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DRGS PAYMENT REFORM AND COST MANAGEMENT: A CASE STUDY IN A PUBLIC HOSPITAL IN CHINA

Jinhua Chen

Dissertation | Master in Business Administration | n. 89765

Supervisors:

Maria João Major, Full Professor, Department of Accounting

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Resumo

Esta dissertação baseia-se em evidência recolhida num hospital público na China para analisar a implementação de Grupos de Diagnóstico Homogeneos (GDH) e a sua ligação com a gestão de custos no hospital.

Em termos metodológicos, o estudo adota o método de estudo de caso, com o objetivo de produzir um conhecimento profundo e rico relativo à prática de GDHs e gestão de custos numa organização específica. O pesquisador coletou evidência de fontes múltiplas, permitindo-lhe apresentar e analisar o processo de implementação dos GDHs no hospital, e analisar como a gestão de custos através dos GDHs suporta estratégias de desenvolvimento do hospital.

O estudo de caso conduzido sugere que a implementação de GDHs em hospitais públicos é uma questão importante para seu desenvolvimento sustentável, e que a gestão financeira e de custos são a chave para a reforma do sector da saúde em andamento na China.

Palavras-chave: Hospitais públicos; China; GDHs; Gestão de custos

JEL Classificação: Política governamental • Regulação • Saúde Pública (I18) ; Contabilidade (M41).

Abstract

This dissertation bases on evidence collected from a Chinese public hospital to analyse the process followed of Diagnosis-Related Groups (DRGs) implementation and the link between DRGs and hospital cost management.

Methodologically, this study employs case study approach, aiming to develop an in-depth and rich understandings of DRGs practices and cost management in a specific setting. Multiple sources of evidence were collected by the researcher, allowing him to analyze the process of DRGs case grouping, cost collection and analysis, and of cost control.

The case study suggests that implementing DRGs in public hospitals represents an important issue to their sustainable development and that the development of appropriate management and cost accounting systems is key to the DRGs reform that is taking place in China.

Keywords: Public hospitals; China; DRGs; Cost management

JEL Classification: Government Policy • Regulation • Public Health (I18); Accounting (M41).

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GLOSSARY

Public hospitals refer to hospitals organized by the Chinese government and included in the financial budget management.

Third Grade Class A hospitals are the highest level of medical institutions classified according to China's Current Hospital Classification Management Measures.

Medical insurance refers to social medical insurance, which is a social insurance system for the basic medical needs of employees.

Medical insurance fund refers to the special fund raised by the medical insurance agency from originations and individuals. It is designated for basic medical insurance of employees in order to ensure their basic medical treatment by the Chinese government under the relevant national provisions.

Clinical pathway refers to the establishment of a set of standardized treatment modes and procedures for a certain disease. It is a diagnosis and treatment process for specific diseases, focusing on the synergy among different specialties, the results of treatment and timeliness in the treatment process.

Performance management refers to the management method that managers and employees achieve organizational goals by encouraging and helping employees to achieve excellent performance on the basis of reaching consensus on goals and how to achieve them.

Graded diagnosis and treatment refer to grading according to the priority of diseases and the difficulty of treatment. Medical institutions at different levels undertake the treatment of different diseases, and gradually realize the medical process from general practice to specialization.

Disease spectrum refers to a disease process composed of fixed spectral order.

Validity, or effectiveness, refers to the degree to which the measuring tool or means can accurately measure the things to be measured.

Reliability refers to the consistency of the results when the same method is used to measure the same object repeatedly. On the other hand, reliability refers to the reliability of measured data.

Dimension refers to the number of independent parameters in mathematics. In the field of physics and philosophy, it refers to the number of independent space-time coordinates.

Hospital coefficient refers to the weight coefficient of hospitals at all levels of each disease group determined under the DRGs payment policy to reflect the differences in medical

level and medical resource consumption among different hospitals. It is an indicator of the hospital DRGs assessment by Y City Medical Insurance Administration.

Entry rate (enrollment rate), the ratio of the number of patients who meet a diagnostic code (ICD-10) to the total number of patients in a specified time period.

Special disease for single discussion refers to the method of determining the approved points or unreasonable treatment for special cases such as excessive cost difference through collective discussion and review of medical insurance experts in the reform of medical insurance payment method based on DRGs points payment.

Day surgery, or ambulatory surgery, refers to the selection of patients with certain indications, and the arrangement of hospitalization, operation, short-term observation after operation, recovery (generally several hours) and discharge within one working day. Patients don't stay in the hospital overnight.

Injury Code, the code of local and systemic reactions caused by the destruction of skin, muscles, bones, viscera and other tissue structures caused by various external trauma factors.

Single disease, a single disease without complications.

Annual liquidation coefficient, in order to evaluate the management quality of designated medical institutions, Y City has set up an assessment liquidation coefficient. The average value of the assessment liquidation coefficient is 1, and the basic medical insurance management index of each medical institution is controlled between 0.97 and 1.02 compared with the average level of medical institutions at the same level.

Number of disease groups, historical average medical expenses of a single disease group ÷ historical average medical expenses of all DRGs disease groups multiply one hundred.

Cost consumption index, it reflects the cost of treating similar diseases. The higher the average hospitalization cost of a certain kind of disease, the greater the value of the cost consumption index of the hospital. Equal to 1 means that the average hospitalization cost of the hospital is equivalent to the average level in the region, and greater than 1 means that the cost of treating similar diseases in the hospital is higher than the average level in the region.

Time consumption index, it is the work efficiency index in the hospital performance evaluation index. How to shorten the average length of stay while ensuring the medical difficulty and quality. The average length of stay in the region is 1. Higher than 1 means that it is higher than the average level while below 1 indicates below average. The lower the time consumption index, the higher the work efficiency treating the same disease.

ACRONYMS

DRGs, or Diagnosis Related Groups, is a management tool developed by American scholars in the 1960s and it is mainly used in short-term inpatient medical service performance evaluation and medical insurance payment management.

ICU, or Intensive Care Unit, concentrates critically-ill patients and provides the best guarantee in terms of manpower, material resources and technology, in order to obtain good treatment results.

VIP, or Very Important Person is a classification of visitors by an organization, party, society and country. This article refers to important patient departments.

CCHI refers to Chinese Classification of Health Interventions.

CMI refers to the average weight of discharged patients in the hospital, which is related to the type of cases treated in the hospital. As one of the core indicators in the DRGs application system, the higher the CMI index, the higher the difficult and dangerous degree of the treated diseases.

ICD refers to International Classification of Diseases.

MDC refers to Medical Diagnostic Classification.

PPS refers to Prospective Payment Systems.

SCI refers to Scientific Citation Index.

HIS refers to Hospital information system which means that an information system that uses computer technology to comprehensively manage the flow of people, logistics and financial flow of the hospital and various departments, and processes the data generated in various stages of medical activities to form various information, so as to provide comprehensive automatic management and various services for the overall operation of the hospital. This refers to the information system of hospital A.

Chapter 1 - Introduction

This chapter introduces the research background and motivation of this study and expounds the research purpose, research questions and research methods of this paper. Finally, this chapter introduces the structure of the paper.

1.1. Research Background and Motivation for the Study

The 19th CPC National Congress proposed to implement the Healthy China strategy, improve the national health policy, and provide the people with all-round and full-cycle health services to meet the people's multi-level and diversified health needs (National Health Commission of the People's Republic of China & National Administration of Traditional Chinese Medicine, 2018).

Medical insurance payment is a critical issue to ensure the development of medical reform in China. It is an important lever to regulate medical services and guide the allocation of medical resources (General Office of the State Council, 2017). As in many other countries, China's healthcare expenditures are increasing, with the imbalance between social health insurance revenues and expenditures continuing to intensify. Some social health insurance pooling regions require subsidies from local governments to operate because their insurance revenues cannot meet their expenditures (Jiang & Peng, 2019).

Diagnosis related groups (DRGs) were developed in the United States in the late 1960s. In the 1980s, the United States took the lead in using DRGs for fixed payment of medical insurance. Nowadays, most developed countries use this tool for budgeting, resource allocation management or purchase of medical services. In essence, DRGs can be used not only for payment management, but also for quality management (National Healthcare Security Administration, 2019).

DRGs consist of a typical prepayment system and package payment by disease case. Since it was first used in Medicare in the United States in 1983, it has been rapidly and widely developed and applied all over the world, and has become the most important payment method used in hospital inpatient services in the world (Wang et al., 2017).

With the advent of China's aging era, it is difficult to maintain the short-term and long-term balance of revenue and expenditure of medical insurance. Introducing DRGs as a management tool and starting the reform of DRGs payment method to replace the current payment by case can make hospitals, medical insurance centers and patients reach a consensus

and maximize their respective interests. This allows medical insurance management departments and medical institutions to achieve financial balance, mobilizing the participation of medical personnel to optimize clinical pathway and standardize diagnosis and treatment behavior. As such it is expectable that service efficiency is improved and that the sustainable development of medical and health undertakings are promoted (National Healthcare Security Administration, 2019).

In 2019, China implemented the DRGs payment system in 30 pilot cities. On November 19, 2021, the National Medical Security Admimistration requested to accelerate the reform of DRGs payment mode, recommending the full coverage on the basis of the preliminary results achieved in the three-year pilot. By the end of 2025, it is aimed that DRGs payment will cover all qualified medical institutions carrying out inpatient services. In addition, it is required to improve the working mechanism, strengthen infrastructure construction and to cooperate to promote the supporting reform of medical institutions (National Medical Insurance Administration, 2021). At present, it is common for China's public hospitals to receive less than their expenses and they are facing challenges in sustained and sound operation. There is an urgent need to completely reverse the tendency of emphasizing resource acquisition over resource allocation and emphasizing clinical services over operation management, to improve the level of refined operation management and seek benefits from strengthening internal management (Finance Department of the National Health Commission of the People's Republic of China, 2020).

Medical care is related to people's livelihood. Public hospitals are the main body of China's medical service system. According to the Statistical Bulletin of China's Health Development in 2019 (National Health Commission of the People's Republic of China, 2020), the number of patients received diagnosis and treatment in public hospitals in 2019 was 3.27 billion, accounting for 85.2% of the total number of hospitals; the number of personnel in public hospitals is 6.002 million, including 5.098 million health technicians (Jin, 2021). In 2016, General Secretary Xi Jinping's speech at the National Hygiene and Health Conference pointed out that it is necessary to build a modern hospital management system and promote the transformation of hospital management. It is necessary to significantly improve the science-based, refined and information-oriented level of hospital management, standardize medical behavior, and constantly improve service capacity and operation efficiency (Finance Department of the National Health Commission of the People's Republic of China, 2020). Moreover, in 2017, the General Office of State Council of China proposed to strive to achieve the organic unity of social benefits and operation efficiency and realize the modernization of

hospital governance system and management capacity (General Office of the State Council, 2017).

In order to standardize the cost accounting of public hospitals, improve the internal management level and operation efficiency of hospitals, improve the construction of modern hospital management system, and promote the high-quality development of public hospitals, Finance Department of the National Health Commission of the People's Republic of China, in February 2021, the National Health Commission and State Administration of Traditional Chinese Medicine required public hospitals to establish effective cost accounting management tools and mechanisms; meet specific cost information needs such as internal cost control, medical service pricing and performance evaluation; promote the transformation of management mode from extensive to refined and standardized; optimize the allocation of resources to improve operational efficiency; guarantee the healthy and sustainable development of public hospitals to better meet the demand of the people's basic medical and health services (National Health Commission of the People's Republic of China, 2021).

This study aims to contribute to the enlargement of knowledge of how DRGs can be succefully implemented in public hospitals in China and how cost management through DRGs can contribute to the efficiency of hospitals.

1.2. Research Purpose and Research Questions

The Chinese government has been promoting health insurance reform in recent years and selected some regions to carry out a DRGs payment pilot (National Medical Security Administration et al., 2019). The management reform of public hospitals in China has also been accelerating (General Office of the State Council, 2017), and DRGs cost management has been gradually applied in some hospitals (National Health Commission of the People's Republic of China, 2021). On November 19, 2021, the National Medical Security Administration required that by the end of 2025, DRGs payment method should cover all qualified medical institutions carrying out inpatient services. Thus, there is the need to select specific hospitals for analyzing DRGs implementation experience, so that empirical contributions about the implementation of DRGs are drawn.

Although a large number of literatures show that DRGs and cost management can strengthen hospital management, few studies have empirically explored this topic at the micro level. Also, how the observed effects are actually handled is rarely understood (Lehtonen, 2007).

According to different objects of cost accounting, hospital cost can be divided into

department cost, cost accounting per visit, cost accounting per bed, medical service cost, disease cost and DRGs cost (National Health Commission, 2021). DRGs cost accounting refers to the process of collecting relevant expenses and calculating the cost of DRGs group with DRGs group as the accounting object according to certain processes and methods (National Health Commission, 2021).

The purpose of this study is investigate the DRGs reform undertaken by a specific hospital (Hospital A) and how cost management of hospital A operates with the development of DRGs. In so doing, it is sought to contribute to the understanding of how DRGs can be successfully implemented in Chinese public hospitals and how cost management can support the improvement of efficiency of hospitals. To achieve the objective set for the investigation, the researcher has formulated a specific research question, as follows:

"How DRGs were implemented in Hospital A and how DRGs contributed to the development of cost management in this hospital?".

