Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

Efficiency Evaluation of Medical Security Payment DRG

Xiaowei Chang
School of Art, Shandong Management University, Jinan, Shandong, China

Abstract:

Based on the brief introduction of the development status, grouping strategy and evaluation efficiency index of DRG medical insurance payment system, this paper analyzes the efficiency of a certain place's medical data from 2017 to 2019. From the analysis results, it can be seen that the use of the DRG system for medical insurance payment can improve the hospital's medical service ability and efficiency, and the hospital's medical safety quality management has been improved. It is hoped that it will be helpful to promote nationwide payment according to DRGs.

Keywords: *DRGs, efficiency evaluation, medical services.*

I. INTRODUCTION

DRGs (diagnosis related groups) divides patients into 500-600 diagnosis related groups according to their age, gender, length of hospital stay, clinical diagnosis, disease, surgical treatment, disease severity, complications, prognosis and other factors, and divides patients with similar medical expenses incurred in the treatment of diseases into the same diagnosis group for management. Generally speaking, it is to divide related diseases into a group and pay for them in a package, instead of paying one by one as before.

DRGs originated in the United States. In the 1970s, in order to carry out medical evaluation scientifically, the health research center of Yale University put forward a new inpatient case combination scheme through the analysis and research of 700000 medical records in 169 hospitals, and named it DRGs for the first time. Later, the federal health finance administration (HCFA) funded the research based on the need of payment, and developed the second generation DRGs, which forms the basis of the existing version.

Due to the deepening of aging and the increase of people suffering from chronic diseases, the total cost of health in our country is increasing. Statistics show that the total health expenditure was 1754.192 billion yuan in 2009 and 5159.88 billion yuan in 2017. In less than 10 years, the total health expenditure has doubled, putting great pressure on the national medical insurance fund. Because the hospital has long implemented the method of charging according to items, the more medical services the hospital provides for patients, the more compensation it will receive. Therefore, the medical cost has increased rapidly. Changing this payment method is the focus of medical cost control in China. In this context, the DRG

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

payment concept was introduced in China. As the key content of medical insurance reform, the reform of payment method by disease diagnosis related group (DRG) has also become one of the important responsibilities of the national medical insurance bureau since its establishment. In June 2019, the national medical insurance bureau and the Ministry of Finance jointly issued the list of national pilot cities paying by disease diagnosis related group (DRG) [1]. In September of the same year, the National Medical Insurance Bureau issued the grouping scheme of national medical security disease diagnosis related group (chs-drg) [2]. The next month, the technical specification for grouping and payment of national medical security disease diagnosis related grouping (chs-drg) [3] was issued. The intensive introduction of a series of schemes and standards indicates that the traditional medical insurance payment method will be gradually replaced by the DRG payment method.

II. DRG AND ITS CURRENT DEVELOPMENTS

2.1 Development of DRG abroad.

Foreign research is earlier than domestic research. It can be seen from the literature of Kim s, Dimitropoulos V, Choi JW, Jeon M and other scholars [4-8]. In the 1980s, the United States took the lead in the application of DRG and found that it could control the rising medical insurance expenses. Since then, many countries in Europe and America have started to adopt DRG. In the process of DRG being introduced and applied by various countries, many versions have been produced, such as G-DRG in Germany, ghm-drg in France, hrg-drg in Britain.

2.2 Development of DRG in China

Hu Mu et al. Launched the relevant practical research on the DRG payment pilot in Beijing [9], pointing out that Beijing has obvious effect of payment, settlement and fee control according to the fixed combination of diseases, and the effect of growth control of medical insurance fund has begun to show. In 2019, the National Medical Insurance Bureau intensively issued a series of policies, schemes and standards, including the list of DRG paying national pilot cities, the grouping scheme of disease diagnosis related grouping (chs-drg), and the technical specifications for grouping and payment of disease diagnosis related grouping (chs-drg), marking the full start of China's medical insurance DRG reform.

