BRIDGING THE GAP: NURSE PRACTITIONER-LED OUTPATIENT INTERVENTIONS TO BREAK THE CYCLE OF HEART FAILURE READMISSIONS

by

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Abstract

Aim: To explore whether Nurse Practitioner-led outpatient interventions targeting heart failure patients can reduce hospital readmissions or emergency department visits, thereby improving healthcare efficiency and demands on hospitals.

Background: Heart failure is a leading cause of hospital readmissions, contributing significantly to healthcare system strain. Despite advancements in HF care, readmission rates remain high, posing substantial clinical and financial burdens. Nurse Practitioners, with their expertise in chronic disease management and holistic care, are well-positioned to address these challenges through proactive, personalized post-discharge care.

Method: An integrative review synthesizing most recent evidence on Nurse Practitioner-led outpatient care models for heart failure patients, focusing on their impact on readmissions and emergency department visits.

Results: Evidence suggests that Nurse Practitioner-led interventions improve post-discharge continuity of care, reducing preventable readmissions and emergency department visits. These models effectively target key factors contributing to readmissions, including medication adherence, dietary management, patient education, and timely patient follow-ups. Although no ethical concerns were identified, additional rigorous research across diverse populations and settings is necessary to solidify the evidence base and guide widespread implementation.

Conclusion: Nurse Practitioner-led care presents a viable and scalable strategy to improve outcomes in heart failure management and alleviate healthcare system pressures. Further research and policy support are crucial to expand and standardize these programs.

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Acknowledgement

For years, I have witnessed the relentless cycle of heart failure readmissions firsthand in the chaotic environment of the emergency department. Each return visit is not just a statistic; it is a story of struggle, with patients caught in a revolving door of hospital care. This is not just a burden on the system; it's a human cost that resonates deeply with me as an emergency nurse and former paramedic. This integrative review is born from that experience, a desire to find a better way to support individuals and alleviate the strain on our already overwhelmed emergency services. The support stems to not only improve the lives of those suffering from heart failure, but also that of my fellow colleagues who are struggling to finish the day in the emergency department. I would like to thank my coworkers for supporting me throughout my Nurse Practitioner education program, and to my professor Dr. Catharine Schiller for her inspiring mentorship and invaluable knowledge she imparted throughout the making of this project. As Hippocrates, the father of medicine, said, "Wherever the art of medicine is loved, there is also a love of humanity" (Aron, 2020). This review is dedicated to the patients on their journey to healing, and to the pursuit of a healthcare system that truly embodies that love.

Chapter One: Introduction

Healthcare systems are under mounting pressure, with hospitals and emergency departments (EDs) struggling to manage high patient volumes while ensuring quality care. Rapid discharge has become essential to free up hospital resources, but for many patients, this signals the beginning of a highly challenging recovery period. The potential for post-discharge complications, lack of timely follow-up, and limited access to primary care have contributed to preventable readmissions, placing further strain on an already overwhelmed system (Barber et al., 2022). This escalating cycle of readmissions is particularly concerning in the context of chronic diseases, where effective post-discharge management is paramount (Finlayson et al., 2018).

Heart failure (HF) is a major contributor to hospital readmissions, given its high prevalence rates and associated comorbidity (Virani et al., 2017). Despite advancements in HF care, readmission rates remain high, and the financial burden related to treatment continues to grow (Virani et al., 2017). Addressing HF through targeted, cost-effective interventions is crucial to improving outcomes and easing the strain on healthcare resources.

Nurse Practitioners (NPs) have emerged as key players in chronic disease management, offering a cost-effective and holistic approach to patient care. Their ability to provide personalized, continuous post-discharge care positions them uniquely to address the key factors driving HF readmissions. This integrative review explores whether NP-led outpatient interventions can reduce readmissions and improve healthcare efficiency by bridging critical gaps in HF management. By synthesizing current evidence, this review aims to highlight strategies for implementing scalable NP-led care models that could enhance patient outcomes, reduce hospital utilization, and offer a sustainable solution to Canada's growing healthcare crisis.

Chapter Two: Background

In today's overburdened healthcare systems, the pressure to expedite patient discharges has become an unavoidable reality. EDs in many countries are facing a national crisis, with both overcrowding and staff shortages creating significant barriers to timely patient care, increasing staff frustration and burnout, and ultimately putting patient safety at risk (Yarmohammadian et al., 2017). With hospitals stretched thin and resources limited, healthcare professionals are often forced to focus on immediate treatment and efficient patient turnover (Yong, 2021). Yet for many patients, discharge is not the end, but rather, the beginning of a high-stake journey fraught with fears and challenges (Rising et al., 2016).

Nationally, 77% of patients treated in EDs are discharged following evaluation and treatment, resulting in a “treat-and-release” approach (Iyeke et al., 2023, p. 2). Unfortunately, once discharged from the hospital, many patients are left to navigate the recovery process alone, without the support and resources available during hospitalization. This discontinuity of care is often due to the difficulty patients face in accessing primary care and follow-up services in a timely fashion (Field et al., 2015).

Canada is grappling with an escalating crisis in primary care and specialist service accessibility (Flood et al., 2023). Primary care clinics, vital for post-discharge continuity, are themselves under strain from limited resources and surging demand. As of 2023, one in six Canadians lack a regular family healthcare provider, and fewer than half can secure a same-day or next-day appointment (Flood et al., 2023). This shortage of timely access fuels significant downstream effects, including delayed diagnoses, restricted specialist referrals, and heavy reliance on already overcrowded EDs (Flood et al., 2023).

Between 2021 and 2022, more than 14 million Canadians visited EDs (Rader & Ritchie, 2023), with a substantial share of these visits stemming from conditions that could have been managed in a primary care setting, had access been available (Flood et al., 2023). In 2020 alone, 39% of Canadians seeking emergency care noted that their conditions could have been addressed by a primary care provider, if they had had the ability to secure a timely appointment (Flood et al., 2023). The "treat-and-release" model practiced by most EDs (Iyeke et al., 2023, p. 2) ultimately sets patients up for treatment failure in a system that lacks continuity and timely resources.

Moreover, the post-discharge period presents an elevated risk of complications, medication errors, and poor adherence to care plans; these are factors that often result in avoidable readmissions, skyrocketing healthcare costs, and an overall decline in quality of life (Barber et al., 2022). The transition from hospital to home therefore represents a critical window in which effective follow-up care, prompt interventions, and coordinated support can make the difference between a successful recovery and relapse and deterioration (Finlayson et al., 2018).

A retrospective cohort study conducted by Moe et al. (2022) aimed to identify which specific subgroup of patients who visited EDs in Canada disproportionally contributed to the highest healthcare spending and increasing acuity needs. This study identified that older adults with multiple chronic comorbidities contributed disproportionally to all other ED visits. Smith et al. (2016) demonstrated that, for these high readmission risk groups, up to 50% of discharged patients presented back to the hospital within 30 days of discharge. Their study identified that timely follow-up services profoundly and positively reduce readmission rates, and this finding is consistent with a significant body of literature. Another study conducted by Field et al. (2014) expanded on this research and found that post-discharge visits in high-risk individuals have far

better outcomes if they are incorporated into comprehensive transitional care programs rather than early primary care physician visits.

The disproportionate burden placed on healthcare resources by high-risk, high-need subgroups necessitates a shift towards targeted interventions. Chronic diseases accounts for substantial healthcare costs in Canada, with nearly 73% of seniors age 65 and older living with at least one chronic condition (Public Health Agency of Canada, 2020). The financial and clinical burden associated with chronic disease makes this population a critical target for interventions. Research by Moe et al. (2022) in Ontario and Alberta underscores this, revealing that older adults with chronic diseases are significant contributors to ED strain due to their increasing high-acuity needs.

To address this issue, policymakers must design and implement tailored, patient-specific care strategies aimed at these high-need groups. This recommendation reinforces the established principle that patients with chronic diseases achieve superior outcomes through consistent, integrated care, as opposed to fragmented, episodic interventions in emergency settings or routine primary care visits (Field et al., 2015; Rader & Ritchie, 2023). Their complex healthcare needs not only necessitates rigorous monitoring but also proactive, patient-centered, multi-faceted interventions that are often not achieved, or achievable, in ED environments and primary care centers. Ironically, the need for such interventions is particularly prevalent in patients who present to EDs for care, which only serves to worsen the problem.

The complexities of HF make it a particularly difficult chronic disease to manage, resulting in high treatment failure rates and a considerable strain on healthcare resources. HF is the leading cause of cardiovascular morbidity, mortality, and healthcare utilization in Canada (Virani et al., 2017) and is a leading cause of hospital readmissions in the United States

(Breathett et al., 2018). It is defined as a clinical syndrome, characterized by a constellation of signs and symptoms (leg swelling, pulmonary congestion, dyspnea, orthopnea), and caused by a structural and/or functional cardiac muscle dysfunction that results in reduced cardiac output (Kurmani & Squire, 2017).

In 2017, over 600,000 Canadians were affected by HF (Virani et al., 2017). At least 20% of discharged HF patients return to EDs after 30 days (Virani et al., 2017), and 30% die within one year of discharge (Charteris & Pounds, 2020). Globally, mortality rate nears 50% within 5 years of diagnosis (Mangini et al., 2013). From an economic perspective, $2.8 billion Canadian dollars are spent on HF and its associated sequelae per year (Virani et al., 2017), and these hospital costs are only projected to rise in the future (Tran et al., 2016). An article published by the Canadian Journal of Cardiology provided an urgent call to action for all Canadian stakeholders to redesign policy initiatives which "must be championed to affect meaningful change" for an optimal and cost-effective future (Virani et al., 2017, p.1). These alarming forecasts underscore the urgent need for new and innovative care models that can prevent hospitalizations resulting from HF and improve patient outcomes.

NPs have emerged as a cost-effective solution to address global physician shortages (Fichadiya et al., 2021; Hansen-Turton et al., 2010). Their scope of practice spans autonomous and collaborative roles across diverse settings, including hospitals, outpatient clinics, and specialized care (Grant et al., 2017). Initially developed to mitigate anticipated medical professional shortages, NPs now function as either autonomous primary care providers or as integral members of multidisciplinary teams, enhancing overall care delivery (Grant et al., 2017). Beyond their broad clinical expertise, NPs excel in chronic disease management, prevention, and health maintenance (Craswell et al., 2018). Their unique value lies in the integration of advanced

medical practice with holistic care, encompassing patient education, counseling, and advocacy; these are skills cultivated throughout their nursing careers (King-Dailey et al., 2022).

With respect to HF care in particular, these core NP competencies directly address key factors that contribute to hospital readmissions, such as medication and dietary non-adherence, inadequate patient education, and delayed follow-up (Charteris & Pounds, 2020). Research consistently demonstrates the effectiveness and proficiency of NPs in managing these critical areas, positioning them well to improve HF outcomes. Despite growing recognition of NP capabilities, much of the remaining skepticism surrounding their role compared to physicians stems from earlier research (Donelan et al., 2013). Currently, there is a notable lack of recent evidence assessing whether the NP scope of practice is equivalent and/or well-suited for the comprehensive management of complex HF patients.

Purpose

The purpose of this integrative review is to systematically analyze the potential for NP-led outpatient interventions to mitigate HF readmissions and ED visits, and to evaluate the viability of expanding programs as a strategy to improve healthcare efficiency. For outpatient interventions to be effective in managing HF, they must take into account the nature of this disease, which is both chronic and complex, and they must acknowledge that hospital discharge represents a fragile transition point in patient care. This review posits that NP-led models, which emphasize post-discharge continuity of care, may provide a structured framework to disrupt the cycle of recurrent hospitalizations. By synthesizing existing research on this topic, this integrative review will generate evidence to inform the development and implementation of scalable, patient-centered interventions aimed at addressing the needs of HF patients in Canada.

Chapter Three: Research Methods

Design

This integrative review is focused on the following question: are NP-led outpatient interventions effective at reducing hospital readmission rates or ED visits for HF patients? To systematically explore this question, the Population, Intervention, Outcome (PIO) framework was adopted. Widely recognized in healthcare research, the PIO framework facilitates the identification and evaluation of evidence by narrowing the focus to a specific population, targeted intervention, and measurable outcomes (Bramer et al., 2018). This structured approach ensures a comprehensive and methodical review, guiding the selection of studies that are most relevant to answering the research question (Bramer et al., 2018).

Key Terms

For the purposes of this review, the terms NPs, outpatient, HF, and readmission and ED visits are defined as follows. NPs refer to any advanced care nurses who are licensed to assess, diagnose, treat, and manage patient care independently, without physician supervision. HF is used as an umbrella term that encompasses all forms of HF, including systolic and diastolic dysfunction, decompensated HF, congestive HF, and both acute and chronic presentations. Readmission and ED visits refer to any return to the hospital—either through inpatient admission or ED presentation—following a previous hospital encounter, regardless of whether the patient was admitted or discharged. Outpatient refers to any NP-led intervention that takes place outside of the hospital setting, such as in primary care clinics, home visits, telephone consultations, remote monitoring, or other community-based services.

