Application and Management of Big Data in Medical Payment

Qiue Li[1,a], Hui Wang[2,b,*], Xingcun Jia[2,c], Zixuan Lu[2,d]

[a]121445859@qq.com, [b]1063057570@qq.com, [c]2023410003@sdtbu.edu.cn,[d]2023420146@sdtbu.edu.cn

[1]Shandong Public Health Clinical Center, Jinan, China
[2]School of Finance, Shandong Technology and Business University, Yantai, China

Abstract. Medical insurance payment is a key mechanism to ensure that the masses get high-quality medical services and improve the efficiency of fund use. We summarize the connotation and value of DRG medical insurance payment mode, and sort out the experience of DRG medical insurance payment mode reform in representative countries in the world. Combining the process and future development goals of China's DRG medical insurance payment mode reform, we explained the problems and challenges that China's DRG medical insurance payment mode reform may face. On this basis, we also put forward countermeasures and suggestions to further improve the reform of DRG medical insurance payment mode. Our research helps to deepen the understanding of DRG medical insurance payment mode, and has important practical significance for promoting the smooth progress of DRG medical insurance payment mode reform.

Keywords: big data; DRG medical insurance payment; medical quality

1. Introduction

Medical insurance is an important part of China's economic and social development, and is a major institutional arrangement that reduces the burden of people's access to medical care. Promoting the reform of medical insurance payment is required for the high-quality development of medical services[1].

Digital technology has gradually become an important engine of economic and social development. Digital technology has also gradually penetrated into the medical field. As a payment method of digital system, DRG can improve the overall efficiency of the medical system under the premise of saving resources of all parties[2].

We summarize the connotation, value and challenges of DRG, and put forward countermeasures and suggestions for its development. This study is helpful to comprehensively understand the reform of DRG medical insurance payment, and has important practical reference value for the implementation of DRG development.

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2. Connotation and value of DRG health insurance payment methods

2.1 Connotation of the DRG health insurance payment methodology

DRG (Diagnosis Related Groups), translated into Chinese as Disease Diagnosis Related Groups, first originated in the United States in the 1960's and 1970's, is a new type of inpatient case grouping, through the case information and software, most of the inpatient hospitalised patients are classified as a certain disease diagnosis related groups, the health care insurance agency to pay the hospital's fees according to the specific grouping of the patient, is used to measure the quality of health care services efficiency as well as an important tool of health care insurance payment. DRG Medicare payment calculation is as equation (1). DRG has become the first choice of many countries in the world to carry out health insurance payment method reform [3].

$$\begin{aligned}\text{Medicare payment} = {} & \text{total weight of general cases} + \text{total weight of psychiatric bed} \\ & -\text{day cases} + \text{total weight of extreme cost cases} \\ & + \text{total weight of QY group cases}) * \text{rate} \\ & - \sum (\text{large major medical payments} + \text{other coverage payments} \\ & + \text{actual cost to the individual}) \qquad (1)\end{aligned}$$

2.2 The value and function of DRG health insurance payment methods

Based on the different endpoint classifications of information systems, the value and function of DRG healthcare payment methods can be developed in the following three ways.

2.2.1. The value and function of the health care side of the DRG. The main task of the DRG management platform on the health insurance side is to dock with the DRG management platform on the hospital side, calculate the DRG grouping weights and DRG rates based on the case data collected from the DRG management platform on the hospital side and the settlement data of the health insurance side, and then further measure the payment standard of each group of DRG, and then carry out the audit and settlement based on the payment standard.

2.2.2. The value and function of the DRG health committee end. The DRG Health Commission end system can carry out data analysis at multiple levels and from multiple perspectives to achieve objective and fair comparative effects. The DRG platform of the health commission also connects with the hospital terminal to master the DRG quality monitoring data of the hospital terminal platform, and monitor the DRG performance of the hospital terminal through DRG performance evaluation data, so as to strengthen the performance management of the hospital terminal DRG.

2.2.3. Value and functionality of the hospital side of the DRG. First, to ensure the accuracy of diagnostic surgery selection and grouping, and achieve the goal of accurate allocation of DRG. Secondly, it is helpful to evaluate and compare from the aspects of profitability and discipline ability, so as to implement reward and punishment programs. Finally, the cost accounting system provides guidance for hospitals to reasonably control cost growth, which is conducive to medical institutions to optimize resource allocation.

