

Measuring and preventing potentially avoidable hospital readmissions: a review of the literature

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Objective	To review literature identifying key components for measuring avoidable readmissions, their prevalence, risk factors, and interventions that can reduce potentially avoidable readmissions.
Data sources and extraction	Literature search using Medline, PubMed and the Cochrane Library up to June 2010, using the terms “avoidable”, “preventable”, “unplanned”, “unnecessary”, “readmission”, and “rehospitalization”.
Study selection	A total of 48 original papers and review articles were selected for inclusion in this review.
Data synthesis	Although hospital readmission seemed to be a term commonly used as an outcome indicator in many studies, it is difficult to make valid comparison of results from different studies. This is because the definitions of terms, methods of data collection, and approaches to data analysis differ greatly. The following criteria for studying hospital readmissions have been recommended: (a) identify hospital admissions and define relevant terms, (b) establish a clinical diagnosis for a readmission; (c) establish the purpose for a readmission, (d) set a discharge-to-readmission timeframe, and (e) identify the sources of information for assessing readmissions. Studies to identify avoidable readmissions usually involve medical records and chart reviews by clinicians using the classification scheme developed by the authors. The proportion of all readmissions assessed as preventable varies from 9 to 59% depending on the population of patients studied, duration of follow-up, type and methodology of the study and case-mix-related factors. A number of studies classified risk factors for readmission into four categories: patient, social, clinical, and system factors. Home-based interventions, intensive education/counselling, multidisciplinary care approaches, and telephone follow-up were the main types of interventions to address potentially avoidable readmissions.
Conclusions	A standard instrument to identify avoidable readmission is important in enabling valid comparisons within the system and at different timelines, so as to permit robust evaluation of interventions. The assessment of preventable risk factors for readmissions also provides a basis for designing and implementing intervention programmes.

Key words

Outcome and process assessment (health care); Patient readmission; Prevalence; Risk factors

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Introduction

Studies that identify reasons for readmissions to hospital are gaining importance in light of changing demographics worldwide.¹⁻⁵ An ageing population in a community generally leads to an increase in the burden of chronic illnesses, multiple morbidities and disability as well as the demand for health care services, particularly hospital beds. Due to the rising demands resulting in pressure on hospital beds, premature discharge of patients from acute hospitals has been observed. The consequences of premature discharges include high hospital readmission rates and lower in-patient quality of care. Not surprisingly, there is an increasing emphasis on identifying and reducing avoidable readmissions, which could also reduce the financial burden on hospitals and improve quality of in-patient care.

The aim of this study was to review the medical literature on identifying the key components for measuring the extent of avoidable readmissions, assess the prevalence of avoidable readmissions, comprehend associated risk factors, and examine

「可避免再入院」的量化與防範：文獻回顧

目的 從文獻中找出可以量化「可避免再入院」的關鍵要素，評估其比率和風險因素，及探討減少可避免再入院的介入計劃方案。

資料來源及研究選取 用以下關鍵詞搜索至2010年6月於Medline、PubMed、及Cochrane Library資料庫發表的文獻：「可避免的」(avoidable, preventable)、「非計劃的」(unplanned)、「非必要的」(unnecessary)、「再入院」(readmission)和「再住院」(rehospitalization)。

資料選取 共48份論著及綜述文章被納入研究範圍。

資料綜合 在眾多研究中，「再入院」似乎是一項普遍被使用的結果指標，可是由於每個研究對再入院的定義各有不同，其搜集和分析數據的方法亦有很大的差異，所以把不同研究準確地作比較會相當困難。以下是一些建議用作研究再入院的準則：(1) 界定「入院」及有關詞語的定義；(2) 制定再入院的臨床診斷；(3) 界定再入院的目的；(4) 擬定一個由出院至再入院的時間表間隔；及(5) 找出用作評估再入院的資料來源。研究可避免再入院的文獻通常透過作者自己設計的分類法，由醫生來查考病人的病歷紀錄和回顧來界定可避免的再入院。可避免再入院的比率由9%至59%不等，視乎病人的類別、隨訪期、研究種類及方法，以及與病例組合有關的因素。部份研究把再入院分為病人、社會、臨床及制度方面四種風險因素。家庭介入為本方案、加強教育或輔導、跨部門多元化醫治模式及電話跟進都是解決可避免再入院的關鍵要素。

