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The Impact of Performance Based Compensation in Chinese Public Hospitals —A Case of LL Hospital

PAN Haishan

Doctor of Management

Supervisor:
PhD José Paulo Esperança, Professor,
ISCTE University Institute of Lisbon

January, 2022

BUSINESS
SCHOOL

Marketing, Operations and General Management Department

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January, 2022

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I declare that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is made in the text.

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Abstract

This thesis addresses the compensation method in public hospitals. The design of incentives for medical services is a challenge faced in most countries.

Chinese public hospitals have experienced a series of changes and experiments. Public hospitals have been excessively profit-seeking with insufficient not-for-profit nature, and access to medical care is difficult and medical bills are expensive, which has been criticized by the public. The method of calculating rewards and incentives based on income minus expenditure has been regarded as one of the main motives for "induced demands". On the one hand, patients' well-being should be the core objective, so medical services require dedication. On the other hand, economic incentives have made hospitals and doctors stuck in the income-generation incentive model. In addition, the advancement of the medical insurance payment system based on the quality of the medical record front sheet led to a decline of the quality of the income-generation hospitals. Based on this dilemma, we propose and discuss the "Public Hospital Innovative Performance Based Compensation-Normative Control Model". We explore the integration of the "normative control model" and Donabedian's "structure-process-outcome" theory. Guided by normative control input and based on the organizational resource measurement goals, we use the method of incorporating the medical record front sheet into the performance accounting to construct a doctor's performance accounting model of "1 + disease weight + medical record factor = effective service patient-times" to construct the doctor's performance accounting payment method. Operating data and a questionnaire were used to observe and monitor the effectiveness of the method.

We found through research that incorporating the medical record front sheet into the design of performance accounting elements improved the quality of medical records in public hospitals, and the normative control model effectively prevented the deformation of medical behaviors caused by incentives.

Keywords: public hospital salary payment, normative control model, effective service patient times

JEL: D33; J33

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Resumo

Este estudo analisa o modelo de remuneração nos hospitais públicos. O desenho dos incentivos para os serviços médicos é um desafio enfrentado em muitos países.

Os hospitais públicos chineses foram submetidos a numerosas mudanças e experiências tornando-se demasiado focados na obtenção de lucros, em prejuízo da prestação geral de serviços. O acesso aos serviços médicos é difícil e os preços são elevados, o que é criticado pelo público. O método de cálculo dos prémios e incentivos baseado na faturação menos despesa é visto como um dos principais motivos da "procura induzida". Por um lado, o bem-estar dos pacientes devia ser o objetivo principal, pelo que os serviços médicos requerem dedicação. Por outro lado, os incentivos económicos tornaram hospitais e médicos reféns do modelo de incentivos baseados na geração de rendimentos. Acresce que a introdução do sistema de pagamentos baseado em seguros de saúde resultante do impresso que regista a qualidade dos serviços médicos levou a uma redução da qualidade dos hospitais geradores de rendimentos. Com base neste dilema, analisamos o "Modelo Normativo de Controlo da Remuneração Baseada no Desempenho dos Hospitais Públicos". Exploramos a integração do "modelo normativo de controlo" a teoria de Donabedian da "estrutura-processo-resultado". Com base no controlo normativo dos inputs e nos objetivos de medida dos recursos organizacionais, usamos o método da incorporação do impresso de registos médicos para construir o modelo de desempenho contabilístico do médico: "1 + peso da doença + fator do registo médico = número de serviços efetivos aos pacientes" para construir o modelo de pagamento com base no desempenho contabilístico do médico. Para controlar a eficácia deste método usamos dados operacionais e um questionário.

.Verificamos que a incorporação do impresso que regista a qualidade dos serviços médicos para construir o modelo de desempenho contabilístico melhorava a qualidade dos serviços médicos nos hospitais públicos e o modelo de controlo normativo prevenia efetivamente a deformação do comportamento médico provocada pelos incentivos.

Palavras-chave: remuneração nos hospitais públicos, modelo normativo de controlo, número de serviços efetivos aos pacientes

JEL: D33; J33

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摘 要

本研究选择了充满风险和挑战的公立医院绩效薪酬支付方法的设计为对象展开研究。医疗问题一直是困扰全球管理的困境和难题，而其中关于激励的问题也一直是各国研究热点问题。

在中国，由于其特定的历史背景，公立医院在发展进程中经历了一系列的变化与波折，其中公立医院经济性过强而公益不足，“看病难”、“看病贵”则一直是对公立医院的诟病，按收入减支出核算奖励激励的方法也一直被认为是“诱导需求”的主要动机之一。正是如此，我们一方面从内心底认同患者利益为公共利益最大化，医疗服务需要奉献精神，医疗激励伤害带来的医疗行为变形将影响到我们每一个人的切身利益；另一方面，我们的医院、医生朋友都受困于创收激励的模式中深陷而不能自拔时，同时，以病案首页质量为主要数据来源的医保支付制度的强势推进，创收中的医院病历质量低下；这焦灼困境中，我们构建了“公立医院创新绩效支付—规范控制模型”，我们探索性的把“规范性控制模型”和 Donabedian 的“组织—过程—结果”理论相结合，以规范性控制输入为导向，基于组织资源测算目标，在过程中尝试用把病案首页纳入绩效核算的方法，构建“1+病种权重+病历因子=有效服务人次”的医生绩效核算模型来构建医生的绩效核算支付方法，用运行数据和问卷的模式来观察和监测方法的有效性。

