

Reducing Readmission Rates Through Remote Monitoring: A Comprehensive Approach
to Managing Heart Failure and Pneumonia

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by

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DEDICATION

I dedicate this work to my family and friends, who have been my unwavering pillars of strength throughout this journey. Their endless support, encouragement, and belief in my abilities have been the driving force behind my perseverance and success. Their encouragement, patience, and belief in me have been the pillars upon which I've built my resilience and determination. Each page of this work is a testament to the love and inspiration they've generously shared with me. I thank them for being my guiding light in moments of doubt and my cheerleaders in times of success. This achievement is as much theirs as it is mine.

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LIST OF ABBREVIATIONS

Congestive Heart Failure	CHF
National Library of Medicine	NLM
Social Determinant of Health.....	SDOH
Heart Failure	HF
Pneumonia.....	PN
Centers for Medicare & Medicaid Services.....	CMS

ABSTRACT

REDUCING READMISSION RATES THROUGH REMOTE MONITORING: A COMPREHENSIVE APPROACH TO MANAGING HEART FAILURE AND PNEUMONIA

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This thesis addresses the significant challenge of high hospital readmission rates in the U.S., with a specific focus on heart failure and pneumonia, and proposes remote monitoring as a viable solution to improve patient outcomes and reduce healthcare costs. Utilizing data from the Centers for Medicare & Medicaid Services, this study delves into the complex factors leading to readmissions, such as care coordination, medication management, and social determinants of health. It argues that remote monitoring—through mobile apps, wearable devices, and teleconsultations—can bridge the care gap post-discharge by allowing for continuous management, early detection of health issues, and greater patient engagement. Despite potential concerns around patient privacy, data security, and equity of access, the research suggests that remote monitoring offers a promising strategy to decrease readmission rates, highlighting the need for future

research and policy shifts towards more technology-driven, patient-centric healthcare models.

CHAPTER ONE

INTRODUCTION

Hospital Readmission has been an increasing issue within healthcare organizations in the United States. As patient care is one of the most essential parts of the delivery of healthcare, hospital readmission puts a strain on that as it could possibly decrease a patient's quality of life, by increasing the risk of worsening their already existing health condition, negatively impacting their mental health status in many different ways to include heightened levels of stress and anxiety as well as possibly putting the patient in a financial crisis as healthcare comes at a significant cost here in the United States. According to the HealthCare.gov website, hospital readmissions can be defined as "A situation where you were discharged from the hospital and wind up going back in for the same or related care within 30, 60 or 90 days. The number of hospital readmissions is often used in part to measure the quality of hospital care, since it can mean that your follow-up care wasn't properly organized, or that you weren't fully treated before discharge" (HealthCare.gov, n.d.).

Reducing hospital Readmission is equally crucial to maximizing the utilization of healthcare resources. Healthcare workers' services must be more appropriate, as they are pivotal in delivering high-quality care. Hospital readmission can lead to a higher demand on these professionals, possibly causing burnout as they have to deal with multiple tasks

they did not plan to include in their work. As readmission can strain healthcare workers, it can also burden the correct allocation of resources within the healthcare system.

Resources like emergency services can be heavily implicated as they might now be used for a health concern that someone could have prevented. Another example is the shortage of resources like hospital beds for treating patients with other medical concerns due to the readmission of patients. Not only does hospital readmission cause a financial strain on the patients per the first paragraph, but it also causes some financial implications on the healthcare facilities. A prime example of that is being penalized per the Hospital Readmission Reduction Program. Though its main purpose is to improve the quality of care, it also seeks to penalize hospitals that do not fall within the range of hospital readmission during a given period of time per their calculations. According to the American Hospital Association, "Through the Hospital Readmission Reduction Program, the Centers for Medicare & Medicaid Services penalizes hospitals for "excess" readmissions when compared to "expected" levels of readmissions. Since the program began on Oct. 1, 2012, hospitals have experienced nearly \$2.5 billion of penalties, including an estimated \$564 million in fiscal year 2018" (American Hospital Association, n.d.). Losing such a large sum of money could cause a delay in using those funds to provide additional resources for a better quality of care or a better working environment for workers.

This thesis aims to examine the intricate surroundings of Hospital Readmission, with a specific focus on the variables of Heart Failure and Pneumonia. Further, a pivotal component of this investigation will be exploring variables to identify strategies for

effectively mitigating hospital readmissions, focusing most of the attention on the potential benefits of remote monitoring. As to why HF and PN were selected as variables, per the CMS, these two conditions are included in the Hospital Readmission Reduction Program, meaning sufficient studies and data will support the claims made in this research (Centers for Medicare & Medicaid Services, 2023). Though HF is chronic, and PN is not, the nature of these two conditions, are still more inclined to encounter hospital readmissions due to the severity of the disease and its possible comorbidities. While HF and PN are complex conditions, they can allow for remote monitoring, which will encourage continuous of patients' post-discharge, reducing readmissions. Remote monitoring may indicate preliminary signs of forthcoming decline, which could reduce the likelihood of sudden exacerbations. Remote monitoring in this scenario also necessitates individualized plans for patient needs as these conditions may exhibit a wide range of varying severity signs. The individualized plans could aim to meet the patients precisely where they are at with their treatments. Undoubtedly, the COVID-19 pandemic increased the use of remote monitoring technologies in healthcare and increased their significance. As worldwide medical facilities struggled to handle the increase in patients and the potential for virus transmission, remote monitoring surfaced as a vital instrument for providing care while reducing in-person interactions. The importance of remote monitoring after the pandemic goes beyond infection control. It signifies a change in healthcare toward a more adaptable, patient-centered strategy.

HOSPITAL READMISSIONS

The CMS defines Hospital Readmission as ‘unplanned readmission within 30 days of discharge’ (Centers for Medicare & Medicaid Services, n.d.). For this thesis, the focus will be on the short-term 30-day readmission model. Hospital Readmissions can occur due to many different reasons including.

Care coordination problems

Medication Issues

Limited patient education

Social determinants of health.

Care coordination problems

The absence of communication between medical staff regarding patient discharge planning can mark this. This can lead to gaps in treatment plans, erroneous transfer of patient information, misinterpretation of the correct treatment of care, and numerous other issues. This claim is supported by the NLM through an article of Discharge Planning which states “Poor communication between the secondary care and the post discharge setting can result in key clinical information not reaching primary care providers, with patients remaining unaware of information that might help them manage their condition and prepare for discharge from hospital” (Gonçalves-Bradley et al., 2016). Another major issue that can come out of care coordination problems is a need for patient engagement stemming from a lack of appropriate communication. This truly limits the space to create a patient-centered approach to care, which poses a challenge to post-discharge care. This could affect the success of the treatment plan as it could lead to

readmission. From possible delays in scheduling follow-up appointments, patients feeling abandoned, and inadequate involvement of patients' caretakers or family members, the lack of coordination and communication is a route that is likely to lead to readmission. When it comes to care coordination, communication might only sometimes be the issue; sometimes, it is comprehension. It is essential to consider medical terminology when communicating with patients. An article retrieved from the NLM focused on Patient-Centered Communication states, "It is helpful to consider all patients as having low health literacy and use appropriate communication techniques that ensure understanding" (Naughton, 2018). As a professional if plain language is not used so that an average person or someone whose first language might not be English will understand what it is and be able to explain it back to the medical professional when asked, that might lead to some problems. The use of medical jargon can definitely detract from a patient experience, even as far as eliminating a possible two-way conversation and encouraging questions.

Medication issues

In terms of discharge planning, issues related to medical complications can contribute to worsening the existing conditions, which in this case are PN and HF. In this context, complex medication regimens can cause readmission problems if not administered properly, emphasizing the need for proper discharge planning. Patients with these conditions frequently require various medications, which may be complicated. Each medication might have a particular dosage, potential side effects, and consistency. Effective communication becomes essential at this point. If instructions aren't

communicated clearly or the patients cannot comprehend what was passed down, this is one of the clear paths to patients getting readmitted. Touching back on the consistency of taking these medications for HF and PN patients, to carefully manage these diseases in hopes of being successfully healed from them, it is very imperative that patients can manage their medication on a consistent level. This also all falls back on communication between the patient and the providers. According to the NLM, “A lack of support and empathy from healthcare providers and a paternalistic manner can negatively impact adherence. Poor patient-provider relationships lead to insufficient patient counselling and leave the patient alone struggling with medication problems. Without trust-based patient-provider communication, patients cannot freely discuss side effects and other concerns related to their medication” (Kvarnström et al., 2021). If the cycle continues like this, there is a chance of symptom exacerbation as well as an increased chance of readmission, not to mention the rates of worsening outcomes when it comes to hospital readmissions. In all reality, each hospitalization can contribute to a decline in the patient's health. To put it on another perspective, an increased chance of worsening of symptoms can highly impact the patient's quality of life as well.

