Use of a Checklist as a Decision Support Aid for Heart Failure Assessment and Management

USE OF A CHECKLIST AS A DECISION SUPPORT AID FOR HEART FAILURE ASSESSMENT AND MANAGEMENT

A Dissertation Presented

by

MaryAnn Hogan

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DEDICATION

The work of this dissertation is dedicated to the memory of my brother Joseph G. Zimmerman, who died far too young from heart failure, and to my children Michael Jr., Kathryn, Kristen, and William for their unwavering love and support.

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ABSTRACT

USE OF A CHECKLIST AS A DECISION SUPPORT AID FOR HEART FAILURE ASSESSMENT

SEPTEMBER 2022

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Heart failure is a serious chronic health problem requiring ongoing management to control disease progression. Consequences of inadequate heart failure management include acute exacerbation, worsening baseline status, and possibly death. Nurses play a key role in surveillance of patients with heart failure and in management of their condition as part of the interprofessional health care team. During episodes of acute decompensation of heart failure, nurses must be able to detect onset of signs and symptoms, initiate appropriate nursing interventions promptly, and communicate with the provider and other team members as needed. Although heart failure is a common health problem in older adults, it is still not well managed in post-hospital care settings, as attested to by high hospital readmission rates. To help reverse this, nurses need to be skilled in heart failure assessment and treatment, which begins in undergraduate nursing education. This experimental study describes how the use of a heart failure assessment checklist could facilitate recognition and management of heart failure exacerbation by student nurses. This could ultimately enhance their professional practice as nurses.

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CHAPTER 1

INTRODUCTION

The Problem

Heart failure is a significant health problem in the Unites States (Paul & Hice, 2014), affecting approximately 6.2 million people at or over 20 years of age in the United States from 2011 to 2014 (Virani et al., 2021). Although the number of people living with heart failure is increasing, approximately 366,464 people had heart failure mentioned on death certificates in 2018 (Benjamin et al., 2019), and approximately 50% die within the five years of diagnosis (Mozzafarian et al., 2016). Because of the chronicity of the condition, ongoing treatment is required, leading to high costs nationally. Heidenreich and colleagues (2011) estimated that $30.7 billion annually are spent on health care services, medication therapy, and missed work days, with an anticipated increase to approximately $69.7 billion by the year 2030. Furthermore, payment for heart failure care is largely fee-for-service, increasing the risk for uncoordinated, fragmented and therefore low-quality care (Maddox et al., 2020). A value-based payment model aimed at long-term heart failure management and prevention of progression has been proposed and will require involvement of several groups including clinicians, payers, and regulators to implement (Maddox et al., 2020).

Nurses, as part of the interprofessional health care team, play an important role in the ongoing management of heart failure. A critical role of the nurse is to recognize signs of acute decompensated heart failure (Paul & Hice, 2014) to facilitate early initiation of treatment and prevent further deterioration. Nurses' thorough knowledge of acute and chronic heart failure aids in optimizing patient care from admission to acute care hospitals until discharge (Paul & Hice, 2014). Nurses also assist patients with self-management of the condition, which is a priority in order to improve quality of life and reduce rehospitalization rates (Albert et al., 2002). Patient and family or caregiver teaching about heart failure self-management can help prevent future decompensation and rehospitalization. Topics include diet, activity, medications, fluid and weight management, signs and symptoms of worsening condition, and when to call the health care provider (Albert et al., 2002; Riley, 2013, 2015; Whitlock & MacInnes, 2010). Across the spectrum of care, it is important for nurses to recognize and act on signs of acute decompensated heart failure, so that early treatment can be initiated to safeguard patients and improve patient outcomes.

The use of a checklist as an assessment and decision support aid may positively affect novice and advanced beginner nurses' ability to identify patient clinical changes that suggest acute exacerbation of heart failure. Although procedural checklists are abundant in physical assessment handbooks and in fundamentals of nursing textbooks, these checklists are strictly procedural in nature. A checklist enhanced with action cues may reduce the time needed to provide beneficial care, with the intent to mitigate the effects of acute decompensated heart failure on the patient.

Checklists, when used as clinical decision support systems (CDSSs) at the point of care, prompt the user to recall important information and remember key steps when performing work in clinical settings. Studies have demonstrated that checklists have been effective in enhancing patient safety and improving communication among health care providers (Anderson et al., 2015; Gawande, 2010; Haynes et al., 2009; Pronovost et al., 2003; Sibbald et al., 2015). Checklists can also support nurse decision-making in patient care situations by cueing assessment of patients' verbal responses, physical assessment data, and documentation in the health record (Gillespie & Peterson, 2009; Scott et al., 2019).

In this study, an educational checklist was introduced to participants as a guide to facilitate assessment and management of an acute exacerbation of heart failure. The Simulation Effectiveness Tool-Modified (SET-M) was used as a subjective measure of participant learning. The Nursing Anxiety and Self-Confidence with Clinical Decision-Making Scale (NASC-CDM©)was used as a subjective measure of participants' anxiety and self-confidence while completing the heart failure assessment. The findings were examined for differences between participant groups.

Nursing Role Effectiveness Model

The Nursing Role Effectiveness Model (NREM) outlines the roles that nurses play in influencing patient outcomes (Doran et al., 2002). The model proposes specific relationships among three components, which include structural components (nurse, nursing unit, and patient variables), process components (independent, dependent, and interdependent nursing roles) and outcome components (patient outcome variables). The NREM is adapted for use in nursing from Donabedian's (1988) structure-process-outcome model of quality care (Doran et al., 2002). Structural variables used in this study are the educational level of the nurse and whether or not an educational checklist is used. The process variables used are the independent functions of the nurse (assessment and nursing actions not requiring a provider order) and interdependent functions, such as communicating appropriately with other health team members when indicated. Patient outcome variables (such as patient clinical status) were not evaluated in this study.

Nursing Surveillance

Nursing surveillance has been described as an intervention (Dougherty, 1999), a process (Kelly & Vincent, 2011), or both (Henneman et al., 2012). It is described by Dougherty as having a behavioral component (the act of conducting assessments) and a cognitive component (interpretation and synthesis of that data). The purpose of nursing surveillance is generally aimed at some form of client protection or reduction of a variety of risks to clients. Nursing surveillance applies in a variety of health care settings and to both adults and children as clients.

Nursing surveillance as a theoretical model for this study is the process proposed by Henneman (2017). The surveillance process consists of data acquisition, data analysis, data dissemination, risk assessment, and prioritization. System factors (culture of safety, open communication, interdisciplinary collaboration, patient/family involvement, and technology such as clinical decision support systems) and human factors (nurse skills, rules, and knowledge) can influence how the nurse conducts the surveillance process, which, in turn, can affect patient outcomes. Negative patient outcomes in this model consist of medical errors, adverse events, morbidity, and mortality (p. 275). In this study, the heart failure assessment checklist served as a clinical decision support document (systems factor), and the underlying knowledge and skills of the participants served as human factors. The elements of the surveillance process applicable to this study are data acquisition, data analysis, and risk assessment. Participants also needed to make a decision about whether to communicate findings to the provider (data dissemination) as part of the study design. Negative outcomes (such as morbidity) were not measured in this study.

Research Questions

This study addressed two primary and two additional research questions. The first primary question was “Does the use of a heart failure checklist increase the number of heart failure assessment questions asked by the participant?” The hypothesis was that the use of a heart failure checklist will significantly ($p <. 05$) increase the number of heart failure assessment questions asked by the participant compared to those who do not use the checklist. The outcome measures were the total number of assessment questions asked on the heart failure assessment checklist and the number of assessment questions asked on the heart failure assessment checklist that are **most** clinically relevant. The items on the checklist that are most clinically relevant were preidentified from the literature. Examples of the most clinically relevant items include fatigue, shortness of breath, chest pain, and weight gain.

The second primary research question was “Does the use of a heart failure checklist increase the number of provider contacts made related to changes in the patient’s condition?” The hypothesis was that the use of a heart failure checklist will significantly increase ($p < .05$) the number of provider contacts made compared to those made without the checklist. The outcome measure was whether or not the participant verbalized the need to contact the health care provider.

This study addressed two additional research questions. First, “How do study participants evaluate the telehealth assessment of the standardized patient actor using the Simulation Effectiveness Tool-Modified (SET-M)?” The outcome measure was the rating provided for items on the SET-M. The ratings for the two groups were compared. The second additional research question was “How do study participants evaluate their anxiety and self-confidence during the telehealth assessment of the standardized patient actor using the Nursing Anxiety and Self-Confidence in Clinical Decision-Making Scale©(NASC-CDM)?" The outcome measure was the rating provided for items on the scale. The ratings for the two groups were compared.

Study Protocol

The study was conducted as a telehealth visit by telephone to a standardized patient actor. Nursing students were recruited via email messages. The inclusion criteria were nursing students who are undergraduates, and who are educated in the performance of physical assessment. The recruitment script emphasized that participation was voluntary. All participants were given a consent form to review and sign. Students needed to sign the form to be able to participate in the study.

This study had these components lasting approximately a total of 1 hour to complete:

1. Participant survey (both groups)
2. Training in use of Heart Failure Assessment Checklist (experimental group only)
3. An educational intervention in the form of a voiced-over PowerPoint training (both groups)
4. Simulation of a telehealth visit limited to 15-minutes (both groups)
5. Completion of the SET-M (both groups)
6. Completion of the NASC-CDM© (both groups)

Both groups received an educational session about heart failure assessment via a voiced-over PowerPoint presentation. The experimental group received instruction on how to use a researcher-developed checklist for heart failure assessment. Participants in the checklist group were instructed to use the checklist during the telehealth assessment visit. Each participant took part in a simulation using a standardized patient in the form of a telephone telehealth visit. During the visit, the standardized patient actor reported acute signs of heart failure (decompensation). Participants in both groups were given a documentation form (set up in parallel format to the checklist) on which they could record their assessment findings as they conducted the interview. After the telephone assessment visit, each participant completed the SET-M and the NASCDM©.

Summary

Nurses are the health team members who provide the most frequent and consistent assessment and care to patients. Regardless of their practice setting (acute care, post-acute care, long-term care, home care), nurses need to be skilled in assessment and management of heart failure in order to recognize and take appropriate action during an exacerbation. Research has demonstrated that checklist use at the point-of-care is more effective than education alone to ensure that key assessments and interventions are not missed, thereby promoting patient safety. Although there is current evidence about the effectiveness of checklists in a variety of applications, there is a gap in the research about the effectiveness of an educational checklist as a tool to facilitate recognition of heart failure exacerbation and to cue appropriate action steps. This study examined whether the use of an educational checklist by nursing students would result in higher rates of recognition of signs of acute decompensating heart failure and initiation of supportive nursing interventions (such as notifying provider) than education alone.

CHAPTER 2

REVIEW OF THE LITERATURE

Scope of the Problem: Heart Failure

Heart failure is a major health problem in the Unites States despite ongoing advances in evidence-based approaches to addressing risk factors, symptom management, and medication therapy (Paul & Hice, 2014). According to American Heart Association statistics (Virani et al., 2021), heart failure affected approximately 6.2 million people at or over 20 years of age in the United States from 2013 to 2016, an increase of approximately 500,000 people over the 5.7 million people affected during the 2009–2012 period. Although the number of people living with heart failure is increasing, approximately 379,000,000 people who die each year have heart failure mentioned on death certificates (Benjamin et al., 2019), and approximately 50% die within the 5 years of diagnosis (Mozzafarian et al., 2016).

As the number of individuals diagnosed with heart failure continues to increase, so do the number of individuals living with heart failure. Because of the nature of the condition, ongoing treatment is required, leading to high costs nationally. Heidenreich and colleagues (2011) estimated that $30.7 billion annually are spent on health care services, medication therapy, and missed days of work because of heart failure. They project that by the year 2030, the total cost of heart failure will increase to approximately $69.7 billion, which is an increase of nearly 127%.

Role of Nurses in Management of Heart Failure

Heart failure management is most effective when there is a partnership between the patient and the members of the health care team (Ruppar, 2010) and when there is agreement by the patient with the team about the importance of adhering to therapy (Jurgens et al., 2010). Nonetheless, nonadherence to therapy, especially medication therapy, remains a challenge (Alsharif, 2016; Gathright et al., 2017; Riegel & Dickson, 2016; Ruppar, 2010). Nurses play a pivotal role in assisting patients with self-management of a variety of health conditions, including heart failure. Self-management of heart failure is a priority in order to improve quality of life and reduce rehospitalization rates for those with heart failure (Albert et al., 2002). Nurses assist patients with self-management using cognitive strategies such as patient teaching provided in the context of a therapeutic relationship. Patient teaching about self-management of heart failure includes diet, activity, medications, fluid and weight management, signs and symptoms of worsening condition, and when the patient should call the health care provider (Albert et al., 2002; Riley, 2013, 2015; Whitlock, 2010).

Another role of the nurse in working with patients with heart failure is providing surveillance for signs and symptoms. Effective surveillance requires knowledge of the health problem, signs and symptoms to monitor, recognition of deteriorating physiological status, implementation of appropriate nursing interventions, and communication with interdisciplinary team members when additional interventions beyond the nurse's role are needed (Henneman et al., 2012).

Challenges in Nurse Recognition and Management of Heart Failure

Despite heart failure being a commonly known health problem, evidence exists in the literature that nurses may not have sufficient knowledge of the condition to provide patient education (Albert et al., 2002; Delaney et al., 2011; Kalowes et al., 2011; Strachan et al., 2014) or to carry out the most effective surveillance (Brooks Carthon et al., 2015).

Albert and colleagues (2002) conducted an exploratory study of nurses' knowledge of heart failure self-management education principles in a convenience sample of 300 nurses employed in a health care system including a university-based hospital, community hospitals, and a home health and palliative care agency. The instrument used was a survey consisting of 20 true or false statements about diet, medications, exercise, fluids or weight, and signs of worsening condition. They concluded that nurses may not be properly educated in self-management principles and that more information may help nurses to provide quality care. Delaney et al. (2011) used a cross-sectional survey design to explore home care nurses' knowledge of heart failure education topics using the survey previously utilized by Albert and colleagues (2002). Results were that the lowest scoring items were asymptomatic hypotension, daily weight monitoring, and transient dizziness, and an overall average score of 78.9% knowledge. Their findings concurred with those of Albert (2002), and they suggested educational programs may lead to improved quality of patient education. The same 20-item instrument was used in a study by Kalowes and colleagues (2011) with a convenience sample of 157 nurses in a university-based and a community-based hospital. They reported a mean score of 14.78 ($\pm$2) and that their findings were similar to those previously published. Strachan and colleagues (2014) reported results of a descriptive qualitative study nested in the second phase of a three-phase mixed-methods study of barriers and solutions to implementing the Canadian Cardiovascular Society heart failure guidelines in long-term care settings. One of the themes that emerged in their results was concern about ability to interpret heart failure signs, symptoms, and acuity.

Providing appropriate nursing care during hospitalization is another important role of the nurse working with patients who have heart failure. Nurses at the bedside provide surveillance aimed at early detection and of warning signs in order to identify and treat complications and adverse events in acute care settings (McHugh & Ma, 2013). Brooks Carthon et al., (2015) conducted a cross-sectional study using three linked data sources, including a nurse survey, patient discharge data, and administrative hospital data, to explore the relationship between missed nursing care and hospital readmissions as they relate to quality of hospital work environment. They reported that surveillance as one type of missed care was reported by 17.8% (SD 6.5) of nurses. Overall, missed nursing care was an independent predictor of heart failure readmissions, but after adjusting for work environment (where nurses were able to perform more time-intensive nursing care activities such as talking with patients and completing patient teaching), this was no longer a significant predictor of readmission. Their results highlighted the importance of nurses' working conditions on delivery of care.

Goodlin et al. (2007) developed and tested an instrument for self-assessed competence and knowledge of heart failure care using Benner's model of novice to expert. After pilot testing and revision, the final survey included 18 self-assessment items and 36 questions (25 true-false, 11 multiple choice) about heart failure assessment, symptoms, prognostication based on heart failure status, clinical data and function, and palliative care in heart failure. Findings were that the instrument distinguished between novice and expert nurses and could be used to develop educational programs for nurses, which could ultimately lead to improved patient outcomes.

Despite education about heart failure in undergraduate nursing programs, there remains a gap in nurses' knowledge about heart failure assessment and management. This educational gap may be partially addressed by modifying the process used to teach nursing students about heart failure. Using a checklist for heart failure assessment that has suggested interventions as decision support aids may partially address this gap by improving patient surveillance for signs of heart failure, which in turn may reduce patient morbidity.

Tools for Educating Nurses About Heart Failure Exacerbation

There is substantial evidence in the literature supporting the use of simulation and educational checklists as effective methods for educating nurses about heart failure recognition and management.

Simulation

Research studies published in the literature support simulation as an effective educational method in nursing in both the classroom and the clinical settings. Simulation has been shown to be more effective than instruction in the classroom alone (Brannan et al., 2008; Bruppacher et al., 2010; Walters et al., 2017). To determine the feasibility of using simulation as a substitution for direct clinical experience with patients, the National Council of State Boards of Nursing conducted a 2-year randomized controlled multisite study using five associate degree nursing programs and five baccalaureate nursing programs. These represented different geographical areas of the United States (Hayden et al., 2014). Students were randomized into one of three groups in which simulation replaced 10%, 25%, or 50% of clinical hours. Of the original 847 enrolled students, 666 completed the study. Outcome measures included scores on standardized tests administered at end of courses and at end of program, validated instruments for measuring critical thinking, clinical competency, and readiness for practice, and pass rate on the National Council Licensing Examination for Registered Nurses (NCLEX-RN©). Results demonstrated that no significant differences existed among groups when up to 50% of traditional clinical experiences were replaced by simulation. This study demonstrated on a large scale that simulation is an effective teaching methodology for nursing students.

Numerous studies have supported the effectiveness of simulation on enhancing undergraduate student learning. Research has demonstrated that simulation increased learning in areas such as general clinical performance (Alinier et al., 2006; Meyer et al., 2011), communication skills (Beaird et al., 2017; Gilfoyle et al., 2017, Paull et al., 2013; Severson et al., 2014), health assessment (Andrea & Kotowski, 2017), recognition of patient deterioration (Cooper et al., 2009; Cooper et al., 2015) and technical skills (Booth et al., 2017; Mariani et al., 2017; McWilliams et al., 2017; Tubaishat, & Tawalbeh, 2015).

