Excess Readmission rates for Heart Failure and Pneumonia by Hospital Type

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Abstract

The improvement of quality care is a major goal for modern healthcare. Quality of care is often measured through readmission rates for specific conditions such as heart failure, pneumonia, total arthroplasty of the knee/hip, etc. This data has been used by the Center for Medicare and Medicaid Services (CMS) to adjust reimbursement rates for hospitals with excessive readmissions. Different hospital operations and management models possess structural differences that may impact the rates of readmission. This study investigated whether there were significant differences in the readmission rates for academic, non-profit, and for-profit hospitals. The results may be important in reshaping guidelines to assess hospitals based on readmission rates. The average excess readmissions for heart failure were in non-profit hospitals for 1.0047, for-profit hospitals for 1.013, and academic hospitals for 0.975. The ANOVA for this set returned a p-value of 1.70284E-05, meaning that the results were statistically significant. As such, academic hospitals have statistically lower readmission rates for heart failure. The excess readmission rates for pneumonia yielded 1.025 for non-profit, 1.024 for for-profit, and 0.99 for academic hospitals. The ANOVA returned a p-value of 2.4899E-09, which suggests the differences seen are statistically significant. As such, academic hospitals also have a statistically lower rate of pneumonia readmissions. The study has implications for consumer decision-making when choosing a hospital. In addition to this, algorithms for benchmarking as well as CMS adjustments to reimbursement rates may consider factoring in the hospital ownership type.

Keywords: Quality Care; Readmissions; Heart Failure; Pneumonia; Data Analysis.

1. Introduction

Quality of care in the medical setting is a major indicator of hospital performance. Not only is quality care a pressing concern for patients choosing to come into the hospital, but reimbursement programs also consider markers of quality care. The quality care measures intend to examine the efficacy of care in terms of medical staff, availability of resources, organization, and care competence.

In the modern healthcare landscape, there are a variety of hospital ownership types. The identifying factors of hospital type are related to some of the variables used in quality care assessments. Specifically, the workflow and organization of care impact perceived quality as well as timeliness of care. Certain key factors, such as mortality rate, were found to be greater in private, for-profit hospitals [1]. Kruse et al. (2018) found that hospital efficiency is equal in both private and public hospitals in the European Union [2]. Though these factors are not directly linked to quality care, these past studies offer an insight into disparities that may be present among different hospital types.

Quality care improvement is a major goal of modern medicine. The Centers for Medicare & Medicaid Services (CMS) reported that the key to improving quality care is standardization and proceeding through evidence-based results [3]. Given that different hospital types have different organizational techniques, a certain hospital type may be better at implementing evidence-based changes. As such, certain hospitals may be better in terms of quality care due to their ability to implement improvements. The effect of differences present in workflow was discussed by Brahmbhatt (2022), who found significantly greater wait times and violations in academic hospital emergency rooms [4].

The assessment of hospitals based on their classification has been investigated before, yielding interesting results. One specific study from 2007 using data from the CMS found that urban hospitals tend to have significantly better-quality care (of 8 categories, only pneumonia was significantly better in quality care in rural hospitals) [5]. There are many factors that impact quality care aside from the location of the hospital. Certain classifications and organizational elements inherent to hospital ownership may also impact healthcare quality measures. Ayanian &Weissman (2003) found that teaching hospitals had better quality care in factors other than nursing care, pediatric intensive care, and some surgical outcomes, which had greater measured quality care in non-teaching hospitals [6]. This study suggests that no one hospital type may be the best in all categories of care. It also further raises the question of whether the workflow characteristics unique to the hospitals may be contributing to the quality of care observed. One study looked into differences in ER quality care and work processes (time until admission, time until sent home, and violations in the past 10 years) by hospital type and found statistically significant differences in 2 of the 3 categories, suggesting that there may be unique factors within the hospital's workflow that impact quality care measures. The existing literature has chosen to look into quality care by ownership type for a variety of healthcare locations, notably nursing homes [7].

There is a gap in terms of readmission rates for hospitals. Akintoye et al. (2017) investigated inpatient mortality and hospitalization costs by ownership type. The study found significant differences among the different hospital types. Interestingly, private hospitalization had lower mortality and a greater cost in comparison to government hospitals [8]. Readmissions are concerning as they present an increased cost of healthcare as well as indicating poor care quality. Average readmission. Weiss & Jiang (2021) reported that the average cost of readmissions was $15,200 [9]. Additionally, higher rates of readmission are linked with lower-quality care [10].

