

## Research Article

# Factors Associated with 30-Day Hospital Readmission among Older Adults: A Secondary Data Analysis

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## Abstract.

Hospital readmissions among older adults pose a significant risk to society. Continued interprofessional efforts are needed to identify older adults at risk for readmission to improve patient health outcomes after hospitalization. This study investigated the factors associated with 30-day hospital readmissions among older adults. **Method:** This study used secondary data analysis from individual patient electronic health records, covering all the admissions data of older adults within one year (January 1 – December 31, 2022) at one general hospital in Pekalongan, Central Java, Indonesia. The study comprised a sample of 930 older adult patients, of which 48 (5.2%) experienced 30-day readmissions, while 882 (94.8%) did not. Binary logistic regression was used to test the relationship between independent variables and dependent variable in bivariate and multivariate analysis. **Results:** The prevalence of 30-day readmission among older adults was 5.2%. More than half of the 30-day readmissions occurred in males, and married older adults. The average length of hospitalization at initial admission was 3.44 + 2.377 days. The top three main medical diagnoses at initial admissions were cataracts (22.9%), cardiovascular diseases (16.7%), and renal diseases (14.6%). Based on multivariate analysis, the factors significantly associated with 30-day readmission were marital status (AOR: 3.161, 95% CI = 1.577 – 6.337) and kidney disease-related diagnosis (AOR: 4.090, 95% CI = 1.664 – 10.052). **Conclusion:** Kidney diseases may play a crucial role in screening for 30-day readmission risk. The hospital should evaluate the care process of patients with kidney disease, to reduce the number of preventable readmissions. Furthermore, the presence of a primary caregiver for older adults should be part of discharge planning in the hospital.

**Keywords:** elderly, readmission, risk, hospitalization, well-being, diagnoses

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## 1. Background

Hospital readmissions are often found among older adults. A readmission is an event of a patient being readmitted who has previously received inpatient services at the hospital [1]. In Western countries, the frequency of 30 days-readmissions after hospital discharge is one in five patients [2]. Patients aged 65 years and older account for approximately 56% of total readmissions and nearly 60% of associated costs [3]. According to previous studies, the frequency of 30-day readmissions is higher for older adults with multiple comorbidities [4], as well as for those with specific medical conditions such as congestive heart failure, pneumonia, chronic obstructive pulmonary disease [3], cardiovascular disease and tumors [5]. Increased readmission frequency was also seen in older adults with a previous history of readmission [2], [6], [7], being male [2], [5], significantly associated with number of medications used [8], age [2], [3], [9], living alone [8] and length of stay at the initial hospital admission [2], [8].

Readmissions pose a significant risk to society. This risk is not only related to the patient's well-being in the form of risk of exposure to infection, the emergence of side effects, episodes of confusion and injuries due to falls [8], but also health economic issues [3]. Readmissions are more costly than the initial care with higher severity [10]. Although most readmissions are considered necessary for older adults, some readmissions are believed to be preventable [11].

Studies in Indonesia reported 30-day readmission rates among older adults of 37.6% [12]; and 21.7% to 18.1% [13]. These rates are lower than findings from other countries. It is possible that the phenomenon of readmission among older adults in Indonesia is different from other countries due to differences in national culture, including the factors associated with it. Continued interprofessional efforts are needed to identify patients at risk for readmission to improve patient health outcomes after hospitalization. This study aimed to investigate the characteristics of 30-day readmissions in elderly patients and the factors associated with the 30-day readmissions in a general hospital in Pekalongan, Central Java, Indonesia.

## 2. Method

We conducted secondary data analysis from individual patient electronic health records covering the population of all the older adult patients undergoing hospitalization within one year (January 1 – December 31, 2022) in a general hospital in Pekalongan. This

TABLE 1: Characteristics of the Study Samples (n=930).

Variables	Readmission (n = 48)	No Readmission (n = 882)	TOTAL (n=930)
<b>Ages (years)</b>	66.27 + 5.928	67.94 + 5.987	67.85 + 5.992
60 – 74 years	43 (89.6%)	752 (85.3%)	795 (85.5%)
75 – 90 years	5 (10.4%)	130 (14.7%)	135 (14.5%)
<b>Sex</b>			
Males	27 (56.3%)	436 (49.4%)	463 (49.8%)
Females	21 (43.8%)	446 (50.6%)	467 (50.2%)
<b>Marital Status</b>			
Married	37 (77.1%)	443 (50.2%)	480 (51.6%)
Others (unmarried/ divorced/ widowed)	11 (22.9%)	439 (49.8%)	450 (48.4%)
<b>Class of Ward</b>			
Class 3	28 (58.3)	551 (62.5%)	579 (62.3)
Class 2	10 (20.8%)	129 (14.6%)	139 (14.9%)
Class 1	10 (20.8%)	148 (16.8%)	158 (17%)
VIP/VVIP	0 (0%)	54 (6.1%)	54 (5.8%)
<b>Length of Stay of 1<sup>st</sup> Admission (Days)</b>	3.31 + 2.433	3.45 + 2.375	3.44 + 2.377
<b>Primary Medical Diagnoses</b>			
Cataract	11 (22.9%)	144 (16.3%)	155 (16.7%)
Cardiovascular diseases	8 (16.7%)	138 (15.6%)	146 (15.7%)
Renal diseases	7 (14.6%)	33 (3.7%)	40 (4.3%)
Pulmonary diseases	5 (10.4%)	152 (17.2%)	157 (16.9%)
Digestive diseases	4 (8.3%)	60 (6.8%)	64 (6.9%)
Musculoskeletal diseases	2 (4.2%)	53 (6%)	55 (5.9%)
Neoplasm	3 (6.3%)	33 (3.7%)	36 (3.9%)
Diabetes mellitus	4 (8.3%)	55 (6.2%)	59 (6.3%)
Others	4 (8.3%)	214 (24.3%)	218 (23.4%)