Simulation is an effective method for teaching and evaluating skills that support patient safety (Byrne et al., 2017; Henneman & Cunningham, 2005; Henneman et al., 2007; Henneman et al., 2010; Ironside et al., 2009; Kato & Kataoka, 2017; Lee et al., 2017; Pauly-O'Neill & Prion, 2013). Because simulation allows for replication of a clinical situation without using an actual patient, it is well suited to research related to patient safety issues (Groves et al., 2017). Results of a study by Henneman et al. (2010) indicated that students made frequent errors during simulation in patient identification, incomplete patient assessment, and incomplete communication of findings to the physician provider. A study by Lee et al. (2017) also found simulation to be a useful method for evaluating patient safety competency, with their results indicating that a majority of students upheld competencies such as introduction to patient, patient identification, location of call bell or personal items away from patient, hand hygiene, and situation, background, assessment, and recommendation (SBAR) handoff.

Simulation has been used in studies related to managing a patient whose status is deteriorating (Ignacio et al., 2017; Scott et al., 2019; Stayt et al., 2015). Ignacio et al. used simulation in a mixed methods study to compare use of a mental rehearsal strategy with use of a mnemonic for managing a deteriorating patient. Mental rehearsal involved the use of imagery, which helps to reduce extraneous cognitive load (Ignacio et al., 2016). Although both strategies led to similar results, findings indicated that successful management was aided by being mentally and emotionally prepared and by recalling and visualizing steps that needed to be taken during the care of the patient. Stayt et al. (2015) conducted a randomized controlled trial to explore the effectiveness of clinical simulation in improving student performance in recognition and management of a deteriorating patient. Members of the control group were given traditional lecture instruction using a systemic approach of airway, breathing, circulation, disability, and exposure. Members of the experimental group were given this instruction during simulation. Their results indicated that the intervention group performed significantly better ($p = 0.02$) on an objective structured clinical examination (OSCE) than the control group. Scott et al. (2019) conducted a randomized control study to determine the effect of decision support checklist in recognizing and reporting a transfusion-associated adverse events (TAEEs). All participants took part in a preintervention simulation session on caring for a patient receiving a blood transfusion. Participants were then immediately randomized to one of three groups: a control group (who received a PowerPoint with general patient safety information), a group who received a PowerPoint slide lecture on TAEEs, and a group who received a TAEE checklist that was reviewed with them. All participants then took part in a second simulation. Results showed that all groups had a significant increase in TAEE recognition from the pre-intervention simulation to the post-intervention simulation (control $p = .03$, PowerPoint $p = .002$, and checklist $p = .03$), but there were no statistically significant differences among the groups in recognition of TAEEs.

Kaplan et al. (2017) used scenarios involving heart failure in simulations aimed at veteran-centered care. Students reported an increase in knowledge about veteran-centered care, heart failure pathophysiology, medications, communication with health care providers, critical thinking, and decision-making abilities. Student knowledge about heart failure also increased significantly ($p = .001$), as measured by a 14-item pretest and posttest using the highest level of difficulty NCLEX style questions (Kaplan et al., 2017).

Genuino (2018) studied the effects of a simulation-based educational program on the perceived self-efficacy of nurses caring for patients with chronic obstructive pulmonary disease (COPD) and heart failure in post-acute care settings. COPD and heart failure are common reasons for rehospitalization of patients in these settings. The education program, which lasted approximately 3 hours, consisted of PowerPoint presentations and discussion with an instructor on topics such as pathophysiology, laboratory and diagnostic tests, common cardiac rhythm strip readings, heart and breath sound assessment, and clinical manifestations and treatments. A simulation followed with a 64-year-old man having an exacerbation of COPD who had heart failure as a comorbidity. The results demonstrated a 5% increase in self-efficacy score from pre-test to post-test, which was significant ($p < 0.001$).

Kim and Yun (2018) used an experimental design to study the effects of a 4-hour system thinking program on critical thinking and problem-solving ability during simulation for a patient with congestive heart failure. The control group used a 4-hour case study instead of system thinking training. Critical thinking and problem-solving ability were measured using previously validated instruments. Findings included an increase in scores for critical thinking and problem-solving in both the experimental and control group, but the change in scores between the two groups was not significant. The researchers recommended repeating the study with a larger sample size and modifying the study design to enhance it.

Leighton et al. (2015) updated the Simulation Effectiveness Tool (SET), first developed in 2005, to be consistent with the International Nursing Association for Clinical Simulation and Learning Standards of Best Practice, the Quality and Safety Education in Nursing practices, and the Baccalaureate Essentials of Nursing Education from the American Association of Colleges of Nursing. The original SET measured student perceptions of the effectiveness of learning in a simulation environment. The revised instrument, which was renamed Simulation Effectiveness Tool-Modified (SET-M), then underwent psychometric evaluation. A sample of 1,288 students from two nursing programs completed the instrument following a simulated clinical experience. The SET-M was found to be a valid and reliable instrument that had four subscales with acceptable internal consistency. These were pre-briefing ($a = .833$), learning ($a = .852$), confidence ($a = .913$), and debriefing ($a = .908$).

In summary, simulation experiences enhance students' knowledge and acquisition of clinical skills (Cant & Cooper, 2017). Several skills are needed in the care of a patient with heart failure. These include the ability to recognize manifestations of acute heart failure during physical assessment (from either new onset heart failure as a complication of myocardial infarction or an acute exacerbation of chronic heart failure), identify abnormal data trends (both physiologically and those noted in the health record), and make a timely judgment about immediate actions to take and when to communicate with other health care providers. Because simulation can aid learning in all of these areas, the literature supports the use of a simulation session in this research study for testing the effectiveness of a heart failure checklist to serve both as an educational aid and clinical decision support tool.

Checklists

Checklists are designed to ensure inclusion of important criteria and provide an ordered outline of key steps for carrying out procedures or specific actions required in identified situations (Gawande, 2010; Hales & Pronovost, 2006; Scott et al., 2019). According to Helmreich (2000), checklists have been used widely over many years in the aviation industry to prevent errors and accidents by standardizing and organizing steps in procedures related to safety and communication among crew members. Principles used to develop aviation industry checklists have been adopted in the health care industry for the same purposes (Gawande, 2010). Checklists designed to standardize procedures while ensuring key steps are included have been shown to improve patient safety in both medical and nursing research (Anderson et al., 2015; Haynes et al., 2009; Malouf-Todaro et al., 2013; Pronovost et al., 2006).

The use of checklists has been applied in health care to improve provider performance and enhance patient safety by reducing adverse events or preventing errors. Checklists have been demonstrated to be effective in a variety of applications, such as prehospital emergency medicine (Chen et al., 2016), completing interventional radiology procedures (Koetser et al., 2013), placing intercostal catheters for pleural decompression (Anderson et al., 2015), enhancing diagnostic accuracy in 12-lead electrocardiogram interpretation (Sibbald et al., 2015), identifying daily goals in intensive care units (Pronovost et al., 2003), reducing catheter-related bloodstream infections (Pronovost et al., 2006; Schulman et al., 2011), ensuring completion of ventilator care bundles in intensive care units (Malouf-Todaro et al., 2013), and promoting surgical safety (El Boghdady et al., 2016; Gawande, 2010; Gillespie et al., 2014; Haynes et al., 2009; World Health Organization, 2007; Zingiryan et al., 2017). Clinicians can benefit from checklist use regardless of their level of experience (Sibbald et al., 2014). Gawande (2010) emphasizes that checklists are especially valuable in improving patient outcomes when they also identify key points at which communication should occur with other team members during the procedure.

Research in nursing across a variety of settings has demonstrated the efficacy of checklist use in detecting adverse signs and symptoms, maintaining patient safety and/or improving patient outcomes. Checklists have been developed and used effectively for monitoring clinical status of patients in intensive care units (Al Ashrey et al., 2016), recognizing and reporting adverse events (Henneman et al., 2017; Scott et al., 2019), recognizing and initiating early treatment for sepsis (Kapoor & Wilson, 2017), administering oxytocin during labor (Sundin et al., 2018), detecting cancer therapy-related symptoms in clinic patients receiving cancer treatment (Williams et al., 2013), adhering to World Health Organization's surgical safety guidelines (O'Brien et al., 2017), and reducing the information gap when patients are transferred from skilled nursing facilities to emergency departments (Tsai & Tsai, 2018).

In the clinical setting, checklists assist in standardizing patient care because they outline the steps of routine nursing care procedures. Checklists also prompt memory recall by clustering information into related groups, which can in turn reduce cognitive load (Ray-Barruel & Rickard, 2018). They are most often used for routine assessments or during periods of transition, such as end-of-shift handoff of care, patient discharge, or preoperative care (Ray-Barruel & Rickard, 2018). Surveillance checklists are used to cue nurses to assess for patient risk factors that could lead to complications, such as sepsis and postoperative complications (Henneman et al., 2012). Checklists may be included in agency-developed nursing policy and procedure manuals. Checklists are often included in published clinical skills reference books, which a clinical agency may be choose as its approved reference for how nursing skills should be performed. The completion of skills validation using checklists is often done at time of hire and then annually to uphold quality patient care. In nursing education, skills checklist manuals generally accompany textbooks teaching fundamental principles of nursing. Checklists are also included in physical assessment textbooks, outlining the sequence of steps to be taken during the physical examination process. Missing from such checklists are cues to action when data do not fall within defined norms and cues for communication about key abnormal findings (Henneman et al., 2008). A checklist to aid in patient assessment of heart failure that has added cues for action when warranted by assessment findings may be a useful tool in the education of novice nurses.

Summary

Heart failure remains a significant health problem in the United States. Despite its prevalence, there are still gaps in knowledge about heart failure, providing adequate surveillance for heart failure symptoms, and nurses' ability to provide patient education about heart failure, including self-management, symptom recognition, and seeking further care. Nurses are unable to teach what they do not know sufficiently well. This represents a gap between education provided regarding heart failure and the knowledge retained and used by the nurse in practice. This study addressed this gap partially by providing an educational tool for prelicensure nurses to aid identification of heart failure symptoms, which is part of surveillance, with suggested nursing actions as decision supports to ensure appropriate care. This, in turn, may reduce morbidity and uphold patient safety.

Although procedural checklists exist for completing physical assessment of patients, such as "head-to-toe" body systems-based assessments, there is no checklist that also includes action steps to address deteriorating clinical condition to guide student nurses in the assessment of a patient with heart failure. A heart failure assessment checklist that also includes cues to appropriate nursing actions, including communication with the health care provider, may help to fill this gap. Administration of appropriate nursing care in a timely way can interrupt deterioration of a patient's condition, and in turn limit morbidity as an outcome in the Surveillance Model.

CHAPTER 3

THEORETICAL FRAMEWORK

Two theoretical frameworks were used in this study. The Nursing Role Effectiveness Model (NREM) supports the independent and interdependent work processes of the nurse. It is a nursing theoretical framework that aligns well with a research study examining the effectiveness of a checklist. The Nursing Surveillance Model addresses the complexity of surveillance and the possible impact of nurse surveillance on interrupting patient deterioration and so is an excellent fit for this study.

Nursing Role Effectiveness Model

The NREM is a nursing theoretical framework based on the structure-process-outcome model of quality patient care, which was originally developed by Donabedian (1988), and further developed by Irvine and colleagues (Irvine et al., 1998). The NREM was subsequently adapted by Doran and empirically tested to establish validity (Amaral et al., 2014; Doran et al., 2002;). The NREM model proposes specific relationships among its structure, process, and outcome components (Doran et al., 2002, p. 29).

The structural component has three variables. They are the nurse, the nursing unit, and the patient (Doran et al., 2002, p. 31). Nurse structural variables include nursing education preparation and work experience. Nursing unit structural variables relate to how nurses' work is designed and include job autonomy (amount of decision-making in determining how nursing work is performed), adequacy of time to perform direct care activities, and role tension between role of nurse and roles of other nursing unit staff (Doran et al., 2002). Patient structural variables are medical diagnosis, length of stay, age, gender, and education (Doran et al., 2002).

The process component of the NREM consists of three nursing role variables labeled as independent, dependent, and interdependent aspects of the nursing role (Doran et al., 2002). The independent facet includes role functions for which the nurse alone is accountable, such as "patient assessment, decision-making, intervention, and follow-up" (Doran et al., 2002, p. 30). The dependent facet refers to nursing activities and associated clinical judgments that occur when medically prescribed interventions are carried out (Doran et al., 2002). The interdependent facet involves activities involving other health care team members and are identified in the model as team communication and coordination of care (Doran et al., 2002). The outcome component of the NREM focuses on patient outcomes, including functional status, self-care ability, and mood disturbance (Doran et al., 2002).

Various studies have used the NREM to examine the role of the nurse and how nurses affect patient outcomes in a variety of settings. Two were conducted in hospital settings (Amaral et al., 2014; White et al., 2015), one in a community-based setting (Carvalho Seabra et al., 2018), one in home care (Doran et al., 2014), and two were integrative literature reviews (Endacott et al., 2009; Mok et al., 2015).

Amaral et al. (2014) tested the NREM using structural equation modeling with a sample of 1764 patients and 364 nurses in four hospitals in central Portugal. Their results illustrated the impact of specific structural variables (practice environment, clinical nursing expertise, nurse specialists ratio, and nursing hours per patient day) on process variables (communication, individualized nursing care, and physician-nurse relationship). The results also illustrated how in turn these process variables impacted the outcome variable of patient functional status (measured using five different scales completed by patients at discharge). This study served to further validate the NREM.

White et al. (2015) used the NREM as the conceptual framework in their study of how much time registered nurses (RNs) and health care aides (HCAs) spent completing various clinical nursing activities while enacting their roles. Work activities were recorded for 35 RNs and 17 HCAs on a second-to-second basis for 5 workdays in a large tertiary care hospital in Alberta, Canada. The data were categorized according to clinical role accountabilities and other work-related activities. Results indicated that RNs spent considerable time on coordination of care and direct care activities such as biomedical assessment and biomedical care (medications and treatments), with comparatively little time spent on psychosocial/cultural/spiritual assessment and support. The findings provided direction for agency personnel in their work to clarify and redesign roles.

Carvalho Seama et al. (2018) employed the NREM in their study aimed at identifying the effectiveness of nursing interventions on health outcomes in patients enrolled in out-patient methadone clinics in Lisbon, Portugal. The sample included three nursing unit teams (totaling 10 nurses) out of 15 treatment units, and 180 patients (60 per unit) enrolled using a systematic sampling procedure. Data were gathered from participants using four previously validated instruments with internal consistency values of 0.854 to 0.895. Data were gathered regarding 50 nursing interventions, which were chosen based on Johnson et al.'s (2009) Nursing Intervention Classification system, results of literature review, and opinion of experts in the field of addictive behaviors (Carvalho Seabra et al., 2018, p. 202). Results indicated that there were significant relationships between both structure and process variables and positive patient health outcomes (quality of life, mental health, satisfaction with care, and fewer consequences of substance dependence).

Doran and colleagues (2014) used the NREM when they investigated the use of evidence-based practice by home care RNs and the effect of this use on specific patient outcomes (dyspnea, pain, falls, and pressure ulcers). Chart audits were used to collect data from 939 de-identified patients from 13 home care offices in Ontario, Canada, with care being provided by a total of 338 RNs. The researchers found that documentation of evidence-based nursing interventions (those that were consistent with best practice guidelines) were positively associated with improved patient outcomes (statistically significant reduction in dyspnea, frequency of pain, falls, and pressure ulcers).

Endacott et al., (2009) completed an integrative review of studies that examined the activities of nurse liaison and outreach services in adult intensive care units (ICUs) in Australia and the United Kingdom and their impact on patient outcomes. After completing the integrative review (consisting of 20 studies using qualitative and quantitative methodologies), Endacott and colleagues used the NREM as an *a priori* model to complete a meta-synthesis of these studies. Although positive patient outcomes were identified (reduced ICU and hospital mortality, reduced unplanned ICU admissions or readmissions, reduced rates of adverse events, and reduced discharge delays), these results could not be attributed directly to the ICU liaison nurse role. The authors concluded that, because of the varied nature of the services provided in this role, the services should be delivered as a treatment package with bundled interventions.

Mok et al. (2015) used the structural components of the NREM framework (patient, nurse, and organizational variables) to synthesize findings in an integrative review of the literature about vital signs (VS) monitoring practices by nurses and their relationship to identifying and reporting deterioration in patient condition (physical cues and abnormal VS). The authors concluded that three factors impact nursing practice for VS monitoring. An over-reliance on technology and a high nursing workload (nurse structural variables) can negatively affect VS monitoring, although the authors noted that additional research is needed about the impact of workload. A well-designed observational chart (with track-and-trigger systems, graphical representation of data, color-coding and banding to flag abnormal readings, and prominent display of respiratory rate) along with proper equipment training, may positively affect detection of deteriorating VS. A well-designed observational chart is an organizational structural variable.

In summary, research has been conducted that outlined a variety of combinations of the structure, process, and outcome components of the NREM. Two studies used specific variables within the structure, process, and outcome components (Amaral et al., 2014; Carvalho Seabra et al., 2018); two used variables within the process and outcome components (Doran et al., 2014; Endacott et al., 2009); one used variables in the process component (White et al., 2015); and one focused on variables (nurse, patient, and organizational) within the structure component (Mok et al., 2015).

The NREM provided a framework for the research questions posed in this study. This study incorporated the variable of nurse (nursing student knowledge and experience) in the structure component and the process variables of nursing assessment (independent role) and communication to members of the interprofessional team (interdependent role).

A graphic (Figure 1a) comparing the NREM as developed by Doran (2002) and the NREM as applied in this study (Figure 1b) are shown here.

