Characteristics and Related Factors of Length of Stay and Readmission Rates of Inpatients Under a DRG Based Payment System: a Cohort Study

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Abstract

Objectives

Panzhihua has implemented the Diagnosis Related Groups (DRGs) since 2018, and the quality of medical under the DRG-Based Payment System is concerned. This study aimed to examine the characteristics of patients under the DRG payment system based on the related factors, length of stay, readmission of inpatients.

Methods

We conducted a retrospective cohort study using data from Hospital Information System (HIS) from 2019 . The study used logistic regression analysis to investigate the factors related to hospitalization time and readmission rate of patients under the DRG payment system.

Results

In this study ,68210 inpatients were included in the study. Among these inpatients ,5.84% were readmitted within 30 days.The factors associated with the increased risk of readmission included age, DRG payment, admission, critical condition, and discharge ($p < 0.05$). Surgical patients had the highest risk of readmission within 30 days (OR=1.04995% CI 0.982-1.122). Among the inpatients readmitted within 30 days, 79.65% of them were readmitted within 14 days. 11.49% of the inpatients were transferred to other hospitals.

Conclusion

The study shows a significant correlation between readmission and age, DRG payment, admission, critical condition, and discharge. The results suggested that high risk groups need in-depth examination and evaluation when discharged and admitted to hospital.

1. Introduction

Diagnosis-related Groups (DRG) is an advanced hospital management method. Many countries have successfully implemented DRG. After implementing DRG based payment systems in Australia, Germany, the UK, Japan, Korea, Scandinavia and other countries, the average length of hospitalization was significantly reduced^[1]. Some studies have shown that the quality of health care has improved^[2-3] or has not changed significantly after DRG implementation^[4]. The medical quality index includes length of stay, readmission rate after discharge, hospital transfer rate and so on^[5]. Although DRG methodology is a valuable information tools for hospital management decision-making, they still have some problems. Due to cost considerations, hospitals may discharge patients early, which could adversely impact the quality of medical care. Besides medical quality, medical behavior is also a research focus, and related studies have shown that the implementation of DRG will lead to changes in medical behavior^[6-7]. Most existing studies have analyzed specific diseases^[8-9], and few have examined patient readmission rates under DRG-based payment systems.

In China, Beijing initially took the lead in DRG research by piloting a program in 2003. The Chinese government mandated the inception of DRG piloting at the national level in 2018^[10]. Panzhihua City is one of the pilot cities. Therefore, this study comprehensively analyzed the distribution and related factors of readmission patients in Panzhihua City in 2019, as well as the characteristics and related factors of inpatients.

2. Methods

2.1. Data source

This study is a retrospective cohort study. The data were obtained from the hospital information system of a medical institution in Panzhihua. The subjects of this study were inpatients from January 1 to December 31, 2019. This study was mainly divided into two parts: length of stay and readmission rate. The first section analyzes the length of stay of inpatients. The second section analyzed the patients with readmission 30 days after discharge.

2.2. Description of variables

In this study, the dependent variables included (1) Whether the patient's length of stay ;(2) whether the patient was readmitted within 30 days after discharge. Independent variables included (1) Demographic characteristics of the patient (i.e. sex, age)(2) approach to hospitalization (i.e. whether through the emergency or general outpatient).

2.3. Statistical analysis

Descriptive statistics were used to analyze length of stay ,30-day readmission and whether DRG-based payment systems were used. Multilevel logistic regression was used to test the correlation between “length of stay”and“readmission within 30 days,” of inpatients under the DRG-based payment system with variables, SPSS version 22.0 statistics software was used for data processing and statistical analysis. A difference of $p < 0.05$ was considered to be statistically significant. All personal identity information in the study was deleted and personal privacy was protected.

3. Results

In 2019, 68210 inpatients were included in the study, including 35491 men (52.03%) and 32719 women (47.97%), most of whom came from the 45–64 age group (32.64%). For readmission 30 days after discharge, we can see from Table 1 that 3983 inpatients were readmitted within 30 days (5.84%). We employed multilevel logistic regression to examine factors associated with readmission within 30 days (Table 1). The results show that DRG charges, age, admission, Operation, critical condition and departure showed significant correlations with readmission within 30 days of discharge ($p < 0.05$).

Table 1
Bivariate and multilevel regression analysis of DRGs patients' readmissions within 30 days after discharge.