結論 要在同一個系統內和於不同時段作準確比較，一個可以量度可避免再入院的標準工具非常重要，這有助穩健準確評估介入治療計劃方案的方法成效。此外，評估可避免再入院的風險因素亦為設計及實施介入治療計劃方案打好基礎。

interventions or programmes which aim to reduce potentially avoidable readmissions. This could yield important insights into facilitating the assessment, implementation, and evaluation of programmes. Such initiatives could reduce potentially avoidable hospital readmissions by identifying target sub-groups whose needs can be specifically addressed, and develop population-wide strategies in Hong Kong.

Methods

Literature searches were performed in Medline, PubMed, and the Cochrane Library of locally and internationally published English language journals until June 2010. The references from the identified articles were further searched for additional sources. Various combinations of the following key words and phrases were used: “avoidable”, “preventable”,

“unplanned”, “unnecessary”, “readmission” or “re-admission”, and “rehospitalization” or “re-hospitalization”.

A total of 187 original papers and review articles were selected for full-text review. Each article was reviewed independently by two persons using a data extraction form. Of these, 139 articles which were less relevant to the avoidable readmissions, eg focus on early or emergency readmissions/other health outcomes, those with unclear definition/methodology/programme description, and those which were commentaries and letters to the editors were excluded. The search resulted in 48 articles being included in the study.

Highlights of literature review

Criteria for measuring readmission

Readmission seemed to be a simple term and commonly used as an outcome indicator by many studies. However, it is difficult to make accurate comparison of the study results since the definitions of terms, methods of data collection, and approaches to data analysis differ greatly among studies.⁶ In view of this, the following recommended criteria were used to measure readmissions¹:

- (1) Identify hospital admissions and definition of terms;
- (2) Establish a clinical diagnosis;
- (3) Establish the purpose for a readmission;
- (4) Set a discharge-to-readmission timeframe; and
- (5) Identify the sources of information to assess readmission.

In general, the first of a series of admissions was called the index hospitalisation or admission, which differentiated it from the subsequent readmissions. Most studies counted and studied only the first readmission after the index admission.⁷ This approach has been criticised and an iterative process was proposed to redefine admissions and readmissions, ie each subsequent readmission becoming an index admission if followed by a further admission.⁸ It was advocated that this would better reflect the clinical course of care. Diagnostic-related groups and the International Classification of Diseases and related problems (ICD codes) were the most frequently used methods of establishing clinical diagnoses.^{1,3,9} To establish the purpose of readmission, one approach was to classify readmissions into three groups, ie foreseen readmissions, unforeseen readmissions related to a previously known affliction, and unforeseen readmissions caused by a new affliction.⁹ Readmissions related to a new affliction are generally thought to be unrelated to any co-morbidity or disease already present in the index admission. The time interval used between the date of discharge from the index admission and readmission was variable,

ranging from 2 weeks to 365 days and specified based on clinical or research interests. A 30-day timeframe was commonly used in studies in the United States and a 28-day timeframe in studies in the United Kingdom.^{2,4,9-14} Two studies had mathematically argued that the 30-day timeframe was an optimal choice to study unplanned readmissions based on statistical modelling such as survival analyses, as well as sensitivity and specificity analyses.^{3,15} Hong Kong studies mainly followed the United Kingdom's 28-day timeframe.¹⁶⁻²⁰ Sources of information to study readmissions included hospital databases, state databases, medical records, reports from health care practitioners, reports from patients and family members, and interviews and focus group meetings. Usually, a combination of the above sources was used, particularly in studies that used databases or medical records, due to the incompleteness of data and/or inadequate documentation in the hospital records.^{3,5,7,9,21-23} A local study conducted in Princess Margaret Hospital in 1994 revealed that the hospital record retrieval rate was rather low at around 58%.¹⁷ Items such as functional limitations, mobility, follow-up arrangements, and discharge destinations were often missing. This reflects a need for better documentation in each patient record. In addition, hospital records might not be able to provide sufficient information about the causes of readmissions. A detailed assessment involving patients, their family, relatives and friends, hospital staff and general practitioners might be useful in collecting relevant information about readmissions, although this approach is rather labour-intensive.¹⁸

