



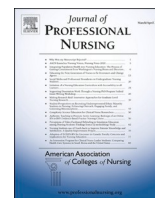
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Graduate nursing student stressors during the COVID-19 pandemic

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ABSTRACT

Background: The COVID-19 pandemic profoundly impacted graduate nursing students at work, home, and school. Stress can influence the ability to focus, study, and may delay continuation in graduate school.**Purpose:** The purpose of this study was to identify the stressors of graduate nursing students during the pandemic.**Method:** A prospective, descriptive, online survey design was used to identify graduate nursing student stressors during the pandemic at one educational institution in the United States. Questions related to employment, COVID-19 exposure, institutional support, future graduate plans were summarized for the total sample and stratified by program (MS, DNP, PhD). Changes in a total stress score were evaluated pre and post onset of the COVID-19 pandemic.**Results:** A total of 222 graduate nursing students completed the survey. The vast majority of students were employed before the pandemic and a significant decrease in employment occurred during the pandemic (97.3% to 90.1%, $p < .001$). Overall stress increased ($p < .001$). The increased total stress was associated with students participating in clinical rotations ($q = 0.024$) and having a change in work hours ($q = 0.022$).**Conclusions:** Nursing schools need to address graduate student concerns during the pandemic, including having clear communication platforms and offering support services.

Introduction

The COVID-19 pandemic (the pandemic) disrupted the lives of everyone in America and across the globe. For graduate nursing students, it has likely influenced every aspect of their lives, including at work, home, and school. Graduate nursing students are registered nurses pursuing a Master's degree in Nursing (MS), Doctor of Nursing Practice (DNP), or Doctor of Philosophy (PhD). Anecdotal discussions with nursing faculty from several schools attest that a large portion of these students are working as nurses while attending graduate school. The average age of nursing students at one MS program was 35.5 years of age (range 27–47) (Serembus & Riccio, 2019) and national data on age of nursing master's degree students is not currently available. National data on DNP students reported the average age of matriculation at age 39.3 years (personal communication, D. Fang, AACN, April 12, 2021) and PhD student matriculation at age 42.2 years (Fang & Zhan, 2021). Given the age of most graduate nursing students, many students may also have responsibilities at home, including children and/or elderly

parents.

Under normal circumstances, time and money are the two factors baccalaureate level nurses have listed as influencing their pursuit of a graduate degree in nursing (D. Beck & Srivastava, 1991; Lee, 2008; Maville et al., 2004). How the pandemic is affecting students' programmatic progression is unknown. The all-encompassing influence of the pandemic on graduate nursing students may delay the continuation of their studies. The personal and organizational stressors of being a nurse during the pandemic may disrupt student plans to complete their graduate programs, if they plan to continue at all.

The pandemic may negatively affect the healthcare workforce at a micro and macro level. There is already a shortage of health care providers in the United States (U.S.) in primary care, mental health, and other areas (Delaney & Vanderhoef, 2019; Wang-Romjue, 2018). In addition, nurse educators with DNP or PhD credentials are in demand (Rosseter, 2019). Masters-prepared nurse practitioners, DNP and PhD nurses are positioned to fill these needs. Unfortunately, many graduate nursing students may be unable to enter the workforce due to

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restrictions in clinical experiences during the pandemic, inability to afford schooling, or other stressors. The aims of this study were: 1) to identify the stressors of graduate nursing students during the pandemic; 2) to assess how stress changed before and after the onset of the pandemic, and 3) to identify factors associated with greater increases in stress. Ultimately, the goal of the researchers is to use this information to understand how graduate nursing institutions can best meet student needs during the pandemic, as a first step in maintaining graduate nursing student retention while continuing to provide excellence in education.

Literature Review.

In review of the literature, no published studies exist specific to the stressors of graduate nursing students related to the pandemic. One study reported stressors of DNP nursing students. The DNP students were described as non-traditional students entering programs later in their careers, while balancing work and families (Robinson & Volkert, 2018). This study found six external stressors that impacted graduate school retention: financial issues, support issues, program stressors, outside demands, time issues, and health issues. Other prior studies of graduate nursing students reported these sources of perceived stress: relationships (Maville et al., 2004; Reilly & Fitzpatrick, 2009), finances (Reilly & Fitzpatrick, 2009), and competing obligations (Maville et al., 2004). Academic sources of stress were time management (including academic demands) and clinical practicum experiences (Maville et al., 2004). Two prior studies, one in the U.S. (Maville et al., 2004) and one in Jamaica (Brown et al., 2016), demonstrated that the majority of graduate nursing students were either moderately or highly stressed.

