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Effectiveness of Using A Simulation Combined with Online Learning Approach to Develop Discharge Teaching Skills

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Abstract

Background

Despite evidence of the impact of discharge teaching on patient outcomes, nursing students are poorly prepared in the pedagogical skills necessary for their role as patient and family educators in clinical

practice. This study evaluated the effectiveness of simulation combined with online learning to improve nursing students' discharge teaching skills.

Methods

The module included simulations before and after an online module on patient/family teaching for hospital discharge. Evaluation measures were student and independent rater evaluations using the Quality of Discharge Teaching Scale- Evaluation form (QDTS-E).

Results

Students (n=153) improved their performance on both content and delivery subscales of the QDTS-E by 20% (student self-evaluations) and 18% (independent raters). However, correlations between student and rater scores were low ($r=.08-.22$)

Conclusion

Use of simulation with online learning in a discharge teaching module can help students build patient education skills to improve post-discharge patient outcomes, contributing to national health priorities to reduce hospital readmissions. With further refinement and testing, the learning module and QDTS-E evaluation form may also be useful for evaluation and continuing education of clinical nursing staff..

Introduction

Learning how to teach patients is a core component of nursing education (Richard et al., 2018). This learning begins early in the nursing education curriculum, often in the form of communication concepts (AACN BSN Essentials, 2008). Preparing to teach patients requires learning about relevant diagnosis-related content and expanding communication skills to include specific teaching principles. Nursing students are introduced to various teaching-learning principles through didactic and interactive experiences in classrooms, online learning modules and /or clinical laboratory experiences (Hagler & Morris, 2017). Application may not be contiguous with learning the theoretical principles, sometimes occurring one or more semesters later in the curriculum (Ivarsson & Gunilla, 2009) and often associated with specific clinical content. Students may have few opportunities in their clinical learning settings to observe and gain experience with patient education and specifically with teaching in preparation for the return home after hospital discharge (Richard et al., 2018). Limited exposure to pedagogical principles and opportunities for application while in school leads to nurses in practice who are less prepared to effectively educate patients about patient self-management (Friberg et al., 2012; Kaariainen & Kyngas, 2010).

Teaching about self-care management after discharge home is a key aspect of discharge preparation and is primarily a nursing responsibility (XXX, 2015). Interventions to promote patient's skills and abilities to self-manage their treatments and medications and engage in health-promoting behaviors typically include structured patient education (Braet, Weltens, & Seamans, 2016). The effect of these discharge interventions in contributing to avoidance of adverse outcomes that lead to hospital readmission has been widely tested (Braet et al., 2016, Leppin et al., 2014; Naylor et al., 2011; Ruppap et al., 2016).

As a United States (US)-based research team with dual roles as nursing faculty and health services researchers, we were motivated to link together our program of research on discharge preparation

with our teaching responsibilities. For many years, our research has focused on nurses' contributions to the discharge process and post-discharge outcomes. This research has provided evidence of the trajectory of influence of the quality of discharge teaching on post-discharge outcomes. Specifically, patients who receive poor quality discharge teaching feel less ready for discharge, leading to more coping difficulty at home post-discharge and greater risk of return to the hospital for an emergency department (ED) visit or readmission within 30 days post-discharge (XXX, 2007, 2011, 2017, 2019). We define discharge teaching as the educational interventions that occur mainly during hospitalization to prepare the patient and family/caregiver for the transition from hospital to home, providing them with information to make informed decisions and the knowledge, confidence and skills needed for their post-discharge self-care (XXX, 2015). Patient-reported quality of discharge teaching is a nurse sensitive measure that we have recommended as an outcome metric of hospital care (XXX, 2011).

Improving discharge practices and reducing readmissions are national healthcare priorities in many countries (Australian Commission on Safety and Quality in Health Care, n.d.; Centers for Medicare and Medicaid Services, 2020; Kristiansen et al., 2015; Naylor et al., 2011). We therefore embarked on a project to build a learning module focused on discharge teaching that would develop the strong patient education skills needed to address these priorities. This study's purpose was to evaluate the effectiveness of a combined simulation with online learning module for improving discharge teaching skills in a sample of US nursing students.

Background

Nurses are expected to incorporate patient education into all aspects of their practice, yet many deficiencies have been observed related to both pedagogical preparation and lack of prioritization in clinical practice settings (Bergh et al., 2012; Bergh et al., 2015, See et al., 2020). New philosophic approaches in health care emphasize patient engagement, patient-centered care and patient responsibility for self-management in health and illness (Carman et al., 2013). These approaches have raised the importance of patient education as a central strategy for improvement of post-discharge outcomes. Further, the increasing burden of chronic illness and efforts to reduce the need and costs for acute care services necessitate nurse competence in patient education (Bergh et al., 2015). Emerging approaches to engaged learning help meet these needs. Effective patient education results from patient engagement and pedagogical/pedagogical learning principles, motivational interviewing and teach-back methods (XXX, 2018).