Target groups

A number of studies have been conducted overseas and locally on measurement of readmissions, reasons/causes of readmissions, and predictors/risk factors. These studies were mainly disease-specific, and tended to focus on elderly patients. In a local Hong Kong context, there were six studies relating to measurement and/or risk factors of readmission. The target groups included elderly patients, adult patients with medical conditions, and patients with tuberculosis.^{16-20,24}

Potentially avoidable readmissions

Definitions

There is a lack of a single and universal definition of an avoidable readmission. Some called it an 'avoidable' readmission. Others used the terms 'inappropriate' or 'unnecessary' readmission.¹ A number of definitions have emerged which incorporate the system, the clinical, the patient, and social factors present before admission or readmission, which if addressed may have averted the hospitalisation.^{3,4,25,26}

An example of a definition identified in the literature review was as follows¹: "Readmission that could have been potentially avoided with better clinical management and stabilization prior discharge or after discharge on an outpatient basis, appropriate discharge planning, or provision of resources at home sufficient to meet the patient's needs."

Procedure and criteria for measuring avoidable readmissions

Studies to identify avoidable readmissions usually involved medical records and chart reviews by clinicians who first ascertained the reasons for admission and then determined whether the hospitalisation was avoidable or not and the reasons for that conclusion. It was usual for two independent reviewers to conduct the determination and if there was no consensus, a third reviewer might be called in and a majority final decision applied.⁴ A classification scheme was designed and used to measure avoidable readmissions. However, the criteria for measuring preventability varied somewhat across studies. Yet mainly they were based on four factors, namely: system, social, clinical, and patient. Several excellent tools can serve to develop instruments which can be applied in a local context to determine whether a readmission is potentially avoidable.^{2-4,13} Such instruments include: a classification scheme designed by Clarke² for assessing readmissions, a categorisation of the causes of readmission elaborated by Halfon et al,³ a checklist for assessing preventability developed by Oddone et al,⁴ and the correlation of the principal and associated factors for readmission proposed by Gautam et al.¹³

Prevalence of avoidable readmissions

The proportion of all readmissions assessed as preventable varied from 9 to 59% depending on the population of patients studied, duration of follow-up, type of study (whether retrospective or prospective), methodology used, and case-mix-related factors (Table 1^{2-5,9,13,27}). For example, the potentially avoidable

TABLE 1. Summary of point prevalence studies of avoidable readmissions^{2-5,9,13,27}

Study	Type of patients	Follow-up period (months)	No. of patients	Avoidable readmissions (%)
Frankl et al ⁹	General medical	4	327	9
Gautam et al ¹³	Elderly	1	109	15
Clarke ²	General medical	1	133	17
Halfon et al ³	General medical	1	174	23
Oddone et al ⁴	General medical	6	811	34
Graham and Liversley ⁵	Elderly	12	153	48
Williams and Fitton ²⁷	Elderly	12	133	59

readmission rate was 9% among all medical patients readmitted within 30 days of a previous discharge in a 4-month period.⁹ On the other hand, it was 59% for readmissions among elderly patients readmitted within 28 days over a 12-month period.²⁷ In Hong Kong, there was also a variation in reported avoidable readmission rates. For example, a study among elderly patients in a geriatric centre at Princess Margaret Hospital found that about 19% of the unplanned readmission (15 out of 79) were considered avoidable upon review of medical records by a panel of three trainees.¹⁷ On the other hand, another study among Prince of Wales Hospital medical patients aged 70 years or older concluded that only 7.7% of first readmissions were avoidable.¹⁸

