Short Communication

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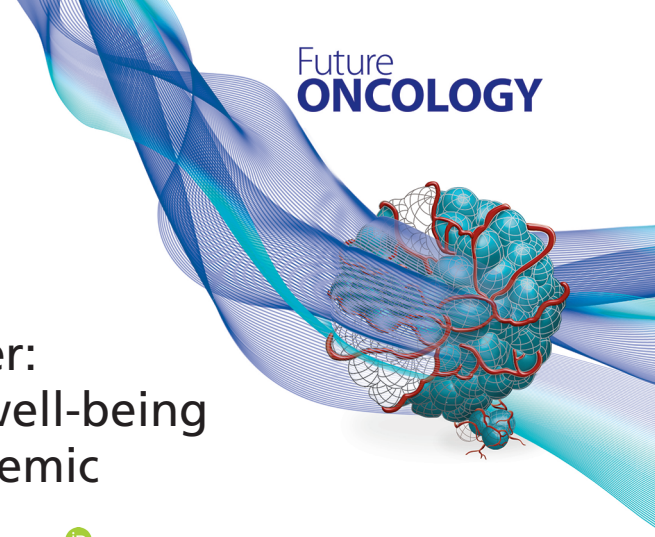

Cancer staff in an NHS cancer center: infections, vaccination, stress and well-being support during the COVID-19 pandemic

Hajer Hadi*[,‡,1], Jasmine Handford[‡,1], Beth Russell[1], Charlotte L Moss[1], Maria J Monroy Iglesias[1], Elke Rammant[1], Sue Smith[2], Saoirse Dolly[3], Kiruthikah Thillai[3], Anne Rigg[3] & Mieke Van Hemelrijck[1]

[1]Translational Oncology & Urology Research (TOUR), School of Cancer & Pharmaceutical Sciences, King's College London, London, SE1 9RT, UK

[2]Dimbleby Cancer Care, Guy's Cancer Centre, Guy's and St Thomas' NHS Foundation Trust (GSTT), London, SE1 9RT, UK

[3]Medical Oncology, Guy's and St Thomas' NHS Foundation Trust (GSTT), London, SE1 9RT, UK

*Author for correspondence: hajer.hadi@kcl.ac.uk

[‡]Authors contributed equally

Aim: To evaluate the impact of the pandemic on the well-being of cancer staff and determine the uptake of opt-in mitigation strategies. **Materials & methods:** Staff at Guy's Cancer Centre (London, UK) participated in an anonymized survey between May and August 2021. **Results:** Of 1182 staff, 257 (21.7%) participated. Ethnicity ($p = 0.020$) and comorbidity burden ($p = 0.022$) were associated with SARS-CoV-2 infection status. Of 199 respondents, seven (3.6%) were vaccine-hesitant, which was associated with low flu vaccine uptake ($p < 0.001$). Greater stress was associated with younger age ($p = 0.030$) and redeployment ($p = 0.012$). Lack of time and skepticism were barriers to using mental well-being resources. **Conclusion:** Albeit cautious, numerous trends the authors observed echo those in the published literature. Improved accessibility, awareness and utility of mental well-being resources are required.

Plain language summary: COVID-19 is caused by the SARS-CoV-2 virus. The pandemic has applied immense pressure to healthcare workers, putting their physical and mental well-being at risk. However, the impact for cancer staff, specifically, is less known. In a survey of 257 cancer staff at Guy's Cancer Centre (London, UK; May–August 2021), the authors found that staff of particular ethnic groups, or with pre-existing illnesses, appeared more likely to become infected with SARS-CoV-2. Few staff were hesitant about SARS-CoV-2 vaccination, appearing more common among those not receiving the flu vaccine. For many, stress increased over time. However, barriers prevent staff from using mental well-being resources. With findings from larger studies, this work will be useful for strategies protecting cancer staff well-being.

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Keywords: cancer staff • COVID-19 pandemic • mental well-being • mitigation strategy • physical well-being • SARS-CoV-2 infection • survey • vaccine-hesitant

COVID-19 is a clinical syndrome caused by infection with SARS-CoV-2. The COVID-19 pandemic has had a profound impact on healthcare systems around the world. Many have been forced to respond by redirecting resources and redeploying staff away from routine services and care. This includes the National Health Service (NHS) in the UK, where mortality rates due to SARS-CoV-2 infection were among the highest in the world in 2020 [1].

Healthcare professionals have had to bear much of the strain applied by the pandemic, putting their physical well-being at risk. In 2020, healthcare workers in the UK were seven-times more likely to contract severe SARS-CoV-2 infection than workers in non-essential professions [2]. As vaccination was found to be effective for mitigating the risk of severe SARS-CoV-2 infection, healthcare professionals were highly prioritized for the SARS-CoV-2 vaccine in the UK once mass rollout began in December 2020.

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The pandemic has also put the mental well-being of healthcare workers at risk. 50% of doctors experienced a progressive worsening of general health and well-being as the pandemic progressed [3] with negative impacts on mental well-being also observed internationally [4–15]. This has been exacerbated by redeployment, lack of training and unclear guidelines surrounding the pandemic [16].

The impact of the pandemic, specifically on the well-being of staff in the cancer sector, has been less fully elucidated. A study by the European Society for Medical Oncology (ESMO) provides an initial insight into the impact on mental well-being [17]. The survey of 1520 oncology professionals in 101 countries found that 38% of oncology professionals experienced feelings of burnout and 25% were at risk of distress. Two-thirds (66%) of oncology professionals felt unable to perform their duties as well as they could pre-pandemic [17]. Taken together, these findings suggest that urgent action is required to support and improve the mental well-being of oncology professionals. Moreover, this is important for ensuring that cancer patients continue to receive high-quality and sustained cancer services and care.