Discharge teaching is a specific example of patient education where the skills of the nurse in preparing the patient for discharge have demonstrable consequences for patient outcomes (XXX, 2007, 2011). Discharge preparation through planning, discharge teaching and coordination of care from hospital to home (XXX, 2015) are required elements of care in regulatory conditions for hospital accreditations and payor requirements (for example, in the US for the Joint Commission [hospital accreditation] and Medicare [government payment program]). Recent international reviews of literature about discharge teaching have summarized the workplace challenges (including nurses' teaching skills, organizational barriers and patient barriers) encountered by nurses in performing high quality discharge teaching (Kang et al., 2018; XXX, 2020).

Nurses are the healthcare professionals with primary responsibility for discharge preparation, coordinating with other disciplines when indicated by the complexity of discharge needs (Ashbrook et al., 2013; XXX, 2015). To successfully conduct discharge teaching, nurses must bring a skill set to the teaching-learning encounter that includes knowledge of the disease and recovery trajectory, how patients should manage their medical needs at home and prevent complications and what patients should do if problems arise. They also must be skilled teachers. In our previous work, we found that the skills of nurses in 'delivering' patient education is a stronger predictor of patient readiness for discharge than the content of the teaching-learning encounter itself (XXX, 2007, 2008, 2009, 2011).

Nurses are better prepared in the content to include in patient education, though often using practice or personal experience-based rather than evidence-based knowledge, but less prepared in the pedagogical/androgical methods and skills needed for effective education (Bergh et al., 2015) and support for self-care (Kaariainen & Kyngas, 2010). Knowing what to teach is not the same as knowing how to teach. Often routinized, giving information is the most common educational strategy, often relying on verbal presentation, checklists and printed materials (Friberg et al., 2012; Kang et al., 2018). With no clear guidelines or evaluation methods for pedagogical competence in the practice workplace (Bergh et al., 2015), lack of training and lack of confidence in teaching skills make nurses reluctant to fully engage in patient education (Friberg et al., 2012). Novice nurses, in particular, are deficient in the knowledge, experience and confidence levels essential for effective patient discharge teaching (Chidume & Pass-Ivy, 2019; Richard et al., 2017). These findings point to the need for improved preparation in discharge teaching during the formative years of nursing education.

The recent emphasis on patient engagement in health care promotes incorporating patients' individual context, needs and concerns into all aspects of their care. In support of US national readmission reduction efforts, the IDEAL discharge model has been introduced as a guiding framework for patient engagement in the discharge planning process (AHRQ, n.d). There are five essential components of the IDEAL discharge process: **I**nclude the patient and family in the discharge planning process; **D**iscuss with the patient and family key areas to prevent problems at home; **E**ducate the patient and family in plain language; **A**ssess how well doctors and nurses explain care to the patient and family and use teach back. **L**isten to and honor the patient's and family's goals, preferences, observations and concerns (IDEAL (AHRQ, n.d.). These guidelines advocate for an interactive teaching-learning style to prepare patients for discharge. Addressing the need for improvement in patient teaching skills during nurses' preparatory education is a proactive strategy to prepare future professional nurses for maximal impact in improving hospital discharge care.

Methods

Study Design.

The study used a pre- and post-test, quasi-experimental design to test the effect of a combined simulation and online module for nursing students' learning about the content and teaching delivery skills for discharge teaching. Specifically, the aim of this study was to improve student performance in discharge teaching.

- Hypothesis 1: Students will self-evaluate their performance at a higher level on the Quality of Discharge Teaching Scale - Evaluation (QDTS-E) form after completing an online learning

module about discharge teaching and participating in Simulation 2 (Sim2) than after Simulation 1 (Sim1), completed before the online module.

- Hypothesis 2: Independent raters will observe and rate student performance at a higher level on the QDTS-E after students participate in Sim2 than in Sim1.
- Research Question: Do students rate their discharge teaching using the QDTS-E similarly to independent raters?

