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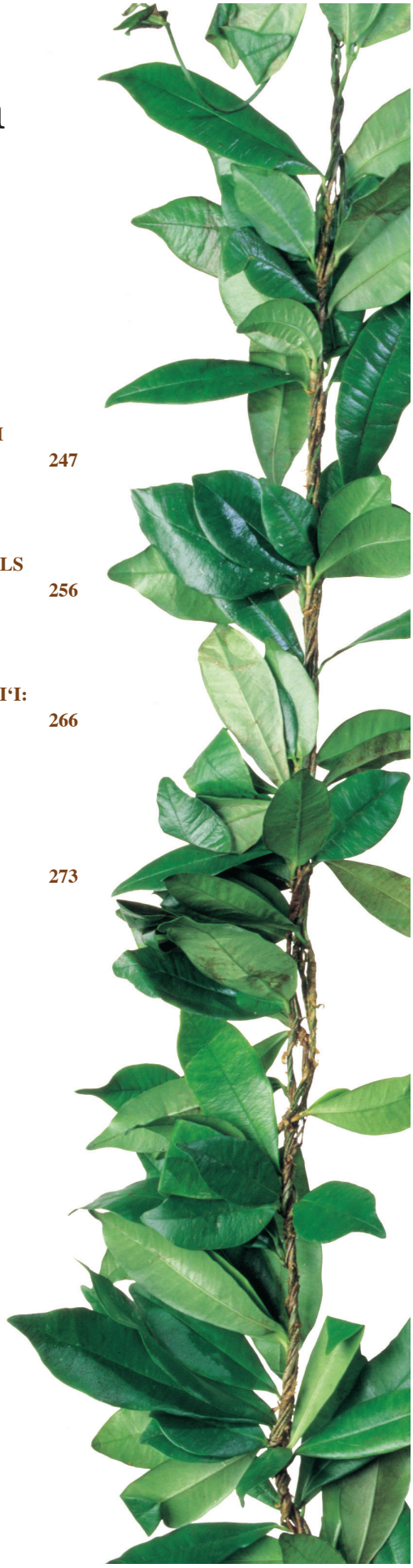

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Occupational Stress among Hospital-Based Nurses in Hawai'i during the COVID-19 Pandemic: A Cross-Sectional Survey

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Abstract

The Coronavirus Disease 2019 (COVID-19) pandemic has caused unprecedented disruption in health care systems and may continue to do so. Nurses, the largest contingent of the nation's health care workforce, have borne the brunt of those disruptions, which have caused increased workload and resultant occupational stress. This study identified differences in nurses' occupational stress by practice specialty, time spent caring for patients with COVID-19, and nurses' demographic characteristics. A descriptive cross-sectional online survey of RNs and APRNs (N=328) was conducted at a Level 1 Trauma Center on the island of O'ahu, Hawai'i in September and October of 2021. Participants completed the 57-item Expanded Nursing Stress Scale (ENSS). Nurses reported an average overall stress score of 2.11 out of 4. The ENSS subscales of workload, patients and their families, inadequate preparation, and uncertainty concerning treatment all had higher mean scores than the total scale. Nurses working in perioperative/procedural areas and obstetrics reported lower overall occupational stress scores than nurses in other specialties. Nurses who spent > 50% of their time caring for patients with COVID-19 reported higher overall occupational stress scores than nurses who spent ≤ 50% of their time caring for patients with COVID-19 ($F = 8.21$, $P < .001$). Nurses over the age of 50 reported less stress than their younger counterparts ($F = 5.75$, $P = .004$). Understanding how occupational stress impacts acute care nurses can aid employers in allocating resources to address the problem, and thus improve workforce retention.

Keywords

COVID-19, hospital-based nurses, occupational stress, workload

Abbreviations

ANOVA = analysis of variance
APRN = advance practice registered nurse
COVID-19 = coronavirus disease 2019
ED = emergency department
ENSS = Expanded Nursing Stress Scale
ICU = intensive care unit
PPE = personal protective equipment
QR = quick response
RN = registered nurse

Introduction

Coronavirus Disease 2019 (COVID-19) continues to evolve and spread worldwide without a clear end. As of October 2022, the World Health Organization reported 625 million confirmed COVID-19 cases and 6.5 million deaths worldwide.[1] In the same timeframe, the Centers for Disease Control and Prevention reported 94.8 million confirmed cases of COVID-19 and over one million deaths in the United States.[2] The Hawai'i State Department of Health reported 334 000[3] confirmed cases of COVID-19 and more than 1600 deaths.[4] The devastating impact of COVID-19 is widespread and has consequently caused tremendous strain on health care systems.[5]

With numerous surges leading to increased COVID-19 cases and hospitalizations, health care workers, especially hospital-based nurses, have had to practice in extremely challenging environments. Early in the COVID-19 pandemic, the full extent of the disease and mode of transmission were not clear and seemed to evolve by the day, which resulted in health care professionals' uncertainty about how to safely care for patients.[6,7] Supplies of personal protective equipment (PPE) were quickly depleted and difficult to replenish due to global supply chain disruptions.[8] The insufficient supply of PPE put nurses in a vulnerable position of potentially becoming infected and transmitting the virus to their patients, coworkers, and loved ones.

The pandemic also caused significant stress in other areas of the health care system. The early waves of COVID-19 caused many hospitalizations resulting in overflowing intensive care units (ICUs)[9] and a shortage of medical oxygen.[10] To preserve limited resources for the most critical patients, many elective surgeries were canceled and nurses working in procedural areas were often redeployed outside their specialty into unfamiliar settings or routines.[11-12] Meanwhile, nurses in ICUs, designated COVID-19 units, and emergency departments (EDs) experienced higher than normal nurse-to-patient ratios and heavier workloads.[13] Uncertainty, lack of adequate resources, heavy workload, and unfamiliar routines brought about by the pandemic all contributed to nurses' occupational stress.

The National Institute for Occupational Safety and Health defines occupational stress as job demands that exceed workers' capabilities, resources, or needs, which causes harmful physical and psychological responses.[14] Excessive workloads combined with resource scarcity among hospital-based nurses can negatively impact their physical or psychological status and cause symptoms such as burnout, anxiety, depression, or insomnia.[7,15,16] Effects of cumulative occupational stress[17] can increase absenteeism and individuals' intention to leave their current job or profession.[18] Fontenot et al[19] suggested nursing shortages could happen in Hawai'i if stressors related to the COVID-19 pandemic cannot be managed or if interventions are not implemented to support hospital-based nurses.

The loss of nurses due to occupational stress could exacerbate a global nursing workforce shortage that predates the pandemic. In 2018, there was an estimated shortage of 5.9 million nurses worldwide.[20] In Hawai'i, the nursing workforce shortage resulted in more than 1300 vacant nursing positions as of the end of October 2022.[21] There are not enough nurses in the state to fill existing openings, yet the State of Hawai'i Department of Labor and Industrial Relations projects that local employers will hire an estimated 740 nurses annually through 2030[22] to account for retirements, job changes, and increased health care utilization stemming from an aging population.[23] If the issue of nurses' occupational stress is not addressed, Hawai'i could face a serious public health crisis. Local schools of nursing do not have the capacity to meet existing or forecasted workforce demand.[24] If the 24% of nurses who have contemplated leaving the nursing profession due to stress[25] leave the workforce, employers will be unable to hire the nurses they need to care for the population.

Given the need to understand the impact of occupational stress on the nursing workforce, this study examined occupational stress levels of hospital-based nurses at a trauma center in Hawai'i during the COVID-19 pandemic. This study sought to identify differences in nurses' occupational stress by practice specialty, time spent caring for patients with COVID-19, and demographic characteristics. By understanding how occupational stress impacts hospital-based nurses, employers can better allocate resources to address the problem, and thus retain the nursing workforce.

Methods

Study Design

A descriptive cross-sectional study was conducted via online survey at a 575-bed Level 1 Trauma Center on the island of O'ahu in Hawai'i.

Participants and Recruitment

Nurses were eligible to participate in the study if they were a registered nurse (RN) or an advanced practice registered nurse (APRN) working in a full- or part-time position at the hospital during the study period. Per diem and travel nurses were excluded from participation as their experience of occupational stress was likely to have been affected by other employment settings. The focus of the study was on nurses working in direct patient care roles, so nurses were excluded from the study if they self-reported spending less than 60% of their total weekly work hours providing direct patient care.

Nurses were recruited using a convenience sampling method. The principal investigator gave informational presentations, posted informational flyers, and distributed quick response (QR) codes that linked to the online survey throughout the hospital. If a nurse chose to participate in the study, they could use the QR code or the link on an informational flyer to access the survey. Participation was voluntary and no compensation was offered.

The survey was hosted on the online survey platform Survey Monkey (Momentive.ai, Niskayuna, NY), a commonly used web-based survey data collection tool. The first page of the survey provided study information. Because the survey collected no personally identifying information, the study was approved with a waiver of signed consent. Participants indicated their consent to participate by advancing to the second page of the survey.

Prior to data collection, the principal investigator obtained permission to use the Expanded Nursing Stress Scale (ENSS) for this study. The study protocol was reviewed and approved by the Research & Institutional Review Committee at the Queen's Medical Center (#RA 2021-042).

Measures

Demographics

The survey measured 8 demographic and employment variables including age, sex, job title (RN, APRN), specialty/department (eg, medical-surgical, critical care, emergency/crisis/trauma), number of years in the nursing profession, number of years in nursing at the study hospital, and time spent caring for patients with COVID-19 in a typical week between July 15 and September 27, 2021 (0%, 1-50%, 51-100%).

Expanded Nursing Stress Scale

The ENSS,[26] is a 9-factor scale comprising 57 items measured on a 5-point Likert-type scale ranging from 0 (does not apply) to 4 (always stressful). The ENSS was designed to measure sources and frequency of nurses' occupational stress and is based on the Nursing Stress Scale developed by Gray-Toft & Anderson (1981).[27] As compared to the original Nursing Stress Scale, the ENSS has 23 additional items that ask about common stressors for nurses, has a slightly different factor structure, and was validated in a study with a larger sample that included nurses from a wider range of settings.[26] As the ENSS measures sources and frequency of stress but not magnitude or intensity, validation of the scale by French et al does not specify score ranges that correspond to low, medium, or high levels of stress. See **Figure 1** for ENSS subscales and questions.

Prior to analysis, the internal consistency of the overall ENSS scale and each subscale was calculated using Cronbach's alpha. The overall ENSS and all subscales had reliability coefficients of 0.7 or higher making them suitable for use in statistical analysis. For all but 1 subscale, Cronbach's alphas in the current study met or exceeded those reported by French et al.[26] Scale characteristics including subscales, descriptive statistics, and obtained Cronbach's alphas are presented in **Table 1**.

Death and Dying

Performing procedures that patients experience as painful.
Feeling helpless in the case of a patient who fails to improve.
Listening or talking to a patient about his/her approaching death.
The death of a patient.
The death of a patient with whom you have developed a close relationship.
Physician not being present when a patient dies.
Watching a patient suffer.

Conflict with Physicians

Criticism by a physician.
Conflict with a physician.
Disagreement concerning the treatment of a patient.
Making a decision concerning a patient when the physician is unavailable.
Having to organize physicians' work.

Inadequate Preparation

Feeling inadequately prepared to help with the emotional needs of a patient's family.
Being asked a question by a patient for which I do not have a satisfactory answer.
Feeling inadequately prepared to help with the emotional needs of the patient.

Problems with Peers

Lack of opportunity to talk openly with other unit personnel about problems in the work setting.
Lack of opportunity to share experiences and feelings with other personnel in the work setting.
Lack of opportunity to express to other personnel on the unit my negative feelings toward patients.
Difficulty working with particular nurse(s) outside my immediate work setting.
Difficulty working with particular nurse(s) in my immediate work setting.
Difficulty working with nurses of the opposite sex.

Problems with Supervisors

Conflict with a supervisor.
Lack of support from my immediate supervisor.
Lack of support by nursing administrators.
Lack of support by other health care administrators.
Criticism by a supervisor.
Being held accountable for things over which I have no control.
Criticism from nursing administration.

Workload

Unpredictable staffing and scheduling.
Too many non-nursing tasks required such as clerical work.
Not enough time to provide emotional support to patients.
Not enough time to complete all of my nursing tasks.
Not enough staff to adequately cover the unit.
Not having enough time to respond to the needs of patients' families.
Demands of patient classification system.
Having to work through breaks.
Having to make decisions under pressure.

Uncertainty Concerning Treatment

Inadequate information from a physician regarding the medical condition of a patient.
A physician ordering what appears to be inappropriate treatment for a patient.
Fear of making a mistake in treating a patient.
A physician not being present in a medical emergency.
Not knowing what a patient or patient's family ought to be told about the patient's condition and treatment.
Being exposed to health and safety hazards.
Uncertainty regarding the operation and functioning of specialized equipment.
Feeling inadequately trained for what I have to do.
Being in charge with inadequate experience.

Patients and Their Families

Patients making unreasonable demands.
Patients' families making unreasonable demands.
Being blamed for anything that goes wrong.
Being the one who has to deal with patients' families.
Having to deal with violent patients.
Having to deal with abusive patients.
Having to deal with abuse from patients' families.
Not knowing whether patients' families will report you for inadequate care.

Figure 1. Expanded Nursing Stress Scale[26] (Used with Permission)

Table 1. Descriptive Statistics and Internal Consistency for ENSS and Subscales				
Subscale	**# Items**	**M**	**SD**	**Cronbach's Alpha**
Death and Dying	7	1.98	0.94	0.87
Conflict with Physicians	5	1.95	0.88	0.76
Inadequate Preparation	3	2.25	0.81	0.79
Problems with Peers	6	1.74	0.77	0.79
Problems with Supervisors	7	2.06	0.99	0.89
Workload	9	2.53	0.73	0.86
Uncertainty Concerning Treatment	9	2.20	0.79	0.86
Patients and Their Families	8	2.41	0.94	0.89
Discrimination	3	1.06	1.11	0.80
Total ENSS	57	2.11	0.71	0.97

Abbreviations: ENSS, Expanded Nursing Stress Scale; M, mean; SD, standard deviation.