1.3. Methodology Adopted and Research Methods

This dissertation adopts the case study as the research strategy to answer the research question posed in the study. More concretely, a descriptive single case study (Yin, 2014) on DRGs implementation process and cost management of Hospital A in Y City, X Province of China has been undertaken. To conduct the case study six main steps were performed interactively (Yin, 2014):

(1) Designing case study;

(2) Preparing to collect case study evidence;

(3) Collecting case study evidence;

(4) Assessing the quality of evidence;

(5) Analyzing case study evidence;

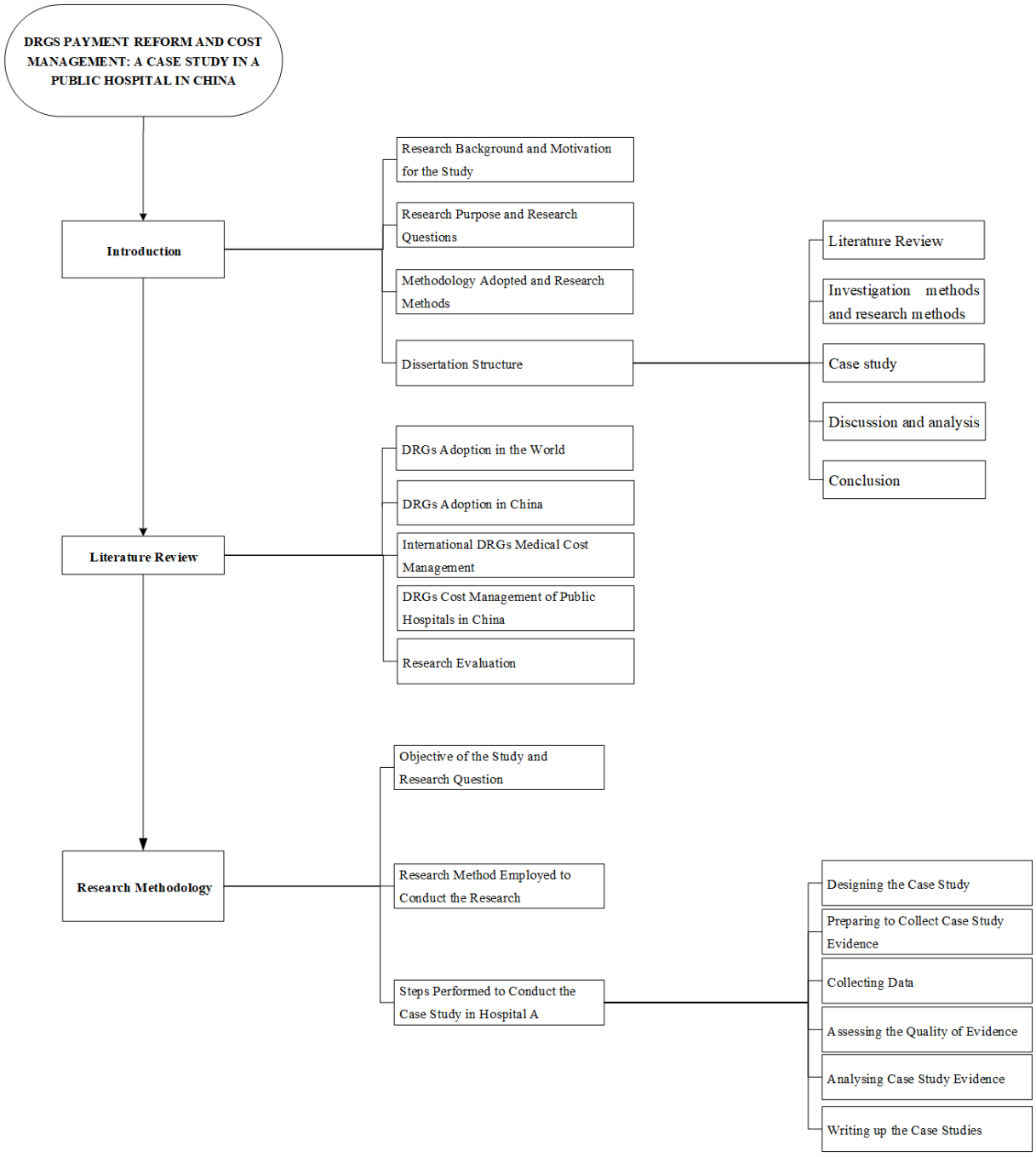
(6) Writing up case studies.

To ensure the quality of the study, the researcher followed Yin's recommendations and developed a chain of evidence throughout the various parts of the research and developed a database to keep the collected evidence.

1.4. Dissertation Structure

Figure 1.1. presents the structure of this dissertation, which is divided into five chapters. The second chapter is the literature review of hospital DRGs and cost accounting. The third

chapter discusses the investigation methods and research methods. The dissertation continues with the description of the case study in hospital A in Chapter 4, discussing and analyzing the case'sfindings in Chapter 5. The dissertion ends with the presentation of conclusions in Chapter 6.



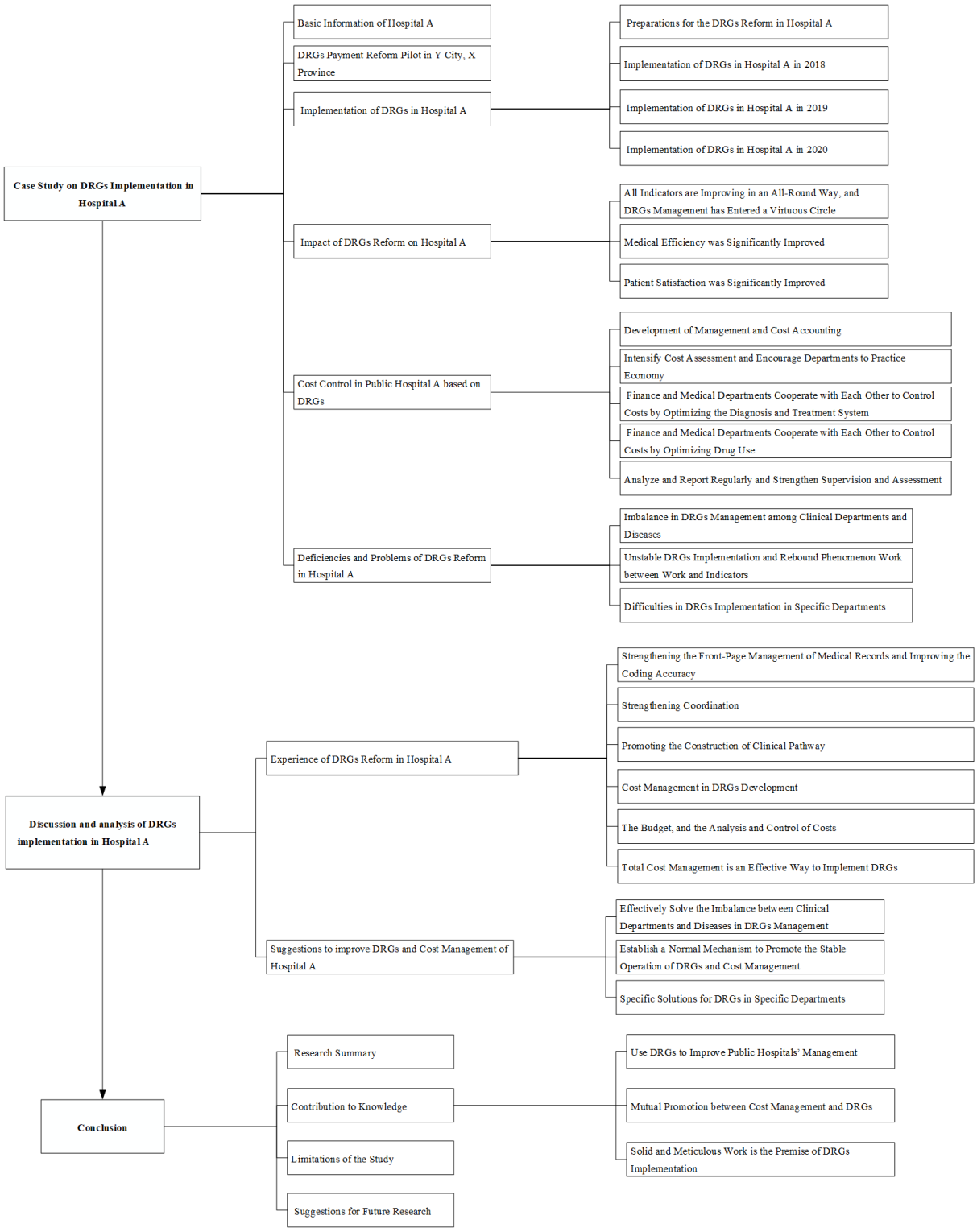


Figure 1.1 Dissertation Structure

Chapter 2 - Literature Review

This chapter aims to provide the latest research results of DRGs adoption in the world (including China), and provide relevant literature on the impact of financial and cost management on hospital DRGs, so as to provide references for this study.

2.1. DRGs Adoption in the World

DRGs, or Diagnosis Related Groups was firstly designed and developed by Yale University in the United States. As its name suggests, DRGs is a method to classify and group in-patients with disease diagnosis as the main classification axis. Patients are divided into different "disease diagnosis related groups" according to the disease type, severity, treatment method, individual characteristics, complications, hospitalization outcome and other factors, and the price, charge and medical insurance payment standard are packaged in groups (Xu, 2019).

DRGs system is a patient classification system (PCS), which summarizes a large number of different (individual) patients treated in the hospital into a controllable number of homogeneous groups with clinical and economic significance, so as to provide a concise measure of hospital activities, or in other words, they define hospital products and promote the comparison of hospital cost, quality and efficiency, and help to improve the transparency of hospitals (Busse et al., 2011).

The first DRGs system, Yale DRGs, was developed by Yale University and introduced in the late 1970s. Its initial purpose was to be used as a tool to measure the utilization of hospital resources. However, after recognizing its potential of a system that can assess hospital production, the American Medical Insurance Association adjusted the system to monitor and reimburse hospital care provided to elderly patients insured under US federal tax funded pension insurance (Busse et al., 2011).

Since then, DRGs has undergone six systematic improvements and is still gradually improving. Its remarkable cost control effect has attracted the attention of many countries in the world (Yao et al., 2018). Since the successful implementation of DRGs in the United States, many countries have introduced the concept of DRGs. The practical experience shows that DRGs suitable for their national conditions can alleviate and effectively control the unreasonable upward trend of medical expenses to a certain extent (Gao & Chen, 2017).

In Europe, Portugal was the first country to implement a DRG-based hospital payment system in

1988. Paying from the occupational health insurance plan accounted for about 30% of hospital activities at that time. From 1991 to 1993, Norway followed suit and DRG-based payment system was adopted in selected hospitals. Ireland began to adopt a DRG-based payment system in 1993 and a DRG-based budget allocation system was established for a limited number of emergency nursing hospitals. Australia's first initiative dates back to 1988, when the Australian Federal Ministry of Health incorporated DRGs into the 1988-1993 medical insurance agreement between the federation and eight states and regions, and began to fund the development of the Australian Version of DRGs (Australian national DRGs) launched in 1992. Victoria was the first state to use DRGs (in 1993) to budget its public hospitals (Busse et al., 2011).

Germany has explored its own G-DRG payment system by referring to the mature DRGs payment system in the United States and Australia in combination with its own medical insurance practice, and achieved good medical expense management results, which has become a successful example of the subsequent exploration and implementation of DRGs (Chang et al., 2016)

In 2000, the German government passed the statutory health insurance reform act, which stipulates that from January 1, 2003, a new and fully covered DRGs payment system will be introduced for hospitalization expenses. Its goal is to increase the transparency of medical expenses and control medical expenses. Germany has only introduced a new payment system and achieved good results in reducing the average length of stay and controlling the growth of medical expenses through 10 years of implementation, although there are inevitable deficiencies in the implementation of the payment system. (Wang et al., 2013)

In 1986, France modififi ed the HCFA-DRG system and developed its own national DRG system called groupes homogènes des malades (GHMs) (ATIH, 2010), translated as 'homogeneous groups of patients'. Later, in 1988, 3M™ Health Information Systems adapted and extended HCFA-DRGs in order to better reflfl ect the pathologies of non-elderly populations (3M, 2005). The resulting All Patients (AP-)DRG system was widely applied in the United States and, subsequently, updated versions of AP-DRGs were adopted in various European coun tries, such as Spain and Portugal, as well as inflfl uencing the development of national DRG systems, such as those of France and Australia. AP-DRGs were later refifi ned by changing the determination of severity levels in order to respond to demands for more accurate assessment of case severity and differences in resource intensity, thus leading to the All Patient Refifi ned (APR-)DRGs (3M, 2003). Together, AP-DRGs and APR-DRGs formed the basis for the Australian National (AN-)DRG system, which was renamed to Australian Refifi ned (AR-)DRGs after

further modififi cations had been introduced into the system (Australian Government, 2004). In 2003, Ireland adopted AR-DRGs (Busse et al., 2011).

In Europe, in the late 1980s, Portugal was in a leading position in the DRG-based hospital payment system, which was used for the payment of occupational health insurance plans. Recently, in many other European countries (such as Britain, France and Germany), the hospital payment system based on DRGs has developed into a major hospital payment system. Its objectives mainly include improving efficiency, activity and transparency; shortening waiting time and stay time; supporting patient's decisions; improving nursing quality; encouraging competition between hospitals. However, in Sweden and Finland, DRGs is still mainly used to improve the transparency of hospital service planning and management (Busse et al., 2011).

Asian countries and regions have also conducted in-depth research on DRGs. According to its national conditions, Japan developed the diagnosis procedure combination (DPC) in 2001. On the basis of DRGs, Japan introduced the standard quota payment method of standard hospitalization days according to different disease categories. Based on the research of Yale DRGs, South Korea has developed a DRGs payment system that combines prepayment and compensation for basic medical costs (Yao et al., 2018).

The reasons for introducing DRGs system in the world are similar, which can be divided into two categories: firstly, the system is to improve the transparency of hospital services effectively (i.e. through patient classification, measuring hospital output, etc.); secondly, the DRG-based payment system pays the hospital according to the number and type of treatment cases, which encourages the hospital to make effective use of resources. In addition, increased transparency and effective use of resources are considered to contribute to improving - or at least ensuring - the quality of health care (Busse et al., 2011).

It can be seen that DRGs in various countries have their own derivation and expansion on the basis of learning from the United States. For example, in terms of the number of groups, the number of DRGs in various countries and regions is different based on the differences in the cognition and methods of disease diagnosis grouping, but its implementation effect is significant (Yao et al., 2018).

The above literature shows that through the practice of DRGs payment in the United States, Portugal, Germany, France, Japan, South Korea and other countries for more than 30 years, this method has many advantages, mainly in effectively curbing the unreasonable growth of medical expenses; reducing the average length of hospital stay; improving the efficiency of medical resources; improving

the transparency of effective services provided by hospitals; strengthening the ability of hospital management and operation management; improveing collaboration between hospital departments.

2.2. DRGs Adoption in China

The introduction of DRGs appeared in China in the late 1980s, and the preliminary research of DRGs began. It is considered that the data carried by domestic medical records have basically met the needs of DRGs grouping. After more than 20 years of development, four mainstream authoritative versions have been formed in China: The first is BJ-DRG of Beijing Medical Insurance Association, which entrusted Peking University to carry out the project of Establishing Medical Information Platform and Introducing DRGs for PPS Exploration and Medical Evaluation. After research and development, it has been applied to 12 cities and provinces, mainly focusing on cost payment and taking into account medical quality evaluation, which fully reflects the demands of medical insurance management (Liu, 2020); the second is the CN-DRG jointly developed by the National Health Commission of the People's Republic of China and the Information Center of the Beijing Municipal Health Commission, which is currently applied to 29 cities and provinces, mainly focusing on the performance evaluation and quality supervision of medical services, and applied to the payment of expenses in some cities, fully reflecting the clinical reality and needs; the third is the II CR-DRG of the Department of Primary Health Care, National Health Commission. At present, it is applied to 7 provinces and 18 cities and counties and it fully reflects the characteristics of disease spectrum at grass-roots level and the management capacity of hospitals and medical insurance at the city and county level. This kind of practice is suitable for the payment and management of New Rural Cooperative Medical System (NCMS) and urban and rural residents; the fourth is C-DRG of the Health Development Research Center of the National Health Commission, which is currently piloted in 8 cities and provinces. It is an innovative practice and covers the clinical diagnostic terms of all disease spectrum with CCHI as grouping tools. This practice is grouped by doctors according to China's disease spectrum and the weight is calculated based on the cost and expense data of more than 1,400 hospitals, and the collection and payment of inpatients are integrated (National Healthcare Security Administration, 2019).

In 2017, the Guiding Opinions of the General Office of the State Council on Further Deepening the Reform of Payment Methods of Basic Medical Insurance (GBF [2017] No. 55) encouraged the national pilot of the DRGs payment and the establishment of DRGs payment system (General Office of

the State Council, 2017).

In 2019, the National Healthcare Security Administration, the Ministry of Finance, the National Health Commission and the State Administration of Traditional Chinese Medicine jointly issued the Notice on Printing and Distributing the List of National Pilot Cities of DRG Payment (YBF [2019] No. 34), which proposed to deepen the reform of medical insurance payment mode and has accelerated the application of DRGs medical payment mode throughout China (Han, 2021).