Limited patient education

Per the National Institutes of Health (NIH), “enhanced medication reconciliation and patient education strategies are critical ways for hospitals to reduce readmission rates. A growing body of research suggests that lack of attention to these two areas is a contributing factor to the revolving door effect of patients discharging from and re-entering hospitals” (Hume & Tomsik, 2014). Inadequate post-discharge education can

lead to a patient's need for readmission. Some examples may include the inability of patients to understand the proper way to take their prescribed medications fully, partaking in activities in which they are permitted or prohibited, dietary restrictions, etc. This may result in poor self-care, which may exacerbate their illness. Inadequate attention to the critical aspects of discharge planning is one of the main reasons why people end up having to come back to the hospital. The failure to fully educate patients not only potentially causes hospital readmissions but also can be physically, mentally, and financially draining to those patients. It is no surprise that patients facing PN and HF will require comprehensive education to facilitate a proper transition from the hospital to their homes. With that being said, some of these patients may struggle to comprehend the many different aspects of what they must do for themselves when they are discharged from the hospital to stay healthy. Communication and comprehension in these life-threatening situations are very crucial as if there is a failure in adherence to post-discharge care at any point, it may lead to potential complications in addition to the already ongoing conditions of PN and or HF. It should also be understood that if communication is not tailored to the patient's style of preference learning, there is a possibility of misunderstanding what is being said. For example, if an individual is more of a visual person, it is essential to include some visuals that might help them understand what needs to be done to remain healthy; it might even help to send that patient home with some visual aids. Some aids could include graphs, charts, diagrams, etc. Depending on whether it approves of this or not, it might be beneficial to include a family member or

caretaker in the patient education process as it takes it to the extra step of ensuring the patient is set for discharge and will likely not be readmitted.

Social Determinants of Health

Per an article written by the NLM on social determinants of health and hospital readmissions, it states “Multiple studies have demonstrated that SDOH such as race, socioeconomic status, and education contribute to a higher risk of readmission” (Obuobi et al., 2021). From this angle, several pathways could result in a patient having to return to the hospital. First, depending on their geographical location, a patient’s access to healthcare services can delay receiving medical attention promptly. Geographical disparities for patients can pose a significant barrier, potentially leading to inadequate medical care when needed. With HF and PN being two of those highly complicated diseases, these patients can be at a disadvantage as if and when they might need medical attention, they can experience obstacles anywhere from prolonged travel times, limited transportation options, smaller healthcare facilities that may not provide all medical services, etc. A patient’s financial status can also severely limit their access to resources essential for recovery, like medication, healthy food items, etc. Finances can be one reason why patients might not want to return to the hospital when needed. According to a study conducted by the Commonwealth fund, “Medical debt is leading many people to delay or avoid getting care or filling prescriptions: more than one-third (34%) of people with medical debt in employer plans, 39 percent in marketplace or individual-market plans, 31 percent in Medicaid, and 32 percent in Medicare” (Collins et al., 2023). Also, according to the Kaiser Family Foundation, “Unaffordable medical bills can lead

to medical debt, particularly for uninsured adults. More than six in ten (62%) uninsured adults report having health care debt compared to over four in ten (44%) insured adults (Figure 10). Uninsured adults are more likely to face negative consequences due to health care debt, such as using up savings, having difficulty paying other living expenses, or borrowing money. Beyond the significant financial consequences of having debt, two-thirds of uninsured adults with health care debt say they have had to make difficult sacrifices, such as eating less, changing their housing situation, or increasing work hours to pay down their debt” (Tolbert et al., 2023). These are all stressors that should be dealt with during discharge planning so patients don’t have to worry about them after discharge, as it can also certainly lead them back to being readmitted. For example, the patient’s treatment can help them apply for financial aid from various organizations to help them with their medical costs. If it is food that the patient is concerned about, they could potentially be set up with services like Meals on Wheels America, which according to their website is an organization that “primarily provides nutritious meals, a quick safety check and much-needed human connection to homebound seniors. In some communities, additional services that keep seniors healthy and safe are also offered, like pet food delivery, senior center meal programs, home repair services and transportation. Each local program works with its own community’s needs and resources to provide a community-specific solution” (Meals on Wheels, n.d.). Many organizations can help address each patient’s needs if the effort is made during their discharge planning process. No patient in an economic hardship should find themselves having to choose between either meeting their basic needs or paying for medical help, both essential to living a

long, healthy life. Patient's health behaviors can certainly be influenced by their SDOH. Their environment, community support, social networks, access to green spaces, and ability to seek and receive help all influence their health behaviors and choices. Recognizing these behaviors' influence can allow healthcare providers to implement targeted interventions to address every patient's needs individually during discharge planning. Patient A might have family support sometimes but not community support when needed, and patient B might have community support but no access to green spaces; every patient has a different experience. Stressors that a patient may have connected to their socioeconomic situation may hinder their capacity to heal. While on the topic, stigmas and discrimination can also be among these stressors. Stressors can certainly impede a patient's healing process and contribute to readmission. Some examples may include heightened stress levels due to some uncertainties in their lives and many more. Not to mention how stigmas and discriminations can also add to those stressors. All of these must be recognized by healthcare professionals and dealt with for optimal recovery rather than the patient being readmitted and starting again from square one.

Comprehensive review of relevant literature on Hospital Readmissions, Remote Monitoring, Heart failure and Pneumonia.

To bolster the few points stated in the previous paragraphs, this section of the thesis is devoted to a comprehensive review of articles that conscientiously delve into the topic of readmission in HF and PN, as well as the need for remote monitoring to reduce hospital readmission, specifically for those two diseases. This section not only seeks to

fortify the credibility of the claims made in this thesis, but it also contributes to a more meticulous understanding of the subject at hand. The first article is titled Impact on Readmission Reduction Among HF Patients Using Digital Health Monitoring: Feasibility and Adoptability Study. This is an article retrieved from the NLM written by Ponrathi Athilingam and Aimon Miranda. This article focuses on the expanding public health concern centered around the increasing prevalence of HF. Despite multiple efforts to reduce readmission rates, they continue to rise, posing an economic burden to many entities. Similar to this thesis, this study emphasizes the need for remote monitoring, explicitly using a mobile device to address HF readmission concerns. This study introduced a mobile phone application that essentially provides digital prescriptions, digital therapeutics, reminders, education, etc. It also offered Bluetooth to be connected to a weighing scale and a blood pressure machine to monitor both continuously. Additionally, the patient's clinical team monitored the device continuously and took appropriate action when the patient's symptoms were evaluated. According to the conclusion of this article, HF management is becoming increasingly challenging, which emphasizes the need for a robust and long-lasting system for patient remote monitoring after hospital discharge. For the authors to identify which patient groups would benefit most from daily remote checks, they evaluated clinical and sociocultural aspects as well as trends in the usage of remote monitoring. Their results also indicated that the measures based on real-time vital sign data could have a major impact on reducing hospital readmissions and healthcare costs (Park et al., 2019). The revelation that real-time vital sign data can be a main driver in reducing readmission rates is

promising for the future. The integration of real-time data will not only enhance medical interventions but also provide healthcare providers with tools for mitigating risks related to HF and optimizing patient outcomes.

This next article is Congestive Heart Failure 30-Day Readmission: Descriptive Study of Demographics, Co-morbidities, HF Knowledge, and Self-Care. It delves into the crucial economic burdens that CHF comes with. In correlation with the thesis, this is one of the main disadvantages of readmissions. The article states, ‘In 2012, CHF contributed over \$30 billion to healthcare expenditures, projected to rise to \$68.9 billion by 2030. CHF, affecting 6.2 million adults in the U.S., is a leading cause of morbidity and mortality, with an all-cause mortality rate of 89.7 per 100,000 in 2017’ (Madanat et al., 2021). It also goes into detail about CHF being a key driver of hospital readmissions. Using Beaumont Hospital as its targeted study area, the study included 196 patients diagnosed with CHF. Some of the data collected include;

- Demographics
- Comorbid conditions
- Medications
- Self-care behaviors, etc.

The author concluded that more studies are necessary to have a deeper understanding of the factors impacting readmissions for CHF, even though the findings of the coexisting condition align with those of other studies. In closing, the authors noted that it is unlikely that a widely accepted prediction model exists at this time to determine a patient's risk of readmission (Madanat et al., 2021). Like the preceding study, this

research strongly advised a shift towards more individualized patient management. By emphasizing the need for individualized patient management, providers will be able to attempt to address the complex interaction of medical, social, and demographic aspects that affect how well patients do, especially when dealing with diseases like CHF.

The article from the Mayo Clinic, *Readmissions in Heart Failure: It's More Than Just the Medicine*, further contributes to and reinforces the thesis of reducing readmissions. Per this article, HF continues to be one of the leading causes of hospitalization, causing so many problems, including being an economic burden. Though incorporating remote monitoring is the main focus of this thesis, it is tough to ignore the economic hardships these readmissions cause to patients and the healthcare system. The NLM seconded this notion by stating, 'In addition, over \$52.4 billion is spent annually to care for patients readmitted to the hospital within 30 days for a previously treated condition.^{7,8} As recently as 2018, there were 3.8 million 30-day all-cause adult hospital readmissions, with a 14% readmission rate and an average readmission cost of \$15,200' (Beauvais et al., 2022). Per the article, despite multiple efforts that have been made to try and curb the problem of readmissions, concerns have been raised regarding the potential disparities in the impact of financial penalties, particularly for hospitals catering to the poor population. This article suggests examining the equity implications of policies targeting HF as apprehensions have been raised about the potential compromise in healthcare delivery to those in greatest need. Remarkably, individuals who are faced with situations placing them in lower-income quartiles have demonstrated an elevated risk of readmission, even when accounting for their younger age and a higher prevalence of

comorbidities linked to unfavorable HF outcomes. Understanding and addressing these disparities is crucial for devising effective strategies that will reduce readmission rates and ensure equitable healthcare outcomes for individuals across all income strata.

