

# Readmission rates and predictors of avoidable readmissions in older adults in a tertiary care centre

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## ABSTRACT

**Context:** Thirty-day readmissions are used to gauge health care accountability, which occurs as part of the natural course of the illness or due to avoidable fallacies during the index admission. The utility of this metric is unknown in older adults from developing countries. **Aim:** To ascertain the unplanned 30-day readmission rate and enumerate predictors of avoidable hospital readmission among early (0–7 days) and late (8–30 days) readmissions. **Settings and Design:** A retrospective chart audit of 140 older adults who were readmitted to a premier tertiary care teaching hospital under Geriatrics from the neighboring states of Tamil Nadu, Andhra Pradesh, and Kerala were undertaken. **Methods and Materials:** Data from health records were collected from the hospital electronic database from May 2015 to May 2020. The data was reviewed to determine the 30-day readmission rate and to ascertain the predictors of avoidable readmissions among both early and late readmissions. **Results:** Out of 2698 older adults admitted to the geriatric wards from the catchment areas, the calculated 30-day hospital readmission rate was 5.18%, and 41.4% of these readmissions were potentially avoidable. The median duration from discharge to the first readmission was ten days (Interquartile range: 5–18 days). Patients had to spend INR 44,000 (approximately 602 USD) towards avoidable readmission. The most common causes for readmission included an exacerbation, reactivation, or progression of a previously existing disease (55.7%), followed by the emergence of a new disease unrelated to index admission (43.2%). Fifty-eight patients (41.4%) were readmitted within seven days following discharge. Early readmissions were seen in patients with malignancies [8 (13.5%) vs. 4 (4.8%);  $P = 0.017$ ], on insulin ( $P = 0.04$ ) or on antidepressants ( $P = 0.01$ ). Advanced age was found to be an independent predictor of avoidable early readmission (OR 2.99 95%CI 1.34–6.62,  $P = 0.007$ ), and admission to a general ward (as compared to those admitted in a private ward) was an independent predictor of early readmissions (OR 2.99 95%CI 1.34–6.62,  $P = 0.007$ ). **Conclusion:** The 30-day readmission rate in a geriatric unit in a tertiary care hospital was 5.2%. Advanced age was considered to be an independent predictor of avoidable early readmission. Future prospective research on avoidable readmissions should be undertaken to delineate factors affecting 30-day avoidable hospital readmissions in developing nations.

**Keywords:** Avoidability, elderly, geriatrics, older adults, preventability, readmission

## Introduction

Readmission shortly after discharge burdens a patient both economically and psychologically.<sup>[1]</sup> It serves as an indicator

of healthcare quality and a guide for resource allocation.<sup>[2,3]</sup> To prevent deleterious health outcomes, primary care, and family physicians must improve post-discharge care.<sup>[4]</sup> Factors associated with readmission include improper discharge planning; failure to send the discharge plan to the primary care physician; poor follow-up practices, especially with primary care physicians; lack of social and community support; unclear instructions to patients on discharge; incomplete diagnosis; inadequately treated medical conditions; sub-optimal patient care; errors in

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Received: 29-09-2021

Revised: 13-12-2021

Accepted: 01-03-2022

Published: 14-10-2022

### Access this article online

#### Quick Response Code:



Website:  
www.jfmpc.com

DOI:  
10.4103/jfmpc.jfmpc\_1957\_21

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**How to cite this article:** Samuel SV, Viggswarpu S, Wilson BP, Ganesan MP. Readmission rates and predictors of avoidable readmissions in older adults in a tertiary care centre. J Family Med Prim Care 2022;11:5246-53.

medication reconciliation; drug interactions and side effects; frailty; malnutrition; severe chronic conditions; the persistence of underlying chronic conditions; lapses in communication between treating team members and the patient; poor management of self-care activities at home following discharge; inability in accessing health care and keeping appointments; incomplete patient education resulting in lack of awareness of whom to contact; where to go and how to manage symptoms at home; nosocomial infections; and poor adherence to medications due to cost or inaccessibility.<sup>[5-21]</sup> Contributory intrinsic factors include old age, high comorbidity burden, low literacy rate, low socio-economic status, and lack of social networks.<sup>[9,10,22-24]</sup> Patients discharged against medical advice are at a higher risk for early readmissions, usually within the first day following discharge (bounce-back readmissions).<sup>[25]</sup> Most research done on 30-day readmissions focus on the community model—a flow of patients between the community and the hospital. Only a segment of the population is considered in this model, and it fails to look at frail older adults in home-care settings and residential long-term care facilities whose care poses challenges to the health care system.<sup>[2]</sup> As liaisons between the various healthcare practitioners involved in patient care, primary care physicians can play a vital role in post-discharge care and reduce hospital readmissions by providing continuing care.<sup>[26,27]</sup>

