

12-1-2021

## **Variations in Medical Students' Educational Preferences, Attitudes and Volunteerism during the COVID-19 Global Pandemic**

Nital P Appelbaum

Sanghamitra M Misra


Jennifer Welch

M Harrison Humphries

Sunthosh Sivam

*See next page for additional authors*

Follow this and additional works at: [https://digitalcommons.library.tmc.edu/baylor\\_docs](https://digitalcommons.library.tmc.edu/baylor_docs)

 Part of the [Cognition and Perception Commons](#), [COVID-19 Commons](#), [Epidemiology Commons](#), [Interprofessional Education Commons](#), [Medical Sciences Commons](#), [Medical Specialties Commons](#), and the [Psychiatric and Mental Health Commons](#)

---

---

**Authors**

Nital P Appelbaum, Sanghamitra M Misra, Jennifer Welch, M Harrison Humphries, Sunthosh Sivam, and Nadia Ismail



# Variations in Medical Students' Educational Preferences, Attitudes and Volunteerism during the COVID-19 Global Pandemic

Nital P. Appelbaum<sup>1</sup> · Sanghamitra M. Misra<sup>2</sup> · Jennifer Welch<sup>3</sup> · M. Harrison Humphries<sup>3</sup> · Sunthosh Sivam<sup>4</sup> · Nadia Ismail<sup>5</sup>

Accepted: 27 May 2021 / Published online: 9 June 2021

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2021

## Abstract

Public health crises require individuals, often volunteers, to help minimize disasters. The COVID-19 pandemic required such activation of individuals, but little is known about medical students' preferences of such engagement. We investigated potential variations in medical students' educational preferences, attitudes, and volunteerism during the COVID-19 pandemic based on socio-demographics to better prepare for future activation scenarios. A web-based, anonymous survey of U.S. medical students at a single institution was conducted in May 2020. Across four training year, 518 (68% response rate) students completed the survey. During the pandemic, 42.3% (n = 215) wanted to discontinue in-person clinical experiences, 32.3% (n = 164) wanted to continue, and 25.4% (n = 129) were neutral. There was no gender effect for engagement in volunteer activities or preference to engage in clinical activities during the pandemic. However, second-year (n = 59, 11.6%) and third-year students (n = 58, 11.4%) wanted to continue in-person clinical experiences at a greater proportion than expected, while a small proportion of fourth-year students (n = 17, 3.3%) wanted to continue,  $\chi^2(6) = 43.48$ ,  $p < .001$ ,  $\phi = 0.29$ . Majority of respondents (n = 287, 55.5%) volunteered in clinical and non-clinical settings. A lower proportion of fourth-year (n = 12, 2.3%) and first-year students (n = 50, 9.7%) volunteered than expected. Likelihood to volunteer during a pandemic varied by gender, training year, and/or prior experience with disaster event depending on the type of volunteer-site setting. Our findings suggest socio-demographic factors may impact medical student engagement and volunteerism during a public health crisis. Educational leadership should be sensitive to such variations and can facilitate volunteer activities that allow student engagement during future pandemics.

**Keywords** COVID-19 · Medical student experience · Pandemic · Medical student role · Medical student responsibilities

## Introduction

Between April 2009 and August 2010, the world battled the H1N1 influenza pandemic [21]. During the first year that the virus circulated, the Centers for Disease Control estimated

that between 151,700 and 575,400 people died worldwide [21]. In comparison, the SARS Co-V2 (COVID-19) pandemic surpassed two million deaths worldwide within the first year of its circulation, with over half a million of those deaths occurring within the United States [4]. While the world has faced pandemics, none within the past century has halted the daily routines and operations of undergraduate medical education (UME) the way the COVID-19 pandemic has.

In UME, medical students are in a grey zone. They are not yet providers, but they potentially possess significant and useful medical knowledge and skills compared to the general public. In early 2020, New York University Grossman School of Medicine allowed early graduation for qualifying medical students who wanted to volunteer in internal medicine or emergency medicine settings [6, 19]. Such efforts aimed to help alleviate strains to healthcare systems due

✉ Nital P. Appelbaum  
nital.appelbaum@bcm.edu

<sup>1</sup> Department of Education, Innovation, Technology, Baylor College of Medicine, Houston, TX, USA

<sup>2</sup> Department of Pediatrics, Baylor College of Medicine, Houston, TX, USA

<sup>3</sup> Baylor College of Medicine, Houston, TX, USA

<sup>4</sup> Department of Otolaryngology-Head and Neck Surgery, Baylor College of Medicine, Houston, TX, USA

<sup>5</sup> Department of Medicine, Baylor College of Medicine, Houston, TX, USA

to the shortage of providers needed to care for COVID-19 patients in New York City [6]. Similarly, medical students from Denmark, Poland, Germany, China, and the United Kingdom volunteered and engaged in both clinical and non-clinical settings to meet the demands of COVID-19 on the healthcare system [2, 5, 16, 17, 24]. Despite students being engaged during the pandemic, within circles of educators, students, and leadership in UME, there was worldwide debate on whether students belong in clinical environments during a pandemic like COVID-19 [9, 11, 12, 22]. While opinions shared through commentaries and blogs tell stories on both sides of this debate, they do not describe broad perspectives of the medical study population.

