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Evaluating an intervention of telehealth education and simulation for advanced practice registered nurse students: A single group comparison study

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Abstract

As healthcare delivery continues to evolve and expand, nurse educators must prepare advanced practice registered nursing (APRN) students to use telehealth technology safely, effectively, and confidently. The aims of this study were to describe APRN students' beliefs and confidence regarding the delivery of care via telehealth in their future practice. To evaluate these aims, a single group comparison study was conducted. APRN students received an intervention comprised of multimodal telehealth instruction, which involved the simulated application of telehealth with standardized patients. Students' beliefs regarding telehealth did not significantly change between the pre- and post-intervention, in which all areas were rated high pre-intervention. Students reported an increase in their perception and confidence post-intervention. Integration of telehealth into the APRN curriculum is essential to instil knowledge and confidence as healthcare technology advances.

KEYWORDS
advanced practice registered nurses, education, nursing, graduate, simulation, telehealth

1 | INTRODUCTION

The expanded use of telehealth outside of rural settings has accelerated with the global COVID-19 pandemic (Arends et al., 2021; Burt & Kilroy, 2021). Clinicians are expanding their practice to routinely include telehealth and in response, educators are needing to incorporate telehealth content as part of their curricula for advanced practice registered nursing (APRN) students so that they are prepared to provide high quality patient care via telehealth (Diegel-Vacek et al., 2021).

The literature in many health education publications has focused on how nursing schools have adopted new telehealth competencies, piloted new content and integrated telehealth into school curricula (Chike-Harris et al., 2021). Rutledge et al. (2017) discusses studies, which found training students for telehealth using a multimodal approach prepares them with the comfort, knowledge and skills needed to provide healthcare via telehealth. However, there is a paucity of reports on the perspectives of APRN students on confidence and beliefs regarding their preparedness to safely and effectively implement care through telehealth. Therefore, there is a need to evaluate telehealth educational initiatives in APRN education regarding the impact on students' confidence and beliefs of providing care via telehealth safely and effectively.

The curriculum for NP students is guided by the National Organization of Nurse Practitioner Faculties (NONPF), and telehealth aligns with and builds off the core competencies described by NONPF (Chike-Harris, 2021; Rutledge et al., 2018). APRN students are in the perfect position to learn about telehealth early in their education and integrate the knowledge into their clinical experiences, which further prepares them for their future clinical practice (LaManna et al., 2021). Early educational intervention has the potential to provide knowledge and guide beliefs regarding telehealth thus affording APRN students time in their education to further practice and develop skills in telehealth, which they can use as future APRNs.

The purpose of this study was to examine the effects of a new telehealth educational intervention using a multimodal approach including assignments combined with a simulated patient experience via telehealth in improving perception and confidence regarding telehealth in APRN students. We explored this from the student perspective, examining their beliefs and confidence regarding telehealth. We hypothesized that with adequate formal education and training in telehealth, APRN students will have increased perception and confidence in providing care via telehealth and will be better positioned to provide high quality telehealthcare services with patients in their future practice settings.

2 | METHODS

2.1 | Setting, sample and design

For this study, APRN students enrolled in a required Advanced Health Assessment course at a large university were voluntarily recruited to participate. The course was the setting of this study, where APRN students (five nurse practitioner specialties and nurse midwifery) completed required course content, then participated in a telehealth standardized patient (SP) simulation over a period of 2 weeks within the course. All students in the course received the education and participated in the telehealth SP simulation. There were 125 students in the course, of those 68 students consented to participate in the study. The telehealth SP simulation took place on a HIPAA compliant web-based video conferencing platform (Zoom). Both students and the SPs connected remotely via home computers at separate locations, while course faculty connected from computers located onsite at the university. Onsite simulation technicians at the university provided technical support and managed the logistical oversight for the event.

The design of this study included a single group comparison study using pre- and post-survey data to evaluate the students' beliefs about the value of telehealth and confidence in using telehealth as a method of care delivery following the completion of the multimodal telehealth instruction and telehealth SP simulation where students applied the learned concepts in a simulated patient experience. This simulation was a formative graded learning experience.

