Hospital readmission among older medical patients in Hong Kong

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ABSTRACT – **Objective**: To study the risk factors for hospital readmission among older medical patients in Hong Kong.

■ **Design**: Cohort study.

■ **Subjects**: 1,204 consecutive hospital medical patients aged 70 years and over in Hong Kong.

■ **Procedures**: Subjects were interviewed by a research nurse on discharge, and were followed up for six months.

■ **Outcome**: Unplanned hospital readmissions were identified and classified as avoidable or unavoidable. The risk factors for early (within 28 days), recurrent (three or more) and unavoidable readmissions were studied by multiple logistic regression.

■ **Results**: Four hundred and fifty-five patients (37.7%) had at least one readmission in six months; 18%, 6.4%, and 2.9% of subjects had early, recurrent and unavoidable readmissions respectively. Recent hospital stay predicted all types of readmissions. Early readmission was predicted by length of stay, Barthel index (assessment of physical and mental function) and unresolved medical problems. Recurrent readmission was predicted by poor family support, residence in a home for the elderly and unresolved medical problems.

■ **Conclusions**: Hospital readmission may be prevented by ensuring adequate length of stay, so that medical problems are resolved before discharge.

Hong Kong is a special administrative region of China, with a population of 6.2 million. More than 90% of the hospital services are provided by the Hong Kong Hospital Authority, with funding from the central government. Due to the ageing population and poorly developed primary health care services, there is a great demand for hospital beds. Most public hospitals are therefore under considerable pressure to discharge patients as soon as possible. One of the consequences of such practice is the high rate of hospital readmission, particularly for older patients. A local survey of older medical patients discharged from a regional hospital showed that the readmission rate was 11% at one month and 30% by six months. Major problems in communication about medication and follow-up arrangements, lack of community support and increase in functional disabilities were reported.

There has been considerable research on hospital readmission among the elderly in the UK. Several case-control studies have been conducted, and factors such as recent hospital admission and premature discharge have been found to be associated with hospital readmission. An American cohort study showed that male sex, widowhood, illness severity and poor life satisfaction were risk factors for readmission at six weeks. Because there are considerable differences in the health care and social care systems between Western countries and Hong Kong, we performed a cohort study to investigate the incidence of, and the risk factors for, hospital readmission amongst older people in Hong Kong.

**Subjects and methods**

Prince of Wales Hospital (PWH) is the teaching hospital for the Faculty of Medicine, at the Chinese University of Hong Kong. It is located in Shatin, an established new town. The hospital serves a regional population of one million. As PWH is the only acute hospital in the region, and the local older population is relatively stable, the great majority of the local older residents requiring acute hospital admissions come to PWH. In 1996, the ten medical wards in PWH had a total intake of 18,000 patients, 50% of whom were 70 years or older. In that year, 5,091 patients aged 70 years or over, routinely screened by a designated geriatric nurse, were discharged to the following locations: community, 55%; a geriatric rehabilitation hospital, 27%; an infirmary hospital, 6.6%; other hospitals, 3%; and 8.4% died.

This study was conducted in four medical wards in PWH from September 1996 to September 1997. These four wards, chosen arbitrarily, did not differ from the others in terms of staffing and function. In the study period, 1,204 patients (aged 70 years and over) were discharged from these hospital wards to the community (including residential or nursing homes).

On the day of hospital discharge, eligible subjects were interviewed in the wards by a research nurse, using a standard, structured questionnaire. The following information was obtained: (a) demographic data: age, sex, living arrangement; (b) clinical data: main diagnosis, length of
stay, history of admission in previous six months, number of drugs on discharge, time interval between discharge and scheduled follow-up; (c) physical and mental function: Barthel Index (with a maximum score of 20), mental test score (information/orientation section of Clifton assessment procedure, with a maximum score of 12); (d) subjects' perception: subjects were asked if their family were supportive during their illness, and if they felt that they were ready for discharge; (e) the research nurse’s subjective assessment: unfulfilled need for further rehabilitation, whether the medical problems were defined and resolved. The research nurse’s assessment was supported and supervised by a trained geriatrician (TK).