Guy's Cancer Centre (London, UK) provides cancer care on behalf of Guy's and St Thomas' NHS Foundation Trust. Medical treatment, rehabilitation, clinical trials and research are brought together under one roof at the site. Given its status as a specialized tertiary center, Guy's Cancer Centre receives a high volume of referrals and treats ~8000 cancer patients per year, with the patient cohort demonstrating considerable ethnic and sociodemographic variation, given its location within south east London [18]. The center, and in turn all its staff, has been under substantial pressure during the COVID-19 pandemic. Targeted, evidenced-based strategies must be put in place to protect the well-being of all staff supporting cancer care (clinical and nonclinical) for the remainder of the pandemic and beyond. To develop such strategies, an understanding of the impact of the pandemic on the physical and mental well-being of staff and their uptake of previous opt-in mitigation strategies (i.e., staff are able to choose whether to use the resources) is required. To the authors' knowledge, no study has been done to acknowledge this at Guy's Cancer Centre. Therefore, they conducted a survey among staff in the cancer directorate at Guy's Cancer Centre to address the following objectives:

1. To identify staff at particular risk of SARS-CoV-2 infection;
2. To understand the prevalence, and predictors, of vaccine hesitancy among staff;
3. To ascertain how the pandemic has affected stress levels among staff;
4. To determine the level of uptake of mental well-being resources.

Materials & methods

Survey design & deployment

A cross-sectional survey was designed to collect information relevant to the four research objectives (outlined above). The survey and all responses were hosted on RedCap (https://www.project-redcap.org/). Staff in the cancer directorate at Guy's Cancer Centre were invited via email to complete the online survey between May 2021 and August 2021. A reminder email, containing the current response rate, was sent 2 weeks after the initial email. All participants were informed of the survey's purpose and anonymous design in the initial invitation email. As this study was conducted as service evaluation (approved 4 May 2021 by Guy's and St Thomas' NHS Foundation Trust), ethical approval was not required.

The survey was developed through consultation with clinical staff and patients and incorporated adapted NHS questions from the government website on mental well-being. Overall, the questions addressed the following themes: demographics, SARS-CoV-2-related information (e.g., infection and redeployment status), SARS-CoV-2 vaccination status and perceptions, information relevant to staff interacting with patients and distress/burnout. For SARS-CoV-2-related information and distress/burnout, participants were asked to recall two time points: the first wave of the pandemic in the UK (defined as February 2020–November 2020) and the second wave of the pandemic in the UK (defined as December 2020–March 2021). The survey questions were mainly yes/no or multiple-choice answers, but some questions used a Likert scale to provide insight into access to mental well-being resources. A selection of questions used within the survey are listed below as examples:

- Which staff group do you consider yourself to be in? (Choices: doctor, nurse, trained/allied health student, allied health professional, admin and clerical staff, hospital support staff, other). Within the context of this survey, 'doctor' referred to hospital healthcare professionals excluding nurses and allied health staff, as the latter professions could choose the response that was specific to their role;

- Between February and November 2020, have you been redeployed? (Choices: yes, no);
- Compared with the first wave, how distressed did you feel during the second wave? (Choices: less stressed during the second wave, more stressed during the second wave, similar stress levels as during the first wave, I don't know);
- I know where to get support if my mental well-being is being impacted. (Choices: strongly agree, agree, neither agree nor disagree, disagree, strongly disagree).

Statistical methods

Proportions of total respondents were used as descriptive statistics for reporting participant characteristics. Chi-square tests were performed to identify staff characteristics associating with SARS-CoV-2 infection rates and attitudes toward SARS-CoV-2 vaccination. Attitudes toward vaccination were defined as positive (already received at least one dose of the vaccine or intend to receive the vaccine) or negative (no intention of receiving the vaccine). The Kruskal–Wallis test was used to identify staff characteristics associating with stress levels in the second wave relative to the first wave. Respondents with unknown or missing answers to survey questions were excluded from analyses. All statistical tests were two-sided. The threshold for statistical significance was defined as $\alpha = 0.05$. Statistical analyses were conducted using IBM SPSS Statistics for Windows version 27 (IBM Corp., NY, USA).

Results

Response rate

Overall, 257 out of 1182 staff in the cancer directorate took part in the survey, yielding an overall response rate of 21.7%.

Respondent characteristics

The sociodemographic characteristics of all respondents (n = 257) are summarized in Table 1. The majority self-identified as female (n = 201 [78.2%]) and of white ethnic background (n = 183 [71.2%]). Allied health professionals/students showed the greatest representation (n = 81 [31.5%]), followed by nurses (n = 63 [24.5%]). Respondents were mostly fit, with the majority being never smokers (n = 179 [69.6%]) and without any comorbidities (n = 153 [59.5%]).

Table 2 summarizes the SARS-CoV-2-related characteristics of all respondents (n = 257). The majority had received at least one dose of SARS-CoV-2 vaccination (n = 190 [73.9%]) and worked predominantly from the hospital (n = 188 [73.2%] during the first wave; n = 163 [63.4%] during the second wave). Redeployment rates remained consistent across both waves (n = 19 [7.4%] during the first wave; n = 20 [7.8%] during the second wave). The majority of redeployed staff were aged 40 years or below and were employed as a nurse or an allied health professional/student. Marginally more staff tested positive for SARS-CoV-2 during the second wave (n = 17 [6.6%]) compared with the first (n = 11 [4.3%]). Furthermore, over a third of those infected subsequently developed other health conditions (4 out of 11 [36.4%] during the first wave; 8 out of 17 [47.1%] during the second wave).

Staff at particular risk of SARS-CoV-2 infection

After excluding respondents with an unknown SARS-CoV-2 status in the first or second wave, 237 respondents were included in the analysis population for the first wave and 198 in the analysis population for the second wave.

During the first wave, only ethnicity showed a significant association with SARS-CoV-2 status (p = 0.020; Table 3). Staff of Black, Asian, mixed/multiple or other ethnic backgrounds showed greater representation among those that tested positive for SARS-CoV-2 (n = 5 [45.5%]) than those who remained negative (n = 62 [27.5%]). Albeit not statistically significant, there was a higher proportion of staff who tested positive for SARS-CoV-2 (compared with those who remained negative) in staff who were nurses (36.4 vs 23.9%), those who were never smokers (81.8 vs 67.7%), those who worked from the hospital (100 vs 78.3%) and those with no comorbidities (81.8 vs 59.3%; Table 3).