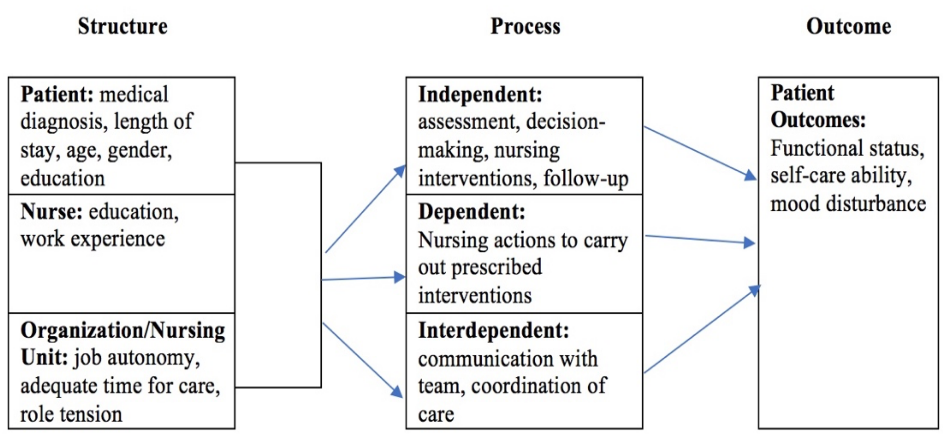

Figure 1a: The Nursing Role Effectiveness Model (NREM).

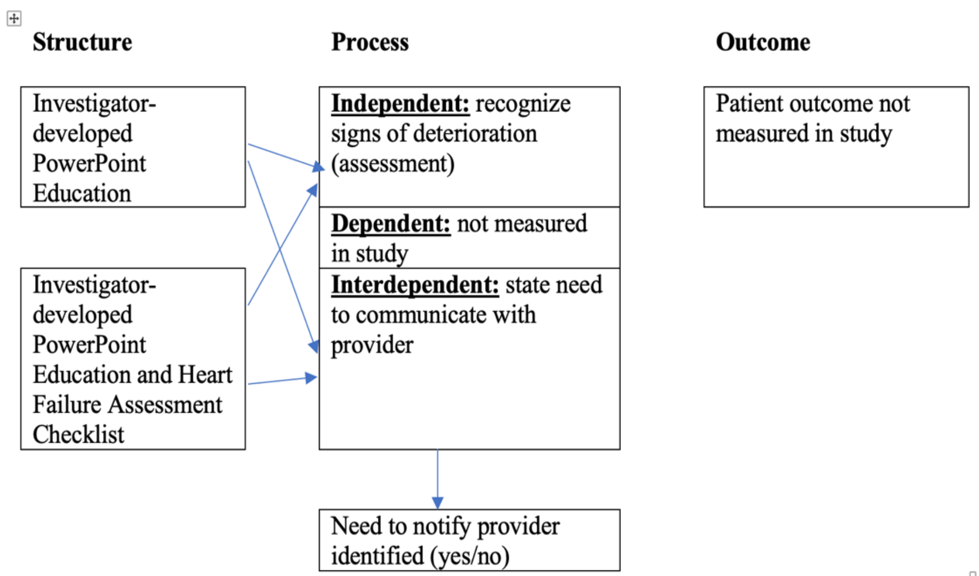

Figure 1b: NREM applied to acute decompensating heart failure simulation.

Nursing Surveillance

In the nursing literature, nursing surveillance has been described as an intervention (Dougherty, 1999), a process (Kelly & Vincent, 2011), or both (Henneman et al., 2012). As an intervention, surveillance has been defined in the Nursing Intervention Classification (NIC) as “the purposeful and ongoing acquisition, interpretation, and synthesis of patient data for clinical decision-making” (Dougherty 1999, p. 524). Nursing surveillance is described as having behavioral and cognitive components (Dougherty, 1999). The behavioral component is the act of patient assessment to acquire data. The cognitive component is the interpretation and synthesis of that data. Henneman et al. (2012) describe surveillance as an active process that goes beyond monitoring (which is described as an assessment) and uses an approach that systematically and selectively attends to patient factors at appropriate times and in appropriate sequences.

Nursing surveillance as a concept has undergone analysis by Kelly and Vincent (2011), Dresser (2012), and Halverson (2022). Kelly and Vincent used a systems framework and analyzed nursing surveillance for acute care settings. Kelly and Vincent’s findings affirmed that in an acute care setting, surveillance is an ongoing process that nurses use individually and cumulatively across nurses with the intent to maintain patient safety (Kelly & Vincent, 2011, p. 658). Their analysis extended the behavioral aspect of surveillance beyond data collection by the nurse to taking action on the data collected. They speak to nurses’ ability to “study, interpret, analyse and act upon data…” (Kelly & Vincent, 2011, p. 658).

Dresser (2012) used a patient safety focus in acute care settings for analysis of nursing surveillance. This analysis built on existing information about nursing surveillance by adding an attribute of pattern recognition, which is needed to be able to identify threats and risks to patients (p. 364). Halverson and Tilley (2022) conducted a concept analysis of nursing surveillance with an aim to examine nursing surveillance in different care settings (p. 455). Their analysis identified the attributes of nursing surveillance as a systematic process, involving pattern recognition, anticipating problems of instability, engaging in coordinated communication, and decision-making. Their analysis added the importance of anticipating problems and taking some form of action to prevent or reduce them. This builds on the work of Milhomme and colleagues (2018) on clinical surveillance in critical care.

The uses of nursing surveillance are typically aimed at some form of patient protection. These uses are often framed as upholding patient safety (Giuliano, 2017; Pfrimmer et al., 2017) or preventing or mitigating adverse events (Kelly & Vincent, 2011), complications (Milhomme et al., 2018), errors (Henneman, 2017; Pfrimmer et al., 2017), patient deterioration (Stotts et al., 2020) or failure to rescue (Dresser, 2012; Kelly & Vincent, 2011; Shever, 2011). By enhancing safety and preventing adverse patient events, there is a greater likelihood of achieving desired patient outcomes.

Nursing surveillance has been examined as it relates to a variety of settings. These include acute care (Dresser 2012), critical care (Henneman et al., 2012; Milhomme et al., 2018; Pfrimmer et al., 2017), and pediatrics (Stots et al., 2020). Halverson and Tilley (2022) reported their analysis as applying across care settings. Dellenfield (2021) made a case for the need to use the construct of nursing surveillance to characterize the unique work of registered nurses in long term care.

The model for the process of nursing surveillance proposed by Henneman (2017) is used as the second theoretical framework in this study. The surveillance process consists of data acquisition, data analysis, data dissemination, risk assessment, and prioritization (see Figure 2a). A variety of factors, including system factors and human factors, can influence the surveillance process. These, in turn, can affect patient outcomes. System factors (Henneman, 2017) are identified as a culture of safety, open communication, interdisciplinary collaboration, patient/family involvement, and technology (such as clinical decision support systems). Human factors include skills, rules, and knowledge (p. 275). Negative patient outcomes in this model consist of medical errors, adverse events, morbidity, and mortality (p. 275).

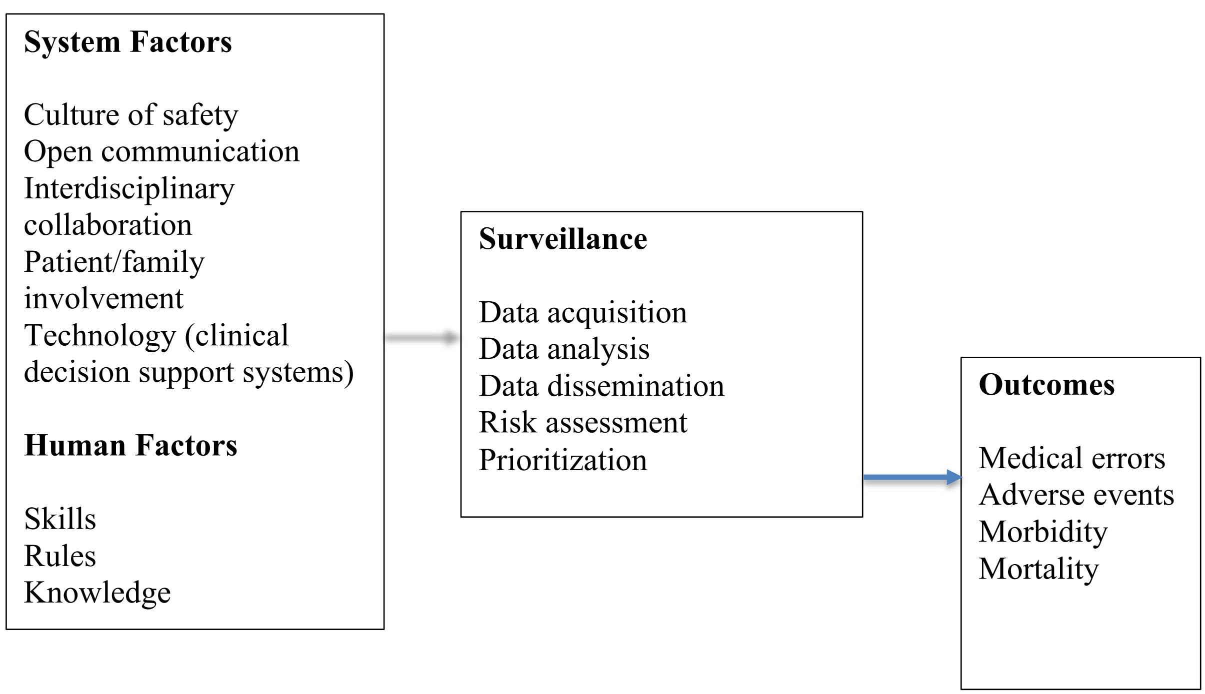

Figure 2a: Nursing Surveillance Model.

In this study, the heart failure assessment checklist served as a clinical decision support document, and was a proxy for technology as a clinical decision support system in the systems factors part of the model. Human factors consist of the underlying knowledge and skills of the participants. Participants engaged in the surveillance process during the study, requiring them to use the processes of data acquisition, data analysis, and risk assessment. Participants also needed to make a decision about whether to communicate findings to the provider (data dissemination) as part of the study design. A decision to notify the provider theoretically reduces the likelihood of a negative patient outcome (increased morbidity) because additional provider orders can be obtained to treat the patient actor, who is the patient in this study. Actual patient outcomes were not measured in this study. A diagram of the nursing surveillance process as used in this study is shown in Figure 2b.

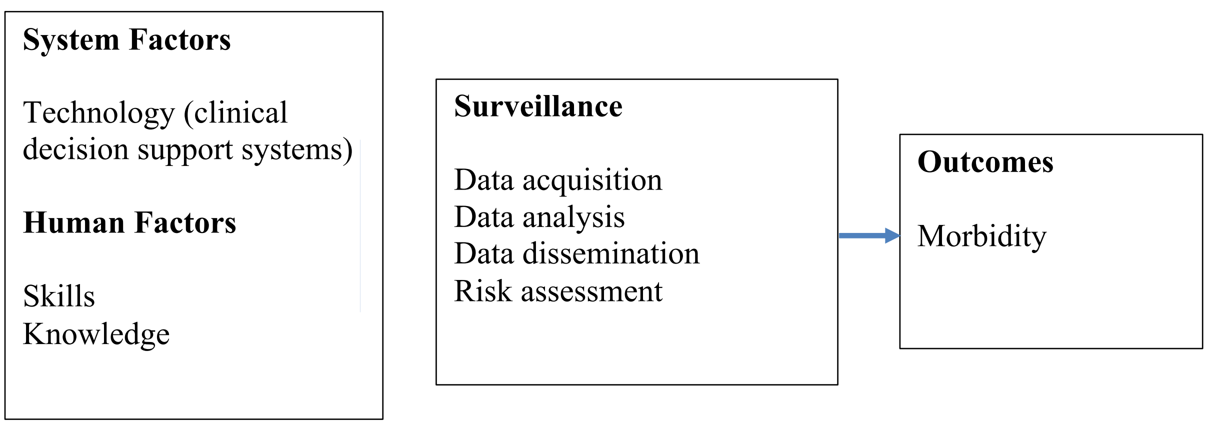

Figure 2b: Nursing Surveillance Model as used in this study.

Because of their prelicensure status, study participants may be classified as novices or advanced beginners using Benner's stages of clinical competence. The five stages are identified as novice, advanced beginner, competent, proficient, and expert

(Benner, 1982, 1984). Because of prior clinical experience, participants may be considered advanced beginners in the areas of patient interviewing and techniques of physical assessment. They may either novices or beginners, depending on prior clinical experience, in assessing patients diagnosed with heart failure. Nurses with little or no experience may not recognize patient-specific risk factors and signs of clinical deterioration in a patient experiencing heart failure exacerbation. Indicators of clinical deterioration must be recognized before corrective interventions can be instituted Shelestak et al. (2015), and such interventions are necessary to avoid failure to rescue and further patient deterioration (Chung et al., 2018).

The use of a checklist as an assessment and decision support aid may positively affect novice and advanced beginner nurses' ability to identify patient clinical changes that suggest exacerbation of heart failure. Simple procedural checklists are almost universally found in fundamentals of nursing textbooks, which teach foundational nursing skills and in physical assessment handbooks. However, these are strictly procedural in nature, and do not provide cues to action based on findings. A checklist with the intent to mitigate the effects of heart failure exacerbation on the patient and that is enhanced with action cues may reduce the time needed to provide beneficial care, with the intent to mitigate the effects of the heart failure exacerbation on the patient.

There is substantial evidence in the literature that supports the value of checklists in clinical patient care, as described more fully in Chapter 2. Checklists have been found to be useful in nursing in monitoring patients receiving oxytocin (Sundin et al., 2018) or therapeutic hypothermia after cardiac arrest (Avery et al., 2015). Checklists are also reported as useful for nurses detecting early signs of sepsis (Kapoor & Wilson, 2017) and managing assessed side effects of chemotherapy (Beaver & Magnan, 2016).

A checklist for assessment of patients with heart failure may be an effective tool to support a more thorough assessment and to cue the novice and advanced beginner nurse to take action when the patient shows signs of heart failure-associated clinical deterioration. As changes in patient status are detected, the checklist would further cue the nurse to communicate with the provider to obtain further prescriptions (interdependent nursing role in process component of NREM). Although not included in this study, a positive impact on patient outcome resulting from treatment of heart failure-associated symptoms would be categorized in the outcome component of the NREM.

An effective checklist outlines critical steps, is precise and easy to read, contains actionable steps, fits the flow of work, and can be completed in a reasonable time (Gawande, 2010). When using a checklist as a guide, the novice nurse must look at the checklist, read the information it contains, and cognitively process the information in order to make a decision about what actions to take next.

Theoretical Definitions

Checklist

Checklists are cognitive aids designed to promote accurate completion of a task (Ray-Barruel & Rickard, 2018). A checklist can organize essential criteria or actions, thus standardizing an approach to a procedure or situation and possibly serving as a clinical decision support system (Hales & Pronovost, 2006). Checklists are beneficial regardless of the level of expertise of the user (Sibbald et al., 2014). The visual cues provided by a checklist can aid in decision-making (McCallum et al., 2010; Sibbald et al., 2015). Procedural checklists for patient assessment contained in nursing textbooks outline the sequence of steps to be carried out by students. Such checklists, however, do not aid decision-making because they do not contain action steps for responding to findings that are outside predefined norms. For this reason, current checklists are useful for ensuring collection of physical assessment data but are not sufficient to ensure safe patient care. According to Gawande (2010), an effective checklist should clearly identify when it should be used, contain all critical steps, use simple sentence structure, contain actionable steps to address issues or abnormal findings, and promote communication with other members of the interdisciplinary team. The checklist to be used in this study includes the necessary steps for assessing and managing a patient with heart failure and meets the criteria identified by Gawande. This type of checklist can increase patient safety by ensuring complete pertinent data collection relevant to heart failure status, cueing correlation with other pertinent data if abnormal findings are detected, and outlining interventions to support timely and appropriate clinical care.

Clinical Simulation

Clinical simulation creates a realistic representation of a patient care situation using mannequins or simulated patients to recreate a clinical environment (Henneman & Cunningham, 2005). It is a controlled environment for learning that closely reflects the complexities of clinical practice without the risk of causing harm to patients (Ironside et al., 2009). Research has demonstrated that well-designed and executed simulation is comparable to actual clinical experience in preparing students for practice (Hayden et al., 2014). Simulation is an effective method to promote development of cognitive domain skills such as knowledge acquisition and critical thinking, psychomotor skills used in clinical practice, and skills needed to work with interdisciplinary teams, such as teamwork (Cant & Cooper, 2010; Fisher & King, 2013; Gilfoyle et al., 2017; Lapkin et al., 2010). In assessing and managing a patient with heart failure, the nurse must be able to use both cognitive and psychomotor skills, and to communicate findings as necessary to appropriate members of the interdisciplinary team. Simulation scenarios are designed to meet pre-identified objectives and are reproducible so that simulation participants have the same experience (Hogg et al., 2006; Ironside et al., 2009; Murray et al., 2008).

In this simulation designed for assessment and management of heart failure manifestations, the simulated patient is a standardized patient who is being assessed by telephone in a telehealth visit after hospital discharge. The standardized patient reported the same signs and symptoms consistently to each participant and provided the same responses to participant questions. Because simulation has been widely used in research examining the effectiveness of checklists, it is an appropriate method to test whether an educational and decision support checklist improves the performance of nursing students in detecting and managing heart failure decompensation.

Artifacts of Interest

Artifacts of interest for this study included the heart failure assessment checklist, a standardized patient, a Visiting Nurse Association (VNA) health record, a documentation form for recording findings from telehealth visit, and a script for the patient actors identifying answers to any assessment questions they may be asked during the telephone assessment visit.

Checklist. The study was designed to reveal whether the participant used the heart failure assessment checklist during patient assessment. The results can provide insight into whether the use of a heart failure assessment checklist helped participants recognize that the patient has signs of decompensating heart failure and supported participants in decision-making about further assessments and communications that were warranted.

Standardized Patient Actor. During this telehealth VNA follow-up visit, the patient reported returning signs of heart failure that slowly trended downward from data documented in discharge and first VNA in-person visit, to the second-day post-discharge telehealth visit conducted by participants. The trends that signaled return of heart failure included an increase in heart rate (from 76 to 88 beats/min), decrease in oxygen saturation (from 94% at hospital discharge to 93% at interview), increase in weight from 176 pounds (80 kilograms) to 180 pounds (81.82 kilograms) and onset of shortness of breath and peripheral edema (in feet). For any assessment question asked by a participant, the same response was provided by the patient actor.

