Readmission within 30-Day as a Key Indicator for Academic Hospital Performance: Rate and Risk Factors


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ABSTRACT

Background: Unplanned hospital readmission is a concern for health care providers and is frequently used as a quality indicator for hospital care.

Objectives: This study was conducted in order to examine the rate and associated factors for 30-day readmission in internal medicine units at King Abdulaziz University Hospital, Jeddah.

Methods: This study retrospectively collected data for patients who had readmission within 30 days of hospital discharge from January 2010 to December 2013. The following information was obtained for all patients: patient demographics, admitting medical service, diagnosis at the first admission, presence of hypoxia, sepsis, and hospital length of stay at the first admission. The data for patients was then compared with 30-day readmissions to those who did not have readmission within 30 days.

Results: Of the 3838 patients who had hospital admission within the study period, 678 (17.7%) had readmission within 30 days. The mean patient age was 52 years (SD, 21.2 years). Patients who had readmission within 30 days were more likely to be female; older than 65 years of age; diabetic; hypertensive; bed ridden; and to have a history of stroke, bed sores and/or sepsis (all P values ≤ 0.001, except for stroke, P = 0.003).

Conclusion: This study showed that about 18% of patients had readmission within 30 days. Those patients were of older age, with comorbidities like diabetes or stroke or were bedridden.

Keywords
Readmission rate; Bed ridden; Quality; Length of stay; Discharge
INTRODUCTION

Unplanned hospital readmission is frequently used as a quality indicator for hospital care[1-8]. The unplanned readmission rate within 30 days of hospital discharge has varied in studies (9-20%) from different countries and different health care centers[9-12]. However, several reports have questioned the validity of the hospital readmission rate within 30 days of hospital discharge as a quality indicator, and some investigators have suggested that this measure requires further validation[13-15]. An important concern about unplanned readmissions is the increased cost associated with preventable issues[6,8,12,16]. Van Walraven et al.[22] showed that preventable readmission rates vary, depending on whether clinical or administrative data are used[13]. Several factors have been associated with 30-day readmission rates. The factors associated with unplanned readmission within 30 days include hospitals with high occupancy rates, older patient age, chronic obstructive pulmonary disease (COPD) and longer initial hospital stays[17-19]. Other reasons that could explain differences in unplanned readmission rates within 30 days of hospital discharge include hospital composition, patient population and local community resources[20]. One important reason to examine the rate of readmission within 30 days is to recognize the economic burden of unplanned readmissions[11]. Saudi governors have adopted the 2030 Saudi Vision, which aims to provide optimal health care services for Saudis, with appropriate efficient utilization of economic resources[21,22].

This study was conducted at King Abdulaziz University Hospital (KAUH), the largest academic medical center in western Saudi Arabia, to explore the unplanned readmission rate within 30 days of hospital discharge in internal medicine care units.

METHODS

This retrospective cohort study performed data analysis for all patients admitted to internal medicine units from January 2010 to December 2013.

Setting

KAUH is a tertiary academic medical center. The medical units are composed of male and female medical wards, each with a 50-60 bed capacity at any time point. The isolation unit (IU) is a 10-bed unit, and the coronary care unit (CCU) is a 10-bed unit with a high turnover rate. The male and the female medical units admit patients under different medical subspecialties. The CCU primarily admits acute coronary ischemia patients. The IU primarily admits patients with infectious diseases who require isolation to prevent disease transmission to health care providers. The internal medicine department at KAUH includes all internal medicine subspecialties.

Inclusion criteria

All admitted patients with complete electronic and paper data files were included.

Exclusion criteria

Patients with incomplete data were excluded from the analysis.

Data

Data collection was performed both manually from patient medical records and electronically from the hospital information system. Demographic data was also collected for each patient, including age, sex and nationality. The diagnosis at admission, admission date, readmission date, admitting department and admitting medical subspecialty was then determined. Patients were identified who underwent mechanical ventilation and/or ICU transfer during the first admission. Patients were also identified who were bedridden during the first admission and those who required deep venous thrombosis (DVT) prophylaxis. Patients’ vital signs and O2 saturation levels at the first admission (i.e., normal or abnormal) were also obtained. We examined the mortality rates for patients with and without readmission within 30 days. The relationship between readmission within 30 days and all other variables was examined.

STATISTICAL METHOD

The statistical program used during this study was the IBM SPSS Statistics for Windows, Version 20 (IBM Corp., Armonk, NY USA). This study determined the descriptive statistics and used the chi-square test to examine the relationship between the 30-day readmission rates and categorical data, including differential diagnoses. The student’s "t" test was used for this study to compare the difference between the mean patient age and hospital length of stay. This study also used multiple regression analysis to determine the effect of several variables on the 30-day readmission rate.