Prosocial behaviors broadly refer to “acts that are defined by some significant segment of society and/or one’s social group as generally beneficial to other people” [15]. Social psychologists classify volunteering as a prosocial behavior at macro-level act considering it occurs within the context of a large group or organization and has prolonged engagement [15]. Motivations to engage in prosocial behaviors are thought to vary based on individual differences, but perceived expectations for engagement and salience of role identity are both strong antecedents to volunteerism [7]. Students who felt as though there was an expectation they volunteer and that their identity as a medical student included volunteerism displayed greater interest in volunteerism [7].

In a large Chinese study, most medical students expressed interest in volunteering during COVID-19 in direct and indirect activities [24]. However, senior students expressed greater interest than junior students and hazards of volunteer work negatively influenced volunteerism [24]. Another study of Chinese medical students found that participants with high prosocial motivation were more likely to engage in volunteerism during a public health emergency [20]. Within that study, two variables mediated the relationship between motivation and behavior: the belief that a career in medicine is a calling and high beliefs of social responsibility [20].

Like the non-U.S. studies, we aimed to identify group differences on volunteerism, and the desire to continue UME clinical activities during the pandemic. Considering the novel aspects of COVID-19, our medical school recognized the need to gather data to better understand the medical student experience and perspective on undergraduate medical education during this unprecedented time.

## Methods

### Participants and Procedure

We recruited all medical students across four training years (MS1, MS2, MS3, MS4) at Baylor College of Medicine

School of Medicine to complete our study survey between May 11–30, 2020. Utilizing the Qualtrics (Provo, UT) email distribution system, we sent an initial recruitment email and deployed two additional reminder emails to non-respondents. We raffled off several items (i.e. parking vouchers, t-shirts, fashionable scrubs) to incentivize participation, while emphasizing study participation was voluntary and data were collected anonymously. The Baylor College of Medicine Institutional Review Board approved our research protocol through expedited procedures.

### Study Measures

The research team, comprising of clinical faculty, the associate dean of curriculum, medical students and an organizational psychologist, developed survey items based on key domains of interest. These domains were attitudes about the medical student role, preferred level of engagement in education during COVID-19 and associated motivations, engagement in volunteer activities during COVID-19, barriers to engaging clinically during COVID-19, and the likelihood of volunteering during a pandemic across various settings. Survey items were continuously refined and piloted with students through cognitive interviewing techniques [23]. Students from each training year were also invited to pilot the survey and provide feedback on improvement (e.g., unclear items that undermined validity, additional response options). The survey included various question types including five-point Likert scales (agreement, likelihood), multiple choice, retroactive pre/post comparison, and open-ended questions.

Personal characteristic items included gender, age, ethnicity, marital status, parental status, whether respondents or their close personal contacts were high risk for COVID infections, and direct prior experience with adverse impact from a disaster event (e.g., H1N1, hurricane, flooding).

### Statistical Analysis

We analyzed participant characteristics through descriptive statistics (counts, percentages) and changes in pre/post perceptions regarding medical student roles/responsibilities through paired sampled t-tests. Chi-square tests probed for group differences based on gender, training year, and prior experience with a disaster with engagement in volunteer activities and education during COVID-19. One-way ANOVA tests also probed for group differences based on the same demographics as the prior comparison for likelihood of volunteering during a pandemic across various settings, and Tukey’s test for post-hoc analysis was conducted for training year. The Holm-Bonferroni [10] method was used to adjust for multiple comparisons.

## Results

### Participants

Approximately 68.2% (518 of 759) of our medical students responded to the survey. There was representation from all four training years, and most respondents identified as female (n = 308, 59.4%) and as either Caucasian/White (n = 230, 44.4%) or Asian (n = 198, 38.2%)

(Table 1). A limited number of respondents considered themselves high-risk for COVID-19 (n = 35, 6.8%), yet 62.7% (n = 325) had close personal contacts who would qualify as high-risk for COVID-19. About half (n = 275, 53.1%) experienced a prior disaster event such as a previous pandemic (H1N1), hurricanes, flooding, fire, tornado. Based on our sample size, group comparisons were possible with training year, gender, and prior experience with disaster event.