Visiting Nurse Association Health Record. The VNA Health Record provided consistent baseline information about the standardized patient to each study participant. It contained documented information about the patient including a hospital discharge summary, findings from first VNA nurse visit 2 days prior (which was conducted in person), and recent trends in vital signs and patient weight. Information from hospital discharge and the first VNA visit showed the beginning of negative trends in key assessment data. Together, these data could be used as a baseline before conducting the assessment interview and making decisions about any actions that were warranted. For participants in the group who were not using the heart failure assessment checklist, it provided the same baseline data, including early data trends, as participants in the group who used the checklist.

Documentation Form for Visit. Both groups of participants were given the same form on which to document assessment findings. The form was set up to mimic the assessment categories (body systems) found on sample VNA forms, but reordered slightly to reflect the order of assessments on the heart failure assessment checklist. This slight reordering would not affect the accuracy of the assessments made, but by aligning the order with the heart failure checklist, it could increase the accuracy and completeness of documentation by participants.

Standardized Patient Actor Script. The standardized patient actor was given a script that contained all questions on the heart failure assessment checklist and a list of the answers to be provided. It also contains scripted answers to other general health assessment questions that might be suggested by the documentation of visit form. If the participant asked any questions that were not on the script, the standardized patient was instructed to reply “I don’t know.”

CHAPTER 4

METHODS

Research Questions

This study addressed two primary research questions:

1. "Does the use of a heart failure checklist increase the number of heart failure assessment questions asked by the participant?" The hypothesis was that the use of a heart failure checklist would significantly ($p <. 05$) increase the number of heart failure assessment questions asked by the participant compared to those who did not use the checklist. An experimental, prospective, randomized control design was used to compare the behavior of student nurses who received (a) heart failure education by PowerPoint presentation, (b) heart failure assessment checklist, and (c) instructions for use of the checklist (experimental group) to the behavior of student nurses who received heart failure education alone via a PowerPoint presentation (control group). A convenience sample of 56 student nurses was recruited to participate in the study with random assignment to one of two groups. The study had a post-test only experimental design. The outcome measures were the total number of assessment questions asked on the heart failure assessment checklist and the number of assessment questions asked on the heart failure assessment checklist that are **most** clinically relevant. The items on the checklist that were most clinically relevant were preidentified from the literature. Examples included fatigue, shortness of breath, chest pain, weight gain, peripheral edema, and changes in vital signs (increased respiratory rate, and decreased oxygen saturation).

2. "Does the use of a heart failure checklist increase the number of provider contacts made related to changes in the patient's condition?" The hypothesis was that the

use of a heart failure checklist would significantly increase ($p < .05$) the number of provider contacts made compared to those made without the checklist. The outcome measure was whether or not the participant verbalized the need to contact the health care provider.

And the study addressed two additional research questions.

3. "How do study participants evaluate the telehealth assessment of the standardized patient actor using the Simulation Effectiveness Tool-Modified?" The outcome measure was the rating provided for items on the Simulation Effectiveness Tool-Modified. The ratings for the two groups were compared.

4. "How do study participants evaluate their anxiety and self-confidence during the telehealth assessment of the standardized patient actor using the Nursing Anxiety and Self-Confidence in Clinical Decision-Making Scale©?" The outcome measure was the ratings provided for anxiety and for self-confidence on the scale. The ratings for the two groups were compared.

Participants

Participants consisted of a convenience sample of nursing students from one university who are enrolled in either the 4-year track or the accelerated track of a baccalaureate nursing program. Inclusion criteria were enrollment in a prelicensure undergraduate track and completion of a course in physical assessment. Participants received a $25.00 honorarium for participating in the study, which was expected to take a total of approximately 1 hour of participant time.

Sample Size and Groups

The study aimed to enroll a total of 56 students, with 28 participants each in an experimental group and a control group. The sample size was based on a power analysis using Chi Square to achieve a power level of 80% and a significance level (α) of 0.05. (See Appendix A). Participants in Group 1 (control group) and Group 2 (experimental group) received instruction on heart failure via a voiced-over PowerPoint educational session. Those in Group 2 received additional instruction in the form of printed directions on how to use the heart failure assessment checklist. After training, both groups then participated in the same simulation. See Figure 3 below.

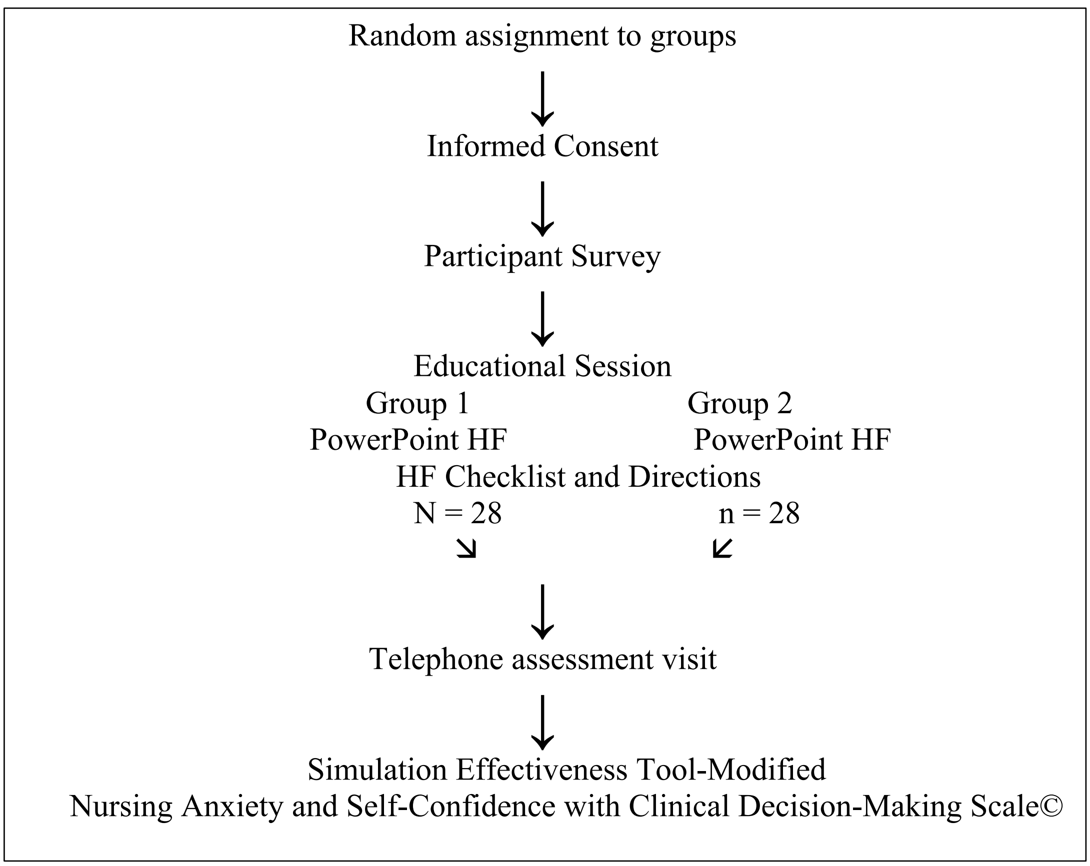

Figure 3: Study design.

Setting

The study was conducted as a telehealth visit by telephone to a standardized patient actor. A telephone visit format instead of a videoconference format was purposefully used in this study to protect the anonymity of study participants. Patient actors received a script to use during the telehealth assessment visits and had the opportunity to review the script and have questions answered by the researcher before the study began. Patient actors also had a practice session with the researcher as a "dry run" before working with study participants.

Instruments

Heart Failure Assessment Checklist

The investigator-designed checklist includes the assessments to make for a patient diagnosed with heart failure and key decision points, based on changes in patient condition, at which the participant may verbalize to notify the provider and/or provide additional teaching to the patient.

The original 16 items included in the heart failure assessment checklist were derived from the literature. The checklist was then rated for item level content validity index (I-CVI) (Polit & Tatano Beck, 2006) by four heart failure experts (3 clinical and 1 research expert). Items were rated by experts on a scale from 1 (not relevant) to 4 (highly relevant). Content experts were also asked to give comments and make suggestions for items rated 1 (not relevant) or 2 (somewhat relevant). Most items (87%) were rated 3 (quite relevant) or 4 (highly relevant). Two items (13%) were deleted or revised. One item was rated a "2" by two experts. That item (anxiety) was deleted from the checklist.

A second item “confusion” was changed to “new memory issues” based on expert feedback.

The remaining 14 items were rated 3 or 4 by all experts, resulting in a I-CVI of 1.0 for all items in the heart failure assessment checklist. This value is consistent with the criteria developed by Lynn (1986) for item acceptability (I-CVI of 1.0) to be considered reasonable representation of the universe of possible items when there are five or fewer expert raters. All items with a I-CVI of 1.0 were included in the checklist used in the study.

Participant Behavior Completion Instrument

The behavioral instrument is a check sheet that the patient actor used to check off the assessment items as they were asked by a study participant (Appendix B). The instrument is investigator-developed and contained a listing of the items on the Heart Failure Assessment Checklist.

Participant Demographic Survey Instrument

After agreeing to participate in the study and signing an informed consent, participants completed a demographic survey (Appendix C). The survey included questions about the participant’s experience taking care of patients with heart failure, and whether the experience was in a simulated setting, in nursing school clinical experience, or from additional patient care experiences outside of nursing school (such as a health care employee). It also included related questions about experience in working with patients with other cardiac problems or with respiratory problems, since signs of heart failure have both cardiac and respiratory components.

Simulation Effectiveness Tool-Modified (SET-M)

The SET-M, a 19-item instrument, is a revision of the original 12-item SET, developed to evaluate students' perceptions of their learning in a simulation environment (Leighton et al., 2015). The revisions were made to be congruent with 2013 Standards of Best Practice: Simulation published by the International Nursing Association for Clinical Simulation and Learning (Leighton et al., 2015). Leighton et al. completed an exploratory factor analysis that identified four subscales with the following acceptable internal consistencies: pre-briefing (a = .8333), learning (a = .852), confidence (a = .913, debriefing (a = .908). They concluded that the revised instrument was valid and reliable.

Nursing Anxiety and Self-Confidence in Clinical Decision-Making Scale© (NASC-CDM)

The NASC-CDM© is a 27-item instrument developed by White (2014) to assess undergraduate nursing student anxiety and self-confidence during decision-making. The scale is a 6-point, Likert-type instrument with two subscales for anxiety and self-confidence. Higher scores on each subscale indicate higher levels of the trait, while lower scores indicate lower (White, 2014). The scale has been translated into Turkish and Korean.

Other Equipment

Study participants needed to use a computer or other device that had internet access to access the online prerecorded heart failure education via a provided link, and to sign up for the interview with the patient actor. Participants also needed to use a telephone to conduct the interview.

Operational Definitions

Checklist

The investigator-designed checklist includes the assessments to make for a patient diagnosed with heart failure and key decision points, based on changes in patient condition, which the participant may verbalize to notify the provider and/or give additional teaching to the patient. Items on the heart failure assessment checklist were derived from the literature and underwent item-level content validity (Polit & Tatano Beck, 2006) by four experts in the area of heart failure (two clinical experts, one nurse educator expert, and one nurse researcher expert).

Exacerbation of Heart Failure

The exacerbation is characterized by changes in documented patient data from date of hospital discharge, to first VNA visit conducted in person on day after discharge, to the current visit (2 days after VNA in-person visit). The changes are shown in Table 1.

Table 1: Changes in documented patient data.

	Hospital Discharge data (3 days before telephone assessment)	VNA In-Person visit data (2 days before telephone assessment)	Telephone assessment visit data
Temperature	98.4 F	98.6 F	Not measured
Heart Rate	72	76	88
Blood Pressure	136/86	134/86	132/86
Respiratory Rate	16	18	28
Oxygen Saturation	94%	93%	93%
Breath sounds	Clear	Clear	Unable to assess
Shortness of Breath	Not documented	Not documented	Yes
Fatigue	Not documented	Not documented	Yes
Weight in pounds (kilograms)	176 (80)	176.6 (80.1)	180 (81.82)
Peripheral Edema	None	None	Yes

Between the day of discharge and the in-person VNA nurse visit the day after discharge, four assessments of heart failure showed slight changes in a negative direction, which were heart rate, respiratory rate, oxygen saturation, and weight. The heart rate and respiratory rate remained in the normal adult range of 60–100 beats/minute and 16–20 breaths/minute, respectively. The oxygen saturation was slightly below the normal range of 95–100% on both days, Changes were purposefully small to identify the start of a negative trend, but kept the patient's status stable overall. By the date of the telehealth assessment visit, seven assessments of heart failure trended in a negative direction. These included continued negative trends in the four previously identified (heart rate, respiratory rate, oxygen saturation, and weight). In addition, there was onset of three new symptoms of heart failure (fatigue, shortness of breath, and edema). Using the process of surveillance to detect trends in data, the patient displayed a worsening state of heart failure.

Clinical Simulation

The clinical simulation took place in the form of a telehealth assessment of a human simulated patient (patient actor) via telephone.

Study Protocol

The following protocol was followed in completing the study:

1. Randomly assigned participant to one of two groups using randomization software.
2. Asked participant to complete consent form (Appendix D). Provided participant with a copy of the consent form.
3. Asked participant to complete a demographic survey (Appendix C).

4. Provided participant with a packet of printed information to be used in the study.
    a) Included these documents in the packet for both the experimental and control groups:
        i) A patient information sheet, which provided the participant with background information prior to completing the 15-minute health assessment visit with a patient actor by telephone (Appendix E).
        ii) A Documentation of Visit form, which the participant had the option to use during the interview because most nurses document as they assess patients (Appendix F).
        iii) An evaluation of the telehealth assessment visit using the Simulation Effectiveness Tool-Modified (Appendix G).
        iv) An evaluation of participant anxiety and self-confidence during the telehealth assessment visit using the Nursing Anxiety and Self-Confidence with Clinical Decision-Making Scale© (Appendix H).
    b) Provided these additional documents in the packet for the experimental group:
        i) Heart failure assessment checklist with decision support cues (Appendix I)
        ii) Directions for use of the heart failure assessment checklist (Appendix J)
5. Provided education to participant. Those in Group 1 viewed and listened to a voiced-over PowerPoint presentation on heart failure (Appendix K) that was posted to a folder in the UMass Amherst Microsoft OneDrive. Participants in Group 2 viewed and listened to the voiced-over PowerPoint presentation on heart failure and received education on using the heart failure assessment checklist (see again Appendix I) using the scripted directions (see again Appendix J).

6. Participant scheduled and completed the telephone assessment visit with a patient actor. Participants in Group 2 were asked to use the checklist during simulation (See Appendix I for checklist and Appendix F for documentation of assessment visit form). During the assessment, the patient actor used a script (Appendix L) to answer participant questions and checked off items on the heart failure assessment checklist that were asked by the participant (see Appendix B again).
7. Asked participant to complete the Simulation Effectiveness Tool-Modified (see again Appendix G) to evaluate the telephone assessment experience.
8. Asked participant to complete the Nursing Anxiety and Self-Confidence with Clinical Decision-Making Scale (see again Appendix H) to evaluate their anxiety and self-confidence during the telephone assessment.
9. Had participant return the SET-M and NASC-CDM© forms.
10. Collected completed assessment checklist from patient actor for each participant.

Data Collection

The following data were collected:

1) Survey data, including nursing program and patient care experience outside of nursing program
2) Heart Failure Assessment Checklist completion data
3) SET-M data
4) NASC-CDM© data

Statistical Methods

To determine frequency outcomes of heart failure symptom assessments made, counts were done for the number of total assessments made by participants in the control and experimental groups and the number of clinically relevant assessments made by participants in each group. The Fisher's exact test for categorical data was used to compare the control and experimental groups. Stata/MP 15.1 for Windows (StataCorp LLC, College Station, TX) was used for statistical analyses.

The Fisher's exact test for categorical data was used to compare the control and experimental groups for the outcome of the decision to contact health care provider. Because students may not encounter patients with heart failure frequently during clinical experiences in the nursing program, it was postulated that the heart failure plus checklist education group (experimental group) would have more thorough assessments and make a determination to call a health care provider more often than the heart failure education alone group (control group).

An a priori power analysis (see Appendix A) was conducted to determine the minimum sample size required to test the study hypotheses. Results indicated that a sample size of 56 (28 in each group) would be required to achieve a power of 0.8 (β = 80%), an α of 0.05, and a medium effect size, using the Chi-square test for two independent proportions.

Secondary Analyses

Demographic data of participants (nursing program track and experience with heart failure, other cardiac health problems, and respiratory problems) were collected. Although there may be differences between undergraduate nursing students in traditional 4-year and accelerated tracks, substantial differences between groups were not expected because subjects were randomly assigned to groups. For this reason, a description of results was completed but not an examination of outcomes by demographics.

The SET-M was used to measure participant subjective perceptions of learning during simulation. Between-group comparisons were made about items related to pre-briefing before the simulation and items related to the simulation itself.

The NASC-CDM© was used to measure participant subjective perceptions of anxiety and self-confidence during simulation. Between-group comparisons were made using the Mann-Whitney test on the Likert scale data for anxiety and self-confidence reported by participants.

Assumptions

Four assumptions underlay this research. The first was that participants in either group would respond similarly to the recruitment email (Appendix M). Second, they would not share information about the content of the telehealth assessment visit with other potential participants. Third, participants in each group would have a similar experience with patients diagnosed with heart failure and patients whose status was deteriorating. Finally, participants would complete accurately both the SET-M and the NASC-CDM© to capture their perceptions about learning, anxiety, and self-confidence during the simulation.

CHAPTER 5

RESULTS

<u>Introduction</u>

The final sample size for this study was 23 of the original planned target of 56. For this reason, it was considered to be a pilot study because it was insufficiently powered. Of the 23 participants, 10 were in the experimental group and 13 were in the control group. Comparisons were made between the two groups. No in-group comparisons were made because of the small sample size. The following sections outline the results by group for each research question.

