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Section I

Introduction

A recent study has shown that adults with both heart failure (HF) and diabetes mellitus (DM) experience more severe clinical outcomes than HF patients without DM (Rosano et al., 2017). The same study has also revealed that patients with dual diagnoses of DM and HF are at a significantly increased risk of rehospitalization, have extended hospital stays, and experience higher mortality rates than patients without DM (Rosano et al., 2017; Dunlay et al., 2019). Current evidence further notes that patients diagnosed with dual HF and DM often receive uncoordinated care plans. Such unplanned care results in unstable transitions from hospital to home care and unsatisfactory self-care management during the pre-and post-discharge periods (Dunlay et al., 2019; Kenny & Abel, 2019; The Joint Commission, 2010). As each diagnosis is independently challenging, when the diseases occur concurrently, they increase patients' risks of hyperglycemia and other complications, such as cardiac symptoms (Dunlay et al., 2019). Thus, regular, planned care is crucial to positive care outcomes.

Transitioning care from the hospital to the home can be potentially dangerous, particularly for vulnerable patients who have had shorter hospital stays. That is, patients may go home when they actually require more extended care, resulting in unexpected readmissions. Therefore, the purpose of discharge planning is to incorporate multidisciplinary services to ensure that high-quality care is sustained during patient transfer (Coleman, 2003; Naylor & Keating, 2008). Providing high-quality transitional care from the hospital to the home can be difficult due to changes in routine tasks, such as starting the patients on new medications. These factors can lead to sentinel events, resulting in readmission within 30 days (Burke et al., 2013; Mennuni et al., 2017; Baptissta et al., 2016). Such unplanned readmissions can be extremely expensive. In the United States, a study of Medicare fee-for-service reported statistics for twelve million Medicare beneficiaries discharged from hospital in 2004 found that one-fifth of patients were re-hospitalized within 30 days. Nearly 50% of post-discharge patients did not follow up, adding up to a $17.4 billion financial burden to the $102.6 billion in total hospital payments that year (Hartman et

al., 2019). Therefore, this quality improvement (QI) project aims to develop strategies that may improve the process of safely transitioning patients with DM and HF from the hospital to the home and the possibility of decreasing readmission within 30 days.

Background

According to previous observational studies, individuals with DM are at a two to four times greater risk of developing HF than individuals without DM (Dunlay et al., 2019). In treating DM, providers focus on targeting hemoglobin (A1C) levels, having most patients seek to attain levels in the range of 7.1% to 8%. With each incremental increase in A1C, there is an increased risk, from 8% to 36%, of developing HF (Bahtiyar et al., 2016; Dunlay et al., 2019; Nasir & Aguilar et al., 2012). Thus, research concerning the pathophysiology of DM and HF has revealed that DM may precipitate the development of structural heart disease and HF. DM progression may cause oxidative stress, atherosclerotic changes, inflammatory deficits, coronary artery disease (CAD), the deterioration of intracellular calcium, and the accumulation of advanced glycation end products (AGEs) (Dunlay et al., 2019). DM also exacerbates the development of HF prognoses, subsequently increasing the risk of high blood glucose, insulin resistance, and hyperinsulinemia (Dunlay et al., 2019; Tousoulis et al., 2014). The prevalence of comorbid DM and HF is higher in adults aged 60+. As HF has poorer prognoses than DM, it should be given priority over DM when care is being provided (Dunlay et al., 2019; Rosano et al., 2017).

Managing DM in an HF setting is a significant task. Without appropriate DM management, patients diagnosed with HF are at substantial risk of poor outcomes, ineffective health quality, and high healthcare costs (Bahtiyar et al., 2016; Nasir & Aguilar, 2012). It is, therefore, crucial to identify the risk factors related to glycemic control among patients with HF and DM by analyzing post-discharge data from electronic health records (EHRs). It is also necessary to correlate risk factors with selected variables that mitigate and reduce HF and DM obstacles. Secondary data analysis results, as well as best evidence-based practices and guidelines, will provide HF teams with baseline data for managing patients with HF and a history of DM. Recent guidelines for glycemic regimens based on comorbid patient

conditions have accentuated the individual use of a glycemic regimen based on data from patients with multiple conditions and potentially adverse effects from medical treatments.

Substantiated research evidence demonstrates that patients with dual diagnoses of DM and HF still encounter poor prognoses for both diseases (House et al., 2016; Kenny & Abel, 2019; Rosano et al., 2017; Wiviott et al., 2019). Balanced glycemic control, based on an analysis of aggregated patient data, can help providers better evaluate and treat patients with DM and HF. Currently, developing treatment strategies to improve the cardiovascular outcomes of patients with type 2 DM (T2DM) remains a crucial priority (Packer et al., 2018).

This QI project has employed an audit tool for data collection (specifically designed for applying research evidence and following evidence-based guidelines) to pinpoint gaps in blood glucose management and future quality of care references that may be communicated to HF teams. The Doctor of Nursing practice (DNP) gathered demographic data and specific risk factors concerning the sampled patients (in collaboration with the Heart Failure Disease Management (HFDM) team at the hospital in which the research took place), as well as baseline information about the HFDM team itself. The audit tool was dependent on reviewing patient charts and extracting data from EHR chart reviews. The tool itself also provided inclusion/exclusion criteria for extracting information from the charts of patients dually diagnosed with HF and DM (see Appendix A).

Organization

This QI project took place at a faith-based hospital in a large, Southern metropolitan area. This hospital is a not-for-profit institution accommodating about 1,000 licensed beds in the Texas Medical Center. Nearly 4.8 million patients visit this hospital yearly, including 45,511 emergency room (ER) visits and 41,976 admissions. Established in 1918, the hospital provides high-quality services to its regional, national, and global patients. Within the institution, the payer system is broad. It includes Medicare, Medicaid, third-party payers, out-of-pocket cash payments, and charitable donations. The American

Nurses Credentialing Center (ANCC) has also appointed the organization as a Magnet facility (Aiken et al., 2009).

This hospital has a cardiac intensive care unit (CICU), as well as three resolute acute care cardiology units (ACCUs), one of which cares specifically for advanced heart failure (AHF) patients. The AHF ACCU manages inpatients with various medical treatments, including continuous diuretic infusions, left ventricular assist devices (LVADs), inotropic infusions, and implanted pulmonary artery monitoring devices. The HFDM team, which collaborates with AHF physicians, incorporates the American Heart Association's (AHA) guideline-directed medical therapy (GDMT) into patient care, most often using the "Get With The Guidelines–Heart Failure" resource. This hospital-based performance improvement tool helps ensure that HF patients receive up-to-date, evidence-based care (Houston Methodist, 2019). The HFDM team in this institution also supports transitional care by offering post-discharge visits in the hospital's transitional care clinic (TCC). The DNP scholar chose to develop this QI project at this institution because the HFDM team, delivering care in the hospital's outpatient clinic, observed high blood glucose levels seven days post-discharge follow-up appointment. Nevertheless, the HFDM team lacked the data necessary to validate their observations.

Population

The population for this QI project consisted of adults, aged 18+, who had been dually diagnosed with HF and DM, had been hospitalized at this institution between July 1 and December 31, 2019, and had been discharged to their homes.

Stakeholders

The key stakeholders for this project were the hospital system, the HFDM team, the clinical providers, the nurses, and the patients.

Needs Assessment

Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

A SWOT Analysis helps identify the strengths, weaknesses, opportunities, and threats of implementing a project in an organization. In this case, the SWOT Analysis assessed the hospital's internal and external dynamics related to the QI project. A 2001 report from the Institute of Medicine (IOM) recommends safe, timely, effective, efficient, equitable, and patient-centered care, as well as safe care transitions from the hospital to the home. Evidence-based best practice guidelines also hold that post-discharge continuity is critical for patient safety (Institute for Healthcare Improvement, 2017). In the present case, the hospital's HFDM team identified a needs assessment gap while providing quality care to HF and DM patients during their seventh-day follow-up appointments at the HF clinic. The patients' glucose levels were found to be higher than they had been at the time of the last admission. Therefore, the DNP student and the HFDM team developed an audit tool to identify glycemic control risk factors and manage HF and DM patients, including selected demographics. The DNP student used this audit tool to extract data from the EHRs for this QI project (Moran et al., 2020; Eddy & Stephenson, 2016). Appendix C presents the findings of the SWOT analysis.

Gap

The HFDM team noted that, as they were providing care in the HF clinic, their patients with comorbid HF and DM experienced worse outcomes than patients without this dual diagnosis. However, the team had no empirical evidence—only observations. They, therefore, wanted to find baseline data to determine risk factors and potentially mitigate and provide early interventions aligned with organizational strategic goals (needs assessments).

Team Members and Roles

Successful teamwork is a critical part of a patient's care in acute hospital and outpatient settings. The intricacies of patient safety in hospitals underline how necessary it is for health professionals to collaborate and communicate effectively. Health entities in the United States (US) focus on improving

patient safety through staff training and teamwork education programs (Eddy & Stephenson, 2016). In this project, the team was made up of three prominent leaders with distinct roles. The clinical leader in the sampled hospital had the authority to evaluate and implement the changes suggested by the QI project's results. To obtain further technical expertise, the nurse manager assisted with this project, and an additional technical support team helped design the effective audit tool for data collection. The clinic coordinator, serving as the day-to-day leader, was a constant resource for information beneficial to this project. The student worked side-by-side with the HFDM and technical support teams to develop the audit tool.

Inquiry Question

Identifying risk factors related to glycemic control and the management of patients with HF and DM, what practices should be implemented to improve patients' outcomes and disease progressions?

