

Early Unplanned Readmission of Elderly in Singapore: A Retrospective Study

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Abstract

Study Objective: To study the incidence and profile of elderly patients requiring early unplanned readmission within 15 days of discharge from a regional hospital and the predictive factors for readmission. **Patients:** All patients (n = 150) aged 65 years old and above who were readmitted within 15 days into the hospital's geriatric unit in the western region of Singapore over a period of 10 months were retrospectively studied. **Methodology:** Demographic data, information on patients' medical problems and social environment were gathered from the patients' medical, nursing and therapist records. A control group (n = 103) consisting of patients not readmitted over 15 days were gathered over the same period. **Results:** The percentage of readmission over the period between 1 January 1999 and 31 October 1999 was (150/1632) 9.2% (95% CI, 7.8% to 10.7%). There were a total of 150 patients with an equal number of male and female patients. The patients had a mean of 4 medical problems. Cardiovascular disease was noted in 73% (95% CI, 65.5% to 80.2%) of the patients during the index admissions. They were noted to be ambulatory and were staying with their own families. Half of the patients were discharged from the index admission with no adjustment to their previous care system. The majority of patients (68.7%; 95% CI, 59.9% to 75.4%) required readmission because of medical problems. Fifty per cent of the patients admitted for a new medical complaint were secondary to sepsis. Thirty per cent (95% CI, 22.8% to 38.0%) of the study population had both medical and social issues. The main predictive factors noted when compared to a control group of 103 patients (using a stepwise logistic regression model) were number of medical problems (P = 0.0128; OR = 1.4; 95% CI, 1.1 to 1.9) and number of previous admissions (P = 0.005; OR = 1.6; 95% CI, 1.2 to 2.3). **Conclusion:** Unplanned readmissions are relatively common in elderly patients. They cannot be entirely prevented in view of multiple chronic illnesses. Further studies, looking at early detection of medical problems and prevention of nosocomial infections are warranted to decrease the problem of readmissions for this group of elderly.

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Introduction

The number of elderly people in Singapore is expected to increase over the next 2 decades. The proportion of those 60 years and above is estimated to increase from the present 11% to 27% by the year 2030. In the year 2000, there were 277 admissions per 1000 population for those in the 65 years and above age group as compared to 61 admissions per 1000 population for those aged 15 to 64 years.¹

An increased number of sicker and medically frail elderly will increase the demand for health services. This group of frail elderly will likely require frequent admissions for treatment of their chronic medical condition; together with advances in medical knowledge and technology,

these will contribute to the increasing cost of providing healthcare.

Our primary aim in this study was to identify the incidence of early unplanned readmission of the elderly in Singapore. The study is also partially descriptive of the elderly requiring readmissions and we also aim to identify the predictive factors for readmission hence allowing us to better adjust our treatment strategies to decrease the high usage of inpatient facilities by our elderly.

Materials and Methods

The study period was from 1 January 1999 to 31 October 1999. The study population comprised patients

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aged 65 years and above who were discharged and readmitted into the geriatric ward of the same hospital in the western region of Singapore.

Information was obtained from the patients' filed medical and nursing records. Case records of a control group who had no readmissions were obtained for comparison over the same study period.

Definitions

An unplanned readmission in this study was defined as an inpatient readmission that was not scheduled at the time of prior discharge to the same department. All episodes of unplanned admissions within 15 days were included and used as a numerator for the calculation of readmission rate. The discharge denominator was calculated after the exclusion of all deaths and transfers. The term index admission described the period in the hospital from which the baseline discharge resulted.

Data were collected on patients' demographic details, a range of information on the index admission, the score for the elderly cognitive assessment questionnaire, and the calculated Modified Barthel scores where there was sufficient data.

The Elderly Cognitive Assessment questionnaire (ECAQ)² is a brief screening test of cognitive function. This objective screen has less bias on educational status and is proposed to be more suited for the elderly in less developed nations. A cut-off value of 7 and below was used to indicate the presence of cognitive impairment. The total achievable score is 10.

The Modified Barthel's score³ measures the functional severity of disability in self-care, sphincter control and mobility, and serves as a gauge of a person's activities of daily living. The maximum score is 20 and indicates independence.