**Table 1** Participant characteristics

Characteristic	Count (%)
Training year	
MS1	124 (23.9%)
MS2	146 (28.1%)
MS3	146 (28.2%)
MS4	102 (19.7%)
Gender	
Male	208 (40.2%)
Female	308 (59.5%)
Prefer not to answer	2 (<1.0%)
Race/Ethnicity	
African American or black	8 (1.5%)
Asian	198 (38.2%)
Caucasian or white	230 (44.4%)
Latino or hispanic	56 (10.8%)
Other	18 (3.5%)
Prefer not to answer	8 (1.5%)
Marital Status	
Single (never married)	430 (83.0%)
Married	73 (14.1%)
In a domestic partnership	11 (2.1%)
Other (Engaged)	4 (<1.0%)
Children	
No	500 (96.5%)
Yes	18 (3.5%)
Self in high risk category <sup>a</sup>	
Yes	35 (6.8%)
No	482 (93.1%)
Prefer not to answer	1 (<1.0%)
Personal close contact(s) in high risk category <sup>a</sup>	
Yes	325 (62.7%)
No	190 (36.7%)
Prefer not to answer	3 (<1.0%)
Prior experience with disaster event <sup>b</sup>	
Yes	275 (53.1%)
No	239 (46.1%)
Prefer not to answer	4 (<1.0%)

<sup>a</sup>e.g. Age 60+, diabetes, hypertension, immune suppression, pregnancy

<sup>b</sup>e.g. Previous pandemic (H1N1), hurricane (Katrina, Imelda, Harvey, etc.), flood, fire, tornado

## Perception About Medical Student Role

We captured attitudes related to medical student role through five agreement items, three of which had a retrospective comparison related to pandemics like COVID-19 during our school's mandate to pull students from clinical activities compared to two months later. Our school's initial mandate was March 17, 2020 and the two-month comparison was between May 11–30, 2020. Students returned to in-person clinical experiences May 26, 2020. Approximately 89.8% (n = 465) of students agreed or strongly agreed with the statement, "As a medical student, I can have a positive impact on the health of my patients", yet only 40.5% (n = 210) agreed or strongly agreed that medical students are an essential part of the medical team.

None of the retrospective comparison items resulted in a significant change after the mandate compared to when the initial mandate went into effect after adjusting for multiple comparisons. However, respondents agreed more strongly two months post that during a pandemic like COVID-19, medical student volunteers are helpful in non-clinical settings compared to the initial mandate (Table 2). There was no change in perception when asked about attitudes related to in-person clinical experiences.

## Preference to Engage in Clinical Activities During COVID-19 Pandemic

Students were asked whether they wanted to continue in-person clinical experiences when school administration mandated suspension of such activities in mid-March 2020

**Table 2** Changes in student perception on roles during a pandemic

Perception	Time	Mean (SD)	Paired Samples t-test
During a pandemic like COVID-19, medical student volunteers are helpful in non-clinical settings	Initial mandate	4.21 (0.82)	t (507)=0.24, p=0.03, Cohen's d=0.10 <sup>a</sup>
	Two months post	4.26 (0.87)	
During a pandemic like COVID-19, medical students should be banned from all in-person clinical experiences	Initial mandate	3.23 (1.27)	t (507)=1.40, p=0.16
	Two months post	3.18 (1.26)	
Medical students can be helpful in clinical settings during a pandemic like COVID-19	Initial mandate	3.25 (1.14)	t (507)= -1.03, p=0.31
	Two months post	3.28 (1.15)	

<sup>a</sup>Becomes an insignificant finding after Holm-Bonferroni correction

**Table 3** Engagement in volunteer activities and preference to engage in clinical activities during COVID-19 pandemic

	Were you involved in any volunteer opportunities during the COVID-19 pandemic?				When clinical rotations and preceptorships were canceled, did you personally want to continue or discontinue in-person clinical experiences? <sup>a</sup>			
	Yes	No, but considered volunteering	No, and did not consider volunteering	Chi Sq test-statistic	Continue	Discontinue	Neutral	Chi Sq test-statistic
Prior experience with disaster event								
Yes	145 (28.3%)	97 (18.9%)	33 (6.4%)	$\chi^2(2)=1.69$ , p=0.43	87 (17.3%)	115 (22.8%)	68 (13.5%)	$\chi^2(2)=0.130$ , p=0.94
No	139 (27.1%)	73 (14.2%)	26 (5.1%)		77 (15.3%)	96 (19.0%)	61 (12.1%)	
Gender								
Male	106 (20.6%)	72 (14.0%)	29 (5.6%)	$\chi^2(2)=3.47$ , p=0.18	74 (14.6%)	72 (14.2%)	57 (11.3%)	$\chi^2(2)=6.48$ , p=0.04, $\phi=0.11^b$
Female	180 (35.0%)	98 (19.0%)	30 (5.8%)		90 (17.8%)	142 (28.1%)	71 (14.0%)	
Year								
MS1	50 (9.7%)	62 (12.0%)	12 (2.3%)	$\chi^2(6)=172.38$ , p<0.001, $\phi=0.58$	30 (5.9%)	72 (14.2%)	21 (4.1%)	$\chi^2(6)=43.48$ , p<0.001, $\phi=0.29$
MS2	127 (24.6%)	14 (2.7%)	4 (0.8%)		59 (11.6%)	50 (9.8%)	33 (6.5%)	
MS3	98 (19.0%)	36 (7.0%)	12 (2.3%)		58 (11.4%)	56 (11.0%)	32 (6.3%)	
MS4	12 (2.3%)	58 (11.2%)	32 (6.2%)		17 (3.3%)	37 (7.3%)	43 (8.5%)	
Across all students	287 (55.5%)	170 (32.9%)	60 (11.6%)		164 (32.3%)	215 (42.3%)	129 (25.4%)	

