

Nurses' Knowledge and Practice Regarding Emergency Medical Management of Patients with Acute Heart Failure at BMU

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How to cite this paper: Mazumder, D., Jannat, B. E., & Kanan, M. S. (2025). Nurses' Knowledge and Practice Regarding Emergency Medical Management of Patients with Acute Heart Failure at BMU. *Voice of the Publisher, 11*, 557-581.

<https://doi.org/10.4236/vp.2025.113037>

Received: July 11, 2025

Accepted: September 13, 2025

Published: September 16, 2025

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Abstract

Background: Heart failure (HF) is a major public health concern in Bangladesh, responsible for approximately 0.1 million deaths annually and accounting for 15.23% of total mortality. While evidence-based guidelines can reduce mortality, improve quality of life, and minimize hospitalizations, effective implementation depends significantly on nurses' knowledge and patient education capabilities. **Objective:** To assess nurses' knowledge and practice regarding the emergency management of acute heart failure (HF) at Bangabandhu Sheikh Mujib Medical University. **Methods:** A cross-sectional descriptive study was conducted using the validated instrument Nurses' Knowledge of Heart Failure Education Questionnaire, developed by Dr. Nancy Albert. A total of 385 registered nurses participated. Data were analyzed using descriptive statistics and appropriate inferential tests (ANOVA/ χ^2). **Results:** The mean knowledge score was 13.38 ± 0.36 , or 42.09% correct responses. Only 3.6% of nurses were found to have an adequate level of knowledge regarding HF self-management. The lowest scoring items included: Chronic nature of HF (Q7: 9.1%), Use of potassium-based salt substitutes (Q9: 6.5%), Orthopnea (Q11: 6.2%), Managing transient dizziness (Q18: 5.5%), and NSAID usage (Q8: 4.2%). There was no statistically significant correlation between years of experience, educational preparation, or working ward and knowledge scores ($p > 0.05$). **Conclusion:** Nurses at BMU demonstrated limited knowledge regarding HF self-management principles. These findings underscore the need for targeted educational interventions, continuing education, and in-service training to enhance nurse competence in HF education, reduce readmission rates, and improve patient outcomes.

Keywords

Heart Failure, Nurse Knowledge, Emergency Management, Patient

1. Introduction

1.1. Background

In the context of chronic disease, cardiovascular disease (CVD) can be life-threatening and is responsible for high mortality and morbidity rates. It increases hospital admissions, public healthcare costs, and ultimately reduces quality of life (Bocchi et al., 2013). According to the Global Burden of Disease (GBD) 2013 report, CVD accounted for 31.5% of all deaths and 45% of non-communicable disease deaths—more than twice as often as cancer, and more than all communicable, maternal, neonatal, and nutritional diseases combined in Europe (Townsend et al., 2016). Myocardial infarction, stroke, congestive heart failure, and arrhythmia are the four most common cardiovascular diseases.

Several studies emphasize the importance of education programs for patients with heart failure (HF), demonstrating improvements in clinical outcomes, such as reduced readmission rates, shorter hospital stays, lower healthcare costs, and improved self-care behaviors (Boren et al., 2009; Riegel et al., 2009; Fowler, 2012; Sterne et al., 2014). The Joint Commission mandates that HF education be provided to patients before hospital discharge. Together with the Joint Commission, the American Heart Association (AHA) and the American College of Cardiology Foundation (ACCF) have developed guidelines outlining key HF education topics: diet, physical activity, medication adherence, weight monitoring, symptom recognition, and follow-up care (Sterne et al., 2014). These education components are vital for empowering patients in managing their health post-discharge.

Heart failure, also known as congestive heart failure, is a clinical syndrome marked by symptoms such as dyspnea, orthopnea, and lower limb swelling, along with signs like elevated jugular venous pressure and pulmonary congestion. These manifestations are often the result of structural or functional cardiac abnormalities that impair cardiac output and/or elevate intracardiac pressures (Ponikowski et al., 2016). In Bangladesh, HF is considered an epidemic, affecting about 5% of the population across various CVD types and both genders. Urban residents appear to have a higher prevalence rate (Chowdhury et al., 2018). Rodeheffer & Redfield (2012) defined heart failure as a pathophysiologic state in which an abnormality in cardiac function impairs the heart's ability to pump blood effectively to meet metabolic demands, or does so only at elevated filling pressures (p. 858). The 2013 ACCF/AHA guidelines describe HF as a complex clinical syndrome caused by structural or functional impairments of ventricular filling or ejection (Yancy et al., 2013). While terms like cardiomyopathy or left ventricular (LV) dysfunction describe structural abnormalities, HF is a clinical syndrome that may result from disorders of the myocardium, pericardium, endocardium, heart valves, or great

vessels (Yancy et al., 2013).

The present study highlights significant variability in nurses' knowledge of acute heart failure (HF) management, with a substantial portion of respondents falling below the competence threshold. These findings reflect not only clinical knowledge gaps but also broader systemic issues related to continuing education and professional development in nursing.

Ahmed et al. (2024) conducted a multicenter survey across tertiary hospitals in Southeast Asia and found that nurses with higher academic qualifications (e.g., bachelor's or master's degrees) and more positive attitudes toward evidence-based practice demonstrated significantly greater competency in HF management. Their findings revealed that educational attainment and professional mindset—beyond clinical experience alone—were independently associated with better adherence to HF guidelines, particularly in patient education, fluid restriction, and symptom monitoring.

This aligns closely with current findings, where better performance was observed among nurses with higher education levels. These results underscore the urgent need for structured, competency-based in-service training that fosters not only knowledge but also a sustained attitude of lifelong learning. Institutional policies should prioritize regular refresher courses, mentorship programs, and attitude-enhancing strategies to strengthen nurses' HF care capabilities.

Heart failure is categorized into two types: heart failure with reduced ejection fraction (HFrEF), or systolic HF, and heart failure with preserved ejection fraction (HFpEF), or diastolic HF (Rodeheffer & Redfield, 2012). Both types are equally prevalent, with HFpEF diagnosed in 40% - 71% of patients, averaging around 50% (Fonarow et al., 2007). HFrEF is defined as an ejection fraction <40%, while HFpEF (EF > 50%) requires careful evaluation to exclude non-cardiac causes (Deaton & Grady, 2004). HFpEF can be further classified as borderline or improved. HF classification has evolved from the New York Heart Association (NYHA) Functional Classification, which focuses on symptoms and physical activity, to a staging system recommended by ACCF/AHA 2013. This system categorizes patients from Stage A to D based on risk factors, structural abnormalities, and symptoms (Delaney et al., 2011).