Statistical Analysis

Descriptive statistics are reported as frequency distributions for categorical variables and means and standard deviations for continuous variables. Mean comparisons were performed using one-way analysis of variance (ANOVA) tests. Mean differences are statistically significant at $P < .05$. Mean comparisons were calculated using composite ENSS scale and subscale scores. The composite scores for the ENSS subscales were computed as means to ensure consistent interpretability of scores across subscales with different numbers of items. The overall ENSS score was calculated as the mean of all items on the scale. All statistical analysis was conducted with IBM SPSS Statistics for Windows version 25, (IBM Corp., Armonk, NY).

Results

Sample Characteristics

All of the approximately 1300 RNs and APRNs employed at the study hospital during the survey period were invited to participate. Of these, 490 nurses accessed and answered at least 1 question on the survey. After excluding participants who did not meet the inclusion criteria or who did not respond to the ENSS items, the final study sample comprised 328 participants.

The majority of participants were female (83.2%), ≤ 50 years-old (74.4%), worked full-time at the study site (86.4%), and spent ≤ 50% of their hours in an average week caring for COVID-19 patients (60.4%). The 4 most frequently reported practice specialties were Emergency/Crisis/Trauma (10.4%), Critical Care (14.6%), Medical-Surgical (16.5%), and Perioperative/Procedural Areas (19.5%). Descriptive statistics for demographic variables are presented in **Table 2**.

ENSS Subscale Scores

The overall mean score for the total ENSS instrument was 2.11. Of the 9 subscales, 4 produced means higher than that of the total ENSS. These included workload (M = 2.53), patients and their families (M = 2.41), inadequate preparation (M = 2.25) and uncertainty concerning treatment (M = 2.20).

Tests of Mean Differences

A one-way ANOVA indicated a statistically significant difference in nurses' overall ENSS scores by practice specialty ($F = 7.07$, $P < .001$). Examination of means indicates that nurses working in perioperative/procedural and obstetrics specialties reported lower overall occupational stress scores than nurses working in other specialties. No specialty had an average ENSS score above 2.37. Results are presented in **Table 3**.

A second one-way ANOVA indicated a statistically significant difference in overall ENSS scores by time spent caring for patients with COVID-19 ($F = 8.21$, $P < .001$). Means indicate that nurses who spent > 50% of their time caring for patients with COVID-19 reported higher overall occupational stress scores than nurses who spent ≤ 50% of their time caring for patients with COVID-19 (**Table 3**).

The secondary objective explored whether nurses' reports of occupational stress varied by their demographic characteristics (**Table 3**). Results of one-way ANOVAs indicated no statistically significant differences in overall occupational stress for sex or full-time vs. part-time employment status. One-way ANOVAs did indicate statistically significant differences for age ($F = 5.75$, $P = .004$), the number of years in the nursing profession ($F = 5.61$, $P = .004$), and the number of years employed at the study site ($F = 3.59$, $P = .029$). Nurses > 50 years-old, nurses who have spent > 30 years in the nursing profession, and nurses who have worked at the study site for > 30 years reported the lowest levels of overall occupational stress.

Because age is a risk factor for severe symptoms and mortality from COVID-19, the investigators considered that older nurses may have requested to work on units that limited their exposure to patients with COVID-19. If older nurses were systematically less likely to work with COVID-19 patients, then age and time spent caring for patients with COVID-19 would be confounded in the results. A post-hoc cross-tabulation indicated no significant relationship between age and time spent caring for patients with COVID-19 (chi-square = 1.847, P = .397, *data not shown*). Nurses > 50 years-old were statistically as likely as nurses under the age of 36 to have spent more than half their time caring for COVID-19 patients (39.3% vs 34.9%).

Table 2. Frequency Distributions for Demographic Variables Among Nurses

Demographic Characteristic	Categories	n	% of total (N=328)
License	RN	316	97.2
	APRN	9	2.8
Sex	Male	50	15.3
	Female	272	83.2
	Declined to Answer	5	1.5
Age	20-35 Years	106	32.3
	36-50 Years	138	42.1
	51 Years and Older	84	25.6
Specialty/Department	Emergency/Crisis/Trauma	34	10.4
	Critical Care	48	14.6
	Perioperative/Procedural	64	19.5
	Medical/Surgical	54	16.5
	Telemetry/Step-Down/Acuity Adaptable	55	16.8
	Oncology	13	4.0
	Obstetric	14	4.3
	Other	46	14.0
Average Scheduled Hours Per Week	20-35 (Part-Time)	44	13.6
	Over 35 (Full-Time)	280	86.4
Years Employed at Study Site	15 Years or Fewer	237	72.3
	16 – 30 Years	73	22.3
	More than 30 Years	18	5.5
Years in Nursing Profession	15 Years or Fewer	189	57.8
	16 – 30 Years	101	30.9
	More than 30 Years	37	11.3
Average Time per Week Spent Caring for Patients with COVID-19 (July to September 2021)	None	57	17.4
	1-50%	141	43.0
	51 – 100%	130	39.6

Abbreviations: n, cell size; N, total sample size; RN, registered nurse; APRN, advanced practice registered nurse.

Table 3. Comparisons of Overall ENSS Scores by Demographic and Practice Variables						
	M	SD	95% CI for Mean		F	*P*-value
			Lower Bound	Upper Bound		
Sex					**0.581**	**.560**
Male	2.16	0.75	1.94	2.37		
Female	2.10	0.70	2.01	2.18		
Decline to Answer	1.81	0.59	1.07	2.56		
Age					**5.752**	**.004**
20 - 35 Years	2.21	0.70	2.08	2.35		
36 - 50 Years	2.16	0.68	2.04	2.27		
51 Years and Over	1.89	0.70	1.73	2.04		
Employment Status					**0.855**	**.356**
Part-Time (20-35 hours/week)	2.01	0.65	1.81	2.21		
Full-Time (35+ hours/week)	2.12	0.71	2.03	2.20		
Length of Time Employed at Study Site					**3.592**	**.029**
0-15	2.16	0.71	2.07	2.25		
16-30	2.01	0.66	1.86	2.17		
Over 30	1.76	0.64	1.44	2.08		
Length of Time in Nursing Practice					**5.614**	**.004**
0-15	2.20	0.70	2.10	2.30		
16-30	2.02	0.69	1.88	2.16		
Over 30	1.82	0.66	1.60	2.05		
Practice Specialty/Department					**7.074**	**<.001**
Emergency/Crisis/Trauma	2.35	0.66	2.11	2.58		
Critical Care	2.36	0.62	2.18	2.54		
Perioperative/Procedural	1.84	0.77	1.64	2.03		
Medical/Surgical	2.25	0.64	2.07	2.43		
Telemetry/Step-Down/Acuity Adaptable	2.24	0.59	2.08	2.40		
Oncology	2.27	0.82	1.77	2.77		
Obstetric	1.41	0.53	1.11	1.72		
Other	1.85	0.62	1.67	2.04		
Time per Week Spent Providing Direct Care to Patients with COVID-19					**8.214**	**<.001**
None	1.85	0.63	1.68	2.02		
1-50%	2.05	0.68	1.94	2.17		
51-100%	2.27	0.71	2.15	2.40		

Abbreviations: ENSS, Expanded Nursing Stress Scale; M, mean; SD, standard deviation; CI, confidence interval; F, one-way analysis of variance.

Discussion

This study identified differences in nurses' occupational stress by practice specialty, time spent caring for patients with COVID-19, and nurses' demographic characteristics. The first research objective was to describe nurses' occupational stress by practice specialty. Findings suggest that nurses across all specialties reported similar levels of occupational stress except for nurses who work in perioperative/procedural and obstetric specialties who reported lower overall occupational stress scores. Nurses in both perioperative/procedural areas and obstetrics were less likely than nurses in other specialties to have spent >50% of their time providing direct care to patients with COVID-19. Given the statistical link between more time spent caring for patients with COVID-19 and higher occupational stress scores, it is not surprising that these nurses reported less stress than their colleagues in other specialties. Similarly, a 2022 study by the American Nurses Foundation, found that less than 50% of specialty nurses in perioperative/procedural, obstetric, and oncology reported having extremely stressful, disturbing, or traumatic experiences due to COVID-19. In comparison, over 65% of specialty nurses in ICU, emergency, and telemetry reported having had such experiences.[28]

Though the findings indicate that some nurses experience stress more or less frequently than others, they do not clearly indicate the intensity of nurses' stress. Nurses had an average overall ENSS score of 2.11 out of 4. These scores roughly translate to each measured aspect of nursing practice being "occasionally stressful". These findings are challenging to interpret as, while they appear low, there is no published cut-off score by which to classify nurses as having "low" or "high" stress. A more comprehensive understanding of the issue would require information on both the frequency and intensity of nurses' experience of occupational stress.

The second research objective was to determine whether nurses' reports of occupational stress varied as a function of the amount of time they spent caring for patients with COVID-19. Findings from this study indicate that nurses who spent > 50% of their time caring for patients with COVID-19 reported higher stress scores than other nurses. These findings are consistent with previous research that suggests a positive association between occupational stress and having direct contact with patients with COVID-19 or other factors associated with caring for COVID-19 patients such as having to wear a mask at all times.[29] In another study, 75% of nurses working in a COVID-19 triage hospital experienced significantly higher stress levels vs 60.5% of nurses working in a non-COVID-19 hospital.[30]

The last objective of the study was to determine whether nurses' reports of occupational stress varied as a function of one or more demographic characteristics. Findings indicate that 2 demographic variables, age and time in the nursing profession, were associated with nurses' occupational stress. Nurses who were > 50 years-old and nurses who have practiced nursing for > 30 years reported less stress than other nurses. These findings are consistent with recent data that suggests that younger and more inexperienced nurses are more likely to report negative outcomes of work-related stress. Specifically, a 2022 American Nurses Foundation survey found that 30% of all nurses rated themselves as emotionally unhealthy.[31] This percentage was higher for younger nurses, 46% of nurses under 25 years old compared to 19% of nurses ≥ 55 years-old. The survey also found that nurses with <5 years of experience were more likely to report being emotionally unhealthy (40%) compared to nurses with more than 40 years of experience (13%). Additionally, younger nurses reported higher levels of anxiety (66%) and depression (43%) compared to their older counterparts (35% anxious and 21% depressed). The survey also revealed that two-thirds of nurses under 35 years old reported feeling burned out, which is concerning for the future of the nursing profession.

Hospital-based nurses' most frequent sources of occupational stress as identified by the ENSS subscales were workload, patients and their families, inadequate preparation, and uncertainty concerning treatment. Components that contribute to nursing workload include the amount of time spent providing direct and indirect patient care; complexity of that care; level of physical exertion; and level of nursing competency.[32] The first 3 of these components increased due to the COVID-19 pandemic and level of nursing competency likely decreased due to uncertainty about how each new variant would affect patients and their response to treatment. Other studies have found that the COVID-19 pandemic increased nurses' workload.[13,29,33,34] Increased workload is concerning not only in that it contributes to occupational stress but can also lead to negative outcomes such as burnout, which can compromise patient safety.[35]

Another frequent source of occupational stress in this study was patients and their families. Because of the contagiousness of the disease, hospitals restricted visits from patients' family members. Frustrated relatives often made unreasonable demands, and in some cases, abused staff.[30] Hassan[36] similarly found that distressed patients and angry relatives resulted in suboptimal patient care and were significant stressors for all health care personnel.

The third and fourth most frequent stressors found in this study were inadequate preparation and uncertainty concerning treatment. By the time this study was conducted in autumn of 2021, the pandemic was in its second year. Although health care professionals had a better understanding of the virus by this point, the best available information about COVID-19's transmissibility, resistance to vaccines, likelihood of causing hospitalization, and responsiveness to treatment changed with the emergence of each new variant. The rapid emergence of the delta and omicron subvariants could have caused nurses to be persistently uncertain about how to provide quality care.

The findings from this study are consistent with other scholars' findings that inadequate preparation[30,37] and uncertainty concerning treatment[30] are frequent sources of stress for nurses. Other scholars have found that death and dying is a frequent source of nursing stress,[30,37] which was not the case in the current investigation. Hawai'i ranks 2nd lowest in the nation in COVID-19 deaths,[38] which may explain why death and dying was not a frequent stressor in this study.

Limitations

These findings should be viewed in light of study limitations. The principal investigator works in the perioperative/procedural specialty at the study hospital. This could have contributed to the overrepresentation of perioperative nurses in the sample. In addition to being more likely to participate in support of a colleague, participants from the perioperative/procedural areas may have been especially susceptible to a social desirability bias. The study was conducted at a single site and utilized a convenience sampling method, both of which limit the generalizability of the findings. The study is also limited by the cross-sectional design, limited racial diversity, limited specialty diversity, small sample size, and lack of reliable and valid published cut point for the ENSS. Finally, the timing of the study could have affected results as it was conducted at the end of the delta variant surge. However, this study is valuable in that it sheds light on an important national issue and provides much needed local data which health care leaders can act upon.

Conclusion

This study offers new insight about the work-related factors that most frequently contributed to hospital-based nurses' stress during the COVID-19 pandemic. The current findings suggest that hospital administrators should prioritize resources that can help nurses reduce their feelings of uncertainty and lack of preparedness to care for their patients. The data also indicate that facilities should implement policies that provide nurses with meaningful protection from the abusive conduct of some patients or their families. Hospital administrators should work to improve nurse-to-patient ratios, cross-train between specialties, and increase the number of new graduate hires to fill open positions to assist nurses with managing heavy workloads. Younger, less experienced nurses would also benefit from formal mentoring relationships or opportunities to interact informally with their more experienced counterparts to learn skills and strategies for managing potentially stressful situations at work.

Recent research suggests that managing the sources of nurses' occupational stress may decrease staff turnover, increase nurse satisfaction, and sustain the nursing workforce.[29] Nurse administrators are encouraged to establish supportive work environments and develop interventions to assist nurses in effectively preventing and managing stress. This can be achieved by implementing strategies to target specific sources of stress and creating programs to promote nurses' overall wellbeing. Though further research focused on interventions to prevent and reduce occupational stress is needed, developing targeted interventions can help to reduce burnout and help retain the nursing workforce.