<sup>a</sup>Question had 8 (1.5%) students choose "Prefer not to respond", which was excluded from analysis

<sup>b</sup>Becomes an insignificant finding after Holm-Bonferroni correction

(Table 3). Across all respondents, 42.3% (n = 215) wanted to discontinue in-person clinical experiences, 32.3% (n = 164) wanted to continue, and 25.4% (n = 129) were neutral. Of the students who chose the preference to discontinue in-person clinical experiences, respondents said their preference was due to health concerns for family/friends/close contacts (n = 161, 74.9%), concerns for patients (n = 147, 68.4%), the belief they would not be able to help meaningfully (n = 138, 64.2%), personal health concerns (n = 97, 45.1%), and/or other reasons (n = 26, 12.1%). Reasons that students wanted to continue included the learning opportunity (n = 145, 88.4%), drive to help (n = 113, 68.9%), fear of disruptions (n = 79, 48.1%), uncertain future (n = 64, 39.0%), and 7.3% (n = 12) cited other reasons (e.g., enjoyed their elective, inspired to engage, responsibility as physician).

There was no relationship based on prior experience with disaster event and preference to engage in in-person clinical experiences, however there were relationships based on gender and training year with clinical engagement (Table 3). A greater proportion of females (n = 142, 28.1%) wanted to discontinue clinical experiences, and, in contrast, a greater proportion of males (n = 74, 14.6%) wanted to continue such experiences,  $\chi^2(2) = 6.48$ ,  $p = 0.04$ ,  $\phi = 0.11$ . This gender effect became insignificant after correcting for multiple comparisons. MS2 (n = 59, 11.6%) and MS3 (n = 58, 11.4%) respondents wanted to continue in-person clinical experiences at a greater proportion, while a lower proportion of MS4 (n = 17, 3.3%) students wanted to continue,  $\chi^2(6) = 43.48$ ,  $p < 0.001$ ,  $\phi = 0.29$ . A greater proportion of MS4 (n = 43, 8.5%) students said they were neutral on the topic to continue in-person clinical activities.

### Barriers to Engagement in Clinical Experiences

Our students engaged in the in-person clinical activities until mid-March, however our clinical sites developed policies related to COVID-19 prior to the mandate to end such experiences. When asked what barriers students faced during the two weeks that led up to the mandate, 40.3% (n = 209) could not see certain patients with certain health concerns, 31.9% (n = 165) experienced limits on large gatherings like lectures, and 24.5% (n = 127) could not see patients that required personal protective equipment (PPE) (Table 4). Students were able to select more than one barrier, however 300 (57.9%) respondents encountered at least one barrier to engagement in the clinical learning environment.

### Engagement in Volunteer Activities During Pandemic

Across all respondents, 55.5% (n = 287) volunteered during the COVID-19 pandemic (Table 3). Students who volunteered were asked to specify the types of volunteer

**Table 4** Barriers to clinical experiences two weeks prior to school mandate to end clinical activities

Barriers	All Students (n = 518)
Could not see certain patients with certain health concerns	209 (40.3%)
Limit on large gatherings (e.g. lectures)	165 (31.9%)
Could not see patients that required PPE	127 (24.5%)
Not allowed to be at clinical site	57 (11.0%)
Patients requested restrictions	21 (4.1%)
Other (please specify)	43 (8.3%)
Did not experience any barriers	74 (14.3%)
Not Applicable/no clinical duties at the time	141 (27.2%)

Question asked students to check mark any of the above response options to identify barriers encountered when engaging in clinical activities during the two weeks PRIOR to mandate to restrict students' clinical experiences. Initial mandate was 03/17/2020 and 2 month post data collection occurred between -5/11/2020 and 5/30/2020

activities they engaged in via text comment. Qualitative analysis revealed 15 categories of volunteer activities: food/nutrition (n = 123), mentoring pre-meds (n = 52), call center (n = 43), miscellaneous (n = 41), babysitting/child-care (n = 34), tutoring (n = 33), PPE/medical supplies donations (n = 30), COVID-19 testing (n = 20), hospital shower attendant (n = 16), making cards for elderly and healthcare providers (n = 16), making masks (n = 15), contact tracing (n = 13), blood donation (n = 8), and COVID plasma recruitment (n = 3). Some students volunteered across multiple types of activities.

