

Deploying Telehealth to Reduce Hospital Readmissions
in Rural, Low Income Communities

March 1, 2021

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Abstract

Caring for an aging population with chronic health conditions is placing great strain on healthcare delivery and financing systems both in the United States and throughout the world. This burden is magnified by a fragmented health care delivery system which historically has underinvested in community-based care coordination, remote patient monitoring and telehealth; leading to declines in health status, poor health outcomes, and increases in hospital readmissions. In the United States alone, the cost of hospital readmissions exceeded \$26 billion annually. Adding to these challenges is the lack of access to care experienced by historically underserved populations as well as those individuals and communities who are underinsured or uninsured. Health outcomes for individuals from underserved populations consistently lag those of individuals from higher incomes and with more direct access to care.

This research study was designed to examine 30-day hospital readmission rates experienced by underserved populations using telehealth. Specifically, the study cohort was drawn from the rural, low-income community in and around Hattiesburg, Mississippi in the southern United States. According to the USDA Economic Research Service (ERS), the average per capita income for Mississippi residents in 2019 was \$38,914 with the rural per capita income at \$36,677. For Hattiesburg, average per capita income was \$23,144. The ERS reports, based on 2019 data, that the poverty rate in rural Mississippi is 22.5%, compared with 16.1% in urban areas of the state. As noted in Table 2, 32.5% of residents in Hattiesburg have incomes below the US poverty rate.

This report is a retrospective study of the impact of the use of telehealth on 30-day hospital readmission rates. The technology used was a telehealth product called Premier, provided by Electronic Caregiver, Inc. – a digital health technology company, The Premier product is a cellular-based health hub and mobile personal emergency response system (PERS) which included voice-based medication reminders, 24/7 access to emergency services, daily activity checks, audio televisits, and a care management dashboard for triage of notifications and alerts. Analysis of readmission rates revealed that those individuals opting to utilize telehealth demonstrated a 47.7% lower readmission rate than those not using telehealth, as drawn from data published from the Centers for Medicare and Medicaid Services (CMS) for the participating hospital system. These results demonstrate the ability to reduce hospital readmission rates using telehealth in rural, low-income communities. Follow-on analysis is recommended to focus upon long-term impact on health care utilization and health outcomes.

Deploying Telehealth to Reduce Hospital Readmissions in Rural, Low Income Communities – a
Retrospective Analysis on 30-day Hospital Readmission Rates in Mississippi (USA)

Introduction

In most developed countries, individuals over the age of 65 years are comprising an increasingly larger proportion of the population. In the United States alone, the proportion of individuals over 65 years is projected to increase from its current 15% (~46 million individuals) of the total population to an estimated 24% (~98 million individuals) of the total population by 2060 (Mather, Scommegna, & Kilduff, 2019). Although healthcare advances have increased life expectancy, this has not translated into individuals being healthier later in their lives. This increased life expectancy, coupled with the lack of improved health later in life, has placed great strain on public safety net programs such as Medicare. In fact, Medicare spending was estimated to comprise 15% of total federal spending in 2017, with benefit payments totaling \$702 billion (Cubanski, Neuman, & Freed, 2019). Unfortunately, hospital readmissions have been shown to account for \$26 billion of annual Medicare spending, with nearly 25% of readmissions being considered as potentially avoidable (Center for Health Information Analysis, 2015; Segal, Rollins, Hodges, & Roozeboom, 2014).

Hospital readmissions soon after discharge are expensive. In fact – though any hospitalization is expensive – Medicare recipient readmissions have been shown to be approximately 5% more expensive than typical hospitalizations (Barrett, Wier, Jiang, & Steiner, 2015). Additionally, chronically ill Medicare beneficiaries are estimated to account for 98% of Medicare readmissions (DuBard, Jacobson Vann, & Jackson, 2015). These findings have resulted in hospital readmissions becoming a priority for the Center for Medicare and Medicaid Services (CMS), which implemented the Hospital Readmission Reduction Program (HRRP) in 2012 (McIlvennan, Eapen, & Allen, 2015). Although it is evident that hospital readmission levels have declined since the implementation of HRRP, they remain high, and the observed decline has been varied as a function of condition. In fact, in 2013-2014 there was a 5.6% decrease in hospital readmissions for heart failure patients, but only a 0.5% reduction in readmissions in pneumonia patients (Barrette & McGraves-Lloyd, 2016). Additionally, although readmission rates have decreased, they have still been observed to exceed 18% for targeted conditions and 13% for non-targeted conditions (Zuckerman, Sheingold, Orav, Ruhter, & Epstein, 2016).