Demographic Survey

The Participant Demographic Survey (Appendix C) contained seven items identifying the undergraduate track and semester in which participants were enrolled. Accelerated track students were also asked if they had a prior degree in health care and, if so, what field. Three questions addressed participants' prior experience in working with patients with heart failure, other cardiac health problems, and respiratory health problems. The last question asked about patient care experience outside the nursing program and the role being performed.

No statistically significant differences were found between the experimental group and the control group on any demographic survey items using a two-tailed Chi Square test. Of the 23 participants, 15 were enrolled in the 4-year track (juniors and seniors), and of the 15, eight (61.5%) were in the control group, and seven (70.0%) were in the experimental group. There were no sophomore students. Of the eight participants who were enrolled in the accelerated track, five (38.5%) were in the control group and three (30.0%) were in the experimental group (see Table 2).

Table 2: Participants by nursing program track and semester of enrollment.

UG nursing program track	Control Group n (%)	Experimental Group n (%)	P-value
1 = 4-year track	8 (61.5%)	7 (70.0%)	1.000
2 = Accelerated track	5 (38.5%)	3 (30.0%)	
Semester of enrollment by track			
1 = 4-yr. track-senior year spring	1 (7.7%)	2 (20.0%)	0.719
2 = 4-yr. track-junior year spring	7 (53.8%)	5 (50.0%)	
3 = 4 yr. track sophomore year spring	0 (0.0%)	0 (0.0%)	
4 = Accelerated track spring	5 (38.5%)	3 (30.0%)	

Of the accelerated track participants, four of five in the control group (80.0%) did not have a prior degree in a health care-related field, while one (20.0%) did. In the experimental group, one of three (33.0%) did not have a prior degree in a health-related field, while two (66.7%) did. The control group participant degree was reported as "biology and public health," while the experimental group participants reported degrees in "health and forensic science" and "psychology."

There was no statistically significant difference between the control and experimental groups on prior experience with heart failure. A majority of both groups (92.3% control, 100% experimental) reported having experience caring for patients with heart failure. The most frequently reported location of experience was nursing school clinical (83.3% control, 100% experimental). More than 50% of each group reported experience with heart failure in simulation or health care employment (see Table 3); this item was multiple response whereby participants could select all settings that applied to them.

Table 3: Prior experience with heart failure.

Prior experience heart failure	Control Group n (%)	Experimental Group n (%)	P-value
1 = no	1 (7.7%)	0 (0.0%)	1.000
2 = yes	12 (92.3%)	10 (100%)	
If yes, where (check all that apply)			
1 = clinical (nursing school)	10 (83.3%)	10 (100%)	0.481
2 = simulation	7 (58.3%)	8 (80.0%)	0.381
3 = health care employment	8 (66.7%)	6 (60.0%)	1.000

There was no statistically significant difference between the control and experimental groups on prior experience with other cardiac problems. A majority of both groups (92.3% control, 90.0% experimental) reported having experience caring for patients with other cardiac health problems. The most frequently reported location of experience was nursing school clinical (91.7% control, 100% experimental). Simulation was reported as a site for experience for 50% of the control group and 44.4% of the experimental group. Health care employment was reported equally as a location of experience (66.7% for each group). Location of experience was a multiple response item whereby participants could select all settings that applied to them; see Table 4.

Table 4: Prior experience with other cardiac problems.

Prior experience other cardiac problems	Control Group n (%)	Experimental Group n (%)	P-value
1 = no	1 (7.7%)	1 (10.0%)	1.000
2 = yes	12 (92.3%)	9 (90.0%)	
If yes, where (check all that apply)			
1 = clinical (nursing school)	11 (91.7%)	9 (100.0%)	1.000
2 = simulation	6 (50.0%)	4 (44.4%)	1.000
3 = health care employment	8 (66.7%)	6 (66.7%)	1.000

There was no statistically significant difference between the control and experimental groups on prior experience with respiratory health problems. A majority of both groups (92.3% control, 100% experimental) reported having experience caring for patients with respiratory health problems. The most frequently reported location of experience was nursing school clinical (91.7% control, 90.0% experimental). Simulation was reported as a site for experience for 75% of the control group and 60% of the experimental group. Health care employment was reported as a location of experience by 83.3% of the control group and 60.0% of the experimental group. One participant (10%) in the experimental group wrote in caring for family member as a source of experience although this was not a survey item. Location of experience was a multiple response item whereby participants could select all settings that applied to them; see Table 5.

Table 5: Prior experience with respiratory health problems.

Prior experience respiratory problems	Control Group n (%)	Experimental Group n (%)	P-value
1 = no	1 (7.7%)	0 (0.0%)	1.000
2 = yes	12 (92.3%)	10 (100.0%)	
If yes, where (check all that apply)			
1 = clinical (nursing school)	11 (91.7%)	9 (90.0%)	1.000
2 = simulation	9 (75.0%)	6 (60.0%)	0.652
3 = health care employment	10 (83.3%)	6 (60.0%)	0.348
Write-in = family member	0 (0.0%)	1 (10%)	0.455

There was no statistically significant difference between the control group and experimental group on patient care experience outside the nursing program. A majority of both groups reported having experience outside of school. Only one participant in the control group (7.7%) reported no patient care experience outside of school. The most frequently reported experience was as a direct care giver in acute care, subacute care or long-term care setting (69.2% control, 80.0% experimental). Home health aide was reported as experience for 23.1% of the control group and 30.0% of the experimental group. Prehospital emergency care was reported as experience by none of the control group and 10.0% (n = 1) of the experimental group. See Table 6 for results.

Table 6: Patient care experience outside of school.

Patient care experience outside of school	Control Group n (%)	Experimental Group n (%)	P-value
1 = none	1 (7.7%)	0 (0.0%)	1.000
2 = direct patient caregiver in acute/ subacute/long-term care (CNA, etc.)	9 (69.2%)	8 (80.0%)	0.660
3 = home health aide	3 (23.1%)	3 (30.0%)	1.000
4 = prehospital emergency care (EMT, paramedic)	0 (0.0%)	1 (10.0%)	0.435
5 = other (write-in)	0 (0.0%)	0 (0.0%)	1.000

Heart Failure Assessment Checklist

The Heart Failure Assessment Checklist (Appendix I) contains 23 items. The items are divided among five categories: general, vital signs, respiratory, cardiovascular, and neurological. See Table 7 for a full listing of the Heart Failure Assessment Checklist items and the number of assessments for each item by group. The subset of items that are asterisked are those assessments that are considered most clinically relevant.

Table 7: Heart failure assessment checklist results by group.

	Control N (%)	Experimental N (%)	P-value
*1. Fatigue (yes, no)	6 (46.2%)	8 (80%)	0.197
2. If yes, describe fatigue	0 (0.0%)	7 (87.5%)	**0.005**
3. Heart rate/minute	12 (92.3%)	10 (100%)	1.000
4. Blood pressure (systolic/diastolic)	13 (100%)	10 (100%)	1.000
*5. Respiratory rate/minute	9 (69.2%)	9 (90.0%)	0.339
*6. O2 saturation (%)	11 (84.6%)	10 (100%)	0.486
*7. Shortness of breath (yes, no)	12 (92.3%)	10 (100%)	1.000
*8. If SOB, scale 1–10	1 (8.3%)	9 (90.0%)	**<0.001**
9. If SOB, what doing when occurred?	10 (83.3%)	9 (90.0%)	1.000
*10. SOB when putting on shoes?	0 (0.0%)	6 (60.0%)	**0.003**
*11. SOB when lying down to sleep	4 (33.3%)	7 (70.0%)	0.198
*12. Cough (yes, no)	9 (69.2%)	9 (90.0%)	0.339
13. If yes, productive?	7 (77.8%)	9 (100%)	0.471
14. If productive, describe sputum	7 (100%)	9 (100%)	1.000
*15. Chest pain	9 (69.2%)	9 (90.0%)	0.339
*16. If chest pain, scale 1–10	2 (22.2%)	9 (100%)	**0.002**
17. If chest pain, when chest pain occurs	5 (55.6%)	9 (100%)	0.081
*18. Peripheral edema	11 (84.6%)	9 (90.0%)	1.000
19. If edema, describe	3 (27.3%)	6 (66.7%)	0.070
*20. Daily weight	13 (100%)	10 (100%)	1.000
*21. New memory problems	3 (23.1%)	9 (90.0%)	**0.003**
22. If memory problems, describe	0 (0.0%)	0 (0.0%)	1.000
*23. If no memory problems, any new problems with decision-making	0 (0.0%)	0 (0.0%)	1.000

The first of two primary research questions was “Does the use of a heart failure checklist increase the number of heart failure assessment questions asked by the participant?” The hypothesis was that the use of a heart failure checklist would significantly ($p <. 05$) increase the number of heart failure assessment questions asked by the participant compared to those who did not use the checklist. The outcome measures were the total number of assessment questions asked on the heart failure assessment checklist and the number of assessment questions asked on it that are most clinically relevant.

The total possible number of assessments was derived by multiplying the number of assessments on the heart failure checklist (23) by the number of participants in each group (control n = 13; experimental n = 10). Of the total possible number of assessments possible by group size, 147 of a possible 299 (49.2%) were made by the control group (n = 13). In the experimental group (n = 10), a total of 183 assessments were made of a total possible 230 (79.6%) ($p<0.001$). However, there were no statistically significant differences between groups on assessment of vital signs, daily weight, or presence of fatigue, shortness of breath, cough, chest pain, or peripheral edema.

In reviewing the differences between the groups on the clinically significant items (see Table 8), 90 of 172 assessments (52.3%) were made by the control group (note the *n* was less than 13 for some questions), while 114 of 127 assessments (89.8%) were made by the experimental group ($p < .001$, using the t-test for proportions). Thus, the second hypothesis as it applied to the experimental group assessing more clinically important items was supported.

Table 8: Clinically significant heart failure assessment results by group.

Heart Failure Checklist Item	Control N	Control Group Total		Experimental N	Experimental Group Total
1. Fatigue	6	13		8	10
5. Respiratory rate	9	13		9	10
6. Oxygen saturation	11	13		10	10
7. Shortness of breath (SOB)	12	13		10	10
8. SOB on scale 1–10	1	12		9	10
10. SOB when putting on shoes	0	12		6	10
11. SOB when lying down to sleep	4	12		7	10
12. Cough	9	13		9	10
15. Chest pain	9	13		9	10
16. Chest pain scale 1–10	2	9		9	8
18. Peripheral edema	11	13		9	9
20. Daily weight	13	13		10	10
21. New memory problems	3	13		9	9
23. New problems with decision-making	0	10		0	1
Totals	90	172		114	127

Reviewing in greater depth the differences between groups on specific assessment items (see Table 7), there were no statistically significant differences between the control and experimental groups on assessment of vital signs, daily weight, or the presence of fatigue, shortness of breath, cough, or peripheral edema. Five items did show statistically significant differences between the two groups. Four of those five items were follow-up questions to obtain additional details about a symptom (one on fatigue, two on shortness of breath, and one on chest pain) reported by the patient actor. The fifth question was about whether the patient was experiencing new memory problems.

Question 2 asked the patient to describe fatigue, which was a follow-up question to Question 1 on presence of fatigue. Among six participants (46.2)%) in the control group who asked about fatigue, none followed up with a question to describe it. In the experimental group, seven of eight participants (87.5%) who asked about fatigue followed up with a question to describe it (p = .005).

Question 8 asked the patient to rate severity of shortness of breath on a scale of 1 (least severity) to 10 (most severity) as a follow-up to Question 7 about the presence of shortness of breath. In the control group, only one of 12 participants (8.3%) who asked about shortness of breath asked for a follow-up rating scale, while nine of 10 participants (90%) who asked about shortness of breath asked for a follow-up rating scale (p < .001).

Question 10 was an additional follow-up question regarding shortness of breath, and asked if the patient experienced shortness of breath when putting on shoes. The wording of this question was used to denote bendopnea, which is shortness of breath when leaning forward (Pranata et al., 2019). Zero of 12 participants (0%) in the control group who asked about shortness of breath made this additional assessment, while six of 10 participants (60.0%) in the experimental group made this additional assessment (p = .003).

Question 16 asked the patient to rate severity of chest pain on a scale of 1–10 as a follow-up to Question 15 about whether the patient has experienced chest pain. Of nine patients in the control group who asked about presence of chest pain, only two (22.2%) asked for a follow-up rating scale, while nine of nine participants (100%) in the experimental group did so. (p < .001).

Question 21 asked whether the patient had any memory problems. Three of 13 participants (23.1%) in the control group asked this question, while nine of 10 participants (90%) in the experimental group did so ($p = .003$).

The second primary research question was "Does the use of a heart failure checklist increase the number of provider contacts made related to changes in the patient's condition?" The hypothesis was that the use of a heart failure checklist will significantly increase ($p < .05$) the number of provider contacts made compared to those made without the checklist. Eleven of 13 participants in the control group (84.6%) and eight of 10 participants in the experimental group (80.0%) verbalized the need to contact the provider. This hypothesis was not supported in the study ($p = 1.00$).

Simulation Effectiveness Tool-Modified (SET-M)

One of two additional research questions in this study is "How do study participants evaluate the telehealth assessment of the standardized patient actor using the SET-M?" The SET-M was completed by participants in both groups after conducting the telehealth assessment visit to self-evaluate their learning during the simulation. There are 20 items on the SET-M, 19 of which are divided among three areas: pre-briefing (Questions 1 and 2 [2 items]), simulation scenario (Questions 3–14 [12 items]), and debriefing (Questions 15 through 19 [5 items]). The final item (Question 20) is an open-ended item: "What else would you like to say about today's simulated clinical experience?"

In this study, the pre-briefing consisted of the Patient Information Sheet (Appendix E), which contained an overview of the patient's health status, a summary description of a recent hospitalization for heart failure including assessment data and medical orders upon discharge, and a summary of an in-person VNA nurse visit conducted the day after discharge from the hospital (2 days prior to the telehealth assessment visit). The simulation consisted of the telehealth assessment visit conducted by telephone. The study design did not include a debriefing session, although 10 of 13 participants (76.9%) in the control group and six of 10 (60%) in the experimental group completed survey items related to debriefing.

The Fisher Exact test was used for statistical analysis of these results. There was no statistically significant difference between the experimental and control groups on Items 1–18 of the SET-M (see Table 9). Item 19, which evaluated debriefing as a constructive evaluation of the simulation was rated more highly by the control group than the experimental group ($p = .036$). The finding for Item 19 was unexpected because there was no debriefing session in the study.

Both groups somewhat or strongly agreed that pre-briefing increased their confidence and was beneficial to their learning. All participants in both groups either somewhat or strongly agreed on six items related to the simulation scenario:

1. Being better prepared to respond to changes in patient's condition
2. A better understanding of pathophysiology
3. More confidence in nursing assessment skills
4. More confidence in communicating with patient
5. More confidence in teaching patient about their illness and interventions
6. More confidence in using evidence-based practice to provide nursing care.

Participants in both groups, with the exception of one in the control group, either somewhat or strongly agreed on three items related to the simulation scenario:

1. Having opportunity to practice clinical decision-making skills
2. Confidence in prioritizing care and interventions
3. Confidence in ability to report information to the health care team.

Participants in both groups, with the exception of one in the experimental group, either somewhat or strongly agreed on the simulation scenario item on developing a better understanding of medications. Participants in both groups, with the exception of one participant each in the experimental and control groups, either somewhat or strongly agreed on the simulation scenario item about confidence in providing interventions that foster patient safety. See Table 9 for Questions 1 through 19 on the SET-M.

Table 9: Simulation Effectiveness Tool-Modified results.

	SET-M Item	Control N (%)	Experimental N (%)	P-value
Q1	Pre-briefing increased my confidence.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	1 (7.7%)	3 (30.0%)	
	3 = strongly agree	12 (92.3%)	7 (70.0%)	0.281
Q2	Pre-briefing was beneficial to my learning.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	0 (0.0%)	1 (10.0%)	
	3 = strongly agree	13 (100%)	9 (90.0%)	0.435
Q3	I am better prepared to respond to changes in my patient's condition.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	5 (38.5%)	2 (20.0%)	
	3 = strongly agree	8 (61.5%)	8 (80.0%)	0.405
Q4	I developed a better understanding of the pathophysiology.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	1 (7.7%)	3 (30.0%)	
	3 = strongly agree	12 (92.3%)	7 (70.0%)	0.281
Q5	I am more confident of my nursing assessment skills.			0.650

	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	3 (23.1%)	4 (40.0%)	
	3 = strongly agree	10 (76.9%	6 (60.0%)	
Q6	I felt empowered to make clinical decisions.			
	1 = do not agree	1 (7.7%)	1 (10.0%)	
	2 = somewhat agree	7 (53.8%)	4 (40.0%)	
	3 = strongly agree	5 (38.5%)	5 (50.0%)	0.830
Q7	I developed a better understanding of medications.			
	1 = do not agree	0 (0.0%)	1 (10.0%)	
	2 = somewhat agree	4 (36.4%)	3 (30.0%)	
	3 = strongly agree	7 (63.6%)	6 (60.0%)	1.000
Q8	I had the opportunity to practice my clinical decision-making skills.			
	1 = do not agree	1 (7.7%)	0 (0.0%)	
	2 = somewhat agree	0 (0.0%)	2 (20.0%)	
	3 = strongly agree	12 (92.3%)	8 (80.0%)	0.178
Q9	I am more confident in my ability to prioritize care and interventions.			
	1 = do not agree	1 (7.7%)	0 (0.0%)	
	2 = somewhat agree	2 (15.4%	2 (20.0%)	
	3 = strongly agree	10 (76.9%)	8 (80.0%)	1.000
Q10	I am more confident in communicating with my patient.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	2 (15.4%)	1 (10.0%)	
	3 = strongly agree	11 (84.6%)	9 (90.0%)	1.000
Q11	I am more confident in my ability to teach patients about their illness and interventions.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	2 (15.4%)	2 (20.0%)	
	3 = strongly agree	11 (84.6%)	8 (80.0%)	1.000
Q12	I am more confident in my ability to report information to health care team.			
	1 = do not agree	1 (7.7%)	0 (0.0%)	
	2 = somewhat agree	4 (30.8%)	2 (22.2%)	
	3 = strongly agree	8 (61.5%)	7 (77.8%)	0.799

Q13	I am more confident in providing interventions that foster patient safety.			
	1 = do not agree	1 (7.7%)	1 (10.0%)	
	2 = somewhat agree	6 (46.2%)	3 (30.0%)	
	3 = strongly agree	6 (46.2%)	6 (60.0%)	0.826
Q14	I am more confident in using evidence-based practice to provide nursing care.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	2 (15.4%)	4 (40.0%)	
	3 = strongly agree	11 (84.6%)	6 (60.0%)	0.341
Q15	Debriefing contributed to my learning.			
	1= do not agree	0 (0.0%)	0 (0.0%)	
	2= somewhat agree	0 (0.0%)	2 (33.3%)	
	3 = strongly agree	10 (100%)	4 (66.7%)	0.125
Q16	Debriefing allowed me to verbalize my feelings before focusing on scenario.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	1 (10.0%)	3 (50.0%)	
	3 = strongly agree	9 (90.0%)	3 (50.0%)	0.118
Q17	Debriefing was valuable in helping me to improve my clinical judgment.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	3 (30.0%)	3 (50.0%)	
	3 = strongly agree	7 (70.0%)	3 (50.0%)	0.607
Q18	Debriefing provided opportunities to self-reflect on my performance during simulation.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	0 (0.0%)	2 (33.3%)	
	3 = strongly agree	10 (100%)	4 (66.7%)	0.125
Q19	Debriefing was a constructive evaluation of the simulation.			
	1 = do not agree	0 (0.0%)	0 (0.0%)	
	2 = somewhat agree	1 (10.0%)	4 (66.7%)	
	3 = strongly agree	9 (90.0%)	2 (33.3%)	**0.036**

Eight participants (five in the experimental group and three in the control group) responded with one comment each to Item 20, which asked what else the participant would like to say about the simulated clinical experience. Comments from participants in the experimental group were that “doing a phone call visit was difficult because I wanted to listen to lungs and it was not possible,” that the checklist “made it easy to remember to ask all the right questions,” and that it was “well constructed and helped with verbal.” Two comments from participants in the control group were positive: “It was great real-world practice,” and “Was a fun experience.”