Resulting in a large effect size, there was a relationship between training year and volunteerism where MS2 students volunteered at a greater proportion than statistically expected, but this may be because of the college requirement for that cohort to engage in a service-learning activity during the pandemic (Table 3). MS3 students (n = 98, 19.0%) also volunteered at a greater proportion than expected. However, a lower proportion of MS4 students (n = 12, 2.3%) and MS1 (n = 50, 9.7%) volunteered during the COVID-19 pandemic than expected. No relationships were detected based on gender or prior experience with a disaster experience with volunteerism.

### Likelihood to Volunteer During Pandemic

Students were asked, if given the opportunity, the likelihood of them volunteering in five unique settings during a pandemic like COVID-19. Eight of fifteen group comparisons across class year, gender, and prior experience with disaster event resulted in significant differences, with three findings becoming insignificant after correcting for multiple comparisons (Table 5). Effect sizes with the largest

**Table 5** Group differences based on likelihood to volunteer during a pandemic

During a pandemic, I would volunteer in...	Across all students			Gender			Prior experience with disaster event			Class year		
	Mean (SD)	Group	ANOVA test-statistic	Group	Mean (SD)	ANOVA test-statistic	Group	Mean (SD)	ANOVA test-statistic	Group	Mean (SD)	ANOVA test-statistic
... a surgical clinical setting	2.74 (1.46)	Male	F(1,512)=4.42, p=0.04, $\eta^2=.01^a$	Yes	2.55 (1.44)	F(1,510)=11.386, p=.001, $\eta^2=.02$	MS1	2.98 (1.38)	F(3,512)=7.787, p=0.001, $\eta^2=.04$	MS1	2.98 (1.38)	MS1 > MS3 MS1 > MS4 MS2 > MS3 MS2 > MS4
		Female		No	2.98 (1.46)		MS2	3.06 (1.51)		MS2	3.06 (1.51)	
	3.19 (1.35)	Male	F(1,512)=0.631, p=0.43	Yes	3.11 (1.37)	F(1,511)=2.536, p=0.11	MS3	2.52 (1.45)		MS3	2.52 (1.45)	
		Female		No	3.30 (1.30)		MS4	2.31 (1.37)		MS4	2.31 (1.37)	
...an in-patient care setting	3.45 (1.23)	Male	F(1,512)=0.546, p=0.46	Yes	3.47 (1.25)	F(1,510)=0.141, p=0.71	MS1	3.06 (1.31)	F(3,512)=5.817, p<.001, $\eta^2=.03$	MS1	3.06 (1.31)	MS1 < MS2 MS2 > MS4 MS3 > MS4
		Female		No	3.43 (1.21)		MS2	3.48 (1.28)		MS2	3.48 (1.28)	
	4.08 (1.04)	Male	F(1,513)=15.523, p<.001, $\eta^2=.03$	Yes	4.17 (0.99)	F(1,511)=4.496, p=0.03, $\eta^2=.01^a$	MS3	3.28 (1.38)		MS3	3.28 (1.38)	
		Female		No	3.97 (1.09)		MS4	2.80 (1.35)		MS4	2.80 (1.35)	
...a non-clinical setting	4.03 (1.03)	Male	F(1,512)=22.232, p<.001, $\eta^2=.04$	Yes	4.08 (1.02)	F(1,510)=1.121, p=0.29	MS1	3.29 (1.20)	F(3,512)=2.971, p=0.03, $\eta^2=.02^a$	MS1	3.29 (1.20)	MS1 > MS2, MS3
		Female		No	3.98 (1.03)		MS2	3.62 (1.17)		MS2	3.62 (1.17)	
	4.03 (1.03)	Male	F(1,513)=15.523, p<.001, $\eta^2=.03$	Yes	4.17 (0.99)	F(1,511)=4.496, p=0.03, $\eta^2=.01^a$	MS3	3.56 (1.29)		MS3	3.56 (1.29)	
		Female		No	3.97 (1.09)		MS4	3.23 (1.23)		MS4	3.23 (1.23)	
...a healthcare adjacent setting	4.03 (1.03)	Male	F(1,512)=22.232, p<.001, $\eta^2=.04$	Yes	4.08 (1.02)	F(1,510)=1.121, p=0.29	MS1	4.04 (0.99)	F(3,513)=2.123, p=0.10	MS1	4.04 (0.99)	MS1 > MS2, MS3
		Female		No	3.98 (1.03)		MS2	4.10 (1.03)		MS2	4.10 (1.03)	
	4.03 (1.03)	Male	F(1,513)=15.523, p<.001, $\eta^2=.03$	Yes	4.17 (0.99)	F(1,511)=4.496, p=0.03, $\eta^2=.01^a$	MS3	4.22 (1.10)		MS3	4.22 (1.10)	
		Female		No	3.97 (1.09)		MS4	3.89 (1.01)		MS4	3.89 (1.01)	
...a healthcare adjacent setting	4.03 (1.03)	Male	F(1,512)=22.232, p<.001, $\eta^2=.04$	Yes	4.08 (1.02)	F(1,510)=1.121, p=0.29	MS1	3.94 (0.99)	F(3,512)=2.249, p=0.08	MS1	3.94 (0.99)	MS1 > MS2, MS3
		Female		No	3.98 (1.03)		MS2	4.13 (0.99)		MS2	4.13 (0.99)	
	4.03 (1.03)	Male	F(1,513)=15.523, p<.001, $\eta^2=.03$	Yes	4.17 (0.99)	F(1,511)=4.496, p=0.03, $\eta^2=.01^a$	MS3	4.13 (0.99)		MS3	4.13 (0.99)	
		Female		No	3.97 (1.09)		MS4	3.86 (1.01)		MS4	3.86 (1.01)	

