Application of DRGs in hospital medical record management and its impact on service quality

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Abstract

**Background:** To explore the application of diagnosis-related groups (DRGs) in hospital medical record management and the impact on service quality.

**Objective:** This study introduced DRGs management into hospital medical record management in order to improve the quality of hospital medical record management.

**Method:** The medical record management of our hospital was analysed retrospectively between August 2020 and April 2021. A total of 7263 cases without DRG management before January 2021 were included in a control group, and 7922 cases with DRG management after January 2021 were included in a study group. The error rate of medical records, the specific error items and the scores of service capability, service efficiency and service quality were compared along with the comprehensive scores of the two groups.

**Results:** The error rate of medical records in the study group was significantly lower than that in the control group (19.35% vs. 31.24%, \( P < 0.05 \)). The error rates in terms of diagnosis on admission, surgical procedures, main diagnosis and other diagnoses in the study group were significantly lower than those in the control group. The scores for service ability, service efficiency and service quality were significantly higher in the study group than in the control group (\( P < 0.05 \)). The comprehensive evaluation score of the study group was significantly higher than that of the control group (\( P < 0.01 \)).

**Conclusion:** Applying DRGs in the hospital medical record management can effectively reduce the error rate of medical records and improve the quality of hospital services.

**Key words:** diagnosis-related groups, hospital medical record management, medical service quality, case–control study, retrospective study

Introduction

The scientific and reasonable evaluation of hospital medical service quality is an important part of hospital management. However, due to the diversity and complexity of medical service quality, hospital management quality mainly uses work efficiency and workload as evaluation indicators, which cannot reflect the connotation of medical services and cannot comprehensively indicate different medical service qualities [1, 2]. Research has shown that to effectively improve the reliability of the evaluation results of medical service quality, it is necessary to adjust system risk in its evaluation [3, 4]. Diagnosis-related groups (DRGs) are a casemix classification scheme, i.e. DRGs divide a class of patients with similar clinical conditions who need similar hospital services into a diagnosis group for management purposes [5]. Research has revealed that currently, DRGs are widely used risk adjustment tools in medical management. Payment systems based on DRGs have become an important part of healthcare payments in many countries, which is conducive to promoting risk sharing between medical insurance providers and payers [6]. In addition, DRG-based medical record management is conducive to the conduct of various clinical retrospective studies [7].

The classification factors of DRGs must refer to a patient’s other conditions while considering the diagnosis of a disease and its clinical operations. Therefore, the patient’s medical records must be referred to during assessment [8]. Essentially, the quality of medical records, especially the first page, covers all the factors that need to be considered in the classification of DRGs, and the records’ quality will directly affect the DRG evaluation results. Accordingly, the management of hospital medical records is closely related not only to DRG evaluation results but also to the evaluation of hospital medical service quality [9, 10]. Based on this, the present study introduces DRG management into hospital medical record management, with the aim of exploring the impact on service quality of the application of DRGs in hospital medical record management.

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Methods

General information
The management of the medical records in our hospital from August 2020 to April 2021 was analysed retrospectively. The data of 7263 cases without DRGs and 7922 cases with DRGs before and after January 2021 were included in a control group and a study group, respectively.

Inclusion and exclusion criteria
The inclusion criteria were as follows: (i) full inpatient medical records; (ii) the patients participated in Beijing medical insurance and (iii) hospitalization occurred at any time between 1 August 2020 and 30 April 2021.

The exclusion criteria were as follows: (i) medical records of non-hospitalized patients and (ii) inpatients were not covered by Beijing medical insurance.

Method
The control group used the conventional method, rather than DRG management, to manage its medical records. After receiving the patients, the doctor carefully filled in the outpatient cases, completed the drug prescription and precautions according to the patient's situation and uploaded the medical records to the medical record management system after completion, after which the medical record management personnel filed and sorted them online.

The study group used DRG management to manage its medical records. The hospital transmitted the medical record information of the control group to the information centre of the Municipal Health Bureau. The health information centre processed the information with a DRG grouping device and reflected the grouping results on a service performance evaluation platform. The hospital obtained the case mix index (CMI) values of each department according to the following formula: 

\[ \text{CMI} = \sum \text{work weight/total number of cases.} \]

It sorted and analysed the results.