On November 19, 2021, the National Medical Security Administration issued the Notice on the Three-Year Action Plan for DRG / DIP Payment Reform (YBF [2021] No. 48), requiring to accelerate the full coverage of DRG / DIP payment reform on the basis of the preliminary results achieved in the three-year pilot (National Medical Security Administration, 2021).

Figure 2.1 Time Node of DRGs Development in China

Date	Events
1988	Hospital Management Research Institute was established in Beijing to start DRGs research in China
2008	Established the first version of localized DRGs -- BJ-DRG
2010—2016	The Health Development Research Center of the National Health and Family Planning Commission organized research and developed C-DRG for medical insurance payment after 6 years of research
August, 2011	Six hospitals in Beijing began the pilot reform of DRG-PPS; The Department of Health promoted the application of DRGs in hospital evaluation
2012	Beijing Hospital Management Research Institute officially carried out dynamic maintenance on BJ-DRG
2014	On the basis of BJ-DRG, the 2014 CN-DRG was published for the first time in China
2015	Beijing Hospital Management Institute became a national DRGs quality control center to carry out national DRGs promotion
June, 2017	The general office of the State Council issued guidance and proposed to carry out DRGs payment pilot

November, 2018	CN-DRG grouping scheme 2018 released
December, 2018	Launched the national pilot of DRGs payment
May, 2019	30 cities were selected as national pilot cities for DRGs payment
October, 2019	Released CHS-DRG of National Medical Insurance Administration
November, 2021	National Medical Security Administration issued the three-year action plan for DRG / DIP payment reform

Source: Adapted from Liu et al. (2020, p. 42) and National Medical Security Administration, (2021).

Under the background of increasing medical expenses and increasing pressure on the balance of payments of medical insurance fund, DRGs and its payment accounting method have also become the future development trend of medical services in China. Many regions in China actively explore and pilot the reform of DRGs. There are differences in the practice of reform objectives, forms and paths. At present, many relevant achievements have been published, but there is still a lack of systematic comparison and evaluation research on these cases. One of the key points of DRGs implementation lies in the strong support and cooperation of medical service providers, i.e. medical institutions and doctors. The case study of DRGs from the perspective of hospitals is an important reference for its application and promotion in China (Gao & Chen, 2017).

It can be seen from the above literature that China introduced DRGs payment later. In 2017, China began to pilot DRGs payment in Third Grade Class A hospitals in developed regions. In 2019, the medical insurance department promoted DRGs as a payment method and explored the establishment of DRGs payment system in 30 cities. In November 2021, the National Medical Insurance Administration proposed to accelerate the reform of DRGs payment mode and full coverage on the basis of the preliminary results achieved in the three-year pilot. At present, many DRGs research results have been published in China, but there is still a lack of systematic comparison and evaluation research on cases. The case study of DRGs from the perspective of hospital is an important reference for its application and promotion in China.

2.3. International DRGs Medical Cost Management

The original intention of Yale University to develop DRGs is not to use it to pay, but to help the hospital carry out cost control. After Yale University used DRGs to control hospital costs, American scholars believe that DRGs combines its payment and cost control well (Su, 2019).

Without accurate cost accounting, DRGs system can not run well; the necessity for the cost accounting system to use the cost based on unit analysis is met by the DRGs (Busse et al., 2011).

Hospital management accounting control system and clinical activities are the transmission mechanism of the role of DRGs control framework, and are finally reflected in the hospital's clinical results and observed financial performance in the macro level research (Lehtonen, 2007).

European countries and America mainly carry out three types of cost accounting: DRGs, Department / Specialty and patient; With the development of information technology, the acquisition of basic patient data has become a reality. European countries and America pay more and more attention to the development and application of patient cost accounting technology and issue mandatory or voluntary cost accounting guidelines for the above three types of cost objects (Tan et al., 2020).

Germany, the Netherlands and Australia have issued mandatory cost accounting guidelines, forcing hospitals to conduct DRGs, department and patient cost accounting; the cost accounting of DRGs in Britain is mandatory, and the cost accounting of departments and patients is voluntary; the cost accounting of DRGs and patients in Denmark is mandatory, and the cost accounting of departments is voluntary; the cost accounting of departments and patients in France is mandatory, and the patient cost accounting is voluntary (Tan et al. 2020).

The pattern of paying according to the preset DRGs payment standard forced the medical service provider (hospital) to obtain profits from increasing output in the past to cost control. Only by reasonably controlling the cost and improving the service efficiency can medical institutions and doctors obtain profits. Drugs, consumables and examinations have changed from revenue source to cost. Only by reasonably consuming resources can they operate efficiently, so as to guide hospitals to control the unreasonable growth of medical expenses by shortening the average length of hospitalization and reducing patients' induced medical consumption (Liu & Meng, 2018).

The above literature shows that, on the one hand, DRGs combines its payment and cost control well. At the same time, without accurate cost accounting, DRGs system can not run well.

2.4. DRGs Cost Management of Public Hospitals in China

In recent years, with the implementation of prepayment system, especially the gradual implementation of medical insurance payment and settlement methods such as disease management and disease diagnosis groups (DRGs), the competition in the medical industry has intensified. The reform of medical insurance payment mode has better controlled the growth of medical expenses and the management risks of medical insurance institutions. However, while transferring the responsibility of medical expense control to public hospitals, it also increases the financial risk and management pressure of public hospitals. How to control medical expenses and occupy a favorable position in a science-based manner in the medical market competition has become an important subject of cost management in public hospitals (Yu & Pang, 2017).

The implementation of DRGs payment forced public hospitals to focus more on controlling medical costs, strengthen the fine management of medical costs, guide medical personnel to focus on medical safety, medical quality, internal cost control and reducing loss and waste, select reasonable clinical paths and medical technologies, find the best clinical intervention strategy for diseases, implement diagnosis and treatment in the most efficient way to increase revenue and improve the operation efficiency of public hospitals (Yu & Pang, 2017).

The economic management and cost control of the hospital are mainly to reduce the operation cost of the hospital, reduce the treatment cost of patients, effectively improve the efficiency of the hospital and promote the healthy development of the hospital (Lu, 2014).

The Ministry of Finance, the National Health Commission and other departments pointed out that in recent years, the internal and external environment faced by hospitals is undergoing great changes, such as the reform of medical insurance payment mode and the intensification of medical market competition. In order to maintain its public welfare and embark on a healthy path of sustainable development, hospitals need to pay attention to cost accounting and management, reduce costs and increase efficiency through fine management, protect the rights and interests of medical insurance participants and the long-term sustainable development of medical insurance system (Accounting Department of the Ministry of Finance, 2021).

Therefore, China issued several documents that have put forward requirements for strengthening hospital cost accounting: The Recent Key Implementation Plan of Medical and Health System Reform (GF [2009] No. 12) issued by the State Council in 2009 clearly pointed out the need to strengthen cost

accounting and control and regularly carry out medical service cost calculation (State Council, 2009); In 2017, The Guiding Opinions on Establishing a Modern Hospital Management System (GBF [2017] No. 67) issued by the general office of the State Council made it clear that it is necessary to strengthen cost accounting and control, gradually implement hospital full cost accounting, and gradually establish a dynamic adjustment mechanism of medical service prices based on changes in cost and income structure (General Office of the State Council, 2017); In 2017, The Guidance on Further Deepening the Reform of Payment Methods of Basic Medical Insurance issued by the general office of the State Council (GBF [2017] No. 55) required to stimulate the endogenous driving force of medical institutions to control costs, and to measure and evaluate the diagnosis and treatment costs and efficacy of medical institutions with the support of the DRGs technology (General Office of the State Council, 2017).

The Hospital Accounting Regulation issued by the Ministry of Finance (CK [2010] No. 27) in 2010 fully adopts the accrual basis of accounting, which lays a necessary foundation for hospital cost accounting (the Ministry of Finance, 2010). The Hospital Financial Regulation also puts forward requirements for hospital cost accounting and management (Ministry of Finance and the Ministry of Health, 2010). Therefore, since 2010, most hospitals above the county level have carried out department cost accounting in accordance with the Hospital Financial Regulation and Hospital Accounting Regulation, and the health administrative departments in some regions have also formulated local hospital cost accounting methods (Accounting Department of the Ministry of Finance, 2021). In 2015, the National Health Commission and the State Administration of Traditional Chinese Medicine issued The Operating Measures for Cost Accounting of County-Level Public Hospitals (GWBCWF, [2010] No. 39) (National Health Commission and State Administration of Traditional Chinese Medicine, 2015), which set a basis for the Standard for Cost Accounting of Public Hospitals (GWCWF, [2021] No. 4) in 2021 (Finance Department of the National Health Commission, 2021).

On November 15, 2021, the Ministry of Finance issued the Specific Guidelines for Cost Accounting of Public Institutions - Public Hospitals (CK [2021] No. 26), which encourages the higher-quality development of public hospitals (hereinafter referred to as hospitals), improve the modern hospital management system, standardize hospital cost accounting, and improve the internal management level and operation efficiency of hospitals (Accounting Department of the Ministry of Finance, 2021).

At the same time, the Ministry of Finance pointed out that standardizing disease types and the cost accounting of DRGs will help to accurately reflect the actual cost of diseases and DRGs, provide a basis

for determining the charging and payment standards including medical insurance fund and individual payment, and promote hospitals to control medical costs. It is required to divide according to DRGs groups, take each DRGs group as the cost accounting object, and further calculate its unit cost, that is, DRGs cost. It is necessary for hospitals to take department cost, cost accounting per visit, cost accounting per bed into account, and qualified hospitals can account for the costs of medical service items, diseases, DRGs et al. (Accounting Department of the Ministry of Finance, 2021).

The cost analysis of DRGs disease group can standardize the output of medical services and make the clinical characteristics and cost consumption characteristics of patients in the same group more comparable Carrying out DRGs cost accounting is the requirement to promote the reform of DRGs payment mode and promote hospitals to actively control costs. (Dai et al., 2020).

It is necessary for hospitals to use DRGs tools to obtain standards from normal data, to find problems from difference data and locate the focus of cost management by comparing with benchmark data; From the whole hospital, different departments in the same disease group, different disease groups in the same department, different doctors (groups) in the same disease group and other levels, it is of necessity to target the key departments, doctors (groups) and disease groups with unreasonable expenses using structural analysis, trend analysis and factor analysis in view of the cost composition and changes; Then, through the comprehensive analysis of the indicators of each dimension of DRGs, study and judge the medical behavior, find out the causes of unreasonable expenses, and people and diagnosis and treatment behavior should be specially considered; Finally, evaluate, give feedback on and improve the results to achieve the goal of reasonable control of medical expenses (Zheng, 2019).

The above literature shows that in China, DRGs cost management in public hospitals has been paid more and more attention by the government and the medical community. The Chinese government has issued a series of policies to promote DRGs cost management in hospitals this year, and the academic community has also done a lot of research, but there are few case studies on the implementation and cost management of DRGs in specific hospitals.

2.5. Research Evaluation

From the above literature review, it can be seen that many theoretical achievements have been made in the research of DRGs payment mode and DRG-based cost management at home and abroad; The Chinese government has accelerated the implementation of DRGs payment in recent years, and has

also formulated many policies and measures in hospital finance and cost management. However, the research on DRGs, cost management and performance management by relevant Chinese scholars still stays in the theoretical stage, and there are few relevant practical cases.

Through a field trip to a DRGs pilot hospital, the author has the opportunity to contact first-hand hospital management materials. It is in hope of analyzing and verifying the implementation of DRGs and financial cost management in public hospitals in China throgh case study, so as to provide empirical support for DRGs payment and the modernization of financial and cost management in public hospitals in China.

Chapter 3 - Research Methodology

This chapter aims to describe the methodology and research methods adopted in the dissertation. It explains the decision of the researcher to carry out a descriptive case study and the main research steps that were performed.

3.1. Objective of the Study and Research Question

The objectives of this study include a comprehensive description of DRGs practice, and how DRGs supports the development of hospital management and cost accounting, so that knowledge is derived how to use DRGs in China's public hospitals. X Province has deployed DRGs since 2017 and took the lead in fully implementing the reform in 2018. Thanks to that, the reform of payment by diseases has been regarded as a good example nationwide, which has played a positive role in improving the use efficiency of medical insurance fund, promoting the coordinated development of medical and medical insurance, and better protecting the medical needs of the people (He & YYB, 2020). In addition, on May 20, 2019, the National Medical Security Administration held a video conference on the national pilot undertaking of DRGs payment and identified 30 pilot cities (National Medical Security Administration et al., 2019), including Y City (Chen, 2019), which marked that the national pilot has been officially launched.

Hospital A has a good management foundation and the advantages of joint management and construction between universities and local governments. With the support of the University's scientific research, think tanks and management, Hospital A has studied the reform of DRGs payment in advance since 2016. In 2017, Hospital A began to carry out the basic management of DRGs. Since 2018, Hospital A has proactively carried out various undertakings of DRGs payment according to the unified arrangement of Y City. All indicators have improved comprehensively, and DRGs management has entered a virtuous circle (C2).

Concretley, the investigation seeks to analyse the implementation process of DRGs in Hospital A and the contribution of DRGs to improve cost management practices in this hospital. Therefore in the end of the study, the researcher expects to be able to draw some conclusions on how DRGs can support the reform of public hospitals in China and the development of efficiency in the sector. To achieve this end, the reseacher formulated the following specific research question: "How DRGs were implemented in Hospital A and how DRGs contributed to the development of cost management in this hospital?".

3.2. Research Method Employed to Conduct the Research

The research method employed in this study is case study. The DRGs reform and cost management of China's public hospitals studied in this dissertation is the ongoing one of China's medical insurance reform. It is a contemporary event that the author is unable to control. The case study method is suitable for studying the events that occur in contemporary times when the researcher is unable to control the relevant factors (Yin, 2014). It is most suitable for the following situations: the types of research questions are "how" and "why", the research object is the current events, and the researchers can't control or rarely control the ongoing events (Yin, 2014).

The goal of the research is not to obtain statistical generalization, nor to produce a general law explaining observed phenomena. The author aims to understand the specific practice (DRGs) in a specific hospital (Hospital A) so that some conclusions are drawn about how DRGs can be implemented and cost management operate.

When the purpose of the study is to reveal the overall attributes of the case, the single case study design is more favorable (Yin, 2014). Its most important use is to explain the hypothetical relationship between various factors in real life, which are so complex that cannot be explained by experimental or quantitative investigation (Yin, 2014).

A descriptive type of case study has been adopted as these case studies aim to provide rich descriptions of the management systems, technologies and procedures used in practice. Some organizations can be selected as cases to describe the similarity of practices between different companies. These studies may help to explore the application of traditional or more modern technologies and practices.

3.3. Steps Performed to Conduct the Case Study in Hospital A

The DRGs research in Hospital A mainly follows the steps described below. These steps have been conducted not sequentially but interactively as recommended by Yin (2014).

3.3.1 Designing the Case Study

When planning his research the investigator had to select a public hospital implementing DRGs reform and cost management in China, with the aim of deeply understanding DRGs practice in a specific environment, and making an empirical analysis.

In the research process, the researcher collected and sorted out the relevant evidence of

DRGs reform and cost management in Hospital A. These data are closely related to the research purpose, hence demonstrating, describing or helping to analyze hospital DRGs and cost management.

Hospital A began to carry out DRGs management in 2017 and proactively carried out DRGs payment in accordance with the unified arrangement of Y City since 2018 (C2). Considering the integrity of the data, the time for collecting data and evidence was from 2017 to 2020.