通过研究我们发现，将病案前表纳入绩效核算要素设计，提高了公立医院病案质量，规范的控制模型有效地防止了激励导致的医疗行为变形。

关键词：公立医院薪酬支付，规范控制模，有效服务人次

JEL: D33; J33

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经过了近六年的漫长时间，我终于要走到博士学习的最后一段，如果没有 Virginia 教授对于我的巨大帮助，没有我的导师 José Esperança 教授包容和指导，我想，我是没有机会来撰写这段致谢辞的。

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博士的学习旅程，让我收获满满，除了知识以外，我收获了一生最宝贵的财富，它们是饱满大爱的师生情、纯粹真挚的同学情、共同奋斗的同事情、相伴相持的夫妻同学情，我相信，和妻子共同研究同一方向，同学习，一起奋斗，最后走到毕业这个终点，这将是我们一生最美好的回忆。

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Chapter 1: Research Background

Phased achievements have been made since the implementation of new policies of medical reform in 2009. However, China's medical reform is also confronted with more severe challenges; doctor-patient relationship becomes increasingly strained; the nonprofit nature of public hospitals seems to be changed slightly; significant problems, such as expensive medical services, difficulties in medical insurance, hospitals' hardships, patients' grievances, entanglement of government, helplessness of the market and information asymmetry, have shadowed these achievements in medical reform (Zhao, 2015). As the medical reform has entered a critical and more difficult stage, particularly, a slight move in the reform of public hospitals may affect the situation as a whole (Wu, 2014). "The reform of public hospitals is like an arrow on the bowstring," in fact, not only China but also other countries are faced with the same difficulty in the reform of public hospitals: "introducing competition, introducing market mechanism and introducing new and market-based supervision mechanism"; the reform of public hospitals is reflected in three major models: "autonomation, corporatization and privatization" (Gu, 2006); the reform of China's public hospitals is also confronted with these challenges.

At the executive meeting of the State Council on January 19, 2015, Chinese Premier Li Keqiang stated that "we should deepen the reform of public hospitals and pull more efforts to encourage social capital to participate in this reform." In this wave of the reform of public hospitals, the relationship between hospitals and governments will be changed, so will the hospitals' external policy environment as well as the macro mechanism and the rules of administrative management (Wang, 2015). During the process of macro reform, it is worthy of consideration how, from the perspective of performance, to go beyond the macro level and build a core mechanism that effectively links the macro level with the micro one, and to deal with widely reported social problems in medical services, such as out-of-control medical expenses and multiple complaints from governments, doctors and patients, which are easily neglected.

To establish a modern system for the hospital administration becomes an important goal in the reform of public hospitals. The performance system is defined as the core interest system in hospital administration systems; the construction of medical insurance system

started quite late in China, and like other countries, China's medical insurance payment has also undergone the evolution of "fee for service—global payment—diagnosis-related groups (DRGs)—value-based payment" (Yi et al., 2017). Since 2009, the mode of "fee for service" has introduced the performance motivation mechanism featuring "revenue sharing and rewards for services" for the internal performance payment in hospitals, which directly contributed to the excessive medical treatment resulting from performance motivation (Duan, 2016). In terms of medical quality, insufficient attention has been paid to documents of medical history, which led to relatively poor quality of medical history. What is more, it is reported that doctors are organized to falsify patients' medical history after medical negligence, resulting in worsening doctor-patient relationships, upgraded conflicts and credit crisis in the medical industry.

The performance motivation mechanism featuring "revenue sharing and rewards for services" seems to link the income of hospitals and the performance of doctors. However, the mechanism motivating doctors to create income is also pushing them to change their medical behaviors for the purpose of more interests. Since medical behaviors refer to rigorous evidence-based medicine, reducing the influence of interests on motivating doctors and decreasing uncontrolled medical treatment resulting from doctors' profit-seeking behaviors have become an important foothold in the performance management of hospitals. The establishment of the new performance distribution mechanisms featuring "clinical diagnosis and diagnosis-based whole-process management of basic medical treatment" will effectively improve the status quo of the hospital administration and implement a modern mechanism of hospital administration. The new performance system tries to explore the following issues: regulating and guiding medical behaviors, combining doctors' performance with diagnosis and the implementation of full medical process, promoting the transition from out-of-order doctors' behaviors to well-organized ones under the mode of fee for service, developing doctors' working habit featuring on-time and complete records of full medical process and accelerating the coming of the age of medical insurance payment by a certain category of disease. All these efforts will help the public hospitals to achieve a smooth and sound transformation during the reform of policies.

Since the beginning of reform of medicine and health 40 years ago, China has faced unprecedented challenges as well as unparalleled opportunities. From the early exploration, midterm deepening to the critical stage of new medical reform, the reform of medicine and health in each and every stage displayed distinctive characteristics, which were closely related to the overall strategies and phased characteristics of reform and opening up. Therefore, the

position of medical and health should be subject to the overall economic and social development strategies at that period; the guiding thought for the reform of medical and health were improved with the understanding and deepening of the nature of socialist market economy and socialism; the process and path of the reform of medical and health and of the reform in other fields exert mutual promotion, influence and restriction on each other (L. Li et al., 2008).