Risk factors

There were a number of studies on risk factors for readmission in different patient populations. In general, risk factors can be grouped into four categories: patient, social, clinical, and system.^{4,9,13,28-32} Patient factors associated with readmissions included: socio-economic status, patient behaviours and health status. Social factors included three aspects, namely: coping, carer system, and community services. Clinical factors refer to the adequacy and appropriateness of assessment and treatment, and system factors to the availability, accessibility, and coordination related to and within the health care delivery system. Based on the findings of the studies conducted locally, most risk factors identified in Hong Kong were mainly related to the patients; commonly they entailed multiple morbidity, physical

impairment, medication problems, and a high frequency of previous readmission.^{16,20,24} Patients' living arrangements turned out to be particularly controversial. One study identified living in a residential home for the elderly as increasing the risk of readmissions, whilst another revealed converse findings.^{16,19}

Intervention/programmes to reduce hospital readmissions

Studies of the above risk factors for readmissions provide a basis for developing intervention/programmes to reduce potentially avoidable readmissions. The majority of the programmes were disease-specific and targeted patients with moderate and severe ill-health. There were mainly four types of studied interventions, namely: (i) home-based, (ii) intensive education/counselling, (iii) multidisciplinary care approaches, and (iv) telephone follow-up.³³⁻⁴¹ The majority of the interventions involved a combination of these four approaches. The following outcomes were reported for interventions in heart failure programmes: (i) lower readmission rates in most studies, (ii) lower rates of unplanned readmissions in all studies, (iii) shorter hospitalisation stays in all studies, (iv) lower mortality rates in all studies, and (v) lower costs of care in most studies (Table 2^{40,42-46}).

Observations and implication for future practice

In this review, we have identified the conceptual

TABLE 2. Interventions for heart failure patients to reduce readmissions^{40,42-46}

Study	Intervention	Period (months)	Outcomes	% Change
Stewart et al ⁴²	Home-based intervention provided by a nurse and a pharmacist	6	Unplanned readmissions Death rate Length of hospital stay Cost	↓ 16% ↓ 13% ↓ 191 Days Lower
Inglis et al ⁴³	Home-based intervention with telephone follow-up over 6 months	120	Readmissions Death rate Length of hospital stay Cost	↓ 1.62 Readmissions per patient per year ↓ 12% ↓ 13.6 Days per patient per year Higher
Carroll et al ⁴⁰	Home-based intervention; multiple phone calls; and intensive counselling approach	6	Readmissions	↓ 7 Readmissions
Nucifora et al ⁴⁴	Intensive pre-discharge education led by nurses; phone contacts by nurses post-discharge	6	Readmissions Death rate Length of hospital stay	No effect ↓ 7% ↓ 5 Days
Inglis et al ⁴⁵	Multidisciplinary care provided by community pharmacists; home visits by cardiac nurse	60	Readmissions Death rate Length of hospital stay	↓ 0.5 Readmissions per patient ↓ 15% ↓ 7.8 Days per patient
Ledwidge et al ⁴⁶	Multidisciplinary care provided by specialist nurses and dietitians; and multiple telephone contacts	3	Unplanned readmissions Length of hospital stay Cost	↓ 21.6% ↓ 178 Days Lower

framework for measuring readmissions, targeted groups, and the prevalence of avoidable readmissions. We also explored the risk factors for avoidable readmissions and corresponding interventions to reduce them. Thus, the findings help provide important insights into conducting future studies on avoidable readmissions in Hong Kong, plan appropriate and effective interventions for their prevention, and also improve quality of in-patient care.