With the help of teachers from the project office of Southern Medical University, Hospital A was determined as the research place for this paper. In February 2021, the investigator began to practice in Hospital A, collecting data on the hospital's DRGs and cost management, which constitutes the main source of evidence in this paper.

Successful case studies have to rely on information from various sources (Yin, 2014). Collecting evidence is key and a difficult matter in any case study. After obtaining the consent of the hospital, a list of documents, archives, interviews, physical evidence and other data was prepared. The interviewees identified in the list were: a hospital leader and department heads and staff from office; personnel from the medical insurance price department; personnels from the medical quality control department as well as the clinical department, with an estimated 20 people.

Interview is one of the most important information sources of case study. Because there is usually a connection between interview and investigation, the investigation method of interview was an indispensable source of information for the case study. When conducting the case study, the researcher followed Yin's recommendations: (i) follow your own questioning clues, just as designed in the case study scheme; (ii) strive to ask questions without any bias in order to get the required information (Yin, 2014). Therefore, the author pays special attention to: Being objective as much as possible in the case that relies on existing evidence, such as published reports and other second-hand sources; visiting the case's "website" and interviewing the subjects; not providing solutions, but enabling research subjects to identify their questions and help them find their own solutions.

Given the research design should represent a set of logical statements, it can judge the quality of any given design according to specific logical tests: construct validity, internal validity, external validity and reliability. To ensure construct validity the case study design intends to use a variety of evidence sources such as literature collection, archival records, interviews and physical evidence, and verify various evidence to form an evidence chain. At the same time, it is planned to ask major evidence providers to check the draft case study report

and check the authenticity of the evidence in order to allow internal validity the object of evidence. To allow internal validity the object of evidence collection was defined as the parties involved in DRGs reform and cost management, and the time interval from 2017 to 2020. It is supposed to establish causality from the system, practice and effect of the hospital's DRGs. External validity regards to the degree that the results of a case study can be summarized into a theory and extended to other case studies (Yin, 2014). The empirical analysis of DRGs reform and cost management in Hospital A can be summarized into theory and provide reference for DRGs practice in other hospitals. Finally, reliability, which consist in the repetition of the operations performed in the case study with the same results, the researcher kept a database and a chain of evidence. In conclusion, the quality of case study design can be basically guaranteed. In the research process, objectivity, seriousness and respect for facts are the fundamental guarantee of research quality.

3.3.2 Preparing to Collect Case Study Evidence

To ensure the smoothness of the research, the author applied to Hospital A for DRGs investigation and research when entered Hospital A for internship from February 2021, and received the consent and support of the hospital (See Appendix A and Appendix B)

First of all, prepare for the collection of documents and archives. With the support of the hospital office, the author got a letter of introduction to collect data in Hospital A (Appendix C & Appendix D). In order to reduce unnecessary disturbance to the hospital, the source table of literature and archival records was prepared and handed out to the director of the hospital, and the author contacted relevant departments and personnel to collect data or engage in interviews (see Appendix E).

In order to prepare interviews, the researcher prepared beforehand a list of interviewees. Since the interview involved specific individuals, and in accordance with the requirements of the hospital, the author had to guarantee confidentiality and interviwees anonymity, hence the hospital and interviewees were identified nominally (the hospital was named as A, and the personnel P1, C1, C2... C21) (see Table 3.1).

Table 3.1 Interviews Performed

Serial number	Post	Organization	Department	Gender	Title	Education	Form	Research Code
1	Deputy Director	Y City Medical Insurance Administration		Female		Bachelor's degree	Telephone	P1
2	Vice President	Hospital A		Male	Professor	Doctor of Medicine	Telephone	C1
3.	Director		Office	Male		Doctor	On-the-spot	C2
4	Deputy Director			Male	Technician in Charge	Master	On-the-spot	C3
5	Staff Member			Female	Nurse in Charge	Bachelor's degree	On-the-spot	C4
6	Department Chief		Finance	Female	Auditor	Bachelor's degree	Telephone	C5
7	Staff Member			Male	Senior Accountant	Bachelor's degree	On-the-spot	C6
8	Staff Member			Female	Accountant	Master	On-the-spot	C7
9	Department Chief		Medical Insurance Price	Male	Chief Physician	Bachelor's degree	On-the-spot	C8
10	Deputy Department Chief			Male	Statistician	Bachelor's degree	On-the-spot	C9

11	Staff Member			Female	Attending Doctor	Bachelor's degree	On-the-spot	C10
12	Staff Member			Female		Master	On-the-spot	C11
13	Department Chief		Medical Quality Control	Female	Deputy Chief Physician	Master of Medicine	Telephone	C12
14	Staff Member			Male	Physician	Master	Telephone	C13
15	Staff Member			Female	Nurse	Bachelor's degree	Telephone	C14
16	Director		Clinical	Female	Chief Physician	Bachelor's degree	On-the-spot	C15
17	Deputy Director			Male	Chief Physician	Doctor of Medicine	Telephone	C16
18	Deputy Director			Male	Anesthesiologist (Chief Physician)	Doctor of Medicine	Telephone	C17
19	Doctor			Male	Deputy Chief Physician	Master of Medicine	On-the-spot	C18
20	Inspector			Female	Technician in Charge	Associate Degree	On-the-spot	C19
21	Head nurse			Female	Chief Nurse	Bachelor's degree	Telephone	C20
22	Nurse			Female	Nurse in Charge	Bachelor's degree	On-the-spot	C21

To ensure the quality of the interview process, an interview guide was prepared. (see Table 3.2).

Table 3.2 Interview Guide

Part 1 – About Hospital Resources
Q1. Can you provide some background information on the hospital activity?
Q2. How has the hospital developed?
Q3. How is the hospital's management?
Part 2 – Hospital's DRGs Management
Q4. How was DRGs implemented in the hospital?
Q5. What are the advantages of hospital DRGs implementation?
Q6. What is the practice of hospital DRGs implementation?
Part 3 - Hospital Finance and Cost Management
Q7. How it works hospital finance and cost management?
Q8. What was the role of finance and cost in hospital DRGs implementation?
Q9. What were the changes in finance and cost during hospital DRGs implementation?
Part 4 – Other Questions
Q10. What is your level of satisfaction with the management of the hospital DRGs?
Q11. What do you think that can be improved in the hospital DRGs?
Q12. What do you think can be improved in hospital finance and cost management?
Part 5 - Implementation of DRGs in Y City (for Y City Medical Insurance Administration)
Q13. What is the implementation situation of DRGs in Y City?

3.3.3 Collecting Data

Firstly, the researcher learned about the basic situation of the hospital through the hospital's official website, and learned about the hospital's rules and regulations, documents, agenda, notices, meeting minutes, summaries, reports and statements related to DRGs reform and cost management from the office, medical insurance price department and medical quality control department. Then, field interviews and thematic discussions were conducted with them. According to their suggestions, the researcher visited the president in charge and the medical staff of some medical departments.

The interview mainly lasted from May to November 2021. During the interview, the purpose of the interview was introduced after the interview was agreed by the other party, and semi-structured interviews were conducted according to the interview script regarding the different roles of the respondents.

Some key personnel, including the president of the Hospital A and some department leaders, could not attend the interview. Due to the epidemic situation, it was difficult for clinical departments to conduct on-site interviews. Therefore, the interviews of these personnel were conducted by telephone. As the interview involved specific individuals, in accordance with the requirements of the Hospital, the interview was conducted with anonymity and confidentiality, so the author could not record the interview (but field notes were taken during the interview).

In addition, the researcher also collected the latest policies and interpretations of the Chinese government on public hospitals, medical insurance reform and hospital financial cost management, media and Internet reports on DRGs, with a total of 38 documents (see Appendix F, Appendix G, Appendix H, Appendix I, Appendix J and Appendix K). These pieces of evidence constitute the basic database of the study (Appendix F).

3.3.4 Assessing the Quality of Evidence

Evidence was triangulated following Yin's prescriptions of using multiple sources to collect data (Yin, 2014). In order to ensure the reliability and validity of the data and eliminate the concern about single evidence, the researcher verified the collected data from the local media reports and the work summary of the hospital from 2016 to 2020. The data has high reliability. From the interviews, the researcher was able to conclude that there was a consistence with the DRGs and financial cost management evidence reflected in the written data within the hospital.

Furthermore, as a way to ensure the quality of evidence, the key data to be used in the paper were reviewed by the staff of the hospital office, and data were organized and recorded.

3.3.5 Analysing Case Study Evidence

Data analysis includes three flows of activity: data reduction, data display and conclusion drawing/verification (Miles et al., 2014). Data reduction refers to the process of selecting, focusing, simplifying, abstracting and / or transforming the data in the complete corpus (body) of empirical data such as on-site transcripts, interview transcripts and literature. Through compression, data can be more powerful (Miles et al.,2014). Data simplification is a form of analysis, which sharpens, classifies, focuses, discards and organizes data in a way that can draw and verify the "final" conclusion (ibid). The researcher preliminarily sorted out the collected evidence, eliminated the evidence irrelevant to DRGs and financial cost management, and retained the relavent pieces as research data.

The evidence retained after examination can be divided into two categories: external and internal. The external evidence mainly includes the latest policies of the Chinese government on public hospitals, medical insurance reform and financial management, the literature on DRGs and hospital financial management, the media and public reports on DRGs and hospital financial cost management, and the telephone interview with the deputy director of Y City Medical Insurance Administration. The internal evidence mainly includes the policies, summaries, information, statements and reports of the hospital's DRGs and financial cost management, and the evidence of the basic situation of the hospital. Finally, the interview notes of 21 personnel of the hospital were completed. Internal evidence can be divided into two stages in chronological order. First, before the implementation of DRGs, that is, 2017 and before, and it is mainly the basic situation of the Hospital A and the preparation of DRGs before 2017; Second, after the implementation of DRGs, that is, from 2018 to 2020, and it mainly includes the policies, summaries, information, statements and reports of hospital's DRGs and financial cost management, new basic information evidence of the Hospital A and interview notes of 21 personnel of the hospital. According to the classification of evidence, the researcher prepared simplified tables of evidence sources (see Appendix F). Some tables have actually been formed in the process of evidence collection and classification. In this process, the author was strongly supported by the C2 director of the hospital office and others, and the methods and contents of evidence has been discussed for many times with data has been verified again.

Based on the sorted database, the DRGs and financial cost management of Hospital A have

been preliminarily sorted out, and the results have been achieved in three aspects: DRGs management has entered a virtuous circle, medical efficiency has been significantly enhanced, and patient satisfaction has been significantly improved; Financial and cost management plays an important role, being a driving force of DRGs. The study indicated also that Hospital's DRGs have some problems.

3.3.6 Writing up the Case Studies

Linear analytical structure is a standard structure for writing up research reports. The order of sub topics follows the order of research questions or projects, and it starts with the review of relevant literature; Then it is required to outline the employed research methods, what results have been obtained from the collected and analyzed data, and the conclusions and significance of these results (Yin, 2014). Since the author is the first time to write up a complete case study report, the linear analysis structure is adopted.

Chapter 4 - Case Study on DRGs Implementation in Hospital A

This chapter describes the case study of DRGs implementation in Hospital A and how DRGs operates in the hospital. It also introduces how the management and cost accounting system supports the management of DRGs and how DRGs contributed to improve cost management in the hospital.

4.1. Basic Information of Hospital A

Hospital A is a Third Grade Class A General Hospital sponsored by the government of X Province and Y City in an economically developed province. It was built in the 1920s. In early 2017, the superior government of Hospital A officially signed a contract with a well-known medical university. The hospital covers an area of 200 mu, with a construction area of 260000 square meters, 1500 authorized beds and 2049 actually operated beds. There are 24 administrative departments, 42 clinical departments, 10 medical and auxiliary departments, 2 outpatient departments and 2 Class II Class A hospitals. At present, there are more than 2800 employees, including 117 with senior titles, 412 with deputy senior titles, 75 doctors, 394 masters, 6 doctoral tutors, 29 master tutors and 68 master practical tutors (Official website of Hospital A, http://www.sdrmyy.com/).

Hospital A is a national baby-friendly hospital integrating medical treatment, teaching and scientific research. It has been awarded Postdoctoral Scientific Research Workstation, National Standardized Training Base for Residents and General Practitioners, National Drug Clinical Trial Institution, National Sentinel Medical Institution for Adverse Drug Reaction Monitoring, National Endoscopic and Minimally Invasive Medicine Training Base, Chinese Doctor Humanistic Medicine Practice Skill Training Base, Chinese Medical Doctor Association Comfortable Medical Training Base and EBUS Doctor Training Center, Provincial Clinical Teaching Base, National Breast Cancer Screening Alliance Member Unit, International Translational Medicine Research Center of a Medical University by departments, such as National Health Commission (Official website of Hospital A, http://www.sdrmyy.com/).

In 2017, Hospital A passed the certification of “China Chest Pain Center” (Liang & Jian, 2017) and the certification of “Comprehensive Stroke Center” of China Stroke Society (Lin, Cen & Lao, 2019). In 2021, it was officially awarded the national “Advanced Stroke Center” by the National Brain Prevention Commission (Official website of Hospital A http://www.sdrmyy.com/).

Hospital A has four provincial key clinical specialties: cardiovascular medicine, respiratory medicine, oncology and general surgery, and the rehabilitation medicine department is a provincial specialty of traditional Chinese medicine. There are 5 “provincial medical key specialty cultivation projects” in Y City, 6 high-level medical key specialties in Y City, 4 medical key specialties in Y City, and 2 medical specialty specialties in Y City (Official website of Hospital A, http://www.sdrmyy.com/).

According to the Briefing on Health Statistics of X Province (No. 104) in November 2018, Hospital A’s DRGs discipline construction comprehensive index ranked 25th among 103 Third Grade Class A General Hospitals in the province and ranked 1st among 53 District People’s hospitals in the province (H100).

The hospital has complete large-scale equipment, including PET / CT, SPECT / CT, dual source spiral CT, full-function 160 slice CT, 3.0T magnetic resonance machine, 1.5T whole-body double gradient magnetic resonance machine, medical linear accelerator (LA), Digital Subtraction Angiography (DSA), three-dimensional mapping and navigation system (CARTO 3), multiple real-time three-dimensional color ultrasound, full-automatic inspection line, various high-definition electronic endoscopes high definition laparoscopy and thoracoscopy, hemodialysis machine, German STOCKERT S5 cardiopulmonary bypass machine, central monitoring system, automatic drug dispenser, airway transmission system and other equipment and facilities (Official website of Hospital A, http://www.sdrmyy.com/).

Since the cooperation and joint construction, the hospital has been approved 50 national scientific research projects, including 15 projects approved by the National Natural Science Foundation from 2018 to 2020, and several projects are among the top hospitals at the same level in China; 35 projects were approved by China Postdoctoral Science Foundation, and several projects were listed in the forefront of national tertiary hospitals, including 2 postdoctoral innovative talent support plans, realizing a zero breakthrough in the project of medical institutions in Y City; Approved 3 key projects of a joint fund and 5 scientific and technological innovation projects of Y City (medical scientific and technological innovation platform), realizing the zero breakthrough of the college in provincial key projects and scientific and technological innovation platform; Approved 10 provincial natural science foundation and 17 joint fund youth projects; More than 200 papers have been published in SCI. Among them, one article (IF: 36.216) was published in the international top academic journal Cell in parallel with the first author and the last correspondence author. Two articles on SCI were published in the international top journal BMJ (IF: 30.223), and 10 SCI papers were cited as international references in the 2019 diabetes diagnosis and treatment standard; 43 national continuing

education projects and 288 provincial continuing education projects were approved (Official website of Hospital A, http://www.sdrmyy.com/).