- **Stage A:** High risk for HF without structural heart disease or symptoms.
- **Stage B:** Structural heart disease without symptoms.
- **Stage C:** Structural heart disease with prior or current symptoms.
- **Stage D:** Refractory HF requiring specialized interventions (Delaney et al., 2011).

Common risk factors for HF include hypertension, diabetes, metabolic syndrome, and atherosclerotic disease. Early detection and management of these comorbidities can delay HF onset (Deaton & Grady, 2004). Other causes include dilated, familial, and tachycardia-induced cardiomyopathies. Behavioral factors such as chronic alcohol or cocaine use, and exposure to toxins like ephedra, cobalt, steroids, or chemotherapeutic agents also increase HF risk. HF can also be trig-

gered by myocarditis, infections (e.g., Chagas' disease, HIV), autoimmune disorders, and conditions like amyloidosis, sarcoidosis, Takotsubo cardiomyopathy, and peripartum cardiomyopathy (Deaton & Grady, 2004).

Accurate diagnosis requires a comprehensive history and physical examination. Key factors include family history, symptom duration, weight fluctuations, medication adherence, and dyspnea patterns. A thorough physical exam should assess blood pressure, pulse, jugular venous pressure, heart sounds, right ventricular heave, pulmonary congestion, hepatomegaly, peripheral edema, and extremity temperature (Deaton & Grady, 2004). HF may present asymptotically or with signs of decompensation: exceptional dyspnea, fatigue, orthopnea, paroxysmal nocturnal dyspnea, edema, ascites, tachycardia, and weight gain (Fowler, 2012).

This study aims to assess how well nurses are informed about HF education guidelines at Bangladesh Medical University (BMU), Bangladesh. The primary objective is to determine the need for targeted nursing education to improve patient instruction and health outcomes. Limited resources often challenge not-for-profit hospitals like BMU, making it vital to ensure that nurses are adequately trained to reduce HF-related readmissions and costs.

The findings from this study may highlight specific areas for continuing education and help improve adherence to performance standards set by the AHA and Joint Commission. Previous studies have shown that many nurses are not sufficiently knowledgeable about HF self-management principles (Ahmed et al., 2024; Goodlin et al., 2007; Hart et al., 2011; Kalowes et al., 2011; Lee & Han, 2022). While these studies have examined various hospital settings, few have linked nurse characteristics (e.g., years of experience, education level, and specialty area) to HF knowledge. This study addresses that gap by exploring these variables in relation to guideline knowledge.

1.2. Research Question

What is the level of knowledge and practice of nurses regarding emergency medical management of patients with acute heart failure at Bangladesh Medical University?

1.3. Objective

1.3.1. General Objective

To assess the level of knowledge and practice of nurses regarding emergency medical management of patients with acute heart failure at Bangladesh Medical University.

1.3.2. Specific Objectives

- 1) To assess the level of nurses' knowledge of heart failure education topics as measured by the Nurses' Knowledge of Heart Failure survey instrument.
- 2) To identify the correlation between years of nursing experience and knowledge of HF guidelines.
- 3) To identify the correlation between educational preparation and knowledge

of HF guidelines.

4) To identify the correlation between nursing unit and knowledge of HF guidelines.

5) To assess the knowledge about emergency medications used in acute heart failure management.

2. Methods

This study was carried out to determine their level of knowledge regarding emergency management of patients with acute heart failure among the nurses of a tertiary medical university. The study has been carried out following the methodology mentioned below.

2.1. Study Design

A descriptive cross-sectional study was conducted to determine their level of knowledge regarding emergency management of patients with acute heart failure among the nurses of a tertiary medical university.

2.2. Study Place

The study was conducted in Bangladesh Medical University, which is a postgraduate medical university in Bangladesh.

2.3. Study Period

This study was conducted for a period of 12 months from November 2020 to December 2021. It started from November 2020 with literature review, selection of topic and development of protocol and protocol was presented in the month of December 2020. The subsequent months were passed for questionnaire development, presenting, data collection, compilation and analysis report writing, printing and submission of thesis.

2.4. Study Population

The study population refers to the entire group of individuals who are the focus of the research. In this study, the population includes all nursing staff employed at Bangladesh Medical University (BMU). This population encompasses nurses working in various clinical departments, wards, and specialized units within the hospital.

2.5. Study Sample

The study sample is a subset of the study population selected to participate in the research. Since it is often impractical to study the entire population, a sample is chosen to represent the larger group. In this study, individual nurses working in different departments of BMU were selected as participants.

2.6. Sampling Technique

A non-probability purposive sampling technique was used to select the sample.

This means that participants were chosen deliberately based on specific characteristics relevant to the study objectives, such as their roles in patient care related to acute heart failure management. Purposive sampling allows the researcher to focus on nurses who are most likely to provide relevant data for assessing knowledge and practice regarding emergency management of acute heart failure.

2.7. Sample Size Calculation

The sample size 385 was calculated by using Fisher's formula.

2.8. Eligibility Criteria

Inclusion Criteria:

- Willing to participate in this study
- Participant present during data collection

Exclusion Criteria:

- Severely ill respondents or on leave
- Nurses engaged in patient care during data collection

2.9. Development of Research Instrument

A review of the literature revealed an existing instrument that has been used to assess nurses' knowledge of heart failure (HF) guidelines in previous studies. While limited studies exist on nurses' awareness of heart failure education principles taught to patients, even fewer have explored the factors that may contribute to this knowledge.

Dr. Nancy M. Albert developed the Nurses' Knowledge of Heart Failure Principles Survey (NKHFPS) in 2002, which was adopted for the current study. This instrument evaluates essential educational principles regarding HF self-management. The survey is self-administered and dichotomously scored, addressing five major domains: diet (3 items), fluids and weight (7 items), signs and symptoms of worsening disease (6 items), medications (2 items), and exercise (2 items) (Albert et al., 2002).

The response format is True (Yes) or False (No). Of the 20 items, 15 statements are accurate when marked "False", and 5 are accurate when marked "True." The total score is calculated by summing the number of correctly answered items. Scores range from 0 to 20, with higher scores indicating greater knowledge. A percentage score can also be derived by dividing the number of correct responses by the total number of items.

The NKHFPS has been validated for face and content validity by expert heart failure nurses and patient education specialists. According to Albert et al. (2002), nurses scoring 87.5% or higher are considered knowledgeable about HF self-management principles. Scores below 30% correct may indicate significant knowledge deficits, especially concerning issues such as determining whether to use dry or ideal weight in daily weight monitoring, advising asymptomatic patients on managing hypotension, and recognizing the implications of transient dizziness upon standing.