2.3 Pilot Application Effect of DRG

China's DRG collection and payment reform is still in the exploratory stage, with pilot projects in 30 cities across the country, such as Beijing and Shanghai. Liu Rongfei, Hu Guangyu and others studied the scheme and effect of DRG pilot in cities with different capacity [10-12] and found that the effect in Beijing is obvious, with no reduction in hospital income, reduced patient burden and controllable fund growth. The effect is not apparent in Sanming City, Fujian Province. DRG has no effect on the average length of stay and the effect of cost control is not ideal. The quality of fee control in county-level hospitals is not high, and the space for fee control is limited.

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

III. DRG GROUPING SCHEME

3.1 DRG grouping policy

The DRG group adopts case combination (Case-mix) idea, different disease types should be distinguished by diagnosis, similar cases with different treatment methods, similar cases, but different individual characteristics, age, complications, birth weight, etc., to finally form the DRG group.

3.2 Disease Group Naming and Encoding Rule

The Chinese name of the CHS-DRG disease group was formulated in combination with clinical habits and approved by relevant experts organized by the Medical Insurance Bureau. The code for the CHS-DRG disease group consists of 4-bit codes, which are indicated in English A-Z and Arabic numbers 0-9. The specific meanings of the DRG code are as follows[2]:

The first represents the main diagnostic category (MDC), according to the main diagnosis on the home page of the case, into the main diagnostic disease, indicated in the English letter A-Z.

The second place represents the type of DRG disease group, which is divided into surgery, non-operating room operations (receiving special examinations, such as catheters, endoscopy.) and internal medicine. Presoted in English letters. Among them, 9 letters of A,B,C,D,E,F,G,H,J indicate surgical parts; 6 letters of K,L,M,N,P,Q indicate non-operating room operations; R,S,T,U,V,W,X,Y,Z and 9 letters indicate internal medicine parts.

The third digit indicates the sequence code of the ADRG, represented by the Arabic numbers 1-9.

The fourth place indicates whether there are comorbidities and complications or special circumstances, such as age, conversion. Presoted in Arabic numbers. "1" means serious complications and complications; "3" means general complications and complications; "5" indicates no complications and complications; "7" means death or transfer; "9" indicates undifferentiated; "0" indicates group less than 17 years; other figures indicate other cases to be grouped separately.

Ⅳ. DRG GROUP EFFICIENCY EVALUATION

4.1 Evaluation Purposes

In the process of grouping, it is necessary to continuously evaluate the grouping efficiency of the grouping results, and measure whether the grouping scheme meets the needs of DRG grouping and payment. The evaluation results are the main basis for guiding the modification and improvement of the grouping scheme.

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

4.2 Main Index and Calculation Method

The main indicators of group efficiency evaluation include [2]:

1. ADRG groups.
2. DRG groups.
3. Overall case enrollment rate=Number of cases enrolled/number of cases collected×100%.
4. Specification Case Entry Rate=Number of cases/Number of cases×100%.
5. The proportion of CV<1 groups accounted=Number of DRG groups for CV<1/Number of DRG groups.
6. The proportion of CV<0.8 groups accounted=Number of DRG groups for CV<0.8/Number of DRG groups.
7. The proportion of reasonable cases=Number of enrolled cases in the DRG group that simultaneously met all subgroup criteria/Number of cases was retained after data review×100%.
8. Overall variance reduction coefficient (RIV) is the ratio of the sum of squares to the sum of the subset. The systematic and structured process reduces the variability of data. The better the internal rules of the data grasp, the higher the degree of systematization, and the greater the degree of variation decreases, that is, the greater the RIV.

Ⅴ. TYPICAL CASE-APPLICATION OF THE STUDY RESULTS IN THE HOSPITAL

5.1 Capacity of medical services

5.1.1 DRG groups

The number of DRG groups refers to the number of covered disease diagnosis-related groups in specialized treated cases in the hospital, and each DRG represents a class of disease. The wider the scope of DRG coverage for discharge cases, the larger the scope of medical services that the hospital can provide. As shown in Fig 1, the number of hospital collection groups showed an upward trend from 2017-2019.