Ultimately, the research calls for reevaluating healthcare policies to ensure they do not disproportionately affect vulnerable populations. It highlights the necessity for adequate medical care that considers the entirety of the patient's well-being, rising above the narrow focus solely on their disease, which is what most providers usually focus on.

According to the article's conclusion, the HF patients the authors treated had a condition that had a significant negative influence on both their physical and mental health. The research revealed that these patients' burdens increase when considering the external socioeconomic obstacles, they experience. This underscores the significance of recognizing this stress in delivering compassionate and efficient healthcare. It was also mentioned in the conclusion that choosing the proper drug schedule for their HF is only a tiny part of their total care. It emphasized how important it is for the medical community to improve how patients are treated holistically rather than just concentrating on their illness (Reddy & Borlaug, 2019). Caring for patients with HF involves a world revolving around navigating the complex interplay of biological intricacies. The load on these patients increases when external socioeconomic pressures are introduced into these complex dynamics. The increased stress that all of this involves needs to be understood and acknowledged by healthcare professionals since it has an enormous effect on the well-being of those who are dealing with HF.

The following article being reviewed is titled Diagnoses and Timing of 30-Day Readmissions After Hospitalization for HF, Acute Myocardial Infarction, or Pneumonia retrieved from the JAMA network. This is one of the articles that focused on both HF and PN in terms of readmissions. This article delves comprehensively into the intricacies of 30-day readmission, turning its focus to Medicare beneficiaries. It aims to shed more light on various strategies to reduce readmission rates. The study, which analyzed data from 2007 to 2009, found that there were 329,308 readmissions overall following hospitalizations for HF, 108,992 after acute MI, and 214,239 after PN. It was found that HF and acute myocardial infarcts cohorts, as well as recurrent PN for the PN cohort, are the most common diagnoses for readmission. Most readmissions occurred within 15 days following hospitalization, notwithstanding modifications to the patient's demographics. The study underscored the importance of comprehensive, disease-agnostic strategies for reducing readmissions. Some of these strategies may include;

- Patient Education
- Remote monitoring (highlighted in this thesis)
- Health management
- Shared decision-making practices, etc.

In contrast to other studies that primarily advocated for disease-specific interventions, this article proposes a comprehensive approach by advocating interventions on a broader spectrum. It underscores the importance of moving away from disease-specific interventions and emphasizes strategies that benefit patients regardless of the disease spectrum. The focus is on implementing interventions that positively impact

diverse health conditions, promoting a more inclusive and universally applicable healthcare approach. In some cases, this might be beneficial to patients. The authors of the study concluded with the observation that readmissions within 30 days of discharge were a regular occurrence among Medicare beneficiaries on a fee-for-service plan who were hospitalized for HF, heart attack, or PN. It was stated that this pattern persisted regardless of the patient's age, gender, race, or the time of their readmission, with the exact readmission causes for all of these groups (Dharmarajan et al., 2013). The conclusion underscores an observation that readmissions remained consistent despite a patient's demographic variation. As stated before, this highlights the importance of intervention that can help reduce readmission rates. It is crucial to prioritize interventions that address these shared patterns, as they point to a change in the direction of more inclusive and efficacious strategies to reduce 30-day readmissions among patients hospitalized for PN, HF, or acute myocardial infarction.

The following study, *Pneumonia Readmissions: Risk Factors and Implication*, delves into the critical examination of multiple factors that influence hospital readmissions regarding PN. Given that PN is one of the central focuses of this study, it is only fitting that an article about the subject matter is reviewed. The main focus of this article is to highlight persistent challenges when it comes to readmissions about PN, as there have been over 1 million hospital readmissions due to it. The article sought to tackle the intricate question of preventability. According to this study, the complications arise from non-modifiable factors such as sociodemographic elements, age, and comorbidities. Like any study, this article also acknowledges the fact while a subset of PN cases may

prove challenging to resolve entirely, there is evidence that implies an opportunity for improvement. Room for improvement, however, will still be needed. When looking at it from that context, the study thoroughly explores modifiable factors contributing to readmissions. Some of these were patient-related issues, including medication adherence and the need for tailored interventions. Others comprised physician-related factors that included adherence to treatment plans and many more. This article concluded by stating that although it might not be feasible to stop all PN readmissions, there is evidence that the instances given can be reduced, as demonstrated by recent trends in CMS data. The writer stated that many aspects of patients, doctors, and healthcare systems can be changed or enhanced (De Alba & Amin, 2014). Per this study, though reducing PN-related readmissions might be difficult, many opportunities can be taken to minimize them, as evidenced by recent trends in the CMS. The article also gave some successful interventions, including Project RED and Project BOOST (De Alba & Amin, 2014), demonstrating the potential for addressing readmissions when strategies for addressing transitional care are tailored towards specific individuals. Circling this article back to the thesis, even within the framework of remote monitoring, this approach remains highly adaptable when catering to every individual's unique need. Remote monitoring technologies can also allow for personalized patient-centered discharge planning. This not only optimizes the effectiveness of remote monitoring but also enhances patient engagement. The repeated emphasis on patient engagement throughout this study underscores the importance of ensuring the implementation of suggested strategies for reducing readmissions. Patient engagement is an anchor in the success of all these

interventions, mainly through communication. Promoting open communication leaves room for the patients to receive educational resources, medication resources, etc. The NLM supports this claim in a study on patient engagement by stating, “Several U.S. studies recently reported coordinated care trials that actively engaged patients with chronic disease resulted in significant mortality reductions compared to a control group who only took appropriate medications. The studies suggest chronically ill patients engaged in their care live longer than unengaged peers who otherwise receive similar treatment. In other words, health and wellbeing are fostered by engaged and activated patients, who collaborate with their clinician to manage care better” (Krist et al., 2017).

This next article, retrieved from the Permanente Journal, is titled Benefits and Challenges of Remote Patient Monitoring as Perceived by Health Care Practitioners: A Systematic Review. This article, just like the others, holds a significant position like the many previous articles incorporated into this thesis, serving as one of the many pillars reinforcing the core concepts and arguments presented within this thesis. This article provides a comprehensive explanation of the evolution and implementation of telemedicine using the COVID-19 pandemic as an emphasis point. Within this context, wearable devices are one of the primary devices introduced as pivotal tools in remote monitoring. As per the study, wearable devices enable continuous monitoring and systematic data recording regarding patients' physiological conditions and daily activities. This will help patients and their providers immensely by assisting in tracking. As the article has highlighted, healthcare practitioners have shown good attitudes towards telemonitoring. They have recognized the significance of telemonitoring technologies

playing a considerable role in maintaining continuous surveillance of patients between regular clinic visits. The article also details remote monitoring, offering a more authentic representation of patients' health status. This way, it offers a Segway to mitigating the "white coat syndrome" commonly linked with traditional in-person visits to healthcare facilities. This study also accentuates telemedicine's ability to magnify;

- Patient Education
- Self-management
- Overall health outcomes.

It details how empowering patients with access to their data contributes to their education about specific conditions. This also allows patients to have control over their health. It was also stated that this initiative aligns with the broader goals of promoting patient engagement and proactive self-management, potentially resulting in improved adherence to treatment plans and better health-related decision-making. According to the study's conclusion, telemonitoring is seen by medical professionals as a valuable tool for patient management that is becoming more and more significant, and many of them even support using it in their daily work. Several vital subjects highlighted various technologies' role in managing a range of patient populations. The professionals who found numerous advantages of telemonitoring in enhancing patient outcomes and tailoring care were also highlighted in the conclusion. It clarified that even while telemonitoring is generally seen favorably, healthcare professionals have misgivings about several aspects of remote patient monitoring (RPM). The study's final goal was to emphasize how critical it is to find answers to the problems at hand to improve the

platform's performance as it develops into an essential tool for contemporary medical treatment (Luiza Palmieri Serrano et al., 2023). From the conclusion of this article, there is an excellent acknowledgment among healthcare practitioners of the growing significance of telemonitoring as a helpful tool in patient care. The author believes telemonitoring is a dynamic approach capable of personalizing healthcare strategies and enhancing patient outcomes. This article also acknowledges some limitations. The authors mentioned that while the positive perceptions and experiences with telemonitoring are evident, it is also essential to acknowledge that healthcare practitioners are concerned about certain parts of Remote Patient Monitoring. However, the collective effort to mitigate the drawbacks reflects a commitment to optimizing telemonitoring platforms.