Conflict of Interest

None of the authors identify a conflict of interest.

Disclosures

The findings, conclusion (etc.) of this study do not necessarily represent the views of The Queen's Medical Center.

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Rapid Cycle Quality Improvement of Telemedicine Protocols in a Skilled Nursing Facility During the COVID-19 Pandemic

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Abstract

Prior to the COVID-19 pandemic, telemedicine was not well adopted in US nursing facilities. Many nursing facilities have since acknowledged its value due to the need for stricter infection control and reduction of exposure risk from face-to-face visits. A quality improvement project was conducted to improve telemedicine protocols in a high-volume post-acute care nursing facility, enhance provider and facility capability for visits, improve attitudes and skills toward telemedicine, and expand patient access to medical care during the pandemic. Process improvement was facilitated through identifying core areas of need and implementing interventions to address them. Project impact was measured by a retrospective pre-post survey of 7 questions to evaluate process improvement, attitudes, skills, and perceptions using a 5-point Likert scale (5=strongly agree, 1=strongly disagree) completed by 22 respondents (8 medical providers and 14 staff). Scores from before and after implementation were compared using paired t-tests. Respondents expressed improvement in perceived value (3.2 vs 4.8), personal skill/efficiency (2.3 vs 4.2), comfort level (2.3 vs 4.5), and scheduling process (2.3 vs 3.9) for telemedicine visits (all P≤.001). Respondents expressed increased awareness of barriers/benefits of telemedicine (2.8 vs 4.7, P<.001) and improved leadership commitment (2.6 vs 4.4, P<.001). The weekly average number of telemedicine visits per respondent increased significantly after protocol implementation (6.5 vs 25.6, P=.002). With support of facility leadership, interdisciplinary team members and engagement of key stakeholders, a telemedicine protocol was implemented in a single, high-volume, post-acute care skilled nursing facility during the COVID-19 pandemic, allowing patients to receive needed care.

Keywords

Telemedicine, Innovation, Nursing Home, COVID-19 Pandemic

Abbreviations

AMDA = American Medical Directors Association
APRN = advanced practice registered nurse
CMS = Centers for Medicare and Medicaid Services
COVID-19 = novel COronaVIrus Disease-2019, caused by the SARS-CoV-2 virus
IHI = Institute for Healthcare Improvement
PDSA = Plan-Do-Study-Act
RN = registered nurse
SARS = severe acute respiratory syndrome
SQUIRE = Standards for Quality Improvement Reporting Excellence

Introduction

Problem

Nursing homes generally house frail, multi-morbid older adults in a congregate living setting, placing them at risk for novel COronaVIrus Disease-2019 outbreaks, caused by the SARS-CoV-2 virus (COVID-19). In Hawai'i and across the US, nursing homes have experienced repeated outbreaks with a disproportionate number of COVID-19 related deaths. One study reported that 30-day all-cause mortality of symptomatic COVID-19 nursing home residents was 21%.[1] As the need for tight infection control heightened, the Centers for Medicare & Medicaid Services (CMS) released measures in March 2020 restricting routine visitation and communal activities/dining, and requiring implementation of entry screening procedures.[2] Nursing homes in the US were tasked with the challenging responsibility of instituting complex infection control measures in a very short time period to protect residents from surging community levels of COVID-19. The US Department of Health and Human Services also universally approved the use of telehealth services as part of the Coronavirus Preparedness and Response Supplemental Appropriations act, opening the door for telehealth to be used freely in health care facilities including nursing homes.[3]

As a result, health care facilities started implementing telehealth visits as an alternative for physician face-to-face visits to decrease risk of viral exposure and cross-facility contamination.[4] They began to view telemedicine as a means to address workforce sustainability, reduction of provider burnout, infection control, and personal protective equipment conservation due to shortages ongoing at that time.[5]

Available Knowledge

Prior to the pandemic, telemedicine was not well adopted in US nursing facilities. Only 13% of survey respondents at the 2016 annual American Medical Directors Association (AMDA) conference reported that telemedicine was available for use at their facilities.[6] The Society for Post-Acute and Long-Term Care Medicine/AMDA is dedicated to the advancement of nursing home care and research. Before emergency waivers for telemedicine were instituted by CMS, Medicare restricted telemedicine reimbursement to previously established patients[7] in rural areas[8] and limited the frequency of these encounters to once every 30 days; of note, Medicare would not reimburse for new admissions or discharges.[7]

Rationale and Specific Aims

Although such restrictions were lifted on March 30, 2020, nursing homes without pre-existing telemedicine protocols were left to create their own protocols in a hurry. A COVID-19 outbreak, surging community transmission, and provider and staff frustrations with the lack of an efficient protocol highlighted the need for urgent development and implementation of a quality improvement telemedicine project. This project aimed at improving telemedicine protocols in a high-volume post-acute care nursing facility with 288 beds and approximately 100 admissions/discharges monthly, located in Honolulu, Hawai'i. The project goal was to enhance provider and facility capability of executing high volume telemedicine visits, improve provider and facility staff attitudes and skills toward telemedicine, and expand patient access to medical care during outbreaks and quarantines. This rapid cycle, quality improvement project was conducted using Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) guidelines.[9] This project was necessary to ensure that telemedicine was successfully implemented during the COVID-19 pandemic.

Methods

Context

At the start of the COVID-19 Pandemic in March 2020, medical providers (external physicians and nurse practitioners not employed by the nursing home) began utilizing telemedicine for the first time to complete medical visits. From March 2020 to June 2020, telemedicine occurred in a sporadic, as-needed fashion. On June 10, 2020, the nursing facility experienced its first COVID-19 outbreak and was placed on strict quarantine. As a result, providers were asked to limit in-person visits for fear of spreading the virus within the nursing home as well as to other community facilities. Consequently, seemingly overnight, telemedicine demand increased drastically.

Within little over a week, providers along with facility staff and leadership began contacting the medical directors to express frustration with telemedicine operations, citing numerous barriers to successful completion of telemedicine visits. They requested rapid improvement of the facility's telemedicine protocols. As a result, a telemedicine quality improvement project was started. The ongoing outbreak and facility quarantine rules called for immediate improvement to provide patients with much needed care.

Interventions

Needs Assessment

From June 25, 2020 to June 30, 2020, preliminary data gathering included a provider telemedicine needs assessment survey, which was emailed to external medical providers from 5 major health care organizations who regularly rounded in the facility. The survey asked 5 questions: (1) How telemedicine visits were currently being scheduled; (2) Who was called or emailed for appointments; (3) Which technology platforms were being used (eg, Zoom, Skype, FaceTime, etc.); (4) Barriers/challenges experienced (eg, staff availability, internet problems, technology skills/equipment, nursing physical exam skills, etc.); and (5) Number of telemedicine visits occurring per week. Concurrently a series of interprofessional focus groups were held with facility leaders from the departments of nursing, medical records, information technology, and administration to identify specific facility needs and challenges.

From June 30, 2020 to July 7, 2020, needs assessment survey results from external medical providers and facility staff focus group results were collected, reviewed, and used to identify core areas that needed improvement. **Figure 1** provides a detailed timeline of this project.

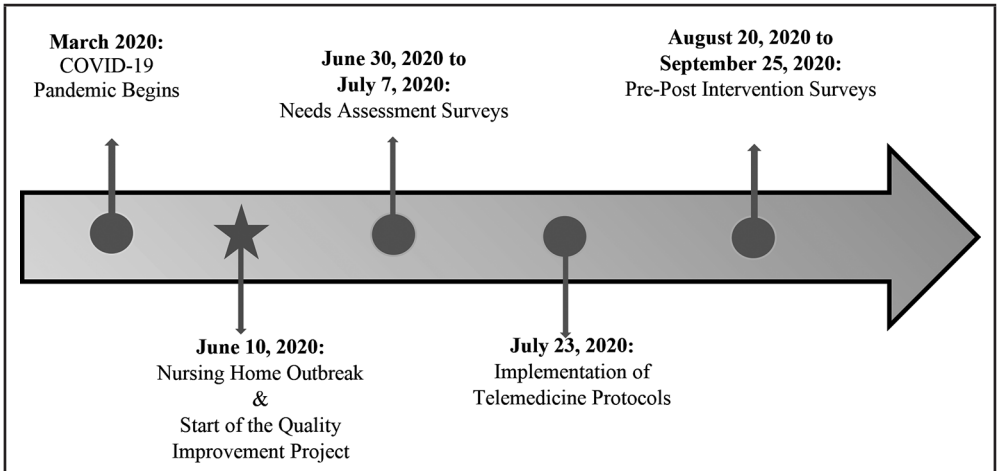

Figure 1. Telemedicine Quality Improvement Project Timeline

Quality Improvement Committee & Development of Protocols

Shortly thereafter, a telemedicine quality improvement committee was created with leaders from nursing, administration, medicine, corporate leadership, and medical records. Weekly meetings were held for the next 3 weeks to draft telemedicine protocols. Task specific protocols for medical providers, unit managers, and medical records staff were developed to guide telemedicine scheduling and completion (**Appendices A, B, and C**). The providers' guide detailed instructions on timeframes required for scheduling, methods for requesting appointments, hours of operation, platforms allowed, among other tasks, while the unit managers' guide detailed protocols for communication with medical records and front-line staff conducting visits. The medical records guide detailed the protocol for scheduling and communicating with outside providers requesting appointments, use of a scheduling calendar, and use of email distribution lists.

Protocol Implementation & Quality Improvement

On July 22, 2020, telemedicine protocols were disseminated to providers, facility unit managers, and medical records staff via email. Forty-eight hours after implementation, real-time feedback was gathered via telephone and email from providers and facility staff conducting telemedicine using the new protocols, and several improvements were quickly instituted based on this feedback. A direct phone line was dedicated for providers to request stat/urgent telemedicine visits, and minimum appointment request lead time was decreased from 48 hours to 24 hours of advanced notice. Another technology platform was also added.

From August 24, 2020 to September 4, 2020, meetings were held with external providers to obtain further real-time feedback. Additional problems were identified including appointments being double-booked and going over time. Some providers were not following the protocols and requesting add-on appointments. Medical directors contacted specific providers to re-educate them on the protocols, and facility staff were instructed to reinforce provider adherence to protocols. Feedback from nursing staff and providers identified a need for a nursing preparation sheet to streamline nursing workload, increase ease of nursing documentation, prepare nurses running telemedicine, and facilitate nursing shift hand-offs.

A nursing preparation sheet was created with input from direct staff and nursing leadership and disseminated on September 18, 2020 (**Appendix D**). The preparation sheet assisted nurses in gathering important information to convey to providers, such as vital signs, changes in condition, and physical exam findings. Nurses utilized the information from the preparation sheet to write required shift documentation.

Study of the Interventions

Continuous process improvements were made using the Institute for Healthcare Improvement (IHI) Plan-Do-Study-Act (PDSA) model over the course of the project.[10] The IHI PDSA cycle has become a scientific standard for quality improvement projects to test changes, by planning it, trying it, observing results, and acting on what is learned.

In the first phase, needs assessment survey results and facility focus group results identified core areas needing improvement, and informed development of the telemedicine protocol.

About 1 month after telemedicine protocols were implemented, a pre-post provider attitudes/skills survey was conducted to evaluate the impact of the project. Telephone interviews with providers who had been working in the facility prior to the start of the project (June 2020) were completed from August 20, 2020 to September 25, 2020.

Measures and Analysis

Qualitative analyses to identify core areas needing improvement were performed using the needs assessment surveys and facility focus groups at the start of this project. Answers were categorized into 5 different themes.

Quantitative analyses were also performed. In August and September 2020, telephone interviews were conducted with facility staff and external medical providers using a retrospective pre-post format comparing attitudes and skills before (June 2020, start of the project) and approximately 1 month after implementation of telemedicine protocols (August-September 2020) (**Figure 1**). Questions were scored using a 1-5 Likert scale (1=Strongly Disagree; 2=Disagree: 3=Neutral; 4=Agree; 5=Strongly Agree). Staff and providers were also asked about the average number of telemedicine visits done in nursing home per week before and after the intervention. Paired t-tests were used to compare pre and post answers.

Telephone interviews were chosen to limit face-to-face interactions and improve the likelihood that providers would reply while working remotely under time constraints. Three additional qualitative questions assessed respondents' views on post-pandemic sustainability of telemedicine: (1) Would you like telemedicine to continue to be an option after the COVID-19 pandemic is over? (2) What factors would support this? (3) What factors would discourage this? All analyses were performed using SAS, version 9.4 (SAS Institute, Inc., Cary, NC).

Ethical Considerations

This study was reviewed by the Institutional Review Board of the University of Hawai'i. It was categorized as a quality improvement project and a waiver of consent was issued.

Results

Qualitative Analysis Results

The needs assessment survey revealed 5 core areas for potential improvement: (1) scheduling; (2) efficiency and timing of visits; (3) staffing and workload challenges; (4) wireless connectivity issues; and (5) need for technology education. A total of 8 providers were surveyed, and the number of providers reporting problems in each core area are shown in **Figure 2**.

Scheduling

Both medical providers and nursing home staff reported no consistent method for scheduling telemedicine visits, leading to chaos and frustration. Appointments were being double-booked, missed, and were often late, highlighting a need for a facility-wide method of communication for dissemination of appointment dates/times to managers and floor nurses. Medical providers requested return confirmation of appointment requests.

Efficiency

Providers wanted increased telemedicine volume, appointment availability, and on-demand visits. The facility saw increased utilization of telemedicine from primary providers and outside specialists such as infectious disease, surgery, and psychiatry, and staff expressed challenges with accommodating the volume. Providers desired complete reports on vital signs, medication lists, bowel movements, oral intakes, and therapy updates during visits. However, facility leadership and staff reported extreme challenges for staff in meeting the providers' needs and balancing direct patient care workloads. Improvements were needed in time utilization, and time limits on telemedicine visits were implemented. The need for a nurse preparation sheet was identified in order to streamline shift documentation requirements (**Appendix D**).