To further understand stressor of graduate nursing students, the literature on stress pre-pandemic for graduate students from other disciplines and undergraduate nursing students was also examined. The rigors of a graduate education are well known and stress is attributed as an inherent part of the graduate education experience (McCaughey & Hinojosa, 2020). Pyhalto et al. (2012) studied Finnish doctoral students and found students struggled with feelings of isolation with a supportive learning environment being a positive pivotal factor in doctoral students' experiences. Moreover, nursing students were found to have higher levels of academic stress compared to other health majors due to learning to work in a profession that requires an individual to care and give (Thomas & Revell, 2016). The combination of working in a caring profession while undertaking the rigors of graduate education may compound stress levels in graduate nursing students. Due to limited evidence on graduate nursing students, this study aims to fill the gap on how the pandemic impacted this student population.

Methods

Design

A prospective, descriptive, online survey design was utilized to evaluate factors affecting stress in graduate nursing students during the pandemic.

Population and setting

The population eligible to participate in the study included all graduate nursing students at one institution in the Rocky Mountain Region of the U.S. Participants also needed to speak and read English and have access to a computer. The graduate students included MS, DNP, and PhD students studying in the university's college of nursing. There were 738 graduate nursing students enrolled in a program of study at the university during the time of the survey. Most of these graduate students were in the MS program with an additional 151 in the DNP program and 51 in the PhD program. The college offers 12 MS specialties, 9 of which have a nurse practitioner focus. There are 5 DNP foci, and 3 PhD foci. Most of these students had significant need for interaction with the health care system during the pandemic in the form

of clinical learning sites, implementation of quality improvement projects, and human subject or other health care research. Access to clinical sites was indefinitely interrupted after the onset of the pandemic and limited access continued through the implementation of this survey.

Data collection tool

The data collection tool was primarily designed by the researchers as a survey to measure the distinct aims of this study related to the pandemic. A consensus model of expert panel review was used to develop some of the questions for the graduate students and to assess face/content validity of each question. The expert panel consisted of the authors and research faculty at the university familiar with survey design. The survey was also piloted and revised by the expert panel prior to launch. In addition, the researchers incorporated two designed and verified scales to measure depression, anxiety, and stress (DASS-21) (Lovibond & Lovibond, 1995) and subjective distress caused by an event (IES-R) (J. Beck et al., 2008; Christianson & Marren, 2012). The results of the two scales are reported elsewhere (Rosenthal et al., 2021).

The electronic online survey was piloted ($N = 10$) prior to launching the full survey. The survey has 9 areas of interest with a total of 149 items. The areas of interest evaluated for the purpose of this study included: demographics and employment; COVID-19 exposure/ disease; silver linings during the pandemic; level of stress pre- and post- onset of the pandemic; and institutional support and future graduate school plans. Truncation of items occurred where possible, to eliminate items that were not relevant to a respondent's stress, thus decreasing respondent burden. When piloted, the full survey was completed in approximately 15 min.

Demographics and employment

The demographic area of the survey included 22 items with focus on age, gender, program of study, race, ethnicity, household income, and living situation. The student employment profile included 22 items evaluating student employment hours, place of employment, and change in work hours due to the pandemic, including change in household income. When applicable, change in work hours of student's spouse/significant other was determined.

COVID-19 exposure/disease

The COVID-19 exposure/ disease area evaluated personal and family COVID-19 exposure and/or disease, including place of exposure, COVID-19 testing, quarantine, and employer compensation.

Silver linings during COVID-19 pandemic

To assess for any positive outcomes, or what the researchers called "silver linings", from the pandemic in students' lives, 4 dichotomous questions (yes-no) on positive experiences in the areas of work, school, home, and "other" were assessed. Students were given the option to explain their response in an open-ended text.

Stressors related to the COVID-19 pandemic- Change in stress

This portion of the survey consisted of nine 5-point scales that assessed participants' perceptions of their pre- and post-COVID onset stress. The pre- and post-onset assessment of stress occurred at the same time, such that participants were asked to reflect on their pre-COVID stress levels after the onset of the pandemic. The nine areas of possible student stress measured included the following subscales: Didactic course work; Clinical rotations; DNP practicum; Work; Caring for family; Finances; Spouse/Significant other's work; Getting sick oneself; and Family member(s) getting sick. Five-point Likert scales (0 = Never, 1 = Almost never, 2 = Sometimes, 3 = Fairly often, 4 = Very often) were used to evaluate the perception of stress before and after the onset of the pandemic. Total stress scores compiled the Likert scale scores of the 9 subscales, such that the range was 0 to 36, with the higher score indicating more areas of stress and higher stress. Post-COVID-19 onset from

pre-COVID-19 change in total stress scores was then assessed. Cronbach's alpha was used to assess the reliability of the nine Likert scale questions in measuring total stress (Tavakol & Dennick, 2011). The estimated Cronbach's alpha was 0.82 when measuring total stress pre-COVID, and 0.85 when measuring total stress post-onset of the COVID-19 pandemic.