Adaptation, Translation, and Reliability of the Instrument

The Nurses' Knowledge of Heart Failure Principles Survey (NKHFPS), originally developed by Albert et al. (2002), was used to assess nurses' knowledge regarding heart failure management and education. To ensure cultural and linguistic appropriateness for the Bangladeshi context, the instrument underwent translation and adaptation processes.

First, the original English version of the NKHFPS was translated into Bangla by a bilingual nursing expert fluent in both English and Bangla. Then, a back-translation into English was performed by a second independent translator who was blinded to the original version. Both versions were compared to ensure semantic, idiomatic, experiential, and conceptual equivalence. Minor adjustments were made to improve clarity and cultural relevance without altering the meaning of the items.

A panel of three experts in cardiology, nursing education, and health communication reviewed the Bangla version to establish face and content validity. The experts confirmed that the items were relevant, comprehensive, and understandable for the target population.

A pilot study was conducted with 15 nurses from a department not included in the final study sample to assess comprehension, language clarity, and time required for completion. Based on the feedback, slight revisions were made to enhance clarity. The pilot data were not included in the final analysis.

To evaluate internal consistency reliability, Cronbach's alpha (α) was calculated for the 20-item Bangla version of the questionnaire using the final study sample. The Cronbach's alpha for the scale was found to be 0.81, indicating good internal consistency (Nunnally, 1978 recommends $\alpha \geq 0.70$ for acceptable reliability in social science research).

Thus, the adapted and translated Bangla version of the NKHFPS was found to be both linguistically appropriate and reliable for use among Bangladeshi nurses.

2.10. Research Approach

This study adopted a quantitative, cross-sectional descriptive design aimed at evaluating the level of nurses' knowledge and their practice concerning emergency medical management of acute heart failure (AHF) at Bangladesh Medical University (BMU). The rationale for selecting a descriptive approach lies in its ability to provide an accurate portrayal of characteristics and knowledge gaps among nurses, enabling the identification of potential areas for education and training.

Before data collection commenced, the full research protocol was submitted to the Institutional Review Board (IRB) of the National Institute of Preventive and Social Medicine (NIPSOM) for ethical clearance. The IRB reviewed and approved the proposal after evaluating its ethical and scientific validity, particularly concerning the rights, safety, and well-being of study participants.

The data collection instrument consisted of a structured questionnaire divided into two sections:

Section A: Socio-demographic Information—This section included variables

such as age, gender, level of education, area of residence, marital status, job designation, department/unit of employment, years of clinical experience, previous training on heart failure management, and average patient load per shift.

Section B: Knowledge and Practice Assessment—This section incorporated the validated Nurses' Knowledge of Heart Failure Principles Survey (Albert et al., 2002) to measure the nurses' knowledge on heart failure education and emergency management principles. Additional items were added to assess practical competencies relevant to AHF care.

2.11. Data Collection Procedure

Data collection was carried out systematically using the following procedures:

Recruitment of Participants: Nurses working in various departments of BMU were identified based on inclusion criteria (e.g., clinical involvement with patients, registered with BNMC, and providing direct or indirect care for heart failure patients). Participation was voluntary.

Mode of Data Collection: Data were gathered using a face-to-face interview technique. This approach was chosen to ensure clarity of questions and consistency in data collection. Interviews were conducted in a quiet and private environment within the hospital premises to maintain confidentiality.

Duration of Interview: Each interview lasted approximately 20 to 30 minutes, allowing sufficient time for participants to respond thoughtfully without disrupting their clinical responsibilities.

Questionnaire Administration: The structured questionnaire was administered directly by the researcher. This method reduced the risk of non-response bias, misinterpretation of questions, and incomplete answers.

Informed Consent: Prior to the interview, each participant was provided with a detailed explanation of the study's objectives, expected outcomes, confidentiality measures, and the voluntary nature of participation. Written informed consent was obtained from all respondents.

Confidentiality and Anonymity: All collected data were kept strictly confidential. Unique codes were assigned to each questionnaire to maintain anonymity. Names or identifiable information were not recorded.

Data Management and Analysis: The researcher was directly involved in the collection, coding, entry, and preliminary analysis of the data using appropriate statistical software. The integrity and accuracy of the data were ensured through double-checking and validation steps.

This rigorous data collection strategy was designed to enhance the reliability and validity of the findings and to ensure a comprehensive understanding of nurses' knowledge and practice in managing acute heart failure emergencies.

2.12. Data Analysis Plan

Following data collection, all questionnaires were thoroughly checked for completeness and accuracy. The data were then entered into the Statistical Package for the Social Sciences (SPSS) software for analysis. Descriptive statistics such as fre-

quencies, percentages, means \pm standard deviations (SD), and medians with interquartile ranges (IQR) were used to summarize the variables.

For inferential analysis, independent t-tests were used for comparing continuous variables, and the Pearson chi-square test was applied for categorical data. A p -value < 0.05 was considered statistically significant. The aim was to identify any statistically relevant associations between nurses' knowledge levels and their demographic or professional characteristics.

2.13. Data Presentation and Interpretation

After verification, the cleaned dataset was organized and presented in the form of tables, charts, and graphs, allowing for clear visualization of the results. The interpretation focused on identifying patterns in nurses' knowledge scores, practice behaviors, and areas with significant knowledge gaps related to heart failure management. Each finding was described with reference to existing literature to provide context and meaning.

2.14. Data Quality Management

To ensure high-quality and reliable data, several steps were taken:

The instrument used was a validated tool with established content and face validity.

A pilot study was conducted to test the clarity and reliability of the questionnaire in the local context.

All data were manually reviewed before entry to detect missing or inconsistent responses.

Frequency runs and logic checks in SPSS were used to identify errors or missing values.

The principal investigator directly supervised all stages of data collection, processing, and analysis to maintain methodological rigor.

2.15. Ethical Consideration

The researcher was reasonably concerned about ethical issues related to the study. For this study, official approvals have been collected from the Institutional Review Board (IRB) of National Institute of Preventive and Social Medicine (NIPSOM) and Bangladesh Medical University (BMU). At the time of data collection, the aims and objectives of the study have been explained to the respondent and written informed consent has been obtained from the respondents prior to data collection. It was ensured that their personal identities would be kept confidential and the data would be used for study purposes only. Participants were allowed to withdraw themselves at any stage of the study.