Database Selection

A systematic literature search was conducted in November 2024 to identify primary research studies that evaluated the impact of NP-led primary care clinics on readmission rates among HF patients. This integrative review employed a comprehensive search strategy across three key databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Ovid MEDLINE, and Google Scholar. Electronic database searches were supplemented by a review of the reference list of each included study to ensure that all relevant literature was captured. To optimize search efficacy, an experienced Knowledge Synthesis Librarian from the University of Northern British Columbia provided expert consultation in the development of subject headings and surrogate terms.

CINAHL was selected for its comprehensive coverage of nursing and allied health literature (Subirana et al., 2005). Ovid MEDLINE, the premier database for biomedical literature, was chosen to capture relevant medical research pertaining to cardiac readmissions and related clinical outcomes (Subirana et al., 2005). Google Scholar was included to broaden the search and capture grey literature or reports not indexed in traditional databases, thereby enhancing the comprehensiveness of the review. These databases, in addition to Google Scholar, were deemed most appropriate for their scope and relevance to the research question, ensuring a robust and thorough analysis of the existing literature.

Search Strategy

As a result of various lexes and interpretations of the concepts “Nurse Practitioner”, “readmission”, and “cardiac patients”, multiple search terms were used in each database to fully capture their respective notions. A description of the search strategy and concepts used for each database is described below.

CINAHL Database

A comprehensive literature search was conducted using the CINAHL Complete database via the EBSCOhost interface, employing advanced search techniques through a combination of CINAHL subject headings and subheadings. CINAHL subject headings are standardized, hierarchical terms from a controlled vocabulary that are used to index and organize articles on a specific topic (Clark College, n.d.). They help to ensure that articles related to a concept are grouped together, regardless of variations in the terminology that may be used by different authors (Clark College, n.d.). Subheadings are qualifiers applied to subject headings to focus on a particular aspect of the topic (Clark College, n.d.). By combining subject headings with relevant subheadings, searches can be refined to retrieve more targeted results on specific dimensions of a broader topic.

This integrative review employed a structured search strategy to explore the intersection of three core concepts: HF, NPs, and Hospital Readmissions. For the concept of HF, the CINAHL subject heading "Heart Diseases" was initially selected to maintain a broad search scope. The "explode" function was utilized to incorporate all related terms, including "Heart Diseases," "Arrhythmia," "Cardiovascular Abnormalities," "Heart Failure," "Heart Hypertrophy," "Myocardial Injury," "Myocardial Ischemia," "Ventricular Dysfunction," and "Heart Defects, Congenital," resulting in 265,630 records. To further enhance comprehensiveness, equivalent subheadings, such as "Cardiac," "Heart," "Cardio," and "Heart Injury," were manually added, expanding the search to 697,491 records. A separate search was conducted using "Heart Failure" as a subject heading to evaluate suggested terms; CINAHL recommended retaining this term, which was subsequently added as a subheading to ensure both broad and relevant coverage.

To explore the concept “Nurse Practitioner”, the CINAHL subject heading "Nurse Practitioners" was selected, and the "explode" function was applied to capture all related subheadings, yielding 26,362 articles. Additional keyword searches utilizing "Advanced Providers," "Advanced Practice Nurs," and "Advanced Nurs" were performed, resulting in 24,482 articles. These terms were then combined to create a broader search set, producing a total of 46,102 records. Given that NPs are considered advanced providers and advanced practice nurses, these subheadings were included to ensure a comprehensive search.

For the concept of readmissions, the CINAHL subject headings "Readmission" and "Patient Admission" were used, initially retrieving 11,956 articles. To expand the search, additional subheadings, including "Rehospitalization," "Return to Hospital," "Return to Emergency," "Hospital Revisit," and "Emergency Revisit," were incorporated, resulting in 42,537 records.

As a final step in the CINAHL database search, the three concept sets were combined using the Boolean operator "AND" to identify articles addressing the convergence of all three concepts. This final combined search yielded 133 articles. A visual representation of this search strategy is provided in Appendix A.

Ovid MEDLINE Database

Within the Ovid MEDLINE platform, a comparable search strategy was implemented. For the concept of HF, the MeSH (Medical Subject Headings) term "Heart Diseases" was selected. Upon selection, Ovid MEDLINE recommended the inclusion of the broader term "Cardiovascular Diseases" and the term "Heart Diseases," both of which were further exploded to capture all related terms. Additionally, the MeSH term "Heart Failure" was utilized, and related narrower terms, including "Edema, Cardiac," "Heart Failure, Diastolic," and "Heart

Failure, Systolic," were incorporated. To further broaden the search, supplementary keywords such as "Cardiac," "Heart," "Congestive Heart Failure," "CHF," "HF," and "Heart Injury" were applied. These searches were combined using the Boolean operator "OR," yielding 1,061,725 records.

For the concept of NPs, the MeSH term "Nurse Practitioners" was selected. Furthermore, the subheading "Family Nurse Practitioner" was included. To ensure comprehensive coverage, the keyword "Advanced Practitioners" was incorporated, and all terms were combined using the Boolean Operator "OR," producing 19,434 articles.

For the concept of readmission, the MeSH term "Patient Readmission" was selected and exploded to include the narrower terms "Hospitalization," "Patient Readmission," and "Patient Admission." Supplementary key terms, encompassing "Return to Hospital," "Return to Emergency," "Hospital Revisit," and "Emergency Revisit," were applied. These terms were combined using the Boolean operator "OR," resulting in 314,015 articles.

As a final step, the three concept sets were combined using the Boolean Operator "AND," yielding 47 articles. A visual representation of this search strategy is provided in Appendix B.

Google Scholar

Consistent with recommendations for supplementing traditional database searches, a targeted search was conducted in Google Scholar without a formal protocol, given its unstructured nature for comprehensive literature reviews (Haddaway et al., 2015). This final scan aimed to capture recent publications potentially not indexed in traditional databases (Haddaway et al., 2015). Following advice of the Knowledge Synthesis Librarian, the first 4 pages of results for the search terms "Nurse practitioner readmission cardiac" were reviewed. This process

retrieved two additional articles that had not been captured within the CINAHL or Ovid MEDLINE databases.

As a final step, the reference lists of all of the selected studies were briefly scanned to identify any additional relevant articles cited by the authors.

Systematic Review Article Search

To enhance the search strategy and ensure comprehensive coverage, a systematic review by Fichadiya et al. (2021) was retrieved from the CINAHL database and its reference list was examined. This systematic review had been selected for its high relevance to the topic and its recent publication date. Reviewing the reference list of this systematic review uncovered three further articles that were relevant to the research question but had not been located through the database and Google Scholar searches.

Inclusion and Exclusion Criteria

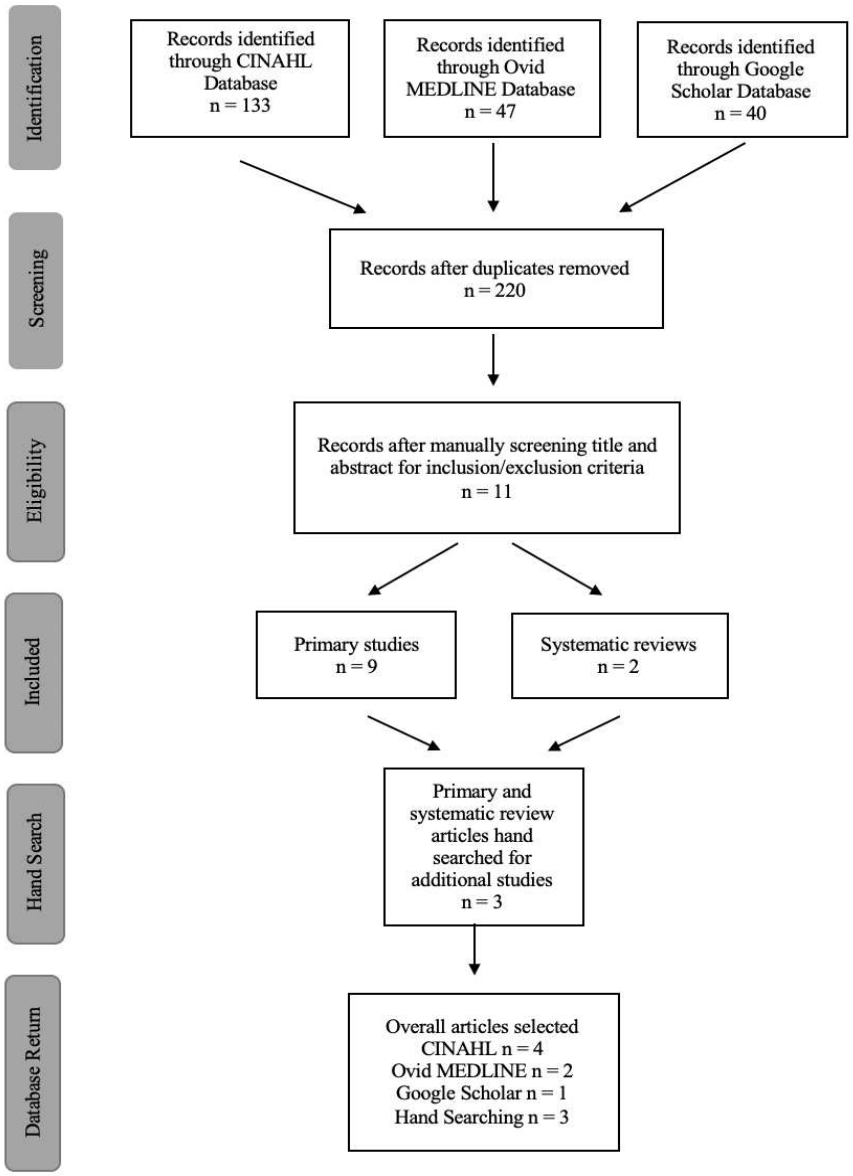
The parameters of this review were established prior to beginning any of the searches described previously. The initial searches, undertaken using a date restriction of publication within the past 10 years, revealed only a limited number of relevant primary research articles. To ensure an adequate sample size for a robust synthesis, this criterion was expanded to include studies published within the past 20 years.

Only primary research studies were considered, with the exception of one systematic review. Any included study needed to: (1) involve NPs as the care providers, (2) focus on HF patients as the patient population of interest, and (3) use hospital readmission rates or ED visits as an outcome. Only studies in the English language were included. The review's scope was further defined by limiting the included studies to those investigating NP care in outpatient settings, specifically excluding interventions conducted solely within a hospital environment.

Additionally, only studies involving HF patients discharged from hospitals, irrespective of their acuity levels, gender, or racial group, were included. Studies that focused on physicians or other advanced practice providers, rather than NPs, were excluded. Figure 1 shows a PRISMA Flow Diagram to visually represent the above search strategies and application of inclusion/exclusion criteria. The complete list and details of selected studies are presented in Appendix D.

Figure 1

PRISMA Flow Diagram



Disclosure of Search Strategy Limitations

To ensure methodological transparency, the limitations inherent in the search strategy are being disclosed. It is possible that restricting the search to English-language publications and to studies published within a 20-year timeframe may have prevented the inclusion of potentially relevant research. Second, the reliance on two specific databases, primarily CINAHL and Ovid MEDLINE, may have resulted in the omission of studies that are indexed in other repositories. The supplementary Google Scholar search, conducted without a pre-defined protocol, could introduce the potential for selection bias. Lastly, the narrow timeline in which this integrative review needed to be completed may have limited the scope of the literature review and resulted in the exclusion of additional pertinent articles.

Critical Analysis

Ten articles, selected according to predefined inclusion and exclusion criteria, underwent a rigorous critical appraisal process. This appraisal was conducted using the Critical Appraisal Skills Programme (CASP) checklist guidelines. The CASP checklists are evidence-based tools designed to help users effectively make sense of critical appraisal by assessing the methodological quality, validity, rigor, and potential biases of various study designs (Buccheri & Sharifi, 2017). This process was also conducted within the framework of established reporting guidelines, ensuring that no essential information was omitted during the appraisal (Buccheri & Sharifi, 2017).

Following the critical appraisal, each article was assigned a subjective credibility rating by the author of this integrative review. This rating, ranging from Level I to Level V, represented the overall credibility and strength of the evidence presented in each study. Level I indicated the weakest evidence, characterized by significant methodological limitations; Level V represented

the strongest evidence, demonstrating robust methodology and a high degree of relevancy. A description of each Level is presented in Table 1. Appendix E contains a table with the detailed critical appraisal of each study.