This second to last article for this section, retrieved from the Mayo Clinic's journal under the title 'Mayo Clinic Study Highlights Development of Remote Patient Monitoring Program during COVID-19 Pandemic,' is an additional exploration into remote patient monitoring. While the primary focus of this study is directed toward the context of COVID-19, the content within the article holds potential applicability to various terminal diseases beyond the scope of the pandemic including PN and HF. The article highlights the Mayo Clinic's Remote Patient Monitoring Program for COVID-19; it details a successful adaptation of a large-scale remote monitoring initiative to address the challenges posed by the acute condition of COVID-19. According to the study, the program catered to the needs of over 7,000 patients, using patients from about 41 states.

These patients went through a thorough evaluation that carefully examined various critical aspects, including

- Feasibility
- Safety
- patient engagement
- Alert rates managed by virtual care teams
- Utilization of acute care resources
- Patient clinical outcomes.

Though there were some initial uncertainties surrounding patient engagement with remote monitoring technology, the study found that the patient engagement rate was 78.9%. Studies like this have called for this thesis to be written. In this era, technological advancements are at an all-time high; the integration of remote monitoring stands out as a transformative force, which is particularly beneficial for patients and even healthcare professionals. This move signifies a slight shift from traditional care models. This allows patients to access continuous health tracking and personalized attention outside healthcare facilities. Looking at this from a broader scope, the advancements in technology within the healthcare world encapsulate an optimistic outlook on the intersection of healthcare and technology. One of the doctors in the study states, “She says staff also monitored patient engagement and used asynchronous and synchronous communication, such as secure messages and telephone calls to check in with patients and offer nonclinical assistance” (Dangor, 2021). This shows the multifaceted nature of remote monitoring in patient care. When healthcare providers employ a combination of

multiple communication styles, it demonstrates their commitment to maintaining a supportive and responsive relationship with patients. As the quote stated, this could be done through secure messaging or phone, which also allows patients to choose what mode of communication works better for them. These strategies certainly align with the evolving landscape of patient-centered care. In conclusion, this article by Mayo Clinic on the Remote Patient Monitoring Program emerges as a success story amongst many others in effectively managing acute conditions. The program could shape a more extensive embrace of telehealth technologies. The positive outcomes show how this and many other successful studies could influence healthcare policies while fostering a sustained adoption of these transformative technologies. This is a significant step forward in recognizing the long-term value and adaptability of remote patient monitoring in enhancing healthcare delivery and patient outcomes (Dangor, 2021).

The final article being reviewed was retrieved from the NLM titled Evaluation of the Effectiveness of Remote Monitoring to Establish a Community Health Intervention During COVID-19: A Community Intervention Trial. Amongst the subtypes of technology in healthcare, telemedicine, and teleconsultation are seen as pivotal components. While telemedicine has been the main focus of multiple articles that have been reviewed, a new term is introduced in this article: teleconsultation. The article represents a shift in healthcare, bridging connections between specialists and patients. This innovative approach streamlines the process of consultations, treatment, and overall care, all while patients get to stay in their original locations. This provides the patients with a convenient and reliable healthcare approach. This article identified one of the

barriers in healthcare, which is unequal healthcare distribution, particularly in rural areas with lagging medical resources. In order to bridge this gap, this study encourages the complete use of remote monitoring and teleconsultation. This article states that not only does remote monitoring provide real-time health status tracking and quick and easy access to medical information, but it also suggests the importance of psychological support, underscoring the role of telemedicine in alleviating psychological stress through remote monitoring and consultation. The article's conclusion stated that telemedicine, especially in remote areas, has been essential in reducing healthcare access problems during the COVID-19 pandemic. It also notes that safe and efficient means of obtaining and disseminating data have made COVID-19 monitoring notably effective. According to the article, telemedicine has improved the use of primary and advanced medical resources by enabling remote diagnosis and treatment through triage consultations (Ji et al., 2022). This article's conclusion suggests the importance of telemedicine in lowering medical barriers, especially in rural areas, while also drawing attention to the apparent advantages of telemedicine. Lastly, according to the conclusion, this study also lays the theoretical foundation for proactive interventions in future public health emergencies, highlighting telemedicine's far-reaching importance in crisis response and healthcare accessibility.

CHAPTER TWO

RESEARCH AND RESULTS

This section of the article dives into the sources that substantiate the many claims regarding the high rates of readmissions. This section provides detailed insights that strengthen the presented arguments of hospital readmissions being at an all-time high when looking at PN and HF, contributing to a more comprehensive understanding of the subject matter. The first two maps (figure 1 and figure 2) in this research are based on information collected from the CMS, which includes an extensive summary from each of the 50 states in the United States of America. The primary goal of this analysis is to investigate hospital readmission rates, particularly concerning two serious illnesses: HF and PN. Two different Excel sheets that CMS produced are being used as the primary data source for this in-depth examination. These sheets provide a thorough examination of the relevant readmission data for various healthcare facilities and the features of the hospitals being considered. A dual-focus approach facilitates a comprehensive comprehension of the complex relationship between hospital-specific factors and the readmission rates of HF and PN patients. This, in turn, offers valuable insights into areas where patient care and hospital management practices could be improved.

PN # of Readmissions by State.

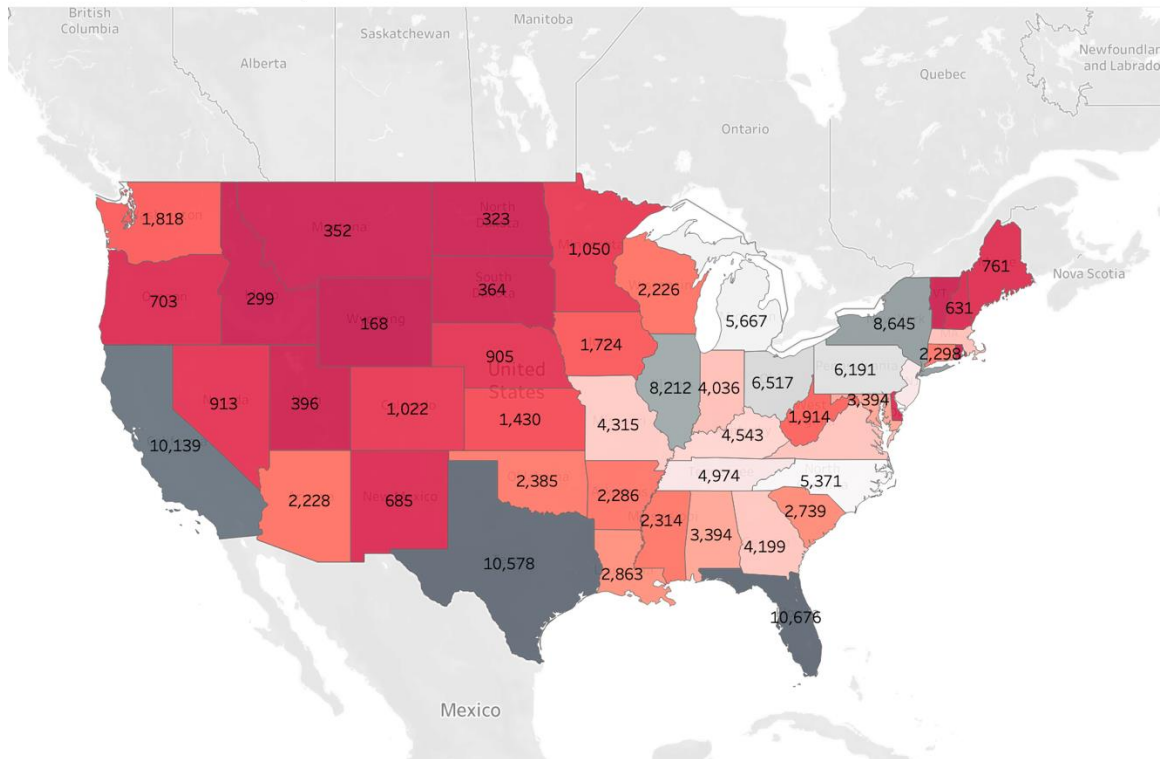


Figure 1 Visual representation of the Pneumonia Readmission Rates across various states with numerical data for a precise depiction of the extent of readmissions in each state (Centers for Medicare & Medicaid Services, n.d.)

HF # of Readmission by State.