3. Results

This cross-sectional study was conducted to assess knowledge and practices of nurses regarding emergency medical management of patients with acute heart

failure at Bangladesh Medical University (BMU). A total of 385 nurses were interviewed from Bangladesh Medical University (BMU). This includes nurses who worked in any department of the hospital; the departments were selected purposively. Data were collected from 30 departments of BMU and the highest number of participants (16%) were from the cardiology department. Then an analysis plan was developed according to the objectives of the study. Descriptive statistics included frequency and percentage which were presented by tables and figures. Mean and standard deviations for continuous variables and frequency distribution for categorical variables were used to describe the characteristics of the total sample. The results have been organized in the following manner.

Table 1. Distribution of respondents by age (n = 385).

Age Group (years)	Frequency (n)	Percentage (%)
25 - 30	195	50.6
31 - 35	127	33.0
36 - 40	55	14.3
>40	8	2.1
Total	385	100.0

Mean age: 31.44 ± 4.34 years.

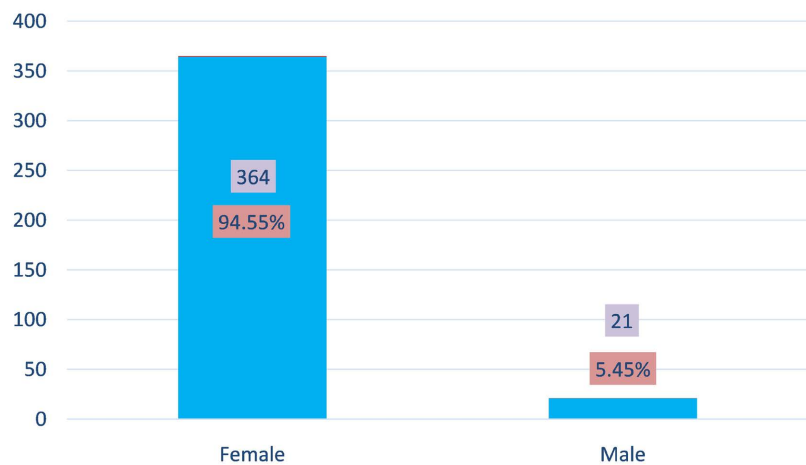


Figure 1. Distribution of participants according to their sex.

Table 1 presents the age distribution of the 385 nursing staff respondents who participated in the study. The mean age of the participants was 31.44 years with a standard deviation of ± 4.34 years, indicating a moderately young sample with some age variation. The majority of the respondents (50.6%) were in the 25 - 30 years age group, suggesting that more than half of the nurses were relatively early in their careers. The second largest group (33.0%) belonged to the 31 - 35 years age range. 14.3% of the nurses were aged 36 - 40 years. Only 2.1% of the respondents were above 40 years, indicating that older and possibly more experienced nurses were underrepresented in the sample. This distribution suggests that the

nursing workforce at BMU is predominantly composed of younger professionals, which may have implications for training needs and experience levels in managing acute heart failure emergencies.

Figure 1 illustrates the gender distribution of the 385 nursing staff who participated in the study. Female participants accounted for the overwhelming majority, with 364 nurses (94.55%). Male participants made up only 21 nurses (5.45%).

Table 2. Distribution of educational qualification (n = 385).

Educational Qualification	Frequency (n)	Percentage (%)
Diploma in Nursing	257	66.8
Bachelor in Nursing	119	30.9
Master in Nursing	3	0.8
Master of Public Health	6	1.6
Total	385	100.0

Previous HF Training: 82 nurses (21.3%) had received prior training in heart failure management.

Table 2 presents the distribution of educational qualification among nurses. The majority of the nurses participating in the study were diploma holders, comprising 66.8% of the total sample. This indicates that most nurses in the sample had completed the foundational level of nursing education, which is typical for clinical nursing staff in Bangladesh.

A significant portion, 30.9%, held a bachelor's degree in nursing, reflecting a considerable number of nurses with higher education and potentially more in-depth theoretical and practical knowledge. Only a small percentage of participants had advanced degrees, with 0.8% holding a Master's in Nursing and 1.6% holding a Master of Public Health (MPH). This suggests that postgraduate qualifications among nurses in this setting are relatively rare.

Additionally, 21.3% of the participants had received prior training specifically related to heart failure (HF) patient management. This highlights an opportunity to enhance specialized training among nursing staff to improve HF care. Overall, the educational profile of participants shows a nursing workforce predominantly educated at the diploma and bachelor levels, with limited representation at the postgraduate level. This distribution may influence the depth of knowledge and clinical practice in specialized areas such as heart failure management.

Table 3. Distribution of respondents by years of service (n = 385).

Years of Experience	Frequency (n)	Percentage (%)
1 - 5 years	223	57.9
6 - 10 years	119	30.9
11 - 15 years	16	4.2
16 - 18 years	27	7.0
Total	385	100.0

Table 3 presents the majority of the nurses in the study, 57.9%, have relatively early career experience with 1 to 5 years of service, indicating a young or recently employed workforce. A substantial portion, 30.9%, have moderate experience ranging from 6 to 10 years, which suggests a balanced representation of mid-career nurses. Only a small percentage of nurses have longer tenure, with 4.2% having 11 to 15 years of experience, and 7.0% serving between 16 to 18 years. This distribution reflects that most nurses in the sample are either in the early or middle stages of their careers, which may influence their knowledge, skills, and familiarity with clinical practices.

Data Analysis and Findings

Research Question 1: What is the extent of nurses' knowledge of acute heart failure management?

The overall knowledge level among nurses about acute HF management was below average, with a mean total score of 13.38 ± 0.36 , which corresponds to 42.09% correct answers. No nurse scored 100% correct; scores ranged from 20% to 60%. A criterion cut-off of 87.5% correct answers was set to define adequate knowledge, but no nurse reached this threshold. The highest score (60% correct) was achieved by only 12 participants, while the lowest score (20% correct) was recorded by some nurses.