<sup>a</sup>Becomes an insignificant finding after Holm-Bonferroni correction



magnitude included females being more likely to volunteer in a healthcare adjacent setting (e.g., blood bank, collecting PPE/donations, call center, testing sites) compared to males,  $F(1,512)=22.232$ ,  $p<0.001$ ,  $\eta^2=0.042$ . Also, training year differences where MS1 and MS2 students were more likely to volunteer in a surgical clinical setting compared to MS3 and MS4 cohorts,  $F(3,512)=7.787$ ,  $p=0.001$ ,  $\eta^2=0.044$ .

## Discussion

There was no clear preference within our sample to continue or discontinue in-person clinical activities during COVID-19; nearly a quarter of respondents were neutral on the topic. Motivations to discontinue included concern for close personal contacts and patients. Motivations to continue clinical in-person activities stemmed from allure of the learning opportunity and desire to help. Considering the timing of COVID-19 in the curriculum, the MS2 and MS3 cohorts may benefit the most from continuing clinical experiences in their development as physicians since they are in their clerkships. In addition, most respondents faced at least one barrier to engaging in in-person clinical activities the two weeks that proceeded the mandate, suggesting potentially limited learning experiences during a pandemic.

Despite the mandate to end in-person clinical activities between March 17, 2020 and May 25, 2020 at our school, respondents volunteered their time outside of school. Volunteer activities ranged from staffing food banks and hospital showers to providing babysitting services and collecting PPE. MS2 students at our institution were provided an approved list of volunteer activities to fulfill their service learning/community service requirement which likely contributed to their increased volunteerism. Graduating students were the least involved in volunteer activities and were also less likely to volunteer in surgical clinical or inpatient care settings compared to junior cohorts despite having the most clinical experience in UME. This finding was contrary to what was similarly studied in a Chinese medical student population [24], which found that senior students expressed greater interest to volunteer compared to junior students. We attributed the lack of volunteerism in our U.S. sample to potentially the natural tendency for seniors to spend the last few months of UME preparing for their transition to internship. Further research is needed on cultural influences on medical student motivation to engage in volunteerism and education during a public health crisis.

Medical students encountered a great deal of uncertainty about their future as physicians with the emergence of COVID-19. School administrations also faced a great challenge to convert traditional curriculum into virtual

and alternative clinical experiences that still capture the same essence as in-person activities. The Association of American Medical Schools (AAMC) published several statements to guide medical schools on the continuation of direct in-person patient contact activities [3]. Such guidance allowed for flexibility depending on contextual factors and included checklists to ensure safe re-entry of students into clinical settings [18]. Despite such guidance, there remained a constant tension between continuing medical education during a pandemic, volunteerism, and the welfare of public health and resources.

Several group differences emerged with the hypothetical situation of being given the opportunity to volunteer in various settings during a pandemic. Most notable was the greater likelihood for females to volunteer in healthcare adjacent and non-clinical sites compared to male students. We are uncertain why such gender differences emerged but encourage further investigation on how motivation, efficacy, and gender relate to engagement across unique volunteer settings during a public health crisis.

During undergraduate medical education, students move through a uniform curriculum with the aim of developing competent, professional physicians. However, the COVID-19 pandemic disrupted the experiences traditionally offered to medical students, and opened up the potential for a diverse set of opportunities for students to volunteer and engage with the public. In Ireland, one school found 69% of their medical students were willing to volunteer during a national disaster but only a minority of students felt their skill level was useful in such emergency situations [8]. In order to support students willing to volunteer during a pandemic, medical schools should integrate emergency preparedness training into their curriculums to increase self-efficacy and skills related to engagement during such events [13, 14]. One U.S. medical school was successful in improving emergency preparedness through a voluntary, self-paced online elective, which allowed flexibility in scheduling and minimal demands on faculty [14]. Such training could also be helpful for just-in-time training opportunities during emergency events. We found that participants increased their agreement that students can be helpful in non-clinical setting during a pandemic two months after being banned from clinical settings. This attitude change may be attributed to the clarification of student roles related to volunteerism during the pandemic,