PICOT Question

PICOT is an acronym meaning patient population (P), intervention (I), comparison (C), outcomes (O), and timeframe (T). This method helps articulate and narrow projected practice transformation guides the formation of purpose statements and delivers timelines for short-term projects (Melnyk et al., 2015).

Population: The population of this research was made up of adults (18 years and older) with diagnoses of HF and histories of DM, who had been hospitalized in, and discharged from, the sampled institution between July 1 and December 31, 2019. Post-discharge, they were considered high-risk.

Intervention: The DNP student conducted secondary data analysis of the EHRs for the patients in the above-described population who had been discharged home.

Comparison: None.

Outcome: This QI project sought to obtain information about the relationships and trends of ideal post-acute/hospital standards for transition care. It also sought to devise evidence-based intervention guidelines founded on aggregated data (drawn from the secondary data analysis) concerning managing patients with comorbid DM and HF.

Timeframe: This QI project took place over six months (July 1, 2019–December 1, 2019), including time allotted for project approval and integration into the hospital's EHRs, project implementation, data extraction analysis of the results.

Purpose

This QI project was designed to identify evidence-based strategies to improve patients' glycemic control and HF management post-discharge based on secondary data analysis.

Project Aims

The project's primary aims included the following. First, it sought to identify risk factors for HF and DM patients through secondary data analysis of EHRs after the patients were discharged from the hospital. Second, it analyzed risk factors with selected variables to determine methods for improving the outcomes of patients with HF and DM. Third, it sought to offer recommendations to the sampled hospital's HFDM team, giving the team members guidance concerning how to manage patients with comorbid HF and DM to improve quality of care and reduce healthcare costs. Finally, the DNP student desired to share the processes experienced during project implementation. Now that the project is complete, she plans to accomplish this sharing via creative work, such as producing posters and PowerPoint presentations to disseminate the results and influence the discussion in this field of QI project. These posters and PowerPoints will be presented at local and regional conferences. Such dissemination of designs, processes, and outcomes allows other scholarly ventures to utterly understand the project, which will be particularly beneficial to this QI as its findings and recommendations are intended to be reported to help design future treatment plans for comorbid HF and DM.

Theoretical Framework

Chronic Care Model

The conceptual framework used for this QI project was the chronic care model (CCM), which provides the elements necessary for the delivery of healthcare systems. It also encourages and sustains productive interactions between patients and providers (Grover & Joshi, 2014). The CCM's components

align with DM and HF self-care management and family support approaches, following an evidence-based practice. Additionally, the CCM advocates for chronic disease management's escalating demands, such as monitoring glucose control for DM and dietary sodium control for HF. Framing this Doctor of Nursing Practice (DNP) project with the CCM offers better intervention recommendations to enhance positive patient outcomes. The CCM's objectives include delivering high-quality, comprehensive care, and guiding patients in self-care management (Coleman et al., 2009; Wong & Sullivan, 2016). Thus, this QI project tailors secondary data analysis, thereby integrating the evidence into practice, and then recommends best practices to the HFDM team.

The number of adults with chronic diseases is multiplying because of the older population's longevity. Managing multiple chronic illnesses requires healthcare providers to shift from being active to being proactive. The CCM approach keeps clinical teams updated about concepts changing in the current healthcare system, thereby establishing a positive environment. In this unique environment, the spotlight is trained on keeping all people as healthy as possible, rather than solely concentrating on acutely ill patients (Coleman et al., 2009). Chronic diseases require continuous self-care management from the affected individual and his/her family or caregiver(s), as well as collaborations with the healthcare system (Coleman et al., 2009). By the end of 2020, about 157 million Americans will have chronic diseases, and 81 million of them will have comorbidities. Around 75% of all healthcare expenditures result from chronic illnesses, and the impact of this annual economic burden is $1.3 trillion in the United States. The CCM, however, ensures better quality of care, improved patient safety, and decreased healthcare costs (Coleman et al., 2009).

Under the Affordable Care Act of 2010, various transitional care programs have improved quality and reduced costs. These programs help hospitalized patients with complex conditions—who are often the most vulnerable patients—transfer safely and promptly from one level of care to another. Most programs are similar and focus on the transitional care model, with positive, effective measures being related to hospital readmissions—a key focus of health reform. Multiple interventions have led to reduced

readmissions in the 30-day period after discharge. The recommended strategies guiding transitional care implementation under the Affordable Care Act include community-based care, Medicare share saving, and payment building experiments (Coleman et al., 2009).

Section II

Literature Review

To understand the extant body of analysis on this topic, the DNP student conducted a literature review in the electronic database collection of the Texas Woman's University Library (TWU). The TWU library databases consist of the Cumulative Index to Nursing and Allied Health Literature (CINAHL) Plus with full text, the Medical Literature Analysis and Retrieval System Online (MEDLINE), Medical Subject Headings (MeSH), the Cochrane Library, and PubMed. To conduct this search, the student used Boolean and MeSH phrases containing the following practical, key search terms: *diabetes*, *heart failure*, *the transition of care*, *DM*, *glycemic control*, and *follow-up appointments*. These search terms were implemented to find specific articles associated with the topic(s) of HF and DM and post-discharge transition of care. This search retrieved 6,000 articles (both inpatient and outpatient) published between 2000 and 2020. Of these, only 100 were systematic reviews and randomized controlled trials (RCTs). The scholar further pared down the result list by choosing to include only peer-reviewed articles concerning HF and DM risk factors, written in the English language, and having been conducted in inpatient or outpatient settings in the last five years (2015–2020). This left 50 articles. Finally, giving attention to the PICOT question and the fact that best practices support evidence-based literature, the researcher removed a further 27 articles, leaving 20, which were chosen for inclusion in the literature review because they used evidence-based study designs from John Hopkins Nursing-Based Practice models. The strength of each article's evidence was classed into a corresponding level as follows.

(a) Level I: Experimental study/RCT or a meta-analysis of RCTs

(b) Level II: Quasi-experimental study

(c) Level III: Non-experimental study, qualitative study, or meta-synthesis

(d) Level IV: Opinion from experts, including systematic reviews or clinical practice guidelines.

(e) Level V: Opinion of an individual expert based on non-research evidence (Newhouse et al., 2005).

Themes

Primary Theme: Primarily, this QI project sought to identify risk factors related to glycemic control and how to improve patient outcomes.

Generalizability: DM affects over 29 million Americans. In contrast, HF affected 6.5 million people in 2015. The prevalence of HF and DM, which is projected to grow by 50% in the next two decades, increases morbidity and mortality rates. However, though these diseases often present together, the guidelines for treating DM and HF are unique, and, therefore, their treatment plans differ. Thus, evidence has shown that there is insufficient guidance specifically designed to care for patients with both HF and DM. While HF and DM share the same pathophysiology, a correlated treatment approach may yield better results. Hence, lowering glucose levels may also reduce HF progression or risk factors (ADA, 2019; Dunlay et al., 2019; Lawson et al., 2019; Galaviz et al., 2018).

The risk of HF associated with DM might be even higher in younger adults and women. Besides age and ischemic heart disease, poor glycemic control is a significant predictor of HF. In the US, recent cases of DM were higher (by 1.5 million cases among younger people than among people 60+. These statistics also indicated an increased risk of HF in younger people compared to those aged 65+ (Dunlay et al., 2019).

Many studies have indicated that uncontrolled glycemic levels in patients with DM and HF are a significant public health concern and indicate poor patient outcomes for disease progression. Since DM and HF share the same pathophysiology, the attendant risk factors increase when the conditions appear together. Glycemic control is a paramount goal for preventing organ damage and other complications arising from DM. However, in standard care practices, achieving long-term glucose control is problematic, specifically for high-risk patients. HF and DM management are, therefore, critical and require specific knowledge to control both diseases, yield positive outcomes, and control costs (Ahn et al., 2017; Aga et al., 2020; Duariz et al., 2017; Dunlay et al., 2019; Murphy et al., 2017; Segar et al., 2020; Ohkuma et al., 2019).

Second Theme: The second theme unpacked in this research is the transition of patient care from the hospital to the home. The selected meta-analyses, systematic reviews, and peer-reviewed studies have shown that the success of transitional care depends on the patient's willingness to change his or her behavior. Interventions such as patient/caregiver support and engagement, care coordination, and effective communication with healthcare staff members are potent means of improving care quality when planning hospital discharge. An excellent illustration of self-care is when patients diagnosed with DM and HF require careful disease monitoring, such as tracking their daily glucose levels, monitoring their weight each day, and taking their medications as prescribed. Studies have indicated that patients' improved knowledge could empower them to take responsibility for controlling their own chronic conditions. Medication reconciliations and scheduled follow-up appointments before discharge may increase self-trust and improve patient adherence to behavior modification. Reviewing each patient's mental conditions can also help ensure that every patient receives the appropriate level of self-care education. Health education and other obstacles that discourage self-care are significant for patient safety and assessing approaches to level-of-care (Backman et al., 2017; Bahtiyar et al., 2016; Braet et., 2016, Burke et al., 2013).