Knowledge Strengths: Using a cut-off of 90% correct response rate per question, nurses showed strong knowledge in these areas:

- Common symptoms of advanced HF (Question 3, 96.4% correct)
- Importance of daily weight monitoring (Q14, 90.1%)
- Recognition of fatigue (Q19, 96.6%)
- Exercise intolerance (Q20, 94.5%)

Knowledge Gaps: Using a cut-off of 30% or lower correct response rate, nurses were least knowledgeable about:

- Physical activity recommendations (Q4, 16.6%)
- Chronic nature of HF (Q7, 9.1%)
- Use of NSAIDs (Q8, 4.2%)
- Potassium-based salt substitutes (Q9, 6.5%)
- Orthopnea (Q11, 6.2%)
- Breathing symptoms (Q12, 11.9%)
- Correct interpretation of daily weight compared to ideal or dry weight (Q15, 23.6%)
- Managing transient dizziness (Q18, 5.5%)

Five questions had less than 10% correct responses, indicating critical knowledge deficiencies especially regarding:

- The chronic nature of HF (Q7)
- NSAID use in HF patients (Q8)
- Potassium-based salt substitutes (Q9)
- Orthopnea as a worsening symptom (Q11)

- Management of transient dizziness (Q18)

Common Misconceptions (highest incorrect responses):

- **Question 8:** 95.84% incorrectly thought NSAIDs like ibuprofen should be recommended for aches and pains in HF patients.
- **Question 9:** 93.51% incorrectly believed potassium-based salt substitutes are safe for seasoning food.
- **Question 11:** 93.77% incorrectly believed that adding extra pillows to relieve breathlessness does not indicate worsening HF.
- **Question 18:** 94.55% incorrectly answered that transient dizziness on standing, which disappears quickly, should be reported as a worsening HF symptom.

The results demonstrate significant gaps in nurses' knowledge regarding key aspects of acute heart failure management, especially in areas related to medication safety, symptom recognition, and lifestyle advice. Although nurses were well-informed about some common symptoms and the importance of monitoring, there were critical misunderstandings about the chronic nature of HF and appropriate self-management principles.

These knowledge gaps may negatively impact patient education, early detection of worsening symptoms, and appropriate management, thereby potentially compromising patient outcomes.

Table 4. Percentage of sample reporting correct responses to questions (n = 385).

		Frequency	Percentage
1	Patients with Heart Failure (HF) should drink plenty of fluids each day. (F)	248	64.4
2	As long as no salt is added to foods, there are no dietary restrictions for patients with HF. (F)	120	31.2
3	Coughing and nausea/poor appetite are common symptoms of advanced HF. (T)	371	96.4
4	Patients with HF should decrease activity and most forms of active exercise should be avoided. (F)	64	16.6
5	If the patient gains more than 3 pounds in 48 hours without other HF symptoms, they should not be concerned. (F)	157	40.8
6	Swelling of the abdomen may indicate retention of excess fluid due to worsening HF. (T)	139	36.1
7	If patients take their medications as directed and follow the suggested lifestyle modifications, their HF condition will not return. (F)	35	9.1
8	When patients have aches and pains, aspirin and non-steroidal anti-inflammatory drugs (NSAIDs like ibuprofen) should be recommended. (F)	16	4.2
9	It is OK to use potassium-based salt substitutes (like "No-Salt" or "Salt Sense") to season food. (F)	25	6.5
10	If patients feel thirsty, it is OK to remove fluid limits and allow them to drink. (F)	200	51.9
11	If a patient adds extra pillows at night to relieve shortness of breath, this does not mean that their HF condition has worsened. (F)	24	6.2
12	If a patient wakes up at night with difficulty breathing, and the breathing difficulty is relieved by getting out of bed and moving around, this does not mean that the HF condition has worsened. (F)	46	11.9
13	Lean deli meats are an acceptable food choice as part of the patient's diet. (F)	296	76.9
14	Once the patient's HF symptoms are gone, there is no need for obtaining daily weights. (F)	347	90.1

Continued

15	When assessing weight results, today's weight should be compared with the patient's weight from yesterday, not the patient's ideal or "dry" weight. (F) Statements in questions 16 - 20 reflect signs or symptoms that patients may have. Please indicate "yes" or "no" to signify whether a patient should notify their HF physician of these signs and symptoms.	91	23.6
16	BP recording of 80/56 without any HF symptoms. (F)	190	49.4
17	Weight gain of 3 pounds in 5 days without symptoms. (Yes/T)	177	46.0
18	Dizziness or lightheadedness when arising that disappears within 5 minutes. (F)	21	5.5
19	New onset or worsening of fatigue. (Yes/T)	372	96.6
20	New onset or worsening of leg weakness or decreased ability to exercise. (Yes/T)	364	94.5

T = True; F = False.

Table 4 shows that the percentage of sample reporting Correct Responses to Questions no 1 - 20. Question 8, "When patients have aches and pains, aspirin and non-steroidal anti-inflammatory drugs (NSAIDs like ibuprofen) should be recommended" was the lowest scoring question, with 369 nurses incorrectly responding 'true', resulting in an incorrect response rate of 95.84%.

Question 9, "It is OK to use potassium-based salt substitutes (like 'No-Salt' or 'Salt Sense') to season food" resulted in an incorrect response rate of 93.51%, with 360 nurses incorrectly responding "true".

Question 11, "If a patient adds extra pillows at night to relieve shortness of breath, this does not mean that their HF condition has worsened" yielded 361 incorrect responses of "true", with an incorrect response rate of 93.77%.

Question 18, "Dizziness or lightheadedness when arising that disappears within 5 minutes" was incorrectly answered "yes" by 364 nurses, yielding an incorrect response rate of 94.55%.

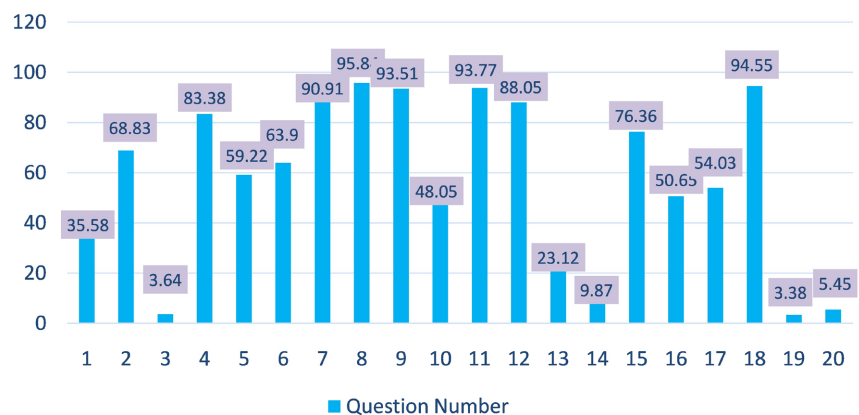


Figure 2. Percentage of nurses answering each question incorrectly.

As shown in **Figure 2**, this study reveals substantial gaps in nurses' knowledge about acute HF management, particularly concerning medication safety, symptom interpretation, and lifestyle modifications. While some aspects like symptom recognition and monitoring were well understood, critical misconceptions may

compromise patient care and education. Targeted training and education programs are needed to improve nurses' competence in HF management, enhancing patient outcomes.