Factors most impacted by COVID-19 pandemic. Students were asked to rank the negative impact of the pandemic on the following aspects of their graduate school experience: Balancing work-family life; Finances; Didactic course work; Clinical rotations; and Synchronous course work. These were ranked from 1 through 5 with 1 being "most impacted" to 5 "least impacted".

Institutional support and future graduate school plans. This section included four 5-point Likert scales, adapted from the Higher Education Data Sharing Consortium (HEDS, 2020) student survey, which evaluated support provided by schools of nursing administration, staff and instructor since the onset of the pandemic (0, strongly disagree [lack of support] to 4, strongly agree [very supportive]). Assessment of future graduate school plans consisted of 2 items asking if school plans had changed since the pandemic and how.

The online survey was developed, managed, and monitored using REDCap data management system. REDCap is a secure, web-based application designed to support data capture for research studies (Harris et al., 2009). Although the dataset from this research is not sharable due to confidentiality, the authors have made their survey available as supplemental material.

Implementation of data collection

This study was approved by the Colorado Multiple Institutional Review Board (COMIRB #20-1069). On June 9th, 2020, all graduate nursing students at the research site were invited via their school email to participate in the study and the survey was open for 3 weeks ($N = 738$). The invitation included a link to the survey in REDCap. After launch, for the next two weeks, students received an invitation reminder each week only if they had not yet completed the survey. The survey closed on June 30th, 2020.

No faculty member was involved in recruitment of participants. The invitation to participate came directly from the data administrator who was contracted from outside the institution. Written informed consent was waived, though the elements required for informed consent were included in the email of invitation (postcard consent). Potential participants were informed that taking the electronic survey implied consent.

Data analysis

Descriptive and inferential statistics were used to analyze data. The total number of respondents was reported separately for each survey item, and all available responses were included when analyzing a given item (missing values were excluded). Due to the number of computed p -values, Benjamini-Hochberg multiple testing adjusted p -values (hereafter referred to as "q-values") were also reported (Benjamini & Hochberg, 1995). Results with q -values < 0.05 were considered to be statistically significant.

Descriptive data

Descriptive statistics were used to analyze questions related to demographic, employment, COVID-19 exposure, "silver linings", institutional support, and data on future educational plans. Categorical survey items were summarized by the count and percent in each category (percent of the total number of non-missing responses), while numeric Likert scale questions were summarized by median and interquartile range, "IQR" (25th quantile, 75th quantile).

Change in employment

Several questions assessed employment status before and after the onset of the pandemic. McNemar's test was used to test for pre-post changes in proportions for binary variables, while mean (standard deviation) and a paired t -test were used to assess changes in average work hours before and after the onset of the pandemic.

Change in stress

Five-point Likert scales (0 = Never, 1 = Almost never, 2 = Sometimes, 3 = Fairly often, 4 = Very often) were used to evaluate the students' perception of stress before and after the onset of the pandemic for stress subscales previously described. Responses were summarized by the median and IQR, using the Wilcoxon signed rank test to test for change before and after the pandemic onset. For each subscale, the change in a student's stress was calculated (post – pre pandemic onset), and the Kruskal-Wallis test was used to test for associations between the "change in stress score" with various categorical survey items (requiring at least 10 subjects per category). Note that students were allowed to answer NA (not applicable) for the separate stress subscales, however, responses of NA were omitted in the aforementioned analyses. A "total stress score" was calculated by summing the integer value across all subscales (NA responses were treated as 0 when calculating the sum). The total stress score was summarized by mean and standard deviation, with a paired t -test to test for differences before and after the pandemic onset. The change in the total stress score was calculated (post – pre pandemic onset) and Welch's one-way ANOVA was used to test for associations between the change in total stress score with other survey items.

Rankings of COVID-19 pandemic impact

Students ranked the negative impact of the pandemic on various aspects of their graduate school experience. In addition, they ranked areas of worry in their overall lives during the onset of the pandemic. These ranks were summarized by median and IQR in the total sample, and stratified by graduate program, using the Kruskal-Wallis test to measure differences across the programs.

Results

Of the 738 students sent surveys, 222 (30.1%) completed the survey. The largest age-group of surveyed students were aged 31 through 40 (41.6%), while 16.7% were non-white or preferred not to answer the race question, and 6.5% identified as Hispanic/Latino ethnicity. Household income was less than \$50,000 per year for 10.5% of responders, while 6.4% had household incomes greater than \$250,000. Most graduate students lived with a spouse/ significant other (75.7%). Of the 10.4% who lived with other (non-spousal/ significant other) adult(s), 30.4% were primary care providers for the adult(s). Income was the only demographic difference between programs, with PhD students tending to have a higher overall income than MS or DNP students ($q = 0.023$) (Table 1).