The second national narrative seminar was successfully held by the hospital in 2018, and the Life and Health Narrative Sharing Center was first established in China to promote the construction of hospitals and medical treatment with warm services and the training of doctors with warm services (Official website of Hospital A, http://www.sdrmyy.com/).

In 2018, in the in-depth implementation of the "action plan for further improving medical services", it won the national advanced unit and was jointly commended by the medical administration and Hospital Administration of the National Health Commission and the Health News (Lin et al., 2019).

4.2. DRGs Payment Reform Pilot in Y City, X Province

X Province has deployed DRGs since 2017 and took the lead in fully implementing the reform in 2018. Thanks to that, the reform of payment by diseases has been regarded as a good example nationwide, which has played a positive role in improving the use efficiency of medical insurance fund, promoting the coordinated development of medical and medical insurance, and better protecting the medical needs of the people (He & YYB, 2020).

On May 20, 2019, the National Medical Security Administration held a video conference to launch the national pilot of DRGs payment, announcing that 30 pilot cities such as Beijing and Tianjin officially launched DRGs payment. Y City became the only pilot city in X Province. Since January 1, 2018, Y City has tried out the reform of paying by disease for 104 medical institutions with inpatient business in the city, and determined 860 DRGs groups, covering more than 12000 diseases in the city, with a recognition rate of 100% (Chen, 2019).

According to the introduction of deputy director Liang of Medical Insurance Administration of Y City, since January 1, 2018, Y City has followed the DRG-PPS system design of "Total budget, Monthly prepayment, Point calculation and Year-end liquidation", adhered to the principles of stakeholder participation and social governance, and tried out the reform of paying hospital fees according to the value of disease components for all 104 designated medical institutions providing inpatient medical services in the city, The trial settlement of this year's medical insurance fund was completed from October to December, and the overall operation was stable. Due to the participation of all staff, the effect of graded diagnosis and treatment has been witnessed (He & Liu, 2019).

According to statistics, in 2018, there were 708000 cases of DRGs paid by disease

component value in the city, the number of ordinary inpatients increased by 3.97% year-on-year, and the total cost per person increased by 5.23%; Compared with 2017, the proportion of individual self-responsibility decreased to 35.39%, and the unreasonable growth of medical expenses in the city has been effectively controlled (Tan & Lin, 2019).

The pilot project of DRGs payment reform in Y City was highly affirmed by the National Medical Insurance Administration, and was rated as "excellent progress" pilot city and "excellent management" pilot city by the National Medical Insurance Administration. In 2020, the remaining funds of 58 medical institutions in the city has reached CNY 170 million, which has reduced the total cost of hospitalization per person in the city for the first time, and promoted the continuous improvement of hospital medical service quality and efficiency indicators (Li, 2021).

4.3. Implementation of DRGs in Hospital A

Hospital A has a good management foundation and the advantages of joint management and construction between universities and local governments. With the support of the University's scientific research, think tanks and management, Hospital A has studied the reform of DRGs payment in advance since 2016. In 2017, Hospital A began to carry out the basic management of DRGs. Since 2018, Hospital A has proactively carried out various undertakings of DRGs payment according to the unified arrangement of Y City. All indicators have improved comprehensively, and DRGs management has entered a virtuous circle (C2).

4.3.1 Preparations for the DRGs Reform in Hospital A

In order to successfully implement DRGs reform, Hospital A has proactively carried out various basic work since 2017.

First, a DRGs special group was established with the participation of the medical insurance price department, medical quality control department, finance department, medical record statistics department, information department, equipment department and various clinical medical technology departments, and with president in charge as the leader. The specific work is in the charge of the medical insurance price department (C8).

Second, DRGs business training was organized. Experts were invited to carry out DRGs special training for all medical staff, and experts from the Government Affairs Center of the Provincial Health Commission gave a special lecture on DRGs overview and evaluation management application (C9).

Third, DRGs equipment was purchased (C11).

Fourth, the DRGs working system of Hospital A was formulated (C8).

Fifthly, in order to standardize the filling of the first page of inpatient medical records, improve the medical quality management level, the training and assessment of "standardized filling of the first page of inpatient medical records" for clinicians in the whole hospital were carried out with more than 600 staff participated. Through training, it can further improve the accuracy of filling in the first page of medical records (H1).

4.3.2 Implementation of DRGs in Hospital A in 2018

The DRGs policy of Y City was implemented from January 1, but the number of disease groups was not announced until October, which caused great difficulties for the smooth implementation of DRGs in Hospital A. Hospital A has overcome difficulties and actively carried out DRGs various work (C8).

First, organized all departments to study DRGs various policies again.

Learned the Notice of Y City on the Trial Implementation of Payment of Inpatient Medical Expenses of Basic Medical Insurance according to the Value of Disease Group and relevant supporting documents, mastered the payment policy, reviewed the filling specification of the first page of medical records, and trained relevant functional departments and all inpatient doctors. More than 30 training sessions were held. Through a series of training, the disease component value payment method was interpreted, analyzed and demonstrated to the hospital management and clinical departments (H2).

Second, strengthened the management of the first page of medical records, including:

Organized each department to correct the first page of medical records for 6 rounds according to the grouping results. A total of 1357 cases were corrected in 2018. In the process of correction, the people concerned learned the grouping rules, and communicated with experts on grouping objections and new technologies and new projects in five rounds of research by the Social Security Administration (H3), which was praised by the director of the Municipal Social Security Administration and other leaders (Medical Insurance Price Department of Hospital A, 2018). The people concerned communicated the data correction and loss rate in various clinical departments, corrected misunderstandings in time, and reduced the loss rate month by month (H3). After several rounds of the first page correction and special meetings for clinical departments, most departments have been familiar with the payment method of disease group score and mastered the basic grouping principle, and the filling quality of the first page

of medical records has been significantly improved (H17).

At the same time, special quality control work was carried out for the filling quality of the first page of the medical record. Special people were asked to be responsible for spot checking about 600 first pages of the medical record every month, and timely rectifying the key departments, key personnel with many key problems, which significantly improved the quality. The operation and operation filling in on the first page of medical records are gradually increasing, CD type (difficult and critical) cases are increasing, and the patient structure is more complex. Various error types are gradually reduced (H18).

Third, the DRGs reporting system has been formulated and implemented.

It mainly includes medical insurance business analysis table, DRGs loss table, hospital cost accounting table and business comprehensive evaluation table, which reflect the situation of the hospital, especially the medical insurance business in many aspects for hospital decision-making reference (H5).

Fourth, the hospital did a good job in docking with the municipal medical insurance management software.

It mainly includes the interface of disease score payment and settlement system, the real-time audit interface of outpatient / inpatient medical insurance of medical institutions, and the interface of sunshine centralized procurement management service platform for drugs and medical consumables, so as to proactively improve the quality of management (H7).

Fifth, the hospital did a good job in policy docking with the Municipal Social Security Administration.

In the process of forming the score of disease group, it kept close contact with the Social Security Administration, organized departments to correct the front page of medical records according to the grouping results, explored its grouping rules, timely communicated with grouping experts on unreasonable grouping, situations requiring separate grouping, new technologies and new projects, and put forward more than 40 opinions and suggestions, and strived for creating more favorable grouping rules and hospital coefficient (H11).

Sixth, the hospital cooperated with the reform of DRGs to carry out multiple rounds of data correction.

According to the Notice of Y City on the Trial Implementation of Payment of Inpatient Medical Expenses of Basic Medical Insurance under the Value of Disease Group, the medical quality control department, together with the medical insurance price department, guided all clinical departments to carry out three rounds of data correction of 100000 insured cases in recent two years, with a total of 8957 cases corrected. Through data correction, the hospital

grouping was increased from 644 groups to 700 groups (H19), the disease group whose per capita cost is lower than that of hospitals of the same level increased from 273 to 349, and the disease group whose per capita cost is higher than that of hospitals of the same level decreased from 369 to 298. It proposed two unique groups of hospitals (H20).

For the cases that have not been settled by DRGs payment in the first half of the year, special correction has been made for large expenses, grade III and IV surgery, mechanical ventilation and targeted drugs. A total of 1156 cases have been corrected (H21).

At the end of September, the Social Security Administration of Y City issued the Notice on Doing a Good Job in the Trial Implementation of Payment of Inpatient Medical Expenses of Basic Medical Insurance according to the Value of Disease Group, which made detailed arrangements for the data correction of social security patients settled in that year, and organized social security personnel of various departments to correct the data of social security settlement cases in the first three quarters of this year, with a total of more than 1000 corrected data (H22).

Seventh, the hospital promoted the construction of clinical pathway.

It established the clinical pathway management framework, formulated the implementation plan of clinical pathway management, determined the 114 clinical pathway diseases carried out this year, clarified the responsibilities of clinical department directors and pathway administrators, collected and analyzed clinical pathway data every month, held clinical pathway administrator meetings, and did a good job in feedback and communication (H23). The implementation of clinical pathway was linked to the performance of departments. The number of clinical pathway managers increased month by month, and the proportion of patients under clinical pathway management in discharged patients increased rapidly. From January to October 2018, 14523 cases of clinical pathway were implemented, accounting for 23% of the number of discharged patients (H24).

Eighth, it established a clinical disease diagnosis code database.

DRGs payment system puts forward high requirements for disease diagnosis code, which requires the accuracy of disease code of discharged medical records to reach more than 95%. In order to avoid human errors in manual coding, the hospital initially established a clinical diagnosis code library, which covered 70% of the first page of medical records. The accuracy and coding efficiency of disease coding were significantly improved (H25).

4.3.3 Implementation of DRGs in Hospital A in 2019

In 2019, the DRGs management of Hospital A achieved the goal of “controlling expenses

and reducing losses" and turnd losses into profits. Firstly, through the implementation of the new policy, data analysis and situation research and judgment, the two management priorities of cost and coding were agreed with the medical quality control department, finance department and other relevant departments. In April, the Interim Regulations on Social Security Expense Management was formulated and implemented as a transitional plan for department expense regulation before the implementation of DRGs performance plan. In September, phased results were achieved by adjusting regulations and strengthening fee control management. The hospital reversed its loss from 6.75% in 2018 (according to the year-end liquidation data) to 0.14% in January October 2019 (according to the year-end liquidation standard of 2018). In particular, from April to October, it has turned loss into profit, and is expected to receive a fee control reward of more than CNY 7 million (H33).

Through various efforts throughout the year, the CMI value of medical insurance cases in Hospital A increased by 3% year-on-year, the cost efficiency decreased from 1.210 in 2018 to 1.043, and the time efficiency decreased from 1.092 to 1.027, quickly approaching the average level of similar hospitals in the city. The proportion of loss groups decreased by 23.7% and the proportion of loss cases decreased by 30.9% in 2018. The average cost of hospitalized patients with medical insurance decreased by 8.3%, of which the per capita drug cost decreased by 18% and the per capita consumables cost increased by 3%. The annual liquidation coefficient is predicted to be 1.03 (the growth rate index of average person time cost is 1.094, the growth rate index of person time head ratio is 0.99, and the coding accuracy index is 1) (H37).

First, it continued to strengthen the management of medical records.

The hospital carried out relevant training on the standardized filling of the first page of medical records in the whole hospital; strengthened the assessment of the timely filing rate and perfection rate, increased the weight of performance assessment, and summarized and analyzed the timely filing rate and perfection rate every quarter; organized the systematic sorting of discharge medical records in 2018 and 2019 in the medical record database; continued to carry out special quality control on the filling quality. Special people were asked to be responsible for spot checking about 400 first pages of medical records every month, and timely rectifying the key departments and key personnel with many key problems, which significantly improved the quality of the first page of medical records (H95).

It also established an effective communication mechanism between clinical departments and coders through WeChat group, telephone, face-to-face discussion and other ways (H96).

It completed the online work of automatic matching coding for inpatient diagnosis, surgery and operation on the first page of medical records and further improved the coding accuracy.

From January to October, there were 65411 discharge medical records in the whole hospital, including 425549 ICD-10 codes, 87544 surgical operation codes, 4493 pathological diagnosis codes and 2241 injury codes, with a total of 519827 codes; The coded medical records are randomly checked by special personnel every month, and the coding accuracy rate has increased from 77% in 2018 to 88.5% (H97).

The hospital promoted the online review system of DRGs and the first page of medical records, provided analysis data of DRGs and the first page of medical records for clinical departments, and provided data support for departments to improve medical quality (H29).

It promoted the launch of structured electronic medical record system; organized clinical departments to carry out four phases of pre-launch training; collected and reviewed the medical record templates submitted by clinical departments; urged engineers to timely improve the new structured electronic medical record system according to clinical reality and needs. At present, the launch of inpatient electronic medical record system has been completed in four batches, and medical record quality control system, outpatient electronic medical record system and the single disease management system have been launched (H30).

Second, it accelerated the construction of clinical pathway and single disease management.It promoted the online implementation of electronic clinical pathway system: (1) completed the doctor's order matching of various clinical pathway diseases; (2) reviewed the diagnostic code and operation (operation) code of each disease; (3) tested the two diseases of full-term natural labor and bronchopneumonia (children), found and helped solve the problems in the test; (4) Pre-launched training for medical staff of relevant departments (H98).

The hospital promoted the launch of single disease reporting management system: (1) collected the data collection points reported by clinical departments and improved the setting of statistical reports; (2) tested the reporting process of each disease, found and helped solve the problems in the test; (3) Pre-launched training for medical personnel of relevant departments (H28).

Third, it communicated closely with Y City's Municipal Social Security Administration and Zhonggong Network experts to grasp the policy trend more accurately and comprehensively and adjusted the business strategy in time (H99).

Fourth, in order to strengthen the construction of medical insurance system and improve the level of policy implementation, the Hospital Medical Insurance Management Regulation was revised, the department social security administrator and DRGs liaison system were implemented, and social security administrator meetings were held regularly to analyze and study medical insurance management and DRGs (H38).

In 2019, Hospital A's DRGs better achieved the goal of "controlling expenses and reducing losses" at the beginning of the year, and the profit and loss of the whole year was basically flat (L1). All indicators are improving in an all-round way, and DRGs management has entered a virtuous circle (L2).

4.3.4 Implementation of DRGs in Hospital A in 2020

The hospital put forward the slogan of "scientific cost control by expanding weight and optimizing structure", and set up the "burden rate" index (the proportion of drug consumption in social security settlement). The hospital guided departments to control drug consumption and improve case enrollment rate and weight, so as to improve profitability (H56).

One is to standardize DRGs coding. In view of coding errors, it increased training for clinicians in understanding the key points of coding rules and a "coding verification system" was set up in the doctor workstation, and clinicians are specially trained and supervised, which improved the doctors' grouping and coding accuracy. The hospital strengthened the review of the discharge medical records of the departments, timely verified the medical records with errors, and gave feed-back to the departments (H60).

The hospital revised the Notice on Printing and Distributing the Implementation Plan for Coding Quality Management and Continuous Improvement of Hospital A, implemented the two-level coding audit of Hospital And department, used the medical record audit system, realized the double check of person and system to continuously improve the coding accuracy, and established the coding quality management assessment system (H71). Various measures have been taken to continuously improve the coding quality. In 2020, the coding error rate of the system verifier will be 7.5%, 3.8% lower than that in the same period (H72).