The physiotherapist, occupational therapist and nursing notes were reviewed for information concerning the mobility of the patients at discharge and the location, setup and home circumstances to which the patients were discharged.

Identification of the principal and associated causative factors for readmission allowed for broad classification into two groups—medical and social factors:

Medical Factors

- New complaint: The reason for readmission was not previously a problem.
- Relapse of previous complaint: The condition that caused the index admission when cured or controlled at discharge recurs after a period of remission, leading to a readmission.
- Progress of previous complaint: The condition causing

the index admission is sufficiently controlled at discharge but steadily deteriorates once at home; hence, leading to a readmission.

- Recurrence of previous complaint: Where the condition causing readmission is not related to the reason for the index admission but is a recurrence of a previous problem.
- Treatment factors: Aspects of medical treatment during the index admission such as adverse drug reactions or medication dosage adjustment are factors for readmission.

Social Factors

- Patient coping factors: Circumstances causing patients to have difficulty in coping are not related to any acute medical condition.
- Carer system factors: Breakdowns in carer ability to cope are a cause for readmission.

Statistical Analysis

Statistical analysis was done using SPSS 10.0. Normality of continuous variables was checked using the Kolmogorov-Smirnov 1 sample test. Parametric tests were used to determine the differences in mean of continuous variables between the controls and patients if normality assumption was satisfied, otherwise Mann-Whitney *U* test was applied. Associations between the 2 groups and categorical variables were assessed using chi-square test. A saturated and forward stepwise logistic regression was carried out to determine the predictive factors for readmission rate, with odds ratios presented where applicable. Statistical significance was achieved with *P* value <0.05.

Results

A total of 1632 discharges were recorded, excluding transfers and deaths, during the period from 1 January 1999 to 31 October 1999.

A hundred and fifty of these discharges were subsequently readmitted within 15 days into the hospital's geriatric unit. The percentage of early readmissions was 9.2% (95% CI, 7.8% to 10.7%). One hundred and three controls were recruited.

The nature and characteristics of these episodes are presented with comparative figures from both groups where appropriate.

Patient Characteristics

The study group had an equal number of male and female patients. The majority of patients were the old-old, with a median age of 83 years. The control group had 103 patients, with 59% female patients. The median age of the control group was 80 years.

There were no statistical differences between the 2 groups in age (*P* = 0.053) and gender (*P* = 0.148).

Index Admission of Readmitted Group as Compared with Control Group

Sixty-three patients (42%) were never admitted prior to the index admission. Thirty-seven patients (24.7%) had been admitted once prior to the index admission. The median number of admissions prior to the index admission was 1 episode. There was 1 patient who was admitted a total of 8 episodes prior to the index admission. On the other hand, most of the control group was never admitted over the last 1 year.

The mean length of stay for both the index admission and the control group was approximately 8 days, with a median length of stay of 6 days ($P = 0.477$).

The patients had a significantly higher number of medical problems compared to the controls ($P < 0.001$; mean $\pm$ SD, 4.4 ± 1.4 vs 3.7 ± 1.4 ; range, 1 to 10 vs 1 to 7) (Table I). This means that the patients were not admitted for a single medical diagnosis alone, but have several co-morbidities that may also require concomitant evaluation, stabilisation and treatment.

The ECAQ was recorded and calculated for 102 (68%) readmitted patients. The median score was 6 out of 10. The control group had 87 (84%) responses recorded with a median score of 5. There was no statistical significance in the cognitive status of both groups ($P = 0.172$).

The Barthel score could be calculated for 131 (87%) patients, and the median score was 18. In the control group, 89 (86%) had their Barthel scores calculated, with a median of 16 ($P = 0.065$).

The demographic and descriptive data for both groups are shown in Table I.

The predominant problem was that of cardiovascular disease (a group comprising patients suffering from ischaemic heart disease, congestive heart failure and myocardial infarcts etc), as shown in Table II.

The mobility of the patients was also recorded before the index discharge. Data collected for this category were descriptive and based predominantly on the physiotherapy records that contained the assessment of a patient's functional mobility and the actual need for proper aids for mobilisation. As already reflected in the Barthel's scores, there was no significant difference in the mobility status of both groups ($P = 0.866$).

