Case Study: Determining whether Remote Patient Monitoring can reduce 30-day Readmission Rates for Congestive Heart Failure (CHF)

Steven Myers, MS

Rockville, MD

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Background

There are approximately 133 million Americans who have a Chronic Disease which accounts for $1.3T in healthcare costs per year. Heart Disease contributes $315B annually and is the number one cause of death in the U.S. Within the cardiovascular disease population 6.5 million adults are diagnosed with Congestive Heart Failure (CHF) each year which represents $30.7B spent annually and accounts for one out of eight deaths according to the Centers for Disease Control and Prevention. Furthermore, the national 30-day readmission rate for CHF is 23 percent, making it the number one Diagnostic Related Group (DRG) for 30-day hospital readmission. CHF is among the high priority conditions in Medicare's Hospital Readmissions Reduction Program (HRRP) and value-based purchasing program.

The role of technology in healthcare delivery can never be underestimated in the 21st century. It has improved the level of care while reducing the costs incurred by the patients (Aceto et al., 2018; Deen, 2015). One of the most critical digital health interventions during the COVID-19 pandemic is telehealth and Remote Patient Monitoring (RPM), which provides real time monitoring of patients by their healthcare provider. Various studies have validated the effectiveness of telehealth and RPM technology in the provision of health care services, especially in improving patient-medical staff interaction while reducing the cost of treatment as a form of patient-centered service. Malasinghe et al. (2017) suggest that remote monitoring that involves the use of mobile monitoring applications has proven to be advantageous to both health organizations and patients. The authors indicate that target sub-groups that will benefit from RPM/Telehealth should include, the elderly, people living with disabilities, and those suffering from chronic diseases. Although the care is not discriminatory, and everybody needing health care should be included in the plan, some groups need remote monitoring care more than others due to the nature of their health requirements (Malasinghe et al., 2017). For example, elderly populations may require frequent visits to health centers, while people living with chronic diseases require regular checkups with their medical provider.

This case study analysis the use of Remote Patient Monitoring with telehealth services in patients discharged from the hospital with a primary diagnosis of Congestive Heart Failure. The program included follow-up calls within 24-72 hours post-discharge and outpatient clinic visits within 7 days for a 30-day duration.

Purpose

This study was designed to evaluate the benefits of 30-day Remote Patient Monitoring (RPM) in high-risk congestive heart failure (CHF) patients to reduce hospital readmissions. Therefore, for this study to achieve its objectives, the participants were subjected to daily remote monitoring and weekly visits to heart failure clinic services which were followed by cardiac rehabilitation therapy after the 30-day period to help reduce hospital readmission rates. The national average for 30-day hospital re-admission rates for CHF is 23% and can lead to poor health outcomes, especially those facing financial constraints and lifestyle challenges. In a study of 2.6 million

patients published in the International Journal of Cardiology Kwok, et, al. found that the cost of 30-day hospital readmission for CHF is approximately $15,618. Therefore, remote monitoring health services can benefit patients and their families. This study assesses whether improved access to healthcare services can reduce readmission rates for CHF patients. The results can help healthcare stakeholders to implement policies and programs that incorporate RPM to reduce the cost of health care while improving health outcomes. The impact of technology in healthcare has improved patient-provider remote interaction. Malasinghe et al. (2016) report that remote technologies in healthcare have contributed to the effective and fast delivery of health services. Therefore, healthcare organizations need to institute remote technology programs to validate its effectiveness and efficiency. Pronovost et al. (2022) explain that remote monitoring of patients suffering from various types of illnesses effectively improved their health outcomes. Although many hospitals were not prepared to monitor their patients from home, the high rates of COVID-19 cases led to the scramble for hospital beds, which were limited (Wright & Caudill, 2020). There are few studies assessing the effectiveness of remote monitoring health care services during COVID-19, but the existing ones indicate that patients had lowered health care costs. The study by O'Connor et al. (2016) found that telehealth reduced 30-day hospital readmissions. They suggest that hospitals need to reduce hospital readmission rates of heart failure (HF) patients and other patients with chronic diseases. Patients suffering from chronic diseases can incur high hospitalization costs due to frequent readmissions. Gordon et al. (2020) explained that when patients are given a chance to recover in their home environment, their improvement is faster than in a hospital environment. These studies indicate that it is possible to improve health care by applying RPM and telehealth services. Therefore, this case study hypothesizes the following:

- Remote Patient Monitoring with telehealth services can contribute to the reduction in 30-day readmission rates for CHF patients.
- Remote Patient Monitoring with telehealth services can help reduce the cost of care for patients discharged with CHF.
- Remote Patient Monitoring with telehealth services will contribute to improved health care

Method

The study used the statistical analysis method, that included data relating to key indicators of CHF. The most important elements were the statistical significance of the values of the relationship between the observed variables. The data collected included the following measurements: all-cause readmission rate, blood pressure, Oxygen intake (O2), and weight of the patients enrolled in the program. Blood glucose was monitored for patients with Type II diabetes as needed. The data entry was done using a fully integrated mobile application which included an android tablet with bluetooth interface to a blood pressure cuff, a pulse oximeter (oxygen/heart rate) and a scale. The data was then transmitted to a web-based clinical interface application

(CIA) via a secure HIPAA compliant network and reviewed by a Nurse Practitioner (NP) and/or a Registered Nurse (RN). Assessment of the patient's condition were shared with a Cardiologists or Primary Care Physician (PCP) weekly or earlier if the therapeutic intervention needed to be revised.

