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Effect of an Emergency Nurse Heart Failure Educational Intervention

Lori Hudgens

California State University, Northern California Consortium Doctor of Nursing Practice

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ABSTRACT

EMERGENCY NURSE HEART FAILURE RESEARCH

Background: Research indicates many nurses lack the appropriate heart failure (HF) education necessary to assist with readmission reduction efforts. Employer approved nurse HF education has resulted in improved nurse HF knowledge, and, reduced readmissions.

Problem: ED nurses require a competent knowledge of heart failure to effectively educate heart failure patients upon admission to the ED. No research has been conducted with ED nurse specific populations to assess ED nurse knowledge of heart failure, and, to determine if heart failure educational interventions increase ED nurse' HF knowledge.

Aims: To evaluate the effectiveness of an ED nurse heart failure educational intervention in improving ED nurses' knowledge of heart failure.

Methodology: A descriptive, prospective, one-group, comparative pre-test/post-test intervention study design was used, with 24 (N=24) nurses filling out the *Nurses Knowledge of Heart Failure Education Principles* survey pre/post exposure to an evidenced-based heart failure educational intervention.

Results: A significant increase in overall ED nurse heart failure knowledge scores was found pre/post intervention, rising from a pre-test M=78.54 (SD=9.38) to a post-test M=90.0 (SD=9.08), $p < .001$, a passing score. Significant ED nurse HF knowledge gains were identified in the areas of HF medications, diet, weight, and symptom management ($p < .05$), with a 171% increase in nurse passing scores.

Lori Hudgens
May 2016

EFFECT OF AN EMERGENCY NURSE HEART FAILURE
EDUCATIONAL INTERVENTION

by
Lori Hudgens


A project
submitted in partial
fulfillment of the requirements for the degree of
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California State University, Northern Consortium
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APPROVED

For the California State University, Northern Consortium
Doctor of Nursing Practice:

We, the undersigned, certify that the project of the following student meets the required standards of scholarship, format, and style of the university and the student's graduate degree program for the awarding of the master's degree.

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CHAPTER 1: INTRODUCTION

Heart failure (HF) is defined as a progressive, chronic condition, reflecting the heart's inability to pump an adequate volume of blood to meet body demands (National Institutes of Health, NIH, 2015). As the heart gradually weakens, fluid often retrograde fills into the lungs, causing debilitating respiratory distress, edema, and nausea (NIH, 2015). Treatment for such acute exacerbations of heart failure symptoms (AFHS) often includes Emergency Department airway support, diuresis, and, stabilization (Weintraub et al., 2010).

The prevalence of chronic heart failure was predicted to rise markedly from 5.1 to 8.1 million heart failure patients by 2030 (Go et al., 2014). Associated treatment costs for heart failure by year 2030 were estimated at \$70 billion dollars per year (Go et al., 2014). Heart failure was cited to be a complex condition to treat as patients often suffered an acute exacerbation of their heart failure symptoms (AHFS) when medications were not taken properly, or, when too much sodium is ingested (Collins & Storrow, 2013; DiDomenico, Kondos, & Dickens, 2010). In the wake of these rising heart failure disease treatment costs, the government took aggressive action in 2012 to reduce reimbursements to hospitals with excess inpatient 30-day hospital readmissions (Centers for Medicare & Medicaid, CMS, 2016).

The Affordable Care Act ushered in a new era of progressive health reform with reimbursements tied to the cost, quality, and value of provided health care services (Peacock, 2012). Under new quality reforms, hospitals with excessive heart failure, pneumonia, and acute myocardial infarction 30-day hospital readmissions received a 1% reduction in reimbursements in 2013, a 2% deduction in 2014, and, a 3% reduction in 2015 (CMS, 2014). Increased penalties were

meant to improve health care quality as many 30-day readmissions were deemed preventable, and, often a reflection of poor quality care, and/or transition planning (CMS, 2016; Grady et al., 2000).

In an effort to accommodate the expanding heart failure population, control costs, and avert readmission penalties, many hospitals opened short-stay ED heart failure observation units (OU) where patients received up to 24 hours of specialized heart failure treatment (Peacock, 2012). ED OU's offered significant cost benefits as the ED is an outpatient unit, not inpatient hospital unit, with patients thus not counted as admissions, readmissions, and are not included in the 30-day readmission penalty formula (Peacock, 2012). Many hospitals instituted ED specific heart failure short-stay admission, treatment, and, discharge protocols (Peacock, 2012). No research, however, validated hospital leaders completed prior ED nurse heart failure knowledge assessments to support these new care models (Peacock, 2012).

ED treatment for heart failure continued to expand to meet the demand. From 2010 to 2014, the annual rate of heart failure patients treated in ED's rose from 676,000 patients in 2010, to 958,167 patients in year 2014, a 42% increase (Go et al., 2014; Storrow et al., 2014). ED short-stay heart failure treatment was initially set forth by ED physicians, without large strategic planning about how to best build strong ED heart failure treatment teams, and, how to best ensure heart failure quality criteria were met (Go et al., 2014). Heart failure quality criteria included evaluation of left ventricular ejection fraction, administration of ace-inhibitor and beta blocker administration for left ventricular systolic dysfunction (LVSD), the delivery of complete heart failure discharge instructions with smoking cessation education, and, anticoagulant administration per protocols (Go et al., 2014).

Nurses, henceforth, required a strong knowledge of heart failure to meet the complex needs of heart failure patients and provide thorough patient heart failure discharge education. Nurse mastery of basic heart failure self-management concepts is deemed an essential pre-requisite to ensure nurses plan for HF education to maximize patient treatment adherence and symptom recognition (Albert et al., 2002). Literature indicated the majority of nurses lacked the essential heart failure knowledge needed to properly educate heart failure patients regarding HF self-care fundamentals (Albert et al., 2002; Mahramus, Penoyer, Frewin, Chamberlain, & Sole; Sterne, Grossman, Gigliardi, & Swallow, 2014). No published nurse heart failure educational interventions, further, were accessible. There was also only one reliable and valid nurse heart failure knowledge assessment tool (Albert et al., 2002), and, no published nurse heart failure educational interventions. Most nursing research studies using heart failure educational interventions used different teaching methods, and had not been replicated.

This literature reflects the growing rise of heart failure patients accessing heart failure medical care in the emergency department (ED), with more ED's managing such patients in short-stay observation units, and, discharging patients from the ED (CMS, 2014; Peacock, 2012). There is a demonstrated need for the completion of nursing research which evaluates ED nurse knowledge of heart failure pre/post exposure to a heart failure educational intervention, to see if ED nurse heart failure knowledge increases significantly. This doctor of nursing practice (DNP) research project accomplished both of these goals. ED nurse knowledge of heart failure was evaluated using the reliable and valid *Nurses' Knowledge of Heart Failure Education Principles* assessment tool pre/post

exposure to a researcher developed evidence-based ED nurse heart failure educational intervention.

As stated, the focus of this ED nurse heart failure research was aimed at exploring the effectiveness of an ED nurse HF evidence-based educational intervention in increased nurse knowledge of heart failure, pre/post intervention. The target goal was aimed at ED nurses receiving a passing score of 17 or more correct items out of 20, or $\geq 85\%$ correct, the standard for passing (Albert et al., 2002). This strategy was deemed essential as ED nurses in the United States work varied and rotating schedules and hours. ED nurses required convenient access to on-site, employer approved, standardized, heart failure education to best prepare them for delivery of early patient heart failure education in the ED to support readmission reduction and quality improvement initiatives.

CHAPTER 2: LITERATURE REVIEW

What is Heart failure?

Heart failure is defined as a chronic, progressive disease where the weakened heart is unable to eject enough blood to meet body demands (National Institutes of Health, NIH, 2015). Heart failure patients often suffer an acute exacerbation of heart failure symptoms (AFHS) when fluid fills the lungs, causing debilitating fatigue, edema, and dyspnea (Storrow et al., 2014). Such events often trigger a patient visit to the ED for emergent stabilization, airway support, and diuresis (Weintraub et al., 2014).

Scope of the Problem: Costs, Disease Incidence, Readmissions

Heart failure disease incidence is predicted to rise 46% by 2030, rising from 5 million, to 8 million affected individuals, with medical costs rising 127% to \$70 billion dollars annually (Go et al., 2014). The typical heart failure readmission costs \$11,000 to \$40,000, or, \$2,067 per day (Casteel, 2012; CMS, 2016; Warden, Freels, Furuno, & MacKay, 2012). A majority of heart failure readmissions, up to 23% to 60% of readmissions, are stated to be preventable, often due to poor patient adherence with the treatment plan, ineffective patient education, or, inferior patient case monitoring and follow-up by practitioners (CMS, 2016; DiDomenico, Kondos, & Dickens, 2010; Grady et al., 2000).

In 2013, government regulators took action to improve health care quality, reduce costs, and reduce costly and preventable 30-day readmissions (CMS, 2016). In 2013, hospitals received a 1% reduction in Medicare reimbursements if 30-day hospital readmission rates were excessive, a 2% reduction in 2014, and, a 3% reduction in 2014 (CMS, 2016). Despite such cost penalties, heart failure

remains a leading cause of hospital admissions, and readmissions, with 80% of patients heart failure patients admitted to the hospital from the ED (Storrows et al., 2014). In wake of these new penalties, trends reflected a consistent increase in ED heart failure visits years 2012 to 2015 despite decreased hospital 30-day heart failure readmissions (CMS, 2016).

ED's currently treat 20% of the national heart failure population, with 958,167 visits recorded in 2014 (Storrows et al., 2014). ED's are thus considered a primary access portal for heart failure care and patient education. Many ED's now treat lower-acuity heart failure patients in 24-hour ED short stay observation units, with ED doctors and nurses making key decisions to admit, monitor, or discharge, within a 24-hour window (Peacock, 2012).

ED nurses, in this way, thus became directly responsible for the immediate prioritization of heart failure care tasks to optimize patient quality outcomes. ED nurses are responsible for the immediate triaging, stabilization, monitoring, and initiation of heart failure patient education teaching early in the ED visit (American Association of Heart Failure Nurses, AAHFN, 2015). A key problem with this strategy, however, was no research existed to validate ED nurse competency to educate patients for self-care, and, to ensure ED nurses understood heart failure basic care concepts to proficiently care for, and educate heart failure patients. The existing literature indicates nurses currently lack knowledge of heart failure basic concepts which can be corrected with education (Mahramus et al., 2014; Sterne et al., 2014).

Government Policy and Regulatory Change

In 2012, the Hospital Readmission Reduction Program (HRRP) was formed under Section 3025 of the Affordable Care Act to reduce preventable health care

costs, and, to improve health care quality (Centers for Medicare and Medicaid, CMS, 2016). Heart failure was immediately targeted as a high-cost hospital and readmission diagnosis. CMS presented new policy regulations and penalties to improve heart failure care coordination processes, patient education, and reduce preventable heart failure readmissions (CMS, 2016).

Under the HRRP, CMS was authorized to assess fines to hospitals with high 30-day hospital readmission rates for three high-risk readmission diagnoses: acute myocardial infarction, pneumonia, and heart failure (CMS, 2016). Hospital penalties were directly linked with hospital 30-day readmission rates (CMS, 2012). Fines were extracted from reimbursements, with eligible readmission cases tracked by International Classification Disease coding (ICD) (DiDomenico et al., 2012).

The government took action to ensure quality improvement processes and cost reduction measures continued in hospitals, authorizing successive increases in hospital penalties from 1% in 2013, to 2% of reimbursements in 2014, to 3% of reimbursements in 2015 for excessive 30-day readmissions (CMS, 2016). CMS (2016) stated readmissions reflected poor quality care at the hospital and clinical level, with providers failing to monitor heart failure patients closely, and, involve patients in their heart failure self care (CMS, 2015).

The quest for quality performance increased in 2014, with CMS expanding the number of eligible penalty diagnoses, from three to six, adding total hip and total knee replace surgeries, and, chronic obstructive pulmonary disease readmission diagnoses into the penalty formula (CMS, 2015). The typical definition of a 30-day defined readmission generally includes the unplanned readmission of a patient for reasons which may or may not be directly related to

the original admission, therefore promoting the highest degree of quality care and patient education (American Hospital Association, 2011).