The distribution of patients in the various mobility categories is shown in Table III.

Those patients who were independent without aids took a median of 6 days to be readmitted while at the other extreme, bed-bound patients took a median of 8 days to be readmitted.

TABLE I: SUMMARY OF STUDY AND CONTROL GROUPS (INDEX ADMISSION)

	Study (n = 150)	Control (n = 103)	P value
Gender			
Male	75	42	0.148
Female	75	61	
Age			
Mean (SD)	83 (6.6)	81.5 (5.8)	0.053
Range	66-101	65-94	
Median	83	80	
Q1-Q3	78-87.25	78-86	
Length of stay			
Mean (SD)	8.14 (6.6)	7.8 (8.2)	0.477
Range	1-38	0-55	
Median	6	6	
Q1-Q3	3.75-10.25	4-8	
Medical problems			
Mean (SD)	4.37 (1.4)	3.7 (1.4)	0.001
Range	1-10	1-7	
Median	4	4	
Q1-Q3	3-5	3-5	
Previous admission			
Mean (SD)	1.3 (1.6)	0.55 (1.1)	<0.001
Range	0-8	0-10	
Median	1	0	
Q1-Q3	0-2	0-1	
Elderly Cognitive Assessment questionnaire			
Mean (SD)	5.6 (3.6)	4.8 (4.5)	0.172
Range	0-10	0-10	
Median	6	5	
Q1-Q3	3-9	0-10	
Barthel score			
Mean (SD)	13.6 (7.8)	11.8 (8.1)	0.065
Range	0-20	0-20	
Median	18	16	
Q1-Q3	7-20	2-19	

SD: standard deviation

Social Aspect of Study and Control Groups

Three-quarters of the patients that were readmitted came from their own homes. Twelve (8%) patients were staying alone while 105 (70%) lived with their spouses/children or lived-in help. Twenty-eight (18.7%) patients were living in nursing homes for the aged.

Likewise, the social circumstances of the control group did not vary widely. Eight per cent of the controls were staying alone while 65% were staying with their own families. Twenty-one per cent stayed in nursing homes.

At index discharge, 82 (54.7%) study patients did not require further intervention in their care system and returned home to their premorbid care system. Twenty patients had improvements made to their previous care arrangement on discharge. This included patients who managed to get hired help or mobilised family members to assist in further care.

TABLE II: MEDICAL PROBLEMS IN THE INDEX ADMISSION

	Study (n = 150)	Control (n = 103)	P value
Cardiovascular	110 (73.3%)	69 (67%)	0.276
Depression/dementia	75 (50%)	45 (43%)	0.323
Orthopaedic	69 (46%)	40 (39%)	0.258
Gastrointestinal	60 (40%)	35 (34%)	0.331
Respiratory	56 (37.3%)	46 (44%)	0.243
Neurological	52 (34.7%)	48 (46.6%)	0.056
Renal	51 (34%)	23 (22%)	0.051
Diabetes	45 (30%)	21 (20%)	0.087

TABLE III: MOBILITY CATEGORIES IN THE INDEX ADMISSION

	Study	Control
Walk independently without aids or assistance	31.3%	30%
Walk independently with aid	26%	25%
Walk with aids and assistance	14.7%	18%
Wheelchair bound	8.0%	3.8%
Bed-bound	16.7%	21%
Not recorded	3.3%	0.9%

Others had been referred to day care facilities for day rehabilitation and social interaction. Three patients (2%) returned to the nursing homes and 28 (18.7%) patients were admitted to a community hospital for continuation of subacute care or rehabilitation. Two patients were discharged to another family member's home.

Readmission of Study Group

The median and mean number of days to readmission was 6 days, with a standard deviation of 4 days. One hundred and three (68.7%) patients were readmitted for medical reasons. Forty-six patients (30.7%) presented with both medical and social problems that warranted readmission. Only 1 patient was admitted based solely on social problems.

The medical reasons for readmission are shown in Figure 1.

Patients readmitted with a new complaint or a relapse of a previous complaint took a median of 5 days to be readmitted. Patients with recurrence of their medical problems took 5½ days to be readmitted. Those that were admitted due to a progression of a previous complaint or treatment factor took a median of 7 days to be readmitted.