1.1 Overview of China's medical reform over the past 40 years

1.1.1 Early stage of medical reform (late 1970s to early 1990s)

The salient feature in this stage was delegation of power. In an interview with People's Daily on January 13, 1979, former Chinese Vice Minister of Health Qian Xinzhong stated that the important measures in medical and health were that "we should act in accordance with objective economic laws and corporate management methods should be used step by step to administer medical and health institutions. They should have the power to determine their own expenditure, business accounting, and purchase of instruments, promotion, assessment, rewards and punishments of staff." In 1985, the State Council of the People's Republic of China (PRC) approved the Report Concerning Some Policy Questions in the Reform of Health Work and pointed out that "we must carry out reform, introduce more flexible policies, streamline administration and delegate powers, conduct multi-channel financing and broaden the development path of health undertakings to do a good job in health work." This marked the official beginning of the comprehensive reform of medical systems in China. Under such a backdrop, health institutions in China had generally implemented responsibility systems in many forms, including: administrative chiefs responsibility system, system of management by objective, system of mission indices, system of fixed-quota contract, system of economic accounting, distribution system of more pay for more work, and the system of the construction of spiritual civilization (L. Li et al., 2008).

The problems of low efficiency and insufficient services that were prevalent in hospitals at that period were addressed in a targeted manner through the reform of delegation of powers in this stage. As a result, the effective supply of medical services increased, the number of hospitals rose, the cost accounting was strengthened, the waste of internal resources in hospitals was under effective control and the efficiency was improved.

In the addressing of the low efficiency of micro entity of hospitals, however, the

contradiction between delegation of powers and the continuous social and economic development became increasingly prominent, which had a negative influence on the medical and health undertakings in the late stage of this reform.

(1) When delegating powers to hospitals, governments also gave up their responsibility to invest in medical and health industry.

(2) In the delegation of greater powers and transferring of more profits, supporting measures had not been taken in a timely manner and perfect monitoring and financing systems failed to be built, which led to the increasingly flexible mechanisms and stronger enterprise attributes in hospitals. As a result, things turned into their opposites when they reached the extreme.

(3) As there were rich medical and health resources, the main contradiction in medical and health system had turned from insufficient supply of services into inequitable distribution and uncontrolled costs of resources. Even so, policies still failed to be adjusted in a timely manner. This was also one of the main reasons for the difficult and expensive access medical care (L. Li et al., 2008).

1.1.2 Middle stage of medical reform (early 1990s to early 2000s)

In this stage, the medical reform was further deepened, and helpful exploration had been made in the system of medical and health services, system of medical securities and system of medicine circulation. Hospitals also began to make active efforts to explore the reform under which the adjustment and improvement of internal operating mechanism was dominant. From the perspective of overall effect, however, the problem of expensive access to medical care emerged in this stage. Especially under the situation of economic deflation throughout China, the five years, from 1996 to 2000, witnessed the most rapid growth in per capita health expenses since the reform and opening up.

In the level of guiding thoughts, starting from the issue of Decision of the Central Committee of the Communist Party of China and the State Council Concerning Public Health Reform and Development in 1997, people became aware of the importance of coordination among the three major systems: system of medical and health services, system of medical securities and system of medicine circulation (CPC Central Committee & The State Council, 1997). However, there was a lack of adequate awareness of the nature and characteristics of medical and health industry, especially for local governments, who even equated this industry with general competitive industries and the responsibilities of medical and health with pure

personal responsibilities (CPC Central Committee & The State Council, 1997)。

From the perspective of specific measures, this stage exposed a major problem in China's management system of medical and health to the public, namely decentralized management organizations and uncoordinated supporting policies among different departments. As a result, the measures of reform failed to produce concerted effect and achieve predetermined results and even strayed from the right path. The failure to implement regional health planning, the system of sort management of medical institutions as well as the bidding and purchasing of medicine was resulted from this problem. To this day, this problem remains a key bottleneck restricting the new round of reform of medical and health (L. Li et al., 2008).

1.1.3 Stage of new medical reform (since the outbreak of SARS in 2003 to 2009)

The outbreak of SARS in 2003 provided a chance for the public health undertakings to enter an important turning period and it also became a hallmark event that promoted the reconsideration of the development of medical and health and stimulated the new medical reform. This round of medical reform directly reversed the position and reform orientation of medical and health. Since the issue of *Opinions of the CPC Central Committee and the State Council on Deepening the Reform of the Medical and Health Care System* (No. 6 [2009] of the CPC Central Committee) in April 2009, in particularly, the reform of the medical and health care system in China has entered a critical adjustment period with remarkable achievements being made.

It was proposed in the new round of medical reform in 2009 that China should establish a four-in-one basic medical health system featuring public health service system, medical service system, medical security system and medicine supply security system that was accessible to all urban and rural residents. The country should improve the system and mechanism of management, operation, input, price and monitoring of medicine and health, strengthen the construction of technologies, talents, information and legal system, and safeguard the effective and normative operation of medical and health care system. From 2009 to 2011, emphasis should be laid on the reforms of basic medical security system, national basic medicine system, grass-roots level medical and health service system, equalization of basic public health services as well as pilot reform of public hospitals.