2.2 | Intervention

The intervention consisted of two parts, (a) an online multimodal telehealth instruction required as part of the advanced health assessment course in the APRN programme and (b) a graded telehealth SP simulation where students applied the learned concepts. The first part included multimodal instruction with videos, assigned readings, web links, live question and answer session and other activities designed to prepare students for the telehealth SP simulation. Content included an overview of telehealth, an introduction to telehealth etiquette, telehealth history taking and physical assessment strategies, legal and regulatory issues, documentation and web-based telehealth resources, see Figure 1. The material presented represented current evidence-based practices for telehealth (Rutledge et al., 2021).

The telehealth SP simulation, the second part of the intervention, was designed using the International Nursing Association for Clinical Simulation and Learning (INACSL) Standards of Best Practice in Simulation (INACSL Standards Committee, 2016). SPs were prepared by the standardized patient coordinator in the university's clinical learning centre. They were instructed and trained on the modality of the simulation and were given the patient case

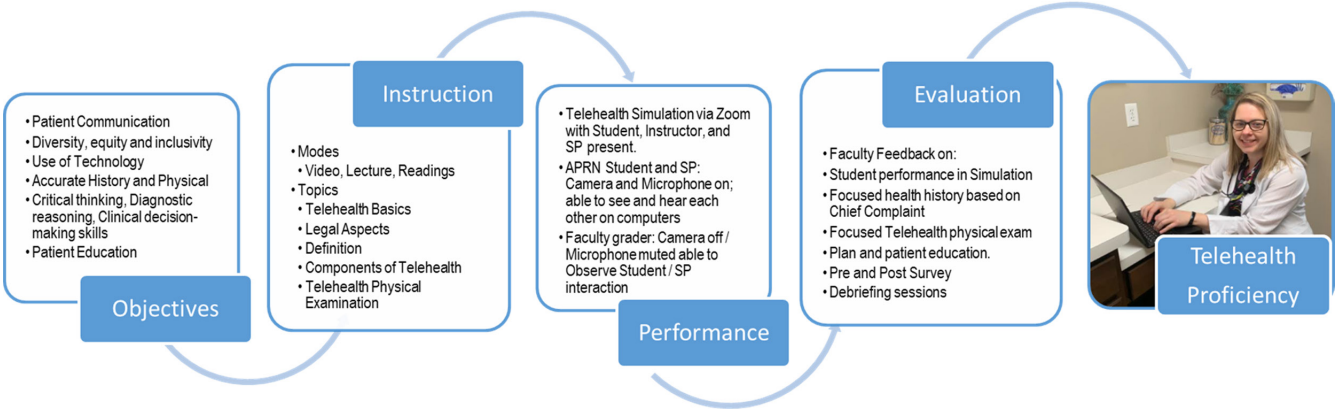

FIGURE 1 Overview of multimodal telehealth instruction and simulation.

(abdominal pain) 2 weeks in advance to practice. During the telehealth SP simulation each student in the course participated in an individual simulated patient encounter with an SP for 15-minutes. Students collected a health history utilizing culturally sensitive, motivational interviewing techniques via Zoom. Faculty viewed each student's patient encounter live on Zoom along with the student and SP, with faculty having their microphone muted and camera off. All student simulations were recorded with video and audio and available for students to review. Students were evaluated by faculty during the live simulation using a faculty created, standard assignment rubric to evaluate their overall performance, diagnostic reasoning, interpersonal and technical skills using telehealth and ability to fulfil the legal requirements for telehealth visits (e.g., confirming patient identity, location, consent to receive care via telehealth, privacy, etc.) (Balestra, 2018; Gustin et al., 2020). Students debriefed after their SP encounter by writing a reflection regarding their performance. Faculty also held a debriefing discussion during their next class session.