Staffing and Workload

Responses to qualitative questions found that increased workload and time constraints were clear barriers to continuing telemedicine for nursing facility staff. Although staff indicated that hiring dedicated telemedicine staff would likely increase desire to continue the program post-pandemic, facility administration conveyed that this would not be feasible due to ongoing staffing limitations and that telemedicine would need to be added to existing staff job responsibilities.

Wireless Internet

Respondents indicated that technology infrastructure needed to improve. Telemedicine encounters frequently stalled or dropped off in certain areas of the facility, and improvement was needed in Wi-Fi strength and range.

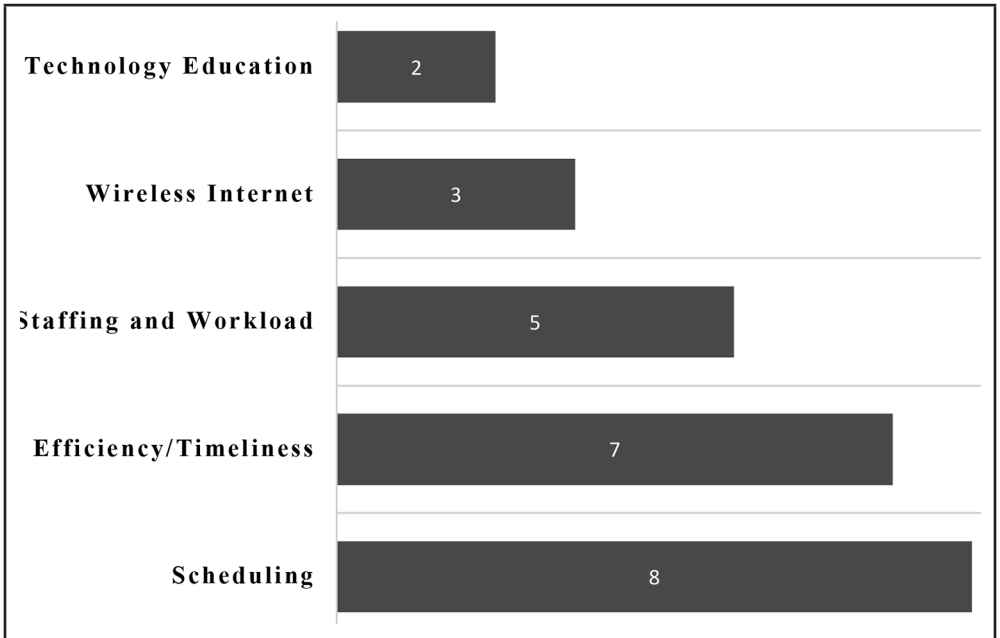

Figure 2. Telemedicine Core Areas for Potential Improvement.
Number of providers reporting problems (8 total providers surveyed)

Education

The need for staff training was identified, as there were steep learning curves for new tasks including using Wi-Fi tablets and different technology platforms. The need for a nurse telemedicine preparation sheet was identified to standardize data gathering expectations. A dedicated in-house telemedicine staff member to oversee appointment scheduling, communication, and provide on-demand troubleshooting was requested by both providers and staff.

Quantitative Analysis Results

Retrospective pre-post attitudes and skills surveys were analyzed quantitatively. A total of 22 surveys were completed, including responses from 8 providers (6 physicians and 2 advance practice registered nurses [APRNs]) and 14 nursing home staff (8 RNs, 1 director/associate director of nursing, 1 administrator/associate administrator, and 2 health information managers).

Table 1 shows scores from before and after implementation of the telemedicine protocol, which were compared using paired t-tests. Respondents expressed improvement in the perceived value of telemedicine (3.2 vs 4.8, $P<.001$); personal skill/efficiency with telemedicine visits (2.3 vs 4.2, $P<.001$); comfort level with telemedicine (2.3 vs 4.5, $P<.001$); and scheduling process for telemedicine visits (2.3 vs 3.9, $P=.001$). They expressed increased awareness of barriers and benefits of telemedicine (2.8 vs 4.7, $P<.001$) and improved leadership commitment (2.6 vs 4.4, $P<.001$).

Telemedicine volume increased significantly after the protocol was implemented, with weekly average number of visits per respondent increasing from 6.5 to 25.6, $P=.002$ (data not shown). The range of weekly telemedicine visits per respondent was 0-50 before protocol implementation, and 0-100 after.

Respondents had mixed opinions about the desire to continue telemedicine after the pandemic. Overall, 75% of external medical providers and 43% of facility staff wanted to continue telemedicine; however, this difference was not statistically significant ($P=.204$) (data not shown). External providers reported the need for continued efficiency and visit reimbursement to be factors that would support the continuation of a telemedicine program post-pandemic.

Discussion

Summary

Prior to the pandemic, telemedicine in nursing homes had not been adopted due to barriers with reimbursement and a lack of protocols, equipment, and dedicated workforce.[11] Even with passage of the Coronavirus Preparedness and Response Supplemental Appropriations Act of 2020, waiving geographic and site restrictions for Medicare reimbursement for telehealth services, and the Office of Civil Rights and Department of Health and Human Services approval to relax privacy requirements of videochat platforms such as Apple FaceTime, Facebook Messenger, and Skype, there was a slow embrace of telemedicine in Hawai‘i and the greater US.[3,12] Only after project implementation was there an increase in telemedicine visits in this facility.

Interpretation

Telemedicine should continue to be a resource for nursing facilities post-pandemic. Many long-term care facilities face challenges with routine access to providers, particularly specialty consultants. Patients often have limited mobility, and transportation to private office consultations remains challenging. There was improved access to specialty care in the facility with availability of consultants in infectious disease, behavioral health, nephrology, neurology, and cardiology. These consultations were not previously available to nursing home patients via telehealth platforms. Telehealth can improve access to specialists who

Table 1. Retrospective Pre-Post Survey of Telemedicine Attitudes and Skills

Questions - Please rate your agreement with each of the following statements BEFORE JUNE 2020 & CURRENTLY (AUGUST-SEPTEMBER 2020): [Likert Scale: 1=Strongly Disagree; 2=Disagree: 3=Neutral; 4=Agree; 5=Strongly Agree]	Pre Mean + SD	Post Mean + SD	*P*-value[a]
1. Telemedicine in the post-acute setting is a valuable resource for providers, nursing home residents and staff.	3.2 + 1.3	4.8 + 0.4	<.001
2. I have skill and efficiency completing or assisting with telemedicine visits.	2.3 + 0.9	4.2 + 0.6	<.001
3. There is a streamlined process to requesting and scheduling telemedicine visits.	2.3 + 1.1	3.9 + 1.0	.001
4. I am comfortable utilizing telemedicine.	2.3 + 0.9	4.5 + 0.6	<.001
5. I am aware of the barriers and benefits of telemedicine in the post-acute/nursing home setting.	2.8 + 1.3	4.7 + 0.5	<.001
6. I feel that the nursing home leadership (including medical directors) have acknowledged the value of telemedicine and demonstrated a commitment to improving the delivery of telemedicine.	2.6 + 1.0	4.4 + 0.7	<.001

[a] Comparisons made using paired t-tests. June 2020 reflected time before implementation of telemedicine protocol, compared with August-September 2020 (N=22).

are unable to visit nursing homes face-to-face and for patients who are bedbound and unable to be transported to outpatient appointments. It is suggested that regular access to telehealth services can reduce recurrent trips to emergency departments and readmissions.[13]

CMS has continued to reimburse certain nursing home telehealth services, and providers continue to use telemedicine nearly 3 years after the first telehealth waivers were approved. Patients continue to benefit from telemedicine primary care visits during outbreaks, and telemedicine specialty consultations have become part of the normal operations at the facility. Although staff were initially less enthusiastic about continuing telemedicine due to its initial perception as challenging and time-consuming, it is possible that they realized the value telemedicine brings regarding patients' access to care and saving time and energy from arranging patient transportation, accompanying patients to in-person office visits, and re-evaluating patients upon return to the facility.

Limitations and Strengths

One limitation is that this project reflects a small number of providers and facility staff. Despite this, attitudes and satisfaction scores improved significantly after the intervention. Another possible limitation is the retrospective pre-post survey design, which may lead to recall bias. This design was selected to provide participants with the opportunity to frame their pre-project responses from the perspective of what they learned during the process. Since data were collected at the same point in time (at the end of the project), the ratings of before ("retrospective pre") and after (post) the project use the same metric. From a pragmatic perspective, completing the survey at the end of the project also reduced the number of surveys for busy clinicians and staff. Also, the short time interval between the pre and post periods makes it unlikely that there was recall bias. Since this project was implemented in a single nursing facility in Hawai'i, generalizability to other nursing homes in the US remains uncertain. The fact that it was conducted in a large, high-volume subacute facility demonstrates that it may be feasible to implement in other nursing homes. A strength of the project was involvement of participants from multiple health organizations ranging from health maintenance organizations to private practitioners, and inclusion of physicians/APRNs and facility frontline staff and leadership members.

Conclusions

This telemedicine quality improvement project highlighted the multifaceted needs of a complex telemedicine program in a high volume post-acute nursing facility, and demonstrated the importance of engaging medical providers, facility leadership and frontline staff in planning, execution, and evaluation. Targeted interventions focused on areas identified in needs assessment surveys, real-time feedback, leadership engagement, and an interprofessional approach were necessary components. External provider and internal staff input played a pivotal role in balancing the needs of each group along with facilitating leadership buy-in. Factors that fostered successful implementation included ease of scheduling, efficiency, skill of telemedicine staff, technology support, perceived value, leadership commitment, and workforce capacity.

Future studies should focus on sustainability of telemedicine in nursing homes post-pandemic. In certain local facilities, telemedicine continues to flourish while in others telehealth encounters are non-existent once more, returning to pre-pandemic states. Examining factors that drive or extinguish sustainability of telemedicine in nursing homes will be important for health care leaders and facilities that wish to sustain telehealth. Further follow-up on current staff, provider and patient satisfaction, health outcomes such as emergency room use and readmission rates, along with total cost of care may be beneficial to study. Examining whether the presence of telehealth options affect provider and staff burnout should also be studied. In conclusion, with support of facility leadership, interprofessional team members and key stakeholders, successful implementation of a complex telemedicine protocol in a high-volume nursing home during the COVID-19 pandemic was achieved.

Conflict of Interest

None of the authors identify a conflict of interests.

Disclosures

Two authors (PB, SVPF) receive medical directorship contracts from the Avalon Health Care Group. One author (LO) received an associate medical directorship contract from the Avalon Health Care Group at the time this quality improvement project was conducted. One author (MU) previously received an associate medical director contract from the Avalon Health Care Group.

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Appendix A

Example Providers' Guide for Telemedicine

To schedule:

- Email the distribution list at: **(Insert email address)**
  - o *Set up a distribution email address that is able to send out information to entire facility and integrate into a calendar*
  - o **We require at least 48-hours advance notice (2 business days)** to schedule a routine follow-up telehealth appointment. This is to ensure that the resident, health information staff, and unit managers are available and properly prepared.
  - o **New admissions can be scheduled 24 hours in advance.** Please email the email above to schedule
  - o **Calling the floor and UMs directly to schedule will not be allowed on a routine basis.**
  - o Urgent/STAT visits for acute issues can be scheduled on case-by-case basis but should not be a usual practice.
    - ◊ For emergencies and after hours ONLY please call the Unit Manager's cell at **(Insert unit manager's cell phone#)**
  - o Please include the following in the email:
    - ◊ Name of resident
    - ◊ Floor/room # of resident
    - ◊ Date and start time for each visit (*please see below for maximum visit times allowed*)
    - ◊ Platform preferred (*see below for acceptable platforms*)
    - ◊ Special Instructions: Please indicate if additional nurse preparation is necessary (e.g. vitals, SBAR, wound care, meds, labs, PO intake, BM record) prior to the appointment.
  - o Health Information Management (HIM) scheduler will respond via email if the date requested is available or if a different date/time is needed.
    - ◊ A calendar invite will be sent to your email address (this calendar invite will also be integrated into the facility schedule)

Telemedicine Hours:

- We request that telemedicine visits are conducted during the following hours : **Mon – Fri from 10am to 3pm**
  - o Allocation of time: (SBAR is required for any new condition)
    - ◊ Admissions/new consults – 45 minutes
    - ◊ Recertifications – 30 minutes
    - ◊ Follow-ups – 20 min

Platforms allowed:

- **(Insert list of allowed platforms)**

Questions:

- Please contact: (Insert contact information with email and phone#)

Recommended pre-visit preparation for providers:

- We ask that all providers review the electronic medical record and "pre-round" prior to the visit so as to offload the nurses from spending a lot of time going through the chart during the visit
- If you do not have electronic med record access, please request access through the HIM Department: **(Insert HIM contact information here)**
- *Suggested items for review prior to your visit, as applicable:*
  - o Vital signs and trends
  - o Diets
  - o Dietary supplements
  - o Medication Lists and Administration Records
  - o Lab results
  - o Nursing progress notes
  - o PO Intake and BM Records
  - o Wounds pictures
- The nurses may provide updates and will provide you with an SBAR for a new issue/condition change. They will not provide routine SBARs for all visits.

Appendix B

Example Unit Managers' Guide to Telemedicine

For scheduled appointments:
- Scheduler from Health Information Management (HIM) will notify the Unit Manager (UM) via email regarding future telehealth appointments within 24 hours.
  - o Telehealth schedule (for the next business day) will be distributed to UM during stand-up meetings.
  - o Verify that the UM/Nurse has the proper resources such as fully charged iPads
  - o Unit Manager's cell phone is also available as a back-up for trouble shooting

Prior to appointments:
- Prior to telehealth appointments, please ensure:
  - o The resident has agreed/consented to the telehealth appointment
  - o The resident is prepared and presentable for the appointment.
  - o All required documentation (nurse prep sheet), including the SBAR, are completed.
  - o Newly acquired vitals should be recorded.