Intervention

The intervention was a six-part learning module that integrated simulation and online learning activities (Figure 1) that focused on developing knowledge around core content for discharge teaching common to all patients being discharged home and building patient education skills. The module was included as an assigned learning activity in the clinical laboratory sessions of the medical-surgical nursing course. Specific patient education about disease self-management was not the focus, though, as part of the assignment, students selected a component of discharge teaching for a patient with a health condition of their choice for simulated teaching. Our goal was to provide practice and foster intentional improvement by action-focused content contained in the online module that could be directly applied during simulated patient teaching. Simulation was used both as a learning tool to link knowledge to action through deliberate learning (Choi et al., 2017) and an evaluative method for the research. The core characteristics of simulations (Choi et al., 2017) were specified as: Scope: completion of a discharge teaching segment, a portion of a full discharge teaching interaction; Modality: a specific patient scenario with a live simulated patient; Environment: a simulation center mirroring the future patient encounters that occur in real-life clinical practice.

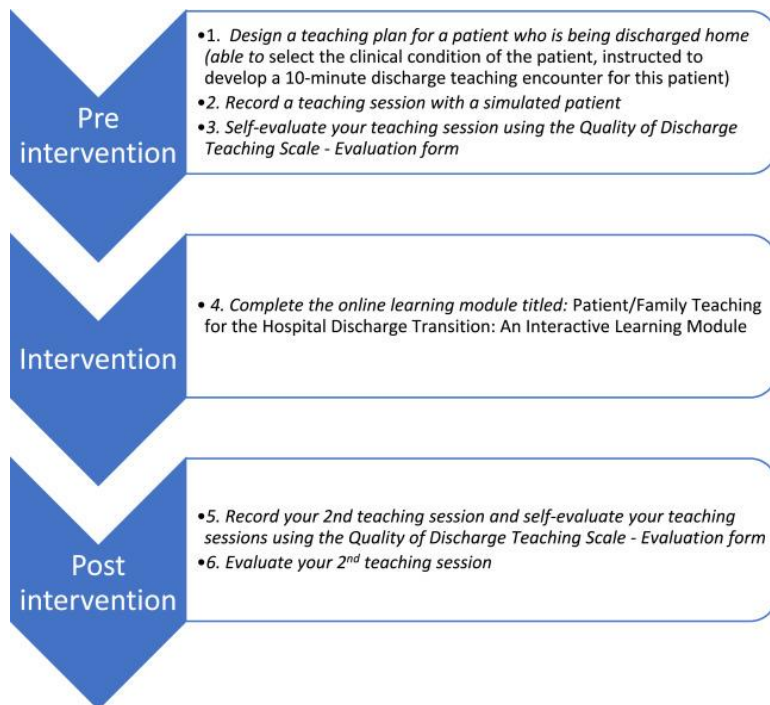


Figure 1. Discharge Teaching Assignment Steps

To create the simulated reality of the discharge teaching encounter, students prepared a 10-minute teaching plan for a patient being discharged to home with a health condition selected by the student. They incorporated the following patient story into their planning:

A woman age 68 is being discharged from the hospital today. In addition to her current health problem that required hospitalization (each student will determine the health problem for discharge teaching), her comorbidities include: hypertension, Type 2 diabetes, hypercholesterolemia, deafness in one ear. She retired at age 65 from her job as a kindergarten teacher. She lives with her husband who had a stroke a couple of years ago and has some functional deficit but has good mobility around the home and walks outside and to other venues with a walker. He is not cognitively impaired. They have two adult children living in the area.

Students used their teaching plan to conduct a simulation of a discharge teaching session (Sim1). Immediately after the session, students reviewed their simulation video playback and self-evaluated their teaching using the QDTS-E form. In the two-week interval before a second simulation session (Sim2), students were instructed to complete the asynchronous online module titled *Patient/Family Teaching for the Hospital Discharge Transition: An Interactive Learning Module*. They then completed Sim2 using the same teaching plan as in Sim1, though enhanced through learning from self-evaluation of Sim1 and the content of the online module.

The online module contained discharge teaching core content and patient/family teaching delivery skills. The design of the module content was based on the *Theoretical Framework to Guide Patient and Family Teaching* (XXX, 2018), a patient-centered approach to patient teaching that integrates four key theories and methodological approaches: patient engagement, motivational interviewing, adult learning principles and teach-back methodology. The online learning module guided students through learning about the core (non-disease-specific) content to be included in all discharge teaching encounters and specific skills for patient and family teaching. The module followed the content domains and skill domains related to the 'delivery' of discharge teaching as measured in the Quality of Discharge Teaching Scale (QDTS), a measure used for patient-reported quality of discharge teaching by the research team in our program of research. The six content domains were consistent with the IDEAL discharge guidelines (AHRQ, n.d.): information about self-care at home; knowledge about medical care treatments and medications; practice with medical care treatments and medications; knowledge about when to call the provider; expected emotions during the discharge transition; and family learning needs of other family members. The 12 teaching skills were aligned with the four theoretical and methodologic teaching approaches: listening to and answering specific questions and concerns, being sensitive to personal beliefs and values, teaching in a way that the patient can understand, providing consistent information, promoting confidence in the person's ability to care for self, confidence in knowing what to do in an emergency, decreasing the patient's anxiety about going home and providing teaching at times that were good for patients and family members. (XXX, 2018). The 12 skills were described in detail in the module with patient examples, guides for assessments and interactive conversations to facilitate the teaching-learning encounter and knowledge self-checks to validate comprehension.