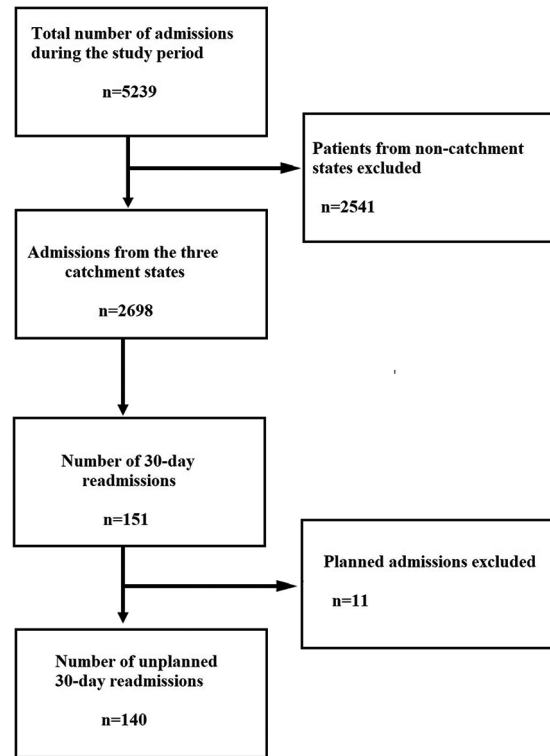
According to the Hospital Readmission Reduction Program (HRRP) of the Patient Protection and Affordable Act (2010, US), readmission is defined as “admission to an acute care hospital within 30 days of discharge from the same or another acute care hospital”. HRRP excluded confounding factors like discharge against medical advice and admission for primary psychiatric diagnosis, rehabilitation, or chemotherapy. Readmission may not necessarily be linked to the cause for index hospitalization. Thirty-day readmission reflects the quality of care rendered by the health care system as it takes into account the discharge planning process and immediate follow-up care. Beyond this 30-day period, readmissions are often linked to out-patient care and individual health care choices like lifestyle measures, compliance to medications, habits, and psychosocial factors.<sup>[1]</sup>

Our study was designed to estimate the proportion of readmissions occurring in a tertiary care centre in South India and to delineate predictors of avoidable readmissions in older adults.

## Materials and Methods

### Study design, setting, period and population

We undertook a retrospective electronic chart audit of 5239 patients admitted to a premier tertiary care teaching hospital under Geriatrics from May 2015 to May 2020. Although this hospital caters to patients from all over India, we chose patients from Tamil Nadu and the neighbouring states of Andhra Pradesh and Kerala. The number of admissions in geriatric wards from these states (2698) was considered as a denominator for calculating the readmission rate [Figure 1]. Inpatients who



**Figure 1:** Flow diagram

were unplanned readmissions to the geriatric wards within the 30-day duration were analyzed to highlight the factors predicting avoidable readmissions in older patients, and to characterize the factors determining early and late readmissions.

Older adults of the age sixty years and above from Tamil Nadu, Andhra Pradesh, and Kerala, who had unplanned readmission to the geriatric wards within 30-days from discharge were included. Patients below sixty years of age, admitted from outside the catchment states, those who had planned readmissions, patients who got readmitted after 30 days, patients with an end-stage renal disease requiring dialysis, and those who required elective surgeries planned during the index admission were not included into the study.