Calculation of the HRRP Readmission Penalty

The HRRP penalty is calculated by multiplying the payment for an initial admission by the adjusted total of excess hospital readmissions (American Hospital Association, 2015). This excess cost calculation number is then multiplied by a national readmission fee per each specific diagnosis, such as pneumonia, and, heart failure (American Hospital Association, 2015). The fee, further, is cumulative, and takes into account the hospital's past performance regarding readmissions, thus requiring hospital's to continuously improve their quality performance (American Hospital Association, 2015).

The final readmission penalty is thus a reflection of the current rate of readmissions, assessed in relation to excess readmission costs, and compared to the national average (American Hospital Association, 2015). A hospital's performance therefore, is measured relative to both past and current performance, and compared with the national average. Hospitals are thus best advised to have no readmissions, as the hospital's past performance is calculated into future year calculations (American Hospital Association, 2015). Many hospitals disagreed with this formula, stating it did little to address improvements organizations made to reduce readmissions (American Hospital Association, 2015).

The penalties assessed by CMS were deemed essential to promote a change in heart failure and chronic condition disease management, as up to 75% of readmissions were deemed preventable, costing \$12 billion dollars annually (Herzog, 2013). The message was clear from government. Health care organizations were expected to improve healthcare quality, care transition

efficiency, and, reduce costs, astutely monitoring patients across the care continuum (CMS, 2012). Hospitals were also expected to actively engage patients in their disease management and learning process to help reduce readmissions and re-visits (Herzog, 2013).

The Future of Government Quality Penalties: Policy

The hospital readmission penalties are clearly here to stay despite discontent from many hospital organizations. Many healthcare organizations have lobbied Congress to suggest an adjustment of the penalty calculation, taking into account patient socio-demographic factors, which often influence readmissions (American Hospital Association, 2015). Hospital leaders have stated that socioeconomic status must be adjusted for, and, the penalty needs to truly reflect the quality of care provided in their organization, in their specific regions (American Hospital Association, 2015).

It appears some form of risk-adjusted penalty will be implemented in the future, but the planning and calculation of these complex formulas is in itself, quite laborious and time consuming (American Hospital Association, 2015). The status and scope of future penalty calculations, further, is likely to expand and increase, with the addition of more diagnoses and/or quality measures. CMS is aligned with the National Quality Forum (NQF) and is required to use its measures (American Hospital Association, 2015).

Heart Failure Core Measure Set: A Joint Commission Standard

The Joint Commission (TJC, 2013) approved a new Heart Failure (HF) Core Measure Set for renewed hospital accreditation in 2012. This new HF Core Measure Set coincided with the new HRRP, with hospitals needing to demonstrate

evidence of compliance with the full heart failure core measure set for quality reporting compliance, accreditation, and, to receive Medicare financial reimbursements. This new HF Core Measure Set represents a standard released by the Joint Commission (TJC) to better assess the quality of care provided to heart failure patients, providing key specific evidence-based practice recommendations to reduce hospital readmissions and Medicare spending on heart failure disease-specific costs (TJC, 2013).

The HF Core Measure Set consisted of four key measures: (1) HF-1 Discharge instructions, (2) HF-2 LVEF (left ventricular ejection fraction assessment), (3) HF-3 ACE-I for LVSD (angiotensin-converting enzyme inhibitor for left ventricular systolic dysfunction), and (4) HF-4 Adult smoking cessation advice/counseling (TJC, 2013). TJC (2013) stipulated HF-1 Discharge instructions were to be reviewed with patients and families prior to discharge as patient non-adherence with physician discharge instructions has been, and still is, a major cause of heart failure readmissions (TJC, 2013).

HF-1 discharge instructions address six required heart failure management behaviors: (1) activity level, (2) diet, (3) discharge medications, (4) follow-up medical appointments, (5) weight monitoring, and (6) action to be taken if symptoms worsen (TJC, 2013). Heart failure experts stipulated patients needed to understand their heart failure prognosis, the purpose of their medications, dietary restrictions, activity status requirements, and self-care tasks to comply with physician instructions to prevent readmissions (TJC, 2013). Providing discharge instructions was seen an essential step where patients could take action to be compliant with care, and, inform providers of important changes in status so proactive decisions could be made.

The HF-2 LVEF assessment recommendation ensures practitioners order a cardiac echocardiogram to accurately evaluate left heart wall function pumping ability upon admission to the hospital (TJC, 2013). Use of cardiac echocardiogram imaging studies is deemed the most accurate measure of left ventricular pumping ability, and, to accurately identify left ventricular systolic dysfunction (TJC, 2002). The heart failure ejection fraction measurement drives effective provider prescribing of evidence-based medications and therapies to reduce heart failure continued dysfunction, and, to improve heart failure functional status (TJC, 2013). A LVEF < 40% is often considered a key point for ACE-I prescribing and intense provider follow-up to prevent readmissions (Lucca, 2015).

Administration of HF-3 ACE-I for left ventricular systolic dysfunction (LVSD) is essential to improve heart failure functional status, to alleviate symptoms, to enhance well-being, and to reduce hospitalizations, and, mortality risks (TJC, 2013). ACE-I are recommended for patients with diagnosed LVEF < 40% (Lucca, 2014). Heart failure patients are further recommended to receive smoking cessation counseling as up to 50% of cardiovascular patients resume smoking within one year of a hospitalization (TJC, 2013). In 2013, TJC stated it would no longer track HF-1 discharge instruction compliance, with this measure now tracked by quality regulators for conditional participation under the Affordable Care Act (CMS, 2015; Go et al., 2014).

Response to Government Policy Change

Organizational

In response to the HRRP penalty and new HF Core Measure Set, hospitals strove to implement evidenced-based readmission reduction strategies targeted at improving heart failure disease management, care coordination, patient counseling

and education, and timely follow-up post discharge (Grady et al., 2000). Many hospitals implemented strategies aimed at providing patient-centered care with attention to providing instructions geared to low health literacy and socioeconomic status demographic populations, as such populations were identified as high-risk readmission populations (Grady et al., 2000). Grady et al. (2000) stated patients who understood their instructions and diagnosis had a 30% reduced risk of being hospitalized, readmitted, and re-visiting the ED.

Hospital organizations, further, strove to reduce readmissions by opening emergency room outpatient observation units, with patients observed, monitored, and/or admitted within 24-hours (Peacock, 2012). Many hospitals quickly noted this strategy proved effective, from a cost perspective, as patients treated in ED's were not tracked and penalized as readmitted patients (Peacock, 2012). Patients could, in essence, re-visit ED's multiple times within a 30-day period, or, be admitted to the hospital, and re-visit the ED within 30-days, without receiving a readmission penalty (Peacock, 2012).

A number of evidence-based heart failure readmission strategies were set forth for organizational leadership. Most strategies included early identification of the heart failure patient on admission to the hospital, or ED, for aggressive discharge planning, care coordination, and patient education and counseling (American Association of Heart Failure Nurses, AAHFN, 2015). Key elements of readmission reduction strategies emphasized improving communication across providers, enhancing patient heart failure education, and, ensuring care coordination post discharge was supported (AAHFN, 2015).

In 2015, the AAHFN set forth key strategy emphasizing education of the heart failure patient upon admission to the ED. The AAHFN (2015) stated ED's or ED nurses were to initiate HF individualized patient education addressing HF

dietary, sodium, medication compliance, and patient self-care expectations. The AAHFN (2015) recommended ED's develop heart failure treatment protocols and admission algorithms to ensure the proper implementation of diagnostic testing and goal directed therapies and evaluation. The AAHFN (2015) stated these measures would ensure patients' responses to therapies were evaluated, self-care discharge instructions were provided, and patients were admitted as appropriate, or discharged if indicated with a follow-up appointment within three days (AAHFN, 2015).

In-patient heart failure readmission reduction strategies emphasized using established standards for treatment, staff education, and, to evaluate program outcomes (AAHFN, 2015). Heart failure specialty organizations recommended use of strategies proven effective for reducing 30-day readmissions. These strategies included: (1) partnering with community providers and hospitals to reduce readmissions, (2) reconciling and clarifying patient medications, (3) ensuring patient discharge summaries are provided timely to follow-up providers, (4) follow-up appointments are made prior to discharge, and (5) assigned team members follow-up test results post patient discharge (AAHFN, 2015). The use of risk-prediction models, further, has proven effective for reducing heart failure readmissions, with Project RED (Re-Engineered Hospital Discharge) cited as a popular example (AAHFN, 2015).

Project RED: (Re-Engineered Hospital Discharge)

Project RED was one highly popular intervention implemented by hospitals to assist with reducing readmissions. Many Project RED hospitals used an enhanced discharge planning strategy with realized readmission reductions as high as 30%, and, for heart failure, 29% (American Hospital Association, 2011). With

Project RED, patients were assigned nursing “discharge advocates” who ensured patients understood their diagnosis, arranged their post-discharge appointments, and, verified medications (American Hospital Association, 2011). A patient educational discharge instruction booklet was given to both primary physicians, and patients, to facilitate consistency of communications in follow-up appointments (Boutwell & Hwu, 2009). Project RED is a team-based initiative, with the nurse navigators facilitating the discharge process and education on admission (Boutwell & Hwu, 2009). Physician, nurse, and relevant care coordinators share relevant communications during the patient course of stay.

Nursing discharge advocates ensured discharge instructions were provided to patients and sent to the primary provider within two days (American Hospital Association, 2011; Landro, 2011). Patients were followed up by telephone within two days to ensure problems were identified, and, resolved, with pharmacists also ensuring medications were understood (American Hospital Association, 2011; Boutwell & Hwu, 2009; Landro, 2011). Project RED has proved successful for reducing 30-day readmissions by 30% (both ED and hospital) (Boutwell & Hwu, 2009). Project RED physician utilizers stated that use of Project RED required high provider time investment to realize cost savings (American Hospital Association, 2011; Landro, 2011).

Heart Failure Emergency Room, or Outpatient Heart Failure Specialty Units

Heart failure specialists, in 2009, advocated the development of heart failure ED short-stay observation units as a strategy to improve heart failure patient access to affordable, high-quality, heart failure care for up to 48 hours (Peacock, 2012). Key recommendations included the use of standardized risk-stratification criteria, best practice protocols, and, discharge assessment criteria

(Peacock, 2012). Standardization of order sets and discharge instructions was important to ensure high-quality care would be delivered consistently, and, to ensure all required quality measures were fulfilled (Peacock, 2012).

Heart failure specialists further recommended all staff receive training regarding heart failure unit policies and competency expectations (Peacock, 2012). All staff were recommended to receive access to ongoing heart failure education (Peacock, 2012). Heart failure experts emphasized leadership organizational support for the heart failure program was essential, with leadership also needing to ensure key linkages were aligned with community partners, emergency personnel, and agencies that support preventive care delivery services, and provision of heart failure care services (Peacock, 2012).

From the financial standpoint, experts stated the key benefits to a heart failure ED outpatient heart failure unit (OU) included the ability to provide timely, efficient, high-quality care within a specified time frame, using organizational resources and staff efficiently (Peacock, 2012). Placing risk-appropriate heart failure patients in the ED OU unit offered the key advantage of avoiding readmission penalties, and/or “watching the clock” once patients were admitted (Peacock, 2012). Hospitals, further, had the ability to bill for the heart failure visit as an acute patient service visit (APS), with laboratory and related tests billed separately (Peacock, 2012). Peacock (2012) stated the use of ED OU had resulted in a 36% decrease in hospital readmissions, a 44% reduction in revisits, a 39% decrease in OU re-hospitalizations, and, a 9% increase in ED discharges. The typical reimbursed charge in the OU was billable as an Acute Patient Charge (APC) level IV or V, with hospitals receiving a baseline payment of \$714.00 (Peacock, 2012).

Social Work Follow-Up Interventions

Rush University Medical Center reduced high-risk heart failure readmissions successfully by having social worker follow-up with heart failure patients post-discharge (American Hospital Association, 2011). Readmission rates for 30-day, 60-day, and 90-day readmissions were reduced significantly. Thirty-day (30-day) heart failure readmission rates were reduced by 15%, 60-day readmissions by 23%, and 90-day readmissions by 23% (American Hospital Association, 2011). Rush researchers utilized a randomized control design, with patients identified for follow up based on clinical condition and social support factors identified in the electronic medical record (American Hospital Association, 2011). Social workers called patients, identified problems, and were available for support as long as needed (American Hospital Association, 2011). This strategy had a significant impact as up to 83% of patient identified problems were not reported until post-hospital discharge for up to 74% of patients (American Hospital Association, 2011).