During the second wave, the number of comorbidities was significantly associated with SARS-CoV-2 status (p = 0.022), with a trend toward a greater burden of comorbidities among those who tested positive compared with those who remained negative (Table 3). Unlike the first wave, ethnicity was not significantly associated with SARS-CoV-2 status (p = 0.229). Although not statistically significant, there was a higher proportion of staff testing positive for SARS-CoV-2 (compared with those who remained negative) in staff who were redeployed (17.6 vs

Table 1. Sociodemographic characteristics of all respondents (n = 257).

Sociodemographic characteristic	Total n (%) n = 257
Age (years)	
20–30	58 (22.6)
31–40	72 (28.0)
41–50	60 (23.3)
51–60	49 (19.1)
60+	13 (5.1)
Missing	5 (1.9)
Sex	
Male	50 (19.5)
Female	201 (78.2)
Missing	6 (2.3)
Profession	
Doctor	42 (16.3)
Nurse	63 (24.5)
Allied health professional/student†	81 (31.5)
Admin and clerical staff	56 (21.8)
Other	15 (5.8)
Ethnicity	
White	183 (71.2)
Mixed/multiple ethnic groups	12 (4.7)
Asian/Asian British	32 (12.5)
Black/African/Caribbean/Black British	15 (5.8)
Other ethnic group	13 (5.1)
Missing	2 (0.8)
Smoking status	
Never	179 (69.6)
Past	56 (21.8)
Current	8 (3.1)
Missing	14 (5.4)
Healthcare discipline	
Clinical oncology	52 (20.2)
Medical oncology	56 (21.8)
Hemato oncology	26 (10.1)
Supportive care	14 (5.4)
Surgical oncology	24 (9.3)
Other	45 (17.5)
Missing	40 (15.6)
Comorbidities (n)	
0	153 (59.5)
1	62 (24.1)
2	15 (5.8)
≥3	5 (1.9)
Missing	22 (8.6)
Usually receive flu vaccine	
Yes	208 (80.9)
No	49 (19.1)
Pregnant or breastfeeding	
Yes	9 (3.5)
No or not applicable	246 (95.7)

†Comprised of allied health professionals (n = 80) and allied health students (n = 1).

Table 1. Sociodemographic characteristics of all respondents (n = 257) (cont.).

Sociodemographic characteristic	Total n (%) n = 257
Missing	2 (0.8)
Carer	
Yes	28 (10.9)
No	227 (88.3)
Missing	2 (0.8)

†Comprised of allied health professionals (n = 80) and allied health students (n = 1).

Table 2. SARS-CoV-2-related characteristics of all respondents (n = 257).

SARS-CoV-2-related characteristic	Total n (%) n = 257
SARS-CoV-2 positive test	
1st wave	
Yes	11 (4.3)
No	226 (87.9)
Missing	20 (7.8)
2nd wave	
Yes	17 (6.6)
No	181 (70.4)
Missing	59 (23.0)
SARS-CoV-2 vaccination doses received	
0	9 (3.5)
≥1	190 (73.9)
Missing	58 (22.6)
Attitude toward SARS-CoV-2 vaccination	
Positive (already vaccinated or intend to get vaccinated)	192 (74.7)
Negative (no intention of getting vaccinated)	7 (2.7)
Missing	58 (22.6)
Redeployed	
1st wave	
Yes	19 (7.4)
No	218 (84.8)
Prefer not to say or missing	20 (7.8)
2nd wave	
Yes	20 (7.8)
No	176 (68.5)
Prefer not to say or missing	61 (23.7)
Predominant place of work	
1st wave	
From home	46 (17.9)
In the hospital	188 (73.2)
In the community	2 (0.8)
Missing	21 (8.2)
2nd wave	
From home	31 (12.1)
In the hospital	163 (63.4)
In the community	2 (0.8)
Missing	61 (23.7)

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Table 3. SARS-CoV-2 status during first and second wave of the pandemic, stratified by staff characteristics.