Third Theme: The third theme drawn from the literature review is the standard of practice for managing high-risk patients with HF and DM. Glycemic control is an indispensable element of DM and HF self-care, which includes medication adherence, glucose monitoring, dietary modifications, physical activity, weight loss, and stress management. Patients must also restrict their dietary sodium, monitor their fluid intake, and take other related measures to manage their symptoms. Therefore, patient education must be specific and must differentiate between the two diseases. The DM self-management education and support (DSMES) approach delivers evidence-based practice that encourages individuals with DM to conduct their own self-care decisions and activities. DSMES is low cost and has the potential to achieve significantly positive clinical outcomes because it increases patients' learning abilities, as well as their proficiency with the competencies necessary for DM self-care. According to the American Diabetes

Association (ADA) and the AHA guidelines, the A1C goal in patients with DM and HF should be patient-centered—based on each patient's clinical functional status. However, the optimum goals for DM and HF A1C levels should be 7% to 8% for most people. A1Cs of >8.5% may lead to symptomatic hyperglycemia. The current study has shown projections that 50% of patients could meet the target goal of an A1C of <7.0%. However, in reality, only a tiny number of patients (14.3%) have actually achieved this goal (ADA, 2018; Aga et al., 2020; Dunlay et al., 2019; Murphy et al., 2017; Win et al., 2016; Wilkinson et al., 2019).

It is necessary to adopt lifestyle modifications, including healthy diets, weight management, and increased physical activity, to control glycemic levels—a crucial step for individuals with DM and HF. A new class of diabetes medications (SGLT-2 inhibitors) has been designed to reduce blood sugar in DM patients, and recent research indicates that these new medications can also benefit HF patients by reducing risk factors and preventing hospital readmissions and mortality. Though SGLT-2 medications are promising, metformin remains the first-line oral antihyperglycemic agent and is still considered the best choice regimen for T2DM due to its superior safety profile (ADA, 2019; Beck et al.,2017; Dunlay et al., 2019; Kenny & Abel, 2019; Kramer et at., 2018; Rosano et al., 2017; van Melle et al., 2020; Wilkinson, Zadourian, & Taub, 2019).

Section III

Methodological Framework

This QI project's overall aim was to find evidence-based strategies to improve nurse practitioners' (NP) management of patients' glycemic control and HF after the patients have been discharged from the hospital to their homes. The project was implemented in the sampled hospital via the Model for Improvement (MFI) framework and the Plan-Do-Study-Act (PDSA) cycle methodological framework. The researcher, collaborating with the sampled hospital's HFDM team and a technical support team, has worked to develop an audit tool based on scientific evidence and the healthcare system. This tool also contained the inclusion and exclusion criteria for data collection.

Via the designed audit tool, the researcher sought to create a retrospective chart from the EHRs of patients diagnosed with HF and DM, who had been admitted to and discharged from the sampled hospital between July 1 and December 31, 2019. The inclusion and exclusion criteria helped develop the chart review according to research evidence and risk factors. Later, data aggregation drawn from the secondary data analysis detected patterns, trends, and risk factors among the patients diagnosed with both HF and DM. The researcher then compared these patterns and trends to the research evidence using data, name strategies, and recommendations, which may affect the selected patient outcomes and disease progression.

The MFI framework and the PDSA are meaningful for QI project planning (Etchells et al., 2016). The first PDSA cycle plan should be ready for implementation after the baseline data has been proven. Assuming that the first PDSA cycle offered baseline information for future efforts, the tool created for data analysis used the inclusion/exclusion criteria designed to fit with that baseline (see Appendix A).

Model for Improvement

In the long-term, this QI is determined to mitigate the risk factors of patients diagnosed with HF and DM—reducing disease progression and improving certain patient outcomes (e.g., disease management, functionality, and quality of life). In the short term, the QI project wants to recognize the risk factors found among patients diagnosed with HF and DM to better understand how this population presents to healthcare organizations.

It was necessary for this data to be recognized via chart review extraction and secondary data analysis during the QI project's implementation stage. Data gathered in this way will confirm the degree to which risk factors occur and how they affect patient outcomes. Based on such a comparative appraisal, improvements can be made in how HF and DM patients are treated. Identifying evidence-based approaches (guidelines) should become part of providers' training courses to help reduce patients' risk factors. To accentuate long-term goals for patient care management, initiate short-term aims, preliminary steps must first be taken.

Steps of the PDSA Cycle

Plan: What initial steps should be taken to meet the short-term goals for this quality improvement (QI) project? (a) Develop an audit tool obtained from demographics variables and high-risk factors (from research findings) in collaboration with the HF team, (b) the inclusion/exclusion criteria should be applied to the chart extractions among patients with dual diagnoses of HF and DM, (c) outline operational definitions of variables agreed upon by HF team, (d) after submitting the proposal to hospital institutional review board (IRB), it was determined this was a QI project, (e) share timeline with HF team, (f) collaborate with HF team members to discuss missing data and how to it was handled throughout chart extractions.

Do: (a) Using the approved audit tool, completed a retrospective chart review (between July 1, 2019 – December 1, 2019)?

Study: (a) The secondary data analysis completed helped to determine statistically significant risk factors, trends, patterns, trends, and, overall, how the sampled population presents to this healthcare institution.

Act: From the overall analysis and data synthesis (a), the DNP student will compare the results to what the evidence found by previous scholars designates. Then, (b) evidence-based interventions (guidelines) will be recommended to supplement the second PDSA cycle (Clinical Excellence Commission, 2020).

The population of interest in this QI project includes patients aged 18+ who have been diagnosed with dual DM and HF and admitted to (and discharged from) the sampled hospital. This research used (a) baseline information regarding the risk factors of patients with HF/DM, (b) guidelines of evidence-based practices that impact selected patient outcomes, and (c) mitigating risk factors that may decelerate the progression of both established diseases. HF and DM. Evidence-based guidelines from previous research were used to develop an audit tool (and validated with the HFDM team) to obtain crucial baseline information about the current HF and DM patient population, particularly information regarding specific

risk factors/issues. This approach incorporated the audit tool to gather data from chart reviews. These reviews, considered in relation to retrospective studies, involved specific data for the population of interest (Clinical Excellence Commission, 2020).

Ethical Considerations

IRB Approval

The project, "Identifying Evidence-Based Strategies to Improve Nurse Practitioner (NP) Providers' Management of Patients' Glycemic Control and HF: Management Post-Discharge to Home—A Quality Improvement Project" was approved by the Houston Methodist Hospital (HMH) Institutional Review Board (IRB), and the TWU checklist was used to review the proposal. The IRB representative determined that the proposal did not meet the criteria for human subject research. Therefore, the QI project was exempt from those IRB guidelines. The scholar received approval for this project on July 8, 2020 (see Appendix B).

Section IV

Findings

Restating the Inquiry Questions

What risk factors are related to managing patients diagnosed with HF and DM (adults aged 18+), who were hospitalized in (and discharged from) the sampled hospital between July 1 and December 31, 2019? What are the standards of practice for managing high-risk patients, as evidenced by documentation in patients' EHRs, according to age, A1C, glucose, ejection fraction (EF), social support, types of consultations, diabetes education, dietary education, and length of hospital stay?

Implementing the Intervention

This QI intervention was granted approval on July 8, 2020, by TWU, and the HMH determined that it was IRB exempt (see Appendix B). The project sought to identify opportunities to improve transitional care for patients with HF and DM. At seventh-day post-discharge follow-ups, the sampled hospital's HFDM team noted that their patients with HF and a history of DM had poor glucose control

outcomes. However, empirical evidence was missing. The HFDM team, therefore, wanted to find baseline data through which they could determine risk factors, mitigate disease complications, and provide early interventions aligned with strategic organizational goals (needs assessment).

Data Collection

The audit tool jointly developed by the scholar and HFDM team was suitable and easy to use for this project, which is a critical characteristic when gathering, collecting, analyzing, and summarizing data and disseminating results. The population of interest was sampled according to the inclusion and exclusion criteria inherent in the audit tool. Ultimately, the sampled population included adults aged 18+, who had been diagnosed with both HF and DM and had been hospitalized in (and discharged from) the sampled hospital between July 1, and December 31, 2019. Post-discharge, these patients were considered substantial risk and were managed by the HFDM team. Patients were excluded from this study if they were under the age of 18, had only one diagnosis of either HF or DM, or had been discharged to skilled nursing facilities, rehabilitation centers, or other healthcare settings rather than their homes (see Appendix A). Following the above conditions, data was extracted from a completed chart review.

This QI project's primary aim was to identify HF and DM patients' risk factors via secondary data analysis of EHRs after the patients were discharged from the hospital to home. In collaboration with the HFDM team and a technical support team, the scholar developed an audit tool, with inherent inclusion and exclusion criteria, to be used to extract data from the EHRs of patients with HF and DM. The project's goal was to analyze risk factors to improve these patients' outcomes and offer recommendations to the HFDM team based on relationships of patterns and trends found to be associated with ideal post-acute/hospitalization standards for transitional care. Following evidence-based guidelines for managing patients with HF and DM to improve care quality and reduce costs.

Sample Size

The retrospective chart study included 83 participants, filtered, out of 300 chart reviews, via paper and pencil work through the exclusion criteria. The demographics selected from the descriptive data

(Appendix A) included the inclusion and exclusion criteria and an audit tool checklist. After the data was initially prepared using paper and pencil, it was organized, analyzed, and assessed, and modifications were made to the data collection strategies in a Microsoft Excel spreadsheet. To accomplish this, the scholar partnered with a TWU statistician to aggregate the data and correlate risk factors related to glycemic control and managing patients with HF and DM. The data were tested and re-tested several times to eliminate errors and maintain consistency and stability. The appraised data was then imported into IBM's SPSS statistics software, version 25, for further study (Pallant et al., 2011).

Table 1: Demographics: Independent variables that include social support.