Specialized Hospital Heart Failure Units

The American Hospital Association (2011) reported a unique case involving the Metro Health Systems success in reducing heart failure readmissions from 15.5% to 7.4%. Metro Health opened a specialized heart failure unit staffed specifically by nurses with specialized heart training (American Hospital Association, 2011). These nurses developed heart failure educational literature addressing important topics, including self-care, dietary restrictions, and limitations (American Hospital Association, 2011). Nurses reviewed materials with patients proactively while in the hospital, and, follow-up appointments were pre-scheduled prior to discharge (American Hospital Association, 2011).

Transitional Care Planning

Nurse-led post-discharge nurse-practitioner practice models were used to assist with reducing complex hospital readmissions. Nurse practitioners were charged with ensuring patients were engaged, actively involved in their care, understood their medications and warning symptoms, and received timely follow up post discharge (Institute for Healthcare Improvement, IHI, 2011; Naylor et al., 2004). The Naylor (2004) nurse practitioner post-discharge model led to successful reductions in heart failure readmissions: Intervention: 104 heart failure patients readmitted vs. Control: 162 readmissions ($p < .05$) (IHI, 2011).

The Coleman, Parry, Chalmers, & Min (2006) care-transitions intervention (CTI) also proved successful in reducing 30-day heart failure readmissions. With the care-transitions intervention (CTI), teams of professionals identified heart failure patients early in the admission process, provided heart failure education and problem-solving assistance, and, ensured patients received timely follow-up within three days (Coleman et al., 2006). Results from the randomized-control study revealed the CTI-intervention group had 8.3 readmissions, versus 10.6 readmissions for the control group (Coleman et al., 2006).

Leadership Directed Hospital Heart Failure Nursing Educational Interventions

Nurse organizational leaders have promoted heart failure quality improvement change. Sterne et al. (2014) utilized a pre-test, post-test research design to evaluate the effectiveness of a one-hour hospital nurse heart failure educational session and evidence-based instructional slide-show. Nurses reviewed the heart failure educational slide-show and attended a one-hour heart failure educational session (Sterne et al., 2014). Nurse heart failure scores increased from

a Mean of 73.89 to a Mean of 82.0 ($p < .001$), with 30-day readmissions decreasing from 25.4% ($n=16$) to 9% ($n=5$) (Sterne et al., 2014).

Mahramus et al. (2014), in a similar way, developed a nurse heart failure educational in-service educational course to teach nurses about heart failure. Mahramus et al. (2014) were on-site nurse educators, likewise capable of testing new practice change. Hospital nurses from different units participated in an on-site educational course with teach-back instruction, with nurse heart failure knowledge scores increasing pre-test to post-test, from a Mean of 66.5 (pre-test), to a Mean of 82.1 ($p < .001$) (post-test) (Mahramus et al., 2014).

General Recommendations: Patient Education and Documentation

Heart failure experts recommended the use of multiple strategies to reduce heart failure readmissions (AAHFN, 2015). Typical recommendations included: (a) ensuring medication lists are reconciled, (b) ensuring the patient's New York Heart Association (NYHA) heart functional status is documented, (c) the patient's functional status, learning barriers, contact, and appointment information are recorded (d) lab tests and discharge summaries are available, (e) a standardized checklist and heart failure protocols are used, and (f) angiotensin-converting enzyme inhibitor usage is recorded (AAHFN, 2015). The AAHFN (2015) advocated early patient self-care education in the ED with staff verifying patient understanding using teach-back teaching.

Heart failure experts recommend patients receive key information to maximize their participation in self-care, and, to reduce preventable readmissions (AAHFN, 2015). Patients were recommended to receive diet, exercise, weight monitoring, and symptom monitoring instructions (AAHFN, 2015). Patients' instructions were to include: (a) dietary instructions: < 3 grams of sodium per day,

(b) physical activity recommendations, physical therapist recommendation first, (c) daily weight monitoring: ensure has a scale, records weight in log, reports 2 pound weight gain, (d) symptom reporting and monitoring instructions: shortness of breath, edema, weight gain, nausea, fatigue, (e) fluid restriction: < 2 liters per day, (f) orientation to the Target-Get With the Guidelines heart failure instructions (AAHFN, 2015).

Patient Socio-demographic Factors Affecting Readmissions

Health care organizational leaders noted that many factors out of their direct control were linked with higher patient readmission rates, including patient race, insurance status, health literacy, and, economic status (American Hospital Association, 2011). For example, African-American males were noted to be higher-utilizers of safety-net hospitals, with higher rates of readmissions (American Hospital Association, 2011). Hospitals serving low income, Social Security, Medicaid patients, and minority populations reported higher ED readmission rates (American Hospital Association, 2011; Bhalla & Kalkut, 2010; Jiang & Weir, 2010). Social-worker interventions were recommended to involve the family and patient in self-care and heart failure education to assist with reducing readmissions (AAHFN, 2014). Social workers are uniquely qualified to provide additional problem solving resources and education to help patients problem solve person-family specific issues, such as managing medication costs, or, strategizing how to arrange transportation to physician appointments (AAHFN, 2015).

Functional status, patient adherence, comorbidities

Successful heart failure readmission reduction interventions need to address important functional status, patient non-adherence, and comorbidity factors. Heart failure 30-day readmission rates have been noted to be higher for 18.2% of Medicare patients with three or more functional limitations (Greyson, Censer, Auerbach, & Covinsky, 2015). Patient non-adherence with treatment, further, especially non-compliance with medications, diet, and self-care predicted 23% to 60% of readmissions (DiDomenico et al., 2010; Grady et al, 2000). Higher numbers of patient comorbidities, further, especially diabetes, end-stage renal disease, peripheral vascular disease, depression, heart failure, and stroke were associated with higher 30-day readmissions (American Hospital Association, 2011; Aranda, Johnson, & Conti, 2009).

The literature review indicated that many patients are not compliant with medications (Grady et al., 2000). The reasons for patient non-adherence or non-compliance with medications are numerous, including the high cost of medications, a lack of medication purpose and understanding, poor provider communication, patient forgetfulness, and taking too many medications (American College of Cardiology, ACC, 2015). The use of effective discharge planning, pharmacist-patient counseling, and home nurse follow up was recommended to assist with patient's understanding their medications, resolving medication issues, and reducing readmissions (ACC, 2015).

Nurses, physicians, and social workers have played an important role in providing patients the social support needed to engage in medication self-care activities (ACC, 2015). A multidisciplinary team strategy has been deemed an essential, effective strategy to assist with the reduction of heart failure readmissions. Key team strategy interventions have included the use of

advanced-practice nurse practitioners, discharge planners, home-care nurses, and telephone follow-up personnel to ensure patient, family, caregiver, and family needs were met before, during, and, after ED discharge (Grady et al., 2000).

Health Literacy Intervention

Patient health literacy, or one's ability to understand, process, and comprehend information to make informed decisions, is associated with heart failure readmission rates (Cloonan, Wood, & Riley, 2013). Persons who cannot read medication labels, and/or process diagnostic information are at increased risk for readmission (Cloonan et al., 2013). The use of patient "teach-back" strategies are recommended to increase patient knowledge of their discharge instructions and medications, with patients repeating back, in their own words, what they understand, so information can be clarified (Cloonan et al., 2013). Regalbuto, Maurer, Chappel, Mendez, and Shaffer (2014) stated only 12% of heart failure patients reported understanding of their instructions.

Strategies to assist low health literacy patients include employing the use of patient "teach-back" strategies, slowed patient conversations, follow-up reminders, and tailored telephone messages, and, the use of simple, comprehensible diagrams and materials (Cloonan et al., 2013). DeWalt et al. (2004), a leader in heart failure health literacy management for patients states educational materials must be tailored to the patients educational and learning level. DeWalt et al. (2004) developed a one-hour heart failure instructional session where either a pharmacist or nurse educator worked with low socioeconomic and low health literacy heart failure patients to ensure they understood their diagnosis, instructions, weighing, and medications.

Patients received one hour of instruction, a heart failure instructional booklet with pictures depicting health-literate heart failure concepts (DeWalt et al., 2004). Patients received information, pictures, and diagrams regarding weighing and recording of weights, avoiding sodium, and when to call the physician (DeWalt et al., 2004). At the end of the study, patients demonstrated improvement in monitoring their symptoms, stated they planned to continue monitoring their condition, and, reported an improvement in their self-reported quality of life score (DeWalt et al., 2004).

Summary of Findings

The selection of re-admission reduction strategies often involves improving care-coordination efforts across points of care, educating patients regarding their self care, training professionals to educate heart failure patients, and ensuring timely post-discharge appointments are planned (American Hospital Association, 2015). Silow-Carroll, Edwards, and Lashbrook, (2011) summarized the evidence above as it relates to readmission reduction intervention efforts, stating top-performing hospitals are not successful in reducing readmissions by focusing on such readmissions, but by heavily investing in continuous quality-improvement practice strategies.

Patients presenting with many of the complex issues mentioned above are strategically identified early, with resources dedicated to these persons to ensure they can adhere to their discharge plan (Silow-Carroll et al., 2011). Top performing hospitals improve quality utilizing several strategies. These quality improvement strategies include: (1) integrating evidence-based protocols into daily routines, (2) utilizing standardized protocols, and utilizing electronic health information systems (Silow-Carroll et al., 2011). Electronic health information

systems are used to identify high-risk populations, send electronic messages, and, to inform clinical decision-making (Silow-Carroll et al., 2011).

High performing hospitals proactively identify high-risk populations, including the uninsured, and heart failure patients (Silow-Carroll et al., 2011). These hospitals ensure such patients receive access to prescription funding, free clinic discharge appointments, and, post-discharge care (Silow-Carroll et al., 2011). Silow-Carroll et al. (2011) reported patients received individualized medication reconciliation and education, warning symptoms to watch for, and, what to do if warning symptoms occur. These authors reported these hospitals took special effort to ensure patients truly understood their discharge instructions, and warning symptoms, and adhered to such physician instructions (Silow-Carroll et al., 2011).

Silow-Carroll et al. (2011) further reported that point-of-care persons, including nurses, pharmacists, discharge coordinators, and hospitalists provided individualized patient-education for high-risk patients, and, all hospital patients, as well as outpatient clinic patients. These hospitals ensured high-risk population health care services were integrated across outpatient and inpatient service settings (Silow-Carroll et al., 2011). Top hospitals ensured care processes were aligned across inpatient and outpatient setting so care was aligned, communication could be shared timely and effectively, and, clinical decisions could be made based on evidence-based best practice protocols (Silow-Carroll et al., 2011). Education, care integration, and access to high-quality, cost-effective care are the key concepts required for readmission reduction efforts to be successful.

Moving Forward – Nurses’ Education of Heart Failure

The primary strategies for readmission reduction emphasized seamless

inpatient to outpatient care coordination, with patients receiving evidence-based heart failure education from nurses (AAHFN, 2015; Silow-Carroll et al., 2011). Silow-Carroll et al. (2011) reported nurses should begin heart failure patient education early, tailoring heart failure education to the patient's health literacy and learning levels, verifying patient understanding using teach-back principles. Teach-back instruction involves nurses providing instructions, with patients stating back, in their own words, what they understand, so information can be clarified (AAHFN, 2015). Nursing use of teach-back principles is advised as it allows for engagement of lower socioeconomic and high-risk minority populations which may lack the ability to read, process, and comprehend complex instructions (AAHFN, 2015). Heart failure experts state patients who understand their self-care instructions are more likely to adhere to the treatment plan (AAHFN, 2015).

New Trends in Heart Failure Care

In 2015, the AAHFN (2015) advanced new strategy for heart failure patient education stating such education should begin with admission to the ED. This shift to start of education with admission to ED was advanced as growing numbers of heart failure patients were being treated in ED short-stay units, making it difficult to plan heart failure patient education with the typical hospital admission (AAHFN, 2015). The AAHFN (2015) further reported education needed to be started early, as the American Heart Association Get-With-The-Guidelines (GWTG) emphasized patients should receive one hour of heart failure patient education (American Heart Association, 2011, 2013).