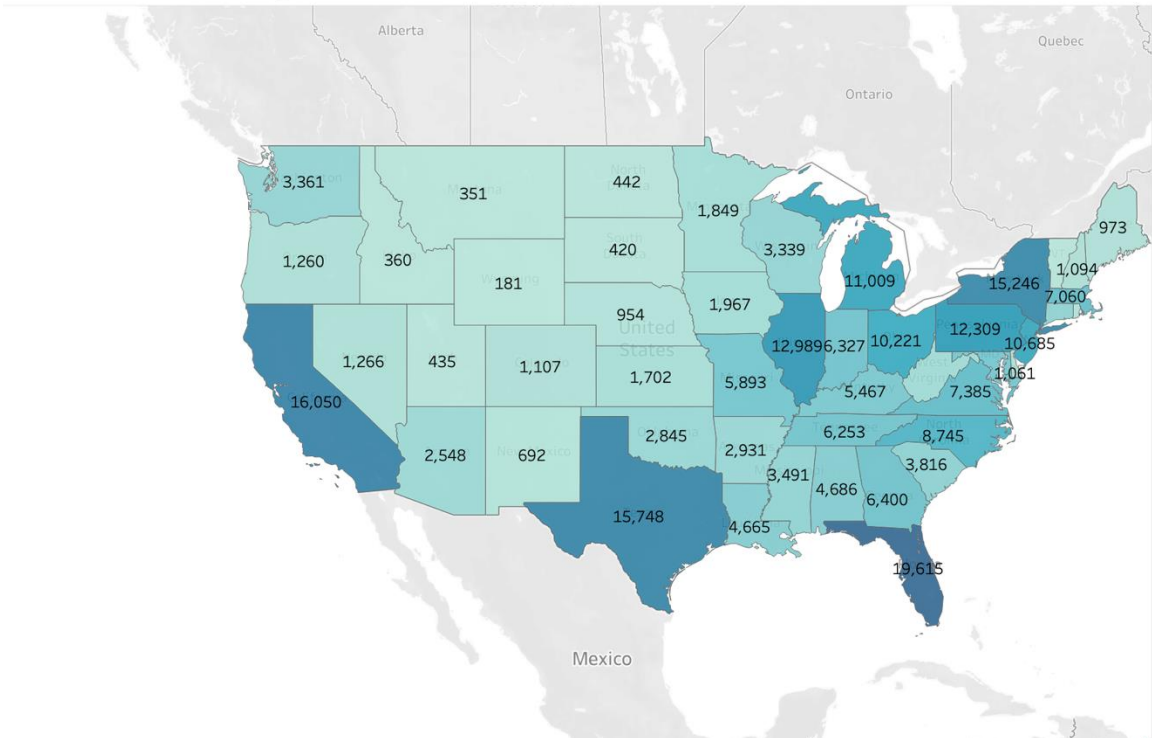


Figure 2 Visual representation of the Heart Failure Readmission Rates across various states with numerical data for a precise depiction of the extent of readmissions in each state. (Centers for Medicare & Medicaid Services, n.d.)

After a closer look at the dataset, two states with elevated readmission rates were chosen as the focus of the study. Florida and Texas stood out as notable due to their high readmission rates. The following two maps (figure 3 and figure 4) focus on the readmission rates of Texas and Florida. This aims to offer a thorough geographic representation that illustrates the variations between Florida and Texas. Due to insufficient evidence to support the thesis's assertions, California was not included in the selection.

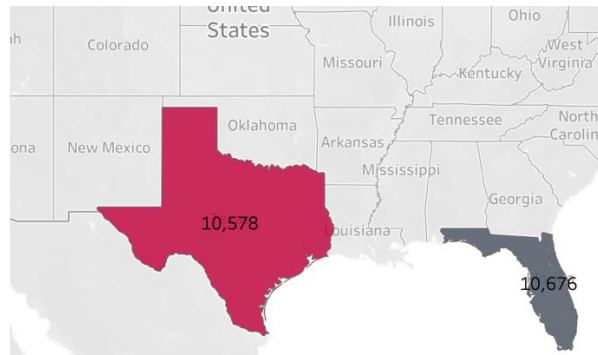


Figure 3 Representation of pneumonia for Florida and Texas
(Centers for Medicare & Medicaid Services, n.d.)

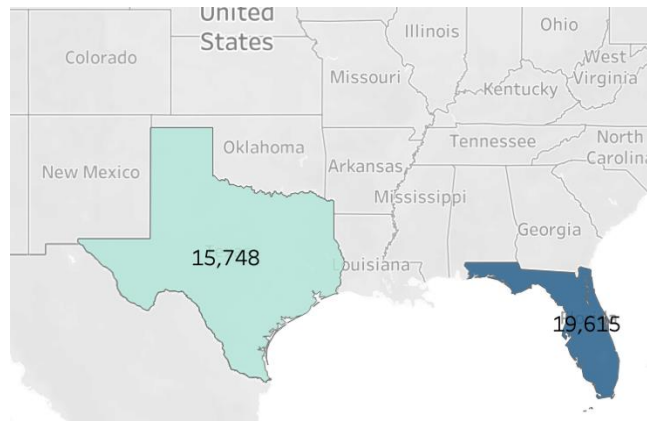


Figure 4 Representation of heart failure for Florida and Texas
(Centers for Medicare & Medicaid Services, n.d.)

The following graph (figure 5) provides a comparative visual of the predicted versus actual number of readmissions for PN and HF in Florida and Texas. The predicted readmission values are illustrated in red and yellow, while the actual readmissions are represented in blue and green. The apparent contrast between the predicted and actual readmission values serves as a visual testament to the challenge posed by high readmission rates in both states. These graphs, by themselves, show the urgency needed to address these readmission issues.

Readmission Stats/ TX & FL

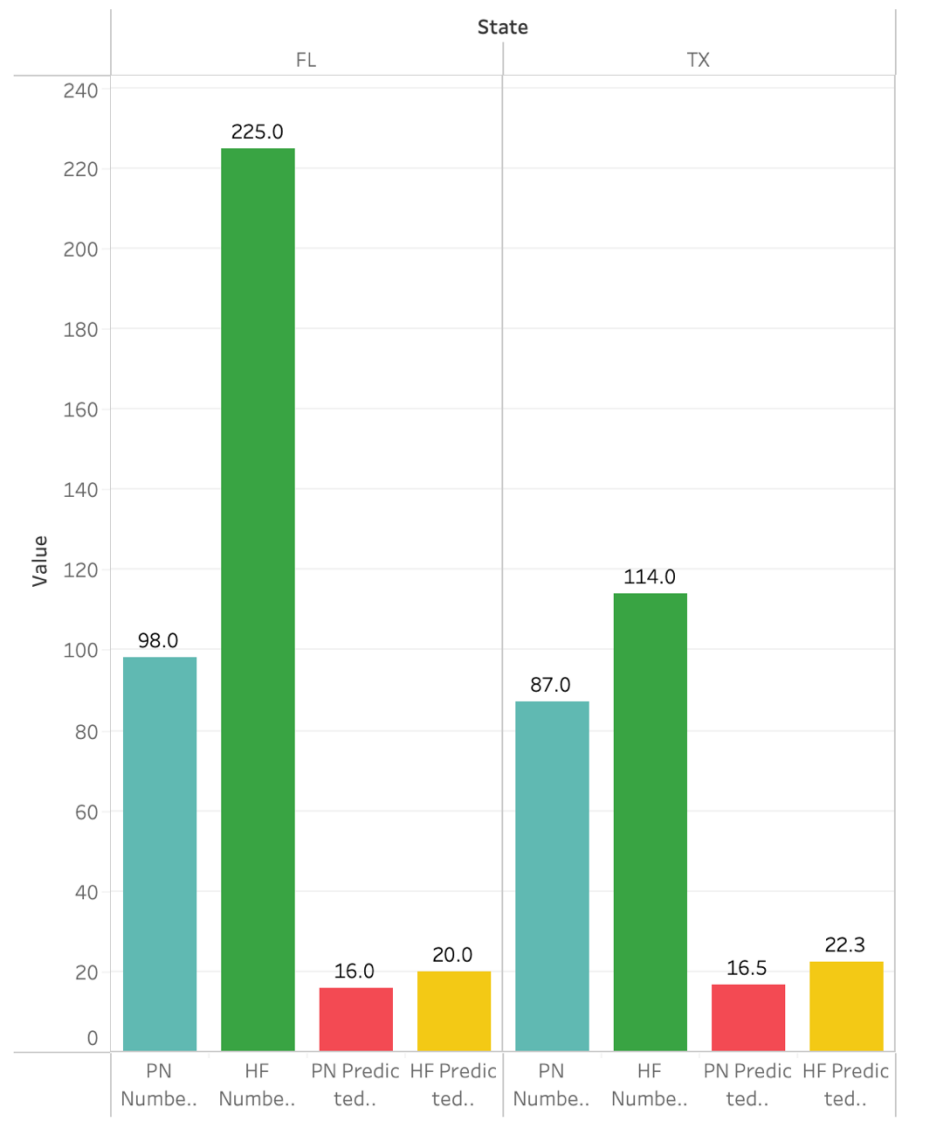
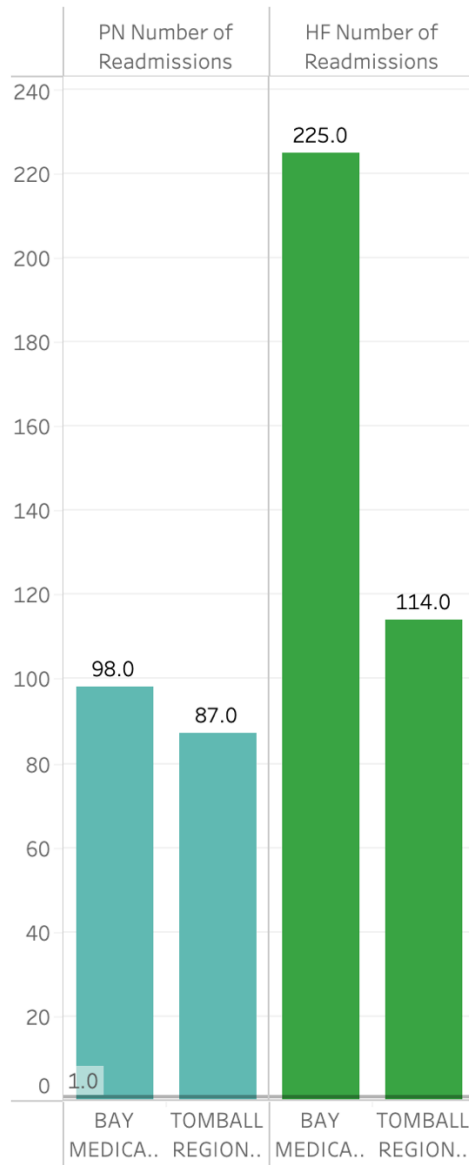


Figure 5 Readmission statistics
(Centers for Medicare & Medicaid Services, n.d.)