After the appointment:
- Sanitize the iPad with approved sanitizing wipes
- Return iPad to medical records

Telemedicine hours:
- Mon – Fri from 10am to 3pm
  - o Allocation of time:
    - ◊ Admissions/new consults – 45 minutes
    - ◊ Recertifications – 30 minutes (SBAR not required)
    - ◊ Follow-ups – 20 minutes (SBAR not required)
- You may be contacted to schedule emergency and after hours visits on your cell phone**.**

Platforms:
(Insert list of acceptable platforms)

QUESTIONS:
- (Insert HIM contact information, email, and phone number)

Appendix C

Example Health Information Management (HIM) Guide for Telemedicine

To Schedule:
- An email account **(Insert email address here)** was established to streamline the scheduling process for all telemedicine appointments.
- All providers are required to request telehealth appointments via the email address above.
- Health Information Management (HIM) Director will ensure that all requests are addressed accordingly and in a timely manner.
- HIM will create/update the online telehealth calendar for all scheduled appointments and send a calendar invite to UM/nurses and medical provider requesting the appointment
- HIM **MUST invite the Unit Manager (UM**) on all scheduled telehealth appointments within 24 hours by including them via the calendar invite.
  - o Ensure the UM/Nurse has the proper resources such as an iPad (must be fully charged).
  - o Unit Manager's cell phone is also available as a back-up for trouble shooting
- HIM Director will bring the next business day's scheduled appointments to the stand-up meeting in the morning for the Unit Managers to provide and discuss with their nurses.
- Ensure that calendar has the following information:
  - o Name of resident
  - o Location and room number
  - o Date and time
  - o Include the following in the notes section:
    - ◊ Platform preferred & call-in information
    - ◊ Provider special instructions: Check if additional nurse preparation is necessary (e.g. vitals, SBAR, wound exposure, meds, labs, PO, BM) prior to the appointment.

Telemedicine Hours:
- Mon – Fri from 10am to 3pm
  - o Allocation of time:
    - ◊ Admissions/new consults – 45 minutes
    - ◊ Recertifications – 30 minutes (SBAR not required)
    - ◊ Follow-ups – 20 minutes (SBAR not required)
- For emergencies and after hours ONLY please call the Unit Manager's cell at **(Insert cell phone#)**

Technology platforms allowed:
- **(Insert list of allowed platforms)**

Questions
- **(Insert HIM contact information, email, and phone number)**

Appendix D

Example Nurse Prep Sheet for Telemedicine Visits:

Assessment: Review of Systems (ROS)

Check mark /write observation

☐ Admission ☐ Consult ☐ Discharge ☐ Recertification

Name: _____ **DOB:** _____ **Room #:** _____

Name of RN: _____ **Date:** _____

NEURO						
	☐ Alert	☐ Confused	☐ Lethargic	☐ Sedated	☐ Agitated	☐ Non responsive
Speech	☐ Clear	☐ Slurred	☐ Apashic			
Oriented	☐ Person	☐ Place	☐ Time	☐ Date		
RESPIRATORY						
Rhythm	☐ Regular	☐ Irregular	☐ SOB	☐ SOB on exertion		
Cough	☐ No cough	☐ Productive/describe sputum				☐ Non productive
Lung Sounds	☐ Clear	☐ Rhonci	☐ Wheezes	☐ Crackles		
Area	☐ RUL	☐ RML	☐ RLL	☐ LUL	☐ LLL	
O2	☐ _____/L	☐ Nasal Cannula	☐ FM	☐ NRB Mask		
CARDIAC						
Rhythm	☐ Regular	☐ Irregular				
Radial pulse	☐ RT present/absent		☐ LT present/absent			
Pedal pulse	☐ RT present/absent		☐ LT present/absent			
PT	☐ RT present/absent		☐ LT present/absent			
Edema	☐ None	☐ Present	☐ Location:			(☐1+ ☐2+ ☐3+ ☐4+)
GI						
Abdomen	☐ Soft	☐ Firm	☐ Distended	☐ Tender	☐ Location	Last BM: _____
Bowel Sounds	☐ Present	☐ Absent	☐ _____ quadrants	☐ Continent	☐Inc	
	☐ Nausea	☐ Vomiting	☐ Diarrhea	☐ Constipation		
GU						
Urine Color	☐ Yellow	☐ Amber	☐ Bloody	☐ Other		
Appearance	☐ Clear	☐ Cloudy	☐ with sediments	☐ Odor		
Moist Complaints	☐ Frequency	☐ Dysuria	☐ Cont/Inc			
Catheter	☐ Foley	☐ SP	☐ Straight cath Describe:	Time: _____	Amount _____cc	
MUSCULOSKELETAL						
Mobility	☐ Full	☐ Limitations	☐ Describe			
Gait	☐ Steady	☐ Unsteady	☐ Activity/Assist	☐ Independent	☐ One/Two persons	☐ Total
SAFETY						
Side rails	☐ Up	☐ Down	☐ Recent Fall? If yes, date:		☐ Injury- Yes or No	
Fall risk protocol	☐ Yes/No	☐ Call light within reach: Yes/No		☐ Bed Low		
SKIN						
Color	☐ Normal	☐ Pale	☐ Cynatotic	☐ Condition: ☐ Clammy ☐ Dry ☐ Moist ☐ Flakey		
	☐ Cool	☐ Warm	☐ Integrity: ☐ Intact ☐ Not intact	☐ Describe		
PAIN						
	☐ Location			Rating (0-10)		
Pain medication given	☐ Time	☐ Recheck time		Rating (0-10)		
PSYCHO/SOCIAL						
Affect	☐ Calm	☐ Agitated	☐ Anxious	☐ Flat	☐ Confused	☐ Depressed ☐ Combative
Involvement in care	☐ Active	☐ Passive	☐ Refuses	☐ Independent		
Demeanor	☐ Pleasant	☐ Unpleasant	☐ Cooperative	☐ Uncooperative		
Visitors	☐ Yes	☐ No	Who:			

VITAL SIGNS	LABS	MEDICATIONS
T: _____ P: _____ R: _____ BP: _____ O2 Sat _____% Room Air On O2 _____L ☐R ☐L		

Kūpuna "Older Adults" COVID-19 Vaccination Efforts in Hawai'i: Barriers and Successes

Miquela Ibrao MPH, MSW; Caroline M. Cadirao; Derrick Ariyoshi; Keali'ialanikulani S. Lopez; Lindsey Ilagan MS; Kathryn L. Braun DrPH

Abstract

Prior to the availability of vaccines, kūpuna *(older adults) accounted for the majority of COVID-19 hospitalizations and deaths. Hawai'i's phased vaccine-release plan prioritized* kūpuna*, but it did not include guidance or strategies for* kūpuna *to get to mass vaccination sites, for those residing in care and foster homes, or for the homebound. This paper presents findings from statewide efforts to facilitate a quick uptake of vaccines among* kūpuna *of all ability levels. Researchers interviewed 32 individuals involved in* kūpuna *vaccination efforts from state and county government agencies, health care organizations, and non-profit organizations. Data on the percentage of* kūpuna *that initiated and completed the vaccination series by age group and island were obtained from the Hawai'i State Department of Health COVID-19 Dashboard. Overall,* kūpuna *vaccination efforts across the state were successful. By July 30, 2021, 94% of adults age 65+ were vaccinated, although prevalence varied by county—from 88% on Maui to 98% on Kaua'i. Key barriers included cumbersome online systems for scheduling vaccination appointments, difficulties for some elders in accessing mass vaccination sites, and the need for education and consent forms in multiple languages. Successful strategies included funding coalitions for effective partnerships, establishing county- and language-specific call centers, and supporting translation/interpretation services, mobile and pop-up clinics, and mechanisms for in-home vaccinations. Hawai'i worked hard to facilitate the quick uptake of COVID-19 vaccines among older adults. Funding for coalitions that could identify gaps, coordinate expertise across public and private sectors, and advocate for elders were crucial elements of the state's success.*

Keywords

Kūpuna*, Older Adults, COVID-19, Vaccinations, Coalitions*

Abbreviations and Acronyms

DOH = Hawai'i Department of Health
EAD = Elderly Affairs Division of the City and County of Honolulu
EOA = Hawai'i State Executive Office on Aging
KAEA = Kaua'i Agency for Elderly Affairs
KVOG = Kūpuna *Vaccination Outreach Group*

Introduction

COVID-19 cases were first recorded in Hawai'i in early March 2020.[1] Although people of all ages contracted COVID-19 in 2020, *kūpuna* (older adults) were the most severely affected and accounted for most of the early COVID-19 hospitalizations and deaths.[2] In 2020, 19% of Hawai'i's population was over the age of 65[3] in comparison to the United States (US) national average of 17%;[4] yet 78% of deaths in the state[5] and 75% of COVID-19 deaths nationally[6] were among those over the age of 65. *Kūpuna* for the context of this paper is defined flexibly as an older adult with multiple chronic conditions that puts them at risk for COVID-19 complications. The state of Hawai'i's COVID-19 response addressed this population through a strategic roll out of the vaccine based on age.

As part of a national effort, all states were tasked by the federal government with creating a COVID-19 Vaccination Plan by October 16, 2020.[7] The initial supply of vaccines were limited nationwide,[8] which led the State of Hawai'i's COVID-19 Vaccination Plan to call for a phased vaccine release (**Figure 1**) based on recommendations from the Centers for Disease Control and Prevention (CDC).[9] Phase 1A was launched in late December 2020 for first responders, health care workers, and *kūpuna* in nursing homes.[10,11] Phase 1B opened vaccinations to those 75 years and older and essential frontline workers at mass vaccination sites. In March 2020, Phase 1C opened vaccinations to those 65 years and older, those 16 years of age and older with a high-risk medical condition, and more essential workers.[12] Phase 2 for those 16 years and older began in April 2021.

With the introduction of mass vaccination sites in January 2021, *kūpuna* stakeholders from the Hawai'i State Executive Office on Aging (EOA), the Elderly Affairs Division of the City and County of Honolulu (EAD), and AARP Hawai'i issued a "Joint Letter of Recommendations for Those 75 Years and Older" that provided insights on the complex barriers *kūpuna* may encounter when visiting mass vaccination sites. Together they founded a multi-sectoral coalition called the Kūpuna Vaccination Outreach Group (KVOG) to meet the diverse vaccination needs of *kūpuna* and caregivers across the state. KVOG focused on O'ahu, where the majority of *kūpuna* in Hawai'i reside. The 3 other counties also created structures and coalitions to manage vaccination efforts in their communities.

In May 2021, the EOA contracted with the University of Hawai'i at Mānoa (UH) Office of Public Health Studies to identify barriers and successes of the *kūpuna* COVID-19 vaccination response. *Kūpuna* vaccination efforts were highly successful based on the number of *kūpuna* that were vaccinated. The collective work of state, county, provider, and community-based organizations resulted in a 94% vaccination rate for older adults across the state by August 2021 (**Figure 2**).[13] The purpose of this paper is to present findings from the evaluation of *kūpuna* vaccination barriers and successes and to outline lessons that can inform vaccination distribution efforts in future pandemics.

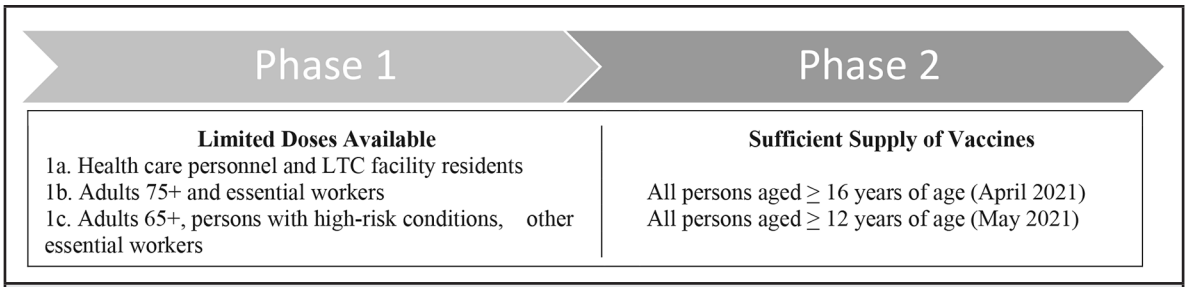

Figure 1. State of Hawai'i Phased Vaccination Plan[10]

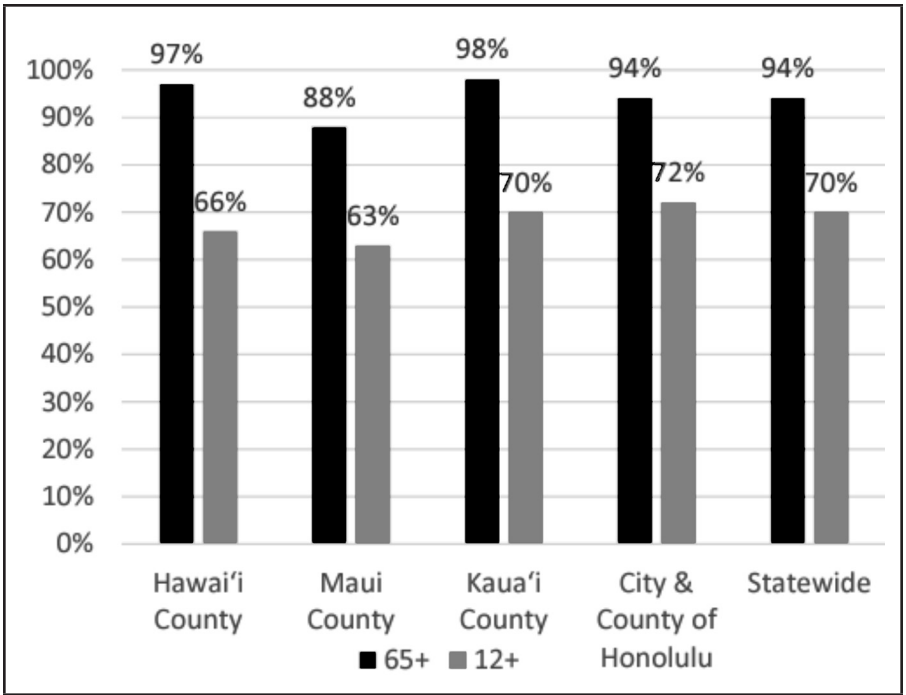

Figure 2. Hawai'i COVID-19 Vaccination Rates By Age Group and County, as of July 30, 2021[a]

[a] Percentage of Hawai'i residents that completed a two-vaccine COVID-19 series by age group and county in the State of Hawai'i as of July 30, 2021. Source: Hawai'i Department of Health. Vaccine Summary. https://health.hawaii.gov/coronavirusdisease2019/tableau_dashboard/21778/

Methodology

A qualitative design was used to collect information on *kūpuna* vaccination efforts. Specifically, the research team interviewed 32 key informants involved in *kūpuna* vaccination efforts from state and county government agencies, healthcare organizations, and non-profit organizations (**Table 1**). Key informants were recruited on O'ahu during a weekly KVOG meeting. Participants who agreed to be intereviewed were then asked at the end of each interview whether they had any one else they would recommend to be interviewed. On O'ahu 21 interviews were conducted with representatives from the Hawai'i State Department of Human Services, the Hawai'i State Department of Health (DOH), the EOA, the Hawai'i State Office of Language Access, the City and County of Honolulu's EAD, 3 health care provider organizations, and 7 community-based organizations and groups. On neighbor islands, participants were recruited through the DOH and EOA Area Agencies on Aging. Neighbor island participants from community non-profits and health care were identified through snowball recruitment. Eleven neighbor island interviews were conducted with representatives from the 3 District Health Offices, 3 Area Agencies on Aging, ALU LIKE, Inc. (Maui), and Community First Hawai'i (Hawai'i Island).