Employment data

The proportion of students working significantly changed before and after the onset of the pandemic (97.3% to 90.1%, $q = 0.002$). Of those students who worked pre-pandemic, most worked as registered nurses in the hospital setting (67.6%), with others working in the outpatient setting (18.8%), other healthcare settings (17.5%), or non-healthcare settings (4.0%). The proportion of students working in a hospital changed from 67.3% to 62.3% after the pandemic onset ($p = .015$, $q = 0.076$). Although work hours changed for many individuals, the average number of work hours per week did not significantly change (32.8 h/ week pre-pandemic vs 33.6 h/ week post-pandemic onset, $p = .69$).

Many of those students who worked noted a change in number of

Table 1
Demographic data for Master’s, Doctor of Nursing Practice, and PhD students^a.

Characteristic	Overall N = 222	N	MS N = 131	DNP N = 72	PhD N = 19	p-value	q-value
Age		221				0.027	0.227
20–25	4 (1.8%)		1 (0.8%)	3 (4.2%)	0 (0.0%)		
26–30	49 (22.2%)		33 (25.4%)	15 (20.8%)	1 (5.3%)		
31–35	51 (23.1%)		36 (27.7%)	13 (18.1%)	2 (10.5%)		
36–40	41 (18.6%)		20 (15.4%)	19 (26.4%)	2 (10.5%)		
41–45	28 (12.7%)		15 (11.5%)	9 (12.5%)	4 (21.1%)		
46–50	27 (12.2%)		14 (10.8%)	7 (9.7%)	6 (31.6%)		
Over 50	21 (9.5%)		11 (8.5%)	6 (8.3%)	4 (21.1%)		
Gender		221				0.929	1.000
Female	203 (91.9%)		119 (90.8%)	66 (93.0%)	18 (94.7%)		
Male	18 (8.1%)		12 (9.2%)	5 (7.0%)	1 (5.3%)		
Variant/non-conforming	0 (0.0%)		0 (0.0%)	0 (0.0%)	0 (0.0%)		
Race		221				0.502	0.903
American Indian or Alaska Native	2 (0.9%)		1 (0.8%)	1 (1.4%)	0 (0.0%)		
Asian	14 (6.3%)		9 (6.9%)	4 (5.6%)	1 (5.3%)		
Black or African American	7 (3.2%)		5 (3.8%)	2 (2.8%)	0 (0.0%)		
Native Hawaiian or Other Pacific Islander	1 (0.5%)		1 (0.8%)	0 (0.0%)	0 (0.0%)		
White	184 (83.3%)		106 (80.9%)	63 (88.7%)	15 (78.9%)		
Prefer not to answer	13 (5.9%)		9 (6.9%)	1 (1.4%)	3 (15.8%)		
Ethnicity		216				0.531	0.903
Hispanic or Latino	14 (6.5%)		11 (8.7%)	2 (2.8%)	1 (5.6%)		
Not Hispanic or Latino	192 (88.9%)		110 (86.6%)	66 (93.0%)	16 (88.9%)		
Prefer not to answer	10 (4.6%)		6 (4.7%)	3 (4.2%)	1 (5.6%)		
Income		220				0.001	0.023
Less than \$50,000	23 (10.5%)		13 (9.9%)	8 (11.4%)	2 (10.5%)		
\$50,000 to \$99,999	75 (34.1%)		45 (34.4%)	24 (34.3%)	6 (31.6%)		
\$100,000 to \$249,999	98 (44.5%)		61 (46.6%)	33 (47.1%)	4 (21.1%)		
More than \$250,000	14 (6.4%)		3 (2.3%)	5 (7.1%)	6 (31.6%)		
Prefer not to answer	10 (4.5%)		9 (6.9%)	0 (0.0%)	1 (5.3%)		
Live alone	27 (12.2%)	222	15 (11.5%)	7 (9.7%)	5 (26.3%)	0.150	0.425
Live with spouse/sig. other ^b	168 (75.7%)	222	101 (77.1%)	54 (75.0%)	13 (68.4%)	0.641	0.991
Live with children	81 (36.5%)	222	49 (37.4%)	22 (30.6%)	10 (52.6%)	0.192	0.465
Live with other adults	23 (10.4%)	222	12 (9.2%)	11 (15.3%)	0 (0.0%)	0.136	0.425
Sig. other ^b work outside	145 (77.1%)	188	85 (75.2%)	49 (79.0%)	11 (84.6%)	0.789	1.000

^a Categorical variables were summarized for the overall sample and stratified by graduate program (MS/DNP/PhD), using count(%) and Fisher’s exact test. Both the original p-values and Benjamini-Hochberg multiple-testing adjusted p-values are reported (q-value).