During the week prior to the student's telehealth SP simulation, all students completed an assignment during their regular lab time with a partner in which they were given instructions for the simulation and practiced how to conduct a telehealth appointment. Two-thirds of the students were in a virtual version of the course and practiced over Zoom with a partner live. The remaining students were in a face-to-face version of the course and had the choice to complete the assignment either in person or over Zoom. Each student in the pair served both the role of an APRN student and the patient, both students were given separate cases to portray as the patient. The practice cases the students used were from systems they had already received didactic and lab instruction on and included chief complaints like sore throat, cough and constipation. The practice scenarios were not timed but provided them with the opportunity to practice and receive feedback prior to their graded telehealth SP simulation. Feedback on the practice encounter was provided by the student partner and faculty.

2.3 | Measurements/pre- and post-test

The measurements consisted of a self-administered online pre-test and post-test, located within the required learning module. The 16-question pre-test was designed to collect general socio demographic information (6 questions) and student belief and confidence questions (10 questions). The post-test contained the same 10 questions about beliefs and confidence, which were derived from the vetted competences established by the telehealth taskforce at the University of Michigan that were adapted from a Delphi study, see Table 1 (van Houwelingen et al., 2016).

The general socio demographic information included items determining which APRN programme the student was enrolled in (nurse practitioner specialty or certified nurse midwife), academic grade point average range, age, gender, work years as a registered nurse (RN) and previous telehealth work experience. A 4-point Likert scale questionnaire, used as both the pre- and post-test, measured the students' telehealth beliefs and confidence. The answer choices included strongly agree, agree, disagree and strongly disagree.

2.4 | Data collection

Students completed the pre-test survey in the course learning management system as a requirement before the content module opening and the post-test survey after completion of the content module and SP simulation. All students enrolled in the class completed the pre-test and post-test surveys, but only the de-identified results of the consented participants were included in the study. This was achieved by recruitment via a Qualtrics survey link that contained informed consent information sent via email from a staff member who kept the faculty and authors blinded to those who responded until after final grades were entered at the end of the semester. Pre- and post-test survey results were then de-identified from the learning management system for those students who consented to participate in the study.

2.5 | Data analysis/statistical analysis

Demographics and experiences related to nursing and telehealth were described by calculating frequency and percentage. Means and standard deviations were used to analyse summary scores of the domains of beliefs and confidence regarding telehealth. Wilcoxon's signed-rank sum test was used to explore the difference between individual item and summary scores pre- and post-simulation. In cases in which participants had incomplete data, the pre-simulation score was used. Data analysis was conducted using the statistical package, STATA (version 17.0; StataCorp).

3 | RESULTS

A total of 125 students took this course, while 68 students, from six APRN programmes (Primary Care Paediatric Nurse Practitioner, Acute Care Paediatric Nurse Practitioner, Family Nurse Practitioner, Primary Care Adult-Gerontology Nurse Practitioner, Acute Care Adult-Gerontology Nurse Practitioner, and Nurse Midwifery, and students in dual programmes) consented to participate in the study.

Demographics of study participants are shown in Table 2. Of the students who elected to share personal information, 68% were age 30 years and under and 87% identified as female. The majority of students (80%) had 4 years or less experience as a registered nurse (RN). Most of the students (97%) had no prior experience providing telehealth services before the telehealth experience, see Table 2.

TABLE 1 Beliefs and confidence of advanced practice nursing students about providing clinical care via telehealth before and after the simulation exercise ($n = 68$)