The CMS has given ample focus to reducing readmission rates in recent years due to the contribution of these readmissions to excess spending on healthcare. In addition to this, many readmission causes may be linked to inadequate care on the initial visit. van Walraven et al. (2011) found that on average, 27.11% of readmissions may be deemed avoidable [11]. Given this, excess readmissions are contributing to the poor quality of care seen today. Older studies reported that readmission rates were not strongly correlated with mortality rates in hospitals [12]. Though this piece of evidence questions the credibility of this statistic, the importance of readmission rates for reimbursement and quality certification remains. In fact, the CMS uses excess readmission rates as the basis for lowering reimbursement [13]. A study by Birmingham and Oglesby looked into differences in readmission rates after the implementation of the Hospital Readmission Reduction Program (HRRP) and whether there were differences between proprietary and non-profit hospitals. The study found there were no statistically significant differences, though non-profit hospitals had a greater decrease in readmission rates [14]. Given that this publication came soon after the implementation of the HRRP, whether the findings are still true today is of particular interest given that healthcare is a rapidly evolving field with an emerging increase in proprietary medical centers (such as the national healthcare organizations of HCA Healthcare, Ascension, Universal Health Services (UHS), and more).

Given that quality care is such a pressing factor for hospitals, patients, and reimbursement organizations, there has been an effort to increase data collection for readmission rates and publish this data. This effort has come primarily through the HRRP of the CMS, which publishes hospital-reported data on key readmission rate conditions such as acute myocardial infarction, chronic obstructive pulmonary disease, heart failure, pneumonia, coronary artery bypass graft, and elective primary total hip/knee arthroplasty. The primary factor used to determine extraordinary readmission rates was calculated risk-standardized unplanned excess readmissions in the aforementioned HRRP. The statistic was calculated by dividing the predicted readmission rate by the expected readmission rate, which gave a ratio indicating whether readmissions were in excess, equal, or less than what had been predicted. This measure was particularly useful in this study as it provided an indication of a hospital with higher than expected readmission rates.

Publications on the Hospital Readmission Reduction Program focused on the efficacy of the program. The program appears to have had mixed results, with a decrease in readmission rates but an increase in mortality rates among hospitalized patients [15]. The dataset has also been used to determine readmissions by insurance type. Ferro et al. (2019) found that readmissions for Medicare patients were greater than for Medicaid patients following the HRRP implementation [16]. Some previous studies looked into the changes in readmission rates following the HRRP program for non-profit and propriety hospitals [14, 17]. These two broad categories group many different operational institutions into a large grouping.

The most similar study in the research comes from a study that looked into readmission rates from 2012–2015 for all 5 readmission criteria. The study found that proprietary hospitals tend to have higher readmission rates. This category

refers to for-profit hospitals with private ownership. The results of the study displayed statistically greater readmission rates in the proprietary group as compared to non-profit and government hospitals [18].

The differences between academic hospitals and other non-profits may be linked to significant operational variations. Furthermore, an academic institution can be categorized as either proprietary or non-profit based on its ownership. However, certain characteristics distinguish academic hospitals, such as the presence of academic physicians, educational objectives, research activities, student physicians, and the duplication of providers' services. Therefore, it is important to consider academic hospitals as a distinct category. The literature currently lacks comprehensive analysis by excluding academic hospitals as a separate category. According to the CMS, hospitals are commonly classified into one of eleven categories. However, when examining readmission rates, the analysis primarily focuses on non-profit and proprietary classifications. Additionally, the effectiveness of the Hospital Readmission Reduction Program (HRRP) in enhancing quality care has been studied, but no literature has been published on this topic since 2018. Hence, there is a further research gap concerning recent readmission data. The existing literature has not explored the average levels for each ownership type, and these findings could be particularly valuable in shaping future healthcare guidelines as the CMS aims to improve quality care across all hospitals.

An analysis of hospital type and readmission rate may provide insight into the workflow components that may be associated with better healthcare outcomes. This information may be useful for consumers as well as for reimbursement directives rating hospitals. Newgard et al. (2013) discovered that even in emergency situations, patients and family members often expressed a preference for one hospital over another [19]. Given this, information on readmission rates may be useful for patients to know ahead of choosing a hospital.