It uploaded and corrected without slackness. The four links of DRGs management are accurate clinical writing, correct compilation of medical records, accurate charging and complete information transmission, so that cases can be accurately grouped and their technical content can be fully expressed. In order to ensure that cases are enrolled according to quality and quantity, in addition to monitoring the accuracy of coding and charging, information upload quality control was also carried out. Therefore, 123 incomplete uploaded medical record codes in September were found and corrected in time, avoiding a loss of CNY 310000 for the hospital. On the other hand, correction is also a link that can't be ignored in the terminal management of DRGs (H63). Through correction, it can not only find the enrollment rule and its dynamic changes in time, but find the errors of grouping device, hospital coding and charging, so as to

correct and avoid losses in time. Therefore, the hospital insisted on organizing and supervising clinical departments to correct cases every month. This year, 431 cases have been corrected, with a total gain of CNY 1.48 million (H64).

Second, it realized the clinical pathway and single disease information management. The hospital promoted clinical pathway and single disease management, adjusted clinical pathway and single disease management committee, and set up clinical pathway and single disease managers in departments. The clinical pathway is connected with HIS system, and the clinical pathway information management has been preliminarily realized. It has covered 37 departments and 190 diseases in the whole hospital. The entry rate of patients who meet the entry criteria of the whole hospital was ≥ 50%, the completion rate after entry was ≥ 70%, and the proportion of clinical pathway management cases in the total discharged cases was ≥ 30%. The single disease is connected with the electronic medical record system, and the network direct report is implemented. The reporting quality of the department is monitored by the deputy chief physician and senior attending physician. The quality control department asked a special person to monitor the reporting quality, strengthen supervision and give feedback to improve the management quality of single disease (H73).

Third, it strengthened the summary and feedback of various work to promote the continuous improvement of medical insurance management. In addition to the original communication channels, in 2020, the quarterly “medical insurance briefing” has been published to summarize the medical insurance operation in a timely manner, and it systematically reported, gave feed-back to and interpreted the DRGs situation analysis, outpatient special diseases and outpatient chronic diseases, maternity insurance, industrial injury insurance, remote medical insurance, violations and policy trends of the hospital to all departments of the hospital, Provide detailed basis for the management decision-making of hospitals and departments (h53).

Fourth, it improved the management efficiency of DRGs and promoted scientific cost control. In view of the relaxation in the management of individual departments in the first half of the year, the Notice on Strengthening DRGs Management was issued, requiring all departments to strengthen cost control and formulate management plans. At the same time, it took the initiative to interview the directors of key departments and DRGs liaison officers, analyzed the causes of soaring costs and urged rectification. On the other hand, it drove the implementation of cost management measures and business promotion programs, and gave appropriate focus on the hospital’s core technology related groups. It not only enhanced the department’s awareness of cost control, but also promoted the development of core technology

under the DRGs payment mode. After a series of measures, the average cost per case decreased from CNY 14053 in the first half of the year to CNY 12987 in the third quarter, and the average profit and loss per case reversed from CNY -324 to CNY +65, with remarkable results (H57).

In order to maximize the DRGs score and control the drug consumption cost, the hospital set up the "burden rate" (Drug fee + Consumables fee / Settlement amount of social security) index to comprehensively assess each department, forcing the departments to focus on controlling the drug consumption cost in addition to studying the coding and enrollment rules (H61). After discussion, analysis and adjustment strategies of various departments, the drug consumption ratio of the whole hospital decreased from 43.36% in the first half of the year to 40.75% in the third quarter, the burden rate decreased from 41.74% to 38.56%, and even decreased to 36.58% in September. The business structure was optimized and the profit potential was improved (H62).

Fifth, it organized departments to exchange DRGs experience and conduct in-depth discussion in the form of interview, discussion, open-day and social security meeting this year; supervised all departments to learn and master the DRGs policies adjusted this year; achieved the annual management goal of "scientific cost control by expanding weight and optimizing structure" (H58). During the communication between departments at all levels, all parties had heated discussions and exchanges on the personalized medical record code, key to case enrollment, change of reference value, and common cost management of the undergraduate department. Each department had a better understanding of rehabilitation group, ICU group, special disease list, separate grouping, growth rate of person ratio, coding verification and others. After discussion, the average number of cases in the first three quarters of this year reached 148.65 points, an increase of 6.22% over last year; The total weight was 4.92 million points, 83.04% of the same period last year; The total medical cost was CNY 450.6 million, 81.03% of the same period last year. The increase of the average number of points per case and the increase of the total number of points are higher than the increase of the total medical expenses, which shows that the average difficulty coefficient of the cases admitted in our hospital has increased, and it also shows that the profitability of DRGs has improved (H59).

Sixth, it strengthened communication and appeal with the Social Security Administration.

In March, the key technologies of key specialties were collected. Through careful analysis and discussion, 96 high and new technologies in 24 departments were applied to the Municipal Social Security Administration in writing to clarify the technical characteristics of the hospital, strive for a higher disease group coefficient and boost the development of specialty technology (H65).

In October, the clinical departments were organized to put forward 14 separate grouping applications in 2021 for technologies not covered by 892 disease groups, especially the advantageous technologies of the hospital, so as to lay the foundation for technology development in the coming year (H66).

In 2020, the cost structure has been effectively controlled through a series of measures, and the DRGs management has achieved good results. The average number of medical insurance cases (CMI related) increased by 6.22% year-on-year; The cost consumption index decreased to 1.028 from 1.068 last year; The time consumption index decreased to 1.010 from 1.043 last year; The burden rate dropped from 41.53% last year to 40.49%; The average profit and loss of each case was reversed from CNY - 24 last year to CNY + 70 (H68).

4.4. Impact of DRGs Reform on Hospital A

4.4.1 All Indicators are Improving in an All-Round Way, and DRGs Management has Entered a Virtuous Circle

Hospital A has implemented DRGs management since January 1, 2018, and DRGs management has gradually entered a virtuous circle.

In 2018, in order to adapt to the reform of medical insurance payment system, the hospital solidly carried out the application of DRGs comprehensive evaluation. The clinical diagnosis code database was initially established, the diagnosis coverage rate of the first page of medical records was more than 70%, and the accuracy and efficiency of disease coding were significantly improved (H25).

In 2019, the hospital formulated and implemented the Interim Provisions on the Management of Social Security Expenses, and achieved phased results by timely adjusting the provisions and strengthening the management of fee control, reversing the loss from 6.75% in 2018 to 0.36% profit from January to November 2019, realizing the conversion from loss to profit (H33). The CMI value of medical insurance cases increased by 3% year-on-year, the cost efficiency decreased from 1.210 in 2018 to 1.043, and the time efficiency decreased from 1.092 to 1.027, quickly approaching the average level of similar hospitals in the city; the proportion of loss groups decreased by 23.7% and the proportion of loss cases decreased by 30.9% in 2018. The average cost of medical insurance inpatients decreased by 8.84%, of which the per capita drug cost decreased by 18% (H37).

In 2020, the management and control indicators of hospital medical insurance expenses has significantly improved. The average number of medical insurance cases (CMI related)

increased by 6.22% year-on-year; The cost consumption index decreased from 1.068 to 1.028; The time consumption index decreased from 1.043 to 1.010; The burden rate dropped from 41.53% last year to 40.49%; The average profit and loss of each case was reversed from a loss of CNY 24 in 2018 to a profit of CNY 70 (H68); The average cost of hospitalized patients with medical insurance decreased by 8.3%, of which the per capita drug cost decreased by 18% and the per capita consumables cost increased by 3%. The annual liquidation coefficient is predicted to be 1.03 (the growth rate index of average person time cost is 1.094, the growth rate index of person time head ratio is 0.99, and the coding accuracy index is 1) (H37).

4.4.2 Medical Efficiency was Significantly Improved

In 2020, the average length of hospital stay was 7.5 days, a decrease of 0.6 days compared with the same period in 2019 (H70); the average number of medical insurance cases (CMI related) increased by 6.22% year-on-year; the cost consumption index decreased from 1.068 to 1.028; the time consumption index decreased from 1.043 to 1.010; the burden rate dropped from 41.53% last year to 40.49%; the average profit and loss of each case was reversed from a loss of CNY 24 in 2018 to a profit of CNY 70; the average cost of hospitalized patients with medical insurance decreased by 8.84%, the proportion of drugs was 26.55%, a year-on-year decrease of 17.52%; the drug inventory decreased by 50%, the proportion of procurement of auxiliary drugs and Chinese patent drugs decreased by 7.7%, and the effect of "cost control and loss reduction" was remarkable (H103).

According to the DRGs data of Grade III hospitals released by X Province in 2019, the total weight of the hospital increased from 73000 in 2016 to 89000, the CMI value increased from 1.05 in 2016 to 1.16, the cost consumption index was 1, the time consumption was 1.02, and the low-risk mortality was 0. The changes of the above indicators reflect the continuous improvement of the service capacity of the hospital (H104).

4.4.3 Patient Satisfaction was Significantly Improved

In 2018, the hospital completed 32000 patient service return visits and satisfaction surveys, carried out medical experience evaluation with QR code, and formed a good monthly evaluation feedback and improvement mechanism. In the third-party satisfaction survey of the whole region in 2018, Hospital A ranked first in the district (H101).

In 2019, the hospital established a continuous tracking account for satisfaction improvement, assigned special personnel to be responsible for feedback tracking, visiting the

weak links of point-to-point communication in departments and improving the monthly feedback and quarterly analysis mechanism; 13370 survey samples were completed, and patient satisfaction showed a positive trend, with comprehensive satisfaction of 92.7 points, an increase of 1.9 points over the previous year. In this year's third-party satisfaction survey of medical institutions in the region, patient satisfaction ranked first in regional hospitals (H102).

In 2020, the hospital carried out in-depth patient satisfaction survey, completed 9627 survey samples, and collected more than 2300 opinions and suggestions. In 2020, the hospital's comprehensive patient satisfaction was 94.5 points, an increase of 1.7 points year-on-year (H105).

The District Health Administration where Hospital A is located announced the results of the patient satisfaction survey of medical institutions in the district in 2020. The hospital has ranked first among district hospitals for three consecutive years (Official website of Hospital A, http://www.sdrmyy.com/).

4.5. Cost Control in Public Hospital A based on DRGs

4.5.1 Development of Management and Cost Accounting

In order to promote DRGs implementation, Hospital A has continuously improved its financial and cost management system, formulated and implemented cost management plan, assigned the chief accountant to formulate the chief accountant system (L22), set up the hospital operation team to analyze the operation of the department and give advice for the business development of the department and cost saving (H74).

In 2020, the cost management system has been further improved in combination with DRGs and financial cost management in 2018 and 2019. It is required that cost accounting can be divided into department cost accounting, medical service project cost accounting, disease cost accounting, cost accounting per bed and cost accounting per visit. The hospital established and improved the hospital cost management and accounting organization system, established a hospital cost management leading group to be fully responsible for the organization, leadership, coordination and implementation of hospital cost management and accounting. The hospital's finance department was equipped with full-time cost accounting personnel to be responsible for specific cost accounting. All business departments, information departments and relevant material management departments were required to cooperate in the statistics of basic data. All functional departments are responsible for the centralized management of costs and expenses （F8）.

In June 2020, the hospital procurement office was established to be responsible for the bidding and procurement of capital construction projects, equipment, reagent consumables, information systems, logistics materials and services other than drugs (H93). It promoted the price reduction negotiations on medical reagent consumables, and implemented centralized online procurement of medical consumables (including reagents) on the third-party government platform (L12).

4.5.2 Intensify Cost Assessment and Encourage Departments to Practice Economy

It implemented the cost management plan (cost control and penalty measures), guided and forced all departments to actively take measures to avoid unreasonable diagnosis and treatment and complications, improve medical quality and shorten hospitalization days, so as to control the total medical expenses and costs. It carried out many rounds of discussion on department DRGs management. In order to promote the department's in-depth study of DRGs management, correctly join the group, control expenses and reduce losses, the finance department, the medical insurance price department and the quality control department carried out several rounds of discussions. On the one hand, it listened to the development of department DRGs management, reasons and countermeasures for loss, difficulties and doubts, on the other hand, it explained the medical insurance policy, cost management scheme and the specification for filling in the first page of medical records, and analyzed the profit and loss of the department (L24).

4.5.3 Finance and Medical Departments Cooperate with Each Other to Control Costs by Optimizing the Diagnosis and Treatment System

The hospital formulated daytime operation management system, shortened the management regulations on average hospitalization days, promoted the development of chemotherapy outpatient and daytime surgery, and controlled the average fees of hospitalization days and times. It made rational use of examination / treatment / medication for outpatient special diseases and outpatient chronic diseases. For patients who enjoy the preferential treatment of outpatient special diseases and outpatient chronic diseases, some projects are carried out outside the hospital in advance or later, which can not only shorten the length of stay and reduce the total cost of hospitalization, but also do not harm the interests of patients (L25).

4.5.4 Finance and Medical Departments Cooperate with Each Other to Control Costs by Optimizing Drug Use

It encouraged rational drug use. On the basis of daily prescription reviews and special reviews, innovative modes such as cross reviews and difficult reviews were introduced to carry out pharmaceutical mentoring cooperation projects with the First Affiliated Hospital of X Province Pharmaceutical University. By promoting the informatization construction of pre-trial parties, a regional trial center of Y City was built to promote safe and rational drug use, control the proportion of drugs and limit the purchase of auxiliary drugs (L26).

4.5.5 Analyze and Report Regularly and Strengthen Supervision and Assessment

The finance department, the medical insurance price department and the quality control department issue data statements every month to feed back the profit and loss overview, the cost structure of each disease group and the situation of hospitals at the same level to the departments, which is helpful for the departments to analyze the causes of losses and formulate targeted measures. The hospital regularly analyzes and summarizes, holds middle-level leaders meetings, social security administrator meetings and social security salons to report the profits and losses of the whole hospital, convey and interpret the latest policy trends, analyze the cost trend, point out existing problems, introduce management experience, emphasize management objectives and put forward specific requirements (L27).

The financial and cost management of Hospital A provides effective data and management support for the smooth implementation of DRGs. The operation and management level of the hospital has been improved by formulating and implementing cost management plan (fee control and deduction measures) and business promotion plan. The smooth implementation of DRGs has effectively improved the medical efficiency of the hospital, and the level of financial and cost management has been further improved (L22).

4.6. Deficiencies and Problems of DRGs Reform in Hospital A

4.6.1 Imbalance in DRGs Management among Clinical Departments and Diseases

The loss rate of individual departments is still high. There are 8 departments with a loss rate of > 5%, including thyroid and breast vascular surgery, second department of gynecology, ophthalmology, surgical department of liver, gallbladder, pancreas and spleen, hematology, cancer medical center, rheumatology and immunology department and VIP (L15).

4.6.2 Unstable DRGs Implementation and Rebound Phenomenon Work between Work and Indicators

The per capita cost rebounded in the first half of 2020: from CNY 13011 in 2019 to CNY 14057 in the first half of 2020. In the first half of 2020, the burden rate of individual departments was more than 50%, up to 65% (L16).

4.6.3 Difficulties in DRGs Implementation in Specific Departments

The anesthesia department, pathology department, laboratory department and other departments have no enthusiasm for cost control, and there is no better method in performance appraisal and cost control (H92).