Nursing Anxiety and Self -Confidence in Clinical Decision-Making (NASC-CDM)©

The NASC-CDM© (White, 2014) was also completed by participants after conducting the telephone assessment visit. The NASC-CDM© is a 27-item instrument used by participants to self-assess their anxiety level and their self-confidence level during simulation. Each of the 27 items contains a statement about to a nursing-related ability. Participants were asked to rate their anxiety level and their self-confidence level for each ability using a scale of 1–6, where 1 = not at all, 2 = just a little, 3 = somewhat, 4 = mostly, 5 = almost totally, 6 = totally. Cut scores (norming) for the scale are not established, so raw scores on the subscales of anxiety and self-confidence were examined (White, 2014). White also suggests that mean scores of a subscale may be used as a cut point to distinguish between high and low levels of anxiety and self-confidence. The intervention (use of checklist) did not significantly reduce anxiety ($p = .956$) or improve self-confidence ($p = .317$) during the simulation. The results for anxiety level and for self-confidence level in study participants are reported separately in Table 10 and Table 11, respectively.

Table 10: NASC-CDM© Anxiety results by group.

Ability	Control Median [25th, 75th Percentile]	Experiment Median [25th, 75th Percentile]	P-value from Mann-Whitney Test
1. See important patterns in information	2 [2, 3]	3 [2, 3]	0.817
2. Identify which clinical information gathered is related to current problem	2 [1, 2]	3 [2, 3]	0.301
3. See full clinical picture of client's problem rather than one part	2 [1, 4]	3 [2, 4]	0.540
4. Recall knowledge learned in past that relates to current problem	2 [2, 3]	2 [2, 3]	0.658
5. Implement 'best' priority decision option for client's problem	2 [2, 3]	3 [3, 3]	**0.024**
6. Interpret meaning of specific assessment finding for client's problem	2 [2, 3]	3 [2, 3]	0.649
7. Evaluate if clinical decision improved lab findings	3 [2, 4]	2 [2, 4]	0.826
8. Recognize need to talk with instructor to sort out assessment findings	2 [1, 2]	1 [1, 2]	0.517
9. Use active listening skills when gathering information about current problem	1 [1, 2]	1 [1, 2]	0.873
10. Assess client's nonverbal cues	2 [2, 3]	2 [1, 3]	0.602
11. Recognize need to review protocol, procedure, or nursing literature to help make decision	2 [1, 2]	3 [2, 3]	**0.048**
12. Decide if information from significant other/family important to current problem	2 [1, 3]	3 [1, 4]	0.838
13. Use knowledge of anatomy and physiology to interpret information gathered about client condition	2 [2, 3]	2 [2, 3]	0.948
14. Act on at least one intervention considering for current problem	2 [1, 3]	2 [2, 3]	0.514
15. Analyze risks of interventions considering for client's problem	3 [2, 4]	3 [2, 3]	0.486
16. Recognize important information during change of shift report	2 [2, 3]	2 [1, 2]	0.113

17. Independently make clinical decision to solve client's problem	3 [3, 5]	4 [3, 4]	0.382
18. Ask client additional questions to get more specific information about current problem	2 [1, 2]	2 [1, 3]	0.630
19. Correlate physical assessment findings with nonverbal cues to see whether they match	2 [2, 3]	3 [1, 3]	0.969
20. Implement one accurate intervention if client has urgent problem	3 [2, 3]	2 [1, 4]	0.470
21. Use knowledge of diagnostic tests (lab, x-ray) to create possible list of decisions to implement	3 [2, 3]	3 [2, 3]	0.850
22. Realize need to talk with instructor or staff nurse about interventions I am considering	2 [1, 2]	2 [1, 2]	0.845
23. Remain open to different reasons for client's problem even though information gathered may point to only one reason	2 [1, 3]	2 [1, 3]	0.852
24. Ask client's significant other/family questions to gather information about current problem	2 [2, 3]	1 [1, 2]	0.068
25. Evaluate if clinical decision I made influenced client satisfaction	2 [1, 3]	3 [1, 4]	0.611
26. Incorporate personal things I know about client to make decisions in their best interest	3 [1, 3]	2 [1, 2]	0.303
27. Consider a possible intervention for problem just because it 'seems' right	3 [2, 4]	3 [2, 4]	0.771
Overall Mean (SD) of the 27 Questions	2.4 (0.9)	2.4 (0.4)	0.956

On the anxiety scale, 25 of the 27 items showed no difference between the control and the experimental groups. The experimental group who used the checklist had increased anxiety on two items. These were Item 5: "Implementing best priority decision option for client's problem" ($p = .024$) and Item 11: "Recognize need to review protocol, procedure, or nursing literature to help make decision" (p = .048). These findings are unexpected since the experimental group might be expected to be less anxious because they had a checklist to use during the simulation. The differences on these two items, although statistically significant, were modest. In reviewing the findings as a whole, the experimental and control groups were more similar than dissimilar in relation to their self-perception of anxiety during the simulation.

Table 11: NASC-CDM© Self-confidence results by group.

Question	Control Median [25th, 75th Percentile]	Experiment Median [25th, 75th Percentile]	P-value from Mann-Whitney Test
1. See important patterns in information	4 [4, 5]	4 [3, 4]	0.292
2. Identify which clinical information gathered is related to current problem	5 [4, 6]	4 [4, 5]	0.167
3. See full clinical picture of client's problem rather than one part	4 [4, 5]	4 [2, 5]	0.385
4. Recall knowledge learned in past that relates to current problem	5 [4, 5]	4 [4, 5]	0.201
5. Implement 'best' priority decision option for client's problem	4 [4, 5]	4 [3, 4]	0.915
6. Interpret meaning of specific assessment finding for client's problem	4 [4. 5]	4 [3, 5]	0.718
7. Evaluate if clinical decision improved lab findings	5 [4, 5]	4 [3, 4]	0.148
8. Recognize need to talk with instructor to sort out assessment findings	6 [5, 6]	5 [5, 6]	0.541
9. Use active listening skills when gathering information about current problem	6 [5, 6]	5 [5, 6]	0.805
10. Assess client's nonverbal cues	5 [3, 6]	4 [2, 5]	0.138
11. Recognize need to review protocol, procedure, or nursing literature to help make decision	5 [4, 6]	4 [3, 4]	**0.005**

12. Decide if information from significant other/family important to current problem	4 [4, 6]	4 [4, 5]	0.943
13. Use knowledge of anatomy and physiology to interpret information gathered about client condition	5 [4, 5]	4 [3, 4]	**0.036**
14. Act on at least one intervention considering for current problem	5 [4, 6]	5 [5, 5]	0.665
15. Analyze risks of interventions considering for client's problem	4 [3, 5]	4 [3, 5]	0.871
16. Recognize important information during change of shift report	5 [5, 5]	5 [4, 6]	0.947
17. Independently make clinical decision to solve client's problem	3 [3, 4]	3 [3, 4]	0.822
18. Ask client additional questions to get more specific information about current problem	5 [4, 6]	5 [4, 6]	0.604
19. Correlate physical assessment findings with nonverbal cues to see whether they match	4 [4, 4]	4 [4, 5]	0.967
20. Implement one accurate intervention if client has urgent problem	5 [3, 5]	5 [4, 5]	0.605
21. Use knowledge of diagnostic tests (lab, x-ray) to create possible list of decisions to implement	4 [3, 4]	5 [3, 5]	0.417
22. Realize need to talk with instructor or staff nurse about interventions I am considering	5 [5, 6]	6 [5, 6]	0.691
23. Remain open to different reasons for client's problem even though information gathered may point to only one reason	5 [4, 6]	5 [4, 5]	0.501
24. Ask client's significant other/family questions to gather information about current problem	5 [4, 5]	5 [5, 5]	0.283
25. Evaluate if clinical decision I made influenced client satisfaction	5 [5, 5]	5 [3, 5]	0.124

26. Incorporate personal things I know about client to make decisions in their best interest	5 [3, 6]	5 [5, 5]	0.528
27. Consider a possible intervention for problem just because it 'seems' right	3 [2, 5]	4 [3, 4]	0.661
Overall Mean (SD) of the 27 Questions	4.5 (0.6)	4.3 (0.6)	0.317

On the self-confidence scale, 25 of the 27 items showed no difference between the control and the experimental groups. The experimental group who used the checklist had decreased self-confidence on two items. These were Item 11: "Recognize need to review protocol, procedure, or nursing literature to help make decision" (p = .005) and Item 13: "Use knowledge of anatomy and physiology to interpret information gathered about condition" (p = .036). These findings are unexpected since the experimental group might be expected to be more self-confident because they had a checklist to use during the simulation. Again, the differences on these two items, although statistically significant, were modest. In reviewing the findings as a whole, the experimental and control groups were more similar than dissimilar in relation to their self-perception of self-confidence during the simulation.

CHAPTER 6

DISCUSSION

Heart failure is a serious chronic health problem that, if not managed well, can lead to acute exacerbation, worsening baseline status, and possibly death. Nurses play a key role in surveillance of patients with heart failure and in management of their condition as part of the interprofessional health care team. Heart failure is still not well managed in post hospital care settings, as evidenced by high hospital readmission rates. To help reverse this, nurses need to be skilled in heart failure assessment and treatment, which begins in undergraduate nursing education. This experimental study sought to understand how use of a heart failure assessment checklist with decision support cues could facilitate recognition of heart failure exacerbation by student nurses and the need to contact a health care provider for additional management.

The final sample for the study was 23, with 13 in the control group and 10 in the experimental group. This sample was smaller than the 56 needed (28 in each group) to achieve a power level of 80% and an alpha of 0.05. For this reason, none of the results are generalizable. The sample was also homogenous, being students enrolled in a single undergraduate prelicensure program in western Massachusetts. There were no statistically significant differences found between the control group and experimental group on attributes such as prior experience working with patients with heart failure, other cardiac problems, or respiratory problems. There was also no difference between the groups on patient care experience outside of the nursing program.

During the heart failure assessment interview, the patient actor responded to questions using the sheet with the scripted answers. The patient actor also used the

Participant Behavior Completion Form to check off the items that a participant assessed during the course of the interview. This form contained a listing of the items on the Heart Failure Assessment Checklist. Before beginning the interviews with actual participants, each of the three patient actors for the study completed a practice session. In these practice sessions, the researcher played the part of the participant, and the patient actor responded to questions and completed the form. Any questions that the patient actors had were answered during this time. The patient actors were also told that they could contact the researcher for anything unexpected. One patient actor contacted the researcher with two observations. After the first interview, the patient actor was asked "How are you feeling today?" as an opening question, and this question did not have a scripted answer. The patient actor replied "OK" with the intent to provide a general neutral response. The second observation was that the participant asked the patient "Can you tell me your vital signs today?" instead of asking about each vital sign separately. The scripted answer sheet had responses for each of the vital signs but did not have a scripted response if the participant asked about vital signs as a single data point. The patient actor reported that the response given to the participant during that interview was "Which ones?" Information on both these points was shared with the other patient actors so if these questions were asked in the future, the scripted answer would be the same. This helped to maintain the uniformity of answers given to participants.

During the telehealth assessment visit with the patient actor, participants in both groups assessed for major signs and symptoms of heart failure. They asked about the patient's daily weight and current heart rate, respiratory rate, blood pressure and oxygen saturation. They also assessed for the presence of fatigue, shortness of breath, cough, chest pain, and peripheral edema. An inclusion criterion for the study was that participants had been educated in health assessment, so participants in this sample had a baseline education in this area. The signs and symptoms of heart failure were also included in the heart failure education that both groups received prior to the telehealth assessment visit (see Appendix K for listing of heart failure assessments).

The one assessment that the experimental group made more often ($p = .003$) was to ask about onset of new memory problems. One possible explanation may be that occurrence of new memory problems may not occur as commonly as some of the other symptoms of heart failure (shortness of breath, weight gain, and peripheral edema as examples). The inclusion of new memory problems on the checklist may have prompted participants in the experimental group to complete this assessment.

In nursing, when a patient responds affirmatively to having a symptom, it is standard practice to complete a "focused assessment," which is a more in-depth assessment about that symptom. One common approach is to use the PQRST mnemonic as a memory aid to include all components of the focused assessment. These components are provoking/palliating factors (what makes the symptom worse or better), quality/quantity (what it feels like and its intensity), region/radiation (where it is located and if it radiates or travels to another area of body), severity (often uses a 1 to 10 scale where one is the mildest symptom and ten is the most severe), timing (when it started, how long it lasts, whether sudden or gradual). Some of these components were included as pertinent follow-up assessment questions for specific major symptoms on the checklist because they were indicated in the literature as clinically relevant symptoms for heart failure.

A statistically significant finding in this study was that the experimental group completed more assessments of clinically relevant symptoms than the control group ($p < .001$). When looking at the subset of clinically relevant symptoms, participants in the experimental group asked more follow-up questions as focused assessments when the patient actor reported the presence of certain symptoms. These included asking about rating scale of 1 to 10 for severity of shortness of breath ($p < .001$), whether shortness of breath occurred when putting on shoes ($p = .003$), and asking for a rating scale of 1 to 10 for severity of chest pain when it occurred ($p = .002$). One possible explanation for this finding is that the checklist provided a visual cue to participants in the experimental group to complete additional in-depth assessments of the reported symptoms. This would be consistent with literature that describes checklists as cognitive aids to assist accurate completion of a task (Ray-Barruel and Rickard, 2018) and can standardize an approach to a procedure (Hales & Pronovost, 2006), which in this study was the telephone assessment. Directions for the use of the checklist were developed and reviewed with participants in the experimental group. These directions may have prompted the participants to refer to the checklist during the assessment. Scott et al. (2019) found that in a study that provided a checklist without also providing instructions for its use, some participants ignored the checklist or referred to it only briefly during the study. Another possible explanation for the differences between groups in the number of follow-up assessment questions may be that participants in the control group had less knowledge or experience about when to pursue a more in-depth focused assessment. This would be something to investigate further in future studies.

One additional comment about the checklist should be noted. In order for the checklist to be a more complete decision support checklist (rather than only having an action cue to contact provider, there needed to be other decision support cues on the form. For this reason, other action cues were added to the decision support checklist:

1. Ask about medications taken today
2. Reinforce teaching about importance of taking medications on time
3. Ask about adherence to low sodium diet
4. Reinforce teaching about low sodium diet
5. Instruct patient to weigh self upon arising, after voiding, and in same amount of clothing.

Although these items were needed to provide a fuller set of action cues, the only one related to a research question for this study was to contact the provider. For this reason, the completion rate of other suggested interventions by groups was not analyzed in this study.

The SET-M was used for self-evaluation of participant learning during the telephone assessment visit with the patient actor. Results showed that there was no statistically significant difference between the groups on any of the pre-briefing or simulation items. In this study, the pre-briefing consisted of study directions and the heart failure education provided to both the experimental and control groups. The simulation was the telephone assessment visit. Although the instrument had a section on debriefing, this was not part of the design of this study. The debriefing items were left on the instrument because the SET-M could not be altered without changing the validity and reliability of the instrument. It is unclear why some participants completed the debriefing section and some did not. One possible explanation is that these study participants were trying to be thorough. An alternative explanation is that these participants thought that because it was on the survey, the debriefing items section must apply. In summary, the positive evaluation of their learning by both groups suggests that simulation was an effective way to support learning for all participants, regardless of whether they had the aid of the heart failure assessment checklist.