According to the analysis results, we could obtain the service advantages and disadvantages of each department, identify the errors and specific items in the management of medical records, make adjustments according to the actual situation to reduce or even prevent the occurrence of defective behaviours and improve the quality and efficiency of medical services. According to the DRG data, the hospital obtained the single-bed work efficiency according to the following formula (single-bed work efficiency = \( \sum \text{work weight/number of beds} \)) and formulated appropriate schemes to reasonably use its bed resources.

The quality control personnel of the hospital analysed the death cases, counted the death rate of the low-risk group, included it in the important evaluation system in the quality management assessment report, reported the relevant information to the corresponding departments and submitted it to the medical quality and safety committee of the hospital for review. The responsible physician reported the specific situations of the cases, and the experts conducted analyses and discussions, assessed the risk cases and formulated targeted measures to minimize mortality in the risk groups (low-risk group and medium- and low-risk groups).

To improve the core competitiveness of the hospital, it was necessary to assess the key performance indicators of each hospital department according to the DRG results, i.e. conduct a performance assessment. The assessment was detailed to each medical staff member, each patient and each bed as much as possible, and the performance of each department was calculated by fully considering indicators such as cost, service quantity and service quality. The performance of each department was assessed according to the following formula: 

\[ \text{performance} = (\text{single-bed work efficiency of the department in the current month} - \text{average single-bed work efficiency of the whole hospital}) \times K \text{ value} \]

where \( K \) is the value (according to the overall change of hospital workload) \( \times \) the calculated number of beds in the department. Rewards and punishments were allocated according to the performance of each department.

Observation indicators
The error rates for medical records and specific error conditions; the indices of service capability, service efficiency and service quality and the comprehensive evaluation scores of the two groups were compared, as follows:

(i) Error rate of medical records: If a medical record was not completed according to the specification, resulting in missing content or filling errors in the record, it was considered a medical record error.

(ii) Details of errors: These mainly included errors in admission diagnosis, operation, main diagnosis and other diagnoses.

(iii) Service capacity indicators: These mainly included the number of DRG groups, the CMI value and the total weight of DRGs. The number of DRG groups indicated the range of diseases that could be treated by a hospital. The more groups, the more disease types that could be treated, and the wider the scope of diagnosis and treatment. The case combination index value (i.e. the CMI) showed the technical difficulty level of disease treatment, and the higher the value, the higher the technical difficulty level. The total weight of DRGs reflected the total number of medical services. The higher the value, the greater the total number of medical services. The service capability score = CMI score + DRG total weight score

(iv) Service efficiency: This mainly included the time and cost efficiency indices, which, respectively, represent the relative level of time and cost spent on treating the same disease. The lower the value, the lower the average length of stay and cost. The service efficiency score = \( \sqrt{\text{time efficiency} \times \text{cost efficiency}} \) \[12\].

(v) Service quality indicators: These mainly included the mortality rate and service quality score of the low-risk group. The lower the value, the better the service quality and safety of the hospital. The service quality score (\( \sqrt{\text{qrt}} \) (\( \sqrt{\text{qrt}} = \text{score of the low-risk group + score of the middle- and low-risk groups} \)) \[13\].

(vi) Comprehensive evaluation score: This was determined according to the following formula: 

\[ \text{comprehensive evaluation score} = \text{standardized service ability score} \times 0.6 + \text{standardized service efficiency score} \times 0.2 + \text{standardized mortality rate} \times 0.2; \text{score standardization} = \text{score value/the highest score of the hospital} \[14\].

Statistical methods
The data in this study were analysed and processed using SPSS 20.0 software. The measurement data were expressed as mean ± standard deviation, and the differences were compared using \( t \)-tests. Count data were expressed in cases (%), and a chi-square test was used to compare the
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Results
Comparison of the error rate of medical records between the two groups
The error rate of the medical records in the study group was lower than that in the control group, and the difference was statistically significant (19.35% vs. 31.24%, \( P < 0.05 \)) (see Table 1).

Comparison of specific error items between the two groups
The error rates for admission diagnosis, operation, main diagnosis and other diagnoses in the study group were lower than those in the control group, and the difference was statistically significant \( (P < 0.05) \) (see Table 2).

Comparison of service capacity indicators between the two groups
In the study group, the number of DRGs, the value of the case combination index (i.e. the CMI), the total weight of DRGs and the score for service ability were higher than those in the control group. The difference was statistically significant \( (P < 0.05) \) (see Table 3).

Comparison of service efficiency between the two groups
The time efficiency and cost efficiency indices of the study group were lower than those of the control group, and the service efficiency score of the study group was higher than that of the control group. The difference was statistically significant \( (P < 0.05) \) (see Table 4).