Sample and Setting.

The study was conducted at a private university in the midwestern United States, where it received expedited approval from the university Institutional Review Board. During two consecutive semesters in 2016 and 2017, all students in an adult medical-surgical nursing course were invited to participate. The course was offered to undergraduate nursing students in the final year of a 4-year Bachelor of Science in Nursing program and students with non-nursing bachelor's degrees who were enrolled in a direct-to-master's degree program. The combined simulation with online learning module was a required part of course work. However, participation in the study was voluntary, clinical instructors were not aware of student results and student performance did not affect course grades. Ninety-eight percent (153 out of 156) of students consented to participate.

Measure:

We used the Quality of Discharge Teaching Scale – Evaluation form (QDTS-E) for evaluation of discharge teaching performance in the simulations (XXX, 2018). The QDTS-E assessed the six content domains and 12 skills of quality discharge teaching that were included in the online module. The tool was a modification of the QDTS which we have tested extensively in our research on predictors and outcomes of readiness for hospital discharge (XXX, 2007, 2011, 2017). The scaling format was 0 (none or not at all) to 10 (a great deal or always) for all but two dichotomous items (no=0 and yes=10) related to confirming that the teaching session occurred at a time that was good for the patient and for family members.

Reliability of the QDTS scale has been consistently above $\alpha=.80$ in use with patients as respondents about the quality of their discharge teaching (XXX, 2007, 2008, 2011). Using a modified QDTS-E, the Cronbach's alpha was .93 and .86 in two studies involving student self-evaluations (MacLean et al., 2018b, 2019) and .97 and .88 for content and delivery subscales when simulated patients provided evaluations of student teaching (MacLean et al., 2018a).

Procedures:

The researchers provided an overview of the research and the combined simulation with online learning module, explaining that completion of the learning module was a course requirement but the use of their self-evaluation data and the review of simulation recordings by independent raters for research purposes were voluntary. Informed consent was obtained for the research.

Students were assigned to a time for the simulations as part of their clinical learning laboratory experiences. Teaching plans were prepared in advance of the first simulation day and reviewed by the clinical instructor. Directly after completing Sim1, students were directed to a debriefing room to view the recording of their simulation and complete the QDTS-E. Sim2 was scheduled two weeks later. Before Sim2, students were required to complete the online learning module which was available to them through their course website. The process for completing Sim2 and the QDTS-E was the same as the first simulation.

Graduate nursing students were hired as research assistants and trained as live simulated patients. They were coached on the patient description given to the students and instructed to be interactive with the student 'teachers' but to not offer information or ask questions unless prompted to do so.

They were instructed to be a quiet, agreeable patient, but to offer some potential challenges to self-care at home if prompted.

Independent raters were assigned to review the simulation videos and record their evaluations using the QDTS-E. The raters were two clinical instructors who were not teaching the course where the simulation was used and three graduate students with experience in acute care nursing. The raters were trained by a member of the research team in review and scoring procedures. At least two sets of video simulations were reviewed and scored with each rater in a practice session. The videos reviewed for practice were not assigned to the rater for review for the study. Each of the student simulation videos were reviewed by two raters. The raters reviewed Sim1 and Sim2 in sequence for each of the assigned students. Students were assigned a code number for the study; raters were blinded to the student’s identity.

Data Analysis.

Paired t-tests were used to determine any differences in total score, subscales and individual QDTS-E item scores between Sim1 and Sim2 for students (hypothesis 1) and independent raters (hypothesis 2). For the research question, concordance between students and rater scores were evaluated using Pearson R correlations and mean differences were derived between student scores and rater scores. All analyses occurred in SPSS v. 25 (Chicago, IL).

Results

One hundred and fifty-three students participated in study. Three hundred and six independent reviews of student simulations were scored (two per student) for Sim1 and 304 for Sim2. Two of the Sim2 rater forms were incomplete and omitted from the analysis. Cronbach’s alpha reliability estimated for the QDTE-S with the student and independent rater samples are presented in Table 1.