The data was extracted from the electronic database of the hospital and reviewed to determine the primary reason for the 30-day readmission, based on a model used by Graham and colleagues<sup>[28]</sup>—an algorithm based on causality and preventability of readmissions. The charts of 140 patients were audited in detail by two blinded consultant geriatricians, and discrepancies among these two assessments were resolved by a final assessment by a third geriatrician. These consultants were not privy to the identity of these patients. Causality and preventability (avoidability) were measured on a 1–6 Likert scale, and  $\geq 4/6$  on both scales were classified as avoidable readmissions. Diseases were classified based on the International Classification of Diseases-10 (ICD-10), and comorbidity burden was assessed using the Modified Charlson Comorbidity Index (CCI). Adverse drug reactions (ADRs), underuse of evidence-based treatment,

and avoidable readmissions were measured using the Naranjo score, the Hallas criteria and clinical judgment by the two geriatricians. Completeness of discharge summary instructions was assessed based on documentation of date for review, health care contact after discharge, investigations that need to be followed up on review, and management of self-care activities at home. Patients readmitted once were those who got readmitted within 30-days from discharge following index admission; those readmitted twice were patients who got readmitted after their first discharge; and those who were readmitted thrice were patients who got readmitted following the second discharge. All these readmissions fell within 30 days of the index readmission. We defined early 30-day readmissions as readmissions occurring within seven days and late 30-day readmission as after seven days from the time of discharge from the index hospitalization.

The primary outcome was the readmission rate. Secondary outcomes included avoidable readmissions among early and late readmissions and predictors of early readmissions. Data collected from index hospitalization and readmissions were demographic variables and medical details.

Ethics approval was obtained from the Research and Ethics committee of the Institutional Review Board (Reference number: IRB Min no. 13214, 2020).

## Analysis

In previous studies, readmission rates varied from 0.1% to 11.3%.<sup>[29]</sup> Assuming an anticipated Odds Ratio (OR) of about 2-times, with 90% power and 5% level of significance with 7.1% being the proportion of 30-day readmission, to show a readmission risk among older adults, the sample size was calculated to be 140.<sup>[29]</sup> EpiData 2.0 software was used to enter the raw data, and the statistical analysis was compiled by the STATA 16.0 software. A *P* value < 0.05 was considered statistically significant. Descriptive data were expressed as mean with standard deviation (SD) or median with interquartile range (IQR) for continuous variables and number (%) for categorical variables. Comparison of continuous variables was examined by independent student's *t*-test and Mann-Whitney *U* test. Statistical analysis of categorical variables was performed using the Pearson Chi-square test and Fischer's exact test. Logistic regression analysis was used to estimate the Odds Ratio with a 95% confidence interval (CI) to evaluate the association between risk factors and 30-day readmission adjusted for sex, age, and comorbidities.

## Results

Of the 2698 patients admitted during the study period from the three catchment states, 140 patients (5.18%) had an unplanned readmission, 58 (41.4%) of which were potentially avoidable. Of the 140 patients readmitted, 13 patients (9.3%) were readmitted for the second time, and four patients (2.8%) got readmitted for the third time after discharge. The mean (SD) age was

75.9 years (8.2 years), and the majority were males (60.7%). Most patients (*n* = 96, 68.6%) were from Tamil Nadu. The comorbidity burden in the study population measured using Charlson Comorbidity Index was high (median: 6, IQR 5–8). The most common comorbidity was Coronary Artery Disease (37.1%), followed by Congestive Cardiac Failure (30.5%). Auditing the discharge medications of the index admission, we found most of the patients were on anti-platelets (64.7%). The most common presenting complaint during the first readmission was shortness of breath (37.2%). Completeness of index admission discharge summary was present only in 46% of the patients. Eighty-two patients (58.5%) were readmitted between 7–30 days. On the univariate analysis of early versus late readmissions, patients with a malignancy were readmitted within seven days of their discharge; [8 (13.5%) vs. 4 (4.8%); *P* = 0.017]. Early readmissions were also associated with the use of insulin (*P* = 0.04) and antidepressant medications (*P* = 0.01) [Table 1].

The reason for readmission in more than half of the study population was due to exacerbation, reactivation, or progression of previously existing disease (total readmissions: 55.7%, avoidable readmission: 63.8%), followed by an emergence of a new disease unrelated to the index admission (total readmissions: 43.2%, avoidable readmissions- 24.3%). The median length of stay for both index hospitalization and first readmission was eight-days, and the median duration between hospital admission and first readmission was ten-days. The median cost of care for an avoidable readmission was 44,000 INR (IQR: 22,000–73,000 INR) [Table 2].