		Patients (%) (n=83)
Caregiver Support	Spouse	36.00%
	Sibling or Child	22.00%
	Home Health / Agency	8.00%
	Self	34.00%
Insurance Group	Commercial Insurance	28.90%
	Medicaid / Other / No Insurance	12.00%
	Medicare / Medicare Replacement	59.00%

Table 1 presents the independent variables concerning caregiver support showed that 36.00% of the 83 sampled patients were supported by their spouses, followed by individuals who had no support (self-care = 34.00%), those who were cared for by siblings or children (22.00%), and those who depended on home health or other such agencies (8.00%). The most commonly used insurance was Medicare or Medicare

replacements (59.00%), followed by commercial insurance (28.90%), and Medicaid, other, or no insurance (12.00%).

Table 2: Demographics: Independent variables

Variables	Demographics	Participants (%), (n=83)
Age in Groups	32–59	40.00%
	60–69	31.00%
	70–88	29.00%
Race	African American	38.60%
	Caucasian	24.10%
	Hispanic or Asian	37.30%

Table 2 presents 83 total participants divided into three age groups: 32–59 (40.00%), 60–69 (31.00%), and 70–88 (29.00%). The races of the participants included African American (38.60%), Hispanic or Asian (37.30%), and Caucasian (24.10%).

Figure 1: Histogram of demographics present age at the time of service

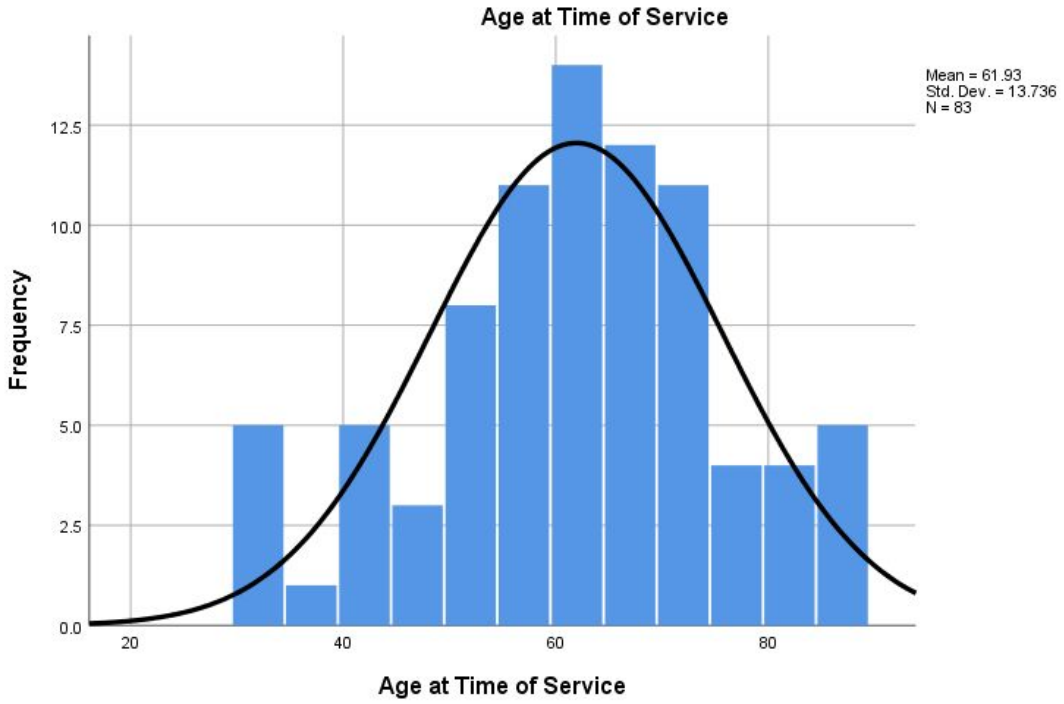

Figure 1 shows the histogram graphic presentation display of the normal curve using statistical interpretation analysis from the SPSS guide. Independent variables comprised n=83 participants, ranging from 32 to 88 years of age, with a mean age of 61.93 and a standard deviation of 13.736. The ranged age is 56 (subtracted from the highest age, 88 to the lowest age of 32). The younger age groups of 32–59 of 33 participants had higher mean = 48.73; median = 51.00; standard deviation = 9.322 than the middle age groups 60–69 of 26 participants: Mean=77.13, median = 75; standard deviation = 3.22. And also, the highest age group of 70–88 of 24 participants: mean age = 77.33; median = 75; standard deviation = 6.409.

Table 3: Findings: Mann–Whitney, clinical significance: Low EF associated with low age (test statistics[a])

	A1C level in the hospital	**Glucose F/U HFDM clinic**	**Age at time of service**	**Length of stay in hospital (days)**

Mann–Whitney U	451.000	540.000	544.000	621.000
Wilcoxon W	704.000	816.000	2,084.000	2,161.000
Z	-.974	-.416	-1.960	-1.205
Asymp. Sig. (2-tailed)	.330	.678	.050	.258

[a]Grouping variable: EF [above/below 50%].

Ranks

Table 4: Sum of ranks related to independent variables of EF

	EF [above/below 50%]	**N**	**Mean rank**	**Sum of ranks**
A1C level in the hospital	Above 50%	22	32.00	704.00
	Below 50%	48	37.10	1,781.00
	Total	70		
Glucose F/U HFDM clinic	Above 50%	23	35.48	816.00
	Below 50%	50	37.70	1,885.00
	Total	73		
Age at time of service	Above 50%	27	48.85	1,319.00
	Below 50%	55	37.89	2,084.00
	Total	82		

Length of stay in hospital (days)	Above 50%	27	46.00	1,242.00
	Below 50%	55	39.29	2,161.00
	Total	82		

Mann–Whitney Comparison

The Mann–Whitney test is a nonparametric test that indicated that variances between two independent groups on a continuous measure were statistically significant. Findings from patients in the lower age group (32–59 years) with EF <50% show that these patients are statistically significantly associated with a high A1C of 9.1% (p-value = 0.050). The Mann–Whitney U test primary value is Ranks test, Z = -1.960, and the significance level, which is given as Asymp. Sig. (2-tailed) 0.050. A probability of p = 0.050 indicated that a result is statistically significant.

Table 5. Variables associated with statistical significance and clinical relevance for high-risk HF and DM patients.

Statistical test	**Interventional variables**	**Outcome [dependent]**	**Statistical significance**	**Interpretation of group difference (Yes/No)**	**Clinical relevance**
Mann–Whitney	EF ● Above 50% ● Below 50%	1. Glucose F/U HFDM clinic 2. Age at time of service	0.05	No No Yes	Low EF associated with low age

		3. Length of stay in hospital (days)			
Mann–Whitney	DM management by the hospitalist ● Yes ● No	1. Glucose F/U HFDM clinic 2. Age at time of service 3. Length of stay in hospital (days)	0.028	No No Yes	Hospitalist associated with high age
Mann–Whitney	Cardiology consultation ● Yes ● No	1. Glucose F/U HFDM clinic 2. Age at time of service 3. Length of stay in hospital (days)	0.343	No No Yes	None
Mann–Whitney	Endocrine consultations ● Yes ● No	1. Glucose F/U HFDM clinic 2. Age at time of service 3. Length of	0.053	No No Yes	Endocrine consultation associated with high age

		stay in hospital (days)			
Mann–Whitney	DM dietician teaching ● Yes ● No	1. Glucose F/U HFDM clinic 2. Age at time of service 3. Length of stay in hospital (days)	0.66	No No Yes	DM dietician teaching low for all ages
Mann–Whitney	Polypharmacy >5 ● Yes ● No	1. Glucose F/U HFDM clinic 2. Age at time of service 3. Length of hospital stay (Days)	0.08	No No Yes	Polypharmacy associated with low age

Clinical relevance is a form of clinical guidelines and the applicability of the research relevant to this project, but it is not significant. The central issue is whether a problem is of significance to a particular issue (p-value <0.05).

Kruskal–Wallis Comparison

Table 6: Findings: Kruskal–Wallis (test statistics[a,b])

	A1C level in the hospital	Glucose F/U HFDM clinic	Age at time of service	Length of stay in hospital (days)
Kruskal–Wallis H	16.014	8.707	6.994	.682
Df	3	3	3	3
Asymp. Sig.	.001	.033	.072	.877

[a]Kruskal–Wallis Test; [b]Grouping variable: type of DM medication.

A1C and glucose were statistically significantly different.

Table 7: Kruskal-Wallis Test in Ranks

	Type of DM medication	N	Mean Rank
A1C level in the hospital	Oral only	11	27.77
	Injectable only	32	42.17
	Oral and injectable	13	43.27
	None	14	19.11
	Total	70	
Glucose F/U HFDM clinic	Oral only	12	31.42
	Injectable only	33	41.73
	Oral and injectable	15	44.77
	None	14	24.96
	Total	74	
Age at time of service	Oral only	12	48.83
	Injectable only	36	34.14
	Oral and injectable	15	49.87
	None	20	46.15

	Total	83	
Length of stay in hospital (days)	Oral only	12	46.25
	Injectable only	36	41.63
	Oral and injectable	15	38.70
	None	20	42.60
	Total	83	

Table 6 and 7 of the above findings are Kruskal–Wallis tests in Statistics and Ranks

The Kruskal–Wallis test is a nonparametric test that compares three or more groups. For example, it may compare one categorical, independent variable with three or more categories of age groups. Outputs from the Kruskal–Wallis test are considered significant if the p-value is <0.05. From this section, it may be concluded, therefore, that the statistically significant level has been reached because there is a difference in the continuous variables across three groups. A1C and glucose were statistically significantly different (i.e., Asymp. Sig. = p-value = 0.001 for A1C and 0.033 for glucose F/U HFDM clinic).