Comparison of service quality indicators between the two groups
The mortality, low-risk mortality and middle- and low-risk mortality of the study group were lower than those of the control group, and the sqrt was higher than that of the control group. The difference was statistically significant \( (P < 0.05) \) (see Table 5).

Comparison of comprehensive evaluation scores between the two groups
The comprehensive evaluation scores of the study group and the control group were 97.26 ± 2.14 and 93.53 ± 4.16, respectively, and the difference was statistically significant \( (t = 68.549, P < 0.01) \).

Discussion
Statement of principal findings
This study retrospectively analysed the data of 7263 cases without DRG management and 7922 cases with DRG management before and after January 2021, respectively. In this

Table 1 Comparison of error rate of medical records between the two groups [cases (%)]

| Group          | Number of medical records | Error rate |
|----------------|---------------------------|------------|
| Control group  | 7263                      | 2269 (31.24)|
| Research group | 7922                      | 1533 (19.35)|
| \( \chi^2 \) value |                           | 285.374     |
| \( P \) value   |                           | <0.001      |

Table 2 Comparison of specific error items between the two groups [cases (%)]

| Group          | Number of medical records | Admission diagnosis | Operation | Primary diagnosis | Other diagnoses |
|----------------|---------------------------|---------------------|-----------|-------------------|----------------|
| Control group  | 7263                      | 1533 (21.11)        | 521 (7.17)| 1824 (25.11)      | 2017 (27.77)   |
| Research group | 7922                      | 624 (7.88)          | 10 (0.13) | 784 (9.90)        | 1424 (17.98)   |
| \( \chi^2 \) value |                           | 544,214             |           | 557,619           |                |
| \( P \) value   |                           | <0.001              |           | <0.001            | <0.001         |

Table 3 Comparison of two groups of service capacity indicators

| Group          | Number of medical records | Number of DRGs | Case combination index value CMI | Total weights of DRGs | Service capability score |
|----------------|---------------------------|----------------|----------------------------------|-----------------------|-------------------------|
| Control group  | 7263                      | 421 (5.80)     | 1.51 ± 0.22                      | 6214.26 ± 512.81      | 89.26 ± 5.51            |
| Research group | 7922                      | 534 (6.74)     | 1.65 ± 0.31                      | 7533.45 ± 627.38      | 95.81 ± 3.29            |
| \( t/\chi^2 \) value |                           | 5.732          | 31.834                           | 141.117               | 89.779                   |
| \( P \) value   |                           | <0.001         | <0.001                           | <0.001                | <0.001                   |

Table 4 Comparison of service efficiency between the two groups

| Group          | Number of medical records | Time efficiency index | Cost efficiency index | Service efficiency score |
|----------------|---------------------------|-----------------------|-----------------------|-------------------------|
| Control group  | 7263                      | 0.86 ± 0.09           | 1.31 ± 0.19           | 32.57 ± 12.81           |
| Research group | 7922                      | 0.81 ± 0.12           | 1.02 ± 0.21           | 42.31 ± 16.29           |
| \( t/\chi^2 \) value |                           | 28.843                | 88.952                | 40.707                  |
| \( P \) value   |                           | <0.001                | <0.001                | <0.001                  |
research, the error rates of medical records, admission diagnosis, operation, main diagnosis, other diagnoses and other items in the study group were significantly lower than those in the control group, indicating that DRG management effectively improved the quality of medical record management. The analysis shows that before the implementation of DRGs, the study group had to identify deficiencies and errors in its medical record management based on the medical record information of the control group, and the DRG management of the study group corrected the errors by completing the medical record information. Accordingly, the medical record management errors in the study group were significantly improved.

**Strengths and limitations**

One strength of this study is that the application of DRGs in hospital medical record management and the associated impact on service quality were analysed using a large-sized sample. However, this study also has some limitations, including the inherent limitations of a retrospective case review. In addition, due to the different recording times of medical record information, the definition of individual symptoms or diseases may have changed, resulting in a change in disease classification, which may have led to potential bias in the DRG classification, which may have led to potential bias in the DRG classification, which may have led to potential bias in the DRG classification, which may have led to potential bias in the DRG classification.