We are from a medical service department. The inspection quantity mainly comes from doctors and medical departments. Consumables and drugs are purchased uniformly by the hospital. We have no way to control the cost of DRGs (C18).

Chapter 5 - Discussion and analysis of DRGs Implementation in Hospital A

This part analyzes the experience and shortcomings of Hospital A's DRGs reform and cost management, and tries to put forward some solutions to the deficiencies and problems that had been identified.

5.1. Experience of DRGs Reform in Hospital A

Below it is summarized the mains apects related to the experience of DRGs reform in Hospital A.

(i) Strengthening the Front-Page Management of Medical Records and Improving the Coding Accuracy

The coding of diagnosis and procedure is important because this information forms the basis for the definition of patient groups (Quentin, 2011). With the reform of DRGs payment system, the data quality of the first page of medical records will be directly related to the operating revenue of the hospital. This will force medical institutions to pay more attention to the data quality of the first page of medical records (Liu & Meng, 2018).

Hospital A has carried out solid work in the training, review, spot check, verification, archiving and database construction of the first page and group coding of medical records, with coding accuracy increasing from 77% in 2018 to 88.5% in 2019 and 92.5% in 2020. In 2019, the DRGs, the first page review system of medical records and the structured electronic medical record system were officially put into operation, which further improved the quality of the first page and grouping coding of medical records, hence laying a solid foundation for the implementation of DRGs.

(ii) Strengthening Coordination

The DRGs payment system involves the collaborative linkage of multiple departments such as health, medical insurance, hospitals and commercial insurance (Liu & Meng, 2018). As an innovative hospital management tool, DRGs can be used not only for the operation analysis of clinical departments, but for the performance evaluation of hospital level, department level and main diagnosis group at all levels, covering the dimensions of capacity, efficiency, cost and expense, quality and safety. The evaluation results are fed back to the management as the basis

for strategic budget adjustment, comprehensively contributing to the improvement of hospital operation and management ability (Luo et al., 2021).

Hospital A has always attached importance to communication with government departments. The medical insurance price department and finance department communicate closely with the Municipal Social Security Administration, National Health Commission, Finance Administration and expert group, do a good job in docking with various management software of municipal medical insurance to more accurately and comprehensively grasp the policy trend, timely adjust the business strategy, implement the government management requirements, and strive for policy support and cost incentives. Medical insurance price department, finance department and other management departments have strengthened DRGs cooperation and communication between management departments and clinical departments through in-depth communication with clinical departments, held special meetings for clinical departments, established an effective communication mechanism between clinical departments and management departments, implemented the department social security administrator and DRGs liaison system, regularly held social security administrator meetings, analyzed and studied the medical insurance management and DRGs situation. In 2020, the quarterly “medical insurance briefing” was published to systematically inform, gave feedback to and interpret the DRGs situation analysis and policy trends of the hospital in that quarter to all departments of the hospital.

The effective communication between DRGs management department of Hospital A and external government departments, expert groups and medical insurance administration, and the mutual cooperation between internal and clinical departments are important experiences for the smooth implementation of DRGs.

(iii) Promoting the Construction of Clinical Pathway

To implement DRGs payment, hospitals should first change the management system, and optimize the disease structure and resource allocation. This implies formulating a reasonable clinical pathway and changing unsatisfying diagnosis and treatment behavior, so that the the quality of medical services and cost reduction and efficiency can be optimized (Luo et al., 2021).

For hospitals, clinical pathway means improving the standardized diagnosis and treatment process, effectively standardizing the medical service behavior, and improving the medical service quality and average length of stay. This would allow to develop a complete and reliable disease payment path system, and to reduce unreasonable expenditure (Wang & Wang, 2021).

In 2018, Hospital A established a clinical pathway management framework, formulating an implementation plan for clinical pathway management. In so doing, 114 clinical pathway diseases carried out in that year were identified, as also clarified the responsibilities of clinical department directors and pathway managers. Through processes of collection and analysis of clinical pathway data discussed among managers every month, the hospital did a good job of feedback and communication. The study demonstrated that there is a link between the implementation of clinical pathway with the performance of departments. In fact, the number of clinical pathway managers increased month by month, and the proportion of patients under clinical pathway management in discharged patients increased rapidly.

While in 2019, managers focused on promoting the launch of electronic clinical pathway system and the launch of single disease reporting management system, in 2020, they focused on the implementation of cost management measures and business promotion programs. This allowed not the department to become more awareness of cost control, but also promoted the development of core technology under the DRGs payment mode.

Hospital's efforts to promote clinical pathway and single disease management, created conditions for the creation of a single disease management committee, and to set single disease managers in departments. The clinical pathway has become connected with HIS system, and the clinical pathway information management has been developed. It has covered 37 departments and 190 diseases in the whole hospital. Moreover, the single disease became connected with the electronic medical record system. The reporting quality of the department become monitored by the deputy chief physician and senior attending physician. These measures have effectively promoted the construction of clinical pathway, optimized the diagnosis, treatment and medication system, thus promoting the smooth implementation of DRGs.

(iv) Cost Management in DRGs Development

In order to achieve the strategic objectives of the hospital, the input of resources is inevitable. The final manifestation of the input and output of resources is the financial statements of the hospital. It is necessary to first formulate specific projects of resource investment according to the strategic direction, and predict how much revenue these inputs can bring, as well as the source and details of revenue. According to the input and revenue forecast of these budgets, continuous tracking should be carried out in order to achieve the practical implementation of the budget (Lian & You, 2020). A basic objective of the health system is to

determine how best to use the limited funds available to promote health and provide health care. In this case, the basic principle can be regarded as maximizing the value of money by selecting the optimal service portfolio subject to the constraints faced by the system (Thomas & Chalkidou, 2016). The cooperation among Hospital A's DRGs, finance and cost management are an important experience for the reform to achieve good results. Cost management promoted the smooth implementation of DRGs.

Carrying out DRGs cost accounting is the requirement to promote the reform of DRGs payment and promote hospitals to actively control costs (Dai et al., 2020,). Without accurate cost accounting, DRGs system cannot run well; the necessity of using cost based on unit analysis in cost accounting system is satisfied by DRGs. However, it must be pointed out that DRGs and cost accounting system should be developed independently. Otherwise, it is impossible to verify the performance of the system alone (Busse et al., 2011).

Cost accounting sets the basis of cost management. In China's New Hospital Financial Regulation, disease cost accounting is a process of taking disease as the accounting object and collecting the medical cost, drug cost and consumables cost of a certain disease according to certain methods (Su, 2019). The New Hospital Financial Regulation requires that public hospitals with certain conditions must implement medical service project cost accounting and disease cost accounting (Su, 2019).

In the process of DRGs implementation, Hospital A continuously improved its cost management system. This has laid a good foundation for the smooth implementation of DRGs and the improvement of financial management.

(v) The Budget, and the Analysis and Control of Costs

Hospital cost is the most basic and important factor in providing medical services. As a measure of health resource consumption in the process of hospital operation, cost budget is an important basis for cost analysis and cost control. At the same time, through strict budget implementation, hospitals can also strengthen cost awareness, reflect and analyze cost changes in the process of medical services, timely carry out cost control and implement cost effect evaluation (Wang et al., 2021).

Since 2017, Hospital A has improved financial and cost management practices, such as unified bidding and procurement mechanism except drugs, implementation of cost management scheme, regular analysis and notification, and implementation of performance appraisal, which has provided effective financial data, decision-making suggestions and management measures

for the smooth implementation of DRGs.

(vi) Total Cost Management is an Effective Way to Implement DRGs

Cost is the sum of various related costs, and its composition is very complex, as result of the various activities performed in the hospital. The summation of costs determines that cost control is a comprehensive activity rather than an isolated behavior (Fei, 2008). Hospital's comprehensive budget management is a systematic project involving many aspects (You et al., 2017). Quality determines the lifespan of the hospital while cost determines how long the hospital will last. Cost and quality are causality, and quality is broad. The comprehensive cost of an organization cannot be directly reduced, but can only be the result of total quality management. Total quality management is essentially a kind of "cost management" (Fei, 2008). Clinicians need to participate in value assessment, as well as to decide how to reuse the released resources. Therefore, more clinical cost information seems necessary in the future (Llewellyn et al., 2016). Since 2018, Hospital A has attached great importance to financial and cost management from hospital leaders to management departments, as well as clinical and logistics departments. Finance and medical departments cooperate with each other to control costs by optimizing diagnosis and treatment and medication systems. Through regular analysis and summary, meetings between middle-level leaders and cost managers were held to: report the profits and losses of the whole hospital; convey and interpret the latest policy trends; analyze the cost trend; point out the existing problems; introduce management experience; emphasize management objectives and put forward specific requirements; all of these has impacted positively on DRGs cost management results.

5.2. Suggestions to improve DRGs and Cost Management of Hospital A

Having as backdrop the description presented earlier presented on DRGs implementation, the researcher discusses next some suggestions to improve DRGs and cost management in Hospital A.

(i) Effectively Solve the Imbalance between Clinical Departments and Diseases in DRGs Management

To explore the comparison and analysis of DRGs data of different medical institutions in the region, for hospitals, it can encourage open and benign competition between departments or hospitals, find the benchmark of discipline development in the region, clarify development

measures, allocate corresponding resources, strengthen communication and cooperation to learn from each other, optimize diagnosis and treatment pathway to make common progress, so as to realize the public welfare value of hospitals (Li et al., 2020).

According to the results of cost accounting analysis, the hospital is advised to adjust the resource investment strategy for the departments with high doctor cost rate but obviously poor department operation efficiency; For the diseases with high cost rate due to obvious small business volume, it is required to appropriately increase the business scale through policy guidance; For those departments where the cost of doctors is obviously unreasonable, the performance allocation quota should be adjusted appropriately (Liu et al., 2019). It is also suggested that the management department and clinical department should cooperate closely to find out the reasons for the eight departments with high loss rate and loss rate > 5%. With the help of carrying out pharmaceutical mentoring cooperation project with the First Affiliated Hospital of X Province Pharmaceutical University and drawing on the good experience and practices of other hospitals, the hospital is advised to formulate practical schemes and proactively solve problems.

(ii) Establish a Normal Mechanism to Promote the Stable Operation of DRGs and Cost Management

Hospitals at all levels should organize medical, clinical, medical records, information, settlement, price, medical insurance, finance, statistics and other personnel to carry out special training on the working principle of DRGs payment, ICD coding, cost classification and other topics, strengthen the sorting and comparison of charge classification, standardize medical record information and medical insurance charge information, do a good job in the connection between Hospital and medical insurance information systems, and promote departmental cooperation and process optimization. Moreover, the interconnection between hospital HIS system, and its medical record, charging and medical insurance settlement systems need to be improved in order to advance the quality of filling in the first page of medical record and data collection of hospital information system, as well as to allow to formulate internal supporting management systems such as price, charge management, supervision, assessment and evaluation under DRGs payment system (Zheng et al., 2020).

The rebound of per capita expenses in the first half of 2020 shows that the normal mechanism of Hospital A's DRGs and cost management has not been fully established. On the basis of summarizing and analyzing the pilot experience in recent three years, it is necessary to

study and formulate a long-term management system in terms of optimizing management procedures, performance appraisal and incentive.

(iii) Specific Solutions for DRGs in Specific Departments

Limited by the development of hospital information construction and internal management refinement, the cost rate calculation of some service units (such as inspection, anesthesia, etc.) is still rough. With the continuous refinement of hospital management and the deepening of cost reduction and efficiency improvement measures, relevant parameters need to be adjusted according to the actual situation (Liu et al., 2019). The anesthesia department, pathology department, laboratory department and other departments in the operating room need to formulate special systems for management. The implementation of DRGs in these service units requires further research.

Chapter 6 - Conclusion

This chapter summarizes the main conclusions of this study and introduces the main knowledge contributions of this study. This paper also evaluates the limitations of the study and puts forward suggestions for further study.

6.1. Research Summary

Taking Hospital As an example, this study presents a descriptive case study on the DRGs implementation and its role in cost management of a specific public hospital in China. Research shows that since the implementation of DRGs reform in Hospital A, all indicators have improved comprehensively, DRGs management has entered a virtuous circle, medical efficiency has been significantly improved, and patient satisfaction has been significantly improved. The financial and cost management of Hospital A provides effective data and management support for the smooth implementation of DRGs. The implementation of DRGs has helped the financial department improve the ability and effect of cost management.

The case study of Hospital A suggests that there is a potential positive effect of DRGs on public hospitals and their cost management systems in China.

6.2. Contribution to Knowledge

The contribution of this paper is mainly to practice and practitioners, which can be summarized as follows.

(i) Use DRGs to Improve Public Hospitals' Management

The implementation of DRGs reform in Hospital A has promoted the overall improvement of various indicators of the hospital, improving medical efficiency and patient satisfaction.

(ii) Mutual Promotion between Cost Management and DRGs

The original intention of Yale University to develop DRGs is not to use it to pay, but to help the hospital carry out cost control. After Yale University used DRGs to control hospital costs, American scholars believe that DRGs combines its payment and cost control well (Su, 2019).

The study shows that Hospital A has implemented accurate financial and cost management,

which strongly supported the implementation of DRGs. The implementation of DRGs also helped the financial department improve the ability and effect of cost management.

(iii) Solid and Meticulous Work is the Premise of DRGs Implementation

The research carried out in Hospital A shows that strengthening the front-page management of medical records and improving the coding accuracy are fundamental for the smooth implementation of DRGs; also, communication and coordination is found a key factor to the implementation of DRGs; finally the study evidenced that another important aspect for the implementation of DRGs consists of the the construction of clinical pathways.

Based on the findings of the case study some suggestions are made to improve the efficiency of DRGs and cost management in Hospital A:

(1) To effectively solve the imbalance between clinical departments and diseases regarding DRGs management;

(2) To establish a normal mechanism to promote the stable operation of DRGs and cost management;

(3) Specific solutions should be studied for the implementation of DRGs in particular departments.

6.3. Limitations of the Study

Some limitations can be identified to the research conducted. First, the scope of data collection is relatively small. Considering the objective factors such as complex department structure, wide business scope and different work processes of functional departments in large public hospitals, it was difficult for the researcher to fully understand each department and business process. This prevented the researcher to collect more data, particularly in clinical departments.

Second, it was impossible to interview and record hospital leaders and medical personnel. Some personnel, including the president of the Hospital A and some department leaders, could not be interviewed. Also, due to the epidemic situation, it was difficult to conduct on-site interviews. Therefore, the interviews of these personnel were conducted by telephone. Also, due to requirements of the Hospital, interviews had to be conducted with anonymity and confidentiality.

6.4. Suggestions for Future Research

DRGs payment is one of the more advanced and scientific payment methods recognized in the world. It is an important means to effectively control the unreasonable growth of medical expenses, establish a new operation compensation mechanism for public hospitals, realize the win-win situation of medical insurance patients and promote the transformation of hierarchical diagnosis and treatment and service mode (National Medical Insurance Administration, 2019). Further research is suggested to replicate this study in other Chinese public hospitals especially in hospitals below Grade III, in which DRGs management and cost accounting systems are being developed. These studies would help to understand about the benefits of DRGs for the management of hospitals and the sector, and how cost management can be developed to support hospitals development.