A sub-review of the patients that were readmitted with new complaints is shown in Figure 2. The patients admitted for infections, particularly from pneumonia and urinary tract, had a high likelihood of nosocomial infection from the index admission. Unfortunately, the data to support this deduction were not readily available in this retrospective study.

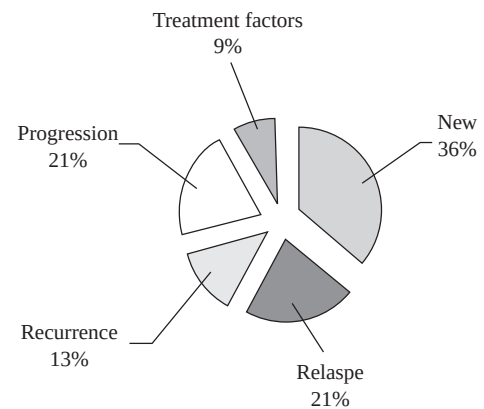


Fig. 1. Medical reasons for readmission in the study group.

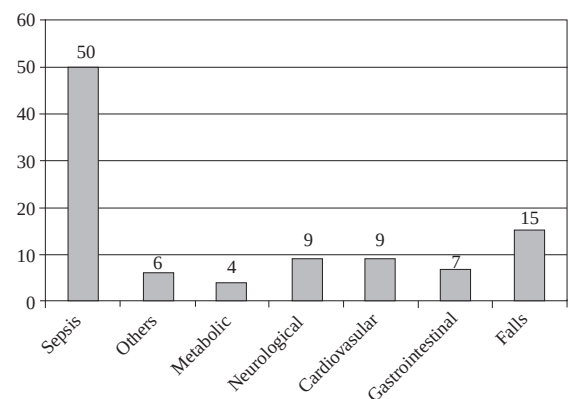


Fig. 2. New complaints leading to readmission (percentage).

Thirteen patients were readmitted due to treatment factors. One patient had postural hypotension with medication for Parkinson's. Two patients sustained subdural haematomas that had required the neurosurgical expertise of a tertiary hospital but were subsequently transferred back when they refused further intervention. An inappropriate choice of antibiotic with incomplete treatment of a patient's pneumonia led to a readmission, while non-compliance to medications contributed to a few readmissions.

Thirty-one per cent of the patients had combinations of medical and social components in their admissions of which 14% had patient coping factors, while 24 (16%) patients had breakdowns in the care system.

There was no significant correlation between

1. Age and number of days to readmission ($r = -0.007$; $P = 0.934$),
2. Number of medical problems and number of days to readmission ($r = -0.046$; $P = 0.577$),
3. Length of stay in index admission and number of days to readmission ($r = 0.013$; $P = 0.872$), and
4. Number of previous admissions and number of days to readmission ($r = -0.083$; $P = 0.313$).

Wheel chair and bed-bound patients took a median of 4

days and 5 days, respectively, to be readmitted. Patients with need for aids and assistance to walk had a median of 5 days to readmission as compared to those who were independent (median, 6 days). However, the correlation between mobility of patients to number of days to readmission was not significant ($r = 0.016$; $P = 0.849$).

Further analysis into the relationship between Mental score and Barthel score revealed that they were significantly positively correlated with each other (Spearman's correlation coefficient = 0.732; $P < 0.001$).

Predictive Factors

Potential predictive factors studied were age, sex, race, number of medical problems, mental score, Barthel score (categorised into 0 to 7, 8 to 14 and ≥ 15), mobility (categorical), home circumstances (categorical), number of adults staying in the same household as the patients, length of stay of both groups, discharge location (categorical) and number of readmissions in the previous year.

For the saturated model, the statistical significant predictive factors for readmissions were number of medical problems ($P = 0.019$; OR = 1.5; 95% CI, 1.1 to 2.0), number of previous admissions ($P = 0.006$; OR = 1.8; 95% CI, 1.2 to 2.8) and number of adults ($P = 0.014$; OR = 0.646; 95% CI, 0.457 to 0.914). Performing a stepwise logistic regression, number of medical problems ($P = 0.013$; OR = 1.4; 95% CI, 1.1 to 1.9) and number of previous admissions ($P = 0.005$; OR = 1.6; 95% CI, 1.2 to 2.3) were the significant predictive variables.