	Pre-intervention				Post-intervention				
	Strongly agree	Agree	Disagree	Strongly disagree	Strongly agree	Agree	Disagree	Strongly disagree	*p*-Value[a]
Belief questions									
I believe that telehealth services are important to advanced practice nursing practice.	37 (54%)	31 (46%)	0	0	47 (69%)	21 (31%)	0	0	0.02
I believe that I should understand how to provide telehealth services as a future advanced practice nurse.	49 (72%)	19 (28%)	0	0	47 (69%)	21 (31%)	0	0	0.62
I believe that telehealth is important to my advanced practice nurse specialty area.	34 (50%)	32 (47%)	2 (3%)	0	39 (57%)	27 (40%)	2 (3%)	0	0.13
I believe that telehealth can improve patient care outcomes.	35 (51%)	30 (44%)	2 (3%)	0	39 (57%)	28 (41%)	0	0	0.12
I believe that telehealth can improve patient access to care.	50 (74%)	18 (26%)		0	51 (75%)	17 (25%)	0	0	0.76
I believe that telehealth is a safe and effective way to manage some patient health concerns.	26 (38%)	40 (59%)	1 (2%)	0	31 (46%)	37 (54%)	0	0	0.08
Sum of scores	Mean (SD) 18.0 (2.1)		Median 19.0		Mean (SD) 18.2 (2.0)		Median 19.0		*p*-Value[a] 0.09
Confidence questions									
I understand the rules and regulations for providing telehealth services.	6 (9%)	30 (44%)	31 (45%)	1 (2%)	16 (23%)	48 (71%)	4 (6%)	0	<0.0001
I understand how to document the necessity of telehealth services.	2 (3%)	26 (38%)	40 (59%)	0	17 (25%)	43 (63%)	8 (12%)	0	<0.0001
I feel prepared to effectively provide telehealth services.	0	25 (37%)	37 (54%)	6 (9%)	9 (13%)	44 (64%)	13 (19%)	2 (3%)	<0.0001
I feel comfortable providing telehealth services.	0	30 (44%)	35 (52%)	3 (4%)	10 (15%)	43 (63%)	13 (19%)	2 (3%)	<0.0001
Sum of scores	Mean (SD) 9.7 (2.1)		Median 9.0		Mean (SD) 12.1 (2.1)		Median 12.0		*p*-Value[a] <0.0001

[a]Wilcoxon's signed-rank sum test used to compare scores of individual items and sums of scores of belief, knowledge and confidence items in the pre- and post-intervention surveys.

TABLE 2 Demographics, clinical specialty programmes and registered nurse experience of advanced practice nursing students ($n = 68$).

	Number (%)
Age	
25 years or younger	27 (40%)
26–30 years	26 (28%)
31–35 years	6 (9%)
36–40 years	4 (6%)
41 years or older	5 (7%)
Gender	
Female	59 (87%)
Male	9 (13%)
Clinical specialty programme	
Primary Care	40 (59%)
Acute Care	18 (26)
Primary Care and/or Nurse Midwifery	10 (15%)
Prior experience providing clinical care via telehealth	
Yes	2 (3%)
No	66 (97%)
Years working as a registered nurse	
≤1 year	23 (34%)
2–4 years	31 (46%)
5–10 years	11 (16%)
More than 10 years	3 (4%)

3.1 | Beliefs of the value of telehealth

Measures of the participants' beliefs about the value of telehealth and confidence about performing telehealth pre- and post-intervention are displayed in Table 1. There was no significant change in students' beliefs regarding the value of telehealth after the telehealth experience and multimodal instruction (mean [median] sum of scores = 18.0 (19.0) and 18.2 (19.0), respectively, before and after the intervention; Wilcoxon's signed-rank test, $p = 0.09$).

Pre-intervention there were no students who thought telehealth services were not important to advanced practice nursing. After the intervention, there was an increase from 54% to 69% of students who strongly agreed that telehealth services are important to advanced nursing practice. Overall, students believed that they should understand how to provide telehealth services as a future APRN, there was no significant difference before and after the intervention, $p = 0.62$. The great majority of students (97%) believed telehealth to be important to their advanced practice specialty area as compared to the same 3% who disagreed both before and after the intervention. When asked about beliefs regarding telehealth improving patient outcomes only 3% of students disagreed pre-intervention and post-intervention there were no students who disagreed with telehealth improving patient outcomes. All students agreed or strongly agreed that telehealth can improve patient access to care both before and after the intervention with no significant change between the scores, $p = .76$. Pre-intervention 97% of students believed telehealth to be a safe and effective way to manage some patient health concerns and post-intervention, 100% of the students believed this to be true.

There were 53% of students who reported they understood the rules and regulations for providing telehealth before the intervention with a significant increase to 94% of students reporting they understood after the intervention, $p < 0.0001$. Pre-intervention only 41% of students reported they understood how to document the necessity of telehealth services, which increased to a significant 88% post-intervention, $p < 0.0001$.