While emphasis has been placed on reducing hospital readmissions, the results of this focus has not been as effective as hoped, with excess readmission rates at 62.4% of reported hospitals/measurements experiencing excess readmission ratios (CMS, 2018). Additionally, even with levied CMS readmission penalties estimated at \$528 million in 2017 (an increase of \$108 million from the previous year), the majority of Medicare patients' (9,195,700) stays occur in hospitals with penalties equal to < 1% (Boccuti & Casillas, 2017).

All of these issues are magnified when examining the health outcomes experienced by individuals from underserved populations. These include individuals from low-income communities, persons of color, individuals requiring language translation services, individuals from rural communities, immigrants resistant to seek healthcare due to safety concerns, persons with disabilities, persons requiring mental health or substance use disorder services, and those who lack health insurance or are underinsured. Moreover, for many of these individuals, their ability to access healthcare services is further compromised due to social determinants of health (SDoH). Together, these factors lead to negative health outcomes, an overuse of emergency medical services, and an increase in readmissions.

Taken holistically, these issues illustrate the importance of proactively expanding access to care to patients and their care communities so as to improve outcomes. One such method that can be considered attractive in these efforts is the utilization of telehealth to enable virtual visits, remote patient monitoring, chronic care management, and transitional care management. Accordingly, the focus of this research was to analyze 30-day readmission rates across two cohorts of individuals in the same rural community from the same institution. One group did not utilize telehealth. The second group utilized a telehealth service.

Methods

Aims

The primary aim of this investigation was to evaluate 30-day readmission rates associated with patients utilizing electronic telehealth and caregiving technology as compared CMS published readmission rates for individuals from the same institution not utilizing electronic caregiving technology. Individuals studied are from a rural, low-income community in and around Hattiesburg, Mississippi.

Design

This was a retrospective medical record analysis to evaluate hospital readmission rates for patients utilizing telehealth. Data was drawn from study cohorts aged 65 years of age and older. Additional demographic data in participants is found in Table 2. Although comparisons were made in this investigation, there was no pre-defined control group. As such, the investigation qualifies as a Level 4 Case Series investigation.

Setting

Patients included in this investigation were residents of the greater Hattiesburg, Mississippi region in the Southeast United States. This is a very low-income, high poverty rural community. All participants were admitted to the hospital system and received medical care prior to being discharged. Following discharge from the care institution, participants who elected to utilize telehealth services – Electronic Caregiver’s Premier electronic system – were included in the investigation. The period of the investigation ran from June 1, 2017 through May 31, 2018.

Data Sources

A search for patient data was conducted utilizing data stored within the hospital facility records system. Specifically, data sources for this investigation included the NetSmart® paperless electronic health records system charts for those patients consenting to participate and utilize the Electronic Caregiver remote patient monitoring telehealth system.

Participant Exclusion

Although effort was made to include all eligible participants, as with most human subject research, there were exclusions. Excluding factors in this investigation included:

- 1) Hospital system patients who were admitted to home care for nursing care or physical therapy, but who had been discharged from a hospital more than 30 days before being admitted into the hospital home care system, or had not previously been in the hospital at all.
- 2) Friends and family members of hospital system employees who had not been admitted into hospital home care system, but who were eligible for inclusion under existing home monitoring systems.
- 3) Hospital system patients who were admitted to homecare but who were readmitted to the hospital before the Electronic Caregiver® Premier system was installed.

- 4) Hospital system patients who had been out of the hospital less than 30 days when the final date of study (May 31, 2018) was reached.

Statistical Design

The underlying statistical design associated with this investigation was a descriptive analysis comparing readmission percentages across the two groups.

Results

With regard to the readmission data, those for both the hospital system and the Electronic Caregiver remote patient monitoring telehealth cohort are displayed in Table 1. Demographic data on study participants are displayed in Table 2.