RESULTS

Of the 3838 admissions screened, 678 patients (17.7%) required readmission within 30 days. The majority of patients (592, 87.2%) with 30-day readmissions were admitted through the emergency department for the first admission, while 78 (11.5%) were admitted from the outpatient department, and the remaining 8 (1.1%) patients had elective planned readmissions. Women comprised 59.4% of the sample (n = 403), and non-Saudis accounted for approximately 64.7% (n = 439); most of the non-Saudis were Yemenis, who represented 20% of the total sample. The mean patient age was 52 years (SD, 21.2 years; range, 15-87 years), and patients 65 years of age...
or older represented the majority of the sample (n = 436, 64.7%).

Comparison of age between male and female patients showed that the male patients were significantly older compared to females, mean of 55.97 years (SD 18.4, 49.3 years and 22.6, respectively; \( P = 0.0001 \)). The endocrinology service had the highest 30-day readmission rate. The proportion of readmission within 30 days among the different medical services (i.e., cardiology, endocrinology, gastroenterology, rheumatology, respiratory, neurology, oncology, nephrology, infectious diseases, and general internal medicine) is shown in Table 1. In addition, patients who required readmission within 30 days were more likely to be females, older than 65 years of age, have a history of diabetes, hypertension, or stroke, be in a bedridden state, or be diagnosed with sepsis associated with pressure ulcers (all with \( P < 0.05 \); Table 2 and Table 3). Patients with a history of ischemic heart disease, renal failure, ventilation required in the unit, or malignancy were less likely to require readmission within 30 days (all \( P < 0.05 \)). The ICU transfer rate did not differ between the two groups. None of the patients who had readmission within 30 days were initially admitted due to COPD exacerbation. Moreover, patients who had hypoxia at the first admission were more likely to be readmitted 30 days after their first admission (456, 67.3%) than those who were not readmitted at 30 days (1717, 54.3%), \( P < 0.001 \). Similarly, patients who had 30-day readmissions were more likely to require DVT prophylaxis at the first admission (Table 2).

The mean (SD) hospitalization length of stay for the first admission of patients who did not require 30-day readmissions was 5.8 days (SD, 6.8 days; median, 4 days; range, 2-33 days). This duration was significantly shorter than that of patients with 30-day readmissions (mean, 8.3 days; SD, 9.3 days; median, 6 days; and range, 2-42 days) (student’s “t” test, \( P < 0.001 \)).

### Table 1.
Number and percent of patients who required 30-day readmission, according to the responsible medical service

<table>
<thead>
<tr>
<th>Admitting Department</th>
<th>Number (Percent)</th>
<th>Total: 678</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endocrinology</td>
<td>249 (36.73%)</td>
<td>249</td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>22 (3.24%)</td>
<td>22</td>
</tr>
<tr>
<td>General</td>
<td>86 (12.68%)</td>
<td>86</td>
</tr>
<tr>
<td>Infection Diseases</td>
<td>107 (15.78%)</td>
<td>107</td>
</tr>
<tr>
<td>Medical Services</td>
<td>21 (3.10%)</td>
<td>21</td>
</tr>
<tr>
<td>Neurology</td>
<td>72 (10.62%)</td>
<td>72</td>
</tr>
<tr>
<td>Oncology</td>
<td>11 (1.62%)</td>
<td>11</td>
</tr>
<tr>
<td>Rheumatology</td>
<td>110 (16.22%)</td>
<td>110</td>
</tr>
</tbody>
</table>