Staff characteristic	SARS-CoV-2 status					
	1st wave (n = 237)			2nd wave (n = 198)		
	Pos (n = 11)	Neg (n = 226)	p-value[†]	Pos (n = 17)	Neg (n = 181)	p-value[†]
	n (%)	n (%)		n (%)	n (%)	
Age (years)			0.812			0.600
20–30	3 (27.3)	51 (22.6)		4 (23.5)	37 (20.4)	
31–40	3 (27.3)	63 (27.9)		4 (23.5)	51 (28.2)	
41–50	4 (36.4)	52 (23.0)		3 (17.6)	45 (24.9)	
51–60	1 (9.1)	45 (19.9)		6 (35.3)	35 (19.3)	
60+	0	11 (4.9)		0	9 (5.0)	
Missing	0	4 (1.7)		0	4 (2.3)	
Sex			0.874			0.772
Male	2 (18.2)	44 (19.5)		4 (23.5)	38 (21.0)	
Female	9 (81.8)	177 (78.3)		13 (76.5)	138 (76.2)	
Missing	0	5 (2.2)		0	5 (2.8)	
Profession/role			0.674			0.918
Doctor	2 (18.2)	36 (15.9)		3 (17.6)	32 (17.7)	
Nurse	4 (36.4)	54 (23.9)		3 (17.6)	45 (24.9)	
Allied health professional or student	4 (36.4)	71 (31.4)		5 (29.4)	57 (31.5)	
Admin and clerical staff	1 (9.1)	50 (22.1)		5 (29.4)	37 (20.4)	
Other	0	15 (6.6)		1 (5.9)	10 (5.5)	
Ethnicity			0.020			0.229
White	5 (45.5)	163 (72.1)		14 (82.4)	127 (70.2)	
Mixed/multiple ethnic groups	0	11 (4.9)		2 (11.8)	5 (2.8)	
Asian/Asian British	3 (27.3)	28 (12.4)		1 (5.9)	25 (13.8)	
Black/African/Caribbean/Black British	1 (9.1)	14 (6.2)		0	14 (7.7)	
Other ethnic group	1 (9.1)	9 (4.0)		0	8 (4.4)	
Missing	1 (9.1)	1 (0.4)		0	2 (1.1)	
Smoking status			0.591			0.290
Never	9 (81.8)	153 (67.7)		8 (47.1)	125 (69.1)	
Past	1 (9.1)	54 (23.9)		6 (35.3)	41 (22.7)	
Current	0	7 (3.1)		1 (5.9)	6 (3.3)	
Missing	1 (9.1)	12 (5.3)		2 (11.8)	9 (4.8)	
Comorbidities (n)			0.584			0.022
0	9 (81.8)	134 (59.3)		10 (58.8)	114 (63.0)	
1	2 (18.2)	55 (24.3)		5 (29.4)	40 (22.1)	
2	0	15 (6.6)		0	14 (7.7)	
≥3	0	5 (2.2)		2 (11.8)	2 (1.1)	
Missing	0	17 (7.5)		0	11 (6.1)	
Received ≥1 dose of SARS-CoV-2 vaccine[‡]						0.302
Yes	–	–		15 (88.2)	172 (95.0)	
No	–	–		2 (11.8)	7 (3.9)	
Missing	–	–		0	2 (1.1)	
Predominant place of work			0.391			0.197
From home	0	46 (20.4)		3 (17.6)	28 (15.5)	
In the hospital	11 (100)	177 (78.3)		13 (76.5)	150 (82.9)	
In the community	0	2 (0.9)		0	2 (1.1)	
Missing	0	1 (0.4)		1 (5.9)	1 (0.6)	

[†]Calculated using chi-square test.
[‡]Not stratified relative to SARS-CoV-2 status during the first wave, given that mass rollout of SARS-CoV-2 vaccines in the UK occurred from December 2020 onwards (i.e., after the definition of the first wave).
Neg: Did not test positive for SARS-CoV-2; Pos: Tested positive for SARS-CoV-2; PPE: Personal protective equipment.

Table 3. SARS-CoV-2 status during first and second wave of the pandemic, stratified by staff characteristics (cont.).

Staff characteristic	SARS-CoV-2 status					
	1st wave (n = 237)			2nd wave (n = 198)		
	Pos (n = 11)	Neg (n = 226)	p-value†	Pos (n = 17)	Neg (n = 181)	p-value†
	n (%)	n (%)		n (%)	n (%)	
Carer			0.935			0.295
Yes	1 (9.1)	27 (11.9)		0	22 (12.2)	
No	10 (90.9)	198 (87.6)		17 (100)	158 (87.3)	
Missing	0	1 (0.4)		0	1 (0.6)	
Redeployed			0.893			0.057
Yes	1 (9.1)	18 (8.0)		3 (17.6)	17 (9.4)	
No	10 (90.9)	208 (92.0)		13 (76.5)	163 (90.1)	
Missing	0	0		1 (5.9)	1 (0.6)	
Felt they had access to adequate PPE			0.714			0.629
Yes	6 (54.5)	105 (46.5)		11 (64.7)	134 (74.0)	
No	4 (36.4)	79 (35.0)		2 (11.8)	20 (11.0)	
Not applicable	1 (9.1)	42 (18.6)		4 (23.5)	27 (14.9)	

†Calculated using chi-square test.
‡Not stratified relative to SARS-CoV-2 status during the first wave, given that mass rollout of SARS-CoV-2 vaccines in the UK occurred from December 2020 onwards (i.e., after the definition of the first wave).
Neg: Did not test positive for SARS-CoV-2; Pos: Tested positive for SARS-CoV-2; PPE: Personal protective equipment.

9.4%), those who were admin/clerical staff (29.4 vs 20.4%), those who were past/current smokers (41.2 vs 26.0%) and those who had not received a dose of the SARS-CoV-2 vaccine (11.8 vs 3.9%; Table 3).

Prevalence & predictors of SARS-CoV-2 vaccine hesitancy

After excluding those with an unknown attitude toward SARS-CoV-2 vaccination (n = 58), 7 out of 199 respondents (3.6%) had negative perceptions of SARS-CoV-2 vaccination and therefore were deemed vaccine-hesitant. Reasons for vaccine hesitancy included distrust in the approval, manufacture and rollout of the vaccines; distrust in the government; apprehension about the side effects; the inability to choose a particular brand of vaccine; and perceptions of themselves as not being high-risk for SARS-CoV-2 infection.

To identify whether certain staff members were more likely to display vaccine hesitancy, the authors stratified staff perceptions toward SARS-CoV-2 vaccination (i.e., positive vs negative) by staff characteristics (Table 4). Vaccine hesitancy was significantly associated with respondents who do not usually receive the flu vaccine ($p < 0.001$). Sex ($p = 0.060$) and role ($p = 0.057$) were borderline significantly associated with vaccine hesitancy, with negative perceptions more common among staff who self-identify as female (n = 6 [85.7%]) or in nonpatient-facing roles such as admin/clerical positions (n = 4 [57.1%]). All doctors, allied health professionals/students and staff of Asian or mixed/multiple ethnic groups were positive in their perception toward vaccination.

Impact of the pandemic on stress

When asked whether staff had taken time off due to stress during the pandemic, 11 out of 257 (4.3%) reported taking stress leave. The proportion increased to 11 out of 180 (6.1%) of staff when excluding those who did not respond to the question (n = 77).

Second, when staff were asked to compare the level of stress they experienced during the first versus second wave of the pandemic, most staff experienced greater (n = 68 [38.6%]) or similar (n = 68 [38.6%]) levels of stress during the second wave compared with the first (Table 5). The authors excluded staff who did not respond to the question (n = 81), leaving 176 respondents in the analysis population. Greater levels of stress were associated with staff who were younger, self-identified as female, were nurses and allied health professionals/students, were redeployed during the second wave and worked in the hospital during the pandemic. Only the associations with age and redeployment reached statistical significance ($p = 0.030$ and $p = 0.012$, respectively; Table 5).

