

Original Article

The impact of diagnosis related group payment on the performance of public hospitals

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Abstract: Objective: To investigate the practical value of diagnosis related groups (DRGs) according to payment for assessing the performance of public hospitals. Methods: According to a random number table, 2400 patients were chosen from 3928 inpatients admitted for treatment in our hospital. Based on nodes implemented in the DRGs, these patients were assigned to the control group and the experimental group (1200 patients in each group). In the control group, patients didn't receive assistance with DRG payment (a clinical performance management approach was carried out based on the type of disease and cost), while patients in the experimental group received DRG. Bed turnover rate, hospitalization time, average cost, mortality, and subjective satisfaction were obtained and compared between the two groups. Results: Compared with the control group, bed turnover rate, hospitalization time, average cost, and mortality in the experimental group were all significantly decreased ($P < 0.05$), while subjective satisfaction was increased ($P < 0.05$). Conclusion: DRG payment is beneficial for reduced clinical hospitalization time, cost, and mortality, and improved bed utilization rate and subjective satisfaction, which is worthy of clinical promotion.

Keywords: Diagnosis related group payment, hospital performance, bed utilization, hospitalization period and cost, subjective satisfaction

Introduction

Public hospitals are non-profit hospitals funded by the state. They are also an important guarantee for the improvement of people's livelihoods [1, 2]. Due to the public welfare nature of public hospitals, the revenue generated is lower than that of medical institutions which are supported by private capital. Additionally, the active service of staff in public hospitals needs to be perfected as a result of their relatively low income [3]. As public service institutions, the management departments of medical hospitals have always been committed to improving their service capability. The full coverage of basic medical security systems has been achieved in China since the implementation of a new round of medical and health system reform. Meanwhile, the reform of medical institutions has also been comprehensively carried out. At present, there are varying degrees of increases in medical expenses in public tertiary hospitals. Accordingly, problems,

such as expensive medical treatment, difficulties in patient admission caused by the shortage of beds, and long waiting time for hospitalization, have developed, affecting the quality of service. Moreover, patients' subjective perception of medical service is influenced by hospitalization-related events, like long hospital stays and high hospitalization expenses. Relevant reforms are taken actively and effectively, with reduction of unnecessary hospitalization costs, and improvement in medical quality, which are essential measures to improve satisfaction in medical service and the service capacity of medical institutions [4, 5].

Diagnosis related grouping (DRG) is a medical insurance payment standard. Cases are allocated to different groups in accordance with actual situations such as the complexity of the disease and the consumption of medical resources, which are determined by the main diagnosis of the disease and combined with comorbidities, surgery and treatment opera-

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tions, and so on. It is a relatively scientific and advanced medical payment model recognized globally [6, 7]. In this model, the severity and complexity of disease are compatible, as well as the consumption of medical resources. Disease-based payment is thus achieved. Furthermore, the wide implementation of DRG payment in areas like quality control, cost accounting, and human resource management is realized [8, 9].

At present, however, the evaluation of clinical application of DRGs is mainly confined to the single-centered assessment of medical expenses. In other words, there are very few studies on hospitalization-related events and patients' subjective satisfaction [10]. Therefore, we applied DRG for inpatients in our hospital, and comprehensively assessed the application value of DRGs in medical activities, hoping to provide more clinical research data for improving the performance of medical activities.

Materials and methods

General information

In the control group, 1200 patients admitted to our hospital between June 2019 and January 2020 were prospectively recruited. After matching the type of disease, gender, and age, 1200 patients who were hospitalized in our hospital between January 2020 and June 2020 were enrolled to the experimental group. Patients in the control group didn't receive DRG payment management, while those in the experimental group did receive it.

Inclusion criteria: Patients completed the overall treatment cycle in our hospital; patients had no disputes; patients were hospitalized for the first time.

Exclusion criteria: The one-day hospitalization cost was less than 1% or more than 99% of the average cost; the length of hospitalization was below 1% or over 99% of the average hospital stay; patients suffered from previous mental illness; patients had speech dysfunction.

Patients in the two groups were aware of the research content and signed the informed consent. This study was approved by the Ethics Committee of our hospital.

Methods

The type of disease: Based on previous research methods, patients were divided into subgroups including the internal medicine, surgery, and intervention group. Ischemic hypoxic encephalopathy of the nervous system (stroke) and respiratory system disease (bronchial pneumonia) were common diseases in the internal medicine department. Interventional therapy was mainly used in percutaneous coronary angioplasty of the cardiovascular system, while surgical treatment was primarily composed of leiomyoma-related operations and inguinal hernia repair [11].