The interview schedules varied slightly across sectors to accommodate for greater specificity. Generally, interview guides included questions about the organizations' experience with COVID-19, the impact of COVID-19 on *kūpuna* and other vulnerable groups in their communities, vaccination barriers, success stories, and data sources. The structured interview

Table 1. COVID-19 Kūpuna Vaccination Efforts Key Informants
Hawai'i State Department of Health (DOH) • Dr. Janet Berreman, MD, MPH, Kaua'i District Health Officer • Gloria Fernandez, DNP, RN, PHNA-BC, Public Health Nursing Branch • Eric Honda, Acting Hawai'i County District Health Officer • Chris "CJ" Johnson, Physical Activity Program Specialist, Chronic Disease Prevention Department • Bridget Velasco, Health Educator, Maui District Health Office • Dr. Lorrin W. Pang, MD, MPH, Maui District Health Officer • Jon Shear, Ready Zone HQ, CEO - Consultant with HDOH • Caroline Cadirao, Director, Hawai'i State Executive Office on Aging • Aphirak "AP" Bamrungruan, Hawai'i State Office of Language Access, Executive Director
Hawai'i State Department of Human Services (DHS) • Curtis Toma, MD, Med-Quest Division (MQD)
Hawai'i State Executive Office on Aging and the Area Agencies on Aging • Derrick Ariyoshi, Elderly Affairs Divisionof the City and County of Honolulu • Horace Farr, Hawai'i County Executive on Aging • Kalani Holokai, Secretary, Maui District Health Office • Emily Ishida, Program Specialist, Kaua'i Agency on Elderly Affairs • Deborah Stone-Walls, Maui County Executive on Aging • Kealoha Takahashi, Kaua'i County Executive on Aging
AARP Hawai'i • Keali'ialanikulani S Lopez, State Director • Audrey Suga-Nakagawa, Associate State Director for Advocacy • Craig Gima, Associate State Director for Communications
Healthcare Providers & Associations • Melissa Ah Ho-Mauga, Vice President of Client Services, St. Francis Healthcare System • Mae Lynne Swoboda, Clinical Administration Manager for Prevention and Health Education, Kaiser Permanente • Stacy Wong, Senior Manager, Communications, Healthcare Association of Hawai'i
Other non-profit, non-governmental associations • Kim Ku'ulei Birnie, Papa Ola Lōkahi and Communications Officer, Native Hawaiian & Pacific Islander Hawai'i COVID-19 Response, Recovery & Resiliency Team, Papa Ola Lōkahi • Ka'ili Christophersen, Maui representative, Kumu Kahi Elderly Services, ALU LIKE, Inc. • Susie Chun Oakland, Director, Lanakila Multi-Purpose Senior Center • May Rose Dela Cruz, Co-Chair, FilCom CARES • Lindsey Ilagan, Kūpuna Program Manager, Hawai'i Public Health Institute • Randy Kurohara, Executive Director, Community First Hawai'i • Jennifer Pecher, Community Impact Director, Aloha United Way 211 • Leslie Tanoue, Director, Kumu Kahi Elderly Services, ALU LIKE, Inc. • Terrina Wong, Director of Social and Immigration Services, Pacific Gateway Center • Kathy Wyatt, Founder & President of Hale Hau'oli Hawai'i Adult Day Care

guide was provided to interviewees prior to their scheduled interviews. Transcriptions were created using the Zoom on-line platform (Zoom Video Communications, Inc., San Jose, CA), and interviews were recorded with participant consent. Data was collected by 2 researchers from the University of Hawai'i Thompson School of Social Work and Public Health as part of an evaluation of the Hawai'i statewide COVID-19 vaccination efforts. All participants agreed to be interviewed and, using a qualitative research method known as "member checking," relevant portions of the interview summaries were shared with interviewees prior to report writing to clarify and extend the findings. Additionally, they were provided with this manuscript to review and approve, and they agreed to have their names published as part of this work.

Data were analyzed by the 2 researchers using Microsoft Office Professional Plus 2019 (Microsoft Corporation, Redmond, WA). Transcripts were reviewed and themes were identified to create summaries of vaccination efforts at the state and county levels and to distill key barriers and successful strategies to increase *kūpuna* vaccine access. The report was provided to all key informants and is available online,[11] and findings were presented to KVOG members in December 2021.

Results

Barriers to *Kūpuna* Vaccination

Three key barriers to vaccinating *kūpuna* were identified through interviews with key informants. They included: (1) cumbersome systems for vaccination scheduling; (2) the rapid need for interpreters and translated health education materials and consent forms in multiple languages; and (3) difficulties posed by reliance on mass vaccination sites for *kūpuna*.

First, to schedule COVID-19 vaccinations, many vaccination providers required registration through cumbersome online systems such as the Vaccine Administration Management

System (VAMS) or their own proprietary registration portals. This proved to be a barrier for many *kūpuna*, including those without computers or smartphones, email addresses, and/or sufficient internet connectivity. *Kūpuna* unfamiliar with online scheduling systems and those with limited English proficiency also experienced barriers. While elders could often get assistance from family members to access and schedule appointments, some others could not.

Second, Hawai‘i is racially diverse. The language diversity in Hawai‘i necessitated the rapid development of translated health education materials and the employment of interpreters at vaccination sites. Respondents emphasized that the need for translation and interpretation services was a significant barrier that had to be addressed rapidly to distribute vaccination effectively and equitably.

Third, mass vaccination sites were initially used as an efficient way to distribute the limited supply of available vaccines, to ensure proper vaccine storage conditions, and to assure standardized registration, vaccination, and observation protocols. Respondents stated that mass vaccination sites worked well for computer-savvy, physically able, and independently mobile older adults or older, less-able adults whose family members could help them navigate the registration process and transport them to mass sites. However, respondents found that many older adults could not schedule appointments or could not get to mass vaccination sites due to frailty, cognitive impairment, and lack of transportation or assistance. Other mass vaccination concerns included crowding, potential for exposure, the potential lack of bathrooms or places to sit if the wait was long, and lack of trust in mass vaccine sites.

Key Success Strategies in Overcoming Barriers

Key informants identified 5 strategies that were successful in overcoming the barriers to COVID-19 vaccinations for *kūpuna*. These included: (1) multi-sector coalitions and advocacy efforts; (2) county- and language-specific call centers; (3) interpretation and translation services; (4) bringing vaccinations to *kūpuna* through community and mobile pop-up clinics in locations where *kūpuna* reside and congregate, and through in-home vaccinations; and (5) community collaborations.

Coalitions

First, a number of well-functioning coalitions were developed at state, county, and organizational levels with the goal of providing accurate education on COVID-19 and vaccines, as well as equitable and timely distribution of vaccines to as many *kūpuna* as possible. These coalitions harnessed the energies of leaders, planners, providers, communicators, community-based groups, and others to come together to address barriers and advocate with and on behalf of *kūpuna* and caregivers.

Although not a comprehensive list, several coalitions and offices that were identified as significantly having impacted the delivery of vaccinations to *kūpuna* included KVOG, FilCom CARES, the Native Hawaiian & Pacific Islander Hawai’i COVID-19 Response, Recovery & Resilience Team, the DOH Community Outreach and Public Health Education group, the County Emergency Operations Center on Kaua‘i, the District Health Offices in Maui County and Hawai‘i County, and Community First Hawai‘i on Hawai‘i Island. The success of these coalitions varied, but in general they advocated for and vaccinated vulnerable groups, coordinated multi-sector solutions to barriers, and engendered comradery in a rapidly changing and challenging health crisis. They also supported call centers, increased education and data collection within disproportionately affected populations, and helped build trust in the public health system among historically minoritized communities.

KVOG, for example, worked at the state level by advocating for earlier-than-scheduled vaccinations for residents and staff of Adult Residential Care Homes, Community Care Foster Faculty Homes, and Developmental Disability Domiciliary Homes, as well as the prioritization of these facilities for personal protective equipment and the development of infection control and vaccination protocols. Within the City and County of Honolulu, KVOG members supported call centers, education, transportation to vaccination sites, vaccination clinics in senior public housing, community-based pop-up and mobile clinics, and in-home vaccination mechanisms for homebound elders.

Call Centers

Second, to support *kūpuna* who had technological and language barriers to vaccinations, county-specific and language-specific call centers with translation and interpretation services were funded and implemented. For example, on O‘ahu the EAD funded Aloha United Way 2-1-1 to operate a *kūpuna* call center that could assist callers in 200+ languages. *Kūpuna* that needed help with scheduling and transportation were referred to St. Francis Healthcare System, which supported *kūpuna* by scheduling vaccination appointments, providing appointment reminders, arranging transportation services, and making follow up wellness calls.

On Kaua‘i, the Kaua‘i Agency for Elderly Affairs (KAEA) became the COVID information and vaccination call center for everyone age 60+ in the County. For mobile elders, KAEA made vaccination appointments and followed up to assure *kūpuna* were supported in receiving their shots. Homebound *kūpuna* were supported by referrals made by KAEA to Kaua‘i Public Health Nurses, who provided in-home vaccinations.

Translation and Interpretation

Third, the inclusion of translation and interpretation services was vitally important for Hawai‘i’s richly diverse population.

For example, the Hawai‘i State Office of Language Access and Pacific Gateway Center, a community-based organization, collaborated to organize translation and on-site interpretation services for a number of vaccination events and initiatives. Interpreters conducted outreach and education as well as interpretation for vaccine administrators. In low-income, senior housing facilities, interpreters went door-to-door to personally invite non-English-speaking residents to attend vaccination drives. The presence of these interpreters was critical to engaging non-English-speaking kupuna and overcoming barriers that threatened vaccine access. Federally Qualified Health Centers and many other community-based organizations employed bilingual staff that assisted in the *kūpuna* vaccination efforts as well.

Taking Vaccinations to the Community

Fourth, to overcome barriers at mass vaccination sites, community leaders in each county took vaccination services to *kūpuna* where they were. For example, the Hawai‘i Public Health Institute (HIPHI) through funding support from EAD organized onsite vaccination clinics for 29 senior housing properties, assisted by pharmacy providers, volunteers, and personnel from HIPHI, Honolulu’s EAD, Catholic Charities Hawai‘i, St. Francis, the Hawai‘i State Office of Language Access, Pacific Gateway Center, and other groups. For 10 more properties, residents were aided to a nearby vaccination site, with Catholic Charities Hawai‘i and St. Francis assisting with transportation and escort. Also, Public Health Nurses administered vaccines in public housing sites that were not exclusive to *kūpuna*, but where many residents were *kūpuna* nonetheless. They helped arrange on-site interpreters, translated and distributed large-print materials, and provided vaccine education.

For the 10 000 or more residents across more than 1900 licensed Adult Residential Care Homes and Community Care Foster Family Homes in the state, representatives from the Department of Human Services Med-QUEST Division took the lead on dividing the list into geographic regions of responsibility. On O‘ahu, pharmacy staff from Times Pharmacy, Pharmacare, 5-Minute Pharmacy, Foodland Pharmacy, the Queen’s Physician’s Office Building Pharmacy, ElixRx, and others traveled to these group homes to vaccinate residents and staff. KTA Super Stores Pharmacy led this effort on the Hawai‘i Island, while the Kaua‘i and Maui District Health Offices led efforts in their respective counties.

Partnering with Community

A fifth strategy was contracting and/or partnering with community-based organizations to reach minority groups, especially those who were historically and continue to be underserved by existing systems of care. An example was FilCom CARES, a community group organized in 2020 to address the significant impact of COVID-19 on Filipinos by offering COVID-19 outreach, testing, vaccination, and resources. Members of the group worked with the Hawai‘i DOH to translate COVID-19 information into conversational Tagalog and Ilocano. Materials were disseminated through FilCom Center’s call center, Facebook page, a weekly radio program, and radio-thons. When the vaccine became widely available, organizers worked with Federally Qualified Health Centers, pharmacies, and other providers to host vaccination clinics at trusted places where Filipinos gather, including Catholic churches and the FilCom Center in Waipahu.

Discussion

Though the COVID-19 pandemic spread quickly, necessitating the rapid deployment of vaccines, many *kūpuna* experienced barriers to vaccine access. For example, national studies estimated that half of older adults lacked internet access at home and needed assistance with using technological devices to schedule vaccination appointments.[14] Mass vaccination sites across the country experienced long wait times and were burdensome for older adults with limited mobility and lack of support. Lessons learned from Hawai‘i’s vaccination strategy should be considered and adopted for future pandemic planning.