### Table 2.
Factors associated with readmission within 30-day

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Patients Not Readmitted</th>
<th>Readmission within 30-Day</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=3160 (82.30%)</td>
<td>N=678 (17.70%)</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>1554 (49.17%)</td>
<td>403 (59.40%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Proportion aged ≥ 65 years</td>
<td>843 (26.67%)</td>
<td>239 (35.30%)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Ischemic Heart Disease</td>
<td>399 (12.63%)</td>
<td>53 (7.81%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>955 (30.22%)</td>
<td>285 (40.04%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hypertension</td>
<td>110 (3.48%)</td>
<td>46 (6.78%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>169 (5.35%)</td>
<td>22 (3.24%)</td>
<td>0.011</td>
</tr>
<tr>
<td>Stroke</td>
<td>139 (4.40%)</td>
<td>43 (6.34%)</td>
<td>0.03</td>
</tr>
<tr>
<td>Malignancy</td>
<td>252 (8.00%)</td>
<td>29 (4.28%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sepsis Due to Pressure Ulcers or Other Infections</td>
<td>158 (5.00%)</td>
<td>68 (10.03%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Bedridden</td>
<td>353 (11.17%)</td>
<td>114 (16.81%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Intensive Care Unit Transfer</td>
<td>297 (9.40%)</td>
<td>59 (8.70%)</td>
<td>0.5</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>91 (2.87%)</td>
<td>37 (5.45%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Initial Mechanical Ventilation in the Medical Ward</td>
<td>196 (6.20%)</td>
<td>28 (4.12%)</td>
<td>0.02</td>
</tr>
<tr>
<td>DVT Prophylaxis at the Initial Admission</td>
<td>1073 (34.00%)</td>
<td>326 (48.08%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*CVa: Cerebrovascular accident; DVT: Deep venous thrombosis*
No difference in the mortality rate was observed between the patients with (10 patients) and those without 30-day readmission (30 patients; mean, 0.01 for both; SD 0.1; P = not significant).

**DISCUSSION**

The data showed that approximately one-fifth of the patients who were admitted to the internal medicine services required readmission within 30 days after being discharged from the initial admission. Similar data have shown different 30-day readmission rates, ranging from 10.5% in the UK to 20% in the United States[9,11]. Similarly, several previous reports have examined the risk factors associated with 30-day readmission[10,11,15]. However, some investigators have examined 30-day readmission of patients based on their diagnoses[3,9,23-25]. In a similar manner this report examined the readmission rate in internal medicine subspecialties, based on the admitting service, to determine common and possibly preventable readmissions, as shown in previous studies[5,12,16]. Unsurprisingly, bedridden and cerebrovascular accident (CVA) patients are largely represented in the group of patients with 30-day readmissions. Lanièce et al.[26] showed a similar result among elderly French patients. Moreover, these findings reflect the economic burden of bedridden patients and demonstrate the need for optimal national home health care services that can provide the best care for such patients and reduce unnecessary readmission costs. In addition, the caregivers of bedridden patients should be educated about the best care available for these patients, which could minimize the risk of infection as well as nutritional and feeding problems and the side effects of polypharmacy[27,28]. Another essential national need in Saudi Arabia is long-term nursing homes that can accommodate bedridden patients who do not have caregivers at home[29]. Establishing optimal home health care services and well-prepared nursing homes will reduce the rate of unnecessary hospital readmissions and relieve major secondary care and tertiary care hospitals of the large number of bedridden patients who fill the capacity of acute care beds.

Although cardiac service was the most frequent admitting service for the first admission, none of the reported 30-day readmissions were due to a new cardiac event, which may represent the optimization of IHD patient care. Data from IHD patients showed that early intervention for acute coronary syndrome patients will improve patient outcomes and quality of life[29]. Krumholz et al.[24] showed that acute myocardial infarction is not associated with an increased 30-day readmission rate.

However, more than one-third of patients with a 30-day readmission had been admitted through endocrine services and had diabetes. This number is not surprising because previous Saudi reports have shown a diabetes prevalence of approximately 30% in this country[30]. This considerable number of diabetic patients reflects the importance of national plans to control and prevent diabetic complications, thereby minimizing the national health burden and cost of treating diabetes, metabolic syndromes and their chronic complications.

Factors that were significantly associated with 30-day admission were older age, DM, sepsis, stroke, and pneumonia, as well as being bed ridden. Together, these factors reflect the long-term outcomes of metabolic syndromes and diabetes as well as their high economic burden.

Previous reports have found similar effects for sepsis and infection as a major cause of high hospital costs and unplanned readmissions[31].

The relatively large number of patients under rheumatology care who are admitted to KAUH can be explained by aggressive patterns of systemic lupus erythematosus and rheumatoid arthritis[32,33]. These...
patients usually receive one or more immune-suppressive medications, placing them at risk for recurrent infections. In addition, at the time this research was performed, the rheumatology service was part of internal medicine services.

Although previous data have shown that COPD is a frequent cause of readmission within 30 days, none of the patients in this study who were admitted within 30 days had COPD. This finding may reflect the low prevalence of uncontrolled COPD patients among this cohort.

The mortality rate was not higher among patients with 30-day readmissions than that in patients without 30-day readmissions, which could be explained by improvements in the quality of care of patients with multiple medical comorbidities; these improvements prolong and improve patient survival, particularly in a tertiary medical center setting. 