Table 4. Attitudes toward SARS-CoV-2 vaccination stratified by staff characteristics (n = 199).

Staff characteristic	Attitude toward SARS-CoV-2 vaccination		
	Negative† (n = 7)	Positive‡ (n = 192)	p-value§
	n (%)	n (%)	
Age (years)			0.429
20–30	1 (14.3)	41 (21.4)	
31–40	4 (57.1)	51 (26.6)	
41–50	0	49 (25.5)	
51–60	2 (28.6)	39 (20.3)	
60+	0	9 (4.7)	
Missing	0	3 (1.6)	
Sex			0.060
Male	0	42 (21.9)	
Female	6 (85.7)	146 (76.0)	
Missing	1 (14.3)	4 (2.1)	
Profession/role			0.057
Doctor	0	36 (18.8)	
Nurse	2 (28.6)	45 (23.4)	
Allied health professional or student	0	63 (32.8)	
Admin and clerical staff	4 (57.1)	38 (19.8)	
Other	1 (14.3)	10 (5.2)	
Ethnicity			0.118
White	4 (57.1)	139 (72.4)	
Mixed/multiple ethnic groups	0	8 (4.2)	
Asian/Asian British	0	25 (13.0)	
Black/African/Caribbean/Black British	2 (28.6)	11 (5.7)	
Other ethnic group	1 (14.3)	7 (3.6)	
Missing	0	2 (1.0)	
Smoking status			0.694
Never	4 (57.1)	130 (67.7)	
Past	2 (28.6)	45 (23.4)	
Current	0	7 (3.6)	
Missing	1 (14.3)	10 (5.2)	
Comorbidities (n)			0.694
0	4 (57.1)	120 (62.5)	
1	1 (14.3)	46 (24.0)	
2	1 (14.3)	13 (6.8)	
≥3	0	4 (2.1)	
Missing	1 (14.3)	9 (4.7)	
Usually receive flu vaccine			<0.001
Yes	0	163 (84.9)	
No	7 (100)	29 (15.1)	
Predominant place of work (1st wave)			0.964
From home	1 (14.3)	35 (18.2)	
In the hospital	6 (85.7)	152 (79.2)	
In the community	0	2 (1.0)	
Missing	0	3 (1.6)	

†Negative represents staff with no intention of receiving the SARS-CoV-2 vaccination.
‡Positive represents staff who have already received at least 1 dose of the SARS-CoV-2 vaccination or who intend to get vaccinated.
§Calculated using chi-square test.
PPE: Personal protective equipment.

Table 4. Attitudes toward SARS-CoV-2 vaccination stratified by staff characteristics (n = 199) (cont.).

Staff characteristic	Attitude toward SARS-CoV-2 vaccination		
	Negative[†] (n = 7)	Positive[‡] (n = 192)	p-value[§]
	n (%)	n (%)	
Predominant place of work (2nd wave)			0.634
From home	0	31 (16.1)	
In the hospital	7 (100)	154 (80.2)	
In the community	0	2 (1.0)	
Missing	0	5 (2.6)	
Pregnant/breastfeeding			0.859
Yes	0	6 (3.1)	
No or not applicable	7 (100)	184 (95.8)	
Missing	0	2 (1.0)	
Carer			0.608
Yes	0	23 (12.0)	
No	7 (100)	168 (87.5)	
Missing	0	1 (0.5)	
Redeployed (1st wave)			0.713
Yes	0	15 (7.8)	
No	7 (100)	175 (91.1)	
Missing	0	2 (1.0)	
Redeployed (2nd wave)			0.238
Yes	2 (28.6)	18 (9.4)	
No	5 (71.4)	169 (88.0)	
Missing	0	5 (2.6)	
Felt they had access to adequate PPE (1st wave)			0.282
Yes	3 (42.9)	90 (46.9)	
No	1 (14.3)	69 (35.9)	
Not applicable	3 (42.9)	31 (16.1)	
Missing	0	2 (1.0)	
Felt they had access to adequate PPE (2nd wave)			0.206
Yes	4 (57.1)	140 (72.9)	
No	0	21 (10.9)	
Not applicable	3 (42.9)	28 (14.6)	
Missing	0	3 (1.6)	

[†]Negative represents staff with no intention of receiving the SARS-CoV-2 vaccination.
[‡]Positive represents staff who have already received at least 1 dose of the SARS-CoV-2 vaccination or who intend to get vaccinated.
[§]Calculated using chi-square test.
PPE: Personal protective equipment.

Uptake of well-being resources

To evaluate the uptake of mental well-being resources, the authors sought to understand the extent to which resources were known and of use to staff during the pandemic. After excluding those who did not respond, 138 out of 186 (74.2%) staff knew where they could access mental health support if needed. This was followed by 29 (15.6%) who responded neutrally and 19 (10.2%) who did not know where they could access mental health support.

Over the past year, the most commonly used well-being resource was the staff support debrief groups (n = 31). Staff also took part in reflective practice (n = 14), received support from occupational health (n = 6), visited the well-being hub (n = 4) and used resources available on the Guy's and St Thomas' trust website (n = 2).

For staff who did not use any resources, this was most frequently due to not feeling the need (n = 32), followed by not having time (n = 31) and not feeling that the resources available would improve their well-being (n = 14).

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Table 5. Stress levels during the second wave compared with the first, stratified by staff characteristics (n = 176).