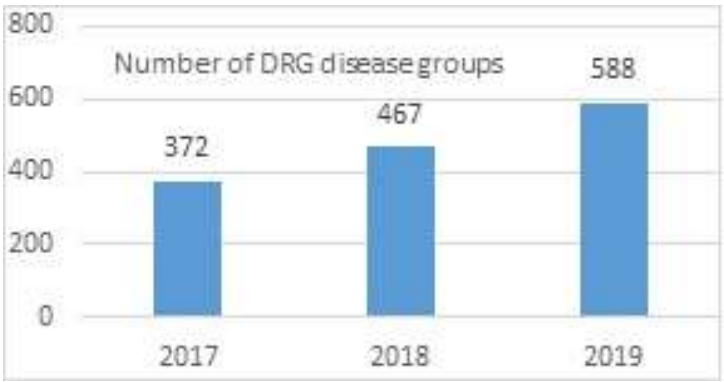

Fig 1: Number of DRG disease groups treated in hospitals from 2017 to 2019

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

5.1.2 Equilibrium of discipline development

CN-DRGs recovers a total of 26 "major disease classification (MDC)", as the index to evaluate the balance of hospital discipline development, and as the standard for the comprehensiveness of diagnosis and treatment skills. It can be seen from TABLE I and TABLE Ⅱ that there were 25 MDCs in total in all discharged cases in the hospital from 2017 to 2019, of which mdcy (HIV infected diseases and related operations) was not carried out in the disease group. The top three cases admitted from 2017 to 2019 were MDCE (respiratory disease and dysfunction), MDCB (neurological disease and dysfunction), and MDCF (circulatory disease and dysfunction).

TABLE I. Number of cases admitted in MDC in a hospital

Group Results	grouping name	Number of cases in 2017	Number of cases in 2018	Number of cases in 2019	Serial number
MDCE	Respiratory diseases and dysfunction	4761	6256	9211	1
MDCB	Neurological disorders and dysfunction	4696	5593	7473	2
MDCF	Cyclic disease and dysfunction	3282	4296	4651	3
MDCO	Pregnancy, delivery, and puerperium	3933	2538	4621	4

TABLE Ⅱ. Number of hospital MDC cases from 2017 to 2019

Group Results	grouping name	Number of cases enrolled	proportion	Serial number
MDCE	Respiratory diseases and dysfunction	20228	18.59%	1
MDCB	Neurological disorders and dysfunction	17762	16.33%	2
MDCF	Cyclic disease and dysfunction	12229	11.24%	3
MDCO	Pregnancy, delivery, and puerperium	11092	10.19%	4

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

5.1.3 Weight Distribution

(1) Total weight of the whole hospital (RW)

A DRGs group represents a class of cases with similar approach, severity, medical resources consumed, and each DRGs group gives a relative weight (RW) reflecting the severity of the disease, difficulty of diagnosis and treatment, and medical resources consumed.

Total DRG weights represent results after standardization of patient discharge visits. Each case, correctly grouped, will be given the weight represented by this DRG disease group, distinguishing between the difficulty of the condition. The total weight number is equal to the sum of the weight of each DRG group and the number of cases in this group, which is an important indicator of hospital medical output. Fig 2 shows the medical output in the hospital in the past three years. (Since 441 cases were unweighted, the number of discharges in the weight analysis was 108,361).