3. International experience with the DRG health insurance payment methodology

Since DRG originated in the United States in the last century, countries such as Germany, France, Japan, and Australia began to follow suit and carried out localised reforms of DRG healthcare payment methods based on their own national conditions. We introduce the experience of other countries in DRG payment reform, such as the United States and Germany.

3.1 Experiences and Practices of DRG Medicare Payment Methods in the US

The reform of the U.S. DRG health insurance payment system is mainly reflected in the following three aspects. Firstly, the prepayment system. Medical services should be priced in advance, and a series of clauses on quality of care should be formulated. Medical services should meet the requirements of high quality and low cost on the premise of hospital profits. Secondly, a system of compensation that takes into account the fact that some of the hospitalisation cases are not covered by the same diagnostic group, but by a fixed reimbursement amount. Secondly, the compensation system. Medicare reimburses a high percentage of the cost per day of admission for patients with expensive or advanced treatments. Thirdly, the regulatory system. After the introduction of DRG, the United States also introduced a matching Peer Review Organization system (PRO). PRO mainly cooperated with CMS, the competent agency of Medicare, to supervise medical service behavior and avoid excessive medical treatment or medical shortage[4].

3.2 Experiences and practices of the German DRG health insurance payment methodology

The reform of the German DRG health insurance payment system is mainly embodied in the following five aspects. Firstly, data unification. Germany has implemented unified DRG coding rules and weighting coefficients nationwide, not only insisting on updating the coding rules annually, but also equipped with an independent department, the Institute for Economic and Social Research (IESR), responsible for formulating the relative weights of the DRG subgroups, and carrying out regular revisions of the weights. Secondly, the financial mechanism. Germany's DRG health insurance payment makes the original cost offset mode to performance-oriented mode, establishes a regular communication mechanism with payers, strengthens the internal budget management of hospitals. Thirdly, the performance mechanism. Germany implements a performance evaluation model combining with hospital positioning and discipline professional ability positioning, and specially plans its DRG evaluation indicators. Fourthly, Additional medical operation and management departments are set up to participate in payment negotiation, hospital decision-making, and performance planning[5].

4. The process and effect of China's reform of DRG health insurance payment methodology

With the acceleration of China's aging process, the basic medical insurance fund is not only facing the challenge of short-term balance of income and expenditure, but also the pressure of medium- and long-term balance of income and expenditure[6], the application of DRG medical insurance payment is of great significance.

By 2022, 206 coordinated regions will have realized actual payment under the DRG payment method reform. In the actual payment areas, the number of designated medical institutions paying according to DRG has reached 52%, the coverage of disease types has reached 78%, and the proportion of health insurance fund expenditures paid according to DRG to the proportion of hospitalization expenditures of the health insurance fund within the coordinated areas has reached 77%. In 2022, the first year of the Three-Year Action Plan for the Reform of DRG Payment Methods, the set targets in four areas, namely, regional coverage, coverage of medical institutions, coverage of disease types, and coverage of the health insurance fund, have been accomplished, of which the coverage of the health insurance fund reached the set three-year target in 2022[7-8]. Detailed target comparisons are as follows.

4.1 Regional Coverage

According to the three-year progress schedule of 2022, 2023 and 2024, no less than 40%, 30% and 30% of the coordinated regions will be initiated to carry out the reform of the DRG payment method and actually pay for the payment.

4.2 Institutional Coverage

A three-year arrangement will be made to achieve full coverage of eligible medical institutions that carry out inpatient services, and the annual progress should be no less than 40%, 30%, and 30%, respectively. 52% of the coverage in 2022 has exceeded the set target by 40%.

4.3 Disease Type Coverage

A three-year arrangement will be made to realize the full coverage of disease types in DRG payment medical institutions, and the annual progress should be no less than 70%, 80%, and 90%, respectively. 78% coverage of disease types in 2022 also exceeds the established target of 70%.