^b Significant other

work hours (some increased, some decreased) (48.2%) and a large majority of the students did not have control over the change in hours (e.g., the changes were employer-driven) (74.3%). Compared to personal incomes prior to the pandemic, 61.2% students were earning the same, 32.9% were earning less, and 15.9% were earning more. Comparing spousal/ significant other incomes before and after the pandemic, 65.4% had no change in earnings, 29.6% had a decrease in earnings, and 5% had increased earnings.

COVID-19 exposure

The study evaluated COVID-19 exposure and disease of graduate nursing student at the time of the survey; 72.1% of students reported exposure to COVID-19 at work and 13.1% reported exposure from other settings. COVID-19 symptoms occurred in 18.6% of students; 20.8% were tested, and 8.9% of those who were tested had a positive test result. Several students were quarantined (14.9%); 57.7% of these were mandatorily quarantined and 42.4% were in self-directed quarantine. Of those who quarantined, 56.2% were compensated in some way from their work whereas 43.8% were not.

Silver linings during COVID-19 pandemic

This section of the survey employed dichotomous (yes-no) responses to elicit students views on positives coming from the pandemic. Students were asked if they felt there were any positives coming from the pandemic in the subcategories of personal and family life, work life, graduate school, and “other”. The subcategory with the largest positives coming from the pandemic was personal and family life; 63.4% felt there

were reportable positive changes in their personal and family lives. In their work, 38.9% found some positives and 26% felt there were positives coming from the pandemic related to their graduate schooling. The school positives focused on the increased flexibility of remote learning, online simulation opportunities, and learning about COVID-19 in classes.

Stressors related to the COVID-19 pandemic

Change in stress

A statistical comparison of pre-pandemic stress levels with post-pandemic onset stress was carried out utilizing the two sets of Likert scales in the survey. Students were asked to reflect on their perception of stress pre-pandemic at the time of the survey in June 2020, after the onset of the pandemic, and completed the post-pandemic onset stress scales at the same time. The total stress score significantly increased from before (mean = 12.2, SD = 5.2) to after (mean = 19.7, SD = 6.8) the pandemic onset (q < 0.001), and also significantly increased within each of the subscales (Table 2). Change in total stress scores and change in stress subscales did not differ between graduate programs (p > .05).

The study evaluated the association between change in total stress scores (post – pre pandemic onset) with 21 student characteristics, including demographic, employment, graduate program, and financial items. The mean change in the total stress score was significantly higher in students who were participating in clinic rotations versus those not doing clinical rotations (8.3 vs 5.9, q = 0.035) and in students who had a change in work hours compared to those not having a change in work hours (8.8 vs 6.2, q = 0.026). Change in the total stress score also differed by gender and pre-pandemic work status (p < .05), but these

Table 2
Change in stress scores pre and post COVID-19 Pandemic onset^a.

	N	Pre	Post	q-Value
Total stress	216	12.2 (5.2)	19.7 (6.8)	< 0.001
Didactic course work	208	2 (2,3)	3 (2, 4)	< 0.001
Clinical rotations	133	2 (1,3)	3 (2, 4)	< 0.001
DNP project practicum	69	1 (0,2)	2 (0, 4)	< 0.001
Work	214	2 (1, 3)	3 (2, 4)	< 0.001
Family	203	2 (1,2)	2 (2, 3)	< 0.001
Finances	217	2 (1, 2)	2 (1, 3)	< 0.001
Spouse/significant other work	179	1 (0, 2)	2 (1, 3)	< 0.001
Getting sick yourself	217	1 (0, 2)	2 (2, 3)	< 0.001
Family member getting sick	214	1 (1, 2)	3 (2, 4)	< 0.001

^a Total Stress Score was summarized by mean (standard deviation), and paired t-test. The stress subscales (0–4 Likert scales) were summarized by median (25th, 75th quantiles) and Wilcoxon signed rank test. “N” is the number of respondents with both pre and values.

differences were no longer significant after adjusting for multiple testing (q > 0.05) (Table 3).

Some non-significant findings in regard to total stress score are worth noting. Having one or more “silver lining” was not associated with the total stress score, in that affirming positives coming out of the pandemic did not affect stress levels, positively or negatively (q = 0.805). No statistical difference in total stress scores was found between programs (q = 0.822). Living situation- living alone, with spouse/significant other, with children, or with other non-spousal adult- was not associated with total stress scores (q = 0.822, 0.271, 0.441, and 0.306, respectively). Supplemental Table A gives the complete results for all student characteristics that were tested for association with change in the total stress score.