The P values for all variables (odd ratios with 95% confidence intervals presented for significant predictors only) for the saturated model are shown in Table IV.

Discussion

Currently, there are no data in Singapore that examined the elderly population requiring early unplanned readmission to a hospital. This study profiles this group of

elderly, identifies its incidence and the predictive factors for readmission.

Previous studies in overseas publications had varied results. The variation as noted by McInnes et al⁴ was largely due to the criteria for entry into the various protocols. The number of days used to select patients ranged from 14 days to 28 days. We adopted 15 days as our main criteria, in keeping with the quality indicators adopted by the Ministry of Health.

The denominator used was also a confounding factor as some protocols included all discharges from the hospital as compared to protocols that excluded deaths and transfers.

The elderly population in Singapore is privileged to have a number of hospitals which are well located around the island with quick access. They may be admitted into any other hospital with ease. Completeness of data may hence be confounded as data were only gathered from our hospital.

The greater the number of medical problems a patient has, the more likely he would be readmitted. Gautam et al,⁵ likewise, noted that their study population had an average of 3 medical problems. Understandably, a patient with many medical problems would have a greater chance of deterioration from any one of his many medical problems and hence require an admission for stabilisation.

Reed et al⁶ indicated that patients with 2 or more admissions in a previous year were also at higher risk of readmissions. Our results proved similar. They suggested that high utilisers of inpatient care get readmitted most. This is not unexpected as medically frail elderly frequently require hospital-based medical care due to their multiple medical comorbidities. Other predictive factors identified previously included age, a longer stay in index hospitalisation, and presence of coping difficulties.⁷

We noted that the elderly in our study had a high prevalence of cardiac disease, seen both in the study group (73%) and the control group (66%). This is consistent with the study by Gautam et al.⁵ Patients with congestive cardiac failure have been noted to have a 20% readmission rate and increased mortality.⁸ Age,⁹ a prior history of cardiac failure, non-compliance to medications or diet, a failed social support system and failure to seek medical help promptly with symptom recurrence contributes to readmission.¹⁰ Nurse-directed multidisciplinary interventions^{11,12} have been shown to be effective in reducing admissions in such patients.

The commonest reason for readmission was a new medical condition. Gautam et al⁵ similarly noted that the majority of their patients had medical problems causing readmission; however, the reason of readmission was that of a relapse of a previous condition rather than a new complaint.

Collidge and Ford¹³ stated that the mean time to

TABLE IV: SATURATED MODEL

Variable	P value	OR	95% CI
Age	0.1335	—	—
Sex (male)	0.1024	—	—
No. of medical problems	0.0189	1.5	1.1 – 2.0
Mental score	0.7974	—	—
Mobility*	0.4185	—	—
Home circumstances*	0.2784	—	—
No. of adults staying in the same household	0.0136	0.646	0.457 – 0.914
Length of stay	0.1432	—	—
Discharge location*	0.4877	—	—
No. of previous admissions	0.0056	1.8	1.2 – 2.8
Barthel score*	0.9981	—	—

OR: odds ratio;

*categorical variables

readmission was shorter in those with related diagnosis while Gautam et al⁵ found that those with new complaints or those with social problems tended to return quicker than those with relapses. We found no significant difference between the mean time taken to be readmitted for a new complaint when compared with that of readmissions due to a related diagnosis.

The social set-up of the study population largely described the readmitted elderly in his eighties staying with his spouse, children or even lived-in help. This is consistent with a local study which reported that 84.6% of those aged >65 years stayed with their children and most were satisfied with this arrangement.¹⁴ Gautam et al⁵ documented that 50% of their study population were living alone. In our study, the patients have a 70% chance of having another adult staying with them. This increased number of adults staying with the elderly in the same household may also result in less readmission. This translated to an inferred source for assistance at home when required. Interestingly, despite inferred availability of ready home help, the readmission rate is still comparable to studies done in the west. This is likely because the readmissions were primarily because of medical conditions, which the patient and his family were unable to manage without any medical input.