Table 1

Study Credibility Rating Scale

Level	Description	Credibility
Level I	Weakest study; least credible evidence	Minimal reliability
Level II	Slightly stronger than Level I	Limited reliability
Level III	Moderate strength and credibility	Moderate reliability
Level IV	Strong evidence; high credibility	Significant reliability
Level V	Strongest study; most credible evidence	Maximum reliability

Data Extraction

To achieve a rigorous and comprehensive synthesis of evidence, a data extraction table was meticulously constructed, as detailed in Appendix F. This table served as a structured repository, designed to collate and organize pivotal information from the ten selected studies. Recognizing the inherent variability across research methodologies and reporting styles, the rationale behind this approach was to standardize the presentation of key study attributes that are most applicable to the research question (Büchter et al., 2020). This methodology facilitated a nuanced comparison and analysis of results across the studies, which was essential for identifying overarching trends, clarifying inconsistencies, and establishing a robust foundation for addressing the research question.

Chapter Four: Findings

Lowery et al. (2012) conducted a retrospective quasi-experimental study to evaluate the effectiveness of an NP-led outpatient disease management clinic, compared to usual physician-led primary care for patients with HF. The study included 969 veterans across six Veterans Affairs medical centers in the Midwestern United States, with participants followed over a two-year period. The intervention protocol adhered to the guidelines of the American College of Cardiology Foundation and included individualized face-to-face patient education, medication adjustments as clinically indicated, structured follow-up telephone calls, and support for lifestyle modifications.

The results demonstrated statistically significant reductions in all-cause mortality at both one and two years post-intervention, although the observed reduction in hospital readmissions was attenuated by the second year. Despite its quasi-experimental design, the study demonstrated strong methodological rigor and was one of the first to identify the diminishing long-term impact of NP-led interventions on HF readmission rates beyond the initial year. This finding challenges the adequacy of the 30-day readmission rates as the sole metric of intervention success and emphasizes the need for long-term outcome evaluation.

External validity was strengthened by the recruitment of a large sample (n = 969) from multiple outpatient sites, thereby enhancing the generalizability of findings. However, the study's non-randomized design and the exclusive inclusion of an all-male veteran population may introduce selection bias and limit applicability to more diverse groups. Notably, the inclusion of participants with fewer comorbidities—specifically those with a life expectancy greater than six months—may have minimized confounding variables and strengthened internal validity. The presence of a relatively healthy cohort likely contributed to the strength of the observed

outcomes, suggesting that the intervention's effectiveness may be more pronounced in patients with less complex health profiles. Nonetheless, further research is needed to determine whether these results can be replicated in more clinically diverse populations.

When comparing the findings from Lowery et al. (2012) with those of Blum and Gottlieb (2014), several key similarities and distinctions emerge regarding the short and long-term effectiveness of NP-led interventions in HF management. Although both studies provide evidence supporting NP-led care in reducing readmission rates, they also consistently demonstrate a decline in effectiveness over time, emphasizing the need for sustained follow-up strategies.

Blum and Gottlieb (2014) conducted an RCT involving 204 HF patients across multiple hospital discharge sites in the United States. The intervention consisted of a comprehensive NP-led outpatient telemonitoring program, which included remote monitoring devices to track weight, blood pressure, heart rate, as well as individualized patient education and guideline-based treatment protocols. Abnormal data readings triggered early clinical evaluations by the NP, who assessed whether treatment escalation was required. Although the intervention design shared several components with that of Lowery et al. (2012), including education and follow-up, the Blum and Gottlieb (2014) study employed a more robust research design (RCT) but involved a smaller sample size.

Importantly, Blum and Gottlieb (2014) did not report detailed information about participants' comorbidities like in the Lowery et al. (2012) study, though they excluded individuals with conditions likely to confound results, such as active substance use, cancer, obesity, and dementia. This approach, while potentially reducing variability, may limit the study's applicability to real-world, complex HF populations. Additionally, the follow-up period

was extended to a mean of 802 ± 430 days (median of 823 days), and concerningly the authors did not disclose the rationale for such variability in this timeline, raising concerns about the consistency of its design.

Nonetheless, the study reported statistically significant reductions in 30-day readmission rates that waned after the first year, corroborating the findings on short-term efficacy of NP-led outpatient interventions seen in the Lowery et al. (2012) study. This pattern is particularly important, as both studies were the longest in duration out of the ten studies reviewed, and hence, reveal a shared challenge: the waning impact of these interventions over time.

A notable limitation of the Blum and Gottlieb (2014) study was that all interventions were delivered by a single NP. The authors noted that this provider offered care that surpassed typical practice standards, yet no specific examples were provided to define what constituted such “exemplary” care. This lack of detail makes replication difficult and raises concerns about generalizability. It is plausible that the observed positive outcomes were influenced by the exceptional skill set of the individual NP rather than the intervention model itself, thereby limiting its applicability across broader NP practice settings.

Similar to the study design of Lowery et al. (2012), Rhiantong et al. (2019) conducted a quasi-experimental study that evaluated the impact of an NP-led continuing care program on 71 patients with HF following myocardial infarction who had been discharged from a cardiac care unit at a University Hospital in Thailand. Through a Designed Continuing Care Program, the study’s interventions were similar to those observed in the aforementioned studies, encompassing timely follow-ups within 14 days of discharge, body weight changes, meticulous care coordination, patient education, medication reconciliation, thorough patient assessments, problem identification, and prompt interventions.

The study resulted in statistically significant reductions in healthcare costs, shorter hospital stays, improved functional status, enhanced quality of life, and greater patient satisfaction, however, they did not lead to statistically significant reductions in three-month readmission rates and ED visits. This finding aligns with the pattern of diminishing intervention efficacy previously observed in Lowery et al. (2012) and Blum and Gottlieb (2014).

It is important to note, that the overall reliability of the study is limited by the characteristics of its unique patient population—who were recruited following myocardial infarction—with HF as a secondary comorbidity rather than a primary diagnosis. This cohort differs significantly from those in previously discussed studies, as patients recovering from myocardial infarction often present with more complex clinical profiles and higher acuity needs—such as increased risk for arrhythmias, hemodynamic instability, and multi-organ involvement. As a result, their patterns of hospital readmission may have been influenced by factors beyond HF alone, potentially obscuring the true effect of NP-led intervention on readmission rates. Nonetheless, shorter duration of effect (less than three months) further underscores the importance of identifying strategies to sustain long-term benefits, particularly when compared to the one-year efficacy reported in earlier studies.

Similar to the Blum and Gottlieb (2014) study, Breathett et al. (2018) also employed an RCT design, representing another high standard in critical appraisal, and examined the effectiveness of NP-led interventions in reducing 30-day readmission rates among HF patients. Breathett et al. (2018) conducted a single-center, investigator-blinded RCT with 206 participants, evaluating the impact of one-on-one outpatient NP education combined with an enhanced tablet-based intervention. The tablet-based intervention included a designed application program which provided patients with extra education around HF, nutrition planning, medication adherence, and

life-style changes. As seen in the Blum and Gottlieb (2014) study, any arisen issues were flagged to medical staff, and early interventions and escalation of care was conducted to prevent medical deterioration. Despite this strong methodological approach, the study's limited sample size, and a funding constraint, led to an underpowered primary analysis.

Due to the primary analysis funding constraints, a secondary analysis was conducted which focused solely on the tablet-based intervention, excluding the one-on-one outpatient NP interventions. The lack of face-to-face NP interactions revealed a statistically significant increase in readmission rates. While the study did not yield robust evidence in support of the tablet-based intervention, it underscored the significance of face-to-face outpatient NP interventions in reducing 30-day readmission rates. This finding is particularly significant as it not only supports the role of NP-led education in reducing HF readmission rates, but also demonstrates that its absence may contribute to increased readmissions—highlighting a strong, potentially causal relationship between NP-led education and improved patient outcomes.

In contrast to the previously discussed studies, Breathett et al. (2018) focused exclusively on 30-day readmission rates and did not evaluate the long-term effects of NP-led interventions. Additionally, the single-center design—similar to that of Blum and Gottlieb (2014)—limits the generalizability of the findings to more diverse populations. Despite ongoing calls in the literature for multi-site studies to strengthen external validity, this gap remains unaddressed, highlighting the continued need for broader evaluation of NP-led models across varied clinical contexts.

Smith et al. (2016) employed a distinct patient recruitment methodology, achieving objectivity despite targeting an HF group with multiple and complex comorbidities. Utilizing the LACE tool, a validated risk stratification instrument, Smith et al. (2016) conducted a case-

control study that objectively identified patients at elevated risk for readmission. The LACE tool assigned participants a score based on: (1) length of the original hospital stay, (2) acuity of their last admission, (3) comorbidity index, and (4) prior ED utilization. A score of 0–6 indicated "low-risk," 7–10 "intermediate risk," and 11–15 "high-risk" for readmission. Their study involved 532 patients discharged from a community hospital in Colorado with a LACE score between 11 and 15, representing a patient population with a 21.48% overall readmission risk.

The study assessed the efficacy of a single NP-led home visit, conducted within 24–72 hours post-discharge, in reducing 30-day hospital readmission rates and ED visits. Interventions focused on clinical assessment, medication adherence, patient education, and necessary medical adjustments. Notably, the study demonstrated a 48.2% relative reduction in 30-day readmissions and a 53.9% relative reduction in ED visits, exceeding the impact observed in the other studies. This drastic improvement may have stemmed from the earlier timing of follow-up, as patients were seen sooner post-discharge than in studies that utilized delayed intervention periods. These findings stand to contradict the notion that a healthier participant cohort, as seen in the Lowery et al. (2012) study, resulted in lower readmission rates.

Although the study's follow-up period was limited to 30 days, as also seen within the Breathett et al. (2018) study, it intentionally targeted a high-risk population with multiple comorbidities, as reflected by elevated LACE scores. The strong outcomes achieved within this context underscore the potential of timely NP-led interventions. Nonetheless, as a quasi-experimental study, it shared the limitations of non-randomized design, which may have introduced selection bias. Additionally, the LACE score-based selection criteria may have excluded certain HF patients who could have benefited from the intervention, potentially influencing the generalizability of findings.

Moore (2016), in collaboration with a Medicare-certified home health agency, developed and piloted an NP-led, home-based HF clinical pathway program aimed at improving post-discharge care, reducing 30-day readmission rates, and achieving better cost savings. This program is defined by its highly integrative approach, implemented and led by an NP working in conjunction with a multidisciplinary team including physical therapists, registered nurses, dieticians, pharmacists, occupational therapists, social workers, and home health aides. This integrative approach to care provision surpasses the integrative interventions observed in other studies, which primarily focused on individual interventions or smaller interdisciplinary teams.

Similar to the early follow-ups seen within the Smith et al. (2016) study, patients were also assessed and seen by an NP earlier, within seven days of initiating home health services, and received a comprehensive intervention over a four-month period. The intervention included routine monitoring of vital signs and weight changes, patient education, medication reconciliation, care escalation protocols, and the use of various telemonitoring technologies—similar to the interventions implemented in the Rhiantong et al. (2019) study. The pathway demonstrated a substantial reduction in ED visits and a significant decrease in 30-day readmission rates, from 27.8% to 9%, with only two patients experiencing readmissions. This represents one of the most pronounced reductions in readmission among the studies reviewed and supports Smith et al.'s (2016) findings that early NP-led intervention produces lower readmission rates. While these results align with existing evidence supporting the effectiveness of NP-led interventions, the magnitude of improvement observed in this study may be partially attributed to the involvement of a multidisciplinary care team, which likely enhanced care coordination, patient monitoring, and education. HF patients may particularly benefit from this approach, as HF decompensation is often influenced by factors beyond medical management

alone—including dietary adherence, fluid restriction, physical activity, and medication compliance (Charteris & Pounds, 2020).

However, Moore (2016) utilized a convenience sampling method and a non-randomized design, without the inclusion of a control group. The use of convenience sampling is particularly concerning, as the study did not report participant characteristics, raising the possibility that the positive outcomes observed may have been influenced by the inclusion of individuals with fewer comorbidities or a higher likelihood of success, rather than the intervention itself. The study's sample size of 22 was small, with no reported power analysis to justify this limited sample.

Siodlak et al. (2020) conducted a pilot study, mirroring the design of Moore (2016), to evaluate a collaborative model involving Clinical Pharmacist Specialists (CPS) and NPs in a HF Access Clinic. While both studies employed a multidisciplinary approach, Siodlak et al. (2020) demonstrated a less integrated model compared to Moore (2016). The intervention described in Siodlak et al. (2020) emphasized a flexible diuretic regimen, timely medication adjustments, and patient education, leading to the greatest reduction in 30-day readmission rates among the studies reviewed. Readmissions decreased to 8%, a significant improvement compared to the institution’s historical rate of 15.8%. Notably, no ED visits or mortality were reported during the follow-up period. This pronounced reduction in readmissions aligns with the positive trends observed in Moore (2016) and demonstrating the efficacy of interdisciplinary interventions. Notably, the study's emphasis on interprofessional collaboration, particularly the CPS involvement, leading to medication discrepancy identification in 58% of visits and optimization in 54% of patients, highlights a unique aspect compared to other studies under review.