Most students in our study experienced barriers to engagement in the clinical environment in the early phase of COVID-19. While attitudes and beliefs are positively correlated with an individual's behavior, the relationship hinges on the intent to enact the behavior as well as perceived behavioral control [1]. For example, a student with strong beliefs for advocacy and civic duty may intend to volunteer at a COVID-19 tracing site, but does not because

they feel the hazards are too high because of a lack of PPE. Schools and hospitals can help clarify the role of students during pandemics through proactive preparedness planning and cultivate role identity in those scenarios to both attract and retain volunteerism during public health crises [7]. In addition, schools can anticipate barriers to educational experiences during pandemics and address barriers to set clear expectations for continuing education while prioritizing public health safety and resources.

Limitations existed in our study, primarily related to the survey research design. We had limited participation from graduating students and considering the nature of our research question, response bias may be of concern. The survey was anonymous however questions about volunteerism and engagement in curriculum can potentially evoke socially desirable bias in responses. When we planned for our study, we were amid the COVID-19 pandemic. Therefore, while survey data is helpful to gauge a snapshot of perception, our study findings are limited to the contextual factors that existed in the early months of the pandemic. Similarly, our findings are bounded to the contextual factors that existed within our geographic location and resource preparedness in our area. Our sample also had limited racial diversity, which prohibited analysis of how race/ethnicity affects students' engagement during a pandemic. The experiences of students underrepresented in medicine may differ from the experiences of our study sample, requiring further investigation. Baylor College of Medicine, like many other U.S. medical schools, still does not have a student population representative of the racial/ethnic diversity of its communities. Recent improvement efforts to address this gap includes training admissions committees on holistic selection approaches, strengthening pipeline programs, and hiring an associate dean of admissions, diversity, equity and multicultural affairs. Despite these improvements, we still have work to do in order to develop a physician workforce that represents the communities we serve in Texas.

For future research, a repeat longitudinal study allowing within person analysis would help better understand the evolution of thought, behavior, and intention within a trainee population during a pandemic. Also, cultural studies are needed across countries to better understand motivations and engagement in volunteerism by medical students and how schools can better prepare for future pandemics.

## Conclusions

Our study provides a unique insight into the complexity of completing undergraduate medical education during a worldwide pandemic. Students varied in perceptions on how to approach education, as well as their preferences in what activities to engage in based on various internal and external

motivations. Such findings suggest socio-demographic factors impact engagement during a pandemic which should be considered by academic leadership. Despite the difficult time, most respondents engaged in some form of volunteerism when there were limitations to their in-person clinical activities.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s10900-021-01009-9>.

**Acknowledgements** The authors wish to thank Dr. Cara Lye for contributions to our initial study design.

**Author Contributions** All authors participated in the study design, conceptualization, and writing of the manuscript. NPA led efforts on data collection, data management, and conducted the statistical analysis. All authors read, edited, and approved the final article.

**Funding** No funding was received for conducting this study.

**Data Availability** The corresponding author may be contacted for all material used and data obtained from this study.

## Declarations

**Conflict of interest** The authors report no conflicts of interest/competing interests.

**Ethics Approval** The Baylor College of Medicine institutional review board approved our research protocol through expedited procedures.

**Consent to Participate** Participation in our anonymous survey was entirely voluntary. The Baylor College of Medicine institutional review board waived the requirement for written informed consent.

## References

1. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
2. Bazan, D., Nowicki, M., & Rzymiski, P. (2021). Medical students as the volunteer workforce during the COVID-19 pandemic: Polish experience. *International Journal of Disaster Risk Reduction: IJDRR*, 55, 102109. <https://doi.org/10.1016/j.ijdr.2021.102109>
3. *COVID-19: Updated Guidance for Medical Students' Roles in Direct Patient Care*. (2020). AAMC. <https://www.aamc.org/news-insights/press-releases/covid-19-updated-guidance-medical-students-roles-direct-patient-care>
4. Dong, E., Du, H., & Gardner, L. (2020). An interactive web-based dashboard to track COVID-19 in real time. *The Lancet Infectious Diseases*, 20(5), 533–534. [https://doi.org/10.1016/S1473-3099\(20\)30120-1](https://doi.org/10.1016/S1473-3099(20)30120-1)
5. Drexler, R., Hambrecht, J. M., & Oldhafer, K. J. (2020). Involvement of Medical Students During the Coronavirus Disease 2019 Pandemic: A Cross-Sectional Survey Study. *Cureus*, 12(8), e10147. <https://doi.org/10.7759/cureus.10147>
6. Ducharme, J. (2020). As the U.S. COVID-19 outbreak worsens, medical students are joining the fight. *Time Magazine*. <https://time.com/5809630/nyu-medical-school-early-graduation/>