Colledge and Ford¹³ acknowledged that 13% of their study population had quoted social reasons for readmission. They described the readmitted population as higher users of social services with no carers. Kelly et al¹⁵ in their study quoted 5.7% and described the typically readmitted elderly as being highly dependent and medically frail. This is not reflected in our study population. Readmission for social reasons formed only a part of the actual reason for readmission. The single patient that had been admitted 5 times due to social circumstances was a 77-year-old male patient living in a walk-up apartment on the fourth level. He had chronic obstructive lung disease and was house-bound because of osteoarthritis of his knee joints with resultant difficulty with stair management. Despite being competent with his medication administration and experiencing only mild attacks, he had himself admitted repeatedly because of his fear of deterioration when he was alone at home.

Earlier studies noted that the needs of the readmitted group required re-organisation for more nursing and social services both before and after discharge. Problems encountered with services after discharge included no arrangement, delay in starting services and inadequate services to meet the patient's needs.¹⁶ Half of our patients were discharged without adjustments to their prior care arrangements. A large proportion of the adjustments made was to improve the post discharge care issues and usage of social services available to maintain the patients' functional status.

Problems experienced by carers and their needs should be addressed and communication with the carers should be improved before discharge of patients.¹⁷ Carers often complain about the effect the task had on their own health and high levels of frustration experienced. This is also reflected in our study. The social issues that form part of the readmissions were due to carer fatigue and requests for extension of stay in the acute hospitalisation, either by the patients themselves or by the carers.

A local study carried out recently indicated there was a great disparity between 'need for service' and 'utilisation'.¹⁸ This study surveyed perceived needs of the hospitalised elderly and their relatives for health services including 24-hour medical help-lines, home visits by doctors, respite care and social day care centres. A similar study can be conducted for readmitted persons to see whether their perceived needs deferred from that of those documented in the former study. Incorporation of the results may lead to a further decrease in the readmitted population, as meeting their needs would facilitate their discharge and reintegration into the community, this can then be extended to prevent early readmission. More community-based social support systems are being planned to meet the needs of the elderly as well as the carers; these measures will go far in reducing readmissions related to lack of caregiver support.

Communication with family physicians for continuing care of the discharged elderly still cause concern.¹⁹ Our department provides each patient with a discharge summary. A review in the specialist outpatient clinic is also scheduled before discharging them to the care of the family physician. This step-down care approach lessens the family physician's contact with a directly discharged elderly.

Previous findings^{4,20} indicated that use of readmission rates as a quality of care indicator is not suitable. Elderly patients have multiple chronic illnesses, which progress despite better management of the previous admission;¹⁵ thus, readmissions do not accurately reflect quality of inpatient care. However, the medical reasons for readmission do suggest deficiencies in the processing and delivery of care, especially at the patient's home.

This study can be further expanded to validate readmission rates as a quality indicator by including an in depth audit of the deficiencies beyond just classifying the types of medical outcomes. Identification of such specific deficiencies may then allow for implementation of home-based disease management.

Disease specific case management²¹ or home-based intervention²² have been shown to decrease readmissions. Home intervention can optimise compliance with treatment regimen. Identifying clinical deterioration early also allowed for intensified follow-up where appropriate. These measures limited unplanned readmissions and were cost-effective if

applied to patients with a history of frequent hospitalisation. However, when under home care systems, many patients still required readmission; female patients with cardiovascular or respiratory problems profiled this subgroup.²³

Finally, for medically frail and highly dependent patients, early intervention with readmission may be appropriate.¹⁵

Conclusion

This study has highlighted the fact that unplanned readmissions cannot be entirely prevented, given the nature of the old-old with multiple chronic diseases. The demographic characteristics of the study group were not significantly different from the control group and were therefore typical of the average geriatric inpatient rather than in a group at risk of unplanned readmissions.

Medical problems were the commonest reasons for readmission and prevention of sepsis, in particular nosocomial infections, and falls risk reduction may reduce the readmission rate. Concomitantly, we should seek to reduce relapses and recurrence of illnesses.

The increased number of medical problems and previous admissions were significant predictive factors identified for readmission in this study; however, the combined knowledge with overseas studies will be useful to assist in intensive management of our patients with these factors and provides a platform for further intervention studies.

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