After analyzing the data of the statewide readmission rates for both Florida and Texas, the next step was selecting specific hospitals within those two states. For this phase, the two hospitals selected to provide a more localized perspective are Ascension

Sacred Heart Bay in Florida and HCA Houston Healthcare Tomball. These two hospitals were selected after focusing only on the states of Texas and Florida. As a result of their greater availability of data compared to other hospitals, these hospitals emerged by comparison. An About page of the Ascension Sacred As stated on their website, Ascension Sacred Heart Bay Hospital provides emergency and specialty care around the clock in Panama City, Florida. They also have a Level II Trauma Center for severe and life-threatening diseases. Their website states they are renowned for competence in several specializations, including women's health, cardiac care, cancer treatment, and stroke care. They use the most recent advancements in robotic-assisted and minimally invasive technology and complete diagnostic services like lab tests and imaging, all conveniently offered in one location (Ascension Sacred Heart Bay, n.d.). According to the hospital's website, the About page for the HCA Houston Tomball states, HCA Houston Tomball has over 350 hospital beds. The Joint Commission has certified them as Primary Stroke Centers, including a Level II Neonatal Intensive Care Unit (NICU), a Level III Trauma Center, and a renowned Chest Pain Center. In addition, HCA offers a variety of additional treatments, including neurology, orthopedics, sports medicine, heart and vascular surgery, and care exclusively for women (HCA Houston Tomball, n.d.). The next graph (Figure 6) shows the specific readmission rates for both HF and PN with a particular focus on both hospitals that were selected. PN is represented in blue while HF is represented in green, for both hospitals. The median number per state for readmission is 1, meaning anything above a 1 shows excessive readmission. These two graphs show a clear representation of how high readmissions are in both states.

STATS for Hospitals.



**Figure 6 Readmission Statistics narrowed down
(Centers for Medicare & Medicaid Services, n.d.)**

The last two diagrams and table (Figure 7, Figure 8, and Table 1) examine variables pertinent to individual hospitals, offering continued comprehensive support for

the claims made in this thesis. Figure 7 and Table 1 are associated with data from Ascension Sacred Heart Bay in Florida, shedding light on specific factors crucial to understanding readmission dynamics in that region. Figure 8 focuses on data associated with HCA Houston Healthcare Tomball in Texas, providing more insight into the variables influencing readmission rates in this healthcare facility. Together, these diagrams contribute valuable insights into the multifaceted factors affecting readmission outcomes at the hospital level.

Table 1 covers the Hospital Consumer Assessment of Healthcare Provider Systems. According to cms.gov, “is a standardized survey instrument and data collection methodology that has been in use since 2006 to measure patients' perspectives of hospital care. While many hospitals collect information on patient satisfaction, HCAHPS (pronounced "H-caps") created a national standard for collecting and public reporting information that enables valid comparisons across all hospitals to support consumer choice. The HCAHPS sampling protocol is designed to capture uniform information on hospital care from the patient's perspective” (Centers for Medicare and Medicaid Services, 2012). This table has three sections;

- Ratings: In this first section, the analysis centers on the specific criteria on which the hospital is being evaluated.
- Percentage: This section examines the quantitative aspect of the study, specifically focusing on the level of support from patients per statement. The comprehensive data set comprises responses from a sample of 324 patients, providing a robust foundation for drawing meaningful conclusions.

- **Difference:** In this final section of the table, the emphasis is placed on illustrating the disparity in numerical terms between a perfect rating and a rating that falls short of a hundred percent excellence. This clearly depicts the quantitative distinctions between an optimal rating and those that deviate from complete perfection. This section underscores the notion that a single error or oversight can potentially result in a patient's return to the hospital.

Table 1 Ratings
(Centers for Medicare & Medicaid Services, n.d.)

Ratings	Percentage	Difference
Patients "always" received help as soon as they wanted	45% (148pp)	32pp
Patients "usually" received help as soon as they wanted	36% (approx.116pp)	
Patients "always" received call button help as soon as they wanted	48% (approx.155pp)	39pp
Patients "usually" received call button help as soon as they wanted	36% (approx..116pp)	
Patients "always" received bathroom help as soon as they wanted	41% (approx..132pp)	13pp
Patients "usually" received bathroom help as soon as they wanted	37% (approx..119pp)	
Staff "always" explained possible side effects	38% (approx..123pp)	3pp
	39% (approx..126pp)	

Staff "sometimes" or "never" explained possible side effects		
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The following diagram (Figure 7) details unplanned visits to Ascension Sacred Heart Bay. Cms.gov describes this as “Unplanned hospital visits are measured within 30 or 7 days after visiting the hospital or having an outpatient procedure” (Centers for Medicare & Medicaid Services, n.d.). This diagram showcases the upper control limit, score, and lower control limit. While the score falls within the range between the upper and lower control limits, it surpasses the lower control limit; this indicates that it exceeds the anticipated threshold for unplanned visits. Points 1 and 7 notably show a proximity to the upper control limit, signifying a potential issue.

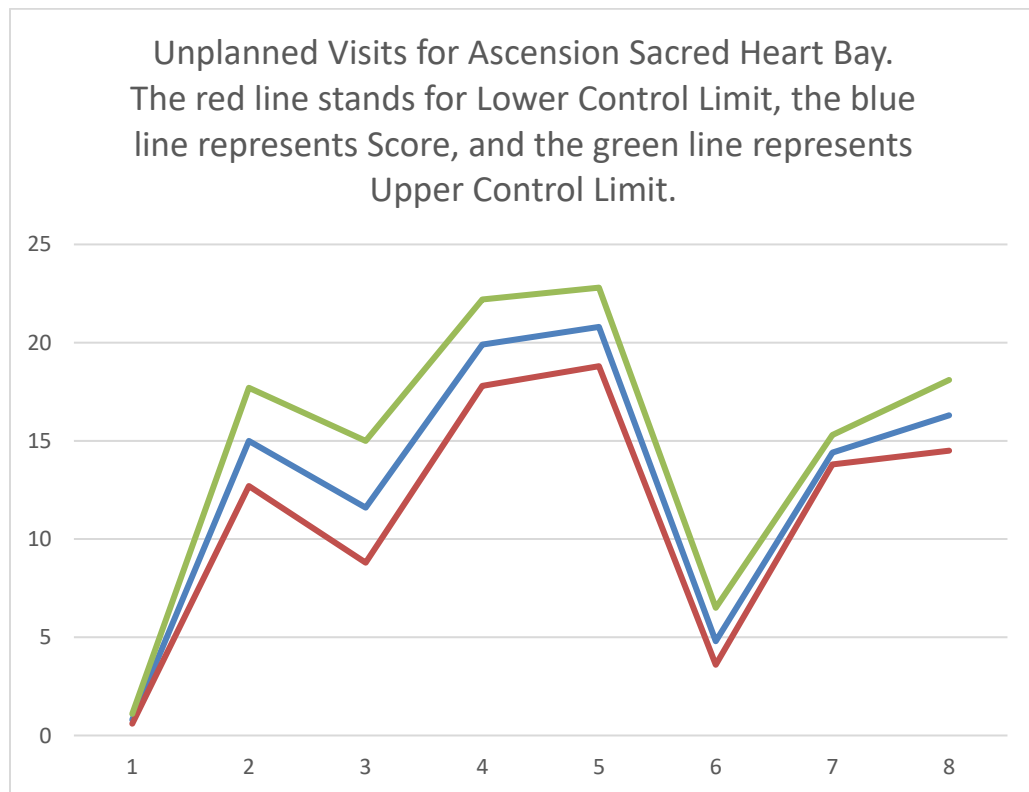


Figure 7 Unplanned Visits Ascension Sacred Heart Bay
(Centers for Medicare & Medicaid Services, n.d.)

This final diagram (Figure 8) shows the unplanned visits for HCA Houston Healthcare Tomball. The lower control limit is pictured in blue, the orange score, and the grey upper control limit. A notable observation is that the score surpasses the lower control limit and is uncomfortably close to the upper control limit. Ideally, the score must consistently remain below the lower and upper control limits to ensure optimal healthcare outcomes.