Major policies in this stage included: establishing a basic medical health system covering urban and rural residents, "strengthening governments' responsibility" as the guiding thought for the reform of medical and health, greatly increasing governmental investment in public

health, strengthening financial transfer payment, sharpening the construction of medical and health service capability in rural areas, vigorously developing community medical services, promoting the new rural cooperative medical care and basic medical insurance system for urban residents, strengthening the production, circulation and management of medicine, and improving the construction of medical ethics.

Meanwhile, the reform of medical and health in this stage became a breakthrough point in dealing with the social contradiction accumulating over the past two decades; during the rapid development of medical undertakings, at the same time, the structural contradiction of expensive and difficult access to medical care became increasingly prominent, and the advantages of market-oriented reform had fully emerged and so did its defect; and sufficient governmental financial resources enabled the public to share the achievements of reform (L. Li et al., 2008).

Based on the summary of achievements and experience in the new medical reform, it is found that there are still many problems left in the deepening of the reform of medical and health care system: (1) rapidly increased total health expenditure has deviated from the original intention of medical reform; (2) the idea of "establishing a sound mechanism for basic medical and health care and strengthening such endeavor at the community level" should be further implemented; (3) the foundation for the system for basic pharmaceuticals is not yet stable and high expenses in circulation links of pharmaceuticals has not yet come down; (4) problems still exists in the reform of public hospitals; (5) a long-term and effective mechanism for safeguarding the continuous medical reform has not yet been built (L. Li & Jiang, 2009).

The reform of public hospitals becomes a key point as well as a difficult one in the new medical reform, which is essential to integrate the distribution of medical resources, promote the equity in medical services, improve medical service performance, and provide the public with cheap and easy access to medical care.

As the public hospitals serve as a core part of the whole medical and health care system, most policies in medical reform need to be implemented with the help of these hospitals. If the efficiency of hospitals is not high, the tremendous national and personal investment will fail to produce economical and adequate medical services. As long as hospitals maintain the income-oriented mechanism, the effects resulting from medical securities will be weakened or even offset and it is difficult for the governmental investment to be turned into the welfare for the public (L. Li & Jiang, 2009).

The problem of "expensive and difficult access to medical care" is mainly reflected in

public hospitals, which serve as the main part of China's medical service system. Currently, some problems, such as imbalanced distribution of medical resources, excessive medical treatment, high drug prices, deviation of technical routes to high end, and emphasis on treatment but neglect in prevention, are mainly resulted from out-of-order system and mechanism of public hospitals.

Many issues are involved in the reform of public hospitals but the core one is to change the incentive mechanism for doctors. Currently, many problems in the medical and health care system are rooted in the deviation of the incentive mechanism for doctors and hospitals. Over the years, the income-oriented incentive mechanism in public hospitals has changed the value orientation and working conditions of the whole medical teams and these hospitals are equated with general competitive enterprises. For a long time, public hospitals have served as public institutions but followed a market-oriented road, which leads to weakened nonprofit nature, distortion of medical behaviors and aggravated profit-driven behaviors. Patients' medical burdens have aggravated; excessive examination and over-medication have greatly damaged the quality of the nation; excessive pursuit of profits has contributed to the distrust between doctors and patients; doctors are weighed down with incomes. These problems deserve out high attention. The enthusiasm of medical staff must be aroused through the reform of public hospitals so that medical staff become angels in white once again.

1.1.4 Impact of economic incentives of the new medical reform on Patients' well being

In order to deal with the problem of "expensive and difficult access to medical care", for years, China has been exploring a path suitable for the medical reform in a large country. However, the profit-driven behaviors in hospitals, insufficient governmental subsidies, non-standard hospital administration systems and legal person management system, unscientific payment mode in medical securities, the lack of scientificity and effectiveness in hospital administration and incentive mechanism have all reflected the insufficient nonprofit nature in China's public hospitals. Therefore, emphasis has been laid on such a nature of public hospitals in the new medical reform.

In the early stage of medical reform, the operating mechanism in China's public hospitals was excessively commercial and market-oriented and these hospitals were equated with general competitive enterprises, which went against the medical and health rule and international practice. As a result, public hospitals travelled from one extreme to another, namely, from scarcity of resources and insufficient incentives before the reform and opening-

up to over-development and excessive profit-driven motivations (L. Li & Jiang, 2009).

Firstly, the positioning of public hospitals is deviated, and the investment is insufficient. As the extension of governments' functions, public hospitals are nonprofit agencies entrusted by governments to safeguard people's good health. In the level of position, the goal of operating public hospitals is to reflect governmental wills and social interests instead of self-development and profit making. In fact, however, many public hospitals bear sole responsibility for their own profits or losses and excessive attention has been paid to the operation of these hospitals while the financial investment has been decreased; what is worse, these hospitals are even encouraged to engage in operational and profitable businesses, which are inevitable under the irrational GDP-based achievement assessment system (L. Li & Jiang, 2009).

Secondly, ineffective assessment and supervision lead to the public hospital operators' violation against the wills of contributors. Governments' monitoring and management on public hospitals are insufficient and they do not have enough authority and means to manage these hospitals' financial conditions, regional health planning, over-standard allocation of new and high technological equipment, and foreign investment (L. Li & Jiang, 2009).