3.2 | Confidence in performing telehealth

Before the intervention only 37% of students felt prepared to effectively provide telehealth services, which increased to 78% of students reporting feeling prepared after the intervention, $p < 0.0001$. There were 56% of the students who felt uncomfortable providing telehealth services before the intervention resulting in significant change with a decrease to 22% after the intervention, leaving 88% reporting they were comfortable providing telehealth services, $p < 0.0001$. After the intervention a significant improvement was seen in the students' overall confidence related to providing telehealth (mean [median] sum of scores = 9.7 (9.0) and 12.1 (12.0), respectively, before and after the intervention; Wilcoxon's signed-rank test, $p < 0.0001$).

4 | DISCUSSION

Since nearly all (97%) of students expressed they believed telehealth was very important in both the pre- and post-test evaluations, we realized that students already see value in telehealth visits for their patients. After the intervention there was a significant improvement in the students' overall confidence in providing telehealth, thus reinforcing the effectiveness of this teaching strategy for this difficult concept. Significant increases were reported in understanding the rules and regulations for providing telehealth and the necessary components in documentation for reimbursement purposes. The student reflection and debriefing sessions conducted by faculty allowed students to identify the benefits and challenges of providing care in the telehealth format. Many students reported physical assessment to be the most challenging aspect; however, during the debriefing, the students were able to discuss techniques they used for collecting this objective data. Ultimately, students felt prepared to effectively provide telehealth visits and reported feeling comfortable providing telehealth services after the educational intervention. Since most students did not feel comfortable prior to the multimodal telehealth instruction, but felt very comfortable after the instruction and demonstrating a simulated telehealth SP experience, we feel this intervention was

very effective. We felt it affirmed the need to use this learning tool in the upcoming advanced health assessment courses to instil confidence in performing telehealth.

4.1 | Limitations and recommendations

This study presents some limitations. At the time of this study, there was not a standardized grading rubric available hence, faculty created a rubric based on needed competencies as described in methods. In addition, the instrument used for the pre- and post-tests was new and not validated. Some of the students may have been more prepared if they completed their assignment for preparation for the SP simulation using Zoom, compared to the students who chose to complete the assignment face-to-face. Data was also not collected regarding how the students felt the SP improved the experience vs practicing with a partner.

Lastly, the study used a convenience sample in a single university, in a single course, with a relatively small sample size (n = 68), and the data were collected during one academic term. While the results are encouraging and overall positive for the target university, they are not broadly generalizable. The results of this study could be replicated and be used in other healthcare schools (e.g., medicine, nursing, social work) to educate students on telehealth and assess students' learning of telehealth competencies by using a telehealth SP simulation. Our findings provide initial data regarding the value of using simulation in telehealth to prepare future APRNs for practice. Further development of telehealth content and simulations with standardized grading rubrics and validated pre- and post-test instruments are planned in future terms of the Advanced Health Assessment course to specifically evaluate student learning outcomes related to telehealth competencies.

5 | CONCLUSION

Preparing APRN students to provide telehealthcare services through the incorporation of multimodal telehealth instruction and simulation experiences during their formal education can position them to effectively care for patients via telehealth in the future. Continuing to integrate and embed advancing levels of telehealth content and simulation throughout the APRN student curriculum can help increase student knowledge, comfort and skills in providing healthcare using the telehealth modality. APRNs who are competent and comfortable providing telehealth are better placed to gain the trust of patients thus remain on track to continue to further increase access to care, improve patient outcomes and reduce health disparities.

AUTHOR CONTRIBUTIONS

Heather Jones involved in conceptualization, methodology, investigation, resources, data curation, writing the original draft, review and editing, visualization and project administration. Beth Ammerman involved in conceptualization, methodology, investigation, resources, writing the original draft, review and editing and project administration. Kevin Joiner involved in methodology, software, validation, formal analysis, resources, data curation, writing the original draft, review and editing and visualization. Deb Lee involved in methodology, investigation, data curation and writing the original draft. April Bigelow involved in review and editing, resources and visualization. Elizabeth Kuzma involved in conceptualization, methodology, investigation, resources, data curation, writing the original draft, review and editing and visualization.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to disclose.