In 2015, the AAHFN (2015) took the lead and thus set forth best practice guidelines for 24-hour monitoring of heart failure patients in short stay units, using

evidenced-based protocols, standardized admission and discharge criteria, and pre-printed order sets (AAHFN, 2015). ED physicians also recommended monitoring heart failure patients in ED short-stay or heart failure observation units (Peacock, 2012). Physicians stated use of ED observation units led to decreased hospital admissions, readmissions, and ED revisits (Peacock, 2012). ED physicians reported the 24-hour time frame expanded physician clinical decision-making ability, enabling ED doctors the opportunity to observe, intervene, and possibly discharge, or admit patients within 24 hours (Peacock, 2012).

ED physicians continued to advocate the use of ED service capacity to advance new heart failure quality initiatives. New ED short-stay advanced heart failure treatment algorithms were introduced which emphasized the use of diuretics, 24-hour cardiac monitoring, airway support, and oxygen therapy (Peacock, 2012). ED nurses were thus directly responsible for the immediate triaging, identification, and provision of life-saving oxygen and medication therapies for ED heart failure patients (AAHFN, 2015). ED nurses were simultaneously responsible for initiating heart failure patient education discussions when the patient stabilized. This is a complex task, as ED nurses must prioritize care tasks by order of highest emergency (AAHFN, 2015).

Key Issues Associated with New Heart Failure Patient Education Timelines

Many of AAHFN and ED physician heart failure practice recommendations were advanced with no discussion regarding training of ED nurses and ED physicians. Some physician experts voiced mortality risks associated with discharging heart failure patients from ED, as, in one study, up to 1.3% of ED heart failure patients died within seven days of discharge from the ED (Lee et al., 2010). The literature reflected no set strategy dictating to hospitals what resources

should be used for ED nurse heart failure education, patient education, and, how ED nurse heart failure knowledge can be evaluated, to properly educate patients for self-care.

What is Known and Missing in Nursing Heart Failure Knowledge Research

Dr. Albert, a prominent nurse heart failure researcher and nurse leader, conducted some of the earliest nursing heart failure nurse research in 2002. Albert et al. (2002) were some of the earliest advocates of nursing heart failure education. Albert et al. (2002) voiced concerns that many nurses lacked the necessary heart failure knowledge necessary to properly educate patients regarding heart failure self management, and, to advance heart failure quality improvement efforts. Albert et al. (2002) stated the typical nurses' educational curriculum included heart failure pathophysiology and treatments in nursing school, with nurses learning heart failure related protocols and procedures, when hired by hospitals.

Dr. Albert (2002) developed the first reliable and valid nurse heart failure knowledge evaluation tool, the only one available for use, with permission, by researchers. Dr. Albert conducted her first nurse heart failure knowledge research study from 2000 to 2002. Dr. Albert (2002) surveyed 300 nurses working as heart failure, critical care, and floor nurses, working in community and university settings. Albert et al. (2002) surveyed nurses working in palliative care, home care, critical care, and heart failure nursing roles. Albert et al. (2002) used self-efficacy theory as a framework for their study, postulating nurses with more heart failure education would be more confident and prepared to step in and provide heart failure patient education during their busy workdays.

Nurses' knowledge of heart failure was evaluated using the reliable and valid (Kappa .70, + construct, validity) *Nurses' Knowledge of Heart Failure*

Education Principles Survey (KNHFEP), a 20-item true-false survey covering six key heart failure self-management topics (Albert et al., 2002). These six heart failure topical themes for nursing and patient instruction address: diet (3 items); exercise (2 items); weight or fluids (7 items); medications (2 items); signs and/or symptoms of worsening heart failure (6 items). A total of 17 to 18 correct responses, or 85% to 90% correct items, is considered a passing score (Albert et al., 2002).

Albert et al. (2002) reported the overall group mean heart failure nurse knowledge score was Mean=15.2, with registered nurses scoring higher than licensed vocational nurses (M=15.3 vs. M=14.1, $p = .004$) (p. 102). Heart failure nurses demonstrated higher heart failure knowledge scores vs. critical care and surgical-medical, telemetry nurses (M=16.2 vs. M=15.1; vs. M=14.7, $p < .001$). Nurses from home care scored higher than hospital versus palliative care practicing nurses (M=15.9 vs. M=15.1 vs. M=14.0, $p = .006$). Albert et al. (2002) informs readers, that this finding may be slightly biased as some home nurses participated in a four-hour heart failure self-management session 30 days prior to the study. Other participants received varying levels of heart failure education, or, none (Albert et al., 2002).

Nurses were reported to lack proficient knowledge of the ideal weight as it pertains to daily weighing, asymptomatic hypotension, and short-term postural dizziness (< 30% correct group response scores) (Albert et al., 2002). Additional findings reflected an overall group knowledge deficit (group scores: range: > 30% correct, < 75% correct) regarding use of active exercise with heart failure, the use of potassium salt substitutes, non steroidal anti-inflammatory agents (NSAIDS), and, non-usage of lean deli meats for a diet low in sodium (Albert et al., 2002). Nurses demonstrated heart failure knowledge competence (> 90% of subjects'

responses were correct) regarding fluid restrictions, medication and low-sodium diet adherence, and warning symptoms (Albert et al., 2002).

Albert et al. (2002) concluded that many nurses lacked sufficient heart failure knowledge to properly educate heart failure patients. Nurses submitted incorrect responses across all five content themes (Albert et al., 2002). Albert et al. (2002) advocated for nurses' receiving proper heart failure education regarding patient self-management concepts using high-quality content material. Albert et al. (2002) reported such education was essential to ensure nurses felt prepared and self-confident to teach heart failure education to patients during their busy work day. Albert et al. (2002) expressed concern that nurses were often unaware of their lack of knowledge of heart failure concepts demonstrated by nurses failing to request additional information on the question in the survey.

Building from Albert's Research

Several nurse leaders, functioning as nurse clinical leaders or educators, chose to use the KNHFEP survey, some using a heart failure instructional intervention, to improve and evaluate nurse knowledge of heart failure. One of the most striking findings in nurse heart failure research conducted includes the lack of research directed at one homogenous nursing sample population, to increase study reliability and validity, and, to reduce sampling variation. Albert et al. (2002), for example, surveyed nurses across five different settings, work roles, and hospital types, thus making it difficult to generalize findings for any specific nursing population, or, hospital setting.

Another key deficiency in nurse heart failure research included the lack of any published, tested, evidence-based nurse heart failure educational interventions, for use in nursing heart failure research studies. Sterne et al. (2014) reported the

use of an evidence-based nurse heart failure educational slideshow, with nurses participating voluntarily in a one-hour, on-site nurse heart failure educational course. Nurses' heart failure knowledge was evaluated pre/post intervention with the KNHFEP survey (Sterne et al., 2014). Sterne et al. (2014) functioned as hospital nurse clinical nurse leader and nurse educators in a Northeastern U.S. hospital. Sterne et al. (2014), similar to Albert et al. (2002), noted many nurses lacked adequate knowledge of heart failure self-management concepts. Sterne et al. (2014) reported nurse heart failure self-management knowledge could be improved with focused heart failure evidence-based education.

Sterne et al. (2014) utilized an exploratory, descriptive, quantitative research study design to explore the effect of a nurse heart failure educational program on nurses' knowledge of heart failure and hospital heart failure 30-day readmissions, pre/post intervention. Sterne et al. (2014) reported 45 (N=45) nurses participated in the educational program, with nurses' heart failure knowledge scores evaluated pre/post intervention. Hospital 30-day heart failure readmissions were evaluated three months prior to, and post intervention (Sterne et al., 2014). Pre-intervention hospital heart failure admissions were assessed from May to July, with the intervention occurring in August, and post-intervention readmissions evaluated from September to November (Sterne et al., 2014).

The results of the Sterne et al. (2014) research study indicated nurses' heart failure knowledge increased, approaching the passing score of 85% correct items per nurse. Nurse heart failure knowledge scores increased from a pre-test Mean of 73.89, SD= 9.59, to a post-test Mean=82.0, SD =7.59, $t=-6.09$, $p < .01$ (p. 102). Heart failure 30-day pre/post intervention readmissions were also reduced from 25.4% (n=16) to 9% (n=5). Forty-five (N=45) nurses from more than eight different units participated in the study: medicine (n=1); medical oncology (n=4);

telemetry (n=11); critical care (n=2); emergency department (n=2); surgery (n=5); maternity (n=6); and, other (n=14). Nurse learning and experiential levels thus range widely, therefore limiting generalization of findings for one department.

The authors reported the intervention positively impacted both nursing and the organization's ability to deliver high-quality, cost-effective heart failure care and patient education. Sterne et al. (2014) advised future educational interventions emphasize cost-effectiveness and time-efficiency so nurses' learning time and knowledge retention are optimized. Sterne et al. (2014) further recommended nurses receive exposure to teaching strategies for older adults, community resources to support heart failure patients upon discharge, and explicit instructions for teaching heart failure discharge instructions to patients (HF-1).

Heart Failure Nurse Education and Teach-Back Strategies

Mahramus et al. (2014) employed the use of a comprehensive nurse heart failure educational intervention and the NKHFEP survey to evaluate the effectiveness of a comprehensive heart failure self-care educational intervention and teach-back strategies. Mahramus et al. (2014) utilized a quantitative, pre-test/post test study design to evaluate nurse heart failure knowledge pre, post, and three months post intervention. The heart failure educational intervention was evidence-based and provided on-site in lecture format over three and one-half hours.

Pre-tests were completed prior to the intervention, and, immediately post intervention. A total of 131 (N=131, time 1) subjects completed the first pre-test/post-test survey after attending the in-service. Mahramus et al. (2014) then sent follow-up emails to nurses via the electronic hospital email system. Electronic emails contained additional heart failure education regarding each HF-1 concept,

such as diet, and, medications (Mahramus et al., 2014). Mahramus et al. (2014) then sent an electronic link for nurses to re-take the NKHFEP survey three months post-intervention, and, after reviewing the emailed evidence based heart failure education. A total of 61 subjects (N=61) completed the 3-month post follow up survey. Three month post-intervention scores reflect (N=61) NKHFEP scores extracted from the larger sample for evaluation at baseline, and, at three months.

Mahramus et al. (2014) recruited 250 nurses from four in-patient nursing units where nurses typically care for heart failure patients. The hospital system was stated to be a large hospital system in the Southeastern United States (Mahramus et al., 2014). Mahramus et al. (2014) offered the intervention eight different times during a two-month timeframe at three different sites. The education intervention lasted approximately three and one-half hours (3 ½), and included a lecture and discussion regarding evidence-based heart failure care, self-management principles, and teach-back strategies with simulation (Mahramus et al., 2014).

A total of 131 nurses (N=131) nurses completed the pre-test/post-test NKHFEP surveys at time one, and, only 61 nurses (N=61) nurses completed follow-up surveys three months-post intervention (Mahramus et al., 2014). Units where nurses participated included: acute care tertiary hospital heart failure unit (n=9), two acute progressive care community hospital units (n=10), (n=25), and, home health (n=17) (Mahramus et al., 2014). Nurses' who completed the first pre-test/post-test surveys demonstrated significant improvement in basic heart failure concepts: Time 1: Pre-test: M=65.1(SD=13), Post-test: M=80.6(SD=9.7), $p < .001$ (Mahramus et al., 2014). Nurses' heart failure knowledge further improved significantly at three months with additional heart failure education: (N=61) Time 2: Pre-Test: Baseline Time 1: M=66.5 (SD=12.9), $p < .001$; Time 2: at 3 months:

Post-test: $M=89.5$ ($SD=7.5$), $p < .001$ (Mahramus et al., 2014). Focused reinforcement regarding teach-back instruction and heart failure education was provided to nurses in the follow-up period, with nurses provided evidence-based links and learning prompts (Mahramus et al., 2014).