The NASC-CDM© showed no statistically significant difference between the control and experimental groups on either anxiety or self-confidence for 25 of the 27 items. The statistically significant findings for the other two items on this scale were unexpected. On the anxiety portion of the scale, the experimental group had higher anxiety levels on two items: “implement the best priority decision for the client’s problem” (p .= 024) and “recognize the need to review protocol, procedure, or nursing literature to help make a decision” ($p = .048$). Overall, this suggests that having the use of the assessment checklist did not help to diminish participant’s anxiety on these two items. Since the checklist is intended to support decision-making by the participant, this finding is opposite of what was expected. One possible explanation might be that the heart failure checklist increased participants’ anxiety because there were additional assessment and management items that they were not previously aware of. The greater anxiety in the experimental group about the need to review other information suggests that the checklist did not assist with decision-making about when to consult other literature. One possible explanation is that participants may have believed that the checklist should obviate the need to consult the literature. On the self-confidence portion of the scale, the experimental group reported lower self-confidence levels on two items: “Recognize the need to review protocol, procedure, or nursing literature to help make a decision" (p = .005) and "Use knowledge of anatomy and physiology to interpret information gathered about client condition" (p = .036). The lower self-confidence reported by the experimental group about the need to review other information may suggest that the checklist did not assist with decision-making about when to consult other literature. Another possible explanation is that participants did not believe they would need to consult other literature because they were using an evidence-based checklist. The lower self-confidence with using knowledge of anatomy and physiology to interpret information about client condition is unexpected. It should be noted that there was one participant in the experimental group whose responses on this scale were high on both the anxiety and self-confidence portions of some items, which is unexpected. It would be interesting to learn whether these trends continue in a future study with a larger sample size, or with a different study design, such as a before-and-after design. For example, did self-confidence increase (or anxiety decrease) from baseline after a training intervention?

The findings of this study support previous literature about the benefit of checklists for more complete data collection and patient surveillance (Al Ashrey et al., 2016; Beigmoradi et al., 2019; de Santana Lemos & de Brito Poveda, 2020; Henneman, et al., 2012; Meira de Sousa et al., 2015; Nilsen et al., 2019). The findings also support what is already known in the literature about the benefits of simulation for learning (Berragan, 2011; George & Quatrara, 2018; Knudsen et al., 2021; Lesa et al., 2021; MacLean et al., 2019; Sanko & Mackay, 2017). This study adds the dimension of telehealth assessment in simulation. This is important because the use of telehealth is increasing in nursing, especially since the onset of the Covid-19 pandemic. It is also possible that in the future a greater number of visits may be conducted in the home setting, making a decision support checklist useful in determining when it is appropriate to contact the provider.

This study has implications for nursing education and research. The use of checklists in a situated learning environment (simulation) as experiential learning may increase the thoroughness of client assessment by nursing students. In addition, the use of checklists that contain action cues to support decision-making in experiential learning situations may enhance learning and retention of knowledge. Although current nursing textbooks contain checklists for clinical psychomotor skills and for general health assessments, decision support checklists may enhance student learning about the role of the nurse in making clinical decisions and exerting clinical judgment.

The results of this study suggest additional areas for future research. First, this study should be replicated using a sample size with sufficient power and draw the sample from more than one nursing education program. This would provide further data about the validity of the heart failure checklist and provide for a possible increase in diversity of participants in the sample.

Second, the study could also be replicated using videoconference technology instead of a telephone assessment. This would provide the participant with the ability to gather some objective data (general skin color, breathing characteristics, presence of edema, and others) as visual cues instead of relying solely on the patient actor verbal reports, which are auditory cues.

Third, a future study could also examine the usefulness of the other decision support cues on the checklist, which was beyond the scope of this study. In addition to contacting the provider, the heart failure checklist had other suggested nursing interventions, such as specific teaching points about heart failure. Inclusion of these items was necessary so that contacting the provider was not the only decision support cue on the checklist. With further research, it may be possible to develop a heart failure assessment checklist with multiple decision cues, and which ultimately might be able to be integrated into electronic health records.

Fourth, this study was conducted over a short period of time. Most participants completed the study (from signing the consent to return of SET-M and NASC-CDM© post-simulation) within 1–3 weeks. A future study could also include a component to reassess retention of heart failure assessment more distant points in time, such as at 6 months post-intervention. Finally, future studies could examine the efficacy of decision support checklists for assessing clients with other cardiovascular health problems.

This study was conducted during the Covid-19 pandemic. It was redesigned from an in-person simulation using high-fidelity mannequins to a telephone assessment visit. For this study, the decision to use a telephone visit was purposeful to protect the anonymity of participants and hopefully enhance participation; however, the study would have been more realistic had it been conducted as a videoconference visit. In the end, it was still difficult to recruit nursing students to participate as they continued with classroom and clinical learning while the pandemic was easing.

Limitations of this study are readily identified, and are discussed here:

1. This study had a small sample size, so it must be considered a pilot study. It had 23 participants, less than half of the 56 that would be required for the study to have sufficient power. It needs to be replicated with a larger sample

to have sufficient power to detect differences between groups. Another limitation is that the sample was drawn from a fairly homogenous group, as demonstrated by the results of the demographic survey. A larger sample size and drawing participants from multiple nursing programs may increase the diversity of students sampled.

2. The Heart Failure Assessment Checklist was developed by the researcher in conjunction with clinical and research experts on heart failure. Therefore, none of the results are generalizable. It requires further validation to determine its usefulness in nursing education.
3. Finally, it was not possible to observe whether the participants engaged in the study protocol as designed. For example, there was no step in the study protocol to verify whether participants reviewed the heart failure education prior to conducting the telephone assessment. Similarly, there was no mechanism to observe whether the experimental group actually used the checklist during the telephone assessment visit.

In conclusion, heart failure remains a significant chronic health problem that does not resolve and is associated with worsening baseline status over time, exacerbations that may require hospitalization, and ultimately may be a cause of death. The use of a heart failure assessment checklist with decision supports may be a beneficial aid to thorough client assessment, assisting the nurse to detect patterns of negative trends in client data, and support decision-making about how to act on these findings. Improved nursing assessment and management of patients with heart failure in the home setting may ultimately help reduce hospital readmissions and health care costs, and support value-based care in heart failure management.

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APPENDIX A

SAMPLE SIZE ESTIMATE

Sample size of 56 (28 per group) based on a Power Level of 80% and Alpha = 0.05

Table 12: Sample size estimate.

Estimated Experimental Proportion of Correct Answers (out of 22 items)	Estimated Control Proportion of Correct Answers (out of 22 items)	Sample Size in each arm at 80% power and alpha = 0.05
90.9%	72.7%	70 (140 total)
90.9%	68.2%	49 (98 total)
90.9%	63.6%	36 (72 total)
90.9%	59.1%	28 (56 total)
90.9%	54.5%	23 (46 total)
90.9%	50.0%	19 (38 total)

APPENDIX B

PARTICIPANT BEHAVIOR COMPLETION FORM (BY PATIENT ACTOR)

Participant No: ___________ **Date: _______**

Assessment Item	Yes	Comment
General (2 items)		
Fatigue (Y/N)		
If Y, please describe		
Vital Signs (4 items)		
Heart rate		
BP (systolic/diastolic)		
Respiratory rate		
O2 saturation		
Respiratory (8 items)		
Shortness of breath (Y/N)		
On scale from 1-10		
What doing when SOB occurred?		
Get short of breath when putting on your shoes?		
Feel short of breath when lie down to sleep at night?		
Cough (Y/N)		
If Yes, coughing anything up (productive)? (Y/N)		
Please describe sputum______		
Cardiovascular (6 items)		
Chest pain (Y/N)		
On scale from 1-10: _______		
What doing when it occurred?		
Peripheral edema (Y/N)		
If yes, please describe:		
Daily weight		
Neurological (3 items total)		
Memory problems (Y/N)		
If Yes, please describe		
If No: Any problems making decisions? That didn't have trouble making before?		

Actions taken by study participant:

1. Call provider Yes_______ No _______
2. Asked patient about which medications taken today Yes ______. No _______
3. Asked patient about time medications were taken today. Yes ______. No _______
4. Instructed patient on ____________________
5. Instructed patient on ____________________
6. Other (describe): ________________________
7. Other (describe): ________________________
8. Other (describe): ________________________

APPENDIX C

PARTICIPANT DEMOGRAPHIC SURVEY

Participant No: ____________________

1. **In which Undergraduate Nursing Program Track are you enrolled? (Check one)**
   - ☐ 4-Year track student
   - ☐ Accelerated track student
2. **In which semester of the nursing program are you enrolled? (Check one)**
   - ☐ 4-year track- senior year
   - ☐ 4-year track- junior year
   - ☐ 4-year track- sophomore year
   - ☐ Accelerated track student
3. **For accelerated students, do you have a prior degree in a health care related field?**
   - ☐ No
   - ☐ Yes. If yes, which field? _________________________
4. **Do you have prior experience working with patients with heart failure?**
   - ☐ No
   - ☐ Yes. If yes, below indicate where you had your prior experience:

   (Check all that apply)
     - ☐ Clinical (nursing school)
     - ☐ Simulation
     - ☐ Health care employment
     - ☐ None
5. **Do you have prior experience working with patients with other cardiac health problems?**
   - ☐ No
   - ☐ Yes. If yes, below indicate where you had your prior experience:

   (Check all that apply)
     - ☐ Clinical (nursing school)
     - ☐ Simulation
     - ☐ Health care employment
     - ☐ None
6. **Do you have prior experience working with patients with respiratory health problems?**
   - ☐ No
   - ☐ Yes. If yes, below indicate where you had your prior experience:

   (Check all that apply)
     - ☐ Clinical (nursing school)
     - ☐ Simulation
     - ☐ Health care employment
     - ☐ None
7. **What is your patient care experience outside of school?**
   - ☐ None
   - ☐ Direct patient care giver in acute/subacute/long-term care (CNA, etc.)
   - ☐ Home health aide
   - ☐ Prehospital emergency care (EMT, paramedic)

     Other ____

APPENDIX D

CONSENT FORM FOR PARTICIPATION IN A RESEARCH STUDY

University of Massachusetts Amherst

Researcher(s): *MaryAnn Hogan, Elizabeth Henneman*

Study Title: Improving Heart Failure Assessment in a Virtual Home Setting.

1. WHAT IS THIS FORM?
This is a consent form which gives you information about this study so you can make an informed decision about participation in this research. This form describes why the study is being done, why you are invited to participate, and what you will do during the study if you choose to participate. We encourage you to take time to review this form and ask questions now and at any other time. If you decide to participate, you will be asked to sign this form and will be given a copy for your records.

2. WHO IS ELIGIBLE TO PARTICIPATE?
All nursing students in the junior or senior year of the 4-year track of the UMASS Amherst Baccalaureate Nursing program and current senior students in the accelerated track of the UMASS Amherst nursing program.

3. WHAT IS THE PURPOSE OF THIS STUDY?
The purpose of this research study is to determine the effect of an intervention on improving heart failure assessment by telephone in a virtual home setting.

4. WHERE WILL THE STUDY TAKE PLACE AND HOW LONG WILL IT LAST?
This study will be conducted by telephone as a virtual telehealth visit to a simulated patient with heart failure. The study will take approximately 1 hour to complete. Because this study is being conducted virtually, you can be in any location to conduct the telephone interview, although you should plan to be in an area that is quiet and where you will not be interrupted.

5. WHAT WILL I BE ASKED TO DO?
If you agree to participate, you will meet with the researcher(s) to sign the consent and have any questions answered. You will also be asked to complete a short survey to provide information about your experience in working with patients with cardiopulmonary problems. Participants will be randomized into two groups; one will receive an assessment checklist and the other will not. Both groups will receive an asynchronous, online educational session on heart failure. Following the educational session, both groups will conduct a telephone interview aimed at patient assessment with a patient actor.

6. WHAT ARE MY BENEFITS OF BEING IN THIS STUDY?
Although you might not have any personal benefit from this study, you may benefit from the information provided and the interview experience. This study will help in the development of better ways to educate nursing students to perform patient assessments.

7. WHAT ARE MY RISKS OF BEING IN THIS STUDY?
We believe there are no known risks associated with this research study.

8. HOW WILL MY PERSONAL INFORMATION BE PROTECTED?
All data will be de-identified and kept in a secure location. All paper records will be kept in a locked file cabinet at the College of Nursing. All electronic data will be password protected and stored on an encrypted computer. All reports of this data will be presented in summary format and you will not be identified in any publications or presentations.

9. WILL I RECEIVE ANY PAYMENT FOR TAKING PART IN THE STUDY?
You will receive $25.00 for participating in the study.

10. WHAT IF I HAVE QUESTIONS?
We will be happy to answer any question you have about this study. If you have further questions about this project or if you have a research-related problem, you may contact the researchers, MaryAnn Hogan at maryannhogan@nursing.umass.edu or Dr. Elizabeth Henneman (henneman@nursing.umass.edu). If you have any questions concerning your rights as a research subject, you may contact the University of Massachusetts Amherst Human Research Protection Office (HRPO) at (413) 545-3428 or humansubjects@ora.umass.edu."

11. CAN I STOP BEING IN THE STUDY?
You may choose to not be in this study and you may choose to stop being in this study at any time. There are no penalties or consequences of any kind if you decide that you do not want to participate.

12. WHAT IF I AM INJURED?
The University of Massachusetts does not have a program for compensating subjects for injury or complications related to human subjects research, but the study personnel will assist you in getting treatment.

13. SUBJECT STATEMENT OF VOLUNTARY CONSENT
By signing this form, I am agreeing to voluntarily enter this study. I have had a chance to read this consent form, and it was explained to me in a language which I use and understand. I have had the opportunity to ask questions and have received satisfactory answers. I understand that I can withdraw at any time. A copy of this signed Informed Consent Form has been given to me.

________________________	________________	________
Participant Signature	Print Name	Date

By signing below, I indicate that the participant has read and, to the best of my knowledge, understands the details contained in this document and has been given a copy.

________________________	________________	________
Signature of Person Obtaining Consent	Print Name	Date

APPENDIX E

PATIENT INFORMATION FOR TELEPHONE ASSESSMENT VISIT

Ms. Sanderson is a 67-year-old woman who has a history of hypertension and mild chronic obstructive pulmonary disease. She formerly smoked 1 pack cigarettes/day for about 20 years and quit one month ago. She was admitted to the hospital 6 days ago with chest pain. She did not experience a myocardial infarction but was diagnosed with heart failure secondary to hypertension. She was treated for heart failure successfully and was discharged from the hospital 3 days ago. She lives alone in a single story home and has a daughter who lives 30 miles away. At discharge, she was referred to the Visiting Nurse Association (VNA) for follow-up visits. A VNA nurse made the first visit in person at the patient's home 2 days ago, which was one day post discharge. You are making the second follow-up visit at 2:00 PM today, but this visit will be completed as a virtual telehealth visit by telephone.

Discharge Note From hospital:

Summary: Awake, alert and oriented to time, place and person. Skin pale pink in color, warm and dry. Skin is intact with no lesions and no areas of pressure injury. Client had peripheral edema of +2 on admission, which resolved by discharge. Cardiac monitor showed normal sinus rhythm during hospitalization. Lungs had bilateral lung crackles on admission approximately 1/3 up from bases, but after treatment with diuretic therapy, breath sounds were clear by discharge. Abdomen remained soft and nontender with active bowel sounds in all 4 quadrants. No constipation noted during admission; last BM was today (day of discharge). Voiding clear yellow urine with no frequency, urgency, or burning. Discharge weight 176 pounds (80 kg).

Vital signs on discharge: Temp. 98.4 F (36.9 C), HR 72, RR 16, BP 136/86, O2 saturation on room air (RA) 94%.

Discharge Orders:
Low sodium diet 1500 mg/day
Activity as tolerated
Weigh self daily each morning upon arising and record
Measure vital signs each morning and record
Enalapril 5 mg by mouth twice daily
Carvedilol 3.125 mg by mouth twice daily
Furosemide 40 mg by mouth once daily in morning
Digoxin 0.25 mg by mouth once daily in morning
Albuterol 2 puffs by metered dose inhaler (MDI) every 4 to 6 hrs as needed
Referral to Visiting Nurse Association (VNA) for follow-up nurse visits
Call medical provider if signs and symptoms of heart failure return

First day post-discharge VNA nurse visit documentation:

Assessment: Awake, alert and oriented to time, place and person. Skin pale pink in color, warm and dry, intact, no peripheral edema noted. Lungs clear to auscultation. Denies constipation or difficulty with urination. Last BM today. Weight today: 176.6 pounds (80.1 kg) Vital signs: Temp. 98.6 F (37 C), HR 76, RR 18, BP 134/86, O_2 saturation 93% on RA.

Interventions: Supervised patient's correct technique in use of home BP monitor; provided instruction in use of at home fingertip oxygen saturation monitor (patient able to give return demonstration for its use). Reinforced instructions on low sodium diet, medication schedule, and how to record daily weight and vital signs on patient's at-home log. Patient advised that the next follow-up visit would be by telephone, and to have log of self-recorded vital signs and weight available at the time of the call.

APPENDIX F

VNA DOCUMENTATION OF VISIT FORM

GENERAL
VITAL SIGNS
RESPIRATORY
CARDIOVASCULAR
NEUROLOGICAL
GASTROINTESTINAL
GENITOURINARY
MUSCULOSKELETAL

APPENDIX G

SIMULATION EFFECTIVENESS TOOL-MODIFIED (SET-M)

Directions: Please complete items that apply to the simulated patient interview that you conducted. For each item, circle one number that corresponds to your answer choice.

Simulation Effectiveness Tool - Modified (SET-M)

After completing a simulated clinical experience, please respond to the following statements by circling your response.

PREBRIEFING:	**Strongly Agree**	**Somewhat Agree**	**Do Not Agree**
Prebriefing increased my confidence	3	2	1
Prebriefing was beneficial to my learning.	3	2	1
SCENARIO:			
I am better prepared to respond to changes in my patient's condition.	3	2	1
I developed a better understanding of the pathophysiology.	3	2	1
I am more confident of my nursing assessment skills.	3	2	1
I felt empowered to make clinical decisions.	3	2	1
I developed a better understanding of medications. (Leave blank if no medications in scenario)	3	2	1
I had the opportunity to practice my clinical decision making skills.	3	2	1
I am more confident in my ability to prioritize care and interventions	3	2	1
I am more confident in communicating with my patient.	3	2	1
I am more confident in my ability to teach patients about their illness and interventions.	3	2	1
I am more confident in my ability to report information to health care team.	3	2	1
I am more confident in providing interventions that foster patient safety.	3	2	1
I am more confident in using evidence-based practice to provide nursing care.	3	2	1
DEBRIEFING:			
Debriefing contributed to my learning.	3	2	1
Debriefing allowed me to verbalize my feelings before focusing on the scenario	3	2	1
Debriefing was valuable in helping me improve my clinical judgment.	3	2	1
Debriefing provided opportunities to self-reflect on my performance during simulation.	3	2	1
Debriefing was a constructive evaluation of the simulation.	3	2	1
What else would you like to say about today's simulated clinical experience?			