DRG payment: We recruited 1200 patients who were hospitalized from January 2020 to June 2020 and collected their relevant medical records. Disease-related case-mix index (CMI) and average cost per time were calculated. Under disease quota, we explored reasons for the increase of average cost per time, such as long hospital stay, extraordinary prescriptions, and bad prescriptions, and carried out targeted treatment, which was performed once every two weeks. The control target was to stabilize the average cost per time/CMI ratio within a certain range. Details were described below. Medical resources consumed by one case-mix indicators were calculated according to the equation: $\text{rate} = \frac{\text{total hospitalization cost}}{\text{total weight}} = \frac{\text{average hospitalization cost} \times \text{the number of cases}}{\text{CMI} \times \text{the number of cases}} = \text{average cost per time/CMI}$. In general, the rate remained relatively stable. During a certain period of time, the increase of average cost per time was consistent with the increase of CMI. When average cost per time was larger than the CMI, it denoted that the increase was unreasonable. The medical records room was responsible for trace and control of the abnormalities. Specialists from the medical office were supposed to conduct inspections and issue written corrections. Moreover, they were in charge of the control of unreasonable growth [12].

Evaluation methods

Main outcome measures: Bed turnover rate (bed utilization and number of turnover times within one month), hospital stay, average cost, and mortality were acquired through reading

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Table 1. Baseline data

| Group | Control group | Experimental group | t/ χ^2 | P |
|---|---------------|--------------------|-------------|-------|
| Gender (male/female) | 578/622 | 590/610 | 0.202 | 0.653 |
| Age (years) | 57.9±8.9 | 58.2±7.6 | 0.888 | 0.375 |
| Type of disease (n) | | | 0.824 | 0.935 |
| Internal medicine (respiratory/neurology) | 200/195 | 198/204 | | |
| Surgery (maternity/inguinal hernia) | 112/295 | 101/300 | | |
| Intervention | 398 | 397 | | |
| Comorbidity (n) | | | 1.930 | 0.587 |
| 1 | 721 | 688 | | |
| 2 | 229 | 242 | | |
| 3 | 150 | 160 | | |
| >3 | 100 | 110 | | |

Table 2. Bed turnover

| Group | Turnover times (times) | Bed utilization rate (%) |
|--------------------|------------------------|--------------------------|
| Experimental group | 7.03±1.01 | 91.22±2.48 |
| Control group | 5.87±0.99 | 86.45±1.74 |
| T | 28.413 | 54.542 |
| P | 0.000 | 0.000 |

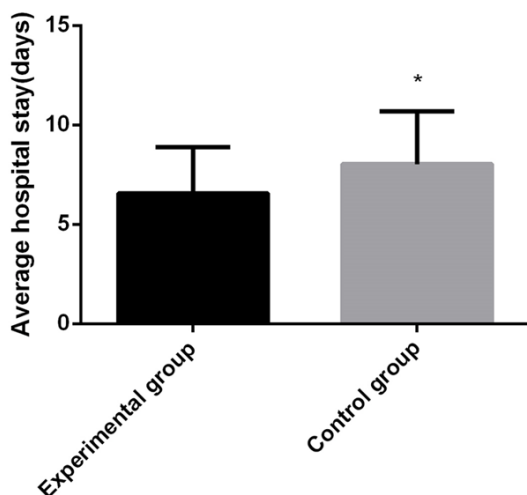


Figure 1. Comparison of average hospital stay between the two groups. Compared with control group, *P<0.05.

the data of inpatients in the medical records room and related departments.

Secondary outcome measures: a questionnaire was applied to assess the subjective satisfaction of patients in the two groups one day before discharge. Total satisfaction = (very satisfied + satisfied + fair)/the total number of patients * 100%.

Statistical methods

All data were analyzed using SPSS statistical software version 22.0. The measurement data were calculated as mean ± standard deviation ($\bar{x} \pm sd$); independent sample t test was used for inter-group comparison. The enumeration data were expressed as number/percentage (n/%); comparison was conducted with chi-square test. The difference was statistically significant when P value was below 0.05.

Results

Baseline data

There were no significant differences with the baseline data, including the type of disease, age, gender, and comorbidities between the two groups (all P>0.05, **Table 1**).

Bed turnover

Bed utilization rate and turnover times in the experimental group were higher than those in the control group, which preliminarily suggesting that DRG can improve the efficiency of bed utilization (both P<0.001, **Table 2**).

Average hospital stay and cost

Average hospital stay and cost in the experimental group were decreased when compared with the control group, which preliminarily denoted that DRG can reduce the hospitalization period and total medical expenses (both P<0.05, **Figures 1, 2**).

In-hospital mortality

The main causes of death in this study included respiratory failure and acute stroke. Compared

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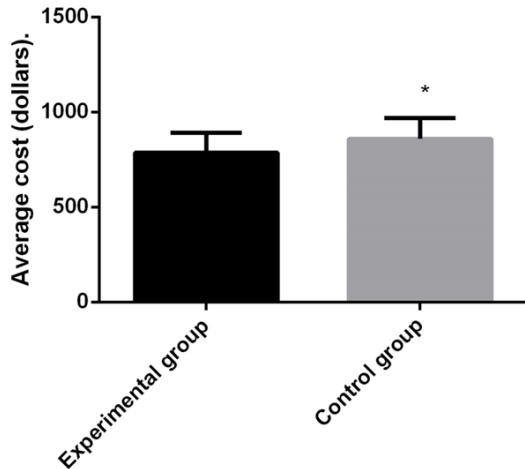


Figure 2. Comparison of average cost between the two groups. Compared with control group, * $P < 0.05$.