2. Methods

Data for this study was obtained through the publicly available HRRP dataset found on the CMS website [20]. The dataset on readmission rates reported hospital name, measure name (the reason for readmission), number of discharges, number of readmissions, predicted readmission rate, expected readmission, and the calculated excess readmission ratio. This data provided by the CMS has been extensively used for the purpose of reimbursement as well as hospital rating (based on readmission rate). The dataset included hospitals in all 50 states. The dataset was processed using Microsoft Excel. The data was sorted by state, and the data for the state of Tennessee was exported to a separate worksheet to be analyzed. Within the Tennessee dataset, certain data points were incomplete (missing data on one or more readmission reasons). There were five factors of readmission measured. From these five measure name categories, the two groups that had more than 50% of hospitals complete data were chosen to be analyzed further. The two most complete datasets were for heart failure and pneumonia. Hospitals containing complete data sets on these factors were exported to a separate worksheet and analyzed independently. Of the 81 hospitals included in the initial survey, 51 had complete data reported for heart failure, and 74 had complete data reported for pneumonia. This data was then sorted into categories for the purpose of studying excess readmission based on ownership type. A hospital website was found, and the hospital page was used to identify the hospital ownership type. Based on this query, each hospital was coded with a number indicating the hospital ownership type (1 = non-profit, 2 = for-profit, 3 = academic). Using this data, the mean excess readmission rate was determined for each hospital type to determine whether any hospital type possessed greater excess readmission rates. Based on the results of this initial inquiry, an analysis of variance (ANOVA) test was conducted on the full data set of excess readmission rates to determine whether the differences observed among groups were statistically significant. The returned p-values provided an insight into whether the differences seen among the groups were significant. Figure 1 displays a concise view of the research methodology.