Table 8: Findings Correlations between key variables

			Age at time of service	**A1C level in the hospital**	**Glucose F/U HFDM clinic**
Spearman's rho	**Age at time of service**	Correlation coefficient	1.000	-.319**	-.187
		Sig. (two-tailed)		.007	.112
		N	83	70	74

	A1C level in the hospital	Correlation coefficient	-.319**	1.000	.489**
		Sig. (two-tailed)	.007		.000
		N	70	70	64
	Glucose F/U HFDM clinic	Correlation coefficient	-.187	.489**	1.000
		Sig. (two-tailed)	.112	.000	
		N	74	64	74

** Correlation is significant at the 0.01 level (two-tailed).

High A1C was statistically significant for a moderate negative correlation to a younger age.

Spearman's rho is a nonparametric correlation describing the relationships between the key variables. SPSS guide explores the correlation between two variables while controlling for other variables. These are known as an incomplete correlation. Pearson correlation coefficient (r) can only take the values of from -1 to + 1. The positive correlation as one variable increases, so does the other. The above correlation as one variable increases, the other decreases. Spearman's rho, age at time services: A1C in hospital, with Correlation Coefficient of - 0.319 and Sig. (2-tailed) .007 considered high A1C levels were statistically significant for a moderate negative to a younger age.

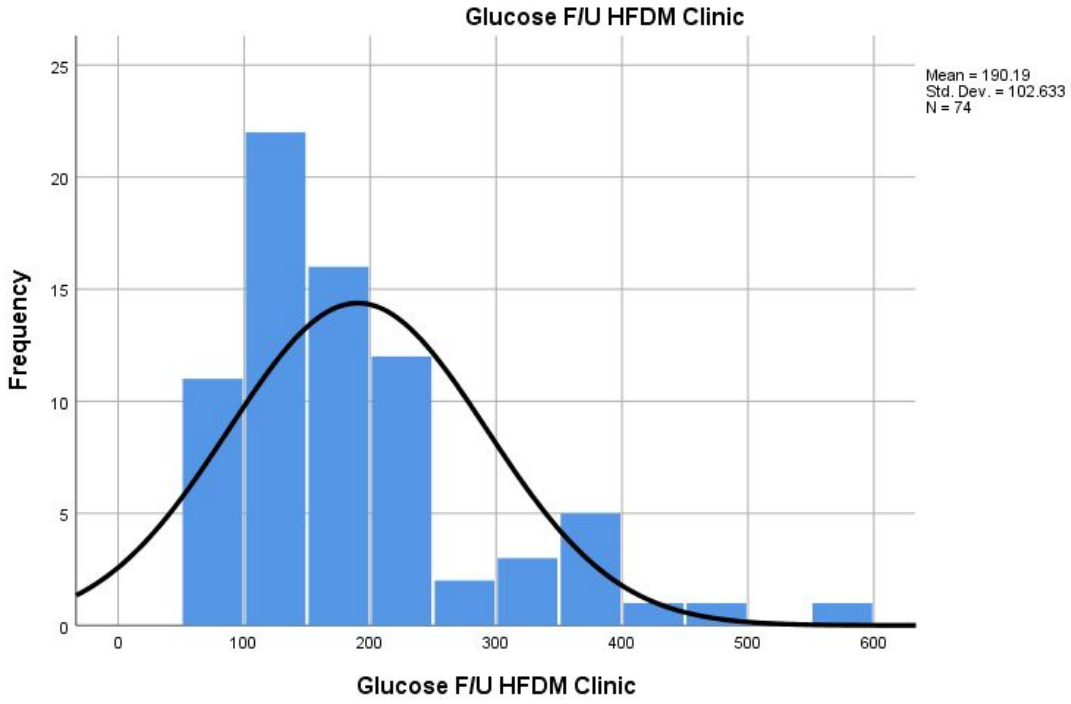

Figure 3. A continuous variable of glucose follow-up clinic appointments with the HFDM team

Interpreting the output from the histogram presented in Figure 3 provides information about the distribution of scores for the continuous variable. The histogram of glucose follow-up in the HFDM clinic is an uneven curve due to the extremely high blood sugars found in less than 5% of the patients' blood sugar results. In this histogram, the blood glucose measures' mean is 190.19, and the standard deviation is 102.633 (n=74). Missing data from the follow-up HFDM clinic visits included (n=9) participants.

Section 1V

Discussion and Conclusion

This project's primary aim was to identify patients' risks for HF and DM through secondary data analysis of their EHRs post-discharge. Second, the researcher sought to analyze those risk factors via selected patient-related variables to understand what factors could lead to improved outcomes in patients with HF and DM. Third, the scholar wanted to offer recommendations to the HFDM team to manage

patients more effectively with comorbid HF and DM to improve the patients' quality of care and reduce healthcare costs. Finally, the researcher wanted to ultimately share the experiences and expertise gained during the project's implementation.

The first primary aim of identifying risk related to glycemic control and HF and DM management was intended to improve patients' disease progression outcomes. The researcher, the hospital's HFDM team, and a technical support team, developed an audit tool based on research evidence and evidence-based practice. This audit tool was used to extract data from the EHRs of patients who were admitted to and discharged from the sampled hospital between July 1 and December 31, 2019. These results were gathered in an effort to improve the current understanding of relationships and trends in hospitals and traditional care management, and they were meant to serve as recommendations for the HFDM team, offering new ways to manage HF and DM patients to, as mentioned above, improve quality of care, and reduce healthcare costs. These processes were among the most important the researcher wished to disseminate.

This QI project identified the following significant statistical variables through SPSS data analysis, including the association between A1C and EF by age group. The 32–59 age group was compared to EF <50% and an A1C of 9.1% with a p-value of 0.050. The Kruskal–Wallis Asymp. Sig for A1C level in the hospital among this group was found to be 0.001 A1C, and it was 0.33 for follow-up glucose levels at the HFDM clinic. This indicated a statistically significant difference. The correlation between critical variables, Spearman's rho, and high A1C, were statistically significant, indicating a moderately negative correlation to the younger age group (32–59).

Strengths

This QI project demonstrated various strengths. First, the DNP student, in collaboration with the HFDM team and a technical support team, created an audit tool to capture hospital management variables documented in the EHRs. This tool was then used to review charts of high-risk patients hospitalized between July 1 and December 31, 2019, and extract data variables

including age, A1C, glucose, EF, social support, types of consultations, diabetes teaching, dietary teaching and length of hospital stay. The HFDM team demonstrated strong leadership during the seventh-day follow-up appointments post-discharge by identifying patients with hyperglycemia and planning to take action to improve the patients' HF and DM outcomes. This paved the way for the QI project as a whole.

Limitations/Barriers

The most substantial limitation of this QI project is the small sample size (N=83) and the short data collection period (July 1 to December 31, 2019). Had the project employed a more extended data collection period, this would have allowed for an increased number of subjects, which could have impacted the findings concerning the HF and DM population. Because of the brief implementation period, there is not sufficient data to determine the project's sustainability. If a larger amount of comprehensive data had been gathered, the program's sustainability would be more likely. This initial study will be handed over to the HFDM team to continue, starting with the second PDSA cycle to solve this limitation. Some obstacles encountered during chart extraction included inconsistent documentation in the EHRs and variables being difficult to find or undocumented. Missing data from the audit tool included the patients' education levels, which is an essential variable, the absence of which might have important implications for the EHR assessments. The researcher, therefore, reported this missing data to the HFDM team.

Summary of Significant Results

The population of interest included adult patients (aged 18+) who had been diagnosed with comorbid HF and DM and had been hospitalized and discharged from the sampled hospital between July 1 and December 31, 2019. Post-discharge, these patients were considered a significant risk. The standard variables relevant for managing HF and DM include age, glycemic control, EF, social support, type of consultations, diabetes education, dietary education, and length of hospital stays. The statistical tests

showed a statistically significant risk factor association between hemoglobin A1C and EF in the 32–59 age group. The audit tool associated with the above meaningful results extracted from the chart review yielded remarkable findings. However, other data showed that a close p-value of 0.05 was not statistically significant but revealed clinical relevance to the selected variables, which may ultimately improve patients' outcomes with comorbid HF and DM.

Recommendations

The CCM approach supports DM management, emphasizing productive interactions between a prepared, proactive care team and an informed, activated patient. The CCM approach also focuses on person-centered, team care, integrating long-term treatment for DM and comorbidities, such as HF. Continuity of care, coordination, communication, and goal setting between all team members is crucial. The ADA guidelines recommend that all persons with DM contribute to their own DM self-management education and support to expedite the knowledge, skills, and abilities necessary for them to manage their own DM self-care. Patients should also be supported in implementing and sustaining the skills and behaviors needed for ongoing DM self-management. This study suggests that persons with multiple conditions may experience a more significant disease burden, which will negatively influence their ability to perform effective DM self-care and achieve glycemic control. Future research should aim to determine how to best design self-care interventions for persons with multiple comorbidities to improve their health outcomes and quality of life (ADA, 2018; Ahn et al., 2017).

Patient-centered care should be implemented based on personal preferences and values. ADA (2019) guidelines emphasize DSMES, effective self-care, improved clinical outcomes, and quality of life. Medical nutrition therapy (MNT) should also be patient-centered for all DM patients. DM care requires self-care assessments to develop management plans that will lead to effective glycemic control, including patients' self-monitoring of blood glucose (SMBG) and A1C. The CCM also involves the regimen of active realignment to meet an individual's needs and research the desired health outcomes for that specific

patient situation. For patients with self-care impairment, referral to a behavioral provider should be considered (ADA, 2018; Aga et al., 2020; Duariz et al., 2017; Segar et al., 2020, Reilley et al., 2015).

