

# Hospital Readmission Through the Emergency Department

Sadrollah Mahmoudi,<sup>1</sup> Hamid Reza Taghipour,<sup>1</sup> Hamid Reza Javadzadeh,<sup>1</sup> Mohammad Reza Ghane,<sup>1</sup> Hassan Goodarzi,<sup>1</sup> and Mohammad Hosein Kalantar Motamed<sup>1\*</sup>

<sup>1</sup>Trauma Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran

\*Corresponding author: Mohammad Hosein Kalantar Motamed, Trauma Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran. Tel: +98-2188053766, E-mail: motamedical@yahoo.com

Received 2015 November 29; Revised 2016 January 19; Accepted 2016 January 19.

## Abstract

**Background:** Hospital readmission places a high burden on both health care systems and patients. Most readmissions are thought to be related to the quality of the health care system.

**Objectives:** The aim of this study was to examine the causes and rates of early readmission in emergency department in a Tehran hospital.

**Patients and Methods:** A cross-sectional investigation was performed to study readmission of inpatients at a large academic hospital in Tehran, Iran. Patients admitted to hospital from July 1, 2014 to December 30, 2014 via the emergency department were enrolled. Descriptive statistics were used to summarize the distribution demographics in the sample. Data was analyzed by chi<sup>2</sup> test using SPSS 20 software.

**Results:** The main cause of readmission was complications related to surgical procedures (31.0%). Discharge from hospital based on patient request at the patient's own risk was a risk factor for emergency readmission in 8.5%, a very small number were readmitted after complete treatment (0.6%). The only direct complication of treatment was infection (1%).

**Conclusions:** Postoperative complications increase the probability of patients returning to hospital. Physicians, nurses, etc., should focus on these specific patient populations to minimize the risk of postoperative complications. Future studies should assess the relative connections of various types of patient information (e.g., social and psychosocial factors) to readmission risk prediction by comparing the performance of models with and without this information in a specific population.

**Keywords:** Hospital Readmission, Emergency Patients

## 1. Background

Hospital readmission has a high burden on both health care systems and patients. Most readmissions are thought to be related to the quality of the health care system. In the US, nearly 20% of patients are readmitted within 30 days of discharge, which is associated with an estimated annual cost of 17 billion dollars (1). Hospital readmission for patients early after an inpatient stay can be a traumatic experience (2).

Risk factors of readmission vary between regions, health care centers and countries and many of them can be avoidable (3-5).

Readmission was reported for pneumonia, congestive heart failure and acute myocardial infarction in the US by the centers for Medicare and medical services in 2009 (6).

Previous studies addressing the risk of readmission proposed risk models for specific disease cohorts, including heart failure, acute myocardial infarction, and pneumonia, or for specific patient groups including the elderly, children or veterans (4, 7-13).

Readmission after 30 days was reported in patients

with pneumonia (20.1%), chronic obstructive pulmonary disease (22.6%), recent vascular surgery (23.9%), psychoses (24.6%) and heart failure (26.9%) (14).

The causes and rate of readmission for trauma patients, unlike other patients have not been extensively addressed. In a previous study, early (30-day) hospital readmission rate was reported for general patients or mixed surgical unit with trauma patients.

In that study, hospitalizations after traumatic injuries correlated with a decreased risk of early readmission and mixed surgical unit with trauma patients comprising 60% of this patient group (15).

Causes of potentially preventable hospital readmission have been consistently identified including premature discharge from hospital, lack of resources for post-discharge treatment and insufficient consultation (16).

In recent years, there has been a great interest to study readmission rate as a of quality of hospital care. Therefore, hospital readmission can be considered as a criterion of poor quality of care (1).

Despite its use for both quality of health care and cost

control, the validity of readmission rates is not evident yet as a criterion of hospital care (17).

Reducing readmission has become a high priority for governments and health care systems (2).

The cost of readmission is very important; accounting for an estimated \$17.4 billion annually for health care in the US (1).

## 2. Objectives

The aim of this study was to examine rates and causes of early readmission via the emergency department in a Tehran hospital.

## 3. Patients and Methods

A cross-sectional design was used to study readmission of inpatients at a large academic hospital in Tehran, Iran. Patients admitted to the emergency department from July 1, 2014, to December 30, 2014 were assessed. This study was approved by the medical research ethics committee. Patients were eligible if they were admitted by emergencies to an emergency service. Patients admitted under the care of their primary care physician were excluded.

We retrospectively selected a subset of enrolled emergency patients for our analysis. In this study, patients with hospitalization greater than 30 days, patients who died during the hospitalization, those transferred to another health care facility, denied medical advice or died within 30 days of discharge were excluded.

In this study, readmission was defined as admission due to any reason to an acute care hospital within 30 days of discharge from the hospital. Data were registered by data collection forms. Demographic and health information were collected within 48 hours of admission.

We extracted general information including age, sex, insurance including marital status. Health care utilization, readmission within 30 days, length of stay in the current hospital admission, type of treatment, type of disease and causes of readmission were recorded.