Thirdly, the payment and incentive mechanism is inconsistent with the requirement of nonprofit nature. Affected by the dual functions of insufficient governmental investment and ineffective monitoring and assessment, public hospitals have developed a path featuring self-profit and self-development; in particular, the expenses of items with greater space for profits, such as some medicine and examination, increase rapidly; and internal departments in public hospitals have for a long time formed an operating mechanism that goes against the nonprofit nature, such as widespread administrative office accounting with the purpose of profits and incomes, and drawing rebate for prescriptions written out; medical staff has to obtain incomes by raising charges

1.2 Reform challenges for Chinese public hospitals

1.2.1 Characteristics of medical services

The differences between medical services and other commercial services lie in: 1. Highly information asymmetry; 2. Strong political complexion and ethical features, also known as externalities, with righteousness and heavy responsibility in livelihood and fairness (Gu, 2006).

From the micro perspective of a hospital, the information asymmetry in medical services is manifested in two levels:

The first level: service. There is great information asymmetry between service providers (doctors) and service purchasers (patients). Except for a few common diseases and frequently-occurring diseases with highly updated and open information, patients usually do not have any professional skills to identify or judge correctly the quality and price of purchased medical services before, when and after they purchase these services (Gu, 2006).

The second level: administration. There is also great information asymmetry between hospital administrators and service providers. Due to professional restriction, it is very difficult for these administrators correctly judge the quality and price of specific medical services in different professions; but this management process requires a series of design and planning of systems before making possible the establishment of management procedures and systems for medical services. And of course, this process will generate related management costs (Gu, 2006).

From the level of services, the most common problem resulting from the information asymmetry is: when interest conflicts between service providers (doctors) and service purchasers (patients) arise, the former can make use of the advantageous induced demands of information asymmetry to stimulate induced consumption so that they can pursue private ends and maximize self-inters (X. Gu & Guo, 2016).

From the level of administration, two situations are manifested:

1. A rule of common interests between administrator and doctors is developed: administrator encourage or tacitly consent to the induced demands, which leads to uncorrelated medical expenses and medical quality that the patient purchases from the medical service as well as uncontrolled medical expenses and quality (X. Y. Zhang & Yuan, 2016); from the perspective of management science, when those who are under administration, namely medical service providers (doctors), are related to interests and incomes but unrelated to risks, they will consciously choose a work mode with low effort costs and low risks and thus another management mode will emerge (Gu, 2006).

2. Dilemma of management of hospitals' administrators and doctors: lack of quality of doctors' work leads to the rise of costs. If sound management procedures for the level of doctors' efforts and for work risks fail to be established, doctors may take advantage of the barriers and information asymmetry to excuse themselves, muddle through their work and shirk responsibility, or argue that they have been confronted with many professional difficulties and they have made great efforts to acquire more leisure time or lower costs while

more incomes and higher quality are neglected. If more progress is to be made in management, the interest conflicts between administrators and those who are under administration will surely arise; and the management difficulties are directly linked with the management costs (X. Gu & Guo, 2015).

The professional characteristics of medical management are manifested in the great information asymmetry between professional management and administrative management, and from the perspective of organizational management, the pursuit of those who are under administration for the maximum self-interest is normal (X. Gu & Guo, 2016). This is one of the research categories of the principal-agent theory.

As a result, medical services are different from other services. The failure to deal with the problems of high degree of information asymmetry in medical services will lead to social problems related to humanitarianism and civil rights with high sensitiveness of social ethics, moral hazards and political attribute.

In the field of information asymmetry, induced demands are common. In the field of medical services, as for the choice of medical items, doctors enjoy the advantage to induce demands but patients have no ability to distinguish the services (X. Y. Zhang & Yuan, 2016). In the design of performance, if doctors are encouraged to draw rebates for items based on incomes, then what kind of administrative capacity can be used to effectively intervene in the quality problems in the medical professional field even the management on medical services fails to do so?

1.2.2 Difficulties in the reform of public hospitals' performance in China

The management on public hospitals' performance is to address the difficulties in the integration of economic efficiency with nonprofit nature; in China, the operation modes of public hospitals have transformed from public institutions under the traditional budget system into independent ones with full autonomy to manage their income and expenses; these hospitals are forced to achieve development by creating incomes on their own due to insufficient financial support, which has become an object of public denunciation (Zan et al., 2017). Since public hospitals pay more attention to the economic efficiency in setting of performance goals, hospital administrators are more likely to create and maximize the incomes. Based on the nonprofit nature, however, public hospitals are required to undertake nonprofit tasks related to public health services, including the social responsibilities to control the excessive growth of medical expenses and reduce excessive medical treatment. But related

goals in these nonprofit tasks go against those in the economic efficiency.

The exploration of the difficulties in the management of hospitals' performance can be based on the two dimensions: high measurable degree and low measurable degree. It is easy to understand the high measurable degree and the majority of departments in hospitals can find the methods and standards for measurement and the only thing we need to do is exploring the rationality of measurement indexes. Through the design of incentive programs, the performance incentives will directly influence individual behaviors in organizations. If clinical departments' workloads are determined in accordance with incomes or items, for example, clinician's working enthusiasm will be directly sourced from the amount of income and rebates of items. They will choose the items with more incomes and rebates. Through incentives of items, such an incentive system can directly change the incomes of items, doctors, departments and hospitals.

