Postgraduate and above	132 (44.1)	1		1	
Graduate	49 (48.5)	1.19 (0.76 to 1.87)	.446	1.24 (0.72 to 2.15)	.444
Missing	2 (33.3)	0.63 (0.09 to 3.29)	.6	0.62 (0.08 to 3.44)	.599
Marital status[b]					
Married	100 (51.3)	1		1	
Single	83 (39.3)	1.62 (1.10 to 2.41)	.016	1.37 (0.87 to 2.14)	.171
Profession					
Doctor/nurse	99 (42.3)	1		1	
Other	81 (48.2)	1.27 (0.85 to 1.89)	.24	1.18 (0.76 to 1.83)	.465
Missing	3 (75.0)	4.09 (0.52 to 83.37)	.225	4.43 (0.50 to 95.03)	.218
The following questions were controlled for the above demographic factors					
Anxiety[a]					
GAD < 10	137 (39.7)	1		1	
GAD ≥ 10	45 (77.6)	5.26 (2.81 to 10.48)	< .001	5.92 (3.06 to 12.18)	< .001

(Continued on following page)

TABLE 6. Univariable and Multivariable Models Examining Factors Associated With Burnout (Continued)

Variable/Question	Burnout,[a] No. (%)	Univariable		Multivariable	
		OR (95% CI)	P	OR (95% CI)	P
Missing	1 (33.3)	0.76 (0.04 to 8.00)	.823	0.80 (0.04 to 9.15)	.864
General COVID-19 fears[a]					
Not fearful	93 (38.9)	1		1	
Fearful	90 (53.9)	1.83 (1.23 to 2.74)	.003	1.89 (1.23 to 2.93)	.004
Perceived support by family[b]					
Supported	120 (41.4)	1		1	
Not supported	62 (54.4)	1.69 (1.09 to 2.62)	.019	1.50 (0.94 to 2.39)	.089
Missing	1 (50.0)	1.42 (0.06 to 36.06)	.806	1.70 (0.06 to 45.28)	.715
Perceived support by social circle[a]					
Supported by social circle	95 (38.2)	1		1	
Not supported by social circle	87 (56.1)	2.07 (1.38 to 3.13)	< .001	1.97 (1.29 to 3.02)	.002
Missing	1 (50.0)	1.62 (0.06 to 41.32)	.734	2.10 (0.08 to 56.23)	.61
Perceived support by general public[a]					
Supported by general public	39 (30.7)	1		1	
Not supported by general public	143 (51.6)	2.41 (1.55 to 3.78)	< .001	2.29 (1.45 to 3.68)	< .001
Missing	1 (50.0)	2.26 (0.09 to 58.04)	.569	2.88 (0.11 to 77.69)	.47
Perceived condemnation by general public[a]					
Not condemned by general public	161 (42.5)	1		1	
Condemned by general public	20 (83.3)	6.77 (2.50 to 23.62)	.001	5.94 (2.11 to 21.32)	.002
Missing	2 (66.7)	2.71 (0.26 to 58.57)	.418	3.96 (0.35 to 90.08)	.278
How confident are you in the level of preparedness of health care facilities in Singapore to manage the COVID-19 outbreak?[a]					
Confident	154 (42.1)	1		1	
Not confident	29 (72.5)	3.63 (1.81 to 7.80)	< .001	3.97 (1.93 to 8.71)	< .001
How confident are you in HCW ability to recognize symptoms of COVID-19?[a]					
Confident	126 (41.0)	1		1	
Not confident	57 (57.6)	1.95 (1.24 to 3.10)	.004	2.01 (1.24 to 3.26)	.005
How confident are you that your infection control training can help prevent contracting COVID-19?[a]					
Confident	155 (42.9)	1		1	
Not confident	28 (62.2)	2.19 (1.17 to 4.21)	.016	2.03 (1.06 to 4.02)	.036

(Continued on following page)

TABLE 6. Univariable and Multivariable Models Examining Factors Associated With Burnout (Continued)