Change in each stress subscale was also evaluated for associations

Table 3
Factors associated with change in total stress score^a.

Variable	N	Mean change	SD	p-Value	q-Value
Clinical rotations				0.003	0.035
No	73	5.9	5.4		
Yes	142	8.3	6.0		
Change in work hours				0.001	0.026
No	111	6.2	6.1		
Yes	103	8.8	5.4		
Gender				0.033	0.130
Female	199	7.7	5.8		
Male	16	3.8	6.6		
Work in hospital, prior ^b				0.027	0.130
No	70	6.2	5.3		
Yes	146	8.0	6.1		
Work in other health care ^c , prior				0.033	0.130
No	178	7.8	6.0		
Yes	38	5.7	5.3		
Work since ^d				0.049	0.136
No	22	9.7	5.4		
Yes	194	7.2	5.9		
Work in other healthcare ^c , since ^d				0.037	0.130
No	183	7.8	6.0		
Yes	33	5.6	5.1		

^a Post – pre pandemic onset using Welch’s one-way ANOVA. The mean and standard deviation (SD) of the change score is reported for each category of a variable. Positive “mean change” indicates increased stress. Both the original p-values and Benjamini-Hochberg multiple-testing adjusted p-values (q-value) are reported. All factors with p-values <0.05 are displayed in this table, see Supplemental Table A for the full list of factors that were tested and contributed to the multiple testing correction.

^b prior to pandemic

^c Other health care included health care sites other than the hospital and outpatient facilities

^d Since the onset of the COVID-19 pandemic

with student characteristics (note the stress subscales take on integer values 0–4, with post-pre change ranging from –4 to 4). Only student characteristics with at least 10 subjects in each category were included and this sometimes varied for the different stress subscales so the characteristics used in the evaluation differed slightly for each stress subscale. Complete results can be found in Supplemental Tables B 1–9.

Students with a greater increase in stress post-pandemic onset related to didactic course work were more likely to be students who lived with children (q = 0.022); worked in a hospital at the onset of the pandemic (q = 0.038); and had a change in work hours (q = 0.002). Students with a greater increase in financial stress were more likely to be students who were not working after the onset of the pandemic (q = 0.001); had a change in work hours (q < 0.001); had less household income (q < 0.001). Change in work hours was also associated with increased work and family stress subscales (q = 0.026 and q = 0.019, respectively). Students who worked in healthcare settings other than a hospital or outpatient setting (e.g., community health, remote monitoring, medical sales, educators) had a lower median stress score change compared to students who did not work in such settings for the finance stress score (q = 0.034).

Changes in the remaining stress subscales were associated with several characteristics with p-values < .05, however, these were no longer statistically significant after adjusting for multiple testing (q > 0.05). For each subscale, these characteristics are listed in parentheses as follows: didactic course work (working in a hospital or outpatient clinic after onset of pandemic), Work (decrease in household income, less positive silver linings), care for family (less positive silver linings), finances (participation in clinical rotations), spouse/ significant other’s work (post-pandemic onset work status, change in work hours), other family members getting sick (working in a hospital post-pandemic onset). As well, female students had greater increases in stress scores related to getting sick themselves and other family members getting sick. However, these changes were no longer significant after adjusting for multiple testing (q > 0.05).

Factors most impacted by COVID-19 pandemic

Students were asked to rank 5 area of their lives with #1 being the area most negatively impacted by the pandemic and #5 being the least negatively impacted (Table 4). Balancing of work-home-school was the area that was most negatively impacted (median rank = 2), while “attending synchronous classes” was the least impacted (median rank = 4), with no statistically significant differences between graduate programs (p > .05).

Institutional Support and Future Graduate School Plans.

Students were asked how often they worried about changes at their school of nursing caused by the spread of COVID-19. Paying bills (finances), doing well in the graduate nursing programs, and successfully

Table 4
Ranking of the COVID-19 Pandemic’s Impact on Graduate Schooling^a.

What about your graduate schooling has been negatively impacted by the COVID-19 pandemic, if any? rank 1–5, 1 being most impacted, 5 being least impacted.