The difficulty of performance management lies in the low measurable degree. Generally, administrative departments and departments of logistic services, such as administrative organs, belong to this scope. From the perspective of organizational management, the lower the measurable degree of performance management is, the more likely it is to generate go-slow and formalism. And things are more likely to be done carelessly and responsibilities are to be evaded. And ones are more likely to boast their capabilities and efforts they have made, but other factors may contribute to the failure to produce high-quality and high-level results, and then working procedures and the scope of responsibility will fail to be determined in accordance with the job content and it will be unable to quantize the content and claim responsibilities and thus tasks will terminate. More interestingly, in the distribution of interests, the complaint about contributions and efforts is more likely to arise in the work with low measurable degree and the appeal for fairness and equality is easily to be used to embrace equitable practice and egalitarianism (Gu, 2006); if administrators are to meet the demands of these complaint and appeal, excessive budgets on performance and new problems related to unfairness and inequality will emerge.

The most common problem in the performance design in administrative departments is staff's selective sluggishness resulting from fixed performance budgets (Gu, 2006). Now that different amount of efforts produces the same results, the sluggishness becomes an inevitable choice, leading to the lower level of completion of tasks compared with the expectations of administrators and leaders. The solution is to base the job functions of these departments on events and to design the key points of events, namely, work frequency, key work factors, quantity, responsibility targets, output criteria and working procedures. "Just assess your

expectations on the staff and take the expectation criteria as the assessment index." More importantly, a system concerning the interest conflicts between administrators and those who are under administration should be built. This means that the approach to the problems related to the low measurable degree should be based on measuring and making explicit the working procedures and controlling risks to effectively improve the quality of supervision and administration, raise the efficiency of administration, shorten the link of management and reduce administrative management costs.

The long-standing problems in the administrative departments in public hospitals include redundancy and bureaucracy, which are in line with the model of maximum sluggishness. A complex set of problems, including human resources, low efficiency and high consumption, intensify the risk of excessive costs of internal administrative management in public hospitals.

1.2.3 Background of economic autonomy of public hospitals in China

Since the reform and development of public hospitals, these hospitals has enjoyed relatively full operation autonomy and most of China's public hospitals boast the right to dispose or even claim the surplus though they has still born the identity of public institutions at the age of planned economy (Zan et al., 2017). As the surplus of public hospitals cannot be used for dividends, it demonstrates little importance to maximize the net profits in financial statements. In maximizing gross incomes, at the same time, the interest motives of hospitals' administrators also increase the labor costs and expenses (including the incomes and welfare of all staff, administrators included, in hospitals, of course).

The most straightforward way to increase gross incomes is taking the measure of direct incentive based on share-cropping system for first-tier doctors or even the stimulus based on the stepped system that is the same as sales commissions (X. Y. Zhang & Yuan, 2016). The composition of doctors' income demonstrates a structure of "basic salary plus surplus commission plus item commission". Doctors' efforts in obtaining commission are directly related to doctors' self-interest and manifested in the increases of patients' expenses and of the gross incomes of hospitals.

1.2.4 The influence of new medical reform policies on hospitals' financial structure

1) The medical reform policies featuring zero-markup on medicine and zero-markup on consumables directly contribute to the decrease of hospitals' incomes and operating costs of consumables (Ao et al., 2011);

2) The reform of medical insurance payment system: from fee for services to global budget to cased-based payment (Yi et al., 2017).

The above two important factors are reflected in the following formula:

Hospitals' business incomes = incomes from medical services (registration, treatment, operations, examination and testing) + incomes from medicine + incomes from health materials (including high-value consumables and zero-charge consumables) + other incomes

Due to the influence of item 1), it is difficult to produce surplus in terms of incomes from medicine and incomes from health materials, instead, it will increase administrative management expenses; therefore, hospitals' disposable incomes are mainly sourced from incomes from medical services (Ao et al., 2011).

Due to the influence of item 2), the payment mode of medical insurance based on the integration of global budget and cased-based payment is reflected in the dual high limits of total incomes and patients' expenses; if doctors are allowed to pursue the incentives of surplus commission and item commission, patients' medical bills will go against the logic of cased-based payment of medical insurance; it is inevitably to touch the ceiling line of payment of medical insurance or fail to pay; therefore, the new reform of payment system is likely to exert influence on the incomes from medical services in hospitals (Yi et al., 2017).

Meanwhile, China still faces various difficulties in the promotion of the mode of cased-based payment because the logic of cased-based payment is based on the international classification standard for diagnosis, clinical pathways are established based on the evidence-based medicine, and corresponding expenses are measured based on pathway standards (Yi et al., 2017). In grass-root hospitals, however, it is more arbitrary than normative in the clinical treatment due to the logic of fee for services, which leads to the poor quality of patients' medical history, high rate of misdiagnose, missed diagnosis and error diagnosis, incomplete information about doctor's advice and fragment of important information; to change such a dilemma, besides the investment resulting from information construction, the improvement of administrators' management capabilities and standards as well as the establishment of normative and effective management systems require a series of training and design of systems and procedures, directly increasing hospitals' management costs (Fritze, 2019).