Variable/Question	Burnout,[a] No. (%)	Univariable		Multivariable	
		OR (95% CI)	P	OR (95% CI)	P
How confident are you in the effectiveness of your PPE?[a,c]					
Confident	157 (42.4)	1		1	
Not confident	26 (72.2)	3.53 (1.70 to 7.87)	.001	3.25 (1.51 to 7.50)	.004
How confident are you in the training you received to manage your current job scope?[b]					
Confident	149 (42.5)	1		1	
Not confident	34 (61.8)	2.19 (1.23 to 3.99)	.008	2.15 (1.17 to 4.02)	.014
How confident are you in managing a suspected COVID-19 case during your work duties?[b]					
Confident	124 (39.9)	1		1	
Not confident	59 (62.1)	2.47 (1.55 to 3.99)	< .001	2.25 (1.37 to 3.75)	.001
How likely do you think you will contract COVID-19?[d]					
Low risk	135 (41.8)	1		1	
High risk	47 (57.3)	1.87 (1.15 to 3.07)	.012	1.88 (1.13 to 3.15)	.016
Missing	1 (100.0)	—		—	

Abbreviations: GAD, generalized anxiety disorder-7; HCW, health care worker; OR, odds ratio; PPE, personal protective equipment.

[a]Definition: Emotional exhaustion ≥ 27 and/or depersonalization ≥ 10.

[b]Significant by multivariable analysis.

[c]15 patients missing.

[d]Significant by univariable analysis.

Surprisingly, despite the immense pressure at the frontline, we found a low rate of burnout: 43.5% of all HCWs. This is lower than rates reported among US physicians (54.4%)[33] and Chinese oncologists (51.0%) prepandemic.[34] Younger HCWs, those with a lower income, and single HCWs were more likely to report burnout on univariable analysis. However, on multivariable analysis, only younger HCWs were associated with burnout. It is likely that those who are younger have a lower income and are also single. Previous studies have found that younger HCWs were more likely to experience greater psychological effects.[29,30,35]

Although it is reassuring that burnout rates are not elevated compared with prepandemic periods, they may possibly increase as the pandemic drags on. We found multiple modifiable factors associated with burnout that may be amendable to interventions. Perceived support from friends and the public was associated with a lower rate of burnout; perceived condemnation from the public was associated with a higher rate of burnout. There were multiple reports of HCWs being ostracized by family and the public in Singapore at the onset of the pandemic.[36] However, the authorities were quick to speak out against this and led by example to appreciate HCWs. There has since been an outpouring of support from the public.[37] This highlights the importance of public education to bolster support for HCWs to combat burnout. HCWs who are anxious and more fearful are at increased risk of burnout. With the prevalence of anxiety many times above the prepandemic rates, it is important to monitor the psychological health of this group of HCWs through psychological wellness and peer-support programs. Policies should be targeted at alleviating fears of HCWs by instituting strict gatekeeping policies to segregate patients at highest risk of COVID-19 from those with lower risk and ensuring adequate supplies of effective PPE. If insufficient attention is paid to supporting HCWs, we will lose our most prized resource in this pandemic.

This study has limitations. First, this study was conducted in a single institution; findings may have limited generalizability. However, we believe that the experiences faced by the study participants may reflect the experiences faced by patients with other chronic diseases that require regular visits to a health care facility. Second, the cross-sectional nature of the study only allows for understanding current emotions, fears, and risk perceptions. Because the pandemic has evolved rapidly since the publication of these data, we were not able to study how those developments may have affected our study population. One of the strengths of our study is the large sample size, which allowed for a diverse population. In addition, with more studies reporting the negative impact of COVID-19 on cancer treatment (eg, delayed diagnosis and treatment),[38] this study gives key insights into the psychological effect of the pandemic on patients, caregivers, and HCWs that can help shape policies at the institutional and national levels. This study was completed within 17 days during the most acute period in Singapore (during the lockdown) and allowed for an accurate depiction of the impact of these measures on the psychological well-being of our study population.

Fears, perceived risk, and anxiety among patients, caregivers, and HCWs were significantly elevated as a result of the pandemic. Reassuringly, confidence in health care facilities remained high, and burnout rates among HCWs were similar to rates previously reported. An individualized approach to target the specific fears and perceived risk of each group will be crucial to maintain the psychological well-being of these vulnerable groups and prevent burnout of HCWs.