All subjects were then followed up for six months. Readmissions were ascertained by examining the computerised hospital database. In this study, only unplanned admissions into the medical wards of PWH within six months of discharge were included. Upon readmission, the medical records of the study subjects were reviewed by the research nurse, under the supervision of one of us (TK). The main causes of readmission were classified as follows: (1) unavoidable causes: deterioration of existing disorder, new medical events and terminal care; or (2) avoidable causes: non-compliance with medication or diet, unresolved medical problems, side effects of drugs, social problems and psychological problems.

The prevalence of and risk factors for three types of readmission were studied. (1) Early readmission was defined as readmission within twenty-eight days of discharge. (2) Recurrent readmission was defined as three or more readmissions in six months. (3) Avoidable readmission was defined as readmission predominantly due to avoidable causes.

In studying the risk factors for readmission, subjects who were not readmitted in the six months of follow-up were regarded as controls. The relative risk (RR) and 95% confidence intervals (95% CI) for the risk factors of the three types of readmission were calculated by multiple logistic regression, using the software SPSS. In each regression model, subjects were compared with those who had not been readmitted. Reference categories, eg female, age 70–79 years etc, were predetermined to have RR of 1.0.

### Results

A total of 1,204 subjects with a mean age of 79.4 years (SD 6.5 years) were studied; 33.7% of these were men. They spent on average 4.5 days (SD 3.6 days) in hospital.

Four hundred and fifty-five subjects (37.8%) had at least one readmission in six months; 217 (18%) were readmitted within twenty-eight days; 77 subjects (6.4%) had three or more readmissions in six months. The primary medical diagnoses of the subjects with early, recurrent and avoidable readmissions are shown in Table 1. Subjects with cardiac failure, ischaemic heart disease and cardiac arrhythmia had the highest rates of readmission for all three types. Patients with malignant diseases had the highest early readmission rate, but their number was relatively small. Chronic lung disease subjects had a high rate of recurrent readmission. The most common causes of the first readmission are shown in Table 2. According to our criteria, 77.7% of these readmissions were deemed avoidable. Overall, 2.9% of all subjects were readmitted at least once for avoidable reasons.

The RR and 95% CI of the risk factors of early readmission, recurrent readmission and avoidable readmission are shown in Table 3. Hospital stay in the previous six months predicted all three types of readmissions. Moreover, early readmission was predicted by length of stay (5–8 days), Barthel index (15–19) and unresolved medical problems. Recurrent readmission was predicted by residence in a home for the elderly (private and subvented), unresolved medical problems and poor family support. The following factors were not found to be associated with the risk of readmission: gender, time till the next scheduled follow-up visit, number of drugs prescribed, mental test score, undefined medical problems, patients' reported readiness for discharge, and the research nurse's perceived patient need for further rehabilitation.

### Discussion

This study was the first large scale cohort study of hospital readmissions of older patients in Hong Kong. Compared

### Key Points

**Older medical patients at risk of readmission can be identified objectively**

**Recent history of hospital stay is the best indicator**

**Premature discharge frequently leads to readmission**

**Few readmissions have predominantly avoidable causes**

| Category                  | Number | Early n | Recurrent n | Avoidable n |
|---------------------------|--------|---------|-------------|-------------|
| Peptic ulcer              | 140    | 24      | 9           | 6           | 3           | 2.1        |
| Chronic lung disease      | 135    | 23      | 17          | 14          | 10          | 2          | 1.5        |
| Ill-defined symptoms      | 126    | 21      | 17          | 7           | 6           | 4          | 3.2        |
| Cardiac failure           | 124    | 34      | 27          | 12          | 10          | 6          | 4.8        |
| Chest infection           | 93     | 16      | 17          | 4           | 4           | 1          | 1.1        |
| Arrhythmia                | 83     | 16      | 19          | 6           | 7           | 5          | 6.0        |
| Diabetes mellitus         | 70     | 10      | 14          | 4           | 6           | 2          | 2.9        |
| Ischaemic heart disease   | 62     | 13      | 21          | 7           | 11          | 4          | 6.5        |
| Stroke                    | 54     | 6       | 11          | 0           | 0           | 2          | 3.7        |
| Cancer                    | 35     | 11      | 31          | 2           | 6           | 1          | 2.9        |
| Genitourinary disorder    | 32     | 4       | 13          | 2           | 6           | 0          | 0          |
| Anaemia                   | 31     | 4       | 13          | 1           | 3           | 1          | 3.2        |
| Others                    | 219    | 41      | 19          | 9           | 4           | 3          | 1.4        |
| **Total**                 | 1204   | 217     | 18.0        | 77          | 6.4         | 34         | 2.8        |
with the UK, the health care services in Hong Kong are much more hospital based, with hospital services consuming 90% of the total public health care funding. In the UK, on the other hand, primary health care practitioners have an important role in the management of chronic diseases and the follow-up of hospitalised patients.