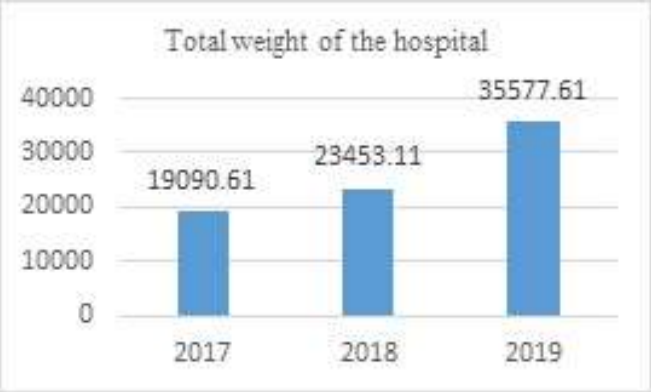

Fig 2: Total weight of the hospital from 2017-2019

(2) Number and proportion of general cases (RW<2) and difficult cases (RW≥2)

Large analyzed weighted cases represent the proportion of total analyzed cases, representing the treatment capacity of difficult cases in the hospital. RW=2 was used as the weight value benchmark of difficult cases to analyze the proportion of cases in each RW segment.

As can be seen from TABLE Ⅲ and TABLE Ⅳ, the distribution of the whole hospital was concentrated in the difficulty range of 0<RW<1. If the lower weight ratio is too high, it shows that the hospital admitted a large number of patients with low difficulty and occupied more beds, which hindered the improvement of the overall medical level.

TABLE Ⅲ. Number and proportion of general cases in hospitals from 2017 to 2019

Year	Number of discharged patients	0<RW<1		1≤RW<2	
		Number of	Proportio	Number of	Proportio

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

		cases	n	cases	n
2017	29028	25933	89.34%	3017	10.39%
2018	34011	29696	87.31%	4118	12.11%
2019	45322	38361	84.64%	6898	15.22%

TABLE Ⅳ. Number and proportion of intractable case in hospitals from 2017 to 2019

Year	Number of discharged patients	RW≥2		Average Length of Stay	Hospitalization expenses
		Number of cases	Proportion		
2017	29028	78	0.27%	9.371795	12299.49
2018	34011	197	0.58%	14.91878	18227.14
2019	45322	661	1.46%	15.79425	27251.81

(3) Treatment ability of intractable cases:

a) Number of intractable cases with RW≥2 segments

The number of intractable cases with RW≥2 is shown in TABLE Ⅴ. It can be seen that the number of difficult cases in the hospital increased gradually from 2017 to 2019, with the largest increase in 2019, reaching 661 cases, indicating that the number of difficult diseases treated in the hospital increased significantly in 2019.

TABLE Ⅴ. segmented number of intractable cases in hospitals from 2017 to 2019

Year	Number of discharged patients	2≤RW≤5	5≤RW≤10	RW>10
2017	29028	72	6	0
2018	34011	188	9	0
2019	45322	643	18	0

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

b) Distribution of difficult cases and disease groups in the hospital

The distribution of difficult cases and disease groups in the hospital is shown in TABLE Ⅵ, TABLE Ⅶ and TABLE Ⅷ. According to the distribution of RW≥2 disease groups in the hospital, BR11 (intracranial hemorrhagic disease with important complications and complications) had the largest number of difficult cases in the distribution of difficult disease groups in the hospital from 2017 to 2019. The average hospitalization days decreased year by year, and the average hospitalization expenses increased.

TABLE Ⅵ. Distribution of RW≥2 disease groups in hospitals in 2017

	Weight	Number of people	Average Length of Stay	Hospitalization expenses
BR11	2.01	41	10.00	12967.67
GB15	3.53	11	6.36	10933.87
SU15	3.13	9	5.56	2249.40

TABLE Ⅶ. Distribution of RW ≥ 2 disease groups in hospitals in 2018

	Weight	Number of people	Average Length of Stay	Hospitalization expenses
BR11	2.01	44	12.18	12809.66
BB25	2.64	28	19.89	21889.54
GB15	3.53	25	6.28	10134.51

TABLE Ⅷ. Distribution of RW ≥ 2 disease groups in hospitals in 2019

	Weight	Number of people	Average Length of Stay	Hospitalization expenses
BR11	2.01	72	8.54	17597.99
FM11	2.24	58	9.74	24025.66
ZC15	2.63	48	21.83	20926.36

5.1.4 Case Mix Index (CMI)

CMI refers to the average DRG weight value of the hospital. This index reflects the technical difficulty of diagnosis and treatment of diseases in medical institutions from the perspective of medical resource

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

consumption. If it is greater than 1, it indicates that the technical difficulty is higher than the average level. TABLE Ⅸ shows the basic statistics of hospital CMI from 2017 to 2019.