These authors reported the percentage of nurses' passing ($\geq 85\%$ correct items) increased after three months. The baseline pre-test ($M=65.1$)/post-test $M=80.6$) scores failed to meet Albert et al. (2002) passing criteria despite significantly improved nurses' knowledge of heart failure. At three months, the overall NKHFEP post-test $M=89.5$ ($SD=7.5$) reflected a passing score per Albert et al. (2002) criteria stipulated a score of $n=17$ correct, or, 85% or more correct items was required to pass the NKHFEP. It was significant to note Mahramus et al. (2014) stated only 6.6% of nurses passed during the pre-test period, 45.9% passing during the post-test period, and, 88.5% of nurses passing three-months post intervention (Mahramus et al., 2014). A call for nurse heart failure replication studies, and teach-back effectiveness on nurse learning was recommended, as they authors reported nurses required proctoring to pass teach-back simulations, and develop teach-back skills (Mahramus et al., 2014).

Additional NKHFEP Nurse Heart Failure Knowledge Research

Additional nurse heart failure research reflects a similar lack of nurse heart failure knowledge. Willette, Surrells, Davis, & Bush (2007), in a quantitative, correlational study using the Albert (2002) KNHFEP survey, reported higher critical care versus telemetry NKHFEP nurse heart failure knowledge scores: $M=16.31$ ($SD 1.96$) vs. $M=15.47$ ($SD=1.93$), $p > .05$. Nurses with greater than two years experience scored higher than nurses with less than two years experience (Mean of 16.19 vs. Mean 14.93, $p = .031$) (Willette et al., 2007).

Willette et al. (2007) reported nurses lacked adequate knowledge regarding asymptomatic hypotension, transient dizziness, and dry weight gain assessments. Willette et al. (2007) emphasized patients need access to daily weight charts with their dry weight included, so they can adequately compare the weight gain to the dry weight, for reporting to the physician. Willette et al. (2007) further stated nurses did not understand that many heart failure medications cause reductions in blood pressure, heart rate, and cause transient dizziness, which is normal. Many nurses incorrectly stated a low, asymptomatic blood pressure (80/56) and transient dizziness should be reported to the physician (Willette et al., 2007).

Washburn and Hornberger (2008) likewise conducted a quantitative nurse research study evaluating nurse heart failure knowledge for community hospital nurses from a Midwestern Hospital. All nurses from a medical unit (n=14) and intensive care unit (n=41) provided care to heart failure patients, with nurses demonstrating similar nurse heart failure knowledge scores: (ICU M=14.7, SD=1.6; medical unit: Mean=14.5, SD=2.1, $p > .05$). The mean overall nurse heart failure mean score was 14.6 (SD=2) (range: 8-19). Washburn et al. (2008) reported nurses often incorrectly answered non-steroidal anti-inflammatory drug (NSAID), potassium salt substitute, weight gain assessment, and asymptomatic hypotension reporting questions. Washburn et al. (2008) stated nurses require knowledge of heart failure pathophysiology during the education process.

Delaney et al. (2011) reported an overall home nurse heart failure nurse knowledge score of M=15.78 (SD 1.69) using the NKHFEP survey. The percentage of correct answers for certain questions was likewise low: asymptomatic hypotension (24.5% correct); dry weight gain reporting (26.6% correct), transient dizziness (30.9% correct) (Delaney et al., 2011). Less than 70% of nurses correctly answered questions addressing the use of NSAIDS, potassium-

based salt substitutes, and a five pound weight gain in five days (Delaney et al., 2011). Delaney et al. (2011) reported home nurses required more access to evidenced based heart failure education to assist with managing heart failure, to reduce readmissions, and, to reduce ED visits.

Fowler (2012) reported minor improvement in community nurses' heart failure knowledge after ED exposure to informal heart failure education, and messaging prompts. Messaging prompts included information regarding heart failure topics, self-management, beta blockers, and NSAIDS (Fowler, 2012). Fowler (2012) stated the mean pre-test score was 16.0, but the post-test mean score could not be collected due to complications with extracting data from Survey Monkey. Fowler (2012) determined nurse knowledge increased with nurses answering more questions correctly post intervention (n=15) (Fowler et al., 2012). Fowler (2012) advocated nurses join the AAHFN to have access to current heart failure research, with colleges getting involved in nurse heart failure education efforts.

Summary of Nurse Heart Failure Research

As these findings indicate, no published evidence-based nurse heart failure educational interventions are accessible to proficiently educate nurses regarding heart failure. These studies indicate the majority of nurses lacks the essential heart failure knowledge necessary to effectively manage heart failure patients, and, to educate heart failure patients for self-care. Nurse educators advise educational programs be developed based on evidence from sound expert heart failure organizations, such as the AAHFN, the American Heart Association, and, the Heart Failure Society of America (HFSA).

These studies further indicated the NKHFEP tool is a respected measure of nurse heart failure knowledge to be used in evaluating nurse knowledge of heart failure, and, the effectiveness of nurse heart failure educational interventions. It is important to note that these studies highlight significant gaps in the literature, specifically, the use of small sample sizes, wide sampling variation across nurse work roles, and, across different hospitals. There is an obvious need to explore nurse knowledge of heart failure on the front lines, with nurses directly accepting heart failure patients into direct care service delivery, such as the emergency rooms of today. There is a great need to develop an evidence-based nurse heart failure educational intervention for use with a homogenous ED nurse population to expand research in this area, and, to enhance the generalizability of findings.

Researching the Gap in ED Nurse Heart Failure Education

Background and Significance of the Study

Heart failure is a chronic, progressive disease projected to cost the U.S. \$70 billion dollars by 2030 (Go et al., 2014). An estimated 825,000 new heart failure cases are diagnosed annually, with heart failure disease incidence projected to rise 46% within 15 years, surpassing 8 million heart failure patients (Go et al., 2014). Heart failure is extremely difficult to manage, with patients often suffering acute exacerbations of heart failure symptoms (AHFS) requiring emergent resuscitation and stabilization in the ED (Weintraub et al., 2014). In 2014, ED's treated an estimated 958,167 patients, with the ED now considered the gatekeeper of heart failure readmission and cost-control efforts (AAHFN, 2015).

ED nurses and physicians are expected to rapidly identify, stabilize, monitor, admit, and/or discharge heart failure patients from the ED to control costs

and reduce readmission penalty risks (Peacock, 2012). ED nurses now play a vital role in readmission reduction and ED heart failure quality improvement efforts. ED's are now charged with ensuring patients receive immediate access to evidence-based heart failure care, patient education, heart failure self-care management education, and, HF-1 discharge instructions (AAHFN, 2015).

Literature reflected, however, that no research has been conducted to evaluate ED nurse knowledge of heart failure. Such research is essential to ensure ED nurses are prepared and competent to proficiently educate heart failure patients for self-care, to manage heart failure patients in ED short-stay units, and to re-evaluate heart failure patients prior to discharge for stability (Anderson, 2014). Quality regulators emphasize direct care providers play a direct role in reducing ED re-visit and hospital readmission costs, with CMS instituting a 3% penalty to hospitals with high 30-day readmission rates (CMS, 2015).

At the center of high-quality care improvement efforts is ensuring patients receive full access to evidence-based heart failure care services and early heart failure patient education from trained ED nurse professionals. The estimated cost-savings of reducing one readmission, or, avoiding one readmission penalty, are estimated at \$40,000 and \$125,000 respectively (Brown, 2014; Warden et al. 2014). The effectiveness of an evidence-based ED nurse heart failure educational intervention on ED nurse knowledge of heart failure needs to be evaluated at this time so evidence-based educational programs can be funded in practice. No independent study involving ED nurses, and, ED nurse heart failure educational interventions has been conducted in the United States to date.

Evaluating ED nurse knowledge of heart failure is important as reimbursements and readmission penalties directly linked to 30-day heart failure hospital readmission rates (AAHFN, 2015). Desai and Stevenson (2012) state

80% of hospital admitted patients enter the hospital from the ED. ED nurse knowledge of heart failure must be assessed to ensure such professionals are competent to educate heart failure patients, provide discharge education, and assist with readmission reduction efforts (Casteel, 2012; CMS, 2015; Lee et al., 2010). Sterne et al. (2014) showed that increased nurse heart failure knowledge directly and/or indirectly led to reduced readmissions and costs.

Statement of the Research Problem

Research regarding ED registered nurse knowledge of heart failure and effective nurse heart failure educational interventions is limited. All efforts should be advanced to research the effectiveness of an evidence-based ED nurse heart failure educational intervention on ED nurse heart failure knowledge, to advance heart failure quality improvement efforts, ED nurse heart failure research, and to reduce preventable readmission costs and penalties. The ED is the new portal of health care access for many heart failure patients who deserve high-quality, cost-efficient, evidenced base care and heart failure education.

Statement of the Purpose for the Research

The purpose of this ED nurse research study was to produce new ED nurse heart failure research and to evaluate the effectiveness of an ED nurse evidence based heart failure educational intervention on ED nurses' knowledge of heart failure, pre/post intervention. Understanding the effectiveness of an ED nurse heart failure knowledge intervention is imperative for nurse leaders as they are responsible for quality outcomes, and the funding of nursing education to produce these outcomes. ED nurse leaders thus require proof that an evidence-based intervention works, so resources and funding can be directed toward such efforts. The fundamental research questions was: What is the effect of an evidenced-based

ED nurse heart failure educational interventional on ED nurse knowledge of heart failure pre/post intervention? The dependent variable was the Nurse Heart Failure Knowledge Score. The independent variable(s) was time, and exposure to the ED nurse heart failure educational intervention.

Theoretical Framework of the Study

Structure-Process-Outcome Theoretical Framework

The Donabedian (2005) Structure-Process-Outcome quality improvement theoretical framework provided a basis for evaluating the effectiveness, efficiency, and cost-effectiveness of a researcher developed, innovative, ED nurse heart failure educational intervention (Butts & Rich, 2015). Donabedian stipulated quality is measured and defined through Structure, Process, and Outcome metrics; outcomes are measured specific to criteria specific to the study in progress (Butts & Rich, 2015). Structure refers to the healthcare environment in which services are rendered, including staffing, human resources, and material variables (Butts & Rich, 2015). Process refers to steps included in the delivery of healthcare services, and, Outcomes, measured per study criteria specific to the study in question (Butts & Rich, 2015). All elements are influenced by cost, resource, and public expectations and limitations (Butts & Rich, 2015).

The Donabedian (1983) model explains how leadership's approval to implement an evidence-based ED nurse HF educational intervention (Structure) can result in improved process and outcome metrics (Butts & Rich, 2015). ED nurses receiving critical heart failure education (resources = Structure), are thus optimally more prepared and confident to efficiently care for, and educate ED HF patients for self-care (improved processes, confident ED nurses). Outcome metrics

include projected improvements in ED nurse HF knowledge scores post intervention (Post-Intervention knowledge scores = Outcome). Other metrics may include potential reduced heart failure readmissions, ED re-visits, and reduced costs (Albert et al., 2002; Anderson, 2014).

Improvements in Structure and Process concepts optimally result in improved ED nurse knowledge of heart failure outcome scores (outcome=nurse knowledge scores) and reductions in ED and hospital readmissions and costly revisits. The Structure-Process-Outcome framework allowed for integration of the self-efficacy model and realized benefits (Albert et al., 2002). ED nurses optimally will feel more confident and knowledgeable about heart failure to take decisive action in today's busy ED's, thus stabilizing patients faster, providing heart failure education upon arrival to ED, and re-evaluating heart failure patients prior to discharge, for stability (Albert et al., 2002; Anderson, 2014).

Emergency Room Nurse Heart Failure Educational Intervention

An ED nurse evidence-based heart failure educational intervention was developed which optimized ED nurse learning time, and was viewable in 10 to 20 minutes. The ED nurse heart failure educational intervention was developed after contacting Sterne (2014) who reduced heart failure readmissions utilizing an evidence-based heart failure PowerPoint, and, one-hour of instruction. As the literature review reflected, an intervention needed to include HF-1 discharge instructions, teach-back instructions, heart failure self-management behaviors (diet, weight, symptoms, medications, fluid restrictions), a discussion of heart failure pathophysiology, a discussion of pre-discharge ED nurse reassessment of the patient for stability, and, a linkage to the relevance to current ED nurse practice. These elements were all included in the heart failure PowerPoint©. In

addition, permission to use key evidence from the AAHFN was approved, as well as from Sterne et al. (2014). This intervention, further, was considered low-cost, efficient, free-standing, and quality-focused, based on CMS public outcome measures (quality outcomes: improved patient heart failure education, and reduced readmission costs).