However, the study’s methodological limitations were similar to that of Moore (2016), who also relied on descriptive statistics, thereby limiting the strength of its evidence. A small

sample size and short follow-up period further raise concerns about generalizability, a limitation shared with the other single-center studies. While the pilot study by Siodlak et al. (2020) may not possess the methodological rigor of Moore (2016), its significant reduction in readmissions reinforces the positive trends observed in other studies, suggesting the potential benefit of collaborative models in HF management.

Charteris and Pounds (2020) employed a quality improvement study using Plan-Do-Study-Act cycles to evaluate an NP led multidisciplinary clinic model for veterans with HF. The study was developed by a Cardiology NP, who established a dedicated HF clinic in collaboration with dietitians and pharmacists, focusing on patient education and goal-setting. Charteris and Pounds (2020) posited that these interventions are critical, as medication nonadherence and poor dietary practices are leading contributors to HF decompensation and subsequent hospital readmissions. The intervention, despite incorporating elements similar to all the other studies, like timely follow-up appointments and patient education, achieved only a 0.2% reduction in 30-day readmissions. These results, although trended positive, contrasts with the substantial reductions seen in all of the other aforementioned studies. This minimal impact, coupled with a small sample size (n=43), high attrition (50%), and substantial inconsistent implementation of engagement tools, raises concerns about the effectiveness and generalizability of their model. The study's limitations, including the lack of a control group and non-randomized design. Despite these methodological shortcomings, the study contributes to the body of evidence on NP led multidisciplinary approaches, suggesting a need for further research with more rigorous designs.

Ballard-Hernandez et al. (2010), being the oldest study that utilized a multidisciplinary approach, aimed at reducing 30-day all-cause readmission rates for HF patients. In this study,

high-readmission risk hospitalized HF patients were identified using questionnaires, who later connected with an NP as an outpatient who conducted follow-up phone calls, monitoring, and referrals as needed. This study, while demonstrating a reduction in readmission rates from 25.9% to 17.6%, shared the same critical limitation of the other non-randomized studies: the absence of a control group and randomization. A significant limitation to this study is the heterogeneous nature of the interventions, encompassing both inpatient and outpatient settings, representing a critical flaw that significantly impairs the relevance of the study's conclusions to this integrative review. Credibility is further compromised by the study's failure to provide any statistical details for its Performance Improvement Project. Despite this deficiency, the study's results stand to support NPs leading a multidisciplinary approach, as shown within the Moore (2016), Siodlak et al. (2020), and Charteris and Pounds (2020) studies.

To broaden the scope of this analysis, a systematic review by Delgado-Passler and McCaffrey (2006) compared the effectiveness of NP-led post-discharge management interventions to those led by Registered Nurses (RNs) for HF patients. This review, unlike the individual studies previously discussed, synthesized findings from predominantly RCT studies, focusing on outcomes such as readmission rates, length of stay, mortality, and healthcare costs. While individual study results varied, a general trend supported the superiority of APN led interventions in reducing readmissions compared to RN led programs. This aligns with the positive trends observed in the majority of the studies reviewed that advocated for NP led interventions. One of the most significant findings identified in the systematic review is presented in the analysis by Delgado-Passler and McCaffrey (2006) of a study conducted by Benatar et al. (2003), who hypothesized that the method of outpatient care delivery may influence outcomes in the HF population. Benatar et al. (2003) found that home visits by

specialist cardiac RNs were less effective in reducing hospital readmission rates compared to NP-led outpatient telemonitoring (Delgado-Passler & McCaffrey, 2006). This finding is particularly important, as it suggests that the effectiveness of face-to-face interventions, such as those demonstrated in the study by Breathett et al. (2018), may not be attributed solely to the delivery format, but rather to the distinct impact of the NP encounter itself.

The review identified inconsistencies in results, likely due to differences in intervention scope, intensity, patient populations, and study designs. For instance, significant reductions in readmissions and mortality were observed in studies like Naylor et al. (1999) and Dahl and Penque (2000), while others, such as Debusk et al. (2004), showed no significant changes in hospitalization rates. These variations highlight the challenge of generalizing findings across diverse healthcare settings, a concern echoed in the variability of results seen in the individual studies reviewed. Furthermore, despite employing a seemingly comprehensive search strategy, the review did not fully address potential biases in study selection or assess the quality of the included studies, thereby limiting its overall reliability. This lack of quality assessment contrasts with the rigorous methodological appraisal applied to the individual studies in this analysis.

Despite these limitations, the systematic review offers valuable insights into the potential benefits of NP-led interventions in managing HF. The variability in results underscores the need for clearly defined population groups and standardized intervention protocols when interpreting outcomes. This highlights the importance of future high-quality, long-term studies to confirm the effectiveness of NP-led post-discharge management and improve generalizability, a recommendation that reinforces the conclusions drawn from the individual study analyses.

Lastly, while Delgado-Passler and McCaffrey (2006) compared NP-led care to that provided by RNs, comparisons to other clinic models—such as outpatient cardiology clinics—

remain limited in the literature. Much of the existing literature advocates for the utilization of NPs in healthcare due to their cost-effectiveness (Perloff et al., 2016), but there is a scarcity of research directly comparing NP-led interventions to those led by cardiologists. This gap in the literature underscores the need for further investigation to delineate the specific contributions of NPs in cardiology care. While such a comparison would likely reveal higher costs associated with cardiologist-led care, the clinical outcomes and cost-effectiveness of NP led interventions compared to specialist-led care remain to be fully elucidated.

In this context, Lowery et al. (2012) provided valuable insights by comparing NP interventions to those delivered in physician-led primary care centers. The study's findings demonstrated that NP led models yielded superior outcomes compared to physician-led primary care centers, challenging the notion that physician-led care is inherently superior and supporting the potential for NPs to provide high-quality, cost-effective care in cardiology.

Chapter Five: Discussion

This integrative review appraised the efficacy of NP-led outpatient interventions in mitigating hospital readmissions among patients with HF. The literature included in this integrative review revealed a reduction in both hospital readmission rates and reliance on ED services when discharged HF patients received NP-led outpatient interventions. While a majority of the studies exhibited statistically significant reductions in these two areas, the magnitude of this effect varied considerably across investigations.

One reason for this variability in outcomes may relate to the diverse intervention modalities employed within each study, as well as the different intensity and comprehensiveness with which they were employed. While the specific interventions used in the studies resulted in varied outcomes, the importance of structured patient education and sustained follow-up care in effective HF management was consistent. In essence, NP-provided patient education, coupled with regular follow-up by the NP, was associated with a significant reduction in hospital readmissions for HF patients. This observation aligns with existing research emphasizing the positive impact of patient education, self-care empowerment, and active patient engagement, particularly among individuals with multiple comorbidities (Charteris & Pounds, 2020). Furthermore, the findings suggest that, while adjunctive educational approaches, such as telemonitoring or digital interventions, may be utilized, their efficacy is most optimized when integrated with direct face-to-face NP engagement (approximately 60 minutes) rather than when they are employed as standalone interventions.

Despite the promising outcomes reported, several challenges remain. The variability in long-term effectiveness of NP-led interventions in reducing HF-related readmission rates and ED visits suggests that, while these strategies are effective during the first year post-discharge,

sustaining their impact over longer periods is more difficult. Further research is needed to identify effective intervention strategies that will make the positive impact last for a longer amount of time. This is particularly crucial given the chronic and progressive nature of HF, which demands continuous and adaptive care within a structured program. Therefore, future efforts should prioritize the development of long-term intervention strategies that extend beyond the initial 30-day to one-year post-discharge period, so that improvements in patient health and the decreased risk of hospital readmissions become longer-lasting outcomes.

This integrative review also emphasized the significance of interdisciplinary collaboration within NP-led care models. Interprofessional models of intervention delivery that integrated pharmacists, dietitians, and other allied healthcare professionals into the care team demonstrated greater reductions in HF readmission rates compared to those that offered NP interventions only. This finding underscores the value of team-based care approaches in managing complex conditions such as HF, reinforcing the imperative for healthcare systems to implement integrated care models rather than using a system of fragmented care delivery. This finding is particularly salient given that research consistently identifies medication non-adherence and dietary indiscretion as primary contributors to acute HF decompensations (Charteris & Pounds, 2020). Addressing these multifactorial contributors requires coordinated efforts from multiple disciplines, highlighting why isolated care models often fall short in preventing readmissions.

A significant knowledge gap regarding HF exists within both the general population and among HF patients themselves (Cowie et al., 2014). Survey data indicates that many individuals who have experienced acute HF will still struggle to recognize the prodromal symptoms of subsequent exacerbations (Cowie et al., 2014). This is particularly concerning given that several

modifiable factors, such as hypertension, respiratory infections, and medication non-adherence, contribute to the exacerbation of HF (Fonarow et al., 2008) but can be effectively managed in outpatient settings. These modifiable risk factors for HF decompensation underscore the necessity of integrating other professions into the care team, such as dieticians and occupational therapists, to augment the care provided by NPs and optimize patient outcomes.

Additionally, this review found that the timing of NP-led interventions played a critical role in their effectiveness at reducing readmission rates and ED visits. Interventions initiated within the first few days post-discharge were consistently associated with superior patient outcomes, including greater reductions in both readmission rates and ED utilization. A contributing factor may be the increasing pressure on hospitals to discharge patients rapidly in order to free up inpatient and ED capacity (Iyeke et al., 2023). However, EDs have not yet systematically integrated HF-specific risk stratification tools to assess discharge readiness, which may result in patients being discharged before they are clinically stable or adequately prepared to self-manage at home (Miró et al., 2020). Early NP involvement during this critical transition period helps bridge these systemic gaps by offering timely reassessment, medication optimization, and individualized education, thereby reducing the likelihood of deterioration and unplanned readmissions.

The generalizability of study findings, or the extent to which the results of the included studies can be applied to broader populations, remains a concern in the existing HF literature. This limitation stems from the single-center design of most studies as well as other methodological weaknesses and research flaws, such as the utilization of a non-randomized research design, selection bias, lack of control groups, and variability of interventions. Therefore, establishing standardized NP-specific protocols for widespread implementation across diverse

healthcare systems will continue to be challenging until further research can extend these findings across diverse settings and populations.

The findings of this review also held implications for healthcare policymakers, particularly in the context of resource allocation and strategic planning. The expansion of NP-led transitional care programs offers a potentially cost-effective strategy to mitigate hospital congestion and enhance HF patient outcomes, addressing a critical need in an aging demographic. Hospital readmissions for HF impose substantial financial burdens on both healthcare institutions and patients, diverting important resources away from preventative care initiatives and long-term management strategies. Each HF-related hospitalization in Canada and the U.S. incurs thousands of dollars per patient, with aggregate expenses exceeding billions annually (Smith et al., 2016); this highlights the economic imperative for finding effective interventions with long-term positive impact. However, future research endeavours should prioritize multi-center studies with larger sample sizes to validate these findings across diverse populations and to explore specific contextual factors that can influence program efficacy.

This review also revealed a particularly striking finding: NP-led HF interventions demonstrated superior efficacy compared to care delivered by a physician-led primary care center (Lowery et al., 2012). These finding challenges prevailing notions and biases regarding the necessity of using physician care for HF interventions as compared to NPs (Htay & Whitehead, 2021). This observation has several important sequelae: (1) the benefits for HF patients if an integrative model, offering specialized and enhanced care beyond the scope of traditional primary care centers, is used; and (2) a recognition that clinical skills of NPs, honed through prior nursing experience, and including such skills as patient advocacy, continuous monitoring, early recognition of critical signs, and health promotion (King-Dailey et al., 2022),

are unique to the role and vital in effective HF management. This finding is also consistent with existing evidence demonstrating the value of the NP role and the tremendous benefits that NPs bring to the care team in various clinical settings (Htay & Whitehead, 2021). Nevertheless, it is important to note that further research is still warranted to quantify the differences in hospital readmission rates between NP-led outpatient interventions and those provided by medical practitioners.

The escalating burden of HF, a leading cause of hospital admissions for individuals aged 65 and above (Fonarow et al., 2008), presents a critical challenge to the Canadian healthcare system. With readmission rates ranging from 20-50% within six months of discharge (Delgado-Passler & McCaffrey, 2006) and the elderly population projected to double in the next decade (Charteris & Pounds, 2020), the strain on EDs is only expected to intensify. This healthcare crisis will continue to converge with the existing primary care deficit in Canada, where a severe shortage of physicians and protracted wait times impede timely access to essential healthcare needs (Field et al., 2015). For patients with chronic conditions such as HF, this scarcity of practitioners and healthcare services is particularly devastating, as continuous monitoring, education, and coordinated care are paramount for preventing exacerbations and maintaining quality of life. This integrative review illuminates a compelling solution: empowering NPs to lead transitional care programs. NPs possess the advanced education and clinical expertise to provide comprehensive care, including patient education, medication management, and interdisciplinary coordination. By strategically utilizing NPs, Canada can simultaneously address the rising tide of HF-related hospital visits and expand access to vital primary care services, thereby alleviating the strain on overburdened EDs and fostering a more resilient healthcare system. This approach would also align seamlessly with the core principles of the Canada Health

Act, ensuring a more equitable access to essential healthcare for all Canadians, irrespective of geographic location or socioeconomic status (Martin et al., 2018).