AFFILIATIONS
[1]Division of Medical Oncology, National Cancer Centre, Singapore
[2]Division of Clinical Trials and Epidemiological Sciences, National Cancer Centre, Singapore
[3]Oncology Academic Clinical Program, Duke-NUS Graduate Medical School, Singapore
[4]Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore
[5]Division of Radiation Oncology, National Cancer Centre, Singapore
[6]Department of Pharmacy, National Cancer Centre, Singapore
[7]Department of Nursing, National Cancer Centre, Singapore
[8]Division of Oncological Imaging, National Cancer Centre, Singapore

CORRESPONDING AUTHOR
Joanne Ngeow, MBBS, MPH, Division of Medical Oncology, National Cancer Centre Singapore, 11 Hospital Crescent, Singapore 169610.

EQUAL CONTRIBUTION
G.K. and J.N. are joint last authors.

Ming Xuan Chia, Jo Lene Leow, Jin Wei Kwek, Rebecca Dent, William Ying Khee Hwang, Konstadina Griva, Joanne Ngeow
Manuscript writing: All authors
Final approval of manuscript: All authors
Accountable for all aspects of the work: All authors

REFERENCES

1. COVID-19 Coronavirus Pandemic, Worldometer, 2020. https://www.worldometers.info/coronavirus/
2. Chang H-J, Huang N, Lee C-H, et al: The impact of the SARS epidemic on the utilization of medical services: SARS and the fear of SARS. Am J Public Health 94:562-564, 2004
3. Maunder R, Hunter J, Vincent L, et al: The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. CMAJ 168:1245-1251, 2003
4. Lu TH, Chou YJ, Liou CS: Impact of SARS on healthcare utilization by disease categories: Implications for delivery of healthcare services. Health Policy 83:375-381, 2007
5. Neal RD, Tharmanathan P, France B, et al: Is increased time to diagnosis and treatment in symptomatic cancer associated with poorer outcomes? Systematic review. Br J Cancer 112:S92-S107, 2015 (suppl 1)
6. Liang W, Guan W, Chen R, et al: Cancer patients in SARS-CoV-2 infection: A nationwide analysis in China. Lancet Oncol 21:335-337, 2020
7. Burki TK: Cancer guidelines during the COVID-19 pandemic. Lancet Oncol 21:P629-P630, 2020
8. Gossage L: Coronavirus means difficult, life-changing decisions for me and my cancer patients. The Guardian, United Kingdom. 2020. https://www.theguardian.com/society/2020/mar/19/cancer-patients-coronavirus-outbreak-difficult-decisions
9. Smith SK, Herndon JE, Lyerly HK, et al: Correlates of quality of life-related outcomes in breast cancer patients participating in the Pathfinders pilot study. Psychooncology 20:559-564, 2011
10. Pinquart M, Duberstein PR: Associations of social networks with cancer mortality: A meta-analysis. Crit Rev Oncol Hematol 75:122-137, 2010
11. Authers DM: A sacred walk: Dispelling the fear of death and caring for the dying. Tampa, FL, A & A Publishing, 2008
12. World Health Organization Coronavirus disease (COVID-19) advice for the public, 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public
13. Brooks SK, Webster RK, Smith LE, et al: The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. Lancet 395:912-920, 2020
14. Cortiula F, Pettke A, Bartoletti M, et al: Managing COVID-19 in the oncology clinic and avoiding the distraction effect. Ann Oncol 31:553-555, 2020
15. Wu Y, Wang J, Luo C, et al: A comparison of burnout frequency among oncology physicians and nurses working on the frontline and usual wards during the COVID-19 epidemic in Wuhan, China. J Pain Symptom Manage 60:e60-e65, 2020
16. Singapore Department of Statistics: Population Trends 2019. https://www.singstat.gov.sg/-/media/files/publications/population/population2019.pdf
17. Ministry of Health Singapore: 57 more cases discharged, 1,016 new cases of COVID-19 infection confirmed. 2020. https://www.moh.gov.sg/news-highlights/details/57-more-cases-discharged-1-016-new-cases-of-covid-19-infection-confirmed
18. Ministry of Health Singapore: Circuit breaker to minimise further spread of COVID-19. Singapore. 2020. https://www.moh.gov.sg/news-highlights/details/circuit-breaker-to-minimise-further-spread-of-covid-19
19. Chapman GB, Coups EJ: Emotions and preventive health behavior: Worry, regret, and influenza vaccination. Health Psychol 25:82-90, 2006
20. Spitzer RL, Kroenke K, Williams JB, et al: A brief measure for assessing generalized anxiety disorder: The GAD-7. Arch Intern Med 166:1092-1097, 2006
21. Leung GM, Quah S, Ho LM, et al: A tale of two cities: Community psychobehavioral surveillance and related impact on outbreak control in Hong Kong and Singapore during the severe acute respiratory syndrome epidemic. Infect Control Hosp Epidemiol 25:1033-1041, 2004
22. Zhai G, Suzuki T: Risk perception in Northeast Asia. Environ Monit Assess 157:151-167, 2009
23. Schaufeli WB, Bakker AB, Hoogduin K, et al: On the clinical validity of the Maslach burnout inventory and the burnout measure. Psychol Health 16:565-582, 2001
24. Maslach CM, Jackson SE, Leiter MP: Maslach Burnout Inventory Manual. Palo Alto, CA, Consulting Psychologists Press, 1996
25. R Foundation: The R Project for Statistical Computing. https://www.r-project.org/
26. Wolf MS, Serper M, Opsasnick L, et al: Awareness, attitudes, and actions related to COVID-19 among adults with chronic conditions at the onset of the U.S. outbreak: A cross-sectional survey. Ann Intern Med 173:100-109, 2020