TABLE Ⅸ. Basic information of hospital CMI from 2017 to 2019

Year	Number of patients analyzed	CMI	Average expense	Mean drug	The proportion of drugs
2017	29028	0.66	4062.78	1498.25	36.88%
2018	34011	0.69	4566.39	394.448	8.64%
2019	45322	0.78	5429.73	1952.83	35.97%

The CMI change curve is reflected in the time range, and the average difficulty of diagnosis and treatment of cases admitted in the hospital is reflected. Fig 3 shows the CMI change curve of the hospital from 2017 to 2019. It can be seen that the average diagnosis and treatment difficulty of the hospital is increasing year by year.

Fig 3: Changes in the whole hospital in CMI, 2017-2019

5.2 Efficiency of medical services

The efficiency of medical services is measured by the cost consumption index and the time cost index, reflecting the medical cost of treatment and the length of hospitalization time for similar diseases. When the index value is equal to 1; the index is less than 1 indicates lower medical expenses or short hospital time, indicating higher service efficiency of the hospital; the index value is greater than 1 indicates higher medical expenses consumption or longer hospital stay, and the service efficiency of the hospital is low.

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

As shown in Fig 4, both the time consumption index and the cost consumption index in the past three years are all below 1, indicating the high efficiency of hospital medical services.

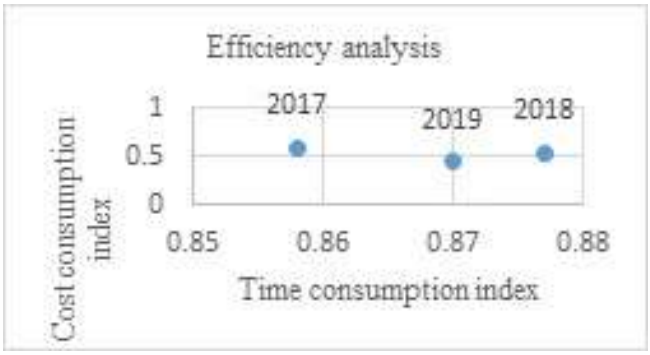

Fig 4: Whole-hospital efficiency analysis from 2017 to 2019

5.3 Safety of medical services

Medical safety indicators use low-risk group mortality and low-risk group mortality, which are used to measure the safety and quality of hospital inpatient services.

The basic principle of low- medium and low risk group mortality is that the case is not serious, and once the death occurs, it means that the cause of death may not be in the disease itself, but in the clinical process. Thus, high mortality in low/medium to low risk DRG cases, suggesting potential problems with clinical or management processes.

Fig 5 and Fig 6 show the downward trend of low-risk mortality and medium and low-risk mortality in 2017 to 2019, showing that hospital medical safety and quality management has improved.