Table 1. Reliability^a of Quality of Discharge Teaching Scale – Evaluation Form (QDTS-E) with Students and Independent Raters

	Students n=153		Independent Raters n=306	
	Simulation 1	Simulation 2	Simulation 1	Simulation 2
Total QDTS-E	0.83	0.85	0.91	0.93
Content Subscale	0.54	0.74	0.74	0.81
Teaching Delivery Skills Subscale	0.81	0.87	0.87	0.89

^aCronbach’s alphas for standardized items (used due to the mixed scaling format)

Mean scores for students and raters increased from Sim1 to Sim2 for the full scale and both the content and teaching skills subscales (Table 2), supporting hypotheses 1 and 2. For both students and raters, the mean increase was approximately 2 points (on a 0 to 10 point scale), a 20% increase in the quality of teaching. On examining QDTS-E item scores, the student mean scores on the 18 items ranged from 1.6 to 8.7 for Sim 1 and 2.9 to 9.4 for Sim 2 and reviewer scored ranged from 1.0 to 7.3 for Sim 1 and 4.5 to 8.1 for Sim 2 (Table 2). For students, scores increased significantly for all items except ‘check

to make sure your patient understood the information and instructions'. The greatest increases were items related to content subscale items about 'emotions to expect after discharge' [2.9 points], 'who and when to call if you have problems after going home' [2.7 points] and 'family members or significant others [received information] about patients care at home after discharge' [2.3 points] and teaching delivery skill items to 'instill confidence in your patient that he/she would know what to do in an emergency' [2.7points] and 'decrease your patient's anxiety about going home' [2.5 points]. Confirming that the teaching time was good for the patient increased by 4.8 points (from 4.0 to 8.8, meaning that the 40% of students in Sim1 increased to 88% of students performing this teaching behavior in Sim2); similarly, confirming the teaching time with the family increased by 5.2 points.

Table 2. Changes in QDTE scores before and after completion of the learning module

Quality of Discharge Teaching Scale-Evaluation (QDTS-E)	Student Self-Score N=153			Independent Rater Score N=153 (Sim 1), N=151 (Sim 2)		
	Sim1 Mean (SD)	Sim2 Mean (SD)	Difference (Sim 2 minus Sim1) Mean (SD), p	Sim1 Mean (SD)	Sim2 Mean (SD)	Difference (Sim 2 minus Sim1) Mean (SD), p
QDTE TOTAL SCALE	5.9 (1.5)	7.9 (1.2)	2.0 (1.4)***	4.8 (1.4)	6.5 (1.6)	1.7 (1.3)***
CONTENT SUBSCALE: In your discharge teaching session, how much information did you provide	4.9 (1.8)	6.9 (1.9)	2.0 (1.8)***	4.9 (1.6)	6.4 (1.7)	1.4 (1.2)***
1. Taking care of yourself after discharge	7.4 (2.2)	8.6 (1.8)	1.3 (2.2)***	6.9 (1.7)	8.0 (1.5)	1.1 (1.3)***
2. Emotions to expect after discharge	3.2 (3.0)	6.0 (3.1)	2.9 (3.4)***	3.0 (2.4)	4.5 (2.9)	1.4 (2.3)***
3. Medical care needs or treatments after you go home	7.3 (2.8)	8.3 (2.5)	1.0 (2.6)***	7.3 (1.5)	8.1 (1.4)	0.9 (1.2)***
4. Who and when to call if you have problems after going home	5.3 (3.9)	8.0 (3.0)	2.7 (3.8)***	4.3 (2.9)	6.2 (2.5)	1.9 (2.7)***
5. Practice with medical treatments or medications	4.6 (3.8)	6.2 (3.6)	1.6 (3.2)***	5.2 (2.9)	6.5 (3.0)	1.2 (2.2) ***
6. Family members or significant others about patients care at home after discharge	1.6 (3.0)	3.9 (4.3)	2.3 (4.8)***	3.0 (3.0)	5.0 (3.1)	2.1 (2.7) ***
TEACHING DELIVERY SKILLS SUBSCALE: In thinking about the way you 'delivered' discharge teaching to your patient, how much did you/were you:	6.5 (1.6)	8.5 (1.1)	2.0 (1.6) ***	4.7 (1.4)	6.6 (1.7)	1.8 (1.4) ***
7. answer specific concerns and questions	7.8 (2.0)	9.0 (1.1)	1.2 (2.0) ***	6.4 (1.6)	7.6 (1.7)	1.2 (1.4) ***
8. you listen to your patient's concerns	7.8 (2.2)	9.2 (1.1)	1.4 (2.0) ***	5.5 (2.0)	7.2 (4.5)	1.6 (4.4) ***
9. sensitive to your patient's personal beliefs and values	6.9 (2.8)	8.0 (2.4)	1.1 (2.7) ***	3.7 (2.4)	5.5 (2.7)	1.5 (1.8) ***