This DNP student recommends that depression screening be implemented for all DM patients, including elderly patients. Self-care impairment must also be considered, alongside individualized DM education plans, such as the patient health questionnaire (PHQ-9). People ≥65 years of age should receive annual screenings for mild cognitive impairment or dementia. The CCM should also be implemented and realigned to meet each individual patient's needs and reach desired healthcare outcomes, and, again, patients who do not adhere to their treatment regimens should be referred to behavioral health providers to better coordinate their care.

Section V

Implications for Practice

The 32–59 age groups should be given particular attention. Findings of clinical relevance related to this group included a low EF <50% and a high A1C of 9.1%, both of which were statistically significant with $p \leq 0.050$. The patients may benefit from committed endocrinology follow up to upsurge opportunities to improve diabetes management and mitigate disease progression. The AHA and ADA have introduced a collaborative landmark called "Diabetes by Heart" to comprehensively educate the public on DM and CVD. DM treatment should aim to disseminate evidence-based care for this critical, vulnerable, high-risk population. Based on the AHA's "Get With The Guidelines," this QI project has identified patient risk factors related to glycemic control and HF management to improve patient outcomes and reduce disease progression. The AHA and ADA anticipate improving quality of care for healthful patient

outcomes (mortality, morbidity, health status, disease burden incidence, and prevalence) and behavioral and metabolic factors (exercise, diet, A1C). Again, following the AHA's "Get With The Guidelines," it is crucial to create detailed transitional care records when patients are discharged and get these records to the patients' primary care providers within seven days of discharge. The critical reporting measures for HF and DM patients (particularly A1C) must be included in these reports (Davies et al., 2018; Yancy, 2017).

DNP Implications

The necessities of doctoral educations for advanced nursing practice comprise seven fundamental principles for nurses, including advocating, providing education, and serving in an advisory position regarding healthcare policies (AANC, 2006).

Essential I: Scientific Underpinnings for Practice

Essential 1 integrates organization science, nursing science, biophysics, analytics, ethics, and psychosocial knowledge for the highest nursing level. The DNP provides nurses with new knowledge gained from nursing science through which they can apply their expertise to solve problems related to patient needs (AACC, 2006). Drawing from the knowledge delivered by a DNP, this QI used the CCM framework.

Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking

Organizational and systems leadership is critical for improving patient and healthcare outcomes, and DNP competence in nursing is consistent with the nursing and healthcare goals of eliminating health disparities and promoting patient safety and excellence in patient care. These essential competencies include developing clinical practice guidelines, designing evidence-based interventions, and testing practice outcomes (AACC, 2006). Thus, alongside the HFDM team and a technical support team, the current scholar developed an audit tool to extract data via a chart review, using evidence-based literature to aggregate the retrieved data for this project.

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice

Scholarship and research are the trademarks of doctoral education. Integrating knowledge from different disciplines and applying that information to solve practical problems are significant ways to improve healthcare quality and patient outcomes. The current research, therefore, used analytical methods to critically appraise existing literature and other evidence to determine and implement the best practices. She applied the PDSA framework to this QI project and used relevant findings to develop practice guidelines and improve practice and patient care. The results from this evidence-based practice and research will be disseminated to improve healthcare (AACC, 2006).

Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Healthcare

This QI project is supported by information technology utility, which also aligns with the chronic care model in the healthcare establishment, as well as proactive and population-based care (Coleman et al., 2009). DNP prepared nurses must be proficient with technology system resources to make quality improvement initiatives better and to support practice and administrative decision-making. Thus, technology information systems are the midpoint for providing safe, efficient, and individualized care (AACC, 2006).

Essential V: Interprofessional Collaboration for Improving Patient and Population Health Outcomes

The IOM endorses the necessity of team-based care for all patients' safety and well-being (IOM, 2001). This QI project was, therefore, prepared via interprofessional collaborative practice and teamwork. The teams were made up of patients, advanced nurse practitioners, physicians, and other healthcare providers, who strongly collaborated to meet patient needs in an appropriate manner. The scholar took a leadership role in developing and implementing practice models, standards of care, and other scholarly projects (AACN, 2006).

Team-Based Work

The CCM concepts address how clinical research findings should be translated into real-world practice using a proactive, process-driven, team-based approach, including a multidisciplinary team that involves physicians, advanced practice nurses, nurses, pharmacists, dieticians, social workers, and community health workers. The interprofessional team transparency focused on patients' preferences and effective care coordination across healthcare team members. Research has shown that CCM improves outcomes for patients suffering from multiple chronic illnesses (Coleman et al., 2009). Therefore, by adopting the CCM, the HFDM team may improve DM and HF management statuses when transferring patients from the hospital to the home and, ultimately, to the community.

Sustainability

After reporting the results and offering recommendations to the HFDM treatment team, the sustainability of this project refers to the continued progress stemming from it. To stimulate this process, the scholar will share her results with the HMH and TWU via posters. She believes the HFDM team in the sampled hospital will benefit from this project as they move forward to begin the second PDSA cycle—the plan for which should be ready to implement after the data obtained from the first PDSA cycle has been proven to offer baseline information for future efforts. The scholar, therefore, recommends that the HFDM team continue using the same audit tool created in the QI project for data analysis, as well as the inclusion/exclusion criteria inherent in that tool (see Appendix A). The subsequent research will produce evidence describing interventions (guidelines) that may affect selected patient outcomes and disease progressions.

Application to Other Clinical Settings

The audit tool assists practitioners in determining risk factors for this specific population—those diagnosed with comorbid HF and DM. Using a standard audit tool would enhance the validity and reliability of the data collection. The secondary data analysis findings will help to mitigate the risk

factors, improving the continuity of care associated with better healthcare, patient satisfaction, and outcomes. Additionally, effective communication and care coordination interventions are engaged to improve transitional care outcomes. In the hospital in which this QI project took place, one cohort was made up of AHF patients. In this hospital's CICU, in addition to its three resolute ACCUs, the AHF unit manages inpatient with various medical treatments, including continuous diuretic infusions, LVADs, inotropic infusions, and implanted pulmonary artery monitoring devices. The HFDM team, which collaborates with the AHF physicians, incorporates the AHA's GDMT into patient care (Houston Methodist, 2019).

Project Dissemination

Disseminating the results of a QI project promotes the exchange of information and extends the project's influence. Such dissemination is critical to sustaining improvement and spreading research outcomes into various channels. Through multiple venues, the dissemination process provides real-world information on preparing and delivering data to various groups in unique settings. This project will be shared in collaboration with the HFDM team, developing recommendations, and planning the subsequent ladders for the improvement process. The DNP student presented the project results to the faculty and her peers at TWU via Zoom meeting due to the COVID-19 pandemic and will develop an abstract, poster, and manuscript for dissemination. In particular, the poster is a useful mechanism for sharing much of the information gathered in this project, including the problem statement, data elements, and outcomes, in a visual presentation that is easy to read and understand.

Conclusion

It is particularly important for healthcare practitioners treating comorbid HF and DM to give special attention to the 32–59 age group. In this research, findings of clinical relevance included an EF of <50% and a high A1C of 9.1%, both of which were statistically significant ($p \leq 0.050$). To impact patients' outcomes and slow disease progression require evidence-based interventions and recommended guidelines. Precisely, the patients might benefit from DM

self-management support in addition to education, as well as being referred to behavioral providers if their self-care is impaired.

Next Steps

Concerning the next steps, lessons learned for future work, and the DNP student recommends that the HFDM team initiate the second cycle of the PDSA and use the same audit tool moving forward. Correspondingly, this is a boundless study with many patterns and trends to be monitored for future references to improve patients' quality of life with dual HF and DM and reduce healthcare costs.

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Appendix A

Audit Tool

Using research evidence and evidence-based guidelines, develop an audit tool (in collaboration with the HFDM team) to obtain baseline information on the current HFDM patient population concerning specific risk factors/issues. These may include:

a. HF diagnosis (length of time since diagnosis):

b. HF Classification (identify classification here):

c. Type of DM:

d. Age:

e. Race/ethnicity:

f. Type of insurance:

____Insurance coverage for diabetes medications and supplies: Yes___ No___

g. Caregiver support at home: ___Yes ___No Does the patient live alone? Yes___ No ___

h. Educational level (use the designation from HMH):

_____

i. Provider managing the patient's care during hospitalization (check all that apply):

___Endocrinologist ___ hospitalist ___HF Team

j. Documentation that diabetes teaching occurred: ___Yes ___No

k. Documentation of discharge planning: ___Yes ___No

l. A follow-up appointment with HF clinic: ___Yes ___No

m. Was follow-up with a provider for diabetes management recommended at discharge?

___Yes ___No If yes, what type of DM management? _____

- The extent of glucose monitoring at home (describe):

n. Was a primary care provider identified to hand off diabetes care? ___Yes ___ No

o. A1C during hospitalization (last measure) prior to discharge: _____

p. Patient's glucose at the time of the post-discharge follow-up visit: _____

q. Choice of glucose-lowering pharmacotherapy: _____

r. HF medications (list):

s. HF treatment: Hospitalization____ Clinic____

t. Recent hospitalizations (time; include length of stay): _____

Appendix B

Determination Letter

HOUSTON Methodist LEADING MEDICINE

Shannan K. Hamlin, PhD, RN, ACNP-BC, AGACNP-BC, CCRN
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July 8, 2020

TO: Regina Butuk RN, FNP

SUBJECT: HMAI Determination of Not Human Subject Research: Identifying Evidence-Based Strategies to Improve Nurse Practitioner (NP) Providers Management of Patients' Glycemic Control and Heart Failure Management Post Discharge to Home: A Quality Improvement (QI) Project

Based on the information and protocol provided, the HMRI IRB has determined that the project referenced above does not meet the definition of Human Subject Research per 45 CFR 46 and does not require prior IRB review and approval at Houston Methodist.