27. Chang S, Abdin E, Shafie S, et al: Prevalence and correlates of generalized anxiety disorder in Singapore: Results from the second Singapore Mental Health Study. J Anxiety Disord 66:102106, 2019

28. Kessler RC, Aguilar-Gaxiola S, Alonso J, et al: The global burden of mental disorders: An update from the WHO World Mental Health (WMH) surveys. Epidemiol Psychiatr Soc 18:23-33, 2009

29. Lai J, Ma S, Wang Y, et al: Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. JAMA Netw Open 3:e203976, 2020

30. Thomaier L, Teoh D, Jewett P, et al: Emotional health concerns of oncology physicians in the United States: Fallout during the COVID-19 pandemic. https://www.medrxiv.org/content/10.1101/2020.06.11.20128702v1

31. COVID-19 Coronavirus Pandemic. Worldometer. 2020. https://www.worldometers.info/coronavirus

32. Arons MM, Hatfield KM, Reddy SC, et al: Presymptomatic SARS-CoV-2 infections and transmission in a skilled nursing facility. N Engl J Med 382:2081-2090, 2020

33. Shanafelt TD, Hasan O, Dyrbye LN, et al: Changes in burnout and satisfaction with work-life balance in physicians and the general US working population between 2011 and 2014. Mayo Clin Proc 90:1600-1613, 2015 [Erratum: Mayo Clin Proc 91:276, 2016]

34. Ma S, Huang Y, Yang Y, et al: Prevalence of burnout and career satisfaction among oncologists in China: A national survey. Oncologist 24:e480-e489, 2019

35. Rossi R, Socci V, Pacitti F, et al: Mental health outcomes among frontline and second-line health care workers during the coronavirus disease 2019 (COVID-19) pandemic in Italy. JAMA Netw Open 3:e2010185, 2020

36. Loh M: Nurses in S'pore wary of being ostracised by public, even as work takes its toll during coronavirus outbreak, Today. Singapore Press Holdings, Singapore. 2020

37. Lim J: Covid-19 outbreak: Government to put up fund, online site for public to support healthcare workers, the vulnerable, Today. Singapore Press Holdings, Singapore. 2020. https://www.todayonline.com/singapore/covid-19-wuhan-coronavirus-outbreak-government-put-fund-online-site-public-support-healthcare-workers

38. Dinmohamed AG, Visser O, Verhoeven RHA, et al: Fewer cancer diagnoses during the COVID-19 epidemic in the Netherlands. Lancet Oncol 21:750-751, 2020

■ ■ ■