10. use teaching methods that were best for your patient's learning style	6.9 (2.5)	8.4 (2.0)	1.5 (2.7) ***	3.3 (2.6)	5.2 (3.3)	1.8 (2.6) ***
11. check to make sure your patient understood the information and instructions	8.7 (6.0)	9.2 (1.2)	0.5 (5.8)	6.3 (2.0)	7.5 (2.0)	1.2 (1.7) ***
12. instill confidence in your patient's ability to care for self at home after discharge	6.9 (2.3)	8.7 (1.5)	1.8 (2.4) ***	5.6 (1.9)	7.1 (1.9)	1.5 (1.7) ***
13. instill confidence in your patient that he/she would know what to do in an emergency	4.4 (3.2)	7.1 (3.2)	2.7 (3.8) ***	3.2 (2.5)	4.5 (2.8)	1.3 (2.3) ***
14. decrease your patient's anxiety about going home	5.6 (2.7)	8.1 (1.7)	2.5 (2.5) ***	5.4 (1.9)	6.7 (1.9)	1.3 (1.7) ***
15. present information on self-care at home in a way your patient could understand	8.2 (1.7)	9.2 (1.0)	1.0 (1.6) ***	6.8 (1.7)	8.0 (1.5)	1.2 (1.4) ***
16. consistent in the information you provided to your patient when you repeated information for reinforcement or clarification	8.6 (1.5)	9.4 (1.0)	0.8 (1.4) ***	7.2 (1.5)	8.1 (1.7)	1.0 (1.5) ***
17. confirm with your patient that the teaching session was occurring at a time that was good for your patient	4.0 (4.9)	8.8 (3.3)	4.8 (6.0) ***	2.4 (4.3)	6.7 (4.7)	4.3 (5.6) ***
18. confirm with your patient that the teaching session was occurring at a time that was good for family members or others who should attend	2.0 (4.0)	7.2 (4.5)	5.2 (5.4) ***	1.0 (3.0)	5.0 (5.0)	4.0 (5.0) ***

*p<.001

All items increased significantly for raters (Table 2). The greatest increases in rater scores were items related to 'use teaching methods that were best for your patient's learning style' [1.8 points] and 'listen to your patients concerns' [1.6 points], as well as confirming a good teaching time with the patient [4.3 points] and with the family [4.0 points].

Students rated themselves higher than the raters. (Table 3). Mean differences between student and rater item scores were 1.1 to 1.4 for QDTS-E Total scale but most of the difference was accounted for by differences in evaluations of teaching delivery skills. Correlations between students and raters were low ($r=0.08$ to 0.22). (Table 3), possibly explained by the variation in mean differences between students and individual raters scores (Table 4).

Table 3. Comparison of Student and Independent Rater Scores on Quality of Discharge Teaching Scale-Evaluation (QDTS-E)

	Sim1				Sim2			
	Students Mean (SD)	Raters Mean (SD)	Difference Student-Rater Mean (SD)	Correlation (p)	Students Mean (SD)	Raters Mean (SD)	Difference Student-Rater Mean (SD)	Correlation (p)
QDTS-E Total	5.9 (1.5)	4.8 (1.4)	1.1 (1.8) t=10.42, df-303, p<.001	0.14 (p=.01)	7.9 (1.2)	6.5 (1.6)	1.4 (1.9) t=12.96, df-301, p<.001	0.18 (p=.002)
QDTS-E Content	4.9 (1.8)	4.9 (1.6)	-0.1 (2.2) t=-0.41, df-303, p=.68	0.12 (p=.04)	6.9 (1.9)	6.4 (1.7)	0.45 (2.4) t=3.23, df-301, p=.001	0.08 (p=.17)
QDTS-E Teaching Delivery Skills	6.5 (1.6)	4.7 (1.4)	1.7 (1.9) t=1.43, df-303, p<.001	0.15 (p=.01)	8.5 (1.1)	6.6 (1.7)	1.9 (1.9) t=17.125, df-301, p<.001	0.22 (p<.001)