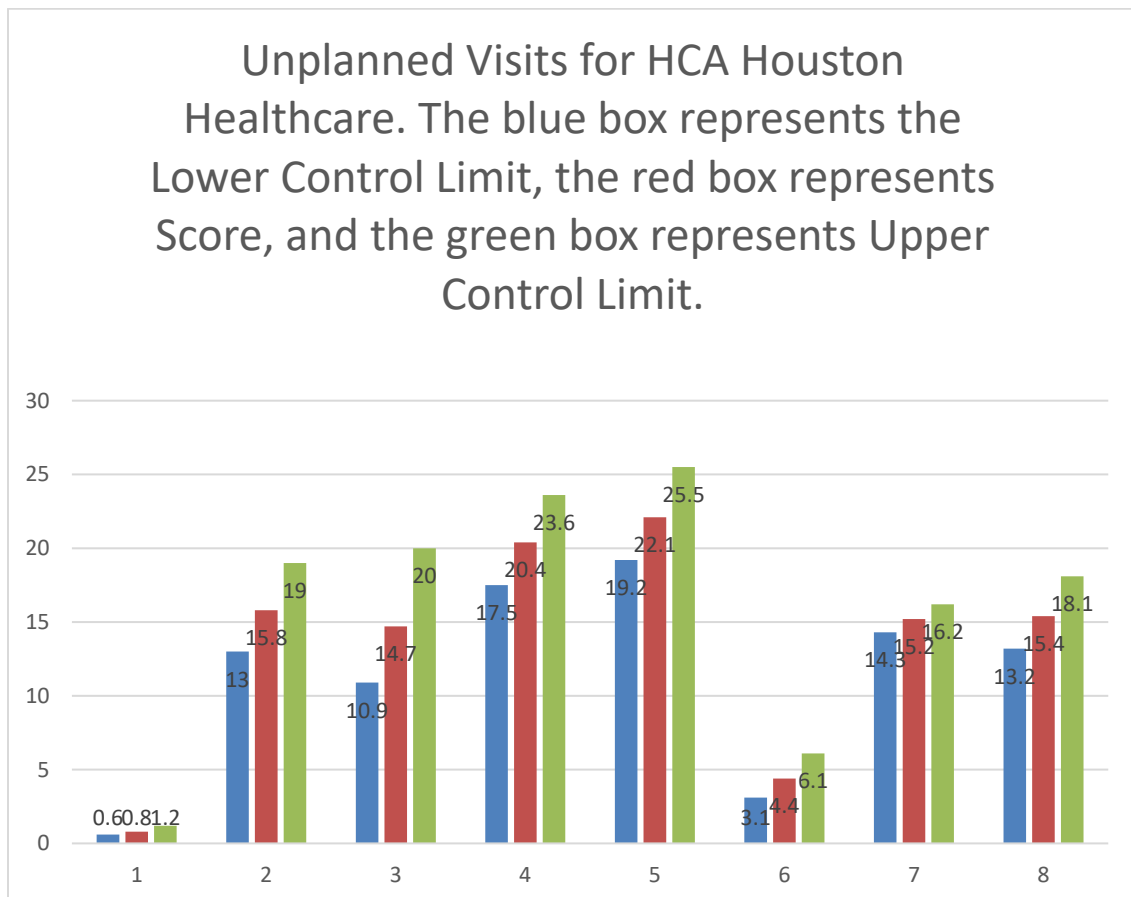


Figure 8 Unplanned Visits (HCA Tomball)
(Centers for Medicare & Medicaid Services, n.d.)

FINDINGS

This section's comprehensive investigation and findings highlight the critical need for creative ways to deal with the consistently high rates of hospital readmissions, especially for patients suffering from PN and HF. This research section of the thesis reveals the complex interplay of factors contributing to readmission by carefully collecting and analyzing data from the CMS across all fifty states, with a focused lens on Texas and Florida due to their noticeably high readmission rates. The high readmission rate is associated with a high patient dissatisfaction rate (Table 1) and a high number of unplanned visits (Figure 7 and 8). The information provided in this section serves as a call to action for legislators and healthcare professionals alike, in addition to adding to the academic debate by synthesizing the vast array of data and merging it with the possibilities of remote monitoring. This thesis goes beyond merely highlighting the problem by proposing remote monitoring as a potential beacon of hope.

CHAPTER THREE

REMOTE MONITORING

With the comprehensive evidence presented in the previous sections on hospital readmissions, this thesis proposes remote monitoring as a viable solution to mitigating the number of hospital readmissions associated with PN and HF. The data analysis consistently highlighted the elevated readmission rates in specific hospitals; this emphasizes the need for targeted interventions. The goal of remote monitoring, in this case, will establish the following;

- A continuous connection between healthcare providers and patients
- The potential to detect early signs of deterioration
- Enhancing proactive care
- Ensuring timely interventions.

This approach aligns with the shift towards preventive and patient-centric healthcare, potentially reducing the burden of unplanned hospital readmissions. Telehealth.HHS.gov defines remote monitoring as “The ability to monitor certain aspects of a patient's health from their own home has become an increasingly popular telehealth option. Remote patient monitoring lets providers manage acute and chronic conditions. Moreover, it reduces patients' travel costs and infection risk” (Telehealth.hhs.gov, 2023). The following pages will focus on multiple suggestions within the realm of remote monitoring that will support patients and help healthcare professionals reduce readmission rates.

- Mobile applications
- Monitoring kits
- Wearable devices
- Teleconsultation
- Bluetooth devices
- Daily automated health surveys

Mobile applications

When it comes to post-discharge practices, mobile applications can be utilized. Secure messaging is one of the many innovative methods that appears as a pivotal tool for patients after discharge, as this feature can facilitate seamless communication between patients and their treatment teams. With this process, patients can relay their concerns, share updates on their recovery progress, and seek guidance on post-discharge care or any other concerns. Depending on the nature of communication a particular healthcare facility might have in place, some patients may be able to receive real-time responses, which undoubtedly enhances patient engagement and allows healthcare professionals to address emerging situations. At this rate, there is a high possibility of finally bridging the communication gap between patients and healthcare professionals. Not only does this have the potential to decrease readmission rates, but it also conserves valuable hospital resources, ensuring they are available for individuals who might require immediate medical attention.

Monitoring kits

Moving on to the following recommendation regarding remote monitoring, monitoring kits emerge as one of the many solutions available. These kits will serve as tools for patients to track their health post-hospital discharge diligently. As these kits will be specifically crafted to facilitate monitoring of various conditions, they will enable the patients to engage in their healthcare recovery journey actively. This will not only promote better health outcomes but will also facilitate timely interventions when necessary.

Some tools that can help with this process include;

- Blood pressure monitor: This tool will enable patients to measure their blood pressure levels regularly. For example, if a patient's blood pressure is elevated, this could be a crucial indicator that the patient might be deteriorating when recovering from HF or PN. Utilizing this device will allow patients to actively monitor their blood pressure while allowing for timely intervention in situations with potential health complications.
- Medication dispenser: The medication dispenser system aims to offer patients a reliable method to manage their treatment regimen effectively. This ensures a timely and consistent administration of their medications. It also serves as an essential component in medication management by providing patients with the tools to stay organized while adhering to their prescribed dosage schedules. This system's role will help optimize the effectiveness of treatment and promote better health outcomes for individuals managing HF and PN.

- Activity tracker: Gentle activity such as light walking can promote circulation and prevent complications like muscle weakness. An activity tracker will be used to record the patient's physical activity levels; this way, they can track their overall well-being and help healthcare providers assess their progress when needed. This creates the atmosphere for adjusting their lifestyle or treatment plan as needed.

- Pulse Oximeter: For patients managing HF and PN, it is no surprise that fluctuations in oxygen saturation can indicate the need for adjustments to their treatment plan. In the case of patients recovering from either PN or HF, a pulse oximeter will serve as a tool for monitoring their oxygen saturation levels. This will help the patient's treatment team by measuring the amount of oxygen in the blood; this way, they can assess respiratory function and possibly detect potential complications such as hypoxemia. This goal will allow patients to monitor their respiratory status at home, which will also open up room for them to establish timely communication with healthcare providers and facilitate proactive management of their conditions.

Wearable device

In this case, a perfect example of a wearable device would be a smartwatch. Wearable devices have many different functions, including tracking a patient's heart rate or monitoring their vital signs. This can then provide valuable insights into their overall health and recovery progress. Additionally, these smartwatches often have built-in features such as alarms that help notify patients to take their medications or even stay hydrated. This is also another way patients can constantly monitor their healing process

while making sure to adhere to their treatment plan and finally being able to seek medical attention if they notice any adverse changes in their health recovery journey.

Teleconsultation

Teleconsultation offers a convenient and effective means of post-discharge care for many different reasons. Being able to schedule follow-up appointments virtually with healthcare providers post-discharge allows patients to relax in the comfort of their homes while still getting medical guidance. Besides that, due to specific SDOH, some patients face getting to a hospital big enough to handle post-care for diseases such as PN and HF, which might be a hassle, possibly due to the distance of those hospitals. Having the options for teleconsultation eliminates the stress of finding a way to get to the hospital. It is also important to note that teleconsultation can possibly reduce the risk of exposure to infectious agents. Finally, it allows healthcare providers to facilitate timely interventions while improving outcomes for individuals transitioning from hospital to home care.