Descriptive statistics were used to summarize the variables distribution of demographics in the sample. The relationship between these variables was assessed using chi-squared tests. Data was analyzed using SPSS 20 software (SPSS, Chicago, IL, USA). P value less than 0.05 was considered as statistically significant.

## 4. Results

We identified 500 index admissions that occurred during six months period of the study. Table 1 depicts demographics of the study sample. The mean  $\pm$  SD age was 54.9

$\pm$  21.3 years and 56.2% were male. About 411 (82.2%) of patients lived within 50 kilometers and had Medicare and Medicaid insurance. Patients with Medicare and Medicaid insurance had a more readmissions compared to others ( $P < 0.001$ ). Table 1 depicts demographics of the study sample.

In total, 390 (64%) patients were married. The mean length of hospital stay was  $5.89 \pm 4.71$  days.

In 417 (83.4%) patients, readmission occurred in those aged above 50 years ( $P < 0.001$ ) (Table 1). 281 (56.2%) of females and 219 (43.8%) of males were readmitted. No significant association was found between gender and readmission ( $P = 0.584$ ) (Table 1).

Readmission in patients who lived at a distance less than 50 km was 82.2%; readmission rate in patients who lived at a distance less than 50 km was more than others ( $P < 0.001$ ) (Table 1).

Patients received either medical or surgical services; 342 (68.4%) patients were in surgery service. Readmission in surgery service was more than medical services ( $P < 0.001$ ).

The main cause of readmission was complications due to surgical procedures (31.0%) (Table 2).

In total, 33.6% of readmissions were due to recurrence. Discharge against medical advice was a risk factor for emergency readmission in 8.5%, but a very small proportion was readmitted despite receiving complete treatment (0.6%). The only direct complication of treatment was infection (17%). Cholecystectomy was the most common disease in 46 (9.2%) patients ( $P < 0.001$ ) and 31 (6.2%) of patients had PCI diseases (Table 3).

## 5. Discussion

The aim of this study was to assess rates and causes of 30-day hospital readmission in emergency patients. Our results demonstrated that postoperative complications increase the probability of patients returning to hospital.

A maximum of 70.5% of hospital readmission following a surgical procedure are due to a medical condition (1). There is a paucity of information regarding readmission rates in surgical patients. Most performed studies focused on procedure-specific readmission rates within specific patient populations (18-21). In a study on patients after coronary artery bypass graft surgery, 16.5% were readmitted in 30 days. The most common reason for readmission was postoperative infection (16.9%) (21). In this study, most patients (68.4%) were in surgery service and readmission in the surgery service was more than medical service.

In one study, lengths of hospital stay, comorbidities and postoperative complications were associated with readmission (20).

**Table 1.** Characteristics of Readmission to Baqiyatallah Hospital, 30-Day Hospital Readmission (N = 500)<sup>a</sup>

Characteristics	No. (%)	P Value
<b>Age</b>		< 0.001
< 20	11 (2.2)	
20 - 39	72 (14.4)	
40 - 59	206 (41.2)	
> 60	211 (42.2)	
<b>Sex</b>		0.584
Female	281 (56.2)	
Male	219 (43.8)	
<b>Insurance</b>		< 0.001
Medicare and Medicaid	411 (82.2)	
Medicare	37 (7.4)	
others	52 (10.4)	
<b>Distance</b>		< 0.001
< 50 km	411 (82.2)	
> 50 km	89 (17.8)	
<b>Marital status</b>		< 0.001
Married	390 (78)	
Single	110 (22)	
<b>Type of treatment</b>		< 0.001
Surgery	342 (68.4)	
Medical	158 (31.6)	
<b>Reason of discharge</b>		< 0.001
Hospital discharge	490 (98)	
Discharge against medical advise	10 (2)	

<sup>a</sup>Length of hospital stay is 5.89 ± 4.71, range: 1 - 45, P = 0.423.

**Table 2.** Causes of Readmission in 30 Days

Cause of Readmission	No. (%)	P Value
Complications of surgery	155 (31)	< 0.001
Recurrence	168 (33.6)	< 0.001
Complete treatment	3 (0.6)	0.112
Infection	85 (17)	< 0.001
Wrong patient	6 (1.2)	0.115
Premature discharge from the hospital	4 (0.8)	0.326
New disease	79 (15.8)	0.02
<b>Total</b>	500 (100)	

In another study on pancreaticoduodenectomies patients, risk factors for readmission were younger age, con-