Recommendations

This integrative review highlighted the potential of NPs to improve HF management and address critical gaps in primary care access and ED over-utilization. Recommendations arising out of this review include:

- financially empowering and supporting NPs to lead transitional care programs that use robust interprofessional collaboration,
- establishing standardized, evidence-based multidisciplinary protocols for NP-led HF care, particularly in seeing patients face-to-face within less than a week post-discharge, and
- prioritizing research aimed at establishing the long-term efficacy and long-term outcomes obtained through an NP-led approach to HF care.

By optimizing NP utilization, healthcare systems can enhance HF patient outcomes, reduce hospital readmissions in this patient population, and improve their access to lifesaving care, all of which are particularly important amidst the escalating human and financial burden of HF and the ongoing primary care and ED crisis in Canada.

Limitations

This review does have limitations associated with the way in which it was conducted and the characteristics of the studies that were included within it. Variability in intervention components and outcome measures across studies hindered precise comparisons between them. The inclusion of studies in the analysis that had methodological weaknesses may have impacted the overall quality of the evidence. Notably, all the studies included in this review recommended further research to validate their findings and to address remaining gaps in knowledge. The

search strategies that were selected and used for this review may not have retrieved all potentially relevant publications on this topic. It is also possible that searching only two databases (CINAHL and Ovid MEDLINE) may have restricted the results; had additional databases, such as Academic Search Complete, PubMed, or Science Direct, been included in the searches, this would have increased confidence that the search results were comprehensive. Finally, the author of this review is a prospective NP; personal aspirations and professional identity may have inadvertently influenced interpretation of the findings. This potential bias should be acknowledged when considering the conclusions drawn.

Declaration of Conflicting Interests

The author received no financial support for the integrative review research, authorship, and/or publication of this paper. The author's enrollment in a NP program may introduce a bias toward the positive outcomes of NP-led models of care. Additionally, the author's experience as an emergency nurse, having witnessed ED overcrowding and frequent readmissions, may influence the perspective on the effectiveness of NP-led clinics in reducing hospital readmission rates. Efforts have been made to maintain objectivity and provide a balanced analysis of the literature.

Chapter Six: Conclusion

The findings of this integrative review underscore the urgent need for healthcare reform in post-discharge HF management. NPs, with their expertise in chronic disease management, continuous monitoring, early recognition of complications, and patient education, offer a scalable, cost-effective, and highly impactful solution. Through NP-led transitional care programs, hospitals can reduce preventable readmissions and decrease reliance on EDs, which has been a consistent driver of healthcare strain. However, HF is only one aspect of a much larger crisis: the overwhelming burden of chronic diseases. The fundamental principles of transitional care—continuity, early follow-up, patient education, and interdisciplinary collaboration—are universally applicable to conditions such as diabetes, chronic obstructive pulmonary disease, kidney disease, and the complex healthcare needs of aging populations. Without decisive action from policymakers, hospitals will continue to be inundated with avoidable readmissions, escalating costs, and worsening patient outcomes. The evidence is clear: NP-led transitional care presents a transformative opportunity to redefine chronic disease management, enhance healthcare efficiency, and improve patient well-being. The time for incremental change has passed—healthcare leaders must commit to expanding these models, recognizing that the sustainability of our healthcare system hinges on proactive, patient-centered interventions that address the root causes of chronic disease mismanagement.

References

Aron, D. C. (2020). *Complex systems in medicine: A hedgehog's tale of complexity in clinical practice, research, education, and management*. Springer.

Ballard-Hernandez, J. M. (2010). Nurse practitioners improving the transition from hospital to home and reducing acute care readmission rates in heart failure patients. *Heart & Lung*, *39*(4), 365–366. https://doi.org/10.1016/j.hrtlng.2010.05.031

Barber, B., Weeks, L., Steeves-Dorey, L., McVeigh, W., Stevens, S., Moody, E., & Warner, G. (2022). Hospital to home: Supporting the transition from hospital to home for older adults. *Canadian Journal of Nursing Research*, *54*(4), 483-496. https://doi.org/10.1177/08445621211044333

Blum, K., & Gottlieb, S. S. (2014). The effect of a randomized trial of home telemonitoring on medical costs, 30-day readmissions, mortality and health-related quality of life in a cohort of community-dwelling heart failure patients. *Journal of Cardiac Failure, 20*(7), 513–521. https://doi.org/10.1016/j.cardfail.2014.04.016

Bramer, W. M., De Jonge, G. B., Rethlefsen, M. L., Mast, F., & Kleijnen, J. (2018). A systematic approach to searching: An efficient and complete method to develop literature searches. *Journal of the Medical Library Association*, *106*(4), 531-541. https://doi.org/10.5195/jmla.2018.283

Breathett, K., Maffett, S., Foraker, R. E., Sturdivant, R., Moon, K., Hasan, A., Franco, V., Smith, S., Lampert, B. C., Emani, S., Haas, G., Kahwash, R., Hershberger, R. E., Binkley, P. F., Helmkamp, L., Colborn, K., Peterson, P. N., Sweitzer, N., & Abraham, W. T. (2018). Pilot randomized controlled trial to reduce readmission for heart failure using novel tablet

and nurse practitioner education. *American Journal of Medicine*, *131*(8), 974-978. https://dx.doi.org/10.1016/j.amjmed.2018.02.017

Büchter, R. B., Weise, A., & Pieper, D. (2020). Development, testing and use of data extraction forms in systematic reviews: A review of methodological guidance. *BMC Medical Research Methodology*, *20*, Article 259. https://doi.org/10.1186/s12874-020-01143-3

Charteris, E. J., & Pounds, B. (2020). A nurse practitioner-led effort to reduce 30-day heart failure readmissions. *Journal of the American Association of Nurse Practitioners, 32*(11), 738-744. https://doi.org/10.1097/JXX.0000000000000470

Clark College. (n.d.). *Nursing research: Database subject headings (CINAHL & MeSH)*. Retrieved February 7, 2025, from https://clark.libguides.com/c.php?g=503130&p=6330517

Craswell, A., Dwyer, T., Rossi, D., Armstrong, C., & Akbar, D. (2018). Cost-effectiveness of nurse practitioner–led regional titration service for heart failure patients. *The Journal for Nurse Practitioners*, *14*(2), 105-111. https://doi.org/10.1016/j.nurpra.2017.11.007

Delgado-Passler, P., & McCaffrey, R. (2006). The influences of postdischarge management by nurse practitioners on hospital readmission for heart failure. *Journal of the American Academy of Nurse Practitioners*, *18*(4), 154-160. https://doi.org/10.1111/j.1745-7599.2006.00113.x

Donelan, K., DesRoches, C. M., Dittus, R. S., & Buerhaus, P. (2013). Perspectives of physicians and nurse practitioners on primary care practice. *New England Journal of Medicine*, *368*(20), 1898-1906. https://doi.org/10.1056/NEJMsa1212938

Fichadiya, P., Then, K. L., & Rankin, J. A. (2021). The impact of nurse practitioners on health outcomes in outpatient heart failure management: A systematic review. *Canadian Journal of Cardiovascular Nursing*, *31*(2), 20-27.

Field, T. S., Ogarek, J., Garber, L., Reed, G., & Gurwitz, J. H. (2014). Association of early post-discharge follow-up by a primary care physician and 30-day rehospitalization among older adults. *Journal of General Internal Medicine*, *30*(5), 565-571. https://doi.org/10.1007/s11606-014-3106-4

Finlayson, K., Chang, A. M., Courtney, M. D., Edwards, H. E., Parker, A. W., Hamilton, K., Pham, T. D. X., & O'Brien, J. (2018, December 12). Transitional care interventions reduce unplanned hospital readmissions in high-risk older adults. *BMC Health Services Research*, *18*, Article 956. https://doi.org/10.1186/s12913-018-3771-9

Flood, C. M., Thomas, B., & McGibbon, E. (2023). Canada's primary care crisis: Federal government response. *Healthcare Management Forum*, *36*(5), 327–332. https://doi.org/10.1177/08404704231183863

Fonarow, G. C., Abraham, W. T., Albert, N. M., Stough, W. G., Gheorghiade, M., Greenberg, B. H., O'Connor, C. M., Pieper, K., Sun, J. L., Yancy, C. W., Young, J. B., & OPTIMIZE-HF Investigators and Hospitals. (2008). Factors identified as precipitating hospital admissions for heart failure and clinical outcomes: Findings from OPTIMIZE-HF. *Archives of Internal Medicine*, *168*(8), 847-854. https://doi.org/10.1001/archinte.168.8.847

Grant, J., Lines, L., Darbyshire, P., & Parry, Y. (2017). How do nurse practitioners work in primary health care settings? A scoping review. *International Journal of Nursing Studies, 75*, 51–57. https://doi.org/10.1016/j.ijnurstu.2017.06.011

Haddaway, N. R., Collins, A. M., Coughlin, D., & Kirk, S. (2015). The role of Google Scholar in evidence reviews and its applicability to grey literature searching. *PloS One*, *10*(9), Article e0138237. https://doi.org/10.1371/journal.pone.0138237

Hansen-Turton, T., Ware, J., & McClellan, F. (2010). Nurse practitioners in primary care. *Temple Law Review*, *82*(5), 1235-1262. https://www.templelawreview.org/lawreview/assets/uploads/2011/07/Hansen-Turton.pdf

Htay, M., & Whitehead, D. (2021, November). The effectiveness of the role of advanced nurse practitioners compared to physician-led or usual care: A systematic review. *International Journal of Nursing Studies Advances*, *3*, Article 100034. https://doi.org/10.1016/j.ijnsa.2021.100034

Iyeke, L. O., Razack, B., Richman, M., Berman, A. J., Davis, F., Willis, H., Gizzi-Murphy, M., Guilherme, S., Johnson, S., Njoku, C., Ramjattan, G., Krol, K., & Kwon, N. (2023). Novel discharge center for transition of care in vulnerable emergency department treat and release patients. *Cureus, 15*(2), Article e34937. https://doi.org/10.7759/cureus.34937

King-Dailey, K., Frazier, S., Bressler, S., & King-Wilson, J. (2022). The role of nurse practitioners in the management of heart failure patients and programs. *Current Cardiology Reports*, *24*(12), 1945–1956. https://doi.org/10.1007/s11886-022-01796-0

Kurmani, S., & Squire, I. (2017). Acute heart failure: Definition, classification and epidemiology. *Current Heart Failure Reports*, *14*(5), 385-392. https://doi.org/10.1007/s11897-017-0351-y

Lowery, J., Hopp, F., Subramanian, U., Wiitala, W., Welsh, D., Larkin, A., Stemmer, K., Zak, C., & Vaitkevicius, P. (2012). Evaluation of a nurse practitioner disease management

model for chronic heart failure: A multi-site implementation study. *Congestive Heart Failure, 18*(1), 64–71. https://doi.org/10.1111/j.1751-7133.2011.00228.x

Martin, D., Miller, A. P., Quesnel-Vallée, A., Caron, N. R., Vissandjée, B., & Marchildon, G. P. (2018). Canada's universal health-care system: Achieving its potential. *The Lancet*, *391*(10131), 1718-1735. http://dx.doi.org/10.1016/S0140-6736(18)30181-8

Mangini, S., Pires, P. V., Braga, F. G. M., & Bacal, F. (2013). Decompensated heart failure. *Einstein (Sao Paulo, Brazil)*, *11*(3), 383–391. https://doi.org/10.1590/S1679-45082013000300022

Miró, Ò., Rossello, X., Platz, E., Masip, J., Gualandro, D. M., Peacock, W. F., Price, S., Cullen, L., Di Somma, S., de Oliveira, M. T., McMurray, J. J. V., Martín-Sánchez, F. J., Maisel, A. S., Vrints, C., Cowie, M. R., Bueno, H., Mebazaa, A., & Mueller, C. (2020). Risk stratification scores for patients with acute heart failure in the emergency department: A systematic review. *European Heart Journal: Acute Cardiovascular Care, 9*(5), 375–398. https://doi.org/10.1177/2048872620930889