For this study, a self-sustaining ED nurse heart failure multi-media slide-show intervention was developed to support ED nurse learning around the clock. ED nurses work varied hours, varied shifts, with ED's open 24 hours a day, 7 days a week. The ED is a unique entity, and, it could not be predicted that the research would be approved for an on-site course of instruction. The ED nurse heart failure educational PowerPoint© was clear, articulate, evidence-based, and, to the point. The ED nurse PowerPoint included a heart failure video link which clearly depicted heart failure pathophysiology and self-management behaviors (Milner-Fenwick, 2013). All appropriate permissions were secured (AAHFN, 2013; 2014, 2015; Milner-Fenwick, Inc., 2013; Sterne et al., 2014).

The slide-show included 40 slides, without audio, so nurses could freely tab through the intervention, and not risk missing audio, if busy. Each slide was dedicated to explaining a relevant heart failure concept for ED nurses. Key content areas including the rise in heart failure disease incidence and ED visits, readmission penalties, heart failure pathophysiology, heart failure discharge instructions, self-care management behaviors, weight, low sodium diet, medication adherence, the purpose and action of medications, and heart failure warning symptoms (Hudgens, L, 2015). Nurses were provided a hard copy full-page print-out of each slide to follow the PowerPoint©, to support, visual, audio, and tactile learning. Approval was received from Sterne (2014), the Fresno State University institutional review board, and, the hospital institutional review board.

Relevance for ED

The ED now provides direct care to 20% of the nation's heart failure population, with 958,167 ED visits recorded in 2014 (Storrow et al., 2014). Eighty percent (80%) of hospital-admitted heart failure patients, further, are directly admitted from the ED (American Association of Heart Failure Nurses, AAHFN, 2015). ED nurses are now expected to immediately triage, room, and stabilize heart failure patients and start the patient heart failure education process upon admission to the ED to optimize patient self-care potential (AAHFN, 2012). ED physicians, further set forth new strategy to assist with the growing heart failure population, advocating for ED nurses to monitor and manage heart failure patients 24 hours a day, seven days a week.

CHAPTER 3: METHODS AND PROCEDURES

Identification of the Research Design

A descriptive, prospective, quantitative, repeated-measures nursing research study design was used to study the effectiveness of an ED nurse HF educational intervention on ED nurse knowledge of HF, pre/post intervention. A one-group, comparative, pre-test/post-test study design method was used. The study was completed in 2015 in an acute-care hospital 30-bed ED in the Western United States.

The aim(s) of the study was to generate new ED nurse heart failure research utilizing a cross-sectional, homogenous sample of ED nurses, and to study ED heart failure intervention effectiveness pre/post intervention. The one-group ED nurse sample was planned for one group of ED nurses, a homogenous sample, sampled at the pre and post intervention phases. The results of this study will optimally be used to transform and improve ED nurse HF care, with future studies utilizing innovative evidence-based practice methods. This study, further, aims to advance ED nurse heart failure research, science, practice, and innovation.

Description of the Sample Population and Methods

A total of 24 of 78 Emergency Room Registered Nurses volunteered to participate in the ED study. Subjects were first briefed on pre/post intervention methods, provided time to answer questions, and signed informed consents. Subjects were informed about how the slideshow intervention worked, with the researcher available on-site if technical difficulties. Subject inclusion criteria included: (1) Hospital A employed ED nurse with valid Board of Registered Nursing (BRN) license, in good standing, (2) not a float nurse, and, (3) not a traveler nurse. Exclusion criteria included: (1) not a Hospital A ED registered

nurse or without a valid BRN license, in good standing, (2) float nurse, or (3) traveler nurse.

Hospital and Fresno State University Institutional Review Board (IRB) (DNP 1507; July 16, 2015) approvals were obtained prior to the study. Human subjects' training was completed by the researcher. The study sample included 24 employed ED nurses from the 30-bed ED unit. The sample consisted of men and women with varying degrees of education: Associate of Science Degree in Nursing (ADN), Bachelor's Degree in Nursing (BSN), Master's Degree in Nursing (MSN), and Doctor of Nursing Practice (DNP) or PhD, if applicable. The research study was open to floor and charge nurses, nurses working day, evening, and night shifts, and, nurses who worked 8 or 12 hours.

Description of the Data Collection Tools

Nurses Knowledge of Heart Failure Education Principles Survey

The Albert (2002) Nurses' Knowledge of Heart Failure Education Principles Survey (KNHFEP) was selected for this research study as it provides a reliable and valid method by which to assess and evaluate ED nurse knowledge of heart failure, pre/post intervention. The Albert (2002) KNHFEP survey has demonstrated reliability and validity (Kappa .70, + content, face, and construct validity) and has been used in numerous nursing HF assessment and/or educational intervention effectiveness studies (Albert et al., 2002; Albert, N., personal communications, January 15, 2015; Mahramus et al., 2014; Sterne et al., 2014).

The KNHFEP survey consists of 20 true/false items addressing nursing knowledge of heart failure basic care essentials (Albert et al., 2002). HF nurse content areas addressed include: (a) diet: three items (n=3), (b) symptom

management, and signs of worsening of heart failure: six items (n=6), (c) medications: two items (n=2), (d) weight or fluids: seven items (n=7), and (e) exercise: two items (n=2). A minimum score of 17 correct items (85%) is considered passing (Albert et al., 2002).

Demographic Collection Tool

A seven-item demographic data collection tool was used to collect ED nurses' demographic data and sources of nursing education. Items on the demographic tool included: (a) subject age, in years (b) gender, (c) number of years of nursing experience, (d) ethnicity, (e) number of hours worked per week, (f) highest level of nursing education degree obtained, and (g) type of on-site nursing ED education provider in the ED. Variables age and number of years were collected as numbers in years.

Coding of Data

The KNHFEP survey data was first reviewed for completeness of data. Correct answers were numerically coded "5" (5), and incorrect answers, "0" (0). Correct and incorrect survey question response data were then entered into SPSS 23.0. Demographic data was coded: (a) age: total age in numbered of years, age 1 to 99, (b) nursing experience: number of years of nursing experience, years 1 to 99; (c) gender: female =1, male =0; (d) ethnicity: other =0; Asian = 1; African American =2; Hispanic = 3, Caucasian = 4).

Highest level of nursing education was coded as follows: Associate of Science Degree in Nursing (ADN)=1; Bachelor of Science Degree in Nursing (BSN) =2; Master of Science Degree in Nursing (MSN) =3; Doctor of Nursing Practice (DNP) = 4; Doctor of Philosophy, Nursing (PhD) = 5. Employment status was coded as: per diem = 0; short hour =1; part-time, 24 to 35 hours per

week =2; full-time, 36 or greater hours per week =3. Type of current nursing education offered on-site at the hospital was coded: other: yes =1, no =0; on-line nursing education modules: yes =1, no = 0; annual education day, yes =1, no =0; on-site nursing educator: yes =1, no = 0; clinical nurse specialist, ED: yes =1, no =0). Nurses requesting additional information for each NKHFEP survey question was coded: yes=1, no=0.

KNHFEP survey answers were entered into SPSS 23.0, with demographic items entered as well per coding standards. A composite score was computed for the pre and post group intervention scores within SPSS 23.0. Pre and post paired-sample dependent t-tests were computed, with outcomes reflecting an alpha < .05 considered to be statistically significant. A power analysis indicated a total of 27 subjects was needed to achieve a large effect of .50, with a power of .80, and probability of .05.

Description of Data Collection Process

All subjects voluntarily participated and signed informed consents. Participants were provided time to answer questions. Subjects were first briefed on the study purpose, background, research question, and study aims, utilizing standardized briefing and informed consent documents approved by the hospital IRB. Subjects agreed to be present for the two survey periods, with the researcher notifying subjects she would be present, on site, through August 30, 2015, from 0600 to 1000, and 1300 to 1800 daily. Survey collection days covered the time period from July 24, 2015 to August 30, 2015.

Subjects were notified to keep survey content response questions and intervention data confidential to eliminate bias and response error. Distribution of surveys occurred per IRB protocols, at baseline, immediately post intervention, at

two weeks post intervention, and, at four weeks post intervention. Efforts were made to be on-site daily to cover all shifts, and, opposite nurse weekends, as nursing schedules may vary week to week.

Subjects were notified their surveys, informed consents, and confidentiality would be protected per ED health information portability and protection act (HIPPA) protocols. Surveys were stored in a separate lockbox from informed consents, with informed consents destroyed at the end of the study. Surveys and informed consents were stored separately, each in separate lockboxes. Subjects were notified their signature on the informed consent represented implied, informed consent. Subjects were notified via informed consent that individual responses would remain confidential and protected, with responses de-identified and reported in aggregate form.

Distribution of Survey Questionnaires and Demographic Tool

A confidential, secure office suite with three private offices was secured for use prior to the study. The ED suite was located directly outside the ED. Subjects were informed they could enter the survey at any time from 0600 to 1800 daily, before, during, or after their shifts. Informed consents were signed in the entry office at the circular table and secured in a lockbox prior to survey completion.

Subjects then proceeded to office A to complete the NKHFEP baseline survey (Time 1) and seven-item demographic survey. Subjects placed completed NKHFEP baseline and demographic surveys into a secure lockbox. Subjects then proceeded to Office B to watch the ED nurse heart failure educational intervention PowerPoint© with accompanying printout of the intervention. After completing the intervention, subjects returned to Office A and completed NKHFEP (Time 2, Post Intervention). Subjects returned completed surveys into a separate secure

lockbox. Subjects then selected two raffle tickets with a potential “winner ticket” for a \$5.00 gift card approved by the IRB. Winners received the \$5.00 gift card before exiting the office from the researcher. Subjects were instructed to retain confidentiality of survey and intervention material.

Statistical Methods

A one-tailed power-analysis indicated a sample of 27 subjects (N=27) was needed to demonstrate a positive intervention effect with a power of .80, medium effect, and significance of .05. Data analysis included use of descriptive statistics reviewed SPSS 23.0 data logs, advised on data collection methods, and provided insight on composite score computation and dependent t-test analysis post study completion. The use of descriptive statistics, and dependent t-test analyses was completed to analyze data. Sample means, standard deviations, and medians were computed for continuous level variables, and percentages and percent correct, for example, for non-continuous data. Analyses of data and research outcome interpretations, conclusions, and findings were completed utilizing SPSS 23.0 in consultation with the statistician, and, with use of coded, de-identified data.

Discussion of Ethical Considerations

Informed consent, confidentiality, and HIPPA protocols were adhere to (Burns & Grove, 2009). IRB protocols were adhered to, and Human Subjects Research Protection training was completed on on-line. Quality assurance module training, further was completed per Hospital A research department protocols. Completion certificates for quality assurance and human research subjects training were submitted to the IRB.

Subjects were fully briefed on the benefits and risks of the study, and provided time to answer questions. Subjects were ensured survey data would be

protected and secured, remain confidential, with data reported in aggregate form. The researcher secured all surveys and consents throughout the process, with surveys and consents stored in separate lockboxes. Survey data was de-identified and coded per stated protocols, entered into SPSS 23.0 within a password-protected computer for which only the researcher has access. All efforts were made to protect patient privacy during completion of surveys, with doors closed to prevent identification if persons entered, and, ensuring participants understood the survey protocol process.

Description of Proposed Means of Analyzing the Data

The researcher analyzed survey and demographic data using SPSS 23.0 statistical computing software. Descriptive statistics, including use of the mean, standard deviation, and frequency distributions were used for specific demographic and survey response data. Survey yes/no responses were coded and summed, with a composite score for pre-test and post-test surveys computed per statistical worksheets. Composite score results for before and after survey data were secured in SPSS 23.0, and dependent paired t-tests were run in SPSS 23.0. Data was analyzed for skew (3 to -3) and kurtosis (8 to -8), outliers, and significant variations. Questionnaires were also hand-scored by the researcher, with scores checked against the composite score.

Hospital Background and Culture

The ED offers specialty cancer, cardiovascular, emergency room, and stroke care, with the larger hospital hosting more than 200 beds (Hospital A, 2015). The hospital offers access to specialty interventional cardiovascular services and open-heart surgery (Hospital A, 2015). The hospital is a highly

regarded hospital with a commitment to exemplary nursing practice, quality care, and, adherence with national standards for nursing care (Hospital A, 2015).