The overall knowledge level was below average, with a mean score of 13.38 (± 0.36), corresponding to only 42.09% correct answers. No nurse scored 100%; scores ranged from 20% to 60%. The cut-off for adequate knowledge was set at 87.5%, but none reached this. This indicates critical gaps in nurses' understanding of important aspects of HF management, particularly regarding medication safety and symptom interpretation, which may affect patient education and outcomes. Targeted education and training are necessary to improve nurses' knowledge in these areas.

Research Question 2: Is there a correlation between years of nursing experience and knowledge of HF guidelines?

The years of nursing experience among participants ranged from 1 to 18 years. The majority of nurses, 223 (57.9%), had 1 to 5 years of experience; 119 (30.9%) had 6 to 10 years; 16 (4.2%) had 11 to 15 years; and 27 (7.0%) had more than 15 years of experience.

Table 5. Distribution of respondents by years of experience and knowledge score (n = 385).

Years of Experience	Frequency (n)	Percentage (%)	Mean Knowledge Score	Mean Percentage Score (%)
1 - 5 years	223	57.9	8.43	42.13
6 - 10 years	119	30.9	8.66	43.28
11 - 15 years	16	4.2	9.63	48.13
16 - 18 years	27	7.0	8.89	44.45
Total	385	100.0	8.67	43.35

Statistical Analysis: $F = 2.01$, $p = 0.110$ (not significant).

Table 5 presents the mean knowledge scores (%) for nurses grouped by their years of experience. Nurses with 11 to 15 years of experience (n = 16) had the highest mean knowledge score of 9.63 (48.13%), which was slightly higher than other groups. The scores for nurses with 1 - 5 years, 6 - 10 years, and more than 15 years of experience were 8.43 (42.13%), 8.66 (43.28%), and 8.89 (44.45%), respectively, indicating little overall difference across experience categories.

The analysis shows that nurses' knowledge of heart failure (HF) guidelines does not strongly correlate with years of nursing experience. Although nurses with 11 to 15 years of experience scored slightly higher (mean score 9.63, or 48.13%) compared to other groups, the difference in knowledge scores across all experience categories was relatively small. Nurses with less than 5 years of experience and those with more than 15 years both had similar scores around 42% - 44%.

Research Question 3: Is there a correlation between educational preparation

and knowledge of HF guidelines?

All participants were registered nurses under the Bangladesh Nursing & Midwifery Council with varying educational backgrounds. The majority held a Diploma in Nursing (n = 257), followed by those with a Bachelor's degree in Nursing (n = 119). A small number of nurses had a Master's degree in Nursing (n = 3) or an additional Master of Public Health (MPH) degree (n = 6).

Table 6. Educational qualification and knowledge score (n = 385).

Educational Level	Frequency (n)	Percentage (%)	Mean Knowledge Score	Mean Percentage Score (%)
Diploma in Nursing	257	66.8	8.55	42.76
Bachelor in Nursing	119	30.9	8.61	42.07
Master in Nursing	3	0.8	9.33	46.67
Master of Public Health	6	1.6	8.67	43.33
Total	385	100.0	8.62	43.09

Statistical Analysis: $F = 0.89$, $p = 0.235$ (not significant).

Table 6 summarizes the mean knowledge scores across these educational categories. Nurses with a Master's degree in Nursing scored the highest (mean score 9.33, 46.67%), followed by nurses with an MPH (8.67, 43.33%), Bachelor's degree (8.61, 42.07%), and Diploma holders (8.55, 42.76%). The differences in mean scores among the groups were relatively small.

The data indicate only minor differences in HF guideline knowledge related to educational preparation. Nurses with advanced degrees (Master's in Nursing or MPH) had slightly higher mean knowledge scores compared to diploma or bachelor's degree holders; however, the small sample sizes in the master's groups limit strong conclusions.

Overall, these results suggest that higher formal educational qualifications alone may not substantially impact knowledge of HF guidelines among nurses. Continuing professional development and specific heart failure training may be more influential in enhancing knowledge across all education levels.

Research Question 4: Is there a correlation between unit of nursing and knowledge of HF guidelines?

The distribution of nurses by their current employment ward is shown in **Table 7**. Nurses were employed across a wide range of specialized units, with the largest groups working in Cardiology (15.58%) and Neurology (15.06%). Other units included Pediatric Hematology & Oncology (8.83%), Intensive Care Unit (7.53%), Nephrology (7.27%), and several smaller units such as Gynecology, Cardiac Surgery, and General Surgery. Nurses working in specialized units such as Cardiology and Intensive Care Unit (ICU) are more likely to encounter heart failure patients, which may influence their knowledge and familiarity with HF guidelines.

Table 7. Present employment ward of nurses (n = 385).

Department/Ward	Frequency (n)	Percentage (%)
Cardiology	60	15.58
Neurology	58	15.06
Pediatric Hematology & Oncology	34	8.83
Intensive Care Unit	29	7.53
Nephrology	28	7.27
Gynecology & Obstetrics	25	6.49
Cardiac Surgery	23	5.97
General Surgery	22	5.71
Emergency Department	20	5.19
Gastroenterology	18	4.68
Pulmonology	17	4.42
Orthopedics	15	3.90
Internal Medicine	12	3.12
Psychiatry	10	2.60
Dermatology	8	2.08
Ophthalmology	6	1.56
Total	385	100.0

Statistical Analysis: $F = 1.98$, $p = 0.042$ (significant).

Research Question 5: What is the extent of knowledge about emergency medications used in acute heart failure management?

Questions 25, 26, and 27 assessed nurses' knowledge about medications used in acute heart failure management. These included knowledge of appropriate treatments for acute diastolic heart failure, the most common classes of medications for chronic management, and the mainstays of treatment for systolic heart failure.

Table 8. Knowledge about emergency medications used in acute heart failure management (n = 385).

Question	Content	Correct Answer	Correct Responses n (%)	Incorrect Responses n (%)
Q25	Which is NOT used for acute diastolic heart failure? (a) Nitroglycerin (b) Furosemide (c) Ultrafiltration (d) Beta-blockers	C	295 (76.62)	90 (23.38)
Q26	Most common class of medications for chronic diastolic HF management	Diuretics	257 (66.75)	128 (33.25)
Q27	Mainstays of chronic systolic HF treatment include: (a) ACE inhibitors (b) Beta-blockers (c) Diuretics (d) All of the above	D	362 (94.03)	23 (5.97)

Table 8 shows the most nurses correctly identified nitroglycerin as not used for acute diastolic heart failure (76.62%), and a majority knew diuretics are the most common class of medications in chronic management of diastolic heart failure (66.75%). Furthermore, 94.03% correctly recognized that the mainstay of chronic

treatment for systolic heart failure includes multiple approaches (all of the above).