Leighton, K., Ravert, P., Mudra, V., & Macintosh, C. (2015). Update the Simulation Effectiveness Tool: Item modifications and reevaluation of psychometric properties. *Nursing Education Perspectives, 36*(5), 317-323. Doi: 10.5480/1 5-1671.

APPENDIX H

NURSING ANXIETY AND SELF-CONFIDENCE WITH CLINICAL DECISION- MAKING SCALE (NASC-CDM)©

Participant Number: _______________

Directions: Reflect on each item and answer it as accurately as possible. There are no right or wrong answers. Reach each of the 27 statements and circle the option that reflects how you felt during the telephone interview. Answer both the self-confidence and anxiety portion for each item. This should take about 10 minutes to complete.

Abbreviations: SC = Self-Confidence A = Anxiety
Scale: 1=Not at all; 2= Just a little; 3=Somewhat; 4=Mostly; 5=Almost always; 6=Totally

1.	I am ___ self-confident and ___ anxious in my ability to easily see important patterns in the information I gathered from the client.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
2.	I am ___ self-confident and ___ anxious in my ability to identify which pieces of clinical information I gathered are related to the client's current problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
3.	I am ___ self-confident and ___ anxious in my ability to see the full clinical picture of the client's problem rather than focusing on one part of it.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
4.	I am ___ self-confident and ___ anxious in my ability to recall knowledge I learned in the past that relates to the client's current problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
5.	I am ___ self-confident and ___ anxious in my ability to implement the 'best' priority decision option for the client's problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
6.	I am ___ self-confident and ___ anxious in my ability to interpret the meaning of a specific assessment finding related to the client's problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
7.	I am ___ self-confident and ___ anxious in my ability to evaluate if my clinical decision improved the client's laboratory findings.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
8.	I am ___ self-confident and ___ anxious in my ability to recognize the need to talk with my clinical nursing instructor to help sort out client assessment findings.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
9.	I am ___ self-confident and ___ anxious in my ability to use active listening skills when gathering information about the client's current problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
10.	I am ___ self-confident and ___ anxious in my ability to assess the client's nonverbal cues.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
11.	I am ___ self-confident and ___ anxious in my ability to recognize the need to review a protocol, procedure, or nursing literature to help me make a clinical decision.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
12.	I am ___ self-confident and ___ anxious in my ability to decide if information given by significant other/family is important to the client's current problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
13.	I am ___ self-confident and ___ anxious in my ability to use my knowledge of anatomy and physiology to interpret information I gathered about the client's current problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6

14.	I am ___ self-confident and ___ anxious in my ability to act on at least one intervention I am considering for the client's current problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
15.	I am ___ self-confident and ___ anxious in my ability to analyze the risks of the interventions I am considering for the client's problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
16.	I am ___ self-confident and ___ anxious in my ability to in my ability to recognize important information I received during shift-change report.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
17.	I am ___ self-confident and ___ anxious in my ability to INDEPENDENTLY make a clinical decision to solve the client's problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
18.	I am ___ self-confident and ___ anxious in my ability to ask the client additional questions to get more specific information about the current problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
19.	I am ___ self-confident and ___ anxious in my ability to correlate physical assess-ment findings with the client's nonverbal cues to see if they match or don't match.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
20.	I am ___ self-confident and ___ anxious in my ability to implement one accurate intervention if the client has an urgent problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
21.	I am ___ self-confident and ___ anxious in my ability to use my knowledge of diagnostic tests, like lab results or x-ray findings, to help create a possible list of decisions I could implement.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
22.	I am ___ self-confident and ___ anxious in my ability to realize the need to talk with my clinical nursing instructor or staff nurse about interventions I am considering.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
23.	I am ___ self-confident and ___ anxious in my ability to remain open to different reasons for the client's problem even though the information I gathered may point to only one reason.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
24.	I am ___ self-confident and ___ anxious in my ability to ask the client's significant other/family questions to gather information about the current problem.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
25.	I am ___ self-confident and ___ anxious in my ability to evaluate if the clinical decision I made influenced client satisfaction.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
26.	I am ___ self-confident and ___ anxious in my ability to incorporate personal things I know about the client in order to make decisions in their best interest.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6
27.	I am ___ self-confident and ___ anxious in my ability to consider a possible intervention for the client's problem just because it 'seems' right.	S	1	2	3	4	5	6
		A	1	2	3	4	5	6

APPENDIX I

HEART FAILURE ASSESSMENT CHECKLIST

Participant #:_______________ Date: _____________

(Turn over at bottom-2 pages)

Assessments	**Sample interviewer questions (Q)**
General	
❒ Fatigue (Y/N)	Q. "Since your last VNA nurse visit, have you had times when you felt tired or fatigued?"
❒ If Y, please describe	Q. "Can you describe when this occurred and what you were doing at the time?"
Vital Signs	
❒ Heart rate	Q. "What is your heart rate today when you measured it?"
❒ BP (systolic/diastolic)	Q. "What is your BP when you measured it today using your automated BP cuff?"
❒ Respiratory rate	Q. "What was your respiratory rate today?"
❒ O_2 Saturation	Q. "What was the oxygen saturation reading today from your fingertip oxygen saturation monitor?"
Respiratory	
❒ Shortness of breath (Y/N)	Q. "Since your last VNA nurse visit, have you had any times when you had shortness of breath?" OR "Do you have any shortness of breath at this time?"
❒ On scale from 1-10	Q. "Using a scale of 1-10 where 1 is the mildest and 10 is the worst shortness of breath, what number would you use to rate your shortness of breath when it occurs?"
❒ What doing when SOB occurs?	Q. "What are/were you doing when the shortness of breath occurs?"
❒ Short of breath when putting on shoes?	Q. "Do you ever get short of breath when you put on your shoes?"
❒ Short of breath when lying down to sleep?	Q. Do you ever feel short of breath when you lie down to sleep at night?"
❒ Cough (Y/N)	Q. "Do you have a cough?"
❒ If Yes, Coughing up anything (productive)? (Y/N)	Q. "When coughing, were you able to cough anything up?"
Please describe sputum______	Q. "Can you describe what the sputum was like?"
Cardiovascular	
❒ Chest pain (Y/N)	Q. "Since your last VNA nurse visit, have you had any times when you experienced chest pain?"
❒ On scale from 1-10: _______	Q. When the chest pain occurred, how would you rate the intensity of pain using a scale of 1-10, with 1 being the least and 10 being the most?
❒ What doing when chest pain occurred?	Q. "What were you doing at the time?"
❒ Peripheral edema (Y/N)	Q. "Do your feet get swollen or do your slippers or shoes feel tight?
…❒ If yes, please describe:	Q. "Please describe this for me."
❒ Daily weight	Q. "What is your weight today?"

Neurological	
❒ New memory problems (Y/N)	Q. “Since your last visit, have you noticed any time where you had a problem with your memory?”
….If Yes, please describe: --- If No (ask question below)	
❒ Any problems making decisions? That you didn’t have trouble making before?	

Possible Interventions:
Ask about medications taken today?
Reinforce teaching about importance of taking meds on time
Ask about adherence to low sodium diet
Reinforce teaching about low sodium diet
Instruct patient about weighing self upon arising, after voiding, and same amount of clothing
Call medical provider
Other (list)

APPENDIX J

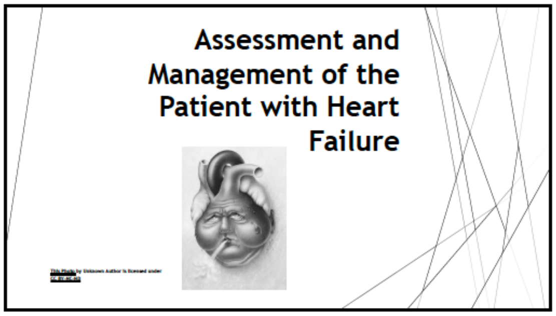
DIRECTIONS FOR USE OF HEART FAILURE ASSESSMENT CHECKLIST

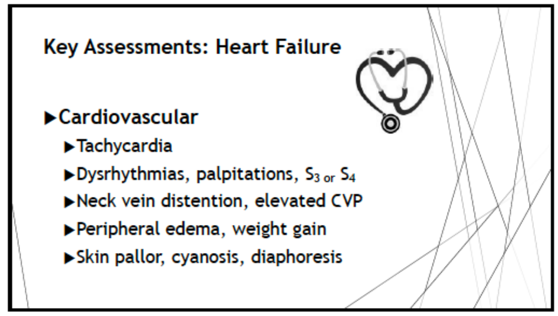
Purpose: The items on this checklist identify important nursing assessments to make for a patient with heart failure. Checklist items are grouped together conceptually (general, vital signs, respiratory, cardiovascular, and neurological) to foster critical thinking and clinical reasoning during assessment, and to serve as a guide to action.

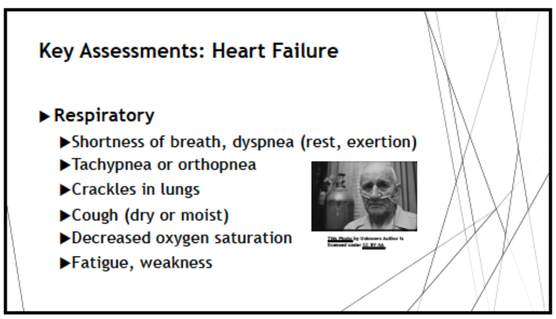
1. Complete the first section of the checklist.
2. Analyze the data to form a judgment about whether the client's condition is stable or changing
    i. If the client's condition is improving, stable, or only slightly worse, or if you cannot make a determination with the data gathered so far, continue with assessment to gather additional data.
    ii. If the client's condition is worsening, complete appropriate nursing actions as outlined on the checklist.
3. Complete the remaining sections of the checklist in order, analyze the data, and take action if indicated as described above.

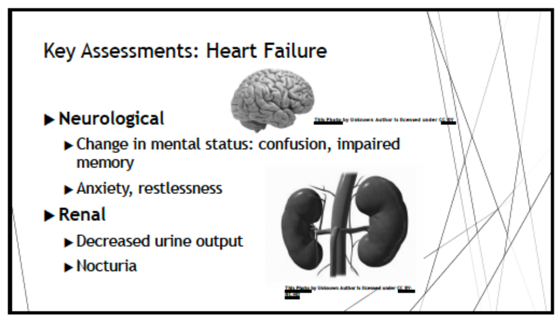
APPENDIX K

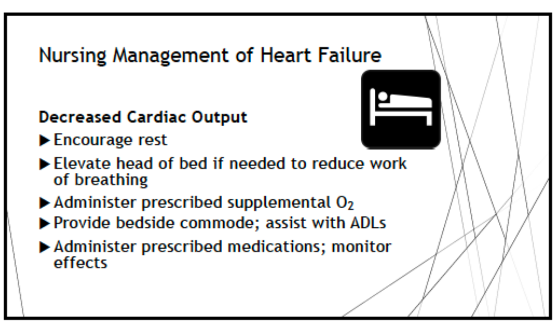
HEART FAILURE ASSESSMENT AND MANAGEMENT EDUCATION

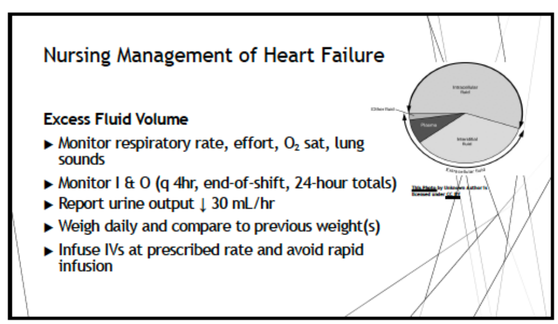












Nursing Management of Heart Failure

Deficient Knowledge

- Diet: low sodium (2 Gm daily), calorie-controlled
- Possible fluid restriction: mild=1500 mL/24hrs, lower if more severe restriction needed
- Energy conservation measures
- Common medications: cardiac glycoside, diuretic, beta blocker, and ACE inhibitor or ARB

Trends Indicating Deteriorating Status

- Monitor trends in data over time (decompensation can be slow or rapid)
- Trends of concern:
  - Increases in: HR, RR, daily weight, fluid retention
  - Decreases in: oxygen saturation, BP
- Trends that warrant calling rapid response team*:
  - Heart rate ↑ 140 or ↓ 40; BP ↑ 180 mmHg systolic or ↓ 90 mmHg diastolic
  - Respirations ↑ 28 or ↓ 8; O_2 sat ↓ 90% despite supplementation
  - Miscellaneous: acute mental status change, urine output 50mL/4hrs; significant concern over condition

* https://psnet.ahrq.gov/primers/primer/4/rapid-response-systems

APPENDIX L

SCRIPTED ANSWERS TO ASSESSMENT QUESTIONS FOR PATIENT ACTOR

Assessments	**Sample interviewer questions (Q) and patient actor responses (A)**
General	
❒ Fatigue (Y/N)	Q. "Since your last VNA nurse visit, have you had any times when you felt tired or fatigued?" **A. Yes**
❒ If Y, please describe	Q. "Can you describe when this occurred and what you were doing at the time?" **A. "I feel fatigued/tired after getting up and dressed in the morning and around 1-2 in the afternoon after having my lunch."**
Vital Signs	
❒ Heart rate	Q. "What is your heart rate today?" **A. "It was 88 when I measured it this morning."**
❒ BP (systolic/diastolic)	Q. "What is your blood pressure when you measured it today using your automated blood pressure cuff?" **A. "It was 132/86 when I measured it this morning."**
❒ Respiratory rate	Q. "What was your respiratory rate today?" **A. "It was 28 breaths per minute."**
❒ O2 Saturation	Q. "What was your oxygen saturation reading today from your fingertip oxygen saturation monitor?" **A. "It was 93%."**
Respiratory	
❒ Shortness of breath (Y/N)	Q. "Since your last VNA nurse visit, have you had any times when you had shortness of breath?" OR "Are you having any shortness of breath at this time?" **A. Yes to either**
❒ On scale from 1-10	Q. "Using a scale of 1-10 where 1 is the mildest and 10 is the worst shortness of breath, what number would you use to rate your shortness of breath when it occurs?" **A. "It's about a 3-4."**
❒ What doing when SOB occurs	Q. "What are/were you doing when the shortness of breath occurs?" **A. "After getting dressed in the morning, climbing stairs, walking out to the car"**
❒ Shortness of breath when putting on shoes	Q. "Do you ever get short of breath when putting on your shoes?" **A. Yes**

❒ Shortness of breath when lying down to sleep	Q. Do you ever feel short of breath when you lie down to sleep at night?" **A. Yes**
❒ Cough (Y/N)	Q. "Do you have a cough?" **A. "Yes, I have had a cough a few times since the VNA visit a few days ago."**
❒ If Yes, Coughing anything up (productive)? (Y/N)	Q. "When coughing, were you able to cough anything up?" **A. Yes**
Please describe sputum______	Q. "Can you describe what the sputum was like?" **A. It was like water and a little foamy."**
Cardiovascular	
❒ Chest pain (Y/N)	Q. "Since your last VNA nurse visit, have you had any times when you experienced chest pain?" **A. "Yes"** If participant asks follow-up Q. "Are you having pain right now?" **A. No**
❒ On scale from 1-10: ________	Q. When the chest pain occurred, how would you rate the intensity of pain using a scale of 1-10, with 1 being the least and 10 being the most? **A. "It was about a 4 or 5."**
❒ What doing when chest pain occurred	Q. "What were you doing when the chest pain occurred?" **A. "When playing with my dog, and when making lunch."**
❒ Peripheral edema (Y/N)	Q. "Do your feet get swollen or do your slippers or shoes feel tight? **A. Yes**
…❒ If yes, please describe:	Q. "Please describe this for me." **A. "My feet feel more swollen today than they did yesterday or the day before."**
❒ Daily weight	Q. "What is your weight today?" **A. "180 lb"**
Neurological (3 items total)	
❒ Memory problems (Y/N)	Q. "Since your last visit, have you noticed any time where you had a problem with your memory?" **A. "No"**
….If Yes, please describe: --- If No (ask question below)	**A. Sometimes I forget if I've taken my morning medication and sometimes I start to call my daughter but then I can't remember if I already called her that day.**
❒ Any problems making decisions? That you didn't have trouble making before?	**No**

Sample patient responses to possible assessment questions not on checklist:

Skin: feels warm and dry to touch; no reports of sweating or diaphoresis; no bruises, rashes or broken skin areas

Mental status: patient able to state name, current date and time, knows she is at home, and is having a telehealth visit by visiting nurse, knows Biden is president.

Gastrointestinal: no nausea or vomiting; patient says abdomen feels soft and does not feel distended. Appetite is OK-eats 3 meals/day; 100% of meals. Last BM today, brown and soft.

Genitourinary: "not sure" how many times urinates during day. No burning or frequency or urgency. Gets up once at night to void.

Musculoskeletal: no joint pain or stiffness, no difficulty walking or moving; no bone pain

Response to any other questions asked by participant that are not on this sheet is "I don't know"

APPENDIX M

RECRUITMENT SCRIPT (EMAIL)

Dear Nursing Students,

As a student in the PhD program at UMass Amherst, I am conducting a dissertation research study to investigate the effectiveness of an educational intervention on participants' ability to conduct a telephone assessment for a patient actor with heart failure. The purpose of this email is to recruit nursing students for the study. You are eligible to participate if you have been educated in health and physical assessment techniques. The study itself will take approximately 1 hour total time to complete. You will complete a brief demographic survey, review educational information about heart failure, and then conduct a virtual telephone assessment visit (15-minute limit) to a patient actor via telephone. You will receive $25.00 for participating in the study.

The study is approved by UMass Amherst IRB with the Protocol 846. All of your information will remain confidential and stored securely for the purpose of the study. Participation in this study does not affect your standing in the Nursing Program or the University. If you meet the criteria, and are interested in participating or have any questions, please email me at maryannhogan@nursing.umass.edu or call me at 413.531.5904. Thank you for your time and consideration.