**Table 3.** Type of Diseases in Patients

Type of Disease	No. (%)
<b>Cholecystectomy</b>	46 (9.2)
<b>PCI</b>	31 (6.2)
<b>Renal disease</b>	25 (5)
<b>Respiratory distress</b>	24 (4.8)
<b>BPH</b>	22 (4.4)
<b>CABG</b>	17 (3.4)
<b>Angioplasty</b>	17 (3.4)
<b>Ileus</b>	16 (3.2)
<b>Abdominal pain</b>	15 (3)
<b>Thyroidectomy</b>	15 (3)
<b>GIB</b>	12 (2.4)
<b>CHF</b>	11 (2.2)
<b>Inguinal fat surgery</b>	10 (2)
<b>Rectum cancer</b>	10 (2)
<b>Fever with rash</b>	9 (1.8)
<b>Appendicitis</b>	9 (1.8)
<b>Cataract</b>	9 (1.8)
<b>Hydronephrosis</b>	8 (1.6)
<b>CVA</b>	8 (1.6)
<b>Distal radius fracture</b>	7 (1.4)
<b>Melena</b>	6 (1.2)
<b>Colon cancer</b>	6 (1.2)
<b>Pain in all body</b>	6 (1.2)
<b>Spinal canal</b>	6 (1.2)
<b>Umbilical hernia</b>	6 (1.20)
<b>Others</b>	182 (36.4)

siderable blood loss, postoperative complications and vessel resection (19). In our study, 31% of emergency readmission was due to complications of surgery and in 33.6% was recurrence. Moreover, only 17% of readmissions were due to infection. In 83.4% of patients, readmission occurred in age above 50 years and most readmission occurred in elderly patients. A study showed that complications after surgeries are the most significant independent causes leading to hospital readmission (20, 22, 23). This is similar to our result. In another study, medical and surgical patients were both affected, though medical patients had a higher hospital readmission rate as 21.1% versus 15.6% in surgical patients at 30 days and accounted for 77.1% of hospitalizations (14).

Most studies noted the importance of reducing hospi-

tal readmission following complex general surgery procedures (24).

In another study, the rate of early hospital readmission for trauma patients was low (4.3%). Some studies assessed readmission rate for injured patients and grouped them by injury type (25-27), but did not specifically focus on hospital readmission within 30 days of initial hospital discharge. Other reports in nontraumatic surgical populations demonstrated readmission rates of 10% - 20% (18, 25, 28).

In 2007, the 30-day readmission rate in non-elderly adults (aged 21 - 64, excluding obstetric admission) was approximately 10.7% for patients with Medicaid and 6.3% for those with private insurance (29). In another study (1.7%) trauma patients were re-evaluated in the emergency department within 30 days of initial hospital discharge. They found that patients with public insurance were more likely to refer to ED (30). In our study, patients with Medicare and Medicaid insurance had a greater readmission rate.

Similar to former studies of readmission in medical patients, trauma patients with preexisting medical conditions and those who experienced complications during the index hospitalization were more likely to be readmitted (31-34).

Published studies were performed only in medical patient population. It is unknown whether any of these interventions would result in decreased readmission in trauma patients. They reported that the most common reason for readmission was infection, followed by noninfectious complications of initial trauma or hospitalization (35).

However, the most common finding in our data, as well as other studies in the literature, was postoperative complications.

In this study, cholecystectomy related to higher readmission rate. A study reported that pancreatectomy, colectomy and liver resection related to higher rates of readmission. They reported that intra-abdominal surgeries were more likely to be related to complications after surgery. In addition, patients who stay in the hospital for at least a day before their surgery are likely to have greater vulnerability to nosocomial infection and further increasing the risk of infectious complication following surgery procedures (24). Therefore, it is recommended that physicians, nurses and etc., consider these specific groups of patients during clinic visits before surgery and their hospital stay to minimize the risk of complications after operation and readmission.

In our study, there was no significant association between age, gender and readmission, which is similar to other studies (24, 35).

One of the limitations of this study was its retrospective nature and therefore sensitive to errors. Moreover, sin-

gle unit investigation was another limitation of our study. Few studies directly compared models within the same population. Additional studies are needed to assess the true preventability of readmission systems. Future studies with larger sample sizes and multi-central should be performed to build and validate predictive models for the risk of 30-day readmission in Iran's healthcare system.

Besides, to build and validate predictive models to assess readmission, innovations to collect various data types for inclusion in administrative data sets should be considered (36). Future studies should assess the association of patients' information (e.g., social and psychosocial factors) and readmission risk prediction by comparing the performance of models in a specific population.

## Acknowledgments

Authors wish to thanks the trauma research center.

## Footnote

**Authors' Contribution:** Study concept and design, Sadrollah Mahmoudi, Mohammad Hosein Kalantar Motamedi; acquisition of data, Sadrollah Mahmoudi, Hamid Reza Taghipour, Hamid Reza Javadzadeh, Mohammad Reza Ghane, Hassan Goodarzi, Mohammad Hosein Kalantar Motamedi; analysis and interpretation of data, Sadrollah Mahmoudi, Hamid Reza Taghipour, Hamid Reza Javadzadeh, Mohammad Reza Ghane, Hassan Goodarzi, Mohammad Hosein Kalantar Motamedi; drafting of the manuscript, Sadrollah Mahmoudi, Hamid Reza Taghipour, Hamid Reza Javadzadeh, Mohammad Hosein Kalantar Motamedi; administrative, technical and material support, Sadrollah Mahmoudi, Hamid Reza Taghipour, Hamid Reza Javadzadeh, Mohammad Hosein Kalantar Motamedi; study supervision, Sadrollah Mahmoudi, Mohammad Hosein Kalantar Motamedi.

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