Considering the costs of a longer hospital stay for patients at their first admission, the costs for those who were not readmitted after 30 days, and the costs of readmission, the health care costs of readmission are expected to be considerably higher. In the Saudi 2030 Vision, health care providers aim to provide the best health care services with optimal resource utilization.

Limitations
The main limitation of this work is that it was a retrospective data collection. A similar prospective data collection is expected to show more accurate results and will limit the exclusion of patients because of missing information.

CONCLUSION
The data showed that approximately 20% of the patients admitted to the medical services at KAUH were readmitted primarily because of complications from diabetes and infections. Implementation of health care strategies is expected to reduce the rate of readmission and minimize its cost. In addition, such implementation can help to free hospital beds for patients with more acute conditions.

Implications:
According to this data, the 2030 Heath Care Vision can be facilitated as follows:

1. Implementation of preventive measures through early education and control of diabetes and its complications.
2. Improvement in the quality of hospital discharge instructions, which can be facilitated by increasing the number and improving the quality of relative educators. Additionally, post-discharge follow-up phone calls should be provided from the hospital call center.
3. Initiating appropriate home health care services to ensure appropriate recovery and strict infection control strategies after patient discharge. These services should include patient educators, nurses, other paramedics (e.g., physiotherapists) and physicians. Such facilities will help bedridden patients and those who have difficulty visiting hospital ambulatory units to have appropriate care at home. In addition, post-discharge home health care can facilitate the early initiation of appropriate treatment, adjustment of medications and recognition of undesired medication side effects.

4. Another important need is for well-equipped nursing homes that can care for vegetative and bedridden patients who cannot be properly cared for in their homes. This process will minimize hospital admissions and readmissions due to complications from infected bed sores, aspiration pneumonia, and sepsis from other causes.

Conflict of Interest
The authors have no conflict of interest.

Disclosure
The authors did not receive any type of commercial support either in the form of compensation or finances for this study. The authors have no financial interest in any of the products devices, or drugs mentioned in this article.

Ethical Approval
Obtained.

REFERENCES


اعادة التنويم خلال 30 يوماً كمؤشر أداء لمستشفى أكاديمي: النسبة والعوامل المرتبطة بذالك

هند قلالة، نسر المي، هاني جاوي، يوسف قاري، سالم بازرعة، أحمد الجهني، سراج ولي، عاشة الشرم، عمر أيوب، عبد الرحيم الشهرى، محمد المخالفي، شادي الخياط، أطلال أبوسندا، محمد دوابع
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إن إعادة التنويم غير المخطط له في المستشفيات هو ذو أهمية لمقدمي الرعاية الصحية، وكثيراً ما يستخدم كمؤشر جودة الرعاية في المستشفيات. وقد فحصنا معدل إعادة التنويم خلال 30 يوماً في وحدات الطب الباطني في مستشفى جامعة الملك عبد العزيز بجدة.

الطريقة: فحصنا معدل إعادة التنويم عبر رجعي للمرضى الذين تم إعادة تسجيلهم في غضون 30 يوماً من خروج المستشفى من كانون الثاني / يناير 2011 إلى كانون الأول / ديسمبر 2013. وحسبنا على المعلومات التالية لجميع المرضى: التركيبة démographique للمرضى، ووحدة التنويم في قسم الطب الباطني، التشخيص عند التنويم الأول، انخفاض نسبة الأوكسيجين في الدم عن التنويم، الإلتئام، الحمومي البكتيري، وطور الإقامة في المستشفى. وعند التنويم الأول، ثم فحصنا مقارنة البيانات للمريضين الذين لديهم إعادة تنويم لمدة 30 يوماً لأولئك الذين لم يتم إعادة تنويهم.

النتائج: من 2383 مريض تم تقييمهم (278 (17.9%) في غضون 30 يوماً. كان متوسط عمر المريض 52 سنة (القياس المعياري 42.6% سنة). وكان أكثر المرضى الذين أعدهم إتش 3 أكبر من 65 سنة من العمر؛ ومرضى السكر وارتفاع ضغط الدم ومرضى الكلى؛ ولم تتم بحثهم عن الحركة؛ وللمريضون الذين تتراوح نسبة الجلطات الدماغية، والقروح السريانية مع تسمم بكتيري.

الاستنتاج: تقارب نسبة إعادة التنويم في المستشفى خلال 30 يوماً إلى 18% وتمثل في كبار السن والمريضين المصابين بالأمراض المزمنة مثل السكر والجلطات الدماغية والمريضين المقدونين عن الحركة.