Hospitals' disposable incomes are mainly sourced from medical services, which are used for hospitals' various expenses, such as expenses for operating development and management expenses, for which personnel appropriation expenditure accounts a large proportion; meanwhile, the investment into management, which is resulted from the reform, also raises related management costs. A research found that: in public hospitals, the amount of personnel

appropriation expenditure is not directly correlated to the level of hospitals' operating capabilities; it is inevitable to raise the appropriation expenditure of in-service staff when hospitals' profitability is improved; but such expenditure do not decrease even the profitability is weakened (Zan et al., 2017). The idea that disposable incomes are based on incomes is only on a theoretical basis; in most cases, hospitals' administrators adjust the personnel appropriation expenditure by taking not only their own financial capability as a reference but also that of hospitals in the same city and at the same level. During the reform, governments' promise to raise staff's salary also increases hospitals' financial pressure, and public hospitals' system determines that once staff's salary is raised, it will be termed as the fixed salary; under such a case, the salary will not drop even if hospitals' profitability decreases (Zan et al., 2017).

Based on the above analysis, two pieces of logic are shown as follows:

1. The performance payment mode of item incentives for doctors effectively increases hospitals' gross incomes but after the payment mode of medical insurance is transformed from fee for services into cased-based payment, the phenomenon that the more services hospitals provide, the more they lose will appear. As a result, the combination of performance payment mode for doctors with medical insurance payment for hospitals is the only simple but effective way.

2. In the face of reform, hospitals will be confronted with such challenges as fine management, increased management costs and high personnel expenditure; even under such a case, hospitals still need to transform from extensive management into fine management that is based on the reform of payment logic, and to optimize management procedures to effectively optimize costs and improve performance.

1.2.5 The exploration of governmental financial compensation for public hospitals

In the new round of medical reform, public hospitals grew wildly. In these years, something that is not prohibited by laws is recognized as permissible and even though it is prohibited, one may engage in them if others so do. As a result, once there are certain documents or decrees of prohibition introduced based on discipline inspection and supervision or other civil and criminal laws and regulations, a hasty reform will be promoted, which throws related administrators into prison. Jokingly, the post of a director of public hospitals is deemed as high-risk job.

Based on the difficulties in the reform of public hospitals, the public is more likely to

reach a consensus on the following aspects: the macro environment such as systems, payment system and system of financial support. Some experts even believe that if the problems related to the macro environment fail to be addressed, it is a fruitless approach to carry out reform in the internal departments in hospitals. But the author does not think so. Honestly, the problem related to the macro environment is a reason for the dilemma and if we do not effectively solve the problems related to internal management in the micro level, it will constantly raise the administrative costs in the reform and further increase medical expenses. For example, we have devoted more financial support to the reform of public hospitals in recent years, and the data of medical and health financial expenditure from 2009 to 2014 shows that a total amount of four trillion yuan has been allocated, for which the financial expenditure for the central government account 1.2 trillion yuan (Zan et al., 2017). Take Beijing as an example: in strengthening governmental financial compensation for the reform of public hospitals, Beijing adopted a policy that the equipment whose value exceeds 50,000 yuan in municipal public hospitals will be paid by Beijing Municipal Bureau of Finance; five years later, data shows that the total debts increased by two times compared with that of 2009 and the asset liability ratio grew by 16%; in the items of performance evaluation enjoying Beijing municipal medical financial funds in recent years, it is found that "occupied budgets" and "soft constraint on budgets" are prominent in the budget enforcement of the financial expenditure; in fact, however, the availability of this expenditure has not been improved and related experts in Institute of Economics of Chinese Academy of Social Sciences have developed some arguments on the phenomena of "more loss for more financial compensation" (Zan et al., 2017). Such a phenomena can be found in the investment of fixed assets, besides, in terms of compensation for personnel expenditure, such expenditure in the public hospitals is not correlated to the operating capability of hospitals; on the contrary, the more compensation there is, it is more likely to fail to raise the working enthusiasm of medical staff and to improve hospitals' operating situation. These public hospitals are associate organizations as they belong to the same municipal hospital system in Beijing. And therefore, it is inevitable to put the same amount of financial expenditure into the compensation for personnel expenditure in the same system, which raises the financial budgets. However, the increase of expense has nothing to do with improvement of internal management and of operating efficiency (Zan et al., 2017).

The author's opinion is that: if the governance order of internal environment fails to be established and improved, the external governance will not contribute to the improvement of the quality, efficiency and effect of the clinical frontline. Hospitals' expense is a key part in

the whole medical reform; hospitals' quality is the stop to maintain one's dignity; and hospitals' governance is the toughest issue to be addressed in the reform. We need to try to transmit the macro medical reform policies to the whole final clinical process and realize the dream of building a satisfactory medical system the rest of our life. Then hospitals' micro governance is believed to be the most valuable mission.

During the reform of China's public hospitals, we need to focus on the current difficulties in these hospitals and figure out effective ways to deal with a series of problems, such as the information asymmetry between "administrative power" and "business power", invalid restriction of business power, low level of standardization in clinical medical behaviors, simple interest incentives, redundancy in administrative and logistic departments, extensive management functions and manpower shortages in normative management.

1.2.6 "Induced demand" challenges to the reform of public hospitals

In conclusion, public hospitals are the main providers of medical services and the concentrated contradiction point of some problems in the reform of public hospitals; such problems as "expensive medical services, difficulties in medical insurance, hospitals' hardships, patients' grievances, entanglement of government, helplessness of the market and information asymmetry" (Zhao, 2015), is resulted from the distribution system of "interest conflict between doctors and patients" and the design mode of incentive-based salary raises the induced medical demands.