Variable	Total		No		Yes		P value	Adjusted OR	95%CI		P value
	N	%	N	%	N	%					
Total	68,210	100.00%	64,227	94.16%	3,983	5.84%					
gender							0.070				
female	32,719	47.97%	30,626	93.60%	2,093	6.40%		0.834	0.781	0.890	1.331
male	35,491	52.03%	33,601	94.67%	1,890	5.33%		1			
DRG charges							0.006				
yes	36,400	53.36%	34,255	94.11%	2,145	5.89%		0.910	0.851	0.974	0.006
no	31,810	46.64%	29,972	94.22%	1,838	5.78%		1			
age (year)							0.000				
≤ 18	11,158	16.36%	10,729	96.16%	429	3.84%		0.501	0.443	0.566	0.000
19–44	15,647	22.94%	14,711	94.02%	936	5.98%		0.720	0.655	0.790	0.000
45–64	22,267	32.64%	21,081	94.67%	1,186	5.33%		0.661	0.608	0.719	0.000
≥ 65	19,138	28.06%	17,706	92.52%	1,432	7.48%		1			
approach to hospitalization							0.000				
emergency	15,755	23.10%	14,901	94.58%	854	5.42%		0.405	0.339	0.484	0.000
outpatient	51,019	74.80%	48,055	94.19%	2,964	5.81%		0.426	0.359	0.505	0.000
transfers	1,436	2.11%	1,271	88.51%	165	11.49%		1			
operation							0.157				
yes	31,694	46.47%	29,805	94.04%	1,889	5.96%		1.049	0.982	1.122	0.157
no	36,516	53.53%	34,422	94.27%	2,094	5.73%		1			
critical condition							0.001				
yes	11,668	17.11%	11,038	94.60%	630	5.40%		0.850	0.769	0.940	0.002
no	56,542	82.89%	53,189	94.07%	3,353	5.93%		1			
departure							0.013				
departure	66,906	98.09%	63,010	94.18%	3,896	5.82%		0.625	0.463	0.843	0.002
transfer	696	1.02%	661	94.97%	35	5.03%		0.580	0.370	0.910	0.018
death	608	0.89%	556	91.45%	52	8.55%		1			

Surgical patients had the highest risk of readmission within 30 days of discharge (OR = 1.049 95% CI: 0.982–1.122). In terms of DRG charges, the risk of readmission within 30 days after discharge was significantly higher in patients who paid for DRG than in patients who did not pay for DRG (OR = 0.908, 95% CI 0.862–0.957). A significant increase in the risk of readmission within 30 days for patients aged 19–44($p < 0.05$). For admission, the risk of readmission within 30 days was significantly higher in patients admitted to our hospital by transfer ($p < 0.05$). From the severity of the disease, the results showed that the higher the risk of readmission within 30 days in patients who were not critically ill ($p < 0.05$).

We studied the time distribution of readmission within 30 days of discharge and calculated the interval between discharge and remission by subtracting from the discharge date minus the remission date. From Fig. 1, we can see that the proportion of patients with readmission within one day after discharge was the highest (15.02%), which gradually decreased with the number of days. Within 14 days of discharge, the proportion of patients with readmission accounted for 79.65%.

4. Discussion

This study examined the patient characteristics and related factors of readmission within 30 days under the DRG-based payment system. With regard to the risk of readmission within 30 days after discharge, the results of this study showed that there was no significant difference between different genders. Some studies have shown that DRG payment can affect the number of outpatient visits after discharge^[11]. Our study showed that patients DRG payment had a higher risk of readmission within 30 days. With regard to age, the results of this study showed that patients over 65 had the highest risk of readmission within 30 days. It may be because elderly patients are poor health or chronic disease, which increases the probability of readmission within 30 days. With regard to the severity of the disease, the results of this study showed that non-hazardous patients had the highest risk of readmission within 30 days. The number of complications is proportional to the consumption of medical resources^[12]. With regard to admission, patients referred to the hospital for 30 days were at higher risk of readmission. It may be that the risk of readmission is higher because of the severity of the disease. With regard to admission, patients referred to the hospital for 30 days were at higher risk of readmission. With regard to the departure, 8.55% of the dead were readmitted within 30 days. Because serious illness causes death, the risk of multiple admission is very high.

From Fig. 1, which shows the time distribution of readmission within 30 days of discharge, we can see that patients admitted within 14 days after discharge accounted for 79.65% of all readmissions. Many re-hospitalized patients within 14 days may be due to the hospital's more surgical patients. Surgical patients need surgical treatment, but more basic diseases, temporarily unable to perform surgery. After rehabilitation through the first hospitalization, readmission to the next stage of treatment. A small increase in the number of patients readmitted on day 18 (3.08%) was not significantly different from those who had a readmission on day 14 (2.02%).

5. Limitations

Our study is an analysis of the data in the hospital information system not include all possible factors for complete examination. We studied patients who were readmitted within 30 days, and concerning the readmission of study subjects, we were unable to distinguish between planned and unplanned readmissions.

6. Conclusions

Our study found that factors associated with readmission within 30 days included patient age, approach to hospitalization, operation, critical condition, and departure methods. About the risk of readmission within 30 days, surgical patients were at the highest risk, followed by patients charged for DRG. We recommend further investigation of possible causes to help high-risk readmission patients avoid readmission risk. we did not find healthcare providers had significant rule avoidance and advantage-taking behaviors, in which hospitals may delay readmission by 1 to 3 days to avoid the 14-day readmission indicator.

7. Declarations

Ethics approval and consent to participate: This experimental plan has been approved by the Ethics Committee of Panzhihua Central Hospital. The data used by the study obtained the informed consent of parents and / or legal guardians under the age of 18. All methods are implemented in accordance with the relevant guidelines and regulations.

Consent for publication: All authors have approved the manuscript and agree with submission.

Availability of data and materials: Not applicable.

Competing interests: The authors have no conflicts of interest to declare.

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Authors' contributions: This study was designed by Shiwei Xie .The data in this paper was collected and analyzed by Mingwei Luo. All authors was contributed equally to this paper .

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Figures

Figure 1

Readmission interval after discharge