Please understand that should your protocol change in any way your new protocol will need to be resubmitted for review and a new IRB determination made before any data collection can begin.

If you have any questions, do not hesitate to contact me. Best of luck on a successful quality improvement project!

Sincerely,

Shannan Hamlin, PhD, RN, ACNP-BC, AGACNP-BC, CCRN, NE-BC
HMAI IRB Designated Member

Appendix C

SWOT Analysis

Strengths (Internal)	**Weaknesses (Internal)**
● Strong organizational leadership ● Faculty advisor/clinical mentorship ● Effective communication ● Interprofessional coordination ● AHA-HF "Get With The Guidelines" ● Information technology: Epic is user friendly	● Insufficient documentation ● Inconsistent patient cognitive assessments ● Limited time for implementing this project ● Inconsistent handoff
Opportunity (External)	**Threats (External)**
● Improve the outcomes of patients with HF and DM ● Improve patient satisfaction. ● Decrease rehospitalization rates ● Collect baseline data that will possibly be useful for future study ● Improve the quality of care and reduce costs	● HIPAA violations ● Complex HF and DM disease management ● Lack of insurance ● Lack of research concerning comorbid HF and DM

Appendix D

Evidence Table

Synthesis Section	Purpose	Design/Sample	Sample	Results	Implications
1	To determine the effect of intensive interdisciplinary transitional care, healthcare cost, and quality care with better outcomes.	A systematic review. Quasi-experimental study.	N = 2,235 Medicare participants. 285 participants enrolled in safe-med.	Decrease hospitalization and readmission costs.	Care transition models emphasizing strong interdisciplinary patient engagement.
2	To evaluate the association between glycemic measures and HF. To assess the long-term use of glycemic measures in managing HF and DM.	Descriptive study. Retrospective study.	N = 8,576 patients. A follow-up to 6.4 years.	It associates high hemoglobin A1C with an increased risk of HF.	Long-term uncontrolled A1C and association with HF and DM risks factors
3	To use self-care behavior to control glycemic measures in adults with T2DM and comorbid HF.	A cross-sectional, correctional, RCT study analyzing return to the clinic (RTC) for six months	N = 118 represented males based on sex (male/female). N=119 represented African Americans based on race. High school education: N = 114.	Mean A1C was 8 ± 1.8%, and fasting mean of 165.	Self-care to investigate the correlation between diabetes self-care behaviors and independent predictors.

4	To determine the association between the hemoglobin glycation index level, total mortality, and cardiovascular complication risks among patients with T2DM.	A systematic review and meta-analysis. Prospective cohort studies.	N = 37,280	DM patients with high glucose levels have significantly high hazard ratios (HR) (95% confidence interval [95% CI] for cardiovascular complications [1.25] [1.16, 1.36] and total mortality [1.26 1.14, 1.39]).	It associates the hemoglobin glycation index with cardiovascular diseases in people with impaired glucose metabolism.
5	To assess healthcare interventions' effectiveness, target patients with poorly controlled T2DM seeking glycemic control, and examine CVD risk in primary care settings.	Systematic reviews of 42 RCTs.	N = 11,250 patients.	Interventions reduced HbA1c by -0.34% (95% CI -46% to -0.22%). Patients with HbA1c levels over 9.5% showed greater improvements in HbA1c.	DM is managed more effectively in primary care clinics than in hospitals. Interventions are also better implemented in primary care settings than in hospitals.
6	To conduct a comprehensive, systematic review with a meta-analysis of sex differences about the excess risk of HF and DM.	Systematic review with meta-analysis; data from 47 cohorts.	N = 12,142,998 individuals. 253,260 HF events.	HF associated with T1DM was 5.15 (95% CI 3.43. 7.74) in women and 3.47 (2.57, 4.69) in men. HF associated with T2DM was 1.95 (1.70, 2.22) in women and 1.74 (1.55, 1.95) in men. Women have a higher risk of developing HF than men	The risk of developing HF is associated with diabetes and is significantly higher in women than in men.

7	To explore the impact of DM on mortality in HF patients.	A meta-analysis of RCTs.	N ≥ 1,000 large observational registries were containing at least one full year of data.	Diabetes associated with a higher risk of all-cause death (random-effects hazard ratio [HR] 1.28 [95% CI 1.21, 1.35]), cardiovascular death (1.34 [1.20, 1.49]), hospitalization (1.35 [1.20, 1.50]), and the combined endpoint of all-cause death or hospitalization (1.41 [1.29, 1.53]).	The presence of diabetes adversely affects long-term survival, hospitalization, and risk in acute and chronic HF patients.
8	To synthesize global evidence concerning the impact of lifestyle modification (LSM) strategies on DM incidence and risk factors in one parsimonious model.	A systematic review and meta-analysis.	N = 177,272 reporting incidences of weight outcomes.	In analyses combining controlled and uncontrolled weight incidences, better results were obtained with LSM, with the participants exhibiting 33% lower odds of developing DM than the controls.	Overall, LSM strategies are presented for preventing diabetes in low- and middle-income countries.

9	To critically analyze the body of evidence regarding the effectiveness of person- and family-centered care transition interventions on quality of care and patients' experiences.	A Systematic review and meta-analysis include randomized and non-randomized control trials.	N = 6,130 articles searched Relevant articles 23/358 certified the feasibility of this study.	The chi-squared test results were considered statistically significant at $P < 0.05$; a value greater than 50% may show substantial heterogeneity.	The transition of care from hospital to home should focus on safe and effective patient and family-centered care.
10	To identify discharge interventions from hospital to home, reduce hospital readmissions within three months, and understand readmissions' effects on secondary outcome measures.	Systematic review and Meta-analysis.	N = 47 studies consist of two quantitative data obtained from two different research.	The chi-squared test of the subgroup difference (p = 0.02) was statistically significant.	Caregivers require training to promote patient empowerment and increase self-care competence.

11	To compare transitional care services' effectiveness in decreasing all-cause death and all-cause readmissions following hospitalization for HF.	A systematic review and meta-analysis.	N = 12,356 patients.	Telephone, telemonitoring, pharmacist, and education interventions did not significantly improve clinical outcomes.	Nurse home visits and disease management clinics (DMCs) decrease all-cause mortality after hospitalization for HF.
12	To determine whether hospitalization for heart failure (HHF) occurs more or less frequently than major adverse cardiovascular events (MACE) in people with T2DM.	A meta-analysis of CVD trials.	N = 47 studies.	HHF and myocardial infarction (MI) correlate with age and previous MI history ($P < 0.05$). CVD, ratios of HHF/MI, and HHF/stroke were similar between groups.	HHF is a joint event of T2DM, even in those without prior CVD.
13	To assess the effects of metformin on the incidence of cardiovascular events and mortality.	A meta-analysis with 35 RCTs.	N = 7,171 participants. 11,301 treated with a comparator. The overall of 35 clinical trials included 7171 and 11 301 participants treated with metformin and compared with participants who had respectively, who had 451 and 775 cardiovascular events, respectively	Showed that metformin reduced adverse CV events (MI, stroke, peripheral artery disease, and cardiovascular death) compared to placebo/no therapy.	Metformin was not concomitant with momentous events or benefited cardiovascular disease. P=0.34. Compared to no therapy statistically significant with a value of p=0.031