Staff characteristic	Stress levels			
	Less stressed during the 2nd wave (n = 40)	Similar stress levels as during the 1st wave (n = 68)	More stressed during the 2nd wave (n = 68)	p-value[†]
	n (%)	n (%)	n (%)	
Age (years)				0.030
20–30	7 (17.5)	11 (16.2)	20 (29.4)	
31–40	4 (10.0)	20 (29.4)	21 (30.9)	
41–50	13 (32.5)	21 (30.9)	12 (17.6)	
51–60	13 (32.5)	11 (16.2)	13 (19.1)	
60+	3 (7.5)	4 (5.9)	1 (1.5)	
Missing	0	1 (1.5)	1 (1.5)	
Sex				0.366
Male	11 (27.5)	16 (23.5)	12 (17.6)	
Female	29 (72.5)	48 (70.6)	56 (82.4)	
Missing	0	4 (5.9)	0	
Profession/role				0.615
Doctor	9 (22.5)	12 (17.6)	13 (19.1)	
Nurse	10 (25.0)	12 (17.6)	22 (32.4)	
Allied health professional or student	12 (30.0)	20 (29.4)	22 (32.4)	
Admin and clerical staff	6 (15.0)	20 (29.4)	9 (13.2)	
Other	3 (7.5)	4 (5.9)	2 (2.9)	
Ethnicity				0.895
White	27 (67.5)	51 (75.0)	52 (76.5)	
Mixed/multiple ethnic groups	3 (7.5)	1 (1.5)	2 (2.9)	
Asian/Asian British	7 (17.5)	6 (8.8)	10 (14.7)	
Black/African/Caribbean/Black British	3 (7.5)	4 (5.9)	3 (4.4)	
Other	0	5 (7.4)	1 (1.5)	
Missing	0	1 (1.5)	0	
SARS-CoV-2 positive test (1st wave)				0.439
Yes	1 (2.5)	2 (2.9)	3 (4.4)	
No	39 (97.5)	66 (97.1)	64 (94.1)	
Missing	0	0	1 (1.5)	
SARS-CoV-2 positive test (2nd wave)				0.834
Yes	4 (10.0)	5 (7.4)	6 (8.8)	
No	36 (90.0)	62 (91.2)	61 (89.7)	
Missing	0	1 (1.5)	1 (1.5)	
Received ≥1 dose of SARS-CoV-2 vaccine				0.987
Yes	38 (95.0)	66 (97.1)	65 (95.6)	
No	2 (5.0)	2 (2.9)	3 (4.4)	
Attitude toward SARS-CoV-2 vaccination				0.446
Positive	39 (97.5)	67 (98.5)	65 (95.6)	
Negative	1 (2.5)	1 (1.5)	3 (4.4)	
Usually receive flu vaccine				0.433
Yes	33 (82.5)	54 (79.4)	59 (86.8)	
No	7 (17.5)	14 (20.6)	9 (13.2)	
Predominant place of work (1st wave)				0.244
From home	8 (20.0)	14 (20.6)	7 (10.3)	
In the hospital	30 (75.0)	53 (77.9)	60 (88.2)	
In the community	1 (2.5)	1 (1.5)	0	
Missing	1 (2.5)	0	1 (1.5)	

[†]Calculated using Kruskal–Wallis test.
PPE: Personal protective equipment.

Table 5. Stress levels during the second wave compared with the first, stratified by staff characteristics (n = 176) (cont.).

Staff characteristic	Stress levels			
	Less stressed during the 2nd wave (n = 40)	Similar stress levels as during the 1st wave (n = 68)	More stressed during the 2nd wave (n = 68)	p-value†
	n (%)	n (%)	n (%)	
Predominant place of work (2nd wave)				0.635
From home	6 (15.0)	11 (16.2)	9 (13.2)	
In the hospital	32 (80.0)	55 (80.9)	57 (83.8)	
In the community	1 (2.5)	1 (1.5)	0	
Missing	1 (2.5)	1 (1.5)	2 (2.9)	
Redeployed (1st wave)				0.522
Yes	3 (7.5)	4 (5.9)	5 (7.4)	
No	37 (92.5)	64 (94.1)	62 (91.2)	
Missing	0	0	1 (1.5)	
Redeployed (2nd wave)				0.012
Yes	2 (5.0)	3 (4.4)	14 (20.6)	
No	37 (92.5)	63 (92.6)	53 (77.9)	
Missing	1 (2.5)	2 (2.9)	1 (1.5)	
Felt they had access to adequate PPE (1st wave)				0.144
Yes	20 (50.0)	32 (47.1)	32 (47.1)	
No	12 (30.0)	22 (32.4)	29 (42.6)	
Not applicable	8 (20.0)	14 (20.6)	6 (8.8)	
Missing	0	0	1 (1.5)	
Felt they had access to adequate PPE (2nd wave)				0.278
Yes	33 (82.5)	47 (69.1)	51 (75.0)	
No	1 (2.5)	7 (10.3)	9 (13.2)	
Not applicable	6 (15.0)	13 (19.1)	7 (10.3)	
Missing	0	1 (1.5)	1 (1.5)	
Taken time off due to stress				0.547
Yes	2 (5.0)	2 (2.9)	6 (8.8)	
No	38 (95.0)	61 (89.7)	61 (89.7)	
Prefer not to say	0	5 (7.4)	1 (1.5)	

†Calculated using Kruskal–Wallis test.
PPE: Personal protective equipment.

Discussion

Overall, the authors found that ethnicity and comorbidity burden were statistically significantly associated with SARS-CoV-2 infection status in the first and second wave, respectively. Albeit not statistically significant, other factors such as role, working location, redeployment and smoking status appeared to show trends with SARS-CoV-2 infection status, although trend directions were inconsistent between waves. A small minority of respondents displayed vaccine hesitancy, which was (although limited by small sample size) significantly associated with low uptake of the flu vaccine and showed trends toward staff in nonpatient-facing roles and those who self-identify as female. Over one-third of staff experienced worsening stress levels as the pandemic progressed. Those of younger age and staff who were redeployed had significantly increased stress levels, with similar findings for staff who self-identified as female, those who were nurses and allied health staff and those who worked in the hospital (albeit not statistically significant). However, numerous barriers to the uptake of well-being resources were identified, including awareness (a quarter of respondents were unable to explicitly state where they could access support), accessibility (unable to find the time) and utility (skeptical of the effectiveness of available resources).