hospital is a type C hospital, which is a general hospital that has facilities and capabilities of medical services of at least four basic specialists and four specialist medical support [14]. In 2022, the number of beds provided in this hospital was 191 with an average bed occupied rate of 77.34%.

All data in this study were extracted from the individual patient electronic health records. We used a total sampling technique on all older adult data for one-year period to obtain the study sample. A total of 965 older adult patients was hospitalized

TABLE 2: Primary Medical Diagnoses Based on Number of Admissions (n=48).

Primary Medical Diagnoses	Number of Admissions			
	2 times (n=34)	3 times (n=7)	4 times (n=4)	6 times (n=2)
Cataract	11 (32.4%)	-	-	-
Cardiovascular diseases	7 (20.6%)	1 (14.3%)	-	-
Renal diseases	1 (2.9%)	2 (28.6%)	2 (40%)	2 (100%)
Pulmonary diseases	2 (5.9%)	2 (28.6%)	1 (20%)	-
Digestive diseases	2 (5.9%)	1 (14.3%)	1 (20%)	-
Neoplasm	3 (8.8%)	-	-	-
Diabetes mellitus	3 (8.8%)	-	1 (20%)	-
Musculoskeletal diseases	2 (5.9%)	-	-	-
Others	3 (8.8%)	1 (14.3%)	-	-

during 2022, including 48 patients undergoing 30-day readmissions and 35 patients undergoing readmissions of more than 30 days. For data analysis purposes, the 35 patients undergoing readmissions of more than 30 days were excluded from the study sample. Thus, the sample in the study was 930 older adult patients, consisting of 48 patients with 30-day readmissions (5.2%) and 882 patients without readmissions (94.8%).

Thirty-day readmission is defined as a patient’s return to hospital during 30 days of discharge from the previous hospitalization. This variable was categorized into “yes” and “no”. The factors investigated in this study were age, gender, marital status, ward class, length of stay, and main medical diagnosis. Data on age, gender, marital status, ward class, and main medical diagnosis were obtained at the initial admission. Length of stay was obtained after the patient was discharged from the initial admission.

We described the variables by presenting frequency distribution tables. To see the number of admissions of older adults, we described the number of admissions based on the main medical diagnoses. We used binary logistic regression to test the relationship between independent variables and dependent variables in bivariate and multivariate analysis. Independent variables that had a p-value <0.15 in the bivariate analysis were used as the model in the multivariate analysis, which further used a significant level of <0.05. All statistical analyses were performed using IBM SPSS version 22.

TABLE 3: Bivariate Analysis of Factors Associated with 30-day Readmission (n=930).

Variables	UOR	p-value	95% CI
<b>Ages</b>	<b>0.949</b>	<b>0.062</b>	<b>0.897 -- 1.003</b>
<b>Sex</b>			
Males (ref: Females)	1.315	0.359	0.732 – 2.362
<b>Class of Ward</b>			
Class 3 (ref)			
Class 2	1.525	0.268	0.465 – 2.042
Class 1 or VIP	1.330	0.453	0.632 – 2.799
<b>Length of Stay of 1<sup>st</sup> Admission (Days)</b>	0.976	0.705	0.859 – 1.109
<b>Marital Status</b>			
Married	<b>3.333</b>	<b>0.001</b>	<b>1.679 -- 6.618</b>
Others (unmarried/ divorced/ widowed)			
<b>Primary Medical Diagnoses</b>			
Cataract (ref: no)	1.524	0.236	0.759 – 3.057
Cardiovascular diseases (ref: no)	1.078	0.850	0.494 – 2.353
Renal diseases (ref: no)	<b>4.392</b>	<b>0.001</b>	<b>1.833 -- 10.524</b>
Pulmonary diseases (ref: no)	0.558	0.226	0.218 – 1.433
Digestive diseases (ref: no)	1.245	0.684	0.433 – 3.583
Musculoskeletal diseases (ref: no)	0.680	0.600	0.161 – 2.878
Neoplasm (ref: no)	1.715	0.386	0.507 – 5.806
Diabetes mellitus (ref: no)	1.367	0.563	0.474 – 3.943

TABLE 4: Multivariate Analysis of Factors Associated with 30-Day Readmission (n=930).