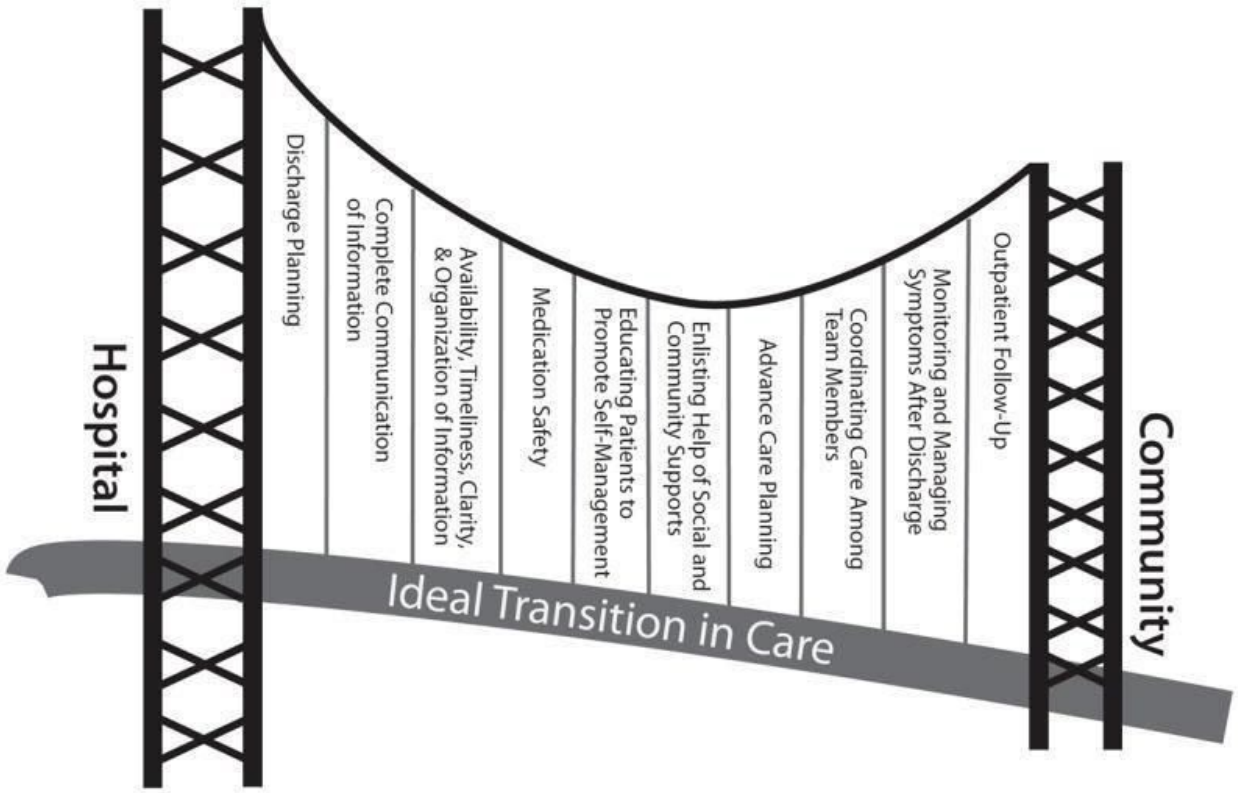
14	To conduct a prospective cost-effective analysis of a randomized clinical trial. Focus on improving comorbid self-care for persons with both HF and DM.	RCT.	N = 134	Significant improvement in medication adherence and diet among T2DM patients in the intervention group compared to the control group ($p < 0.001$).	One study showed a statistically significant improvement in medication adherence and diet among patients with T2DM in the intervention.
15	To date, the evidence regarding the effectiveness of health education using the teach-back method.	Systematic review.	Twenty-one articles that included 12 articles of the teach-back method.	Overall, the teach-back method showed positive effects in a wide range of healthcare outcomes, although these were not always statistically significant	One study showed a statistically significant improvement, adherence to medication, and diet among DM patients in the intervention group compared to the control group ($p < 0.001$).
16	Continuous glucose monitoring (CGM) provides essential information to help achieve glycemic targets in people with diabetes.	A systematic review and meta-analysis of 15 RCTs, lasting 12–36 weeks.	N = 2,461 patients.	Reduction in HbA1c (weighted mean difference [WMD[−0.17%, 95% CI −0.29 to −0.06, I2 = 96.2%). Increase in time in range (TIR) (WMD 70.74min, 95% CI 46.73–94.76, I2 = 66.3%). Lower time above range (TAR), time below range (TBR), and CV.	CGM improves glycemic control by expanding TIR and decreasing TBR, TAR, and glucose variability in DM (types 1 and 2).

				Heterogeneity between studies.	
17	Peer support intervention trials have shown varying effects on glycemic control. This study aimed to estimate the effect of peer support interventions delivered by people affected by diabetes (those with the disease or caregivers) on hemoglobin A1c (HbA1c) levels in adults.	Meta-analysis.	N = 14 RCTs 4,715 participants	Showed an improvement in pooled HbA1c level with a standard mean difference (SMD) of 0.121 (95% CI, 0.026-0.217; P =.01 ; I2 = 60.66%) in the peer support intervention group compared with the control group; this difference translated to an improvement in HbA1c levels of 0.24% (95% CI, 0.05%-0.43%).	DM; glycemic control; HbA1c. Self-efficacy; support groups. The peer support interventions for diabetes yielded statistically significant results for all parameters except A1C.
18	To investigate cause-specific outcomes and trends associated with T2DM among individuals with incident HF.	Cohort study.	N = 87,709 patients with incident HF from 1998 to 2017.	Hospitalization and mortality rates reduced over time in both groups. Nevertheless, the reduced mortality rate was more significant among those with T2DM than among those without it (−1.4% [95% CI, −1.8% to −0.9%] vs. −0.7% [95% CI, −1.2% to −0.2%]; P for the difference in trend <.001).	The higher risk of all cause-specific outcomes and emerging non-CVD trends associated with T2DM patients who experienced HF showed an urgent need for earlier comorbidity management and patient-centered multi-morbidity care.

19	To identify hyperglycemia risk factors.	A retrospective analysis.	N = 8,231 DM patients.	A slight increase in risk was observed with HbA1c 7.0 to <8.0%. The risk for HF hospitalization increased progressively from HbA1c 8.0 to <9.0, 9.0 to <10.0, and >10.0% (HRs = 1.10, 1.27, and 1.71, respectively; P < 0.001).	The increasing number and poor prognosis of DM patients with HF require new strategies to prevent and treat DM's critical, increasing complications.
20	To examine studies that evaluated different elements of the CCM.	Systematic reviews. RCTs.	N = 273; recorded data through searching. Quantitative synthesis n = 12 included in the studies.	Prevention and early intervention can be multidimensional and systemic solutions.	Prevention and early intervention can be multidimensional and systemic solutions.

Appendix E

Transition of Care from the Hospital to the Home and Outpatient Follow-Up in the Community



Ideal Transition in Care related to the CCM: patients' transitioning from the hospital to the home and, ultimately, to the community (Burke et al., 2013).

Appendix F

Operational Definitions Extracted from Audit Tool

Measurement characteristics	Operational definition
EF	1. Heart Failure with Reduced Ejection Fraction of ≤ 50%; systolic, HHF with reduced ejection fraction (HFrEF) ≤ 50%; successful therapies have been identified. (Yancy et al., 2017). 2. Heart Failure Preserved Ejection Fraction 50 ≥ (Diastolic HF); HF with preserved ejection fraction (HFpEF) ≥ 50%; several criteria were used to define HFpEF further. The diagnosis of HFpEF is challenging because other potential noncardiac causes of symptoms, which are suggestive of HF, must be excluded. Successful therapies were pinpointed. a. HFpEF, borderline 41 to 49%. These individuals fall into a borderline or intermediate group. Their characteristics, treatment patterns, and outcomes are similar to those of patients with HFpEF. b. HFpEF improved ≥40. A subgroup of patients with HFpEF, who previously had HFrEF. These patients with improvement or recovery in EF may be clinically distinct from persistently preserved or reduced EF. Further research is needed to characterize these patients better (Yancy et al., 2017).
T1DM	Type 1 diabetes: Autoimmune b-cell destruction, usually to absolute insulin deficiency. 5–10% of people with DM have T1DM. Treatment includes insulin therapy, diet, and exercise (ADA, 2018).
T2DM	Type 2 diabetes: Normally, the body becomes resistant to insulin, or the pancreas does not produce enough insulin. About 90–95% of individuals with DM have T2DM and is characterized by hyperglycemia. DM treatments include lifestyle modification, oral medication, and insulin (ADA, 2018).
Age	Patient participants included three aged groups: Lowest (32–59), middle (60-69), highest (70 -88). Patients grouped by age.

Race	Race/ethnicity. Patients grouped by race: Hispanic, African American, Caucasian, and Asian.
Insurance	Insurance coverage: most patients are covered by Medicare/Medicaid, private insurance, or no insurance.
Insurance Group	Group 1: Commercial Insurance (Aetna, BCBS, Humana). Group 2: Medicaid and Medicaid Replacement (Medicaid, Molina, Superior Health Plan). Group 3: Medicare and Medicare Replacement (Medicare, Devoted Health, Optimum, Texan Plus, WellCare, Amerigroup). Group 4: Community Exchange Plans. Group 5: CHAMPVA (Government–VA). Group 6: Uninsured.
Caregiver	Living arrangements: care support at home or living alone.
Caregiver Group	1. Spouse: spouse. 2. Non-spouse family members include brother, sister, daughter, son, or grandchildren. 3. Private caregiver and Home Health services. 4. Home Health services, spouse, or family. 5. Self-care – No caregiver support at home.
DM Managed by the Hospitalist	Hospitalist provides DM care management.
Inpatient Cardiology Consultation	Cardiology consultations for follow-up, either during hospital admission or post-discharge.
Endocrinology Consultation	Endocrinology consultations for follow-up of uncontrolled DM management.
DM Dietician Teaching Documented	Documentation showing that education has been provided to DM patients by a dietician.
Doc DM Discharge Teaching	Documentation that DM discharge education has been provided.
F/U DM Man/Endo	A follow-up appointment to provide the DM management support is recommended at discharge.

A1C in hospital	The last A1C during hospitalization, measured before discharge. Hemoglobin A1c: a steady glycoprotein formed when glucose binds to hemoglobin A1c in the patients' blood. This test looks for hemoglobin with glucose attachments, and it rates the intensity of hemoglobin A1C over two to three months (ADA, 2018). A1c test results are reported as percentages (estimated blood glucose over two to three months, similar to blood sugar monitoring at home. The goal for most adults with diabetes is to reach an A1C <7%. An A1c of ≥6.5% or a fasting glucose of 126mg/dl meets diabetes diagnosis criteria(ADA, 2018).
F/U HFDM Clinic Glucose Level	The patient's glucose level at the time of the seventh-day post-discharge follow-up appointment, following AHA-HF guidelines. However, according to Epic documentation, glucose test results were not specified whether they were fasting or random. The definition of timely follow-up varies from one to four weeks after discharge. However, the most current AHA-HF guidelines recommend follow-up visits seven to ten days after hospital discharge (Albert et al., 2017).
DM Med	Diabetes medications (pharmacological interventions) therapy.
Oral only	Yes or No.
Injectables	Yes or No.
Oral and Injectables	Yes or No.
HF Medication	Heart failure medication (pharmacological interventions).
ACE/ARB	Yes or No.
Statin	Yes or No,
Total number of medications >5	Yes or No. Polypharmacy: Patient taking five or more medications daily (Masnoon et al., 2017).
LOS	LOS: Length of stay, defined as Arrival Date–Discharge Date (or Admission Date–Discharge Date if Arrival Date is missing).