However, responses indicate knowledge gaps regarding some specific treatments, such as the appropriate use of ultrafiltration and the role of potassium supplements. This suggests a need for further targeted education to enhance nurses' understanding of pharmacologic management in acute and chronic heart failure.

Table 9. Level of knowledge regarding emergency medical management of acute heart failure at BMU.

Knowledge Level	Score Range (%)	Frequency (n)	Percentage (%)
Poor	0% - 49%	371	96.4
Moderate	50% - 74%	14	3.6
Good	75% - 100%	0	0.0
Total		385	100.0

Mean Score: 13.38 ± 0.36 (42.09% correct responses).

A total of 385 registered nurses participated in the study to assess their knowledge on the emergency medical management of acute heart failure (AHF) using a validated questionnaire. **Table 9** presents the mean raw knowledge score was 13.38 ± 0.36 out of 32, equivalent to 42.09% correct responses. The vast majority of participants (96.4%) demonstrated poor knowledge of AHF emergency management. Only 3.6% of nurses achieved a moderate level of knowledge, and none scored in the good category. These findings reveal a critical knowledge gap in emergency heart failure management among BMU nurses.

Statistical Analysis of Knowledge Scores by Demographics

Table 10. Educational qualification and knowledge score.

Educational Level	n	Mean Score (%)	SD	F-value	p-value
Diploma in Nursing	257	42.76	8.45	0.89	0.235
Bachelor in Nursing	119	42.07	7.92		
Master in Nursing	3	46.67	9.81		
Master of Public Health	6	43.33	8.16		

No statistically significant difference was found in knowledge scores among nurses with different educational qualifications (Diploma, BSc, Masters, MPH). **Table 10** shows that the minor variations in mean scores (e.g., nurses with master's degrees scoring slightly higher), these differences were not significant ($p = 0.235$). Higher academic qualifications alone did not predict better knowledge of HF self-care principles. This may suggest a lack of emphasis on HF education across all nursing curricula, regardless of degree level.

Relationship between experience and knowledge is shown in **Table 11**. Although nurses with 11 - 15 years of experience had the highest average score (48.13%), there was no statistically significant association between years of experience and knowledge.

rience and knowledge level ($p = 0.110$). Experience alone did not significantly improve HF knowledge, possibly due to insufficient ongoing training or lack of exposure to HF-specific education during practice.

Table 11. Years of nursing experience and knowledge score.

Experience Years	n	Mean Score (%)	SD	F-value	p-value
1 - 5 years	223	42.13	8.22	2.01	0.110
6 - 10 years	119	43.28	8.56		
11 - 15 years	16	48.13	9.12		
16 - 18 years	27	44.45	7.89		

Table 12. Ward assignment and knowledge score.

Ward Type	N	Mean Score (%)	SD	F-value	p-value
Cardiology	60	45.23	9.12	1.98	0.042*
ICU/CCU	29	46.78	8.95		
Medical Wards	156	41.45	7.88		
Surgical Wards	85	40.12	8.23		
Other Units	55	42.89	8.67		

*Statistically significant ($p < 0.05$).

Table 12 shows that A statistically significant difference was observed in knowledge scores based on ward assignment ($p = 0.042$). Nurses working in critical care units (CCU/ICU) had significantly higher scores than those in surgical wards. Nurses working in specialized or high-acuity settings (like CCU) may have more frequent exposure to HF patients and protocols, leading to better knowledge acquisition. This highlights the importance of clinical environment in shaping clinical competence.

Table 13. Heart failure training and knowledge score.

HF Training	N	Mean Score (%)	SD	t-value	p-value
Yes	82	48.67	9.45	3.89	<0.001*
No	303	40.78	7.62		

*Statistically significant ($p < 0.05$).

Table 13 presents the HF-related training scored significantly higher than those who had not ($p < 0.001$). Targeted training programs are strongly associated with better knowledge, underscoring the importance of continuing education in improving HF management competency among nurses.

4. Discussion

This chapter presents a discussion of the study findings based on the study objec-

tives. Heart failure is a complex chronic illness requiring patients to engage in self-monitoring techniques such as symptom recognition, weight monitoring, exercise adherence, and medication compliance (Yancy et al., 2013). Multiple studies have highlighted gaps in nurses' knowledge of heart failure, particularly regarding self-monitoring and assessment (Albert et al., 2002; Washburn & Hornberger, 2005; Goodlin et al., 2007; Delaney et al., 2011; Hart et al., 2011; Kalowes et al., 2011; Fowler, 2012; Mahramus et al., 2014). It is critical that nurses possess comprehensive knowledge about heart failure to effectively educate patients and provide consistent care. Enhanced nursing education on heart failure can reduce contradictory patient information, decrease hospital readmissions, lower healthcare costs, and improve patients' quality of life.

4.1. Discussion on Socio-Demographic Characteristics of Nurses

The socio-demographic profile of the 385 nurses participating in this study at Bangladesh Medical University (BMU) offers critical context for interpreting their knowledge levels regarding emergency management of acute heart failure (AHF). These characteristics—such as age, gender, educational qualification, years of experience, and current ward placement—provide insight into the factors that may influence knowledge acquisition and clinical competence.

4.2. Age Distribution

The majority of nurses were aged between 26 - 30 years, with a mean age of 31.44 ± 4.34 years, indicating a relatively young nursing workforce. Younger nurses may have had less exposure to heart failure cases or emergency scenarios, which could partially explain the overall low knowledge scores. However, they may also have more recent academic exposure, suggesting that curriculum enhancements are needed to better prepare graduates. Supporting literature by Alharbi et al. (2020) found that age was not always a predictor of higher knowledge unless paired with specific training or clinical exposure.

4.3. Gender

Female nurses constituted the majority of participants (94.55%), reflecting national trends in the nursing profession in Bangladesh. However, no significant association was found between gender and knowledge levels in this study, which is consistent with previous findings that clinical knowledge is not inherently gender-dependent but influenced by training and experience.

4.4. Educational Qualification

The educational profile shows:

- Diploma in Nursing: 66.8%
- Bachelor's in Nursing: 30.9%
- Master's in Nursing/Public Health: 2.4%

A clear trend emerged, showing that nurses with higher academic qualifications

tended to score better on the knowledge test, though overall scores remained low across all categories. Nurses with a master's degree achieved a slightly higher mean score (46.67%), but none reached the "good" knowledge level. This suggests that pre-service education alone may be insufficient, and continuous in-service education is necessary for improving emergency management competencies.