Discussion

This investigation examines the impact of remote patient monitoring and telehealth on hospital readmission rates in those individuals over 65 years from rural, low-income communities. This is an important area for continued investigation given the impact on access to care given the covid19 pandemic, the rising awareness of the impact of social determinants of health (SDoH) on health status, and the continued un-and-underinsured population in the US – disproportionately found in rural and low-income communities. Any move toward broad adoption of methods to achieve value-based care needs to account for the health status and outcomes of these individuals and communities.

The key finding of this investigation is that use of remote patient monitoring and telehealth may have the potential to reduce unintended hospital readmissions for discharged patients over 65 years of age from rural, low-income communities. Previous investigations have reported 30-day unplanned hospital readmission rates across individuals 65 years and older to range between ~13% and 16% depending on age (Berry et al., 2018). Additional data have suggested readmission rates for Medicare average ~16.1% (Berry et al., 2018). The data describing the readmission rates associated with the hospital system were observed to be higher (19.3%) to these published rates while those observed for those patients electing to utilize the Electronic Caregiver telehealth system were dramatically lower than these previously published estimates (10.1% vs. 13%-16%).

Previous work has suggested the most frequent principal admitting diagnoses for hospital readmissions are not related to fractures resulting from falls, but rather due to conditions associated with potentially avoidable admissions (i.e. - symptoms-related events and medication mismanagement) (Berry et al., 2018; Rosen, Fridman, Rosen, Shane, & Pevnick, 2017). Thus, advancing capabilities within telehealth and remote patient monitoring to include PERS, medication management, care plans, vital capture, and care reminders may function to complement integrative care systems not only by facilitating various response options when help is requested remotely, but also by providing both remote symptom assessment and increased adherence to prescribed medication regimens. However, more investigation into these potential aspects is necessary.

Limitations

It should be noted that the investigation presented in this document has limitations that include:

- 1) Study-site. This investigation was conducted as a single-site study. Additional work outside the hospital system and the target region in the Southeastern US is necessary. In its current state, the generalizability of the results of this investigation are not confirmed. However, we have no underlying cause to infer that the results would not generalize.
- 2) Observational Investigation. This was a retrospective, observational study. We infer that the influencing factor for hospital readmission reduction was the utilization of electronic caregiving technologies. However, it cannot be confirmed that uncontrolled aspects associated with the study sample may have influenced the observed readmission rates.
- 3) Exclusions. It was outlined previously that potential participants were excluded from this investigation for various reasons. These excluded individuals (if included), may have changed the results of the investigation. Although this alteration in the investigation could have been positive with regard to the utilization of electronic caregiving technologies, it also could have been negative. The authors have no way of identifying the impact of these exclusion on the investigation.

Conclusions

Based on this retrospective analysis, telehealth has the potential to impact hospital readmission rates in individuals over the age of 65 years from rural, low-income communities. Specifically, the Electronic Caregiver remote patient monitoring and telehealth system demonstrated a 47.7% reduction

in hospital readmission when compared to the open-source numbers associated with the institution from which the sample of participants was recruited. These type of outcomes speak highly of the ability of telehealth to improve health outcomes and deliver value-based care. Larger scale, prospective studies are recommended to further study the impacts and opportunities to enhance quality of care and optimize resource utilization, particularly among members from underserved communities.

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Table 1

Data utilized, by group, to determine readmission rates throughout the investigation.

Data Source	Total Discharges	Readmissions	Rate of Readmission
Hospital System	5013	968	19.3%
Electronic Caregiver®	69	7	10.1%

Note. Data for hospital discharges and readmission from Centers for Medicare and Medicaid Services (2018).

Table 2

Demographics of study cohort and Hattiesburg, Mississippi (MS)

	Hattiesburg, MS	Study Cohort (n = 69)
Gender/Male	45.2%	34.8%
Gender/Female	54.8%	65.2%
Race/Black	53.3%	7.8%
Race/Caucasian	40.3%	84.4%
Race/All Other	6.4%	7.8%

Notes: 2019 Demographics of Hattiesburg, MS (source: <http://www.city-data.com/city/Hattiesburg-Mississippi.html>)

- Population of Hattiesburg MS was 45,836. Study cohort was drawn from around the region.
- Median household income was \$34,058; 26% below Mississippi state average of \$45,792
- 32.5% residents live in poverty.
- Forrest Health is a regional medical provider drawing from 19 rural counties throughout southern Mississippi