As identified in the literature, there are many types of readmissions (planned readmission, unplanned readmission, early readmission, emergency readmission, unnecessary readmission).¹ Specifically, potentially avoidable hospital readmissions are of interest to many researchers. Not all readmissions are avoidable. Those considered potentially avoidable are the ones that may be prevented if better quality of hospital, community, and home care could be delivered. Many researchers have attempted to measure preventability of readmissions, and various definitions of avoidable readmissions are used. Due to differing definitions of terms, methods of data collection, and case-mix-related factors, valid comparison of study results is difficult. Thus, the criteria for measuring readmissions developed by Landrum and Weinrich¹ could provide a consistent basis for studying avoidable readmissions in the hospital system prevailing in Hong Kong. This could enable valid comparisons within the system and at different timelines. It may also permit robust evaluations of interventions to reduce preventable readmissions, and enable cost-effectiveness analyses.

The main sources of information for studying avoidable readmissions are from routinely collected hospital data sets, information from review of medical records and charts, and reports from patients/families and health care practitioners. Most of the information from the latter two categories may not be captured in routine hospital databases, meaning that it is likely that detailed evaluations of avoidable readmissions require additional efforts. Collecting such information will be difficult to sustain on an on-going basis. It may therefore be useful to develop indicators of avoidable readmissions, which could be collected in hospital data sets for monitoring purposes and to provide alerts for action.

Several excellent tools could be used to develop an instrument to assist in determining whether a readmission is potentially preventable.²⁻⁴ They include: the classification scheme developed by Clarke² for assessing avoidable readmissions, the categorisation of the causes of readmissions elaborated by Halfon et al,³ and the admission preventability screen designed by Oddone et al.⁴ The correlation of the principal and associated medical and social causative factors for readmission proposed

by Gautam et al¹³ could also prove useful.

Studies of patient, clinical, social, and system risk factors relevant to avoidable readmissions could provide a basis for developing intervention programmes to reduce such readmissions. Even the study of non-preventable factors such as patient age, socio-economic status, and health status may be useful in the designing of suitable interventions.

Interventions to reduce avoidable readmissions can be successful and have usually been designed for specific illnesses. Commonly they involved a combination of the four already-mentioned approaches, namely: home-based interventions, intensive education and counselling, multi-disciplinary care, and telephone follow-up. Outcome studies of interventions, including those directed at cost savings, have generally been positive. In Hong Kong, the Hospital Authority has implemented various initiatives and programmes to support discharged patients and to continue their rehabilitation in the community to avoid unnecessary readmission.⁴⁷ For example, there are outreach medical, nursing, and allied health services, including the Community Geriatric Assessment Teams, Community Nursing Services, and Community Psychiatric Teams. One Hong Kong cluster analysis showed that Community Nursing Services were effective in reducing unplanned readmissions.⁴⁸ There are also new types of interventions, which entail revision of existing programmes with the addition of new content. For example, a Community Health Call Centre involves a nurse who gives an active follow-up call to high-risk patients 24 to 48 hours post-discharge. In an Integrated Discharge Support Programme, hospitals can provide pre-discharge planning and the non-governmental organisations can provide community support services and training for carers. The Risk Prediction Model on Elderly Emergency Admission uses a HARRPE (Hospital Admission Risk Reduction Program for the Elderly) score to identify elderly patients at high risk of medical emergency admissions. The Social Welfare Department and non-governmental organisations have also provided social care services to support discharged patients in the community. Many Hospital Authority programmes are cluster-based and may be ad hoc and require more rigorous evaluations. Nevertheless, consideration should be given to extend effective programmes on a territory-wide basis, so long as they have favourable outcomes.

Conclusion

Our study has provided a summary of the literature on avoidable readmissions, which can help identify possible intervention strategies to reduce potentially avoidable readmissions. There is no standard approach across different countries for measuring

avoidable readmissions. Development of standard criteria and an instrument are essential prerequisites to make valid comparisons within the system and at different timelines, and to permit robust evaluation of interventions. The identification of risk factors related to readmissions also provides a useful basis for designing and implementing intervention

programmes.

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