Within this study, a higher proportion of staff of Black, Asian, mixed/multiple or other ethnic backgrounds tested positive for SARS-CoV-2 infection during the first wave of the pandemic. This trend is in keeping with

reports published elsewhere. The UK-REACH study (n = 10,772) found healthcare workers of Black ethnic groups were more likely to be infected than colleagues of white ethnic groups [19]. Public Health England identified similar trends in the general public, with the highest age-standardized rates of SARS-CoV-2 infection among Black ethnic groups and lowest among white ethnic groups [20]. Given that studies have suggested that, once infected with SARS-CoV-2, people from Black, Asian and other minority ethnic groups are at increased risk of severe disease or death [18,20,21], additional work is required to understand the factors (sociodemographic, occupational or otherwise) underlying the association with acquiring SARS-CoV-2 infection to inform targeted protective measures moving forward. Physical proximity to others within an occupation has been shown to strongly correlate with infection exposure [22], supporting this study's observation that nurses and those working in the hospital were more likely to acquire SARS-CoV-2 during the first wave of the pandemic. Perhaps surprisingly, none of the aforementioned associations were observed during the second wave in this study and, in some cases, the trend proved the opposite. While small sample sizes may, in part, contribute to variation in findings between waves, the authors cautiously postulate whether those most likely to acquire SARS-CoV-2 did so during the first wave, providing them with increased levels of immunity and reduced likelihood of acquisition during the second wave. Finally, the authors have not found evidence to support a direct association between comorbidity burden and likelihood of acquiring SARS-CoV-2, as observed in the second wave within the study. Confounding due to lack of adjustment for other factors associated with SARS-CoV-2 infection may underpin this finding.

At the time of completing the survey, SARS-CoV-2 vaccination was optional. In December 2021, a vaccine mandate was introduced for NHS workers [23]; however, this has since been reconsidered [24], likely leaving vaccination at the discretion of the individual. As SARS-CoV-2 vaccination has been shown to reduce the risk of severe SARS-CoV-2 infection and transmission [25], it is within public health interest to still encourage vaccination where possible. Reported prevalence of vaccine hesitancy among healthcare workers varies considerably within the literature, particularly by country and date of assessment relative to vaccination rollout [26–29]. Although not specific to cancer staff, the UK-REACH study is, to the authors' knowledge, the most comparable by country and timing to the current study. It is also the largest study of vaccine hesitancy among healthcare workers in the UK. UK-REACH reported vaccine hesitancy in 2704 out of 11,584 (23%) healthcare workers in the UK, assessed from vaccine rollout in December 2020 until the end of February 2021 [28]. The lower prevalence observed in the current study (3.6%) may, in part, be due to the later assessment time point (May–August 2021), by which point public health measures would be expected to have encouraged additional staff members to accept vaccination. Indeed, within a similar time frame, Office for National Statistics (ONS) data showed a widespread fall in vaccine hesitancy in London [30]. However, this was only by -4% [30], suggesting that other factors may have also contributed to the low prevalence of vaccine hesitancy in the current study. The authors cannot discount missing data as a potential factor. Given that SARS-CoV-2 vaccination was a contentious and divisive topic, it is possible that bias was introduced if staff displaying vaccine hesitancy felt uncomfortable disclosing this information and therefore declined to answer.

The small sample size and potential aforementioned bias likely influenced the analysis relating staff characteristics to vaccine hesitancy. Although the findings are somewhat anecdotal in isolation, key significant (or borderline significant) trends the authors observed have been corroborated internationally. First, low uptake of the flu vaccine in the previous season was associated with greater SARS-CoV-2 vaccine hesitancy in nurses in Hong Kong and China [31] and was an independent predictor of vaccine hesitancy in UK-REACH [28]. In line with the present findings, this may be indicative of a role for promoting the dual-uptake of SARS-CoV-2 and flu vaccination moving forward. Second, UK-REACH and a study of healthcare workers in the USA also identified female sex as a predictor for vaccine hesitancy [27,28]. Finally, the latter study identified lower SARS-CoV-2 vaccine acceptance among healthcare workers who were not directly patient-facing [27], and greater vaccine hesitancy was observed among nonpatient-facing staff in Guy's and St Thomas' NHS Foundation Trust (including noncancer staff) more widely (unpublished data). Therefore, staff in less-patient-facing roles may be a key area of focus for strategies encouraging SARS-CoV-2 vaccine uptake. Previous studies among healthcare workers and the general population have identified ethnicity as a key factor (e.g., vaccine hesitancy was more prevalent among people of Black, Black African, Black Caribbean, white other and Pakistani ethnic backgrounds compared with those of white British/Irish ethnic background) [28,32]. By contrast, the present study found no strong association between ethnicity and perception of SARS-CoV-2 vaccination, perhaps due to influences of the small sample size and differences in the ethnic groupings used in analysis as well as efforts made by Guy's and St Thomas' NHS Foundation Trust to encourage vaccination among staff members from minority ethnic groups.

Negative impacts of the pandemic on the mental well-being of healthcare professionals have been documented internationally [3–15]. Within the cancer sector specifically, surveys have shown that 34–38% of oncology professionals experienced burnout, while 25% have been at risk of distress during the pandemic [17,33]. While the present study also observed negative impacts on the mental well-being of cancer staff, with over a third experiencing worsening stress over the pandemic, these findings cannot be directly compared with those in the literature due to methodological differences in defining and measuring mental health deterioration. In the UK as a whole, the number of known SARS-CoV-2 cases was considerably greater during the second wave compared with the first wave [34], applying greater burden to healthcare systems and likely contributing to the deterioration in mental well-being observed in this study. The authors found that greater stress was associated with redeployment, which echoes findings from previous studies [35,36] and is likely to be, in part, due to disruption of normal circumstances and/or a lack of training and experience in the new role [37]. The latter may also contribute to the greater stress observed in younger staff. Redeployment to SARS-CoV-2 wards has been shown to exacerbate stress in employees beyond that of colleagues in regular wards [38]. However, as the authors of the present study did not capture data on where staff were redeployed to, they cannot state the extent to which this underpins their findings. In line with their observation that greater stress also appeared to be associated with nurses, previous studies have identified nurses as one of the most affected groups of healthcare workers [39,40]. Studies placed nurses at greatest risk of developing post-traumatic distress symptoms and anxiety [40] and to be 4.5-times more likely to experience burnout than healthcare assistants [39].