Moe, J., Wang, E. Y., McGregor, M. J., Schull, M. J., Dong, K., Holroyd, B. R., Hohl, C. M., Grafstein, E., O'Sullivan, F., Trimble, J., & McGrail, K. M. (2022). Subgroups of people who make frequent emergency department visits in Ontario and Alberta: A retrospective cohort study. *CMAJ Open*, *10*(1), E232–E246. https://doi.org/10.9778/cmajo.20210132

Moore, J.-A. M. (2016). Evaluation of the efficacy of a nurse practitioner-led home-based congestive heart failure clinical pathway. *Home Health Care Services Quarterly*, *35*(1), 39–51. https://doi.org/10.1080/01621424.2016.1175992

Public Health Agency of Canada. (2020). *Prevalence of chronic disease and risk factors among Canadians aged 65 years and older: A rapid review*. https://www.canada.ca/en/services/health/publications/diseases-conditions/prevalence-chronic-disease-risk-factors-canadians-aged-65-years-older.html

Perloff, J., DesRoches, C. M., & Buerhaus, P. (2016). Comparing the cost of care provided to Medicare beneficiaries assigned to primary care nurse practitioners and physicians. *Health Services Research*, *51*(4), 1407-1423. https://doi.org/10.1111/1475-6773.12425

Rader, T., & Ritchie, L. (2023). Emergency department overcrowding in Canada: Multistakeholder dialogue. *Canadian Journal of Health Technologies*, *3*(10). https://doi.org/10.51731/cjht.2023.761

Rhiantong, J., Malathum, P., Monkong, S., McCauley, K., Viwatwongkasem, C., & Kuanprasert, S. (2019). Outcomes of an advanced practice nurse-led continuing care program in people with heart failure. *Pacific Rim International Journal of Nursing Research*, *23*(1), 32–46. https://he02.tci-thaijo.org/index.php/PRIJNR/article/view/119723/115853

Rising, K. L., Hudgins, A., Reigle, M., Hollander, J. E., & Carr, B. G. (2016). "I'm just a patient": Fear and uncertainty as drivers of emergency department use in patients with chronic disease. *Annals of Emergency Medicine*, *68*(5), 536-543. https://doi.org/10.1016/j.annemergmed.2016.03.053

Siodlak, M. M., Sgarlata, C., Chung, I. W., Kashyap, A., Murray, D. R., & Middleton, W. S. (2020). Integrated nurse practitioner and pharmacist post-discharge heart failure clinic: Impact on patient outcomes. *Journal of Cardiac Failure*, *26*(10S), S106. https://doi.org/10.1016/j.cardfail.2020.09.306

Smith, J., Pan, D., & Novelli, M. (2016). A nurse practitioner–led intervention to reduce hospital readmissions. *The Journal for Nurse Practitioners, 12*(5), 311-316. https://doi.org/10.1016/j.nurpra.2015.11.020

Subirana, M., Solá, I., Garcia, J. M., Gich, I., & Urrútia, G. (2005). A nursing qualitative systematic review required MEDLINE and CINAHL for study identification. *Journal of Clinical Epidemiology*, *58*(1), 20-25. https://doi.org/10.1016/j.jclinepi.2004.06.001

Tran, D. T., Ohinmaa, A., Thanh, N. X., Howlett, J. G., Ezekowitz, J. A., McAlister, F. A., & Kaul, P. (2016). The current and future financial burden of hospital admissions for heart failure in Canada: A cost analysis. *Canadian Medical Association Journal Open*, *4*(3), E365-E370. https://doi.org/10.9778/cmajo.20150130

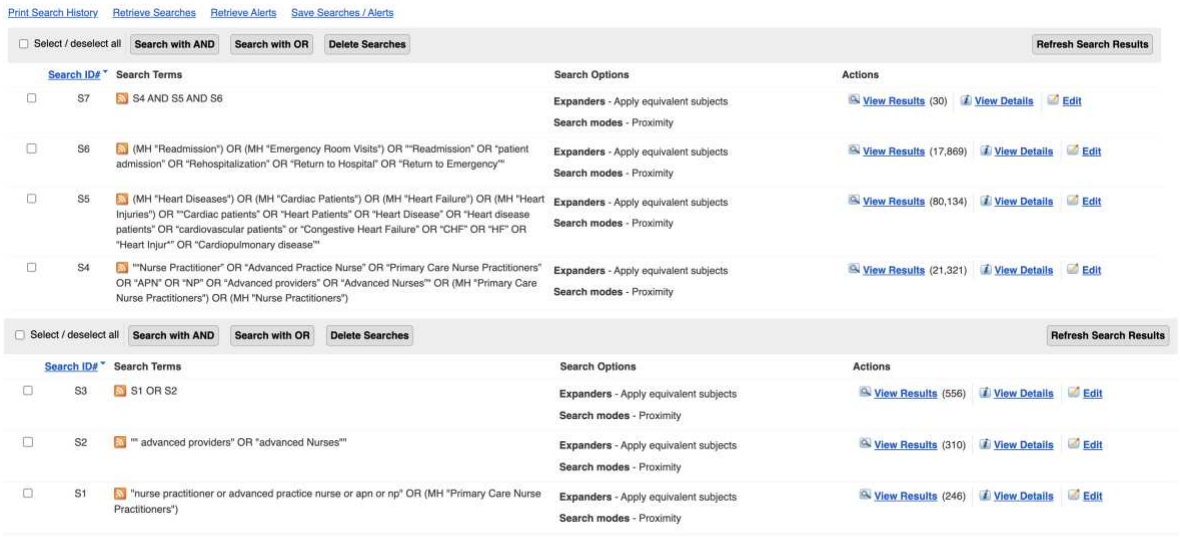
Virani, S. A., Bains, M., Code, J., Ducharme, A., Harkness, K., Howlett, J. G., Ross, H., Sussex, B., Zieroth, S., & Board and Membership of the Canadian Heart Failure Society. (2017). The need for heart failure advocacy in Canada. *Canadian Journal of Cardiology*, *33*(11), 1450-1454. https://doi.org/10.1016/j.cjca.2017.08.024

Yarmohammadian, M. H., Rezaei, F., Haghshenas, A., & Tavakoli, N. (2017). Overcrowding in emergency departments: A review of strategies to decrease future challenges. *Journal of Research in Medical Sciences*, *22*(1), Article 23. https://doi.org/10.4103/1735-1995.200277

Yong, E. (2021, November 16). Why health-care workers are quitting in droves. *The Atlantic*. https://www.theatlantic.com/health/archive/2021/11/the-mass-exodus-of-americas-health-care-workers/620713/

Appendix A

CINAHL Search Strategy

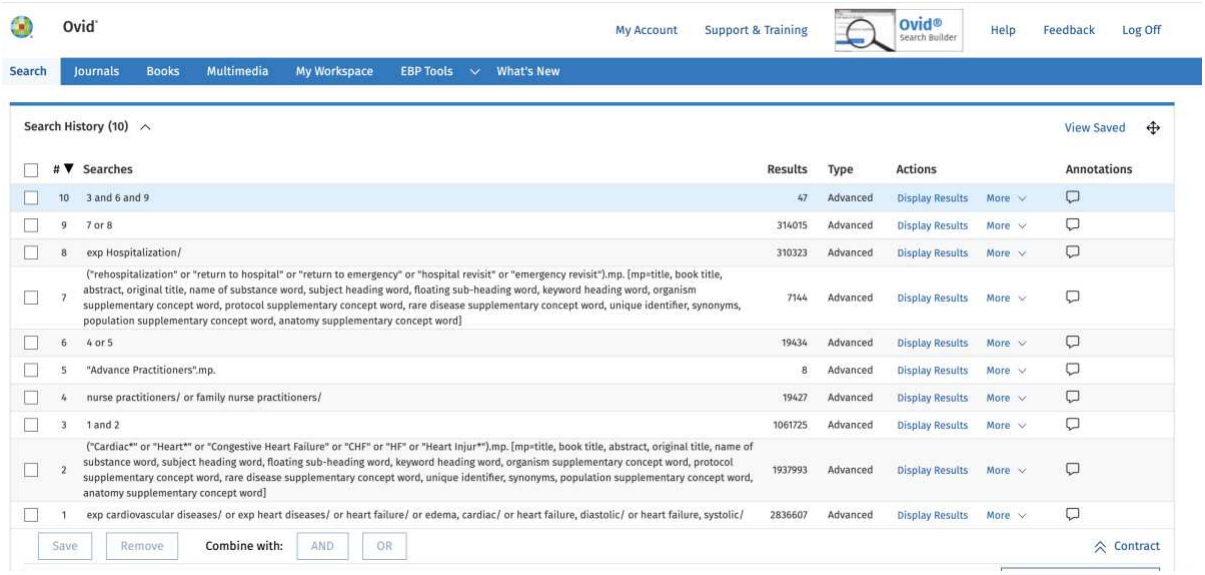


Note. Screenshot taken from the CINAHL Complete database via EBSCOhost.

EBSCOhost. (n.d.). *CINAHL Complete*. EBSCO. Retrieved November 24, 2024, from https://www.ebsco.com/products/research-databases/cinahl-complete

Appendix B

Search Strategy Ovid MEDLINE



Note. Screenshot taken from the Ovid MEDLINE database.

Wolters Kluwer. (n.d.). *Ovid MEDLINE*. Ovid. Retrieved November 24, 2024, from https://www.ovid.com/product-details.medline.html

Appendix C

Search Strategy Summary

Database Source	Inclusion Rationale	Search Strategy	Results
CINAHL Complete **Via** **EBSCO host**	Thorough indexing of nursing and allied health literature	**Concept 1:** Heart failure Step 1: CINAHL subject heading term: "Heart disease" exploded to include related subheadings such as "Heart Diseases", "Arrhythmia", "Heart Failure", "Myocardial Injury", etc. Step 2: Additional subheadings "Cardiac*", "Heart*", "Cardio*", "Heart injur*", "congestive heart failure", CHF", "HF". Step 3: Combined with OR to retrieve 697,491 results**.** **Concept 2:** Nurse Practitioner Step 4: CINAHL subject heading: "Nurse Practitioners" exploded to include related subheadings: "primary care nurse practitioner" Step 5: Additional subheadings: "Advanced Providers", "Advanced Practice Nurs*", "Advanced Nurs*", "NP", "APN". Step 6: Combined with OR to retrieve 46,102 results**.** **Concept 3:** Readmission Step 7: CINAHL subject heading: "Readmission" and "Patient Admission" Step 8: Additional subheadings: "Rehospitalization", "Return to hospital", "return to emergency", "Hospital revisit", "Emergency revisit", "emergency room visits" Step 9: Combined with OR to retrieve 42,537 results**.** Step 10: Final combination – all three concepts combined with AND to retrieve 133 articles**.**	133 articles

Ovid **MEDLINE**	Extensive biomedical database providing robust source of peer-reviewed clinical research	**Concept 1:** Heart failure Step 1: MeSH term: "Heart Diseases" exploded to include recommended terms: "cardiovascular diseases", "heart diseases", "Heart failure", "edema, cardiac", "heart failure, diastolic", "heart failure, systolic". Step 2: Additional keywords: "cardiac*", "heart*", "congestive heart failure", "CHF", "HF", "Heart injur*" Step 3: Combined with OR to retrieve 1,061,725 results **Concept 2:** Nurse Practitioner Step 4: MeSH term: "Nurse Practitioners" with qualifier term "family Nurse practitioner" Step 5: Additional keyword: "Advance Practitioners" Step 6: Combined with OR to retrieve 19,434 results **Concept 3:** Readmission Step 7: MeSH term: "Patient Readmission" exploded to include "Hospitalization" and "Patient Admission" Step 8: Additional keywords: "Return to hospital", "Hospital revisit", "Emergency revisit", "return to emergency". Step 9: Combined with OR to retrieve 314,015 results Step 10: Final combination – all three concepts combined with AND to retrieve 47 articles	47 articles
Google Scholar	Used for a broader scan, capturing recent publications not indexed in traditional databases	Step 1: keywords inserted into search bar: "Nurse Practitioner readmission cardiac" Step 2: reviewed first 3-4 pages of search results Step 3: identified additional relevant articles not indexed in databases Step 4: articles which cited study were also reviewed. Step 4: process guided by UNBC librarian recommendations	2 articles
Systematic Review by Fichadiya et al. (2021)	Relevance and recent publication date	Step 1: systematic review found in CINHAL Step 2: article read and included articles reviewed Step 3: 3 articles selected due to high relevance to the topic Step 4: ensured inclusion of studies not captured in database searches.	3 articles