Bluetooth devices

An example of a Bluetooth device that might benefit PN and HF patients' recovery post-discharge is a Bluetooth-enabled spirometer. This will help these patients to monitor their lung function and respiratory health remotely. The Bluetooth-enabled spirometer can be connected to a smartphone or a tablet, allowing for easy tracking of lung function measurements and transmitting the data to healthcare providers for review and analysis. This goal is to allow for early detection of changes in lung function in hopes of facilitating early interventions and preventing further complications.

Daily automated health surveys

An example of this can be an application that can be accessed with an electronic device that allows patients to answer questions daily about their health. Examples of these questions could include questions about their;

- New symptoms
- Medications
- Physical health
- Any other questions they might have, etc.

This could also be customized to include questions that pertain to individual patients. For example, if a patient did not eat healthy before experiencing HF, one of the questions highlighted in the survey could ask if the patient had any vegetable or fruit intake for the day. Completing this survey each day will enable the patients to provide valuable data to their healthcare providers, who can remotely monitor their progress and again intervene promptly in case of the rise of any concerning trends or symptoms emerging. One thing that the app can do is provide personalized recommendations to help patients better manage their condition. For example, if patients did not eat healthily before experiencing HF, if they answered no to having no vegetables or fruits, the application can provide some easy vegetable meals or fruit recommendations for them to eat. The automated health survey will provide a convenient method for individuals to monitor their health status after hospital discharge regularly. It will contribute to improved outcomes during the post-discharge while providing another proactive remote monitoring method for patients in the comfort of their homes.

LAW AND ETHICS

While considering remote monitoring as a possible solution for hospital readmissions, examining all aspects, including its legal and ethical implications, is essential. For this system to work, it is essential to thoroughly consider these ethics and laws when implementing remote monitoring concerning the patients' rights and privacy. According to the U.S. Department of Health and Human Services, “Covered health care providers and health plans (covered entities) can use remote communication technologies to provide audio-only telehealth services when such communications are conducted in a manner that is consistent with the applicable requirements of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) Privacy, Security, and Breach Notification Rules (HIPAA Rules). The U.S. Department of Health and Human Services (HHS) Office for Civil Rights (OCR) developed this guidance to help covered entities understand how they can use remote communication technologies for audio-only telehealth in compliance with the HIPAA Rules, including when OCR's Notification of Enforcement Discretion for Telehealth Remote Communications (Telehealth Notification) is no longer in effect.” (U.S. Department of Health & Human Services, 2022). A considerable part of remote monitoring encompasses collecting and transmitting patient health information. When this process is initiated, healthcare providers must prioritize the secure transmission and storage of patient data to safeguard patient privacy effectively and comply with the Health Insurance Portability and Accountability Act (HIPAA). These regulations are essential as they are stringent measures to ensure the confidentiality and integrity of patient information. Adhering to these legal requirements

protects patients' privacy while fostering trust between healthcare providers and patients, but it also maintains a strict adherence to data protection laws in remote monitoring.

According to [telehealth.hhs.gov](https://www.telehealth.hhs.gov), “Most states require you to get your patient's official informed consent before you can provide treatment using telehealth. Patients can give informed consent through signed paperwork completed before the appointment and verbal consent at the beginning of each session. The additional participant must also consent if someone else joins the visit, such as a caregiver or another provider” ([Telehealth.HHS.gov](https://www.telehealth.hhs.gov), n.d.). Before even going into details about what remote monitoring is to a patient, it is crucial to fully explain informed consent and to include comprehensive information about its purpose, potential risks, and benefits. This ensures that patients fully understand how their data will be utilized, who will have access to it, and what will be done to safeguard it. Looking at this from the healthcare provider side, it is essential to understand that these providers are responsible for ethically and accountable using patient data collected through remote monitoring programs. It is crucial to adhere to the terms outlined in the patient's consent. For example, a patient's data should not be shared or exploited for commercial gain without explicit consent. This whole process touches on maintaining the trust and transparency that has possibly already been established between the providers and the patient and respecting their rights and privacy. Upholding these standards is a step forward in promoting remote monitoring initiatives.

According to an article titled *The Ethical and Legal Implications of Remote Monitoring of Medical Devices*, derived from the NLM, “For many patients, data

access thus derives from an interest in managing their health care, in some cases with a level of urgency or attention that would be impractical otherwise. Thus, we find a strong argument from respect for patient autonomy to provide patients greater access to their device data. While the scenarios above might be why patients would want access, their right to self-determination, ownership over their physiology, and opportunity to participate fully in their health maintenance weigh heavily in favor of providing access” (Cohen et al., 2020). Remote monitoring seeks to allow patients to actively participate in managing their health and recovery process. Not only do remote monitoring processes allow patients to access their data, but most of these technologies are also equipped with information needed for patients to comprehend their health data. This also promotes the space for patients to engage in decision-making with their healthcare providers to foster a collaborative approach to healthcare management. All in all, this enhances patient autonomy by promoting a sense of ownership over one's health outcomes.

Disadvantages of remote monitoring

Though remote monitoring offers numerous positive outcomes, it is also associated with negative implications. While this thesis seeks to promote remote monitoring, it is equally important to acknowledge its drawbacks. Despite remote monitoring's high potential to improve healthcare access and quality, remote monitoring may also pose challenges, such as

- Data security concerns: Given that remote monitoring is centered around sensitive patient information, it is normal for concerns to arise about the potential of

unauthorized access to their data during transmission over networks or the f data breaches or cyberattacks targeting remote monitoring systems.

- Equity and access: While remote monitoring might be beneficial for some patients, it is crucial to consider equity and access. Regardless of a patient's socio-economic status, it is imperative to consider a patient's socio-economic status when offering the option of remote monitoring as part of the healing process.

- Risk of alarm fatigue: This can occur when healthcare providers become desensitized to frequent alerts generated by monitoring systems. This might be a disadvantage to the patients, especially those recovering from HF and PN, as it can lead to delayed responses to critical issues. If this action is continued, it can undoubtedly compromise the patient's safety and recovery process, as there is a high potential that a genuine emergency may not receive the correct attention within a certain amount of time.

CHAPTER FOUR

DISCUSSION

The potential for remote monitoring to transform patient care is demonstrated by the use of this technology to lower hospital readmission rates. Remote monitoring allows for early detection of declines in patients' health state, allowing prompt treatments and maybe preventing readmissions. It does this by giving continuous, real-time data on patients' health status. However, it is crucial to acknowledge the challenges, including data security, equitable access, and the risk of alarm fatigue. Addressing these issues is critical for the successful implementation of remote monitoring systems. The ethical and legal considerations, particularly regarding patient privacy and informed consent, underscore the need for careful planning and adherence to regulations.

LIMITATION

One limitation of this study is its narrow focus on only two states, Florida, da, and Texas, as well as on just PN and HF. This decision was made intentionally to maintain a smaller scale for this thesis and to concentrate on the specific geographic areas characterized by high readmission rates. Though this approach allowed for a more targeted examination of the problem, it may limit the generalizability of the findings to a broader population. The emphasis on these particular states and two diseases still seeks to provide valuable insights into regional variations, other diseases, and factors contributing to readmissions, which could inform future research endeavors. One additional limitation that needs to be taken into account is the comparatively new nature of remote monitoring.

Considering how recently these technologies have been widely used, there is a distinct lack of detailed data that can assist with and direct more in-depth study efforts.

NEXT STEPS

This thesis lays the groundwork for future initiatives aimed at improving patient care and the effectiveness of healthcare systems. Future studies could investigate how remote monitoring could help with a variety of chronic and acute health disorders, expanding their emphasis beyond simply HF and PN. New studies can scale towards the idea of possibly initiating pilot programs that utilize modern remote monitoring technologies, the insights and conclusions drawn from this thesis can be further tested and refined for broader implementation.

CHAPTER FIVE

CONCLUSION

In conclusion, the extensive evidence presented in this thesis strongly suggests that remote monitoring holds significant promise for gradually reducing readmission rates associated with HF and PN, even though immediate reductions in readmission rates cannot be guaranteed unequivocally. Healthcare systems can enhance patient care and progress toward more sustainable and effective chronic condition treatment by leveraging the potential of remote monitoring technologies. Consequently, while the path to realizing these improvements may require time and adaptation, the findings of this thesis provide a compelling case for the broader adoption of remote monitoring as a strategic measure to reduce the burden of HF and PN readmissions ultimately.

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BIOGRAPHY

Mariam Adam resides in Northern Virginia but is originally from Ghana, where she is known by her local name, Abena. She currently serves as a Behavioral Health Specialist for the Fairfax County Government, where she specializes in mental health services. Mariam's academic achievements include a Bachelor of Science in Health Administration and, as of May 11th, a Master of Science in Health Informatics, both degrees obtained from George Mason University. She deeply values the time spent with her family and close friends, cherishing these moments above many others.