The present study found that, although mental well-being resources were available, their level of uptake was hampered by lack of awareness, issues with access and skepticism of their utility. In line with the present study, lack of time, among other access issues, has been highlighted as a major barrier to the use of health and well-being services in other NHS institutions [41,42]. The present study has highlighted this as an area for further improvement within an NHS cancer center. A needs-led and strategic approach, which incorporates staff engagement throughout, would help remove barriers and facilitate the use of mental well-being services to support staff members during the remainder of the pandemic and beyond.

Although this study addressed a range of pertinent topics, providing a broad picture of the impact of the pandemic on cancer staff well-being at an NHS cancer center, the authors acknowledge that it was subject to several limitations. Data were collected from a single hospital in London, limiting the generalizability of the findings. The authors cannot rule out the presence of self-selection bias due to the voluntary nature of the survey. Furthermore, given that respondents were required to recollect two historical time points when reporting SARS-CoV-2 infection status and relative stress levels, recall bias may have been introduced. The authors anticipate that this is more relevant for findings related to stress, given its subjective nature. Missing data, across the survey, exacerbated an already small sample size. As such, strong inferences cannot be made from the data in isolation, particularly regarding factors associated with vaccine hesitancy, which was based on a sample size of seven. The small sample size also prevented more in-depth, advanced analyses from being conducted, including multivariable analyses looking at the adjusted impact of staff characteristics on SARS-CoV-2 infection status, vaccine hesitancy and stress. Finally, the generalizability of the stress-related findings is limited, given that the study did not use a previously validated work-related stress measure.

Conclusion

Overall, this study suggests that the pandemic has adversely impacted the well-being of many clinical and nonclinical cancer staff at an NHS cancer center. The impact on physical and mental well-being, as well as the uptake of vaccination, appeared nonuniform across different cohorts of staff populations. Although these trends cannot be strongly concluded and generalized using this study in isolation, many of the associations the authors observed echo those published elsewhere in the literature. Uptake of mental well-being resources requires careful consideration, with strategies developed to ensure that these services are accessible, useful and known to all cancer staff during the remainder of the pandemic and beyond. Future multicenter studies, such as the ongoing NHS Check survey [43] led by King's College London and King's Health Partners, will also provide a more robust idea of trends observed across the NHS as a whole and aid the development of nationwide strategies to protect the well-being of healthcare staff.

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Summary points

- While the effect of the COVID-19 pandemic on the well-being of healthcare professionals (not sector-specific) has been widely documented, the specific impact on the cancer sector is less well known.
- The authors conducted a survey among cancer staff (clinical and nonclinical) at an NHS cancer center in London (UK) to investigate the impact of the pandemic on the physical (SARS-CoV-2 infection) and mental (stress) well-being of cancer staff and to determine their uptake of previous opt-in mitigation strategies (SARS-CoV-2 vaccination and mental well-being resources).
- The overall response rate was 21.7% (257 out of 1182 cancer staff), with the majority of respondents self-identifying as women (78.2%) and of white ethnic background (71.2%).
- More staff tested positive for SARS-CoV-2 during the second wave of the UK pandemic as compared with the first (6.6 vs 4.3%, respectively), with over a third of those infected subsequently developing other health conditions (4 out of 11 [36.4%] during the first wave; 8 out of 17 [47.1%] during the second wave).
- SARS-CoV-2 infection status was significantly associated with ethnicity ($p = 0.020$) and comorbidity ($p = 0.022$) in the first and second wave, respectively, while other factors such as role, working location, redeployment and smoking status showed nonsignificant trends.
- Of staff with a known attitude toward vaccination ($n = 199$), the prevalence of SARS-CoV-2 vaccine hesitancy was low ($n = 7$, 3.6%) and this appeared to be associated with staff in nonpatient-facing roles ($p > 0.05$), those who self-identify as female ($p > 0.05$) and those who do not usually receive the flu vaccine ($p < 0.001$).
- More than one-third of staff ($n = 68$ [38.6%]) experienced increasing levels of stress as the pandemic progressed, with greater levels of stress being significantly associated with staff who were younger ($p = 0.030$) and those redeployed during the second wave of the pandemic ($p = 0.012$).
- Many staff did not explicitly know where they could access mental health support, should it be required (48 out of 186 respondents [25.8%]), while others did not have time to access mental well-being resources or were skeptical of how effective the resources would prove to be.
- Given the public health interest, encouraging the uptake of SARS-CoV-2 vaccination where possible remains important, and this study highlights a need to improve the awareness, accessibility and utility of mental well-being resources.

Author contributions

MV Hemelrijck, S Dolly and A Rigg conceived the study idea. CL Moss, MJM Iglesias, B Russell, E Rammant, S Smith and K Thillai acquired the data used in this study. MJM Iglesias, B Russell, CL Moss, S Dolly and MV Hemelrijck curated the data used in this study. H Hadi and J Handford analyzed the data. H Hadi and J Handford wrote the first draft of the manuscript. A Rigg, MV Hemelrijck, S Dolly, B Russell, CL Moss and MJM Iglesias critically revised the manuscript. H Hadi and J Handford had full access to all of the data in the study and took responsibility for the integrity of the data and the accuracy of the data analysis. All the authors contributed to the article and approved the submitted version.

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Ethical conduct of research

Ethical approval was not required, as this study was conducted as service evaluation (approved by Guy's and St Thomas' NHS Foundation Trust on 4 May 2021). Reference number 12058.

Data sharing statement

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to ethical reasons.

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