On multivariable analysis, advanced age was found to be independent predictors of avoidable early readmission (OR 1.11 95% CI 1.02–1.22, *P* = 0.017) [Table 3] and admission to the general ward was associated with early readmissions (OR 2.99 95% CI 1.34–6.62, *P* = 0.007) [Table 4].

The reason for readmission for the second time (10.8%) included aspiration pneumonia, candidemia, chronic obstructive pulmonary disease exacerbation, septicemia, Non-ST elevation myocardial infarction and heart failure, thalamic stroke, H1N1 pneumonia, and hepatic encephalopathy.

## Discussion

Unplanned hospital readmissions often weigh down health care resources and cause unanticipated health care expenses for patients and their families. It serves as an indicator of health care quality and integrity of transitional care.<sup>[16,30]</sup> We reviewed 2698 charts and found that the unplanned 30-day readmission rate was 5.18% with a mean (SD) age of 75.9 years (8.2 years). In a Swedish study conducted among adults aged over 65 years admitted in medical and surgical specialties, readmission rate was 18%. The mean 30-day readmission rate was 12.9% in a retrospective study done in Texas among patients visiting primary health care physicians.<sup>[10,31]</sup> Another study found the odds of readmission reduced by 56% when discharge plans

**Table 1: Baseline characteristics of the study population**

Variables	n (%) n=140	Early readmission (0-7 days) n=58	Late readmission (8-30 days) n=82	P
Number of readmissions				
Readmitted once	123 (87.9)	53 (91.4)	70 (85.4)	0.63
Readmitted twice	13 (9.3)	4 (6.9)	9 (10.9)	
Readmitted thrice	4 (2.8)	1 (1.7)	3 (3.7)	
Male	85 (60.7)	38 (65.5)	47 (57.3)	0.33
Age (years) <sup>a</sup>	75.9±8.2	74.7±8.3	76.7±8.14	0.14
Catchment states				
Tamil Nadu	96 (68.6)	36 (62.1)	60 (73.1)	0.23
Andhra Pradesh	13 (9.3)	5 (8.6)	8 (9.76)	
Kerala	31 (22.1)	17 (29.3)	14 (17)	
Charlson comorbidity index <sup>b</sup>	6 (5-8)	6 (4-7)	6 (5-8)	0.27
Co-morbidities				
CAD	52 (37.1)	21 (36.3)	31 (37.8)	0.85
CCF	43 (30.5)	13 (22.4)	30 (36.6)	0.07
CVA	26 (18.4)	8 (13.5)	18 (22)	0.22
COPD	42 (29.8)	16 (27.1)	26 (31.7)	0.60
Dementia	23 (16.3)	7 (11.8)	16 (19.5)	0.24
Diabetes mellitus	91 (65.0)	40 (67.7)	52 (63.4)	0.27
CLD	11 (7.9)	12 (20.6)	11 (13.4)	0.25
CKD	14 (10.0)	6 (10.1)	8 (9.7)	0.93
Malignancy <sup>†</sup>	12 (8.5)	8 (13.5)	4 (4.8)	0.017
Discharge drugs at index admission				
Beta blockers	69 (49.3)	27 (46.5)	41 (50.6)	0.6
Alpha blocker	37 (26.6)	20 (34.4)	17 (20.9)	0.07
CCB	43 (30.7)	20 (34.4)	22 (27.1)	0.51
ACEi/ARBs	54 (38.8)	24 (41.3)	30 (37.0)	0.6
Diuretics	46 (33)	22 (37.9)	24 (29.6)	0.3
Beta agonists	39 (28.2)	20 (34.4)	19 (23.7)	0.16
Antimicrobial agents	50 (35.9)	21 (36.2)	29 (35.8)	0.9
Antiplatelet therapy	90 (64.7)	39 (67.2)	51 (62.9)	0.27
Oral ant diabetic agents	53 (37.9)	23 (39.6)	29 (35.8)	0.21
Insulin therapy	21 (15.1)	13 (22.4)	8 (9.8)	0.04
Antidepressant agents	12 (8.7)	9 (15.5)	3 (3.7)	0.01
Chief complaint at readmission				
Dyspnea (NYHA II-IV)	51 (37.2)	23 (41.8)	28 (34.1)	0.36
Cough	44 (31.2)	15 (25.4)	29 (35.3)	0.20
Fever	40 (28.6)	17 (28.8)	24 (29.3)	0.95
Altered sensorium	21 (14.8)	5 (8.5)	16 (19.5)	0.06
Others	91 (64.3)	39 (66.1)	82 (63.4)	-
Completeness of discharge summary	64 (46.0)	25 (43.1)	39 (48.1)	0.5