Hospital A is a primary stroke center and provider of nationally recognized Get With the Guidelines stroke recommendations for 24 months (Hospital A, 2015). The nursing culture is one of shared governance, transformational leadership, nursing practice and quality councils, research, and patient and nursing satisfaction. ED nurses are unionized, have access to current evidence-based practice education, and, have computerized electronic health records and technologies by which quality outcomes can be evaluated and tracked.

Organizational values include a commitment to the improvement of healthy communities with compassion and quality while delivering high-quality, cost-effective care (Hospital A, 2015). The organization was committed to distinguishing itself by providing safe, preventive healthcare services, by fostering a culture of respect for employees and superior performance development, and by ensuring health care is controlled locally (Hospital A, 2015). Core organizational values include providing healthcare access, continuous improvement, compassion and caring, patient safety, teamwork and mutual respect, integrity and honesty, excellence, and resource stewardship (Hospital A, 2015).

Hospital A has partnered with local hospital affiliates to delivered high-quality care locally, but controlled independently (Hospital A, 2015). These organizations emphasize providing value-driven, high-quality care where processes are not duplicated, and where care is coordinated by teams of expert practitioners, with medical outcomes monitored and evaluated (Hospital A, 2015).

CHAPTER 4: RESULTS

Presentation of Findings

Study sample participant demographic characteristics will be presented in table and text formats (See Table 1). Next, findings from statistical analysis of survey data from the demographic and *Nurses' Knowledge of Heart Failure Education Principles survey* (Albert, 2012) tools will be described. Then, the final results of significant ED nurse heart failure knowledge gains will be submitted.

Sample Population

A total of 24 (N=24) ED nurses participated in the study, a 30.7% participation rate (See Table 1). The majority of ED nurses were female (91.7%: n=22), Caucasian (66.7%; n=16), age 28 to 41 (54%), with 5 to 12 years of nursing experience (54.2%). Fifty-percent (50%), or 12 of 24 ED nurses, had a BSN in nursing, followed by 41.7% (n=10) of nurses with an ADN, and 8.3% (n=2) with an MSN. Most subjects 70.8% (n=17) reported working full-time, or greater than 35 hours per week, followed by 16.7% (n=4) workers reporting working part-time (24 to 25 hours per week), and 12.5% (n=3) working per-diem.

ED Nurse On-Site Heart Failure Education

The majority of nurses (n=22, 91.7% of ED nurses) reported on-site ED nurse education was available in different formats. A majority of ED nurses reported receiving education in annual nurse education days (n=19; 79.2%), from an on-site ED nurse educator (n=16; 66.7%), and/or, from on-line educational modules (n=12; 50%). A fewer number of ED nurses (n=5; 25%) reported receiving on-site ED nurse education from clinical nurse specialists (CNS),

persons specially trained to educate nurses to improve the quality of nursing care, and, quality outcomes.

Table 1

Demographic Characteristics (N=24)

Categories	Variable	Freq	%
Age	27-37	9	37.5
	38-48	9	37.5
	49-59	6	25
Gender	Male	2	8.3
	Female	22	91.7
Employment Status	Full-Time	17	70.8
	Part-Time	4	16.7
	PER Diem	3	12.5
Education	ADN	10	41.7
	BSN	12	50
	MSN	2	8.3

The Nurses' Knowledge of Heart Failure Education Principles Survey

The *Nurses' Knowledge of Heart Failure Education Principles* survey (Albert, 2012) provided a reliable and valid estimate of ED nurse knowledge of heart failure basic core concepts. For this study, the chief goal was to evaluate the effectiveness of an ED nurse heart failure educational intervention on improving ED nurses' knowledge of heart failure basic concepts, pre/post intervention. ED nurse pre and post intervention scores were thus collected utilizing the NKHFEP survey pre exposure to the intervention, and, post exposure to the intervention.

Correct answers were coded “5”, and incorrect answers, “0”, with a total of 100 possible points for 20 correct questions (N. Albert, personal communications, January 15, 2015). The total number of correct items at baseline, and, post intervention, were analyzed in SPSS 23.0 using item frequency response scores, dependent paired t-tests, and pre/post one-group composite dependent t-tests. Individual nurse heart failure scores were then summed in SPSS 23.0 using composite scoring methods to obtain a baseline one-group pre and post intervention ED nurse heart failure knowledge score. Scores were further computed to reflect the total overall mean of percent correct answered questions, as a score of greater than, or equal to, 85% is passing per Albert et al. (2002).

One-Way Power Analysis

One-way power-analysis projections for a power of .80, effect size of .50, and statistical probability of .05 required a sample of 27 subjects (df 26), and a critical t of 1.70. The total sample in this population was 24 subjects (N=24), reflecting close proximity of required sample size to report statistically significant results; this sample total (N=24) fell slightly short of the target sample (N=27). A one-tail power analysis was used to confirm the hypothesis that ED nurse HF knowledge scores would increase post exposure to an ED nurse HF educational intervention. Given the sample of respondents was smaller than anticipated 24 versus 27, the one-tail power analysis allowed for detecting a slightly larger effect of .53 vs. .50 using a power of .80. The results of this study confirmed the critical t was achieved: Pre-test: M=78.54 (SD=9.38), Post-test: M=90.0 (SD=9.08), $t=-5.25$, $p < .001$)

Statistical Analysis and Findings

Standardized tests for normality and distribution were within normal limits for pre/post intervention results. Paired-sample dependent t-tests (N=24) confirmed the ED nurse heart failure educational intervention was effective (See Table 2, 4) with ED nurses scoring statistically significant higher NKHFEP scores post-intervention: Pre-test M=78.54 (SD=9.38), post-test M=90.0 (SD=9.08), df=23, $t = -5.25$, $p < .001$. As Table 2 depicts, the overall ED nurse

Table 2

Pre/Post Intervention One-Group ED Nurse Dependent T-test scores

<u>Dependent Variable</u>	<u>N</u>	<u>Pre-Test M(SD)</u>	<u>Post-Test M(SD)</u>	<u>t(df)</u>	<u>p</u>
ED nurse knowledge of heart failure	24	78.54(9.38)	90.0(9.08)	5.25(23)	$p < .001$

Note: CI=confidence interval; UL=upper limit; LL=lower limit. Results presented using a 0 to 100-point scale. ≥ 85 points, or 85% correct required for passing, N. Albert, personal communications, January 15, 2015. Nurses' Knowledge of Heart Failure Education Principles Survey, 2012, Copyright N. Albert.

heart failure knowledge score increased from an overall pre-test mean of 78.54(SD=9.38) to a post-test mean of 90.0(SD=9.08), df=23, $t=-5.25$, $p < .001$; CI: -15.96, -6.94). Table 1 illustrates the significance of ED nurse heart failure knowledge gains pre/post intervention represented on a scale of 0 to 100 points, with each correct response receiving 5 points, for 20 questions. Albert et al. (2002) stipulate a score of 17 correct, or ≥ 17 correct items (85% or greater) is a passing score on the NKHFEP survey. The mean pre-test/post-test scores reflected an increase from 78% items correct, to 90% of items correct. The null hypothesis was thus rejected as a significant ($p < .001$) improvement in ED nurse heart failure knowledge was observed post exposure to the ED nurse heart failure educational intervention.

The same NKHFEP survey was also scored on a 0 to 20 point scale, with each correct answer receiving 1 point (See Table 3). This scoring method was used to compare results with prior research in the discussion section. Study results reflected a significant increase in ED nurse heart failure knowledge post exposure to the intervention: pre-test M=15.70 (SD=1.87), post-test M=18.0 (SD=1.82), df=23; $t = -5.25$, $p < .001$ (CI: - 3.19, - 1.39). The mean pre-test/post-test scores reflected an increase from 78% items correct, to 90% of items correct. Mean difference scores increased pre/post intervention (M=-2.29, SD (2.13), $p < .01$).

Table 3

Pre/Post Intervention One-Group ED Nurse Dependent T-test scores

<u>Dependent Variable</u>	<u>N</u>	<u>Pre-Test M(SD)</u>	<u>Post-Test M(SD)</u>	<u>t(df)</u>	<u>p</u>
ED nurse knowledge of heart failure	24	15.70(1.87)	18.0(1.82)	5.25(23)	$p < .001$

Note: CI=confidence interval; UL=upper limit; LL=lower limit. Results adapted for comparison with research using a 0 to 20-point scale. ≥ 17 or more correct items required for passing, N. M Albert, S. Collier, V. Sumodi, S. Wilkinson, J. Hammel, L. Vopat, C. Willis, and B. Bittel, 2002, *Heart & Lung*, 31(2), p. 104. Copyright Elsevier, Inc.

Key pre to post statistical analyses deserve discussion as outlier scores can influence overall score means. Therefore the statistical median must be reported as it is less sensitive to outliers, with the pre-test median and mode: Median=80.0 (80% correct) and Mode= 80 (80% correct), and Post-test: Median= 95 (95% correct), and Mode=95 (95% correct). Further evidence (see Table 4) supports the effectiveness of the ED nurse HF educational intervention on improving ED nurse knowledge of HF as the number and percentage of ED nurses successfully passing the NKHFEP survey post-intervention (score 85% or higher) increased from 29% (n=7) of all nurses pre-intervention, to 79% (n=19) of all nurses post intervention, a 171% increase (See Table 4).

Table 4

ED Nurses With Passing Scores: Pre/Post Intervention (N=24)

<u>Total Correct Items</u> (of 20)	<u>Pre-Intervention</u> (of 24 nurses)	<u>% Passed</u> (of 24 nurses)	<u>Post-Intervention</u> (of 24 nurses)	<u>% Passed</u> (of 24 nurses)	<u>% change:</u> <u>Increase</u>
17 or more correct items (>=85% correct)	7	29.4%	19	79.8%	171%

Note: A score of 17 or > correct of 20 items, or 85 points (=85%) is required for passing. N. Albert, personal communications, January 15, 2015; N. M. Albert, S. Collier, V. Sumodi, S. Wilkinson, J. Hammel, L. Vopat, C. Willis, and B. Bittel, 2002, *Heart & Lung*, 31(2), p. 104. Copyright Elsevier, Inc.

These results, further, were statistically significant (Mean = 90.0, $p < .001$), and indicated a majority of ED nurses (approximately 80%, $n=19$) exited the study with a competent, validated knowledge of heart failure basic concepts. Prior to exposure to the heart failure educational intervention, 17 nurses, or 70.8% of participating nurses, failed the survey. Further data analysis (see Table 5) indicated ED nurses developed a competent knowledge of medication effects and usage, activity, diet, sodium and fluid restriction guidelines, and, symptom and weight monitoring for heart failure patients.

Post-intervention statistical results yielded improved overall ED nurse knowledge on seven ($n=7$) of 20 NKHFEP survey items (see Table 5). ED nurse heart failure scores rose significantly regarding non-usage of NSAIDS ($p=.011$), potassium-based salt substitutes ($p=.01$), lean deli meats ($p < .05$), and ED nurse

recognition that abdominal swelling often reflects worsening heart failure ($p < .05$) (see Table 5). ED nurses further evidenced significant knowledge improvement in evaluating the accuracy of today's weight with the ideal/dry weight, as opposed to yesterday's weight ($p < .01$). Nurses also evidenced improved knowledge of transient postural hypotension and dizziness ($p < .001$) concepts as well as asymptomatic hypotension concepts ($p < .05$). Nurses exited with improved knowledge that heart failure medications often reduce blood pressure and compensatory responses and do not require a physician report (Albert et al., 2002).