The primary outcome was to determine if remote patient monitoring services for Congestive Heart Failure (CHF) would contribute to a reduction in 30-day readmission rates in the home setting. Therefore, the study aimed to answer the following research questions:

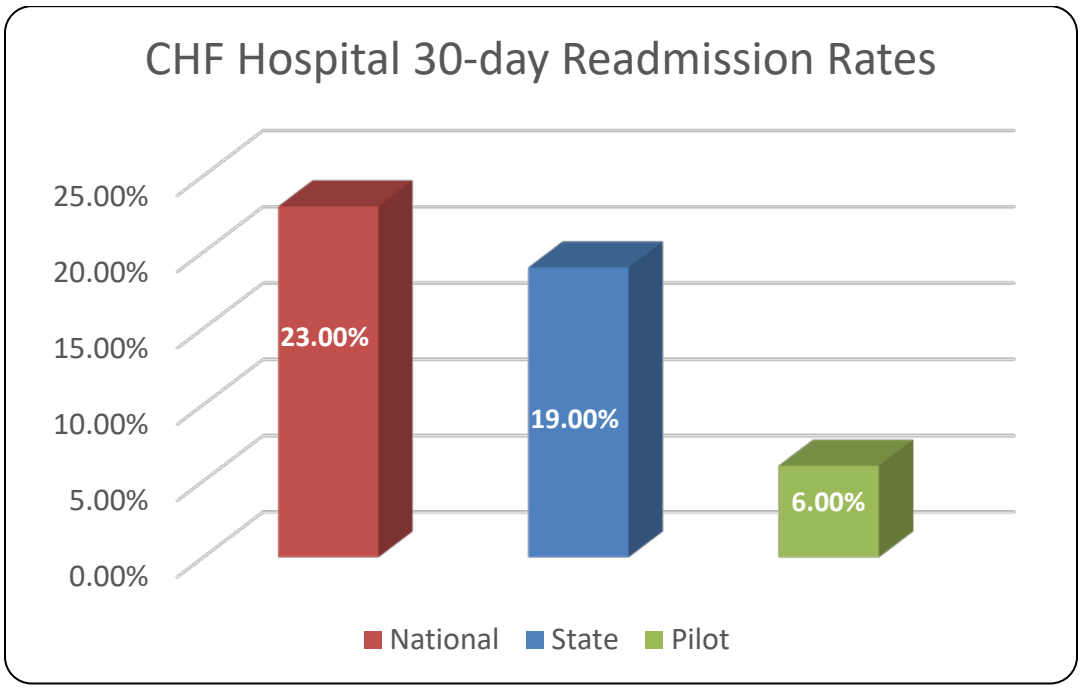
- Does a remote patient monitoring program with telehealth reduce 30-day hospital readmission for CHF patients?
- Do CHF patients using the remote monitoring program improve clinical outcomes and have a reduction in the cost of care?

Results

Approximately 123 patients from a National Healthcare System's inpatient population were screened based on their primary diagnosis related group (DRG) of CHF and their eligibility to participate in the pilot. A total of 86 patients with primary heart failure were enrolled. The participants provided consent to voluntarily provide their data to the study. Participants were not compensated for their participation. The Nurse Practitioner (NP) and Registered Nurses (RN) monitored the patients progress daily and provided a summary report to the Cardiologist and the Primary Care Physician (PCP) upon completion of the 30-day program.

Eighty-six patients, approximately 69.91%, were eligible and were recruited to participate in the program. 85% (69) of the enrolled participants completed the program successfully. Patients were enrolled in the pilot program for 30 days to determine readmission rates post discharge. The participants indicated a significant improvement as measured by a QOL survey and had a lower all-cause readmission rate of 6%. This percentage translates to approximately 5 patients out of the 86 total enrollees were readmitted. The national 30-day readmission rate for CHF patients is approximately 23%. Therefore, there was a significant reduction in 30-day CHF readmission rates versus the national average which was statistically relevant. Based on these results we calculated the cost savings to be approximately $234,000 over the 30 day period.

After completion of the 30-day remote monitoring program, about 51% or 41 patients voluntarily were enrolled in cardiac rehabilitation to help improve their cardiac function and healthcare outcomes.



Discussion

One method of reducing the cost of healthcare is to reduce patients' 30-day hospital readmission rate, especially in patients discharged with a primary diagnosis of CHF. Therefore, any strategy that can be applied to increase the efficiency of their treatment while reducing the amount of time they spend in the hospital should be studied and implemented, especially in an era where hospitals have recorded an increase in the cost of care (Kripalani et al.,2014; McIlvennan et al., 2015). This study has found that the application of remote patient monitoring can have a significant impact on reducing readmission rates. Therefore, organizations should consider adopting remote patient monitoring with telehealth services for patients discharged with a chronic disease. Multiple studies have validated that remote healthcare services have multiple benefits, including reducing total costs, supporting family members, and allowing the patient to recover in their home environment (Ong et al., 2016; Yager, 2020).). It is the responsibility of various healthcare stakeholders to work as a team to develop an effective policy to reduce the cost of care while improving the quality of care for chronic disease patients using remote patient monitoring and telehealth services.

Conclusion

Quality health care services in the 21st century is a priority that healthcare systems must manage with fewer resources and at a lower cost. One way of improving the quality of care is by embracing digital technology and implementing remote patient monitoring with telehealth services. This study's aim was to determine whether remote patient monitoring could contribute to lower readmission rates, resulting in reduced health care costs and giving patients the tools necessary to manage their Congestive Heart Failure more effectively in their home environment. We concluded that Remote Patient Monitoring (RPM) reduces 30-day hospital readmission rates while reducing cost of care and therefore, should be considered as a viable therapeutic intervention upon hospital discharge.

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