**Interpretation within the context of wider literature**

Medical record information, especially which contained on the first page, is an important part of the information used in patient diagnosis and treatment. Its quality is closely related to the accuracy of medical data and department work standards. The accurate entry of medical record content ensures the integrity, accuracy and objective basis of medical record information [15]. Research by Yang et al. [16] showed that the quality management system of the first page of medical records is conducive to reducing the error rate of medical records that affects DRG enrolment and grouping. Diagnosis-related grouping is a combined risk assessment scheme. To group patients with the same characteristics into one group for management, its classification is comprehensively considered in strict accordance with the patients’ medical record information before including it in several groups for management. It is an important refined management tool for hospital service quality [17]. The quality of medical record information is directly related to the grouping of DRGs. Only when all the contents of medical records are full, accurate and standardized, can the quality of DRGs be improved on the basis of ensuring the quality of the information [9]. Medical record information mainly includes patient information, diagnosis and treatment data, hospitalization information, expense data, etc., which will affect DRG grouping information, including admission diagnosis, surgical operation, main diagnosis and other diagnoses. The completion of the above project indicators directly affects the accuracy of DRGs [18].

Xu et al.’s research showed that the application of DRGs in medical record management can comprehensively compare multiple medical services, fully reflect the characteristics of different diseases through DRG weight values and effectively improve the quality of medical services [19]. Compared with the control group, the time efficiency and cost efficiency indices of the study group were significantly lower, indicating that the efficiency of DRG management services was significantly improved. The time efficiency and cost efficiency indices were closely related to the grouping of DRGs. After the treatment of medical records, surgical operations or major diagnostic errors will reduce the efficiency of medical services. For example, there were many complications and serious conditions that required additional medical resources to be consumed. Failing to include complications or diagnostic operations will reduce cost efficiency and time efficiency. The management of DRGs can effectively reduce the error rate of medical records, which is one of the important reasons why the service efficiency of the study group was better than that of the control group.

Heqiong et al. [20] believe that there is a certain connection between the various evaluation indicators of DRGs. Hospitals need to improve CMI values and reduce time and cost efficiency indices; they must improve diagnosis and treatment technologies and improve their ability to treat patients in critical conditions. However, they also need to improve their service quality to achieve the purpose of reducing the cost and time of residential treatment and ensuring the safety of patients.

There are differences among different disease treatment groups and departments in terms of disease admission type, professional technology, speciality, etc., but standardized evaluation indicators are not applied in the evaluation of hospital service quality, which leads to poor reliability of the evaluation results [21]. In this study, the application of DRGs in the medical record management effectively reduced the mortality of the low-risk group and the medium- and low-risk groups and effectively improved the hospital’s service quality. The analysis showed that the application of DRGs can encourage hospital departments to form a positive competitive environment, actively improve workflows and enhance the levels of both the hospital’s service technology and service quality. Li et al. [22] found that DRG-based medical record management results are used to evaluate the performance of each department in a hospital, and corresponding rewards and punishments based on the performance results are conducive to promoting the improvement of departments with low scores and actively adjusting hospital resources, thus improving the quality of hospital medical services.
Implications for policy, practice and research
Medical record information is the source of DRG evaluation data, which can effectively improve the objectivity of evaluation results. The application of DRGs in medical record information management, including similar patients in the clinical treatment process and resource consumption into the same DRG group, can effectively reduce the impact of the diversity of medical services on the evaluation process, thereby improving the scientificity of the evaluation results. It can effectively reflect existing problems in a hospital’s service process and make targeted adjustments to improve the hospital’s medical service capacity.

Conclusion
In conclusion, hospital medical records are the key information basis for the evaluation of hospital medical service quality, and the accuracy of medical record data is the basis for the accurate grouping of DRGs. The application of DRGs in medical record management can effectively reduce the error rate of medical records and play an important role in the evaluation of hospital service capacity, service efficiency and service quality to effectively improve the quality of hospitals’ medical service.

Data availability statement
All data generated or analysed during this study are included in this published article.

Contributorship
Conception and design of the work was contributed by Q.Z.; data collection was contributed by Q.Z. and X.L.; supervision was contributed by Q.Z.; analysis and interpretation of the data was contributed by Q.Z. and X.L.; statistical analysis was contributed by Q.Z. and X.L.; drafting the manuscript was contributed by Q.Z.; critical revision of the manuscript was contributed by Q.Z. and X.L.; approval of the final manuscript was contributed by Q.Z. and X.L.

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Ethics and other permissions
This study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of Western Hospital of Beijing Chaoyang Hospital Affiliated to Capital Medical University.

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