Variables	AOR	p-value	95% CI
<b>Ages</b>	0.970	0.295	0.915 – 1.027
<b>Marital Status</b>			
Married (ref: others)	3.161	<b>0.001</b>	<b>1.577 -- 6.337</b>
<b>Primary Medical Diagnoses</b>			
Renal diseases (ref: no)	4.090	<b>0.002</b>	<b>1.664 -- 10.052</b>

### 3. Result

The prevalence of 30-day readmission among older adults was 5.2%. Table 1 illustrates the characteristics of the sample in this study. The mean age of older adults was 67.85 + 5.992 years. More than half of the 30-day readmissions occurred in male patients,

and patients with married status. The average length of stay of patients at the initial admission was  $3.44 + 2.377$  days. The top three main medical diagnoses in 30-day readmissions were cataract (22.9%), cardiovascular diseases (16.7%), and renal diseases (14.6%). Cataract was the main medical diagnosis for patients who had two readmissions, followed by cardiovascular diseases (see Table 2). Patients who had more than two admissions were majority patients with renal diseases.

Table 3 shows the results of bivariate analysis of factors associated with 30-day readmission. Age, gender, ward class, and length of stay were not significantly associated with 30-day readmission. Factors that were significantly associated with 30-day readmission were marital status (UOR: 3.333, 95% CI = 1.679 – 6.618) and renal diseases (UOR: 4.392, 95% CI = 1.833 – 10.524).

Based on multivariate analysis (table 4), the logistic regression model explained 7.4% of the variances in 30-day readmission of older adults. The factors significantly associated with 30-day readmission were marital status (AOR: 3.161, 95% CI = 1.577 – 6.337) and renal diseases (AOR: 4.090, 95% CI = 1.664 – 10.052). Older adults with married status had a readmission risk of 3.161 times greater than patients with other marital statuses (unmarried/divorced/widowed). Older adults with renal diseases had a 4.09 times greater risk than other patients to have 30-day readmission.

## 4. Discussion

In this study, the prevalence of 30-day readmissions among older adults was 5.2%. This prevalence is smaller than the prevalence of 30-day readmission from other studies in Indonesia [12], [13], either a study in the United States of 22.3% [15] and a study in the Switzerland of 7.8% [16]. The present study states that married patients have a greater risk of 30-day readmission. This finding is in contrast to research from other countries. A systematic review of mostly articles published in the United States found that older adults without a spouse or unmarried/widowed older adults had a higher risk of re-hospitalization [17]. It was suggested that married older adults had more social support at home than their counterparts so that they were at significantly reduced risk of readmission [18]. Culturally in Indonesia, hospitalized patients need their families to accompany them during their hospitalization. Spouses are part of the older adults' support system during hospitalization. Thus, the absence of someone who can be a patient's caregiver in the hospital is one of the considerations for the older adults to be

re-hospitalized, even if they need. Then, the presence of a primary caregiver for older adults should be part of discharge planning in the hospital.

The main medical diagnosis that was significantly associated with the 30-day readmission of older adults was renal diseases (chronic renal failure and urinary retention). The 30-day readmission in older adults with renal diseases can be confirmed not because of the hemodialysis program, but because of the emergency conditions that occur in patients. Hemodialysis services are provided as outpatient services in this hospital. Therefore, the patient's readmission was not included in the planned 30-day readmission and was potentially preventable. Preventable readmissions are common in hospitals and demand greater healthcare resources. These readmissions also pose a threat to patient safety such as adverse drug events, infectious events, procedural complications, and avoidable exacerbations of disease states or functional decline.

The present study found that cataract was the main medical diagnosis that dominated older adults with 30-day readmissions, even though it was not significantly associated with 30-day readmission. Cataract patients usually undergo planned readmission at the hospital because they have to undergo eye surgery. This eye surgery is performed on one eye first, with an interval of 2 weeks to 1 month for subsequent surgery on the other eye.

Age was also not significantly associated with 30-day readmission. Another study stated that age above 75 years is a risk factor for 30-day readmission [9]. This different result may be due to differences in the study sample in terms of age. In our study, the number of older adults aged 75 years and above was less than 15%, compared to 53.7% of older adults aged 75 years and above in the other study [9]. Further research is still needed using a larger sample size, so that it can cover a wider age range.

## 5. Conclusion

The present study reports that the 30-day readmission prevalence at the hospital is lower than findings from other studies. However, some unplanned 30-day readmissions are potentially preventable. The hospital should pay more attention to patients with medical diagnoses of cataract, cardiovascular disease, and renal disease, which are the top three main diagnoses of 30-day readmissions. Renal disease can be an important part of 30-day readmission risk screening at the hospital. Hospital can evaluate the care process of patients with renal disease, so as to reduce the number of preventable

readmissions. Furthermore, the presence of a primary caregiver for older adults should be part of discharge planning in the hospital.

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