7. Finkelstein, M. A., Penner, L. A., & Brannick, M. T. (2005). Motive, role identity, and prosocial personality as predictors of volunteer activity. *Social Behavior and Personality An International Journal*, 33(4), 403–418.
8. Gouda, P., Kirk, A., Sweeney, A.-M., & O'Donovan, D. (2020). Attitudes of medical students toward volunteering in emergency situations. *Disaster Medicine and Public Health Preparedness*, 14(3), 308–311. <https://doi.org/10.1017/dmp.2019.81>
9. Hai, S., Baroutjian, A., & Elkbuli, A. (2020). Challenges and ethical considerations for trainees and attending physicians during the COVID-19 pandemic. *Journal of the American College of Surgeons*, 231(2), 301–302. <https://doi.org/10.1016/j.jamcollsurg.2020.05.009>
10. Holm, S. (1979). A simple sequentially rejective multiple test procedure. *Scandinavian Journal of Statistics*, 6(2), 65–70.
11. Kramer, J. B., Brown, D. E., & Kopar, P. K. (2020). Ethics in the time of coronavirus: recommendations in the COVID-19 pandemic. *Journal of the American College of Surgeons*, 230(6), 1114–1118. <https://doi.org/10.1016/j.jamcollsurg.2020.04.004>
12. Miller, D. G., Pierson, L., & Doernberg, S. (2020). The role of medical students during the COVID-19 pandemic. *Annals of Internal Medicine*, 173(2), 145–146. <https://doi.org/10.7326/M20-1281>
13. O'Byrne, L., Gavin, B., & McNicholas, F. (2020). Medical students and COVID-19: The need for pandemic preparedness. *Journal of Medical Ethics*, 46(9), 623–626. <https://doi.org/10.1136/medethics-2020-106353>
14. Patel, V. M., & Dahl-Grove, D. (2018). Disaster preparedness medical school elective: Bridging the gap between volunteer eagerness and readiness. *Pediatric Emergency Care*, 34(7), 492–496. <https://doi.org/10.1097/PEC.0000000000000806>
15. Penner, L. A., Dovidio, J. F., Piliavin, J. A., & Schroeder, D. A. (2005). Prosocial behavior: Multilevel perspectives. *Annual Review of Psychology*, 56, 365–392. <https://doi.org/10.1146/annurev.psych.56.091103.070141>
16. Rainbow, S., & Dorji, T. (2020). Impact of COVID-19 on medical students in the United Kingdom. *Germes*, 10(3), 240–243.
17. Rasmussen, S., Sperling, P., Poulsen, M. S., Emmersen, J., & Andersen, S. (2020). Medical students for health-care staff shortages during the COVID-19 pandemic. *Lancet*, 395(10234), e79–e80. [https://doi.org/10.1016/S0140-6736\(20\)30923-5](https://doi.org/10.1016/S0140-6736(20)30923-5)
18. *Resources for Medical Schools During the COVID-19 Pandemic*. (2020). AAMC. Retrieved Sep 29 2020, from <https://www.aamc.org/coronavirus/medical-education>
19. Schaye, V. E., Reich, J. A., Bosworth, B. P., Stern, D. T., Volpicelli, F., Shapiro, N. M., Hauck, K. D., Fagan, I. M., Villagomez, S. M., & Uppal, A. (2020). Collaborating across private, public, community, and federal hospital systems: Lessons learned from the Covid-19 Pandemic response in NYC. *NEJM Catalyst Innovations in Care Delivery*, 1(6), 343.
20. Shi, Y., Zhang, S., Fan, L., & Sun, T. (2021). What motivates medical students to engage in volunteer behavior during the COVID-19 outbreak? A large cross-sectional survey. *Frontiers in Psychology*, 11, 569765. <https://doi.org/10.3389/fpsyg.2020.569765>
21. *Summary of Progress since 2009 Pandemic Influenza (Flu) CDC*. (2019). <https://www.cdc.gov/flu/pandemic-resources/h1n1-summa ry.htm>
22. Watson, A., McKinnon, T., Prior, S.-D., Richards, L., & Green, C. A. (2020). COVID-19: Time for a bold new strategy for medical education. *Medical Education Online*, 25(1), 1764741.
23. Willis, G. B., & Artino, A. R. (2013). What do our respondents think we're asking? Using cognitive interviewing to improve medical education surveys. *Journal of Graduate Medical Education*, 5(3), 353–356. <https://doi.org/10.4300/JGME-D-13-00154.1>
24. Yu, N.-Z., Li, Z.-J., Chong, Y.-M., Xu, Y., Fan, J.-P., Yang, Y., Teng, Y., Zhang, Y.-W., Zhang, W.-C., Zhang, M.-Z., Huang, J.-Z., Wang, X.-J., Zhang, S.-Y., & Long, X. (2020). Chinese medical students' interest in COVID-19 pandemic. *World Journal of Virology*, 9(3), 38–46. <https://doi.org/10.5501/wjv.v9.i3.38>

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.