Characteristic	Overall N = 222	N	MS N = 131	DNP N = 72	PhD N = 19	p-Value
Balancing work-family-school	2 (1, 4)	206	2 (1, 3)	3 (1, 4)	2 (1, 4)	0.313
Finances	3 (2, 4)	201	3 (2, 4)	4 (2, 4)	3 (3, 4)	0.875
Didactic course work	3 (2, 4)	201	3 (2, 4)	3 (2, 4)	3 (2, 3)	0.772
Clinical rotations	3 (1, 5)	191	3 (1, 5)	4 (2, 5)	5 (2, 5)	0.056
Attending Synchronous Classes	4 (2, 5)	194	4 (3, 5)	3 (1, 5)	3 (2, 4)	0.061

^a The median rank (25th quantile, 75th quantile) is reported for the overall sample, and stratified by graduate program. Kruskal-Wallis test was used to test for differences between graduate programs.

using technology for online classes were their greatest worries, whereas they were least worried about having enough to eat and a place to sleep (Table 5). There were no statistically significant differences between graduate programs ($p > .05$). Although the vast majority of students did not worry about basic human needs, some did; 11 surveyed students were worried about having enough to eat and/or a place to sleep (5% of surveyed students).

Almost one-third (31.5%) of the 168 students who were involved in clinical rotations during spring and early summer semesters were forced to discontinue these due to pandemic restrictions for students at clinical sites. Didactic courses continued to be online during the pandemic, but skills labs were reconfigured to align with national and institutional requirements for social distancing. Despite the stressors related to the pandemic, students felt supported by the administration, staff, and faculty (data available upon request).

After adjusting for students who were able to graduate at the end of spring 2020 semester and missing data (7.9% and 3.2%, respectively), 80.2% of students planned to continue in school without any change in their program plans, whereas 18.2% of students stated that their graduate education plans had changed due to the pandemic. Of those students who stated that their plans had changed, 17.1% planned to take a leave of absence and 2.9% planned to discontinue their graduate education. Most of the students who stated that their educational plan had changed were not sure how it would change (80%).

Discussion

Students surveyed were significantly more stressed after the onset of the pandemic in all the subscales evaluated, including didactic course work, clinical rotations, DNP projects, work, family, finances, spouse/significant other's work, getting sick, and friends-family getting sick. This indicates the all-encompassing impact of the pandemic on graduate nursing students.

Living arrangements had no significant relationship with stress scores, which was a surprising finding. We hypothesized those living

alone might have higher stress scores due to isolation and lack of support within the home. We also anticipated students with children would have higher stress given the need to home school in addition to work and graduate nursing school responsibilities. In fact, the joy of having more time with children might have overshadowed the additional stressors due to the pandemic.

The resilience of the students during the pandemic is notable, regardless of the overarching stress. A vast majority of students realized positive aspects of the pandemic in their home life and one-third observed positive outcomes at work. In addition, student resilience was exemplified by the vast majority of students who were continuing with their graduate education without program changes.

We found no statistical difference in total stress scores among the three types of graduate programs (MS, DNP, PhD) or among our 12 MS programs. This is noteworthy since each program has a different program director whose individual style of leadership might have affected students differently. The college of nursing sent centralized communication via the Dean's office to all students throughout the pandemic. Use of standardized leadership communication across the college might have contributed to the insignificant differences in total stress scores among programs.

A review of the literature on graduate nursing students in the U.S., revealed a dearth of data on their employment while in graduate school. The vast majority of students surveyed work as registered nurses in a variety of settings, the majority in a hospital setting. In addition, they worked, on average, over 30 h per week. This is an immense difference compared to medical students and physician assistants who are advised against working while in graduate school (Coulson, 2017; Medical School Headquarters, 2020). Further research on how employment impacts graduate nurses' education is needed. Is there a "tipping point" where the number of hours worked during graduate school is harmful to a student's education? Even with an urgent need to broaden access to health care in the U.S., a lack of federal funding to aid these students persists (Safriet, 2011).

A change in work hours during the pandemic significantly contributed to students' overall stress. The change in work hours was most often initiated by the students' employer, such that the student did not have control over the change. As most students had a decrease in hours, this may have contributed to financial stress, but finances did not contribute to overall stress. Therefore, the stress may have been more related to the lack of control in their work lives. Employment is a large part of graduate nurses' lives and changes in this usually steady aspect of their lives, such as working less, taking more call, or working in other areas, may cause increased stress, regardless of financial changes.

For those in the midst of clinical rotations during the onset of the pandemic, clinical rotations contributed significantly to overall stress. Although students felt well-supported by the institution, clinical assignments in graduate nursing programs are an agreement between a clinical site and the college of nursing. Initially, clinical sites closed to all students (medical and nursing) in early March 2020 and gradually opened to students with certain restriction starting in late May 2020. For students planning to graduate in May 2020 or just stay on track to graduate on time, this was a major stressor. Some programs opened up online simulation labs for students to get clinical hours; others added clinical case study hours to keep students' clinical critical thinking sharp. When clinic sites began discussing readmitting students, the college provided personal protective equipment (PPE) as initially this was a barrier to student return. As clinic sites opened, students were able to participate in telehealth visits, an innovative clinical experience. Advanced practice nursing programs cannot function without clinical sites for their students. Faculty and college administration need to maintain a solid relationship with clinical sites and advocate for their students in situations such as the pandemic.