Table 4. Differences in QDTS-E Among Independent Raters#

	Rater 1 N=56	Rater 2 N=23	Rater 3 N=25	Rater N=108	Rater 5 N=94
QDTS-E Total Sim1	1.9 (1.7)	-0.3 (1.7)	2.5 (2.0)	0.6 (1.8)	1.1 (1.6)
Sim2	2.5 (1.7)	0.7 (1.7)	2.9 (1.8)	0.6 (1.8)	1.4 (1.5)
QDTS-E content Sim1	1.1 (1.9)	-1.4 (1.9)	1.6 (2.6)	-0.8 (2.2)	0.0 (1.8)
Sim2	1.6 (2.2)	-0.3 (2.5)	2.5 (1.8)	-0.5 (2.4)	0.4 (2.1)
QDTS-E Teaching Sim1	2.3 (1.9)	0.2 (1.9)	3.0 (1.9)	1.4 (1.8)	1.6 (1.8)
Delivery Skills Sim2	3.0 (1.9)	1.2 (1.7)	3.1 (2.0)	1.1 (1.8)	1.9 (1.6)

#calculated as student score minus independent rater score

Discussion

The simulation combined with online learning approach effectively improved discharge teaching content and teaching skills of the nursing students. This is consistent with MacLean et al. (2018b) who tested an information module on readmission risk along with a teach-back method in a simulated patient discharge teaching session and found better discharge teaching communication in the simulated environment than a no-intervention control group. Similarly, our online learning module contained both readmission risk prevention information and teach-back methodology.

Consistent with our goal of improving discharge teaching practices that would have an impact on patient outcomes specifically related to self-care management at home following discharge, the improvement in all items of the QDTS-E as rated by both students and independent raters was encouraging. In particular, the greatest improvements were noted in discharge teaching content related to 'who and when to call for problems'. This item is a critical piece of standard discharge teaching (Ashbrook et al., 2013) that promotes readmission avoidance through access to professional community contacts who can rapidly respond to concerns before problems or anxiety escalate.

Other content items with notable improvement included 'discussing emotions to expect at home' and 'providing content to family members'. Observation of discharge teaching during clinical practicum experiences may have led to poor skill development in these areas prior to completion of the learning module. Nurses in clinical practice report lack of time for teaching and often focus on patient learning about their disease and treatment, with information giving as the primary teaching approach (Friberg et al., 2012; Kang et al., 2018).

Student's scores were higher than raters on the teaching delivery items of the QDTS-E in both Sim1 and Sim2, but overall improvement was similar; students reported a 20 % (mean=2.0) improvement and raters reported an 18% improvement in discharge teaching delivery skills

Our simulation with online module engaged students in a one-time sequence of practice, self-reflection and modification of their teaching behaviors. It is certainly possible that repeated sequences would produce additional gains.

The areas of greatest improvements for students in teaching skills delivery were related to instilling confidence in the patient and decreasing anxiety. Raters noted greatest improvements in selecting teaching methods that were best for the patient and listening to patient concerns. Both students and raters noted improvements in conducting teaching at times that were good for the patient and family. All of these improvements are in areas that may not be well modeled during observations in clinical practicum experiences. Nurse role models in practice settings often have had limited preparation in pedagogical skills and are pressed for time to conduct discharge teaching within the constraints and priorities of their patient assignments (Friberg et al., 2012; See et al., 2020). Clinical instructors might consider whether nursing staff at clinical practicum sites are the best role models for patient education. Student observations of clinical instructors educating patients could be an alternative that provides real-world demonstration of best teaching practices.

In addition, nurse managers at practicum sites might consider collaborating with clinical instructors to provide education for nursing staff in effective patient education and specifically discharge teaching

content and teaching delivery skills. Developing innovative academic-practice partnerships can increase opportunities for use of simulation experiences for practicing nurses. Nurse managers recognize the importance and value of patient education in achieving patient clinical outcomes and satisfaction (Bergh et al., 2015). Evidence supports the effectiveness of in-site simulation experiences for improving patient outcomes, including morbidity and mortality (Goldshtein et al., 2020). This approach can support the transition to practice of newly graduated nurses (Thomas & Mraz, 2017; Ruslan, & Saidi, 2019; and enhance skills of experienced nurses, preparing them for preceptorship roles (Wilson et al., 2013). An academic-clinical site partnership could produce immediate practice improvements as well as better prepare the next generation of nurses.

