

# A Pilot Investigation into Utilizing Electronic Caregiving Technology to Reduce Hospital Readmissions in Older Patients

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# Abstract

Caring for the aging population is placing great strain on both healthcare systems and those social programs designed to support this group throughout the developed world. With the cost of hospital readmissions exceeding \$26 billion and expected to grow, reducing the burdens associated with this issue has come into focus. This focus has led to the investigation of various methods for reducing readmissions. One current area of limited study to date is the use of electronic caregiving technologies. As such, the goal of the current pilot study was to assess the impact of the Electronic Caregiver® Premier system on hospital readmission rates. Analysis of readmission rates for the single site utilized in this study revealed that those individuals opting to utilize the Electronic Caregiver® Premier technology demonstrated a 47.67% lower readmission rate than those individuals opting not to utilize the electronic caregiving system. The positive nature of these results justifies continued investigation into this topic to confirm hospital readmission rate reduction through the use of electronic caregiving technologies.

# 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.<sup>1</sup> 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 as 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.<sup>2</sup> Unfortunately, hospital readmissions have been shown to account for \$26 billion of medicare spending with nearly 25% of readmissions being considered as potentially avoidable.<sup>3-4</sup>

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 a typical hospitalization.<sup>5</sup> Additionally, chronically ill Medicare beneficiaries are estimated to account for 98% of medicare readmissions.<sup>6</sup> 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.<sup>7</sup> 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, 2013-2014 a 5.6% decrease in hospital readmissions for heart failure patients but only a 0.5% reduction in readmissions in pneumonia patients.<sup>8</sup> Additionally, although readmission rates have decreased, they have still been observed to exceed 18% of targeted conditions and 13% for non-targeted conditions.<sup>9</sup>

Although emphasis has been placed on reducing hospital readmissions, the results of this focus has not been as effective as hoped with readmission rates reported for 62.4% of reported hospitals/measures experiencing excessive readmission ratios.<sup>10</sup> 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%.<sup>11</sup> Based on these issues, additional methods for providing support to hospitals and patients in an effort to improve outcomes are needed. One such method that can be considered attractive in these efforts is the utilization of technology. Thus, the focus of this pilot investigation is to compare readmission rates across two groups of individuals from the same institution, those choosing to utilize electronic caregiving technologies and those choosing not to utilize electronic caregiving technologies.

# Methods

## Aims

The primary aim of this investigation was to evaluate 30-day readmission rates associated with those patients utilizing electronic caregiving technology and compare those with CMS published readmission rates for individuals from the same institution not utilizing electronic caregiving technology.

## Design

This was a retrospective medical record analysis to evaluate hospital readmission rates for geriatric patients utilizing electronic caregiving technology. Additionally, 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 Southeast United States. All participants were admitted to the care institution and received medical care prior to being discharged. Following discharge from the care institution, participants who elected to utilize electronic caregiving technology 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® Premier home monitoring system.

## Participant Exclusion

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

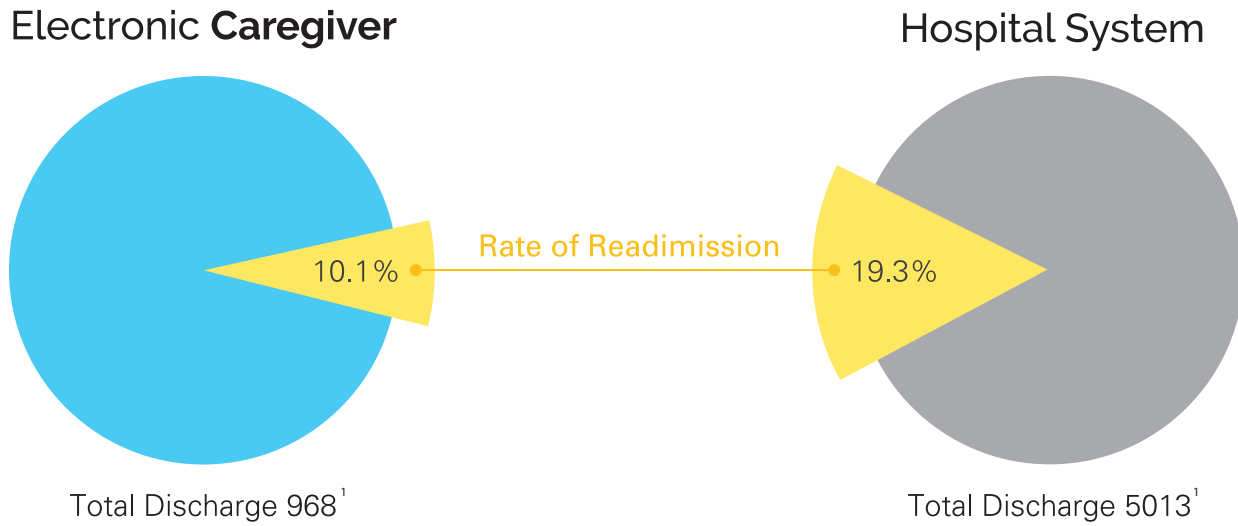
- 1) Hospital system patients who were admitted to home care for nursing care or physical therapy, but who had been discharged from a hospital more than 30 days before being admitted into FGHC, or not previously in the hospital at all.
- 2) Friends and member of family of hospital system employees who had not been admitted into Forrest General Home Care, 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® Premier cohort are displayed in Table 1.



**Figure 1.** Data utilized, by group, to determine readmission rates investigated throughout the investigation.

<sup>1</sup>Data source – <https://data.medicare.gov/Hospital-Compare/Hospital-Readmissions-Reduction-Program/9n3s-kdb3/data>



## Discussion

There are currently few known investigations examining the impact of electronic caregiving technologies on hospital readmission rates in those individuals over 65 years. This area is an important area for continued investigation given the current costs of medical care, the strain this cost places on individuals, family, healthcare institutions and the government and the projected population growth rates associated with this demographic.

The key finding of this investigation is that use of electronic caregiving technologies may have the potential to reduce unintentional hospital readmissions for discharged patients over 65 years of age. 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.<sup>12</sup> Additional data have suggested readmission rates for Medicare average ~16.1%.<sup>12</sup> 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® Premier system were dramatically lower than these previously published estimates (10.1% vs. 13%-16%).

While electronic caregiving technologies are traditionally thought of as Personal Emergency Response Systems (PERS) or Medical Emergency Response System (MERS) and primarily used as fall alert and/or monitoring systems, this is not always the case. The Electronic Caregiver® Premier system utilized in this investigation incorporated capabilities of activity detection, medication management, family monitoring connected applications and telemedicine. While the use of these system attributes was not formally investigated in this study, previous work has suggested the most frequent principal admitting diagnoses 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).<sup>12-13</sup> Thus, advancing capabilities within electronic caregiving technologies 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 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 could have also been negative. The authors have no way of identifying the impact of these exclusion on the investigation.

## Conclusions

Based on this pilot investigation, electronic caregiving technology has the potential to impact hospital readmission rates in individuals over the age of 65 years. Specifically, the Electronic Caregiver® Premier system utilized in this work demonstrated a 47.67% reduction in hospital readmission when compared to the open source numbers associated with the institution from which the sample of participants was recruited. These results justify continued investigation into this topic using more rigid experimental design and prospective techniques.

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