Recommendations

Based on thematic findings from key informant interviews, the research team proposed three recommendations for reaching *kūpuna* and other disproportinately affected groups in future pandemics: (1) engage all levels of stakeholders in pandemic response efforts from the beginning; (2) prioritize early support for community-based vaccination along with mass services; and (3) incorporate and fund community coalition and organizations in response efforts.

More specifically, government-led emergency operation centers should work closely with leaders in the Med-QUEST Division, the Hawai‘i Public Housing Authority, and leaders of the Hawai‘i Aging Network to identify venues where older adults are living and congregating and support them to devise and carry-out vaccination efforts with these *kūpuna*. The Hawai‘i Aging Network includes the EOA, the 4 county-based Area Agencies on Aging, and community-based organizations that provide direct services to *kūpuna*.

Although distributing vaccines through mass vaccination sites is an efficient strategy when faced with a limited supply of a vaccine that needs to be stored under extremely specific conditions, many *kūpuna* were not able to participate due to difficulties with the online scheduling system, frailty, cognitive impairment, fear, lack of transportation, and/or lack of culturally and linguistically appropriate and age-empowered support. Taking the vaccine to trusted, safe places where *kūpuna* live and congregate, including long term care facilities, care homes, foster homes, domiciliary homes, senior housing properties, adult day care and senior centers, community clinics, places of

worship, homes, and so forth was a successful strategy. State- and county-level command centers should support efforts to organize vaccination of *kūpuna* at these sites.

Government-led emergency operation centers and Aging Network stakeholders should engage and fund community coalitions and organizations to increase the state's capacity to identify, engage with, and vaccinate elders. Community, non-profit, and private organizations can assist with call centers, education, and outreach to vulnerable communities, quickly create translated materials, provide interpretation services, and host community-based vaccination events for historically underserved groups. Coalitions can help to facilitate education and coordination across government, private, non-profit, and community-based organizations in vaccinating the public. Coalition members' multi-sector roles can assist with collaboration, reduce redundancies, and create a more resilient community. The early inclusion of community organizations and coalitions in planning efforts and funding opportunities is critical.

Finally, the inclusion of community groups in decision-making processes allows them to better advocate for their needs. For example, definitions of *kūpuna* vary across organizations and communities. *Kūpuna* are typically defined as those 65 years and older, although prevalent health disparities among certain ethnic groups and historically marginalized communites have led the US Older Americans Act to define older adults as those 60 years and older, while the Federally Qualified Health Centers define older adults as those 55 years and older.[15] While the state's strategic plan prioritized *kūpuna* by age, it did not account for minority groups that experience chronic diseases at early ages. This perpetuated disproportionate disease burden and death among Native Hawaiians, Filipinos, and Pacific Islanders in Hawai'i.[16]

Limitations

The information in this report was limited by the short timeframe within which data were collected (June-August 2021), which limited the number of individuals interviewed. Additionally, the report only covers the Hawai'i State response to the COVID-19 pandemic but does not include an evaluation of the Federal response. Given the high population of military, military families, and military retirees in Hawai'i, this gap in knowledge is significant. The rapid spread of the COVID-19 pandemic necessitated an urgent move to collect and report on data which did not allow for the full inclusion of other coalitions, activist groups, and *kūpuna* who were leaders in the community themselves. Space limitations precluded the sharing of more accounts of challenges and successes in vaccinating older adults in this manuscript, but more information can be found in the online evaluation report.[12]

Conclusion

This report serves to document COVID-19 barriers to vaccination efforts with *kūpuna* and strategies that were successful in overcoming these barriers in Hawai'i. Findings should be useful in the event of another pandemic and for vaccination efforts for seasonal influenza, pneumonia, shingles, and other vaccines targeting older adults. Particularly important is meeting *kūpuna* where they are through multi-sector partnerships.

Conflict of Interest

None of the authors identified any conflicts of interest.

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A Screening Program for SARS-CoV-2 among University of Hawai'i at Mānoa Residence Hall Students during the COVID-19 Pandemic

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Abstract

The University of Hawai'i at Mānoa (UHM) created a COVID-19 pandemic team to collaborate, plan, and mitigate the spread of COVID-19 across the campus. The purpose of this study was to identify asymptomatic and pre-symptomatic cases of SARS-CoV-2 among unvaccinated UHM residence hall students during 3 distinct intervals (semesters) within the COVID-19 pandemic. Supervised self-administered nasal swab testing samples were collected from unvaccinated UHM residence hall students and sent to a clinical laboratory for COVID-19 RT-PCR testing to detect SARS-CoV-2. Positive cases were contacted and placed in isolation while contact tracing was initiated. The screening program performed 2219 tests on 725 unique persons with the identification of COVID-19 infections in 38 asymptomatic unvaccinated students and an additional 10 cases through contact tracing. A positive correlation existed between the screening program case numbers and the state of Hawai'i 7-day average positive cases as demonstrated with a Pearson coefficient of 0.79 and P<.001. The COVID-19 positivity rate was greater during Spring Semester 2022 compared to both Spring Semester 2021 (P<.001) and Fall Semester 2021 (P <.001). This program served as a component of a larger strategy to mitigate the effects of the COVID-19 pandemic on the UHM campus. Additional benefits of the program included opportunities to increase COVID-19 awareness, enact health policy measures, evolve to meet changing pandemic demands, and maintain a safe UHM campus.

Keywords

SARS-CoV-2, COVID-19, University of Hawai'i, Screening Program, Screening Testing, Residence Hall Students, Congregate living, COVID-19 Response Team

Abbreviations

CDC = Centers for Disease Control and Prevention
COVID-19 = Coronavirus Disease 2019
DLS = Diagnostic Laboratory Services
HDOH = Hawai'i State Department of Health
HWBWG = Health & Well-Being Working Group
NCAA = National Collegiate Athletic Association
RT-PCR = Reverse Transcription Polymerase Chain Reaction
UHM-CRT = UHM COVID-19 Response Team
UH = University of Hawai'i
UHM = University of Hawai'i at Mānoa
UHSM = University Health Services Mānoa

Introduction

The SARS-CoV-2 virus has infected more than 768 million people worldwide since the beginning of the Coronavirus Disease 2019 (COVID-19) pandemic through July 2023.[1] Transmission of SARS-CoV-2 can occur via direct or indirect contact with saliva and respiratory secretions of both symptomatic and asymptomatic infected persons, making it difficult to contain.[2] In response to the expanding pandemic, the state of Hawai'i issued a mandatory statewide shelter-in-place order, shutting down all non-essential businesses and schools, including the University of Hawai'i at Mānoa (UHM) campus on March 23, 2020. During this shut-down, only essential employees were permitted to come onto the UHM campus and nearly all in-person instruction was converted to remote learning for the remainder of the 2020 Spring and Summer instructional semesters.

In response to the COVID-19 pandemic, many institutions of higher education across the United States established teams to collaborate, plan, and mitigate the spread of COVID-19 across their respective campuses. Baylor University developed health and safety protocols that included requiring face coverings, social distancing, universal entry screening, testing before arrival on campus, randomized screening testing, diagnostic testing of symptomatic and exposed individuals, and wastewater surveillance testing for SARS-CoV-2.[3] The University of California, Berkeley, launched its own pop-up SARS-CoV-2 testing laboratory to enable an asymptomatic screening testing program for the campus community.[4]

Options for SARS-CoV-2 testing include surveillance testing, screening testing, and diagnostic testing. Surveillance testing is used by public health officials to track the prevalence and rate of spread of an infectious disease outbreak such as COVID-19. Since surveillance testing is performed on de-identified laboratory testing specimens, the results are not traceable back to specific individuals, and thus cannot be used for independent case management.[5] Waste-water testing is a form of surveillance testing involving the detection of SARS-CoV-2 RNA which is shed in the feces early during the clinical course of disease by infected persons.[6] Screening testing refers to laboratory tests performed on persons who do not have symptoms of COVID-19 infection or are not known close exposures of individuals with active COVID-19 infection. An advantage of screening testing is that results can identify asymptomatic or pre-symptomatic SARS-CoV-2 infections early so that actions can be taken to prevent further transmission.[7] Diagnostic testing is a form of testing used to diagnose and assist in the management of persons who present with symptoms possibly due to COVID-19 infection or who are known close contacts of COVID-19 cases.[5,7]

In March 2020, the University of Hawai'i (UH) established a COVID-19 Health & Well-Being Working Group (HWBWG) comprised of UH health professionals from various disciplines to

provide guidance on how to mitigate the effects of the COVID-19 pandemic on the UHM community, in coordination with the Hawai‘i State Department of Health (HDOH) and the Centers for Disease Control and Prevention (CDC). The HWBWG established a UHM COVID-19 Response Team (UHM-CRT) based at University Health Services Mānoa (UHSM), whose responsibilities were to investigate any reported UHM student and employee COVID-19 cases, assess infection transmission risks to University spaces occupied by recent positive cases, conduct contact tracing, provide support and contact with persons who were in isolation or quarantine, and serve as an educational resource for the UHM community. The HWBWG also created a UHM campus COVID-19 testing program that targeted the campus populations at highest risk for infection using best practices for COVID-19 testing, positive case management, and contact tracing.

While the health and safety of all UHM employees and students were acknowledged, the HWBWG identified students living on campus in the UHM residence housing as the most COVID-19 vulnerable campus population. The enhanced infection risk was due to their congregate living situations, ample social interactions, low priority for early vaccination, and potential for vaccine reluctance.[8] The purpose of this effort was to implement a testing program and identify asymptomatic and pre-symptomatic cases of SARS-CoV-2 among unvaccinated UHM residence hall students during 3 semesters of the COVID-19 pandemic.

Methods

Study Population

Inclusion criteria for the UHM COVID-19 screening study population were all UHM residence hall students who were not vaccinated against COVID-19 during the academic semesters of Spring 2021, Fall 2021, and Spring 2022. Exemptions from inclusion were granted to those unvaccinated students who: (1) were within 90 days of recent COVID-19 infection; and (2) who submit valid test results obtained external to the testing program. The testing population numbers varied by semester based upon the current availability of COVID-19 vaccines and status of full vaccination completion. To the authors' knowledge, no residence hall students had achieved full vaccination status during the Spring semester 2021 (January 11, 2021- May 12, 2021) since the newly Emergency Use Authorization-approved COVID-19 vaccination series was not available to most UHM students until the late spring and summer of 2021. Consequently, all UHM residence hall students were required to participate in the UHM COVID-19 screening program during Spring semester 2021. COVID-19 vaccines subsequently became widely available during the 2021 summer which led to the university mandating that all students living in UHM residence halls must be fully vaccinated against COVID-19, effective August 23, 2021. Exemptions from the vaccination requirement were only granted for those who had religious or medical reasons. Fully vaccinated residence hall students were not required to take part in the screening program. University of Hawai‘i employees were similarly required to be vaccinated against COVID-19 between August 23, 2021 and March 28, 2022, with only medical or religious exemptions to the vaccine requirement. Any unvaccinated UH employees were required to be tested weekly through a separate statewide testing program and not included in this residence hall student COVID-19 screening program. This study was approved by the UH Human Studies Program as exempt from federal regulations pertaining to the protection of human research participants.

SARS-CoV-2 Screening Program Protocol

During the Spring 2021 semester, in which COVID-19 vaccinations were not available for most college students,[9] the majority of UHM courses were still not being held in person and residence housing facilities were open for students at approximately 50% capacity. Due to clinical laboratory COVID-19 testing capacity limitations, all residence hall students could not be tested each week. Instead, testing was limited to approximately 60 randomly selected residence hall students using a random number generator. Individuals selected for testing were determined in proportion to relative census of each residence hall. During the 2021 summer instructional sessions, UHM campus housing was closed and testing was paused.

Throughout the Fall 2021 and Spring 2022 semesters, COVID-19 vaccines were widely available and required for all UHM residence hall students. Testing was conducted on all unvaccinated residence hall students, rather than a random sample as in the Spring 2021 semester. Students with clinical symptoms possibly due to COVID-19 or who were known close contacts of COVID-19 cases were referred to their own health care providers for further care and were not included in this screening program.

COVID-19 screening test samples were collected by a self-administered nasal swab under the observation and guidance of a UHSM staff member wearing personal protective equipment in an open air location at the UHSM campus building. COVID-19 nucleic acid amplification testing based on reverse transcription polymerase chain reaction (RT-PCR) to detect SARS-CoV-2 was performed at the John A. Burns School of Medicine Tropical Medicine Clinical Laboratory (Spring 2021) and Diagnostic Laboratory Services (DLS) Clinical Laboratory (Fall 2021 & Spring 2022). Test results were generally available within 24-48 hours from collection.

Positive Results

COVID-19 positive results were provided to the UHM-CRT with the consent of the students being tested. Positive cases were contacted and advised to begin their isolation periods while contact tracing was initiated. Residence housing directors

helped to coordinate the isolation process, identify potential person and common area exposures, facilitate further testing, and ensure proper facility sanitation procedures. The UHM-CRT served as a patient-centered, empathetic source of daily support and health monitoring for students in isolation or quarantine.

Statistical Analysis

Microsoft Excel version 16.75.2 software (Microsoft Corp., Redmond, WA) was used for data compilation, simple statistical analysis using chi-squared tests, and Pearson coefficients for correlation. Statistical significance was set at $P \leq .05$.

Results

A total of 725 unique residence hall students participated in this COVID-19 screening program for an overall number of 2219 COVID-19 tests. Study participants' mean age was 19.8 years (SD=4.2) and stated sex was 66.8% female, 32.9% male, and 0.3% unknown.

Spring Semester 2021 (Vaccine not yet widely available)

During the 17-week Spring semester 2021 (January 10, 2021-May 8, 2021), nearly all 1101 UHM residence hall students were unvaccinated and subject to weekly randomized COVID-19 RT-PCR screening which was conducted from February 1, 2021 to May 5, 2021. Over this period, 676 COVID-19 RT-PCR screening tests were performed, yielding 2 positive results for a positivity rate of 0.3% (**Table 1**). Both positive cases were assessed medically and placed in isolation. Contact tracing conducted by the UHM-CRT led to the identification of 4 additional close contact students who were tested and placed into quarantine to reduce the risk of further disease transmission.