In our study, the readmission rates at one month and six months were 18% and 37% respectively. Readmission rates of older patients in the UK were generally lower, ranging from 6–15.3% at one month\(^6\). However, two London hospitals reported readmission rates as high as 38% at six months\(^5\).

Hospital stay in the past six months was the strongest predictor of readmission. Recent hospital admission was also found to be associated with readmission in case control studies in the UK\(^3\). Although it offers no clue to the causes of readmission, this is a readily available and objective risk factor to alert the attending physicians.

Premature discharge has been suggested to be a cause of readmission in the UK\(^7\). However, no consistent association between length of stay and readmission was found\(^8\). In our study, length of stay of five to ten days was predictive of early readmission. The average length of stay of our medical patients was about four days, reflecting the pressure to discharge patients early; those who stayed longer than four days were either medically unstable or required convalescent or rehabilitative care. For this group of patients, a further stay of up to four days was probably inadequate. In addition, being discharged with unresolved medical problems was a predictor of early readmission and recurrent readmission. Overall, the data suggested that premature discharges did occur and led to readmissions.

Residence in a home for the elderly was a predictor of recurrent readmissions. In contrast, in the UK, no consistent association was found between residential or nursing home care and readmission rates\(^9\). This suggested that there are problems in the quality of care in our homes for the elderly, especially private homes. The case-mix of private homes for the elderly in Hong Kong is similar to that of private nursing homes in the UK, but there is a relatively low welfare subsidy (maximum of £500 sterling per month) made available to meet the home charges. Hence the quality of care in the private homes for the elderly in Hong Kong is much poorer than that in British private nursing homes.

Subvented homes for the elderly in Hong Kong are equivalent to residential homes run by social services in the UK. Their accommodation and staffing is better than in private nursing homes and their residents are generally less frail. It was disappointing that residence in these homes was associated with recurrent readmissions, especially as they were visited every month by the local hospital based geriatric outreach team and the offer of geriatric outpatient consultation made within three days of request. This highlighted the limitations of a hospital based service in delivering medical care in the community, and the need for an effective primary health service.

Eighty-five subjects were perceived by the research nurse to require further rehabilitation. It was surprising that the perceived need was not a predictor of readmissions. However, 85% of the subjects were also classified as having an unresolved medical problem, which was a stronger independent predictor of readmission.

Only 77% of the first readmissions were avoidable. In contrast, UK studies reported a much higher proportion of avoidable readmissions, ranging from 14.7% to 59%\(^2,10\). One of the reasons for the discrepancy is that we were probably more stringent about the definition of avoidable readmission. In addition, hospital notes might not provide sufficient information about the causes of readmission, which were often complex\(^7\). In studies with detailed assessment involving relatives, hospital staff and general practitioners, the proportions of avoidable admissions were much higher\(^7\). This approach is labour intensive and the judgement of avoidability is necessarily subjective. There is little agreement among clinicians\(^9\) on the avoidability of hospital readmission of older patients with medical problems. Finally, a lack of post-discharge visits by the patient's primary care team or lack of communication with general practitioners were not regarded as avoidable reasons in our setting.