3. Results

The ratio of excess readmission (predicted readmission)/(expected readmission) was used as it is the measure used to reduce Medicare compensation rates by CMS. CMS reports using this figure to compare similar hospitals, and hospitals with excess readmissions could see their Medicare compensation rates reduced. Examining the results on the excess heart failure readmission rates revealed that on average, non-profit hospitals had 1.0047, for-profit hospitals had 1.013, and academic hospitals had 0.975. This implies that academic hospitals have the least excess readmission. The value being less than 1 is indicative of readmissions being lower than predicted. Additionally, for-profit hospitals have the highest excess readmission rates. Given these initial results, an analysis of variance would provide information on whether these differences are statistically significant. ANOVA on heart failure returned a p-value of 1.70284E-05, which is less than the alpha level of 0.05. This suggests that the differences seen among the groups are statistically significant. The results for the average readmission rates for pneumonia revealed values of 1.025 for non-profit, 1.024 for for-profit, and 0.99 for academic. The ANOVA for the pneumonia readmission data returned a p-value of 2.4899E-09, which is below the alpha level of 0.05. This suggests that the differences seen among the groups are statistically significant. Though the differences in each group were of different magnitudes, the ANOVA confirms that these differences are significant. Table 1 displays a summary of the average excess readmission rates discussed.
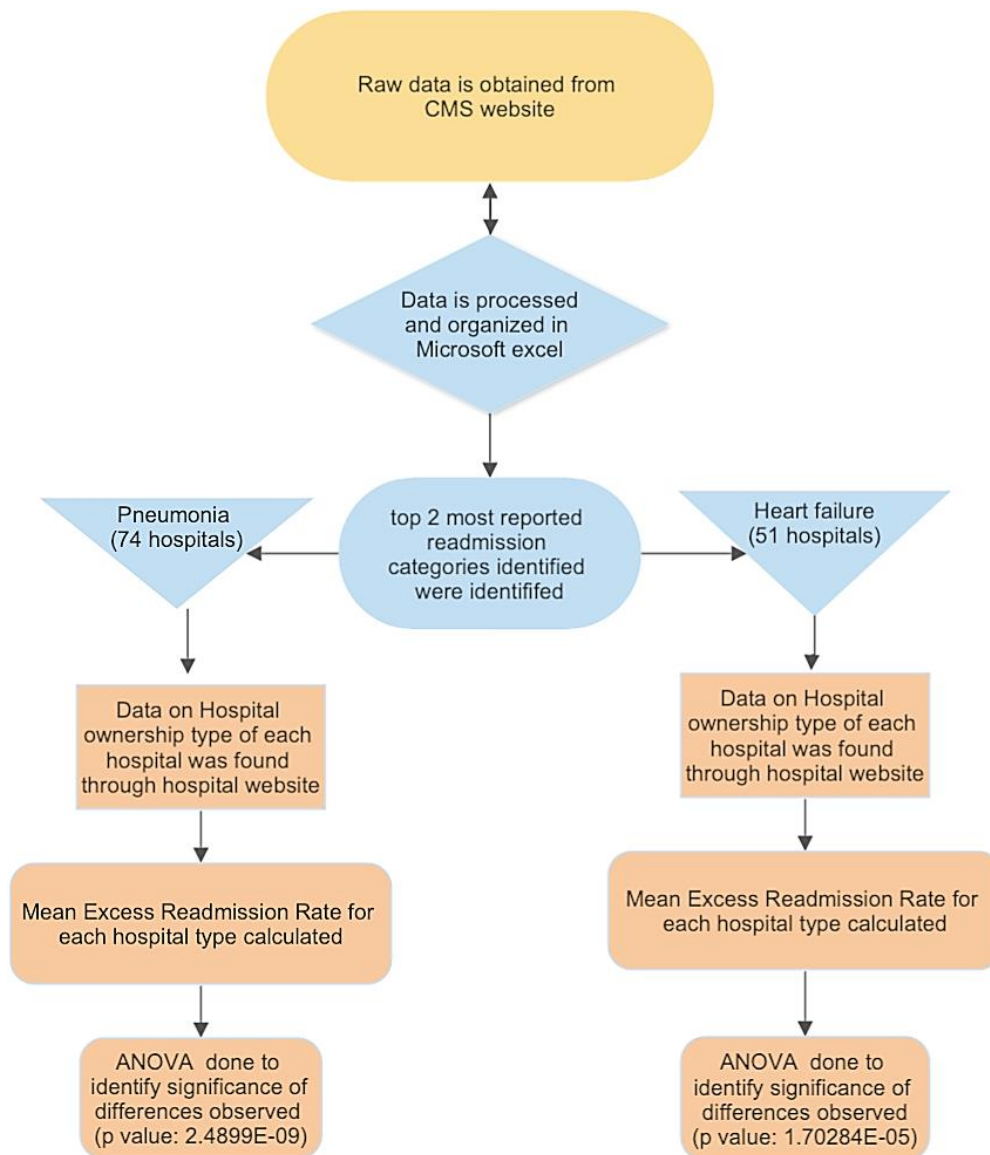
Figure 1. Infographic showing research process methodology

Table 1. Average excess readmission rates

	Pneumonia	Heart Failure
Number of hospitals	74	51
Non-Profit Average Excess Readmission	1.025390909	1.004731429
For Profit Average Excess Readmission	1.023847368	1.013266667
Academic Average Excess Readmission	0.9912	0.97502

4. Discussion

Analysis of the CMS HRRP data reveals that certain hospitals may have statistically higher readmission rates. In fact, academic hospitals had statistically lower readmission rates and a lower excess readmission ratio than the other two groups. This implies that academic hospitals have lower than predicted readmission rates (compared to similar hospitals). The for-profit hospitals had greater readmission rates than the other two groups for both readmission reasons tested. This is concurrent with the findings from the 2018 study, which found proprietary hospitals had greater readmission rates [18]. The findings from this study are useful in that the academic hospital was a separate inclusion. Additionally, this category had significantly lower readmission rates than the non-profit and for-profit categories. As such, future studies may consider this section an independent category.

This provides implications that may drive consumer decision-making. In choosing a hospital to receive service at, the consumer may consider the readmission data. Previous publications have discerned that patients and families of patients often take an active role in choosing the facility in which to receive medical care, even in emergent situations

[19, 21]. Readmissions for the same medical cause are unfavorable to patients and their families. Given this, readmissions may play a strong role in choosing a hospital to receive care.