<sup>a</sup>Mean (Standard deviation), <sup>b</sup>Median (Interquartile range), CAD - Coronary artery disease, CCF - Congestive cardiac failure, CVA - Cerebrovascular accident, COPD - Chronic Obstructive Pulmonary Disease, CLD - Chronic liver disease, CKD - Chronic Kidney Disease, CCB - calcium channel blockers ACEi/ARBs - angiotensin-converting enzyme inhibitor or Angiotensin receptor blockers, NYHA class - New York Heart Association class for Dyspnea. <sup>†</sup>Malignancy including hematological

were sent to primary care physicians.<sup>[18]</sup> Therefore, primary care and family physicians play a vital role in improving transition care resulting in reduced hospital readmissions,<sup>[26,32]</sup> and their turnover can affect readmission rates.<sup>[33]</sup> We conducted the first study analyzing avoidable readmissions among older adults in India.

It is difficult to ascertain whether a higher readmission rate could be attributed to easy accessibility to a health care facility, variations in the care provided, or multiple comorbid conditions of patients.<sup>[10]</sup>

Older adults from rural areas of India have poor access to quality health care services and rely on prevalent unproven home

remedies or native medications.<sup>[34]</sup> Although females have higher life expectancy,<sup>[35]</sup> we found a lower readmission rate among them as 60.9% who got readmitted were males. Older adults, especially females, are often limited to home care even for life-threatening conditions due to financial constraints.<sup>[36-39]</sup>

As observed in previous studies, 30-day readmissions had a higher comorbidity burden (mean Charlson comorbidity index 6, IQR 5–8), possibly due to the pathological changes and physiological processes associated with aging, such as declining functional reserves.<sup>[10,40,41]</sup> Although malignancy (metastatic malignancies, lymphoma, leukemia) was associated with early readmissions [8 (13.5%) vs. 4 (4.8%),  $P = 0.017$ ], data from previously published studies show that early readmission rates

**Table 2: Proportion and predictors of avoidable readmissions among early and late readmissions, and univariable analysis**

	Total readmissions n (%)	Avoidable readmission			P
		n (%) n=58	Early readmission (0-7 days) n=17	Late readmission (8-30 days) n=41	
Dead, n (%)		9 (15.5)	4 (25.5)	5 (12.2)	0.43
Reason for re-admission					
Reason for readmission as a result of adverse reaction to patient's ongoing medications	5 (3.5)	3 (5.2)	1 (5.8)	2 (4.9)	0.66
Reason for readmission as a result of an adverse effect of a new drug introduced during the index admission	17 (12)	8 (13.8)	1 (5.9)	7 (17.1)	0.249
Exacerbation or reactivation or progression of previously existing condition as one of reasons for readmission	78 (55.3)	37 (63.8)	11 (64.7)	26 (63.4)	0.59
New disease as the reason for readmission	60 (43.2)	22 (37.9)	8 (47.1)	14 (34.2)	0.26
Length of hospital stay, the duration between hospital admissions, and cost of hospital readmissions					
Length of stay admission during the index admission <sup>b</sup>	8 (6-12)	10 (6-13)	8 (5-12)	10 (7-14)	0.16*
Duration of days between discharge date of primary admission and readmission <sup>b</sup>	10 (5-18)	13 (6-21)	4 (3-6)	16 (12-22)	<0.01*
Length of stay during readmission <sup>b</sup>	8 (5-13)	7 (5-11)	6 (5-9)	8 (6-12)	0.39*
Cost of care during readmission (×10 <sup>4</sup> in Rupees) <sup>b</sup>	5 (2.5-11.1)	4.4 (2.2-7.3)	4.9 (3.4-6.6)	4.4 (2.1-9.8)	0.73*
Completeness of discharge summary	65 (46.43)	23 (37.29)	11 (39.29)	11 (35.48)	0.763