4.4 Medical Insurance Fund Coverage

DRG medical insurance fund expenditure accounts for 70% of the hospitalization medical insurance fund expenditure within the coordinated area, and the yearly progress should be no less than 30%, 50% and 70% respectively. The actual coverage of 77% in 2022 has already reached the target of the three-year action plan.

Regarding the supervision of the health insurance fund, in 2022, the NHPA organized 24 groups of flight inspections, inspected 48 designated medical institutions and 23 health insurance agencies in 23 provinces, and detected 980 million yuan of suspected illegal and irregular funds. Although the number of health insurance flight inspections decreased compared to 2021, the suspected illegal and irregular funds detected in 2022 were 75.6% higher, which shows the strength of health insurance flight inspections and the determination to investigate and deal with the illegal and irregular use of health insurance funds.

5. Challenges facing the reform of China's DRG health insurance payment methods

5.1 Challenges for medical institutions

Under the new DRG health insurance payment method changes, medical institutions need to achieve cost reduction and increase efficiency through refined cost accounting. But the reality is that hospitals still have difficulties in calculating the cost based on the packing of disease types. Currently, there is a lack of information and data on the costing of disease types, and the current DRG health insurance payment system cannot reflect the actual cost of disease types.

5.2 Challenges on the part of the health insurance sector

Medical insurance institutions need to make multiple judgments on the behavior of medical institutions. For example, whether the medical institution has the behavior of buck-passing, undertreatment, overtreatment, and decomposition of hospitalization. Unlike the traditional health insurance payment method, which is based on itemized payment, the DRG health insurance payment method has set up corresponding payment standards for each disease group. However, with the continuous development of medical technology, the cost of treatment will inevitably exceed the amount of the current health insurance payment standard, which requires to adjust the payment standard according to different situations.

5.3 Challenges of linking health insurance and medical institutions

On the one hand, the continuous adjustment and change of DRG grouping version has affected the progress of the negotiation on payment weights and constrained the realization of the negotiation goal, which is not conducive to the rational allocation of medical resources and the standardization of the order of medical consultation. On the other hand, the DRG payment weight negotiation has the characteristics of heavy task, short time, and prominent contradiction, which requires the hospital experts involved in the negotiation to have solid medical professionalism and the basic theoretical knowledge of DRG[9-10].

6. Conclusion

6.1 Further optimize medical technology decision-making and management

With the advancement of technology in the medical field, the incorporation of new items and the application of new technologies require the support of scientific decision-making concepts and management concepts. Attention should be paid to the complementary role of the exclusion mechanism to the DRG packaged payment mechanism. Medical insurance management department should guide the medical institutions to accept patients with difficult and complicated illnesses. Medical institutions should also do a good job in the management of new technologies, the use of supervision and maintenance of related equipment. Management departments should comprehensively evaluate the treatment effect to ensure that patients benefit as much as possible and reduce the waste of medical resources.

6.2 Further strengthening the supervision and management of medical behavior

Medical institutions should follow the orientation of returning medical services to clinical value, and further improve the quality of medical services and the efficiency of the use of medical insurance funds. The hospital should actively innovate the incentive and restraint mechanism to mobilize the enthusiasm of medical staff. For some areas that need the support and encouragement of medical insurance policies, the tilted constraint incentive mechanism will be implemented. The comparison results can be publicly displayed within a certain range to find out the deficiencies through peer comparison, thus motivating medical institutions to take the initiative to strengthen their internal management and resist fraudulent insurance fraud, excessive medical care, medical inadequacy, cost shifting and other irregularities, so as to improve the quality of medical services.

6.3 Further improving the DRG payment negotiation mechanism

With the promotion of hierarchical diagnosis and treatment as the negotiation goal, the relative stability of DRG grouping versions should be ensured. Under the premise of version stability, data analysis and grouping optimization can be carried out every year according to the DRG operation status of the previous year, but it should be guaranteed that each version will be used for at least three to five years, and that the data used to carry out the weighting negotiation will be continuous and comparable as far as possible, so as to facilitate the provision of reliable data support for the adjustment of grouping for scientific decision-making. Departments should take the initiative to open up the DRG medical insurance payment standards, grouping schemes, grouping results, negotiation schemes, negotiation results, and operation analysis, so as to improve the transparency and credibility of DRG medical insurance payment.

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