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Appendix A

Research Application

Dear leaders concerned:

I am Jinhua Chen, a student of the master's degree program of medical and health management in the cooperation between Southern Medical University and ISCTE IUL of Lisbon University.
Gender: Male
ID number: 610102199604150353
Now I'm interning in the hospital office.
I am here applying to the hospital for investigation and research on DRG reform and management to improve my practice ability, adapt to health management as soon as possible, and complete the writing of my graduation thesis.
I sincerely ask you distinguished of the hospital to allow me to collect materials on DRG management and reform and interview relevant departments and personnel. The materials and interviews will only be used for the school's research report.
I solemnly promise that during the investigation, I will strictly abide by the rules and regulations and work discipline of your hospital, abide by the epidemic prevention and control and confidentiality regulations of your hospital, and ensure that the relevant data collected will not be leaked. After the first draft of the research report is completed, it shall be submitted to the office of the hospital for review and approval before it submits for external use.
If there is any research result, it is preferred to submit it to the hospital management for reference.
I sincerely hope that you will approve and support it.

Jinhua Chen
February 15, 2021

Appendix B

Application for supplementary investigation and research

Dear leaders concerned:

I am Jinhua Chen, a student of the master's degree program of medical and health management in the cooperation between Southern Medical University and ISCTE IUL of Lisbon University.
Gender: Male
ID number: 610102199604150353
Now I'm interning in the hospital office.
In September 2021, I applied to the hospital for investigation and research on DRG reform and management, which was strongly supported by the hospital. With the deepening of investigation and research, it is necessary to supplement the financial and cost management data related to DRG.
I sincerely ask you distinguished of the hospital to allow me to collect DRG related financial and cost management materials and interview relevant departments and personnel. The materials and interviews will only be used for the school's research report.
I solemnly promise that during the investigation, I will strictly abide by the rules and regulations and work discipline of your hospital, abide by the epidemic prevention and control and confidentiality regulations of your hospital, and ensure that the relevant data collected will not be leaked. After the first draft of the research report is completed, it shall be submitted to the office of the hospital for review and approval before it submits for external use.
If there is any research result, it is preferred to submit it to the hospital management for reference.
I sincerely wish that you will approve and support it.

Jinhua Chen
September 15, 2021

Appendix C

Introduction letter of investigation and research

Relevant departments (offices) and personnel of the hospital:

This is to introduce Jinhua Chen to your department (office) to collect relevant data on DRG reform and management of our hospital and interview relevant personnel. The collected relevant data and interview records are only for himself to write the research report.

Please give active assistance in compliance with the provisions on epidemic prevention and control and confidentiality.

If you have any questions, please feed back to the hospital office in time.

Please arrange it properly.

Hospital office (seal)

February 16, 2021

Appendix D

Introduction letter of investigation and research

Relevant departments (offices) and personnel of the hospital：

This is to introduce Jinhua Chen to your department (office) to collect DRG related financial and cost management data of our hospital and interview relevant personnel. The collected relevant data and interview records are only for himself to write the research report.

Please give active assistance in compliance with the provisions on epidemic prevention and control and confidentiality.

If you have any questions, please feed back to the hospital office in time.

Please arrange it properly.

Hospital office (seal)

September 17, 2021

Appendix E

Sources of Documents and Archives

Sources	Forms	Provider's requirement	Notes
Tutor	Articles, Books		
Official website of the Chinese Government	Archives, Information et al.		
Official website of the Ministry of finance of China	Archives, Information et al.		
Official website of X Provincial Government, medical insurance Administration and Health Commission	Archives, Information et al.		
Y City Municipal Government, Medical Insurance Administration, official website of Health Commission	Archives, Information et al.		
Hospital A's official website	Archives, Information et al.		
Hospital A's official website	Archives, Information et al.	Anonymous	
Hospital A's Office	Archives, Agenda, Bulletin, Conference records, Summary, Report et al.	Anonymous	

Sources	Forms	Provider's requirement	Notes
Hospital A's Office	Archives, Agenda, Bulletin, Conference records, Summary, Report et al.	Anonymous	Partial confidentiality of financial data
Medical Insurance Price Department of Hospital A	Archives, Agenda, Bulletin, Conference records, Summary, Report et al.	Anonymous	
Medical Quality Control Department of Hospital A	Archives, Agenda, Bulletin, Conference records, Summary, Report et al.	Anonymous	
Clinical department of Hospital A	Archives, Agenda, Bulletin, Conference records, Summary, Report et al.	Anonymous	
Media and Communication	Archives, Information et al.	Anonymous	

Appendix F

Evidence Sources

Category	Subcategory	Quantity	Primary simplification		Quadratic simplification	Application	Code by paragraph	Remarks
			Reason	Reserved quantity				
Chinese government policy database	Management and reform of public hospitals	10	It has nothing to do with the hospital's DRGs and financial costs	4	Mark relevant contents of the study to be cited	Quote in the text, including references.	N/A	
	Medical insurance reform	20		12				
	Hospital finance and cost management	8		7				
Media report database	Public media	4		4				
	Official media	9		9				
Hospital A's internal source	Policy system	12		8		1. Paragraph decomposition 2.Code 3.Quote in the text.	F1, F2, F3....F8	
	Work summary	178		14			H1, H2, H3....H105	
	Financial cost statement	28		28			N/A, proofread other data	
	Information report, etc.	27		6			L1, L2, L3....L28	
Interview	Hospital A's internal source	21		19			C1, C2....C21	
	Hospital A's external source	1		1			P1	

Appendix G

Policies for Management and Reform of Public Hospitals in China

Serial number	Source	Department	Policy	Release time	Remarks
1	www.gov.cn	General Office of the State Council	Guidance of the General Office of the State Council on Establishing A Modern Hospital Management System (GBF [2017] No. 67)	2017.7.14	Evidence
2			Guidance of the General Office of the State Council on Reforming and Improving the Comprehensive Supervision System of the Medical and Health Industry (GBF [2018] No. 63)	2018.7.18	
3			Opinions on Strengthening Performance Appraisal of Tertiary Public Hospitals (GBF [2019] No. 4)	2019.1.16	
4	Official website of National Health Commission	National Health Commission	Policy Interpretation: Opinions of The General Office of the State Council on Strengthening the Performance Appraisal of Tertiary Public Hospitals		
5		Luo Li, Institute of Hospital Management, Fudan University	Expert Interpretation: Opinions of the General Office of the State Council on Strengthening the Performance Appraisal		

Serial number	Source	Department	Policy	Release time	Remarks
			of Tertiary Public Hospitals: An Important Measure to Implement the People-Centered and Medical Reform Policy: Comprehensively Strengthen the Performance Appraisal of Tertiary Public Hospitals		
6		Yiping Lv of Beijing Municipal Hospital Administration	Expert Interpretation: Opinions of the General Office of The State Council on Strengthening the Performance Appraisal of Tertiary Public Hospitals: The Implementation of Performance Appraisal of Tertiary Public Hospitals is A Systematic Project		
7		National Health Commission	Guidance on Strengthening Performance Appraisal of Grass-Roots Medical and Health Institutions (Trial) (GWBJCF [2020] No. 9)	2020.8.13	
8		National Health Commission and State Administration of Traditional Chinese Medicine	Guidance on Strengthening the Operation and Management of Public Hospitals (GWCFW [2020] No. 27)	2020.12.21	Evidence
9	www.gov.cn	General Office of the State Council	Opinions on Promoting the High-Quality Development of Public Hospitals	2021.5.14	

Serial number	Source	Department	Policy	Release time	Remarks
			(GBF [2021] No. 18)		
10	Official website of National Health Commission	National Health Commission, etc.	Notice on Printing and Distributing High Quality Development Promotion Action of Public Hospitals (2021-2025) (GWYF [2021] No. 27)	2021.9.14	

Note: After data simplification, 4 pieces are used as evidence

Appendix H

Policies of China's medical insurance reform

Serial number	Source	Department	Policy	Release time	Remarks
1	www.gov.cn	General Office of the State Council	Guiding Opinions on Further Deepening the Reform of Payment Methods of Basic Medical Insurance (GBF [2017] No. 55)	2017.6.20	Evidence
2			Guidance on Reforming and Improving the Comprehensive Supervision System of the Medical and Health Industry (GBF [2018] No. 63)	2018.8.3	
3	Official website of National Health Commission	National Health Commission	Opinions on Adhering to People's Health as the Center and Promoting the High-Quality Development of Medical Services (GWYF [2018] No. 29)	2018.8.7	Evidence
4			Policy Interpretation of the Opinions on Adhering to People's Health as the Center and Promoting the High-Quality Development of Medical Services	2018.8.16	
5	Official website of National Medical Insurance Administration	National Medical Insurance Administration	Notice on Applying for the National Pilot of Grouping Payment According to Disease Diagnosis (YBBF [2018] No. 23)	2018.12.10	
6	www.gov.cn	General Office of the State Council	Recent Key Implementation Plan for Medical and Health System Reform (2009-2011) (GF [2009] No. 12)	2009.3.18	

Serial number	Source	Department	Policy	Release time	Remarks
7	Official website of National Medical Insurance Administration	National Medical Insurance Administration, etc.	Notice on Printing and Distributing the List of National Pilot Cities of DRG Payment (YBF [2019] No. 34)	2019.5.21	
8	www.gov.cn		Opinions on Implementing Healthy China Action (GF [2019] No. 13)	2019.6.24	
9		National Health Commission	Healthy China Action (2019-2030)	2019.7.9	
10	Official website of National Medical Insurance Administration	National Medical Insurance Administration	Notice on Printing and Distributing the National Pilot Technical Specifications and Grouping Scheme of DRG (YBBF [2019] No. 36)	2019.10.16	Evidence
11			National Medical Security Disease Diagnosis Related Grouping (CHS-DRG) Grouping Scheme (Core Group ADRG)	2019.9.30	
12			National Healthcare Security Diagnosis Related Groups (CHS-DRG)	2019.10	
13	Official website of National Health Commission	Medical reform group of the State Council	Notice of the State Council Leading Group for Deepening the Reform of the Medical and Health System on Further Popularizing the Experience of Deepening the Reform of the Medical and Health System in Sanming City, Fujian Province (GYGF [2019]	2019.11.15	

Serial number	Source	Department	Policy	Release time	Remarks
			No. 2)		
14	www.gov.cn	the State Council	Opinions on Deepening the Reform of Medical Security System	2020.2.25	Evidence
15	Official website of National Medical Insurance Administration	National Medical Insurance Administration	Notice on Printing and Distributing the Sub Grouping Scheme of CHS-DRG (Version 1.0) (YBBF [2020] No. 29)	2020.6.12	
16			Notice on Printing and Distributing the Management Procedures for DIP Medical Security Handling (Trial) (YBBF [2021] No. 27)	2021.5.20	
17		National Medical Insurance Administration, etc.	Pilot Scheme for Deepening the Reform of Medical Service Price (YBF [2021] No. 41)	2021.8.25	
18		General Office of the State Council	Notice on Printing and Distributing the National Medical Security Plan for the 14th Five Year Plan (GBF [2021] No. 36)	2021.9.23	
19	Official website of National Health Commission	National Medical Reform Group	Implementation Opinions on Further Popularizing the Experience of Sanming City, Fujian Province and Deepening the Reform of Medical and Health System (GYGF [2021] No. 2)	2021.10.8	
20	Official website of National Medical Insurance Administration	National Medical Insurance Administration	Notice of the State Medical Security Administration on Printing and Distributing the Three-Year Action Plan for DRG / DIP Payment Method Reform (YBF [2021] No. 48)	2021.11.19	Evidence

Note: after data simplification, 12 pieces are used as evidence

Appendix I

Chinese government's policy on hospital finance and cost management

Serial number	Source	Department	Policy	Release time	Remarks
1	Official website of the Ministry of Finance	Ministry of Finance	Notice on Printing and Distributing Hospital Accounting System (CK [2010] No. 27)	2010.12.31	Evidence
2			Notice on Printing and Distributing Hospital Financial System (CS [2010] No. 306)	2010.12.28	
3	Official website of National Health Commission		Notice on Printing and Distributing the Operating Measures for Cost Accounting of County-Level Public Hospitals (GWBCWF [2015] No. 39)	2015.7.28	
4	Official website of the Ministry of Finance	Ministry of Finance	Notice of the Ministry of Finance on Printing and Distributing the Basic Guidelines for Management Accounting (CK [2016] No. 10)	2016.6.22	
5	Official website of National Health Commission	National Health Commission	Notice on Printing and Distributing the Cost Accounting Norms of Public Hospitals (GWCWF [2021] No. 4)	2021.2.3	Evidence
6			Interpretation of Cost Accounting Standard of Public Hospitals	2021.2.3	
7	Official website of the Ministry of Finance	Ministry of Finance	Notice on Printing and Distributing Specific Guidelines for Cost Accounting of Public Institutions - Public Hospitals (CK [2021] No. 26)	2021.11.15	
8			The Person in Charge of the Accounting Department of The Ministry of Finance Answered Reporters' Questions on Printing and Distributing the Specific Guidelines for Cost Accounting of Public Institutions - Public Hospitals	2021.11.15	

Note: after data simplification, 7 pieces are used as evidence

Appendix J

Media reports on DRGs and financial cost management

Serial number	Source	Author	Report	Release time	Remarks
1	Y City Daily	Weijian Liang	The Chest Pain Center of Hospital A Has Passed the National Certification	2017.12.21	
2	Y City Daily	Shu Lin	Shunde's "Government and School Cooperation" Has Achieved Results	2019.1.23	
3	Guangzhou Daily	Xuehua He	Guangdong and Guangzhou "Pay by Disease Score" Won the National Experience Exchange	2020.10.28	
4	GuangMing Daily	Zhenya Jin	Public Hospitals Will Develop in This Way in the Next Five Years	2021.6.5	

Appendix K

Network report on DRGs and financial cost management

Serial number	Source	Author	Report	Release time	Remarks
1	Hospital A's Medical Insurance Price Department		Assiduous Research and Active Communication -- Our Hospital Communicated with DRGs Group Experts On Site Again	2018.5.28	
2	Y Municipal Medical Insurance Administration		The Only One in X Province! Foshan Has Become A National Pilot City of "DRG Payment"!	2019.5.21	
3	Tsinghua Medical Service Governance	Jialin He	Foshan DRG Payment Reform Performance Evaluation Launch and Exchange Meeting	2019.8.25	
4	Y Municipal Medical Insurance Administration		The National Medical Insurance Administration Came to Foshan to Investigate the Progress of DRG Payment	2019.11.25	
5	Y Municipal Medical Insurance Administration		Xiao Xue, Director of the Provincial Medical Security Administration, Led A Team to Investigate the Medical Security Reform in Foshan	2020.4.17	
6	Y Municipal Medical Insurance Administration		The Expert Group of the National Medical Insurance Administration Came to Foshan to Investigate the DRG Payment	2020.9.30	

Serial number	Source	Author	Report	Release time	Remarks
7	X Provincial Medical Insurance Administration		The Promotion Meeting of the Pilot of the Regional Point Method Total Budget and Payment by Disease Score of the National Medical Insurance Bureau Was Held in Guangzhou	2020.10.28	
8	Hospital A's Customer Service Department	Mingxia Fu	Continuous Improvement, We Are Always on the Way - Our Hospital Won the First Place in the District Hospital in 2020	2020.12.10	
9	Y Municipal Medical Insurance Administration		Foshan Introduced its Experience and Practice at the Seminar on the High-Quality Development of Medical Security and the Construction of Multi-Level Medical Security System	2021.5.21	