\*Two-sample Wilcoxon rank-sum (Mann-Whitney) test for comparison of variables among avoidable and non-avoidable readmission. <sup>a</sup>Mean (Standard deviation), <sup>b</sup>Median (Interquartile range)

**Table 3: Multivariable model of predictors of potentially avoidable readmissions of early and late readmissions**

Variable	Early readmission		Late readmission	
	Odds ratio (95% CI)	P	Odds ratio (95% CI)	P
Age	1.11 (1.02-1.22)	0.017	1.06 (0.99-1.14)	0.072
GW patients	1.16 (0.26-5.15)	0.841	0.63 (0.22-1.82)	0.389
Delirium	0.42 (0.06-8.52)	0.465	0.99 (0.29-3.33)	0.998
CCF	3.39 (0.67-17.04)	0.139	2.48 (0.91-6.78)	0.077
Alpha-blockers	6.28 (0.87-45.22)	0.068	0.65 (0.20-2.11)	0.476
Beta agonist	1.88 (0.35-10.23)	0.464	1.16 (0.37-3.64)	0.797
Antidepressants	0.45 (0.05-4.02)	0.472	1.55 (0.27-9.05)	0.624
Insulin use	2.14 (0.29-15.39)	0.448	1.45 (0.32-6.59)	0.626

CI – Confidence interval, GW – General ward, CCF – Congestive cardiac failure, GW – General ward, Anti-PD – Anti-Parkinson's disease drugs

**Table 4: Multivariable analysis of predictors of early readmission**

Variable	Early readmission	
	Odds ratio (95% CI)	P
Age	0.96 (0.91-1.01)	0.167
GW patients	2.99 (1.34-6.62)	0.007
CCF	0.51 (0.22-1.18)	0.119
Delirium	2.53 (0.78-8.21)	0.121
Alpha-blockers	1.10 (0.44-2.70)	0.835
Antidepressants	0.97 (0.26-3.58)	0.967
Anti-PD drugs	1.48 (0.25-8.73)	0.660
AChEi	0.61 (0.68-54.5)	0.105
Insulin use	0.53 (0.18-1.50)	0.234

CI – confidence interval, GW – general ward, CCF – Congestive cardiac failure, Anti-PD drugs – Parkinson's disease drugs, AChEi – Acetyl cholinesterase inhibitor

were low (2%) compared to late readmissions in patients admitted for cancer treatment.<sup>[42]</sup> Since data on early and late readmissions in oncology and hematology are limited, especially among older adults, research in this area is imperative.

Previous studies show that medications like corticosteroids, antimicrobial agents, and anti-diabetic agents (mainly insulin) along with polypharmacy are associated with 30-day readmission.<sup>[43-45]</sup> In one of the few studies done on patients taking anti-depressants, readmission rate was found to be lower.<sup>[46]</sup> In our study, early readmissions were associated with the use of anti-depressant medications [9 (15.5%) vs. 3 (3.7%), *P* = 0.01] and insulin therapy [13 (22.4%) vs. 8 (9.8%), *P* = 0.04].

Of the 140 readmissions, 58 (41.4%) were labelled as avoidable readmissions by two blinded geriatricians auditing the electronic charts. Any discrepancy was resolved by a third geriatrician, and the decision was considered final. A systematic review found that the median proportion of readmissions termed “avoidable” based on a single reviewer was 27.1%, with a wide confidence interval (5 to 79%). Another survey calculated the avoidable readmission rate to be 26.9% based on two-physician reviews. Data on the avoidable 30-day readmission rate in older adults in India is lacking, and the true proportion of avoidable readmissions is inconclusive due to the complex factors interlinked with readmissions, such as post-discharge care, caregiver burden, and socio-economic factors. Indicators of potentially avoidable readmissions include decision-making in the emergency department, failure to convey vital information to the out-patient healthcare professional, premature discharge, and failure to establish care goals in patients with serious illnesses.<sup>[3,28]</sup>

According to a retrospective study, the rate of preventable early readmission was higher than late readmission, with different risk factors associated with each. Early readmissions were related to an acute illness burden, duration of index hospitalization, and assessment by a rapid response team during the index admission.