CMS currently uses readmission rate data to adjust reimbursement rates. Hospitals that display high readmission rates are penalized through decreased reimbursement rates. This practice may encourage taking on a greater patient volume to offset lost revenue. This solution may be detrimental as it does not address the cause of the readmission rates and instead takes on a larger patient volume to balance the lost funds from readmission rates. Though this balances out the financial damages caused by the penalty, the high volume is likely to act as positive feedback that may increase the total number of readmissions to the hospitals. Given this, the CMS may choose to use penalizing methods beyond adjusted reimbursement for repeat offenders with excess readmission rates. The data from this study may be helpful in identifying which groups are especially divergent. The scale for readmission should be different depending on hospital type. If academic hospitals are judged on the same scale as for-profit hospitals, they may have a significant subset of readmissions that have been scrutinized and addressed under tailored guidelines.

From the perspective of the healthcare industry, readmissions present a situation of give and take. Increased readmissions do account for an increase in revenue brought into the hospital; however, they also come with a downgrade in publicly available rankings, decreased reimbursement, and the possibility of penalties from CMS and other national organizations. As time goes by, patient volume continues to increase, and ignoring indicators of poor-quality care will likely lead to continually worsening care. Factors contributing to readmissions are often not fully under hospital control. Jindal et al. (2018) looked into the factors contributing to readmission rates and suggested revisions to the HRRP penalty structure that account for the factors that hospitals cannot change [22]. Assessment based on readmission rates must account for a variety of factors and contributors.

Recent discussions on quality care improvement often discuss the principle of benchmarking and comparing performances by similar clinicians seeing a similar patient base. The primary concern raised with benchmarking is the ability to standardize hospitals. Given the results of this study, the practice of benchmarking should consider the type of hospital ownership. This can be seen as the readmission rates are linked to quality care and operational practices. Given the findings that show academic hospitals have significantly lower readmission rates, hospitals aiming to reduce their readmission rates may choose to utilize the academic hospital model.

The structure of the data collection relies on hospital-reported data, which is subject to errors in collection. Data on readmission rates may be particularly difficult to track if a patient does not choose to attend the same facility regularly. Given that the data comes from the CMS, it may be deemed reliable. The dataset was not complete in that not all hospitals in the state reported data. Certain readmission rates were also more reported than others. This may be due to hospital level and ability to treat. Not all hospitals may be equipped with cardiovascular centers or arthroplasty surgical centers. This factor may explain the data reporting given 70 of the 95 Tennessee counties are classified as rural, and hospitals in these counties may primarily be access centers for primary care and routine healthcare access.

Future studies may choose to study the behavior of hospital systems after they incur penalties for excess readmission rates. Additionally, it may be useful to study the hospitals that do not fit the trends observed (i.e., an academic hospital with greater than average readmission rates) to understand the factors that are causing these sites to possess greater readmission rates. Efforts such as these may be useful to identify and monitor practices contributing to poor-quality care.

5. Conclusion

The results of the study display a statistically significant deviation in excess readmission rates for non-profit, for-profit, and academic hospitals. This conclusion was reached through data analysis of the mean excess readmission rates and ANOVA testing to establish statistical significance. Given the findings of this study, the practice of standardizing hospitals and providers through benchmarking readmission rates would require accounting for hospital ownership type. Currently, the CMS bases on reimbursement adjustments on readmission rates. The results of this study suggest that this adjustment should account for hospital ownership type. For-profit and non-profit hospitals have significantly higher readmission rates than academic hospitals. Thus, non-profit and for-profit hospital types should be scrutinized more firmly. Academic hospitals have significantly lower readmission rates, and the infrastructure contributing to this lower readmission rate should be studied further. Operational aspects of academic hospitals that are responsible for low readmission rates may serve as a model that may be applicable to other hospitals. In addition to this, patient decisions may be impacted based on study results. The higher readmission rates of non-profit and for-profit hospitals may drive patients to choose to receive care from academic hospitals. The findings of the study shed light on the operational practices that differentiate hospitals. Academic hospitals are criticized for their duplication of services; however, they seem to be affiliated with better quality care. Whether or not this increased quality of care equates to better finances is unclear. Future adjustments to medical payment structures may aim to target the source of readmission rates rather than only penalizing high readmission rates. This may include a payment structure based on patient health improvement rather than patient volume.

6. Declarations

6.1. Data Availability Statement

The data was collected through the Center for Medicare and Medicaid Services. Data is publicly available.

6.2. Funding

The author received no financial support for the research, authorship, and/or publication of this article.

6.3. Institutional Review Board Statement

Not applicable.

6.4. Informed Consent Statement

Not applicable.

6.5. Declaration of Competing Interest

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the author.

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