Appendix D

Articles Retracted within the Inclusion/Exclusion Guidelines

Platform	Number of Articles after Inclusion/Exclusion Criteria	Article Title and Author
CINAHL	4	1. Nurse practitioners improving the transition from hospital to home and reducing acute care readmission rates in heart failure patients. **Author:** Ballard-Hernandez et al. (2010) 2. A nurse practitioner-led effort to reduce 30-day heart failure readmissions. **Author:** Charteris and Pounds (2020) 3. Evaluation of the efficacy of a nurse practitioner-led home-based congestive heart failure clinical pathway. **Author:** Moore (2016) 4. Outcomes of an advanced practice nurse-led continuing care program in people with heart failure. **Author**: Rhiantong et al. (2019)
Ovid MEDLINE	2	5. Pilot randomized controlled trial to reduce readmission for heart failure using novel tablet and nurse practitioner education. **Author:** Breathett et al. (2018) 6. The influences of post discharge management by nurse practitioners on hospital readmission for heart failure. **Author:** Delgado-Passler and McCaffrey (2006)
Google Scholar	1	7. Integrated Nurse Practitioner and Pharmacist Post-discharge Heart Failure Clinic: Impact on Patient Outcomes. **Author:** Siodlak et al. (2020)
Systematic Article (Fichadiya et al., 2021)	3	8. The effect of a randomized trial of home telemonitoring on medical costs, 30-day readmissions, mortality and health-related quality of life in a cohort of community-dwelling heart failure patients. **Author:** Blum and Gottlieb (2014) 9. Evaluation of a nurse practitioner disease management model for chronic heart failure: A multi-site implementation study **Author:** Lowery et al. (2012) 10. A nurse practitioner–led intervention to reduce hospital readmissions. **Author:** Smith et al. (2016)

Appendix E

Critical Appraisals

Ballard-Hernandez et al. (2010)	
Purpose	The study assessed the efficacy of a NP-led intervention in reducing 30-day readmission rates for HF patients.
Design & Intervention	performance improvement team intervention approach, utilizing a pre-post intervention design. The intervention consisted of a NP-led multidisciplinary approach, which included the creation of standardized order sets, provision of education, consultations, and follow-up visits/phone calls
Validity	Limited detail on sample size or participant characteristics beyond HF diagnosis hindered external validity assessment, yet the outcome, 30-day all-cause readmission rates, was clearly defined, relevant, and measurable.
Methodological Soundness	While a detailed description of interventions was provided, the analysis lacked mention of controls for potential confounding variables. The pre-post intervention comparison design, absent a control group and failing to address confounding variables, weakens the study's rigor, and insufficient sampling details preclude generalizability.
Result/Outcome	30-day all-cause readmission rates decreased from 25.9% to 17.6%; statistical significance and confidence intervals were not reported; no formal layout of results; no detailed analysis on participant characteristics
Applicability	Despite methodological limitations that weakened overall credibility, the study demonstrated promising outcomes for heart failure patients benefiting from individualized education, counseling, and earlier, more frequent follow-ups. The pivotal role of NP participation in HF patient care was suggested, but requires further credible research for conclusive demonstration
Disclosed Bias/Limitation	The study exhibited a lack of clearly defined inclusion/exclusion criteria for the study population and lacked clarity regarding consistent implementation of the intervention across different patients and settings within the hospital.
Credibility Rating	**Rate Level: II** limited reliability and credibility

Blum and Gottlieb (2014)	
Purpose	Evaluate the impact of home telemonitoring on 30-day readmissions, hospitalizations, rates, costs, mortality, and quality of life in HF patients. while not the primary focus, the study involved NP-led care within the telemonitoring group.
Design & Intervention	Randomized Controlled Trial; outpatient telemonitoring using technology such as weight scales, blood pressure monitoring, and other devices, remote assessments, medications, etc.; included guideline-based treatment and intervention done by one NP; Patients followed until death or until end of study, at 30-day readmission, 1 year, and 2 years.
Validity	Patients were randomized; no mention blinding; study matched patients based on characteristics such as age, gender, comorbidities, disease severity, etc.; both groups received consistent guideline-based therapy/interventions and monitoring by one NP; clear mention of inclusion/exclusion criteria; mention of confounding variable control efforts; very clear implementation of intervention; results reliable and analyzed using chi-square tests and t tests; CI mentioned
Methodological Soundness	Large number of participants (204) to detect meaningful data with good statistical power; very clear primary outcome (30-day readmission); participants allowed to care outside of study which could have influenced results
Result/Outcome	Statistically significant results in telemonitoring with NP involvement led to a reduction in 30-day readmission rates (33.7%) compared to usual care (45.3%), noticeably during the first year; reduction in hospitalization and costs, although not statistically significant in long-term
Applicability	NP outpatient telemonitoring resulted in a moderate decrease in 30-day and 1-year readmission rates, but did not have sustained effects after 1 year; since no reduction in hospitalization, costs, or quality of life observed, study raised questions regarding the "30-day readmission timeline" as a quality indicator and the use of telemonitoring in the management of HF.
Disclosed Bias/Limitation	Statistically significant results only observed in first year; study mentioned that findings may not be generalized to all populations; adherence to telemonitoring; technical aspects of the telemonitoring system – malfunctioning, may cause variation in results; no mention on performance bias; no mention of dropout rates or how missing data was handled; participants received exceptional care by one NP which can introduce performance bias and results which could not be replicated
Credibility Rating	**Rate Level: IV** high credibility and reliable results

Breathett et al. (2018)	
Purpose	Evaluated whether the addition of a novel tablet application to NP education was superior to NP education alone in reducing 30-day readmission rates after heart failure hospitalization
Design & Intervention	Randomized-control trial; intervention involved education with tablet application in addition to one-on-one NP education session; focused on HF overview, nutrition planning, medication adherence, and life-style modifications
Validity	Detailed and consistent intervention; investigator-blinded study; randomizations; clear exclusion and inclusion criteria; clear details on participants who were similar between control and treatment groups; clear primary and secondary outcomes; results laid out clearly with chi-analyses and t-testing; obtained institutional board approvals; clear sample size; no mention of CI
Methodological Soundness	Study did not mention if it controlled for potential confounding variable; study underpowered and did not reach enough participants for a strong effect size; single-center location and cannot form generalizability; study acknowledged for these factors; ethical considerations taken
Result/Outcome	30-day all-cause readmission rates increased to 50% without NP education compared to 20.4% with NP education which was statistically significant. All-cause readmission rates at 30-days trended lower in patients with treatment compared to control but was not statistically significant.
Applicability	Study showed promising results that patients with HF benefit from individualized one-on-one education, counseling, and guidance; inconclusive as to which education methods are superior; NP interventions are effective at reducing HF readmission rates, although more research needed to form generalizability
Disclosed Bias/Limitation	Single centered, underpowered and under-funded; cannot generalize results without further research
Credibility Rating	**Rate Level: IV** high credibility and reliable results

Charteris and Pounds (2020)	
Purpose	The study aimed to reduce 30-day all-cause readmissions in veterans with HF and to improve patient engagement in care.
Design & Intervention	A quality improvement design was implemented using Plan-Do-Study-Act (PDSA) cycles. The intervention consisted of a multidisciplinary clinic model incorporating follow-up appointments, patient education, and engagement tools.
Validity	The study was not a RCT, limiting the ability to establish causality. The sample size was small (n=43), and the population was narrow. Recruitment was limited by follow-up difficulties.
Methodological Soundness	The interventions were inconsistent and subjective. Engagement tools and measurements changed throughout the study, leading to potentially untrustworthy results.
Result/Outcome	A minimal readmission reduction of 0.2% was observed. Patient engagement and satisfaction improved. However, due to the very specific clinic model, the results may not be generalizable to larger populations.
Applicability	NP-led interventions were found to improve self-care and reduce hospitalizations in veterans with HF. However, the study's limitations suggest that further research is needed, requiring cautious interpretation of the findings.
Disclosed Bias/Limitation	The study had a small sample size, and 50% of the patients were uncontacted. The implementation of the engagement tools was inconsistent, and the intervention period was short (8 weeks).
Credibility Rating	**Rate: Level I** very weak and unreliable study, needs further research for stronger evidence

Delgado-Passler and McCaffrey (2006)	
Purpose	Evaluate how post-discharge management interventions done by NPs versus Registered Nurses (RNs) impact hospital readmission rates for patients with HF.
Design	RCTs and other controlled clinical studies, all focusing on post-discharge interventions for HF patients.
Validity	Study selection criteria and inclusion criteria were clearly defined; however, exclusion criteria were not specified. Measured outcomes included readmission rates, length of stay, mortality, and costs. Various statistical analyses, including t-tests, ANOVA, chi-square, regression analysis, and ANCOVA, were employed to assess outcomes across intervention and control groups.
Methodological Soundness	While individual studies exhibited outcome variability, the general trend supported the effectiveness of NP-led interventions compared to RN-led interventions in reducing readmission rates. Variable study limitations, including small sample sizes and short follow-up periods, hindered the generalizability of findings. Inconsistencies across studies, potentially attributable to differences in intervention scope and intensity, variations in population health conditions, follow-up periods, and study designs, were observed. Results precision varied, yet consistent outcomes were also noted.
Result/Outcome	**Riegel et al. (2002):** Telephonic nurse case management resulted in a significant decrease in rehospitalization rates and inpatient costs. **Debusk et al. (2004):** Nurse care management did not yield a significant reduction in hospitalization rates. **Dahl and Penque (2000):** NP-led multidisciplinary programs significantly reduced mortality and readmissions. **Benatar et al. (2003):** tele-management by NPs was more effective than home nurse visits in reducing HF readmissions. **Naylor et al. (1999):** NP-led discharge planning and home visits demonstrated a significant reduction in rehospitalizations.
Applicability	Offers valuable insights into the effectiveness of NP-led interventions in reducing readmissions for HF patients and seems rigorous with comprehensive search strategy. Intervention benefits are not uniformly effective across diverse patient populations or healthcare settings, suggesting a need for further high-quality, long-term studies to validate these findings
Disclosed Bias/Limitation	Intervention benefits are not uniformly effective across diverse patient populations or healthcare settings. Long-term studies required for validation; quality of studies variable; potential selection bias not fully addressed; studies are older and may not be applicable
Credibility Rating	**Rate Level: II** limited strength and reliability

Rhiantong et al. (2019)	
Purpose	The study aims to compare outcomes of individuals with HF receiving a Continuing Care Program led by NPs and those receiving usual care
Design & Intervention	quasi-experimental study employed a pretest and post-test design with a comparison group. Study outcomes included body weight changes, complications, functional status, quality of life, ED visits, the time interval between discharge and first readmission, and readmission rates. The intervention comprised timely follow-up appointments within 14 days post-discharge and Monday-Friday availability, care coordination, problem identification, patient education and counseling, medication reconciliation, monitoring, and proactive interventions. The study was conducted at a 2000-bed university hospital in Thailand. Clear data collection methods.
Validity	Purposive sampling; participants were recruited from two urban clinics, resulting in a small sample size of n=71, an effect size of 0.5 was observed. Ethical approval was obtained, and informed consent was documented; clear inclusion/exclusion criteria; design was appropriate and addressed a clear research question. Details of interventions clearly laid out and consistent; Participant demographics were clearly outlined, representing a generalized patient population. CI and p values stated.
Methodological Soundness	Robust data collection was conducted using hospital records (EMRs), ensuring standardization; however, cross-checking was not reported. The follow-up period focused on the 30-day readmission rate. Statistical methods employed included chi-square for categorical data. Results were clearly presented. Ethical considerations stated.
Result/Outcome	Body weight showed no changes at discharge/three months. ED visits and readmissions rate were not statistically significant at three months post-discharge. Length of stay and costs of care were significantly reduced in the intervention group. Satisfaction, quality of life, and functional status significantly improved. P-values and CI reported.
Applicability	NP-led primary care reduced hospital readmissions for HF. Patients reported higher satisfaction, improved health outcomes, and cost-effectiveness. The findings support the expansion of NP roles in primary care for enhanced care continuity and reduced hospitalizations. However, further research is needed to assess long-term effects and broader applications.
Disclosed Bias/Limitation	Study limitations were clearly delineated, including the intervention's conduct at a single hospital, potentially limiting representation of other settings, and a small sample size with high attrition. Recruiting patients with a wider range of HF severity would enhance result generalizability, particularly given the small sample size, and would have bolstered the study's power and significance.
Credibility Rating	**Rate Level: IV** high strength and reliability