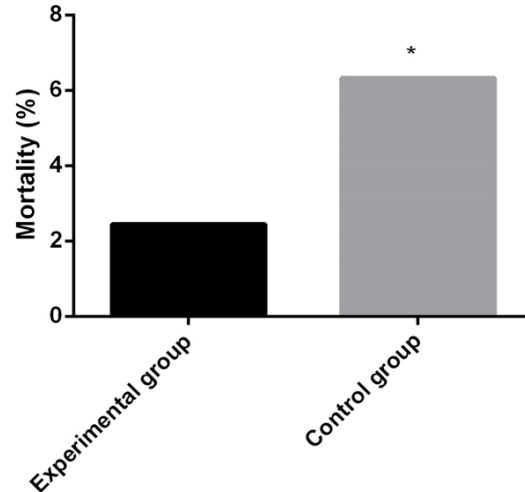


Figure 3. Comparison of mortality between the two groups. Compared with control group, * $P < 0.05$.

with the control group, mortality in the experimental group was reduced, which preliminarily indicated that DRG can decrease mortality (2.35% vs. 6.32%, $P < 0.05$, **Figure 3**).

Subjective satisfaction

Subjective satisfaction in the experimental group was higher than that in the control group, which preliminarily suggesting that DRG management can improve patients' clinical treatment satisfaction ($P < 0.001$, **Table 3**).

Discussion

Improving service capacity of public hospitals is both the focus and difficulty of the reform in the national medical and health system. A hospital assessment system is important for assessing the reform and orientation of public hospitals. In this system, an effective incentive and restraint mechanism is established. In this way, positive orientation is formed, showing the important significance of sustainable development of public hospitals [13]. In China, the reform of public medical institutions has been continuously explored since the 21st century, and the National Healthcare Security Administration, a relevant directly-administered department was founded. In this way, a regional hospital management model is taken into account. In addition, the practical application effect on improving the service capacity of public medical institutions is obtained [14].

DRG management was initiated from the United States. In this model, a novel case combina-

tion plan, which is named DRG, was formulated by analyzing patients' data in medical institutions [15]. Subsequently, various countries gradually combined the model with a medical expense settlement, and created a charging system that is in line with the local medical system. In the past ten years, provinces and cities in China have progressively integrated DRG with local medical insurance systems. Therefore, the important practical application value such as protection of insured persons, regulation of medical behavior, and constrains of medical expenses has been achieved [16].

A comprehensive evaluation of the practicality of DRG in public hospitals was conducted in this study from the points of clinical service capability and patients' subjective satisfaction. In terms of clinical service capability, medical staff managed by DRG increased performance by shortening the length of hospital stay, rather than previous blind pursuit of total number of inpatients. What's more, DRG management required doctors to pay more attention on the quality of operations and accelerated postoperative recovery. Accordingly, the turnover and utilization rate of beds are increased. Clinical service capability is ultimately improved. In this study, our results displayed that the utilization of beds in the experimental group was improved when compared with the control group. In addition, the average hospital stay was shorter than that in the control group. These were consistent with the conclusion that DRG can improve service efficiency [17, 18].

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Table 3. Subjective satisfaction

| Group | Very satisfied | Satisfied | Fair | Unsatisfied |
|--------------------|----------------|-----------|------|-------------|
| Experimental group | 748 | 342 | 80 | 30 |
| Control group | 600 | 315 | 185 | 100 |
| X ² | 38.720 | | | |
| P | 0.000 | | | |

Moreover, information management is required in DGR management to remind clinicians in real time to constrain costs based on the types of diseases and economic conditions. Accordingly, patients' total medical cost is constrained, while medical resources are saved. Here, we found hospitalization expenses in the experimental group were lower than that in the control group, suggesting that DGR can decrease patients' medical expenses. This was consistent with the conclusion made in previous studies [19, 20].

The improvement of the quality of medical care is also an important part of medical reform. In DGR management, clinicians are required to make relevant evaluations based on patients' conditions like disease characteristics and severity. Hence, they are fully aware of patients' conditions and can make adequate preparations for the surgery. In the end, the security assurance of medical activities is improved. In our study, results showed that mortality in the experimental group was lower than that in the control group, which preliminarily denoted that DGR can improve the safety of medical activities. It is consistent with the conclusion reported previously [21]. DGR management contributed to the accelerated postoperative recovery, reduced hospitalization cost, increased quality of medical care, and improved clinical service capability. Eventually, the subjective satisfaction of patients was raised, which was consistent with the research results reported previously [22].

However, this study is a single-centered study performed in a small number of patients. A large-scale, multi-centered study is required to improve the clinical validation. In addition, the application of DGR management in traditional Chinese medicine hospitals is will be implemented. Subsequent research will also focus on the potential prevarication to patients.

In summary, the application of DGR management in clinical care management is beneficial for the speed up of patient recovery after sur-

gery, increased bed utilization rate, improved capacity and quality of clinical service, all of which increase patients' subjective satisfaction.

Disclosure of conflict of interest

None.

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