The reforms of public hospitals and new changes in the medical industry in recent years have forced public hospitals to carry out internal reform. The internal operating mechanism, which belongs to hospitals' micro management, should give full play to the creativity of hospitals and directors based on the consistent goals and responsibility and rights. We should set clear objectives in the reform, break the original systems, have the courage to bring forth new ideas, make active efforts to reform the hospitals' internal decision and implementation systems, management system, human resource management system and salary distribution system, fully arouse the enthusiasm of hospitals' staff, strengthen hospitals' sustainable development, coordinate internal and external environment in hospitals and promote hospitals' development in a better and faster manner.

With the further development in the internal reform of public hospitals, the establishment of a scientific, improved and effective performance assessment and distribution system has always been one of the important aspects in the reform of public hospitals in China. In this

stage, it has become a burning question for hospitals' administrators to find a set of integrated solutions that not only meet the requirements of macro policies of the reform of performance and distribution system and help to improve hospitals' regional competitiveness but also do not cause strong and long-term management turbulence.

Based on the open ideas such as the research on the status quo of the reform of public hospitals, the breakthrough point in the medical reform is to establish a win-win relationship between doctors and patients and the key to straighten out difficulties in the reform lies in the coordination of doctor-patient interests.

Fundamentally, the performance of public hospitals is based on the design of interest systems, which further promote the effective strategic management, goal management, quality management, and the realization of win-win relationships among the interests of medical work, patients' interests, and the interests of medical insurance, especially because that doctors' interests are closely related to the quality of patients' diagnosis and treatment. Under the performance mode of workload-based salary, there is no further solution for the current problems in the clinical management, such as zero diagnosis case, non-standard diagnosis and poor home page of medical records.

Great importance has been attached to the accuracy of home page of medical records and the public has realized the importance of the quality of medical records. But the author believes that, based on the status quo of China's hospital administration, the performance management should transform doctor-patient positive interests into grass-root interests, correlate doctors' interests with their workloads, the grade and severity of patients' diseases, and transform doctors' interest incentives from simple economic interests into the combination of technologies, workloads and job difficulty. Only in this way can we raise the accuracy of home page of medical records and the rationality of medical records. Based on the quality of patients' diagnosis, job quality and the assessment of job difficulty, we should establish systems for medical management and control and transform the hospital administration from the traditional management into a modern one.

For sure, there is inherent information asymmetry between doctors and patients in the medical services. How to avoid new medical ethic problems resulting from excessive incentives? For example, patients' interests may be damaged because of excessive medical treatment due to technologies and job difficulties. This remains a tough management issue in the promotion of performance-based payment in the deepening reform of medical insurance payment system.

1.3 Relation between medical insurance payment and hospital performance

The medical expense payment system involves changes in medical behavior, the choice of payment methods, the scope of payment, how to pay and whom to pay, which affects the behavior of various organizations and individuals in the medical service system. The medical payment system is the most important system in medical service transactions. In hospital management, medical payment system is related to various aspects from economic operation to quality management, including revenue composition, core system implementation, especially performance system design. Therefore, to explore the governance logic of hospital management, we must start with research on medical payment system.

1.3.1 Medical payment system

The standard of the academia to determine whether a health policy is good comes from the *Getting Health Reform Right* published in 2004. Robert (2004) believes that a good health policy system needs to regulate five aspects: financing, payment, organization, regulation, and behavior. These five aspects are interrelated and synergistic, and directly affect the efficiency, quality and accessibility of the health system, which in turn affects performance goals such as health status, resident satisfaction, and risk avoidance.

In medical services, payment specifically refers to the method of compensating health insurance service providers, and the payment method is based on the incentive effect corresponding to the payment method (Cashin et al., 2014). Therefore, the internationally accepted definition of and research on P4P (Pay for Performance) has also been formed. The OECD report pointed out that the health system of any country pays providers through a certain combination of payments. Different payment methods have different incentive focuses and incentive intensity. Therefore, here comes the definition of P4P: through adjustment of payment methods of medical service providers, P4P identifies specific incentive measures and indicators to promote the medical service providers' pursuit of quality and other health system performance goals (OECD, 2010).

Unlike other countries, in China, the medical service payment system specifically refers to the medical insurance payment system. The payers are the National Healthcare Security Administration (the provincial healthcare security bureaus) and the payees are hospitals (Yang, 2012). In some countries such as the United States, P4P is not only payment of the country to hospitals, but often some private sectors or institutions carry out p4p projects, and

the payees also include doctors. For example, the first large-scale private sector P4P program in the United States was initiated by the California Healthcare Association in 2003 and is still ongoing (Cashin et al., 2014).

1.3.1.1 Medical insurance payment methods

As mentioned earlier, different forms of payment mechanisms can exert different incentive and restrictive effects on medical institutions. There are two methods according to the execution time of medical payment. 1) The payment that is determined before the provision of medical services is called prospective payment; 2) The payment that is determined after the provision of medical services is called retrospective payment (Chang et al., 2008).

The purpose of formulating a payment system as the payer is to control medical expenses. To be specific, the prospective payment method is considered as the main means of medical expenses control. The intensity of prospective payment is greater than that of retrospective payment.

1.3.1.2 Prospective payment: global budget

To study prospective payment, it is necessary to figure out how to determine the total amount of prospective payment. In China, the global budget formulates the annual fund expenditure budget in a scientific manner based on the payment and financing of medical insurance funds in the region in recent years, in combination with the number of insured persons, changes in age structure and disease spectrum, as well as policy adjustments, treatment