This study provides beginning evidence of the utility of the QDTS-E as a rating tool for measuring nurse performance of discharge teaching. The scale has previously been used for patient ratings of the quality of discharge teaching by their nurses (XXX, 2007, 2011, 2019). In this study with students and raters, scale reliability was mostly adequate, particularly in the second simulation. Raters varied in their scoring and correlations with student ratings were low. While raters were trained in scoring the simulations, the use of a 0 to 10 rating scale allowed for more individuality in application of the scoring than may be desirable. Raters conducted two practice ratings individually with the trainers before conducting the ratings for the study. More practice as a group of raters may have narrowed the differences between raters (MacLean et al., 2018a). Rater scores represent the expectations of practicing nurses for performance in clinical settings. The rater scores, especially for teaching delivery skills, are lower than scores obtained from patient report in clinical practice, which typically average 8 on a 10 point scale (XXX, 2007, 2019). The low correlations of rater and student scores point to the need for communication of perceptions of teaching competencies between instructors and students so that students have a benchmark for expectations of patient teaching performance.

Strengths and Limitations:

The simulation combined with online learning approach to the intervention allowed us to evaluate the effect of the combined, but not the individual, components of the intervention. The use of simulation as part of the intervention and the evaluation allowed us to leverage the benefits of both online and simulated patient care experiences to help students improve their discharge teaching. The reflection on practice in the self-evaluations was an important aspect of their learning and the opportunity for repetition of the simulation provided a mechanism to practice newly learned skills and at the same time evaluate performance. Using a structured reliable assessment tool aligned with teaching behaviors evaluated by patients in the actual clinical practice settings added to the realism of the module (MacLean et al., 2019).

A further strength of the design was the use of self and independent rater evaluations, though it added a layer of complexity to interpretation of findings. The variability in rater scores could be attributed in part to differences in raters' education and practice (two clinical instructors, three graduate students who were acute care nurses). In addition to improved rater training (MacLean et al., 2018a), reduction in the number of data points on the evaluation scale (0 to 10) could also improve consistency, though it could reduce the sensitivity of the scale to changes in teaching behaviors.

The combined simulation-online learning module used in this study was an ungraded assignment. Results may be different if a student grade is also assigned (Schinske & Tanner, 2014; Stan, 2012).

Completion of the online module was not tracked and students had the ability to skip over portions of the module. In future studies, process metrics to track student completion and time spent in the online activity will help us to better understand the relative contribution of the simulation and online module components of the learning activity to the improvements in teaching skills. Refinement of the independent rater evaluations will be critical to move toward a graded assignment based on skill level. Criteria for minimal performance would need to be established and communicated.

The sample included students in their final year before graduation and licensure as a Registered Nurse. During the instruction session about the learning module, many students indicated that they had limited or no exposure to discharge teaching in didactic or clinical learning formats prior to the assignment. Many indicated there was substantial content on communication with patients in their prior learning experiences. The learning module has not yet been tested with students at other learning levels. To improve the opportunities for student learning through use of the teaching skills throughout their curriculum, the module could be introduced earlier in their course sequence and repeated to assure opportunities for refinement of discharge teaching specifically and patient education skills in general, before entry to practice. Continuation of this development is essential as students become practicing nurses (Bergh et al., 2015, Ivarsson & Nilsson, 2009).

The study was specifically focused on building teaching skills related to discharge teaching. Students were required to submit a teaching plan which were briefly reviewed by the instructors. During the course of the study, we identified a deficiency in student skills in developing content for condition-specific patient education. Students needed more education on writing learning objectives that follow SMART guidelines and are learner focused (Bjerke & Ranger, 2017). This deficiency will be addressed in future development of the module.

Conclusion

The aim of this study was to improve student performance regarding discharge teaching. This was accomplished through the use of a simulation with online learning module. Students wrote and implemented a teaching plan and then evaluated their performance in two practice simulation sessions, one before and one after completing an online learning activity. Students and independent raters both indicated improvement in performance of discharge teaching. The simulation with online learning module on discharge teaching provides an opportunity for students to learn discharge teaching content and skills that support their development in patient education, a core nursing practice skill and contribute to readmission avoidance, a high priority outcome for the individual patient and national healthcare improvements. While this learning activity improved student's ability to teach, continued support for pedagogical growth and experiential knowledge development during the transition to practice will be needed to achieve the desired positive impact on successful patient self-management and decrease readmission rates. To accomplish this continuation of learning, the simulation with online learning approach could be used in clinical practice settings with newly graduated nurses for building discharge teaching skills specifically and patient education skills more generally and for enhancing these skills in experienced nurses.

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CRedit authorship contribution statement

Marianne E. Weiss: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Writing – original draft, Writing – review & editing. **Linda B. Piacentine:** Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Writing – review & editing. **Lori Candela:** Conceptualization, Formal analysis, Investigation, Methodology, Resources, Software, Writing – review & editing. **Kathleen L. Bobay:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Writing – review & editing.

Declaration of Competing Interest

None.

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