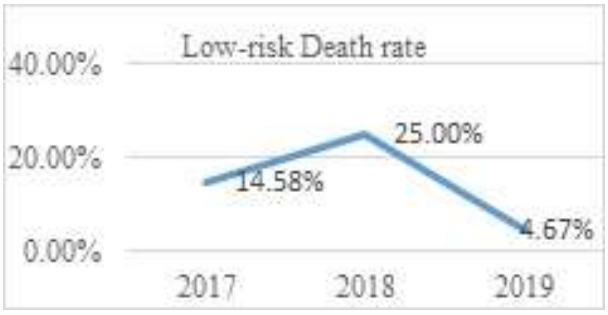

Fig 5: Low-risk mortality from 2017 to 2019

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

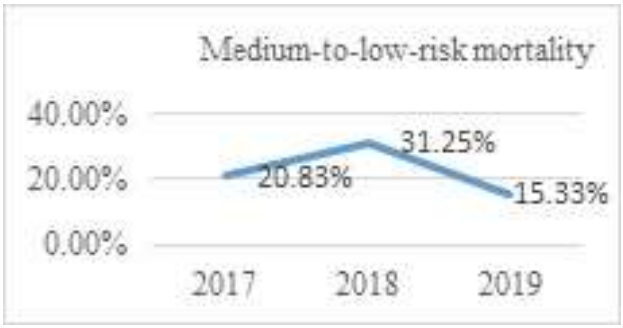

Fig 6: Medium-to-low-risk mortality from 2017 to 2019

Ⅵ. Conclusion

This paper analyzes the development situation of medical security paid DRG at home and abroad, and studies the group efficiency evaluation of medical security paid DRG in 2017-2019, focusing on medical service capacity, efficiency and safety. The efficiency analysis is conducted for the medical data from 2017-2019. According to the analysis results, the DRG system can improve the medical service capacity and medical service efficiency of the hospital, and the medical safety and quality management of the hospital has been improved.

ACKNOWLEDGMENTS

This research was supported by the soft science project of Shandong Provincial Department of science and technology (Grant No. 2020rkb01168).

REFERENCES

[1] National Health Insurance Bureau, National Health Finance Commission, et al. Notice on the Issuance of the List of National Pilot Cities paid by Group Related to Disease Diagnosis. 2019.
[2] National Health Insurance Agency. The National HealthCare Security Disease Diagnosis Related Group (CHS-DRG) grouping protocol.2019.
[3] National Health Insurance Agency. National Healthcare Security Disease Diagnosis Related Grouping (CHS-DRG) grouping and paid technical specifications. 2019.
[4] Kim S, Jung C, Yon J, et al. A review of the complexity adjustment in the Korean Diagnosis-Related Group (KDRG). Health Inf Manag，2020, 49(1): 62-68.
[5] Dimitropoulos V, Yeend T, Zhou Q, et al. A new clinical complexity model for the Australian Refined Diagnosis Related Groups. Health Policy, 2019, 123(11): 1049-1052.
[6] Choi JW, Kim S J, Park H K, et al. Effects of a mandatory DRG payment system in South Korea: Analysis of multi-year nationwide hospital claims data. BMC Health Serv Res, 2019, 19(1): 776.
[7] Jeon M J, Choo S P, Kwak Y H, et al. The effect of diagnosis related group payment system on the quality of medical care for pelvic organ prolapse in Korean tertiary hospitals. PLoS One, 2019, 14(8): e220895.

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 521-532
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

[8] Zemlin M, Goedicke-Fritz S. Reduced Revenues after Introduction of the G-DRG System due to Poor Coding Quality ? Qualification of Coding Staff at 177 German Children's Hospitals. Klin Padiatr, 2019, 231(8): 313-319.
[9] Mu Hu, Ming Lu, Shengpu Du, et al. The Evaluation of the Pilot Study on Diagnosis Related Groups and Prospective Payment System in Beijing. China Health Insurance, doi: 10.369/j.issn.1674-3830.2014.4.13.
[10] LIU Rong-fei, XUE Mei, LI Zi- ling. Research Progress of DRG at Home and Abroad. Health Economics Research, DOI: 10.14055/j.cnki.33-1056/f.2020.10.011.
[11] HU Guang-yu, LIU Jie, FU Ting-hui, LIU Yuan-li. Progress and implications of the DRG-based prospective payment system (DRG-PPS) reform in China. Chinese Journal of Health Policy, 2019,10(9):32-38.
[12] MA Zhong-kai. Exploration on Performance Appraisal Model of Hospital Adapting to DRG Medical Insurance Payment. Chinese Health Economics, 2019, 38 (6):76-77.