Late readmissions were associated with chronic illness burden, social determinants of health, and health education.<sup>[47]</sup>

In an observational study, two chronic diagnoses (heart failure, chronic obstructive pulmonary disease), and three acute diagnoses (acute coronary syndrome, community-acquired lower respiratory tract infection, gastrointestinal bleed) were associated with a drop of readmission rate from 16.5% to 13.8% with a decrease in the length of stay from 5.44 days to 3.98 days (2% annually).<sup>[48]</sup> In our study, the median duration of hospital stay during the index admission was eight days (IQR 6–12 days), and the median duration between discharge from the index admission and first readmission was ten days (IQR 5–18 days). Late readmissions constituted 58.5% of total readmissions, consistent with the trend reported in India.<sup>[29]</sup> The financial impact of readmission was gigantic. The median amount patients spent was 44,000 Indian Rupees (IQR 22,000–73,000 INR), equivalent to approximately 602 US Dollars (1 USD = 73.01 INR, as of 1 September, 2021), for medical care during avoidable readmission. This is the first study in India showing the economic burden associated with avoidable hospital readmission.

The most common cause for readmission was exacerbation, reactivation, or progression of a previously existing disease (55.3%), followed by an emergence of a new disease unrelated to the index admission (43.5%). In India, ‘admission per the decision of the treating doctor’ was the most common reason given for 30-day readmission in general medicine (16.8%).<sup>[29]</sup> In this retrospective study, data on social care, family environment, treatment adherence, and documentation of care plans were not uniformly available for analysis. Discharge summaries of index admissions showed that only 46% had clear instructions for review, patient care at home, and follow-up investigations and out-patient visits. This figure was higher than that reported in Medicare claims, indicating that only half of the patients discharged had an appointment for the first follow-up out-patient visit.<sup>[40]</sup>

As compared to a previous study, we found that advanced age was an independent predictor of early potentially avoidable 30-day readmission (OR 1.11, 95% CI 1.02–1.22,  $P = 0.017$ ).<sup>[23]</sup> This may be due to bed availability, health insurance coverage, or affordability [Tables 3].

In a meta-analysis, increasing the number of team-based healthcare delivery and encouraging self-care were found to be more effective than other strategies in reducing the 30-day readmission rate. Other discharge interventions included proper discharge planning, case management, follow-up via telephone, telemonitoring, health education, medication reconciliation, home visits, scheduled out-patient follow-ups, patient-tailored discharge instructions, rehabilitative interventions aimed at improving functional status, streamlining of services provided, caregiver education, and peer mentoring.<sup>[49]</sup> A recent meta-analysis in older adults with comorbidities showed that short-term (less than three months) readmissions can be reduced by continuity of care. A recent retrospective study showed that the Hospital Elder Life

Program (HELP) used to reduce in-patient delirium can reduce the length of stay during readmission and economic burden among older adults above seventy years of age. Implementing Sub-Acute care for Frail Elderly (SAFE) units following discharge from acute care was not associated with a reduction in the 30-day readmission rate, but the duration of hospital stay was reduced to less than one day in 75% patients.<sup>[27]</sup> A more recent meta-analysis of 19 trials from seven countries showed that communicating about the disease with the patient and counselling on medications reduced 30-day readmissions.<sup>[5]</sup>

This study was done in a tertiary care center that caters to the middle- and affluent classes of society. Most patients (31.3%) came from far-flung places, were not well represented in the readmission analysis, and could have received medical attention from primary care or family physicians upon return to their own homes.

## Conclusion

The 30-day readmission rate in a geriatric unit at a tertiary care center was 5.18%. Advanced age was an independent predictor of early potentially avoidable 30-day readmission, and admission to the general ward was an independent predictor of early readmission.

## Key points

- The 30-day readmission rate in a geriatric unit at a tertiary care hospital was 5.18%.
- Advanced age was an independent predictor of early potentially avoidable 30-day readmission among older adults.
- The odds of early readmission were higher among patients admitted to general wards compared to patients admitted in private wards.

## Acknowledgements

We thank the nursing staff and other hospital workers who contributed to patient care during the course of the patients’ stay.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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