ETHICS STATEMENT

This study was exempt-approved by the Institutional Review Board (IRB) of the University of Michigan (IRB no. HUM00188414). All processes of the study were carried out in accordance with the research governance ethical principles. Participants' informed consent was obtained electronically prior to each survey.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy and ethical restrictions.

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REFERENCES

Arends, A., Gibson, N., Marckstadt, S., Britson, V., Nissen, M. K., & Voss, J. (2021). Enhancing the nurse practitioner curriculum to improve telehealth competency. *Journal of the American Association of Nurse Practitioners*, *33*(5), 391–397. https://doi.org/10.1097/JXX.0000000000000303

Balestra, M. (2018). Telehealth and legal implications for nurse practitioners. *The Journal for Nurse Practitioners*, *14*(1), 33–39. https://doi.org/10.1016/j.nurpra.2017.10.003

Burt, L., & Kilroy, S. (2021). Nurse practitioner student perceptions of a multimodal telemedicine clinical course. *Nurse Educator*, *46*, E122–E126. https://doi.org/10.1097/nne.0000000000001019

Chike-Harris, K. (2021). Telehealth education of nurse practitioner students. *The Journal for Nurse Practitioners*, *17*(3), 310–316. https://doi.org/10.1016/j.nurpra.2020.12.029

Chike-Harris, K. E., Durham, C., Logan, A., Smith, G., & DuBose-Morris, R. (2021). Integration of telehealth education into the health care provider curriculum: A review. *Telemedicine and e-Health*, *27*(2), 137–149. https://doi.org/10.1089/tmj.2019.0261

Diegel-Vacek, L., Cotler, K., Reising, V., & Corbridge, S. J. (2021). Transition of nurse practitioner faculty practice and student clinicals to telehealth: Response to the COVID-19 pandemic. *The Journal for Nurse Practitioners*, *17*(3), 317–321. https://doi.org/10.1016/j.nurpra.2020.12.023

Gustin, T. S., Kott, K., & Rutledge, C. (2020). Telehealth etiquette training: A guideline for preparing interprofessional teams for successful encounters. *Nurse Educator*, *45*(2), 88–92. https://doi.org/10.1097/NNE.0000000000000680

INACSL Standards Committee. (2016). INACSL standards of best practice: SimulationSM simulation design. *Clinical Simulation in Nursing*, *12*, S5–S12. https://doi.org/10.1016/j.ecns.2016.09.005

LaManna, J., Eckhoff, D., Duncan, J., & Anderson, M. (2021). Nurse practitioner student perceptions of a pilot simulated gerontological telehealth visit. *The Journal of Nursing Education*, *60*(7), 408–413. https://doi.org/10.3928/01484834-20210616-10

Rutledge, C., Pitts, C., Poston, R., & Schweickert, P. (2018). *NONPF supports telehealth in nurse practitioner education*. National Organization of Nurse Practitioners. https://cdn.ymaws.com/www.nonpf.org/resource/resmgr/docs/telehealth_paper_final_20181.pdf

Rutledge, C. M., Kott, K., Schweickert, P. A., Poston, R., Fowler, C., & Haney, T. S. (2017). Telehealth and eHealth in nurse practitioner training: Current perspectives. *Advances in Medical Education and Practice*, *2017*(8), 399–409. https://doi.org/10.2147/AMEP.S116071

Rutledge, C. M., O'Rourke, J., Mason, A. M., Chike-Harris, K., Behnke, L., Melhado, L., Downes, L., & Gustin, T. (2021). Telehealth competencies for nursing education and practice: The four Ps of telehealth. *Nurse Educator*, *46*, 300–305. https://doi.org/10.1097/nne.0000000000000988

van Houwelingen, C. T., Moerman, A. H., Ettema, R. G., Kort, H. S., & ten Cate, O. (2016). Competencies required for nursing telehealth activities: A Delphi-study. *Nurse Education Today*, *39*, 50–62. https://doi.org/10.1016/j.nedt.2015.12.025

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