Lowery et al. (2012)	
Purpose	Reduce all-cause mortality, decrease hospital admissions & ED visits at 1 and 2 years, and improve titration of HF medication.
Design & Intervention	Prospective, quasi-experimental study; outpatient NP-led HF clinic compared to usual care (physician-led primary care) Interventions included patient education/motivation, life-style changes, and identifying patients high-risk of complications, follow-up phone calls, medication titration requirements followed by guidelines from the American College of Cardiology Association
Validity	Intervention accurately measured; NP-led disease management was well-defined and measured; comprehensive disease management, individualized care plans, medication optimization, monitoring and follow-up, education and self-management support, coordination of care; patient demographics clearly reported; outcomes measured using standardized data collection methods from Veteran Affairs records, and mortality rates adjusted for baseline differences using Cox proportional hazard regression models.
Methodological Soundness	No randomization; study included all HF patients within the Veterans Health Administration System; high participation rates, male only; study followed patient for 2 years, longest HF management study (insight into sustained interventions); intervention had higher use of beta-blockers and Spironolactone usage, critical in HF management; p value and CI reported, results clearly laid out; ethical consent obtained; details participant characteristics
Result/Outcome	Reduced all-cause mortality in NP-led models at one year and two years; statistically significant results; HF-related hospital admissions were lower in the intervention group at 1 year, but diminished effects at 2 years.
Applicability	Strong evidence that NP-led outpatient management programs improve HF outcomes and reduce readmission rates; bigger RCT studies with randomization needed to eliminate bias and potential confounding factors; study sheds light into long-term effects of interventions.
Disclosed Bias/Limitation	Limited generalizability due to unique patient population; selection bias – patients were volunteers; non-randomization design; lack of resource utilization data from facilities outside the Veterans health care system; although confounding factors were addressed, there's possibility for other unmeasured group differences – primarily male population.
Credibility Rating	**Rate Level: IV** - strong evidence and highly credible

Moore (2016)	
Purpose	The study aimed to evaluate the effectiveness of a NP-led, home-based HF Clinical Pathway Program in reducing 30-day hospital readmissions for HF patients aged ≥ 65 years.
Design & Intervention	clinical pathway program; NP-led at home interdisciplinary approach to HF management; included early NP assessments, telemonitoring, and interdisciplinary care.
Validity	The intervention was well-documented, however, variability in NP visits (e.g., some patients were seen within 7 days while others were seen within 14 days) could lead to inconsistencies in exposure to the pathway.
Methodological Soundness	Convenience sampling was used, and the study was non-randomized and non-blinded. A lack of a control group and a small sample size (n=22) were present. Not all confounding factors were identified, and no confidence intervals or statistical tests were provided for key findings.
Result/Outcome	A significant reduction in readmission rates was observed (27.8% pre-Pathway vs. 9% post-Pathway). Two patients had readmissions (1 for CHF exacerbation, 1 for atrial fibrillation). Early NP interventions and weekly monitoring were key in reducing readmissions. Fewer ED visits were noted. The results are statistically significant but limited by the small sample size (n=22).
Applicability	Statistically significant results may be promising evidence that a HF clinical pathway led by NPs at home can significantly reduce 30-day readmission rates. However, larger and more credible studies are needed to support broader implementation.
Disclosed Bias/Limitation	The non-randomized design and small sample size limit the strength of evidence. Results are context-specific to home health and may not generalize to broader populations. The study was biased as blinding was not achieved, and there is potential for selection bias due to convenience sampling.
Credibility Rating	**Rate level: III** Moderate strength and reliability

Siodlak et al. (2020)	
Purpose	Evaluated 30-day HF readmission, ED visits, and all-cause mortality in post-discharge patients who were seen at a pilot NP-led Heart Failure Access Clinic (HFAC).
Design & Intervention	Pilot study assessing a Clinical Pharmacy Specialist (CPS) and a NP-led Heart Failure Access Clinic (HFAC); Integrated clinic focused on medication reconciliation, education, and dose optimization
Validity	The pilot study design inherently restricts the generalizability of findings due to the absence of a control group, lack of randomization procedures, and a limited sample size of 24 participants; disclosure of patient characteristics
Methodological Soundness	The analysis utilized descriptive statistics, and a detailed description of intervention processes was provided; however, a formal comparative analysis between the integrated clinic and standard care was not conducted.
Result/Outcome	The 30-day readmission rate was 8%, significantly lower than the institution's historical rate of 15.8%; no ED visits or mortality were observed; and the CPS identified medication discrepancies in 58% of visits, resulting in optimized medications for 54% of patients.
Applicability	The integration model demonstrates strong potential, though further research utilizing larger sample sizes is necessary to validate its effectiveness; furthermore, the interdisciplinary approach also exhibits strong potential.
Disclosed Bias/Limitation	The study employed a small, non-random sample, lacked a control group for comparison with standard care outcomes, and utilized a short follow-up period of 3-4 months
Credibility Rating	**Rate Level: II** limited reliability

Smith et al. (2016)	
Purpose	The study aimed to reduce 30-day readmission rates and acute care return rates (emergency room and other admissions).
Design & Intervention	A case-control study was conducted at a 192-bed community hospital in Denver, USA. The intervention consisted of home visits by NPs within 24-72 hours post-discharge for high-risk HF patients. This single home visit included clinical assessment, medication compliance/education/discrepancy review, medical adjustments, and follow-up laboratory tests.
Validity	The Length of stay, Acuity, Comorbidity, and ED visits in 6 months (LACE) tool was utilized to quantitatively identify patients at risk for hospital readmissions and to stratify all patients. Participants included those with a LACE score of 11-15, with fewer participants in the control group. The study employed a clear outcome measure and addressed a well-defined research question.
Methodological Soundness	P-values and CI were reported. Sampling was conducted based on LACE score, age, and gender, maintaining consistency across participants. The study included 538 qualified participants, with 144 in the control group, demonstrating a good sample size.
Result/Outcome	A reduction in 30-day readmission rates and acute care return rates was observed compared to usual care. Results were clearly presented with detailed statistical outcomes. Specifically, a 42-53.9% reduction in readmission was achieved. The PACT intervention was clearly documented and objective, with statistically significant outcomes and reliable findings.
Applicability	The authors convincingly argue that the PACT intervention, utilizing NP home visits within 24-72 hours of HF discharge, reduces 30-day readmission rates. The study emphasizes the importance of targeted, high-intensity interventions tailored to high-risk patients.
Disclosed Bias/Limitation	The single-hospital study design limits generalizability. Patients in the intervention group were older, potentially underestimating the intervention's effect due to baseline high readmission rates and other comorbidities. Potential confounders, such as demographic differences, were acknowledged. The study focused solely on patients with a LACE score of 11-15, excluding other high-risk groups.
Credibility Rating	**Rate Level: V** strong study, most credible evidence

Appendix F

Data Extraction Table

Ballard-Hernandez et al. (2010)	
Population	HF patients discharged of hospital
Setting	Hoang Hospital in California USA
Intervention	NP-led standardized order sets, education, consultations, follow-ups visits/phone calls, referrals, monitoring; high-risk patients followed as an outpatient in Heart and Vascular Institute by NP
Comparator	None
Measured Outcome	30-day all-cause readmission rates
Key Findings	Readmission rates decreased from 25.9% to 17.6% post-intervention
Limitations	No control group, unclear sample size/characteristics, no mention of confounding variables, limited generalizability.
Strength	Although weak study, results consistent with larger RCTs, and can support NP-led interventions on reducing 30-day readmission rates
Blum and Gottlieb (2014)	
Population	204 HF patients enrolled in Medicare with hospital admission within last year
Setting	the University of Maryland Medical Center, Baltimore Veterans Administration center, and private cardiology practices in Baltimore/Washington DC, USA
Intervention	NP-led telemonitoring, remote assessments, medication management, weight, blood pressure monitoring, guideline-based care
Comparator	Usual care
Measured Outcome	30-day readmission rates and hospitalization rates
Key Findings	30-day readmission rates reduced from 45.3 to 33.7%; observed within 1 year only.
Limitations	No blinding, technical issues with telemonitoring, unclear handling of missing data/dropouts, performance bias; results not sustained after 1 year.
Strength	RCT with large sample size, multiple sites, diverse group of HF patients; consistent guidelines, well-defined outcomes, strong statistical power; strong study supporting NP led interventions to reduce readmissions and hospitalizations

Breathett et al. (2018)	
Population	126 Patients admitted with primary diagnosis of HF
Setting	Quaternary academic center
Intervention	NP education in clinic alongside standardized tablet education
Comparator	Primary comparator: NP education alone Secondary comparator: no NP education
Measured Outcome	30-day all-cause readmission rates
Key Findings	NP care with tablet education had lower 30-day readmission rates, not statistically significant; significantly higher readmission rates without NP education
Limitations	Underpowered, single-center, limited external validity.
Strength	Lack of NP education results in significantly worse outcomes for HF patients and increased 30-day readmission rates. Study strengthens the importance of NP education in improving patient outcomes
Charteris and Pounds (2020)	
Population	Veterans with HF diagnosis
Setting	Southern Arizona Veterans Administration Health Care System with 5,600 patients
Intervention	Multidisciplinary clinic model led by NPs conducting follow-up, education, engagement etc.
Comparator	None
Measured Outcome	30-day all-cause readmissions
Key Findings	0.2% reduction in readmissions, not statistically significant
Limitations	Small sample, narrow population, inconsistent interventions during study, short study, 50% of patients uncontacted
Strength	Easy replication of intervention; hope for better outcomes if intervention sustained overtime and larger sample size

Delgado-Passler and McCaffrey (2006)	
Population	HF patients in various studies
Setting	Systematic review of RCTs and clinical studies
Intervention	NP-led post-discharge interventions of HF patients
Comparator	RN-led interventions
Measured Outcome	Hospital readmission rates; varying timeframe
Key Findings	NP-led outpatient interventions reduced readmission rates vs. RN-led interventions
Limitations	Variable study quality, inconsistent outcomes, no exclusion criteria for study selection, limited generalizability, varying interventions and follow-up periods.
Strength	Although weak, most studies report that outpatient NP-interventions reduce readmissions. More consistency needed between studies to support strength for specific interventions.
Rhiantong et al. (2019)	
Population	HF patients, n = 71 recruited from CCU at the University Hospital in Thailand following acute myocardial infarction and heart failure as a complication.
Setting	2000-bed university hospital in Thailand, outpatient departments
Intervention	NP-led continuing care program: timely follow-ups within 14 days, care coordination, education, medications, monitoring, phone availabilities and care access
Comparator	Usual care
Measured Outcome	30-day readmission rates, ED visits
Key Findings	No statistically significant differences in ED visits and readmission rates between groups
Limitations	Small sample size, single-site, lack of diversity in patient population, limited generalizability, NPs had inpatient unit involvement during study – could have interfered with outpatient results.
Strength	robust data collection, standardized and consistent interventions, credible study Study hold strong support that directed programs for HF can significantly improve outcomes

Lowery et al. (2012)	
Population	969 male veterans treated for HF with no other comorbidities with a life expectancy < 6 months
Setting	6 Veterans Affair primary care medical centers in Midwest USA and 1 affiliated outpatient clinic
Intervention	NP-led disease management, individualized care, medication optimization, education, self-management support
Comparator	Usual care
Measured Outcome	Hospital admissions and ED visits
Key Findings	37% decrease in admissions at 1 year of discharge
Limitations	Non-randomized, male-only, selection bias, limited generalizability, potential unmeasured confounders
Strength	Large and credible study; substantial reduction in admission rates; improved health outcomes; multiple sites; intervention can be replicated to more diverse populations; importance of a multidisciplinary team for HF
Moore (2016)	
Population	22 HF patients 65 years of age or older
Setting	HF patients admitted to Medicare certified home health services in Northeastern USA
Intervention	HF Clinical Pathway Program led by NPs providing HF management at home; interdisciplinary care with physical therapists/dieticians/social workers, early assessments, monitoring, regular follow-ups
Comparator	Usual care
Measured Outcome	30-day readmission rates, ED visits
Key Findings	Readmission rates reduced from 27.8% to 9% with fewer ED visits; statistically significant results
Limitations	Non-randomized, convenience sampling, small sample size, no control group.
Strength	Well-documented intervention with clear pathway; strong study; early NP involvement in a multidisciplinary model shown to reduce readmissions and ED visits

Siodlak et al. (2020)	
Population	Post-discharge acute decompensated HF patients with LVED < 50%
Setting	NP and Clinical Pharmacy Specialist-led HF Access Clinic
Intervention	Integrated care: medication reconciliation, education, dose optimization, monitoring
Comparator	Usual population
Measured Outcome	30-day readmission rate and ED visits
Key Findings	30-day readmission rate of 8% vs. historical rate of 15.8%; no ED visits
Limitations	Weak study; pilot-design, small and non-randomized sample, no control group, short follow-up, limited generalizability
Strength	Although weak in credibility, results consistent among similar studies and aids in supporting NP led interventions
Smith et al. (2016)	
Population	High-risk HF patients with LACE score 11-15
Setting	192-bed community hospital, Denver USA
Intervention	NP-led home visit within 24-72 hours post-discharge: assess improvement, medications, labs, trends
Comparator	Usual care
Measured Outcome	30-day readmission and acute care return rates
Key Findings	42-53.9% reduction in readmissions; statistical significance
Limitations	Single-site study, older intervention group, excluded other high-risk groups, potential confounders
Strength	Strong study; support for directed post-discharge intervention during vulnerable post-discharge period results in profound reduction in readmissions.