Table 5

ED Nurse Heart Failure Knowledge Gains Pre/Post Intervention

Q.	Survey Question	Pre-Test	Post-Test	Mean	t(23)	p
		M(SD)	M(SD)	Difference (SD)		
6.	Abdominal swelling as an indicator	3.75(2.21)	4.58(1.41)	-.83 (1.90)	-2.14	*.04
8.	Use of non-steroidal anti-inflammatory drugs	3.75(2.21)	5.00(.00)	-1.25 (2.21)	-2.76	*.01
9.	Use of potassium-based salt substitutes	3.54(2.32)	4.79(1.02)	-1.25 (2.21)	-2.76	*.01
13.	Lean delicatessen meat consumption	4.16(1.90)	5.00 (.00)	-.83 (1.90)	-2.14	*.04
15.	Use of dry weight as baseline	2.08(2.51)	3.75(2.21)	-1.66 (2.40)	-3.39	**0.00
16.	Asymptomatic hypotension	1.04(2.07)	3.33(2.40)	-2.29 (2.54)	-4.41	**0.00
18.	Transient postural dizziness	1.25(2.21)	3.33(2.40)	-2.08 (2.51)	-4.05	**0.00

Note: * $p < .05$; ** $p < .01$. Q=question; M=Mean; SD=standard deviation; Adapted from "Nurses' knowledge of heart failure education principles," by N. M. Albert, S. Collier, V. Sumodi, S. Wilkinson, J. P. Hammel, L. Vopat, C. Willis, and B. Bittel, 2002, *Heart & Lung*, 31(2), p. 105.

doi:10.1067/mhl.2002.122837. Copyright Elsevier, Inc. Nurses' Knowledge of Heart Failure Education Principles Survey, 2012, Copyright N. Albert.

Results and Discussion

Donabedian Quality-Improvement Model

These statistical data indicate the ED nurse heart failure educational intervention was effective and contributed to increased ED nurse understanding of basic heart failure care concepts ($p < .001$) (Outcome) (See Table 2, 4, 5). Statistically significant ED nurse heart failure knowledge gains pre to post intervention ($p < .001$) further validated the hypothesis that ED nurse heart failure knowledge gains resulted from exposure to, or, participation in a leadership-approved ED nurse heart failure educational intervention and research study. These results validate the Donabedian (2005) Structure-Process-Outcome Quality Improvement Model (see Figure 1) used as a valid framework to plan and explain the ED nurse heart failure quality improvement educational intervention. The Donabedian Model was also used to help explain quality outcomes evidenced by improved overall ED nurse knowledge of heart failure basic concepts ($p < .001$).

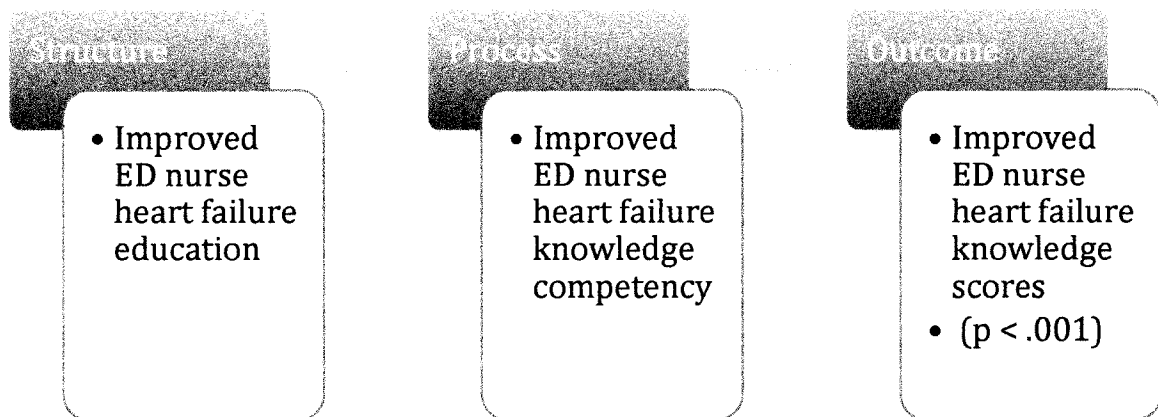


Figure 1. Donabedian Quality Improvement Model

In this study, participating nurses directly benefitted from leadership approved ED nurse heart failure education (Structure) which improved their heart failure knowledge proficiency (Process) as measured by improved ED nurse heart failure knowledge gains ($p < .001$) (Outcome). A majority of ED nurses ($n=17$, $n=79\%$) demonstrated a competent knowledge of basic heart failure knowledge concepts ($p < .001$) post intervention, receiving 85% or more correct responses as opposed to only a minority of nurses ($n=7$, 29%) pre-intervention. The Donabedian (2005) Quality Improvement framework explained the improvement in post-intervention ED nurse heart failure knowledge gains, with a 171% increase in ED nurse knowledge survey passing scores ($n=7$ nurses pre-intervention, $n=19$ post-intervention). The Donabedian (2005) Quality Improvement Model, further, was strategically aligned with the goals of the Magnet facility to provide continuously improved high-quality, evidence-based heart failure care to its cardiac patients as it is a cardiac specialty hospital.

Summary of Findings

The majority of ED nurses who participated in this study were female ($n=22$, 91.7%), Caucasian ($n=16$, 66.7%), age 28 to 58, worked full-time ($n=17$, 70.8%), and had 5 to 37 years of nursing experience. The majority of ED nurses possessed either a bachelor of science degree in nursing (BSN), ($n=12$, 50%), or an associate degree in nursing (ADN) ($n=10$, 41.7%). ED nurses primarily reported receiving on-site nursing education during annual education days ($n=19$, 79.2%), via on-line educational modules, ($n=19$, 79.2%), from an on-site nurse educator ($n=16$, 66.7%). Only 25% of participating nurses ($n=6$) reported receiving on-going nursing education from a clinical nurse specialist.

Pre-post data analysis proved the ED nurse heart failure educational intervention directly contributed to increased nurse knowledge competence regarding basic heart failure concepts ($p < .001$). The overall group mean score rose from a mean of 75.84 ($M=75.84$), a failing score, to an overall mean of 90.0 ($M=90.0$), a passing score ($p < .001$). Further evidence of the intervention's success was reflected in the number of nurses who receiving a passing score post exposure to the educational intervention. The number of nurses who passed the NKHFEP survey increased 171% at the post intervention phase, rising from 7 nurses at the pre-intervention phase ($n=7$, 29.4%), to 19 nurses ($n=19$, 79.8%) post intervention.

Further statistically significant results proved ED nurse knowledge was primarily increased in the areas of NSAID ($p < .01$) and potassium salt substitute usage ($p=.01$), lean deli-meat consumption ($p < .05$), and recognizing abdominal swelling as a sign of worsening of heart failure ($p < .05$). In addition, ED nurses exhibited a significant improvement in understanding the dry or ideal weight was the optimal measurement of comparison versus the daily weight ($p < .001$). Further data revealed a significant increase in ED nurse knowledge understanding that postural hypotension which resolves is not reportable ($p < .001$) as well as an asymptomatic blood pressure of 80/56 ($p < .001$).

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

This study successfully establishes important new ED nurse heart failure research and establishes the effectiveness of an ED nurse heart failure educational intervention in improving ED nurse knowledge of heart failure, pre to post intervention ($p < .001$). This ED nurse heart failure research proved that ED nurse heart failure knowledge competency could be significantly improved using a cost-effective, evidence-based ED nurse heart failure educational intervention, with knowledge assessed successfully with the reliable and valid NKHFEP survey. ED nurses were able to access the cost-effective ED nurse heart failure educational slide show on-site, in 20 to 30 minutes, in the ED. ED nurses were able to self-pace their learning, integrating and incorporating new knowledge timely, and, efficiently, and, demonstrating improved ED nurse heart failure knowledge scores immediately post intervention ($p < .001$).

The Donabedian (2005) Model provided a valuable quality-improvement model and theory to predict improved ED nurse heart failure knowledge outcomes. ED nurse access to leadership approved ED nurse heart failure education and research (Structure) allowed for efficient ED nurse processing of new heart failure education (Process), resulting in improved ED nurse heart failure knowledge scores post-intervention (Outcome) (Butts & Rich, 2013). ED nurse heart failure knowledge scores rose significantly in the span of two weeks, from an overall mean of 75.84 ($M=75.84$) at the pre-intervention phase, to a Mean of 90.0 ($M=90.0$) post intervention, a passing score ($p < .001$).

Nursing Implications

Nursing leadership is charged with ensuring ED patients receive

high-quality, cost-competitive heart failure care upon admission to the ED, and hospital. This study confirms prior research (Albert et al., 2002; Mahramus et al., 2014; Sterne et al., 2014) that nurses' require focused, evidence-based heart failure knowledge to become competent and confident to educate heart failure patients upon admission to the ED, and, to assist with readmission reduction initiatives. Nurse leaders cannot assume nurses' have the required heart failure knowledge to proficiently educate heart failure patients, and, to advance heart failure quality care early in the course of stay.

Nurse leaders should provide continuous evidence-based, innovative heart failure education for ED nurses to keep them apprised of changing regulatory and heart failure requirements, so they can implement key quality initiatives, documentation, and education during their work day. Nurse leaders, further, should support continued heart failure research in their respective organizations to advance heart failure care quality. Nurse leaders should partner with the quality, education, and local universities to advance continued funding of nurse heart failure research. Most of all, these positive results indicate ED nurse leaders should timely and effectively integrate evidence-based heart failure education for ED nurses as such education has been proven to significantly improve nurses' knowledge of heart failure (Mahramus et al., 2014; Sterne et al., 2014).

This study has implications for nurse leaders to provide heart failure education to ED nurses so they may educate heart failure patients upon admission to the ED, consistent with AAHFN (2015) and American Heart Association (2015) guidelines. As only 12% of patients understand their heart failure discharge instructions (Regalbuto et al., 2014), it is ever more imperative that nurse leader integrate evidence-based heart failure education for its nurses, and, update it consistently with changing cardiology, accreditation, regulatory, and quality

requirements. Nurse leaders, further, should partner with local universities and quality bodies to integrate ongoing heart failure research projects on-site in the hospital which align with changing quality reforms.

Recommendations

These positive results should be replicated with a larger sample of ED nurses to further validate findings. The study should be replicated in both non-Magnet and Magnet ED hospitals to establish the role that organizational culture, nursing leadership, and values play in supporting nursing education which contributes to improved outcomes, such as increased and proficient ED nurse knowledge of heart failure. The study should be replicated using the NKHFEP survey, with repeat surveys at two and four weeks to ensure ED nurse learning is retained over time. The study should be further replicated using a modified and improved ED nurse heart failure educational intervention with added weight and fluid management educational content, as well as symptom monitoring content addressing postural and asymptomatic hypotension concepts. Case example concepts are recommended for integration to make the information practical and relevant.

Future ED nurse heart failure research should also focus on including the number of ED heart failure revisits, hospital readmissions, and, ED 7-day, 30-day, and 90-day post ED discharge heart failure mortality rates to demonstrate improved quality, cost, and efficiency outcomes (CMS, 2016; Lee et al., 2010; Sterne et al., 2014). This, and future research should be published, and, presented in collaboration with executive, quality, and cardiology leadership research so team-based management of heart failure improves across all teams, with funds dedicated toward staff and nurse heart failure education. Much of the heart failure

research done today is completed by physicians. As physicians are often physician leaders in hospitals, it is essential that heart failure quality improvement efforts are integrated with nursing and research, with funds allocated for nursing heart failure education..

The positive results from this study are a clear indicator for nurse leaders to invest in innovative nurse heart failure educational programs which will promote high-quality heart failure outcomes. Nurse heart failure education must be flexible, cost-efficient, accessible, and evidence-based to ensure unit nurses are consistently ready, educated, and prepared to execute high-quality outcomes. In prior years, many health care organizations have cut back on nursing education, when, in fact, nursing education budgets should be increased as the complexity of health care and patient acuities have increased. ED nurses are now expected to act quickly and implement many complex, time-sensitive protocols related to stroke, heart failure, pneumonia, and, sepsis care. Nurse leaders who take a proactive vs. reactive approach to heart failure disease management will surely reap saved costs, as Sterne et al. (2014) reported a decreased in readmissions from 25.4% to 9%.

Limitations

Limitations include a small sample population, use of a one-group sample, and, failure to randomize subjects to intervention versus control. Study findings are limited to this one-group sample, their performance post review of the ED nurse specific heart failure educational intervention, and, the specific questions in the NKHFEP survey. Results cannot be generalized to all ED nurse populations as organizational culture, knowledge, education, and, experience varies. In addition, findings are limited as some of the NKHFEP survey items include complex double negative language which may be difficult for nurses to interpret. In addition, the

NKHFEP survey evaluates nurse heart failure knowledge competence in content areas, some of which include only two or three questions. Another limitation included a small sample size with attrition of subjects over time of the study requiring pre/post data analysis per power analysis projections with program chair approval.

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APPENDICES