Summer Instructional Sessions 2021 (Vaccine available)

COVID-19 screening testing was not conducted during the UHM 2021 summer instructional sessions (May 24, 2021-August 13, 2021) due to the low on-campus population and residence hall census numbers.

Fall Semester 2021 (Vaccine required)

During the 16-week Fall semester 2021 testing period (August 22, 2021- December 11, 2021), of 2752 total residence hall students, 176 students were unvaccinated (mainly those who were partially vaccinated or had medical/religious exemptions) and were required to undergo weekly COVID-19 PCR screening testing. Screening was conducted from August 23, 2021 to December 8, 2021. Overall, 871 COVID-19 PCR screening tests were performed, which produced 6 positive test results and a positivity rate of 0.7% (**Table 1**). Newly diagnosed cases were placed in isolation and contact tracing was conducted by the UHM-CRT, resulting in the identification of 2 additional student close contacts who were placed in quarantine per current CDC guidance. As the semester progressed, the number of students in the screening program gradually declined, due to students who moved out of campus housing, became fully vaccinated, or tested positive for COVID-19 and were exempted from testing for 90 days.

Spring Semester 2022 (Vaccine required)

During the 19-week Spring semester 2022 (January 10, 2022-May 14, 2022), of 2612 total residence hall students, 55 unvaccinated students (mainly partially vaccinated and those with medical or religious exemptions) were required to undergo weekly COVID-19 PCR screening, which was conducted from January 10, 2022 to May 5, 2022. Overall, a total of 672 COVID-19 RT-PCR screening tests were performed on these unvaccinated students, which produced 30 positive test results and a positivity rate of 4.5% (**Table 1**). Newly diagnosed cases were similarly placed in isolation and contact tracing was conducted by the UHM-CRT, resulting in the identification of 4 additional close contact students who were placed in quarantine. Effective December 2021, the CDC changed close contact quarantine guidelines, so that fully vaccinated, asymptomatic close contacts would no longer be required to be placed in quarantine. Due to high vaccination rates, this action significantly reduced the numbers of close contacts who were subject to quarantine.

Comparison of COVID-19 Test Positivity Rates by Semester

The COVID-19 positivity rates were significantly higher during Spring Semester 2022 compared to both Spring Semester 2021 (χ^2= 24.1, df=2, $P \leq .001$) and Fall Semester 2021 (χ^2=22.5, df=2, $P \leq .001$). The positivity rate did not differ significantly between Spring Semester 2021 and Fall Semester 2021 (χ^2=1.1, df=2, P= .29).

Correlation in Case Counts between UHM Residence Halls and the State of Hawai‘i

Figure 1 displays the weekly positive COVID-19 case numbers for the UHM residence hall screening program and the State of Hawai‘i at large. A strong positive correlation exists between these case count numbers, as demonstrated by a Pearson coefficient of 0.79 and $P \leq .001$.

Table 1. Summary of COVID-19 Screening Results of 3 Semesters, University of Hawai'i at Mānoa				
	Spring Semester 2021 (1/10/21-5/8/21)	**Fall Semester 2021 (8/22/21-12/11/21)**	**Spring Semester 2022 (1/10/22-5/14/22)**	**All Semesters**
Screening Dates	2/1/21-5/5/21	8/23/21-12/8/21	1/10/22-5/5/22	
Total Unvaccinated Student Positive Cases	2	6	30	38
Total Unvaccinated Students Screened	676	871	672	2219
Positivity Rate	0.30%	0.70%	4.50%	5.50%
Additional Positive Cases Identified through Contact Tracing	4	2	4	10
Chi-squared Test Compared to Spring Semester 2022	(χ^2= 24.1, df=2, *P*<.001)	(χ^2=22.5, df=2, *P*<.001)	-	-

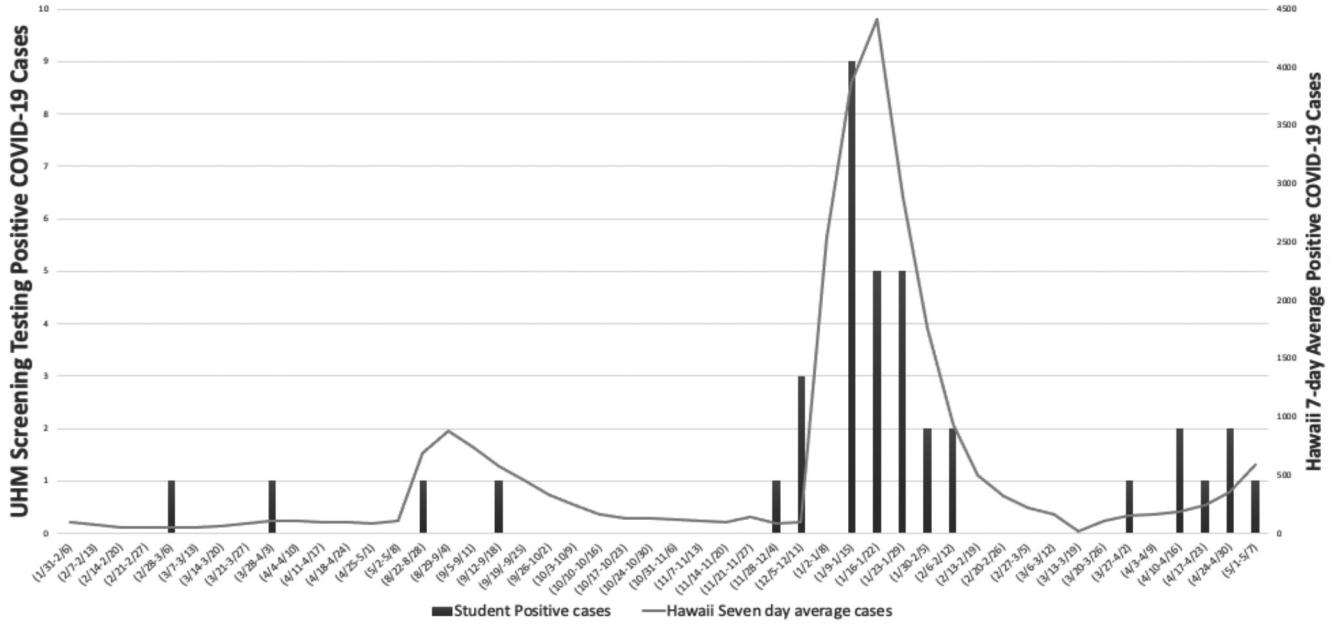

Figure 1 Residence Hall Screening Testing Positives vs Hawaii State Positives February 2021-May 2022

University of Hawai'i at Mānoa (UHM) residence hall COVID-19 screening program weekly positive test results (blue bars) compared to Hawai'i State 7-day average COVID-19 positive test (orange curve) results from February 2021-May 2022.[16] Left vertical axis refers to positive case numbers by week from UHM residence hall testing program. Right vertical axis demonstrates 7-day average weekly positive case numbers. Correlation using Pearson coefficient = 0.79; *P*<.001.

Discussion

The 3-semester duration UHM COVID-19 residence hall student screening program identified 38 COVID-19 positive cases and an additional 10 cases through contact tracing. In assessing the impact and effectiveness of the screening program, it is important to recognize that it served as only 1 component of a larger strategy to mitigate the effects of the COVID-19 pandemic on the UHM campus. The screening program positive case counts does not include cases among symptomatic and exposed residence hall students, non-residence hall students, and employees who were diagnosed with COVID-19 through having undergone diagnostic testing at UHSM, through their medical providers, or at community testing sites which were widely available at the time.

The impact of COVID-19 infections on the UHM campus was likely mitigated further by an adherence to CDC contact tracing, isolation and quarantine standards; shift to remote learning and work; enhanced facility cleaning; limited physical person gatherings; facial masking; staying home when sick; public health education; and COVID-19 vaccination. It is possible that this screening testing program raised awareness of COVID-19 on the UHM campus and altered behaviors, by further deterring large group gatherings, parties, and concerts. The presence of the screening testing program may also have decreased the earlier stigma associated with testing positive for COVID-19, as affected persons were not ostracized but temporarily isolated until they were healthy enough to resume regular activities.

Many institutions conducted COVID-19 screening programs in various forms for their campus populations. Due to significant differences in testing protocols, target populations, and available resources, it is difficult to provide any direct comparison of the results of the UHM COVID-19 screening program to those of other institutions of higher education.[3,10,11]

Over the course of each semester of the screening program, the numbers of unvaccinated residence hall students who were subject to mandatory testing steadily declined. This was likely due to the: (1) the 90 day exemption from testing for those who had a recent COVID-19 infection; (2) submission of test results obtained external to the testing program, such as that required for National Collegiate Athletic Association (NCAA) student-athletes; (3) achievement of a fully vaccinated status; and (4) moving out of the residence halls. It seems possible that the inconvenience of weekly testing and evolving relaxed quarantine requirements for vaccinated as opposed to unvaccinated close case contacts may have provided further incentive for students to complete their COVID-19 vaccination series.

The HWBWG chose SARS-CoV-2 RT-PCR laboratory testing as the preferred methodology over rapid antigen testing given its higher sensitivity, advantage of requiring less frequent testing, reduced need for follow up confirmatory testing, and availability in UHSM affiliated clinical laboratories with existing result reporting procedures. A recent study of 225 individuals who tested positive for SARS-CoV-2, demonstrated that antigen test sensitivity was 64% compared to 84% for RT-PCR tests collected on the same day.[12]

The evolution of COVID-19 variants played a role in the varying numbers of positive cases identified during the screening program. Notable spikes in COVID-19 positive case numbers occurred at the beginning of the Fall semester 2021 as a likely result of recent travel by students returning to campus during the Delta variant surge, and similarly early Spring semester 2022 due to recent student travel and the Omicron variant surge. Both variants exhibited higher relative transmissibility, and the Omicron variant was more likely to cause reinfections and affect persons who were fully vaccinated.[13,14]

A limitation of this screening program was that a number of COVID-19 infections were likely missed among the fully vaccinated asymptomatic students, since only unvaccinated residence hall students were included in the program. A survey of 1378 NCAA student athletes across 15 states who tested positive for SARS-CoV-2, found that 22.4% were infected despite having received full COVID-19 vaccination.[15] UH leadership's decision to include only unvaccinated residence hall students in this testing program was based upon the limited availability of laboratory testing resources and determination that unvaccinated residence hall students were the most vulnerable campus population.

COVID-19 clinical laboratory testing capacity limits also affected study sampling criteria which evolved from randomly selected unvaccinated students during Spring 2021 semester, to all unvaccinated students in Fall 2021 and Spring 2022 semesters. This change in sampling criteria is a potential study limitation and may have resulted in an underestimation of the *P*-values provided. Finally, symptomatic, unvaccinated residence hall students who were referred and evaluated medically for possible COVID-19 infection were not concurrently included in the UHM screening program, an effect that most likely affected the program's case positivity numbers.

Conclusion

This study demonstrates that a COVID-19 screening program of unvaccinated university residence hall students was able to identify a substantial number of asymptomatic/pre-symptomatic COVID-19 infections and additional cases through contact tracing during the COVID-19 pandemic. The results additionally show that spikes in the numbers of positive screening program COVID-19 cases coincided with the State of Hawai‘i 7-day average positive case counts. This program served as only 1 component of a larger strategy to mitigate the effects of the COVID-19 pandemic on the UHM campus, with additional potential benefits of the program including opportunities to

increase COVID-19 awareness, enact health policy measures, evolve to meet changing pandemic demands, and help keep the UHM campus safe.[3,8]

Conflict of Interest

None of the authors identify a conflict of interest.

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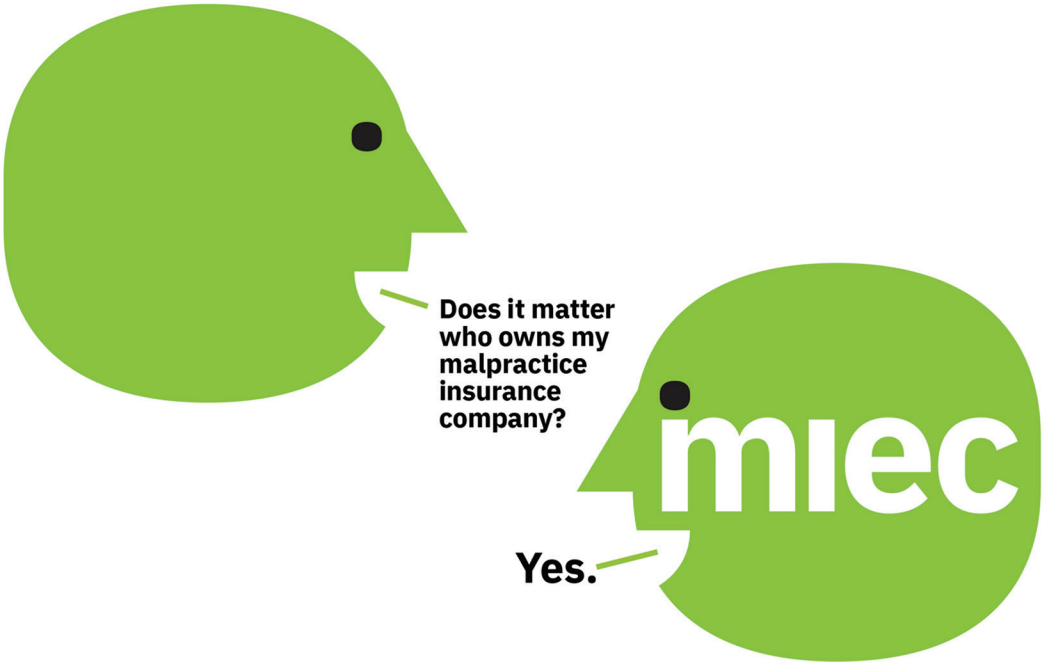

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