Stress related to didactic course work was significantly impacted by having children at home and working in a hospital at the onset of the pandemic. Mothers and fathers in graduate school suddenly had their

Table 5
Ranking of Worries during COVID-19 Pandemic for Graduate Nursing Students^b. Given the changes at the school of nursing caused by the spread of COVID-19, how often do you worry about the following?^a
5 = Very often 4 = Often 3 = Sometimes 2 = Almost Never 1 = Never.

	Overall N = 222	N	MS N = 131	DNP N = 72	PhD N = 19	p- Value
Paying your bills	2 (1, 3)	216	2 (1, 3)	2 (1, 4)	3 (2, 4)	0.801
Doing well in college now that many classes are online.	2 (1, 3)	215	2 (1, 3)	2 (1, 3)	1 (1, 3)	0.471
Successfully using technology for online classes.	2 (1, 3)	216	1 (1, 3)	2 (1, 3)	1 (1, 2)	0.115
Losing friendships and social connections now that classes are online	1 (1, 3)	216	1 (1, 2)	2 (1, 3)	1 (1, 3)	0.553
Having access to health care	1 (1, 2)	216	1 (1, 2)	1 (1, 2)	1 (1, 2)	0.932
Having enough to eat	1 (1, 1)	216	1 (1, 1)	1 (1, 1)	1 (1, 1)	0.755
Having a safe and secure place to sleep every night.	1 (1, 1)	216	1 (1, 1)	1 (1, 1)	1 (1, 1)	0.833

^a Adapted from adapted from the Higher Education Data Sharing Consortium (HEDS, 2020).

^b The median rank (25th quantile, 75th quantile) is reported for the overall sample, and stratified by graduate program (MS, DNP, PhD). Kruskal-Wallis test was used to test for differences between graduate programs.

school-aged children home continuously and had fewer choices for the pre-school or infant children, leaving less time for didactic course reading and assignments, yet parents' work lives continued. With hospital work schedules, this change at home may have been particularly difficult to navigate. In addition, some support systems may have been interrupted, as family may not have been able to travel to help or unable to help due to fear of illness.

Financial stress was a concern for those who were not working during the pandemic and who had a decrease in household income after the onset of the pandemic. From prior studies, we know that finances are a major concern for those considering graduate nursing education. We do not yet understand how personal financial change related to the pandemic will impact graduate nursing student continuation in their graduate programs. The loss of employer programs for tuition payment or reimbursement was not evaluated in this study, but may impact students' decisions to continue in school.

Almost one-third of students were considering a change in their education, but, at the time of this survey, most were unsure what those changes would be. Health care systems are changing due to the pandemic, with more telehealth visits, for example. Work sites overall are changing, with more working from home for the foreseeable future. Home life is changing, with students learning from home part or all of each week, grandparents separated from their grandchildren, and fewer after-school activities, for examples. Time will tell exactly how the pandemic affected graduate nursing programs and how they will be impacted in the future. Reflection on home-work-life balance will most likely guide students' decisions regarding entering or continuing in a program, or modifying how they navigate through a graduate program in the future.

Limitations

This survey was administered to graduate students at one institution and may not be generalizable to other institutions or graduate nursing students overall. Pre-pandemic stress scores were asked of students retrospectively, after the onset of the pandemic, so may not be as accurate as if this data were collected before the pandemic.

Implications for nursing education

The ultimate goal of this research was to use the results to better understand how graduate nursing institutions can best meet student needs during the pandemic, as a first step in maintaining graduate nursing student retention while continuing to provide excellence in education.

At the onset of the pandemic, student stress was amplified. At this study's college of nursing, new resources were developed during the pandemic to support student mental health and basic needs (e.g., student food bank) and should continue post pandemic. Second, a philosophy of academic grace was adopted at colleges during the pandemic, which might serve as an exemplar for educating graduate students beyond the pandemic. Flexible assignment due dates, extending clinical hours between semesters, placing courses that can be taught online, and use of telehealth and simulation are changes students appreciated and may expect in future education. Shifting education practices to measure competencies and not just scores on tests and assignments is a trend accelerated by the pandemic and may be accomplished in the future through malleable curriculum.

Conclusions

School administration and faculty will need to be innovative and flexible while maintaining excellence in education to move forward and upward through and beyond the pandemic. National and state policy advocacy for graduate nursing programs, which help to fill health care deserts with advanced practice nurse and nurse leaders, is needed,

including-but not limited to- more funding for the programs and the students. Colleges of nursing, hospitals, and government institutions have an opportunity to take up this call to support nurses seeking graduate education to build the future healthcare workforce.

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