4.5. Clinical Experience

The majority of respondents (57.9%) had 1 - 5 years of experience, with fewer participants in the >10 years category. Interestingly, those with 11 - 15 years of experience had the highest mean knowledge score (48.13%), although the differences were not statistically significant ($p > 0.05$). Experience does contribute to better understanding, but without structured clinical exposure and targeted training, knowledge may not reach the required competency level.

4.6. Ward Placement

Nurses were deployed across various departments, including general wards, ICUs, and cardiac units. A statistically significant difference was observed in knowledge scores based on ward assignment ($p = 0.042$). Nurses working in critical care units (CCU/ICU) had significantly higher scores than those in surgical wards. Clinical area exposure does offer some advantage, and focused HF protocols and regular training across wards enhance knowledge dissemination.

The socio-demographic findings highlight the following key points:

- A young, largely diploma-qualified workforce with limited emergency training in HF
- Educational level and years of experience show weak positive trends in knowledge scores but are not decisive without ongoing professional development
- Significant knowledge differences based on clinical ward, reinforcing the need for targeted education reforms

4.7. Level of Knowledge Regarding Emergency Medical Management of Acute Heart Failure at BMU

This study assessed the level of knowledge among nurses at Bangladesh Medical University (BMU) regarding the emergency medical management of patients with acute heart failure (AHF). The findings reveal a suboptimal level of knowledge, with an overall mean score of 13.38 out of 32 (42.09%), indicating poor understanding of key concepts related to AHF care. These results are consistent with several national and international studies that have reported inadequate knowledge among nurses concerning heart failure management principles.

Only 3.6% of the participants demonstrated moderate knowledge, while 96.4% fell into the poor knowledge category, and none achieved a good level of knowledge. This is particularly concerning given that nurses are often on the front line in the detection and initial management of heart failure decompensation. The role of

nurses in recognizing symptoms, administering emergency medications, and patient education is critical in preventing complications and reducing readmissions.

The study also found notable gaps in knowledge about:

- The chronic nature of heart failure (only 9.1% answered correctly)
- The use of NSAIDs in HF patients (4.2% correct)
- The appropriateness of potassium-based salt substitutes (6.5% correct)
- Orthopnea recognition (6.2% correct)
- Transitory dizziness and lightheadedness (5.5% correct)

These misconceptions suggest that many nurses may not fully understand the pathophysiology of HF or the implications of pharmacologic and lifestyle interventions, which are essential for emergency and ongoing management.

In comparing knowledge scores by educational level, nurses with a master's degree scored slightly higher than those with bachelor's or diploma degrees. However, even the highest-scoring group (Master's in Nursing) had only 46.67% correct responses, reinforcing the need for continuous professional development and in-service training regardless of formal qualification.

When knowledge was compared across clinical wards, a statistically significant difference was observed ($p = 0.042$), with nurses in cardiac-related units (e.g., Cardiology, ICU) scoring significantly higher. This highlights the potential impact of clinical exposure and experience on HF knowledge.

Taken together, the results indicate an urgent need for structured training interventions at BMU, with emphasis on:

- Emergency pharmacologic management
- Recognition of worsening symptoms
- Lifestyle modifications
- Patient education strategies

These efforts are essential not only to improve clinical practice but also to enhance patient outcomes, reduce hospital readmissions, and support the national effort to reduce cardiovascular mortality.

5. Limitations, Recommendations, and Conclusion

5.1. Limitations

Study limitations include a single institution; thus, results are not generalizable to other hospitals and nurses caring for heart failure patients. Random unit identification was not assessed; data was collected purposively from nurses employed within the hospital. Patients with heart failure are encountered in a variety of settings, and it is important for nurses in all areas to be able to provide adequate education to help patients manage their HF. In retrospect, it would have been beneficial to assess the level of nurses' interaction with HF patients, as heart failure is not always a primary diagnosis for patients. Furthermore, cardiac-focused units will likely encounter HF patients more frequently. Assessing whether participants commonly care for HF patients could have provided more insight into nurses' knowledge of HF education topics.

The short time frame of two weeks did not allow sufficient response time. If the study were to be repeated, it would be best to lengthen availability of the survey to nurses. Additionally, conditions under which nurses took the survey were not controlled, and participants could have collaborated with each other, or used outside resources while completing the survey. Scores would then be a false representation of nurses' knowledge of HF guidelines.

The restrictions because of COVID-19 have had a greater impact on research activities such as reaching out to participants and collecting the data, especially research objectives through which the practice of nurses was supposed to be observed, but it could not be done.

Finally, as participation in this study was voluntary, it is possible that nurses who feel they may have done poorly on the survey chose not to participate, which could have further affected mean scores and may not have reflected the true knowledge of nurses.

5.2. Recommendations

Educating patients is an essential responsibility across all continuums of nursing, and thus, nurses must be able to provide knowledgeable instructions if patients are to independently manage their HF at home. Results of this study demonstrate that nurses working in different wards of the hospital may not be sufficiently educated in HF self-management principles. Findings have identified knowledge gaps that should provide an opportunity for staff education to better prepare nurses in these areas. It could be beneficial to develop unit-specific training for nurses that focus on this particular patient population. Such knowledge gaps can be minimized by assigning the nurses to different departments in rotation at specific periods of time. More research is needed to determine if continuing education interventions for nurses on important HF topics would minimize this knowledge deficit. Determining effective interventions to educate nurses should be another focus of future research to guarantee an optimal level of skills acquisition. Potential strategies include utilizing advanced practice nurses specialized in heart failure to provide education programs for staff and providing resources that allow nurses to remain up-to-date with HF education. Additional studies to be considered could also assess nurses' perceived level of self-efficacy. As previously discussed, nurses with a strong sense of self-efficacy are confident in their abilities to provide adequate HF education and will be more successful in helping patients learn to manage their disease.

5.3. Conclusion

Heart failure is a complex, chronic illness afflicting millions of people and placing a costly burden on the healthcare system. Non-adherence to prescribed self-management principles leads to decreased quality of life for patients, related to harmful symptoms and multiple hospital readmissions. Nurses play a key role in counseling patients, in and out of the hospital, to self-manage their HF. Patient educa-

tion should cover essential HF guidelines, including weight monitoring, diet and exercise recommendations, medications, and symptom management. On the basis of this study, evidence indicates nurses lack sufficient knowledge to provide critical HF education to patients. If nurses are unable to adequately educate patients, it is unrealistic to expect patients to practice self-management behaviors at home. Given the prevalence and chronic nature of HF, it is imperative that healthcare facilities develop effective interventions to educate staff caring for this patient population.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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