This study is consistent with the view that the readmission rate for patients is not a good hospital performance indicator because many readmissions cannot be avoided by improving hospital services alone\(^6,11\). However, this study showed that older medical patients at risk of readmission can be identified objectively, and hospital services can contribute to the prevention of readmission by keeping patients long enough to resolve their medical problems before discharge.

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Table 3. Relative risk (RR) and 95% confidence intervals (CI) for age, gender and significant risk factors for hospital readmission.

| Factor                          | RR (95% CI) readmission |
|---------------------------------|-------------------------|
| (a) Demographic factors         |                         |
| Gender                          |                         |
| Female                          | 1.0                     | 1.0                     | 1.0                     |
| Male                            | 0.8 (0.6-1.2)           | 1.3 (0.7-2.3)           | 0.5 (0.2-1.2)           |
| Age (years)                     |                         |                         |                         |
| 70-79                           | 1.0                     | 1.0                     | 1.0                     |
| 80-89                           | 1.2 (0.8-1.7)           | 0.9 (0.5-1.7)           | 1.0 (0.4-2.3)           |
| 90+                             | 0.8 (0.4-1.6)           | 1.8 (0.7-4.4)           | 2.0 (0.5-7.0)           |
| Living arrangement              |                         |                         |                         |
| With family                     | 1.0                     | 1.0                     | 1.0                     |
| Alone                           | 0.1 (0.5-1.8)           | 0.5 (0.2-1.8)           | 1.7 (0.5-5.7)           |
| Subvented home for elderly      | 1.0 (0.6-1.6)           | 2.2 (1.0-4.8)*          | 0.5 (0.1-1.7)           |
| Private home for elderly        | 1.8 (1.0-3.1)           | 3.7 (1.6-8.5)**         | 0.5 (0.1-1.8)           |
| (b) Clinical data               |                         |                         |                         |
| Admission in last 6 months      |                         |                         |                         |
| No                              | 1.0                     | 2.5 (1.7-3.5)**         | 3.5 (2.0-6.0)**         | 3.1 (1.4-6.9)**         |
| Yes                             |                         |                         |                         |                         |
| Length of stay (days)           |                         |                         |                         |                         |
| 1-4                             | 1.0                     | 1.0                     | 1.0                     |                         |
| 5-8                             | 1.7 (1.1-2.4)*          | 1.5 (0.8-2.8)           | 1.2 (0.5-2.9)           |                         |
| 9+                              | 1.1 (0.6-2.2)           | 0.8 (0.3-2.5)           | 0.6 (0.1-2.8)           |                         |
| (c) Physical and mental function|                         |                         |                         |                         |
| Barthel score (out of 20)       |                         |                         |                         |                         |
| 20                              | 1.0                     | 1.0                     | 1.0                     |                         |
| 15-19                           | 1.8 (1.1-2.7)**         | 1.9 (0.9-3.6)           | 2.4 (0.9-6.1)           |                         |
| <15                             | 1.7 (1.0-3.1)           | 1.7 (0.7-4.0)           | 2.4 (0.7-8.6)           |                         |
| (d) Assessment by research nurse|                         |                         |                         |                         |
| Problem not resolved            |                         |                         |                         |                         |
| No                              | 1.0                     | 1.0                     | 1.0                     |                         |
| Yes                             | 1.7 (1.1-2.5)*          | 2.0 (1.1-3.9)*          | 1.8 (0.7-4.6)           |                         |
| (e) Patients’ perception        |                         |                         |                         |                         |
| Family support*                 |                         |                         |                         |                         |
| Good                            | 1.0                     | 1.0                     | 1.0                     |                         |
| Fair                            | 0.9 (0.5-1.6)           | 1.0 (0.4-2.3)           | 0.5 (0.1-2.4)           |                         |
| Poor or none                    | 1.3 (0.7-2.5)           | 2.7 (1.2-6.1)*          | 1.8 (0.5-6.1)           |                         |

The following factors were not found to be significantly associated with the risk of readmission: age, gender, time until follow-up visit, number of drugs prescribed, mental test score, medical problems not defined, need for further rehabilitation, patients' readiness for discharge.

*p <0.05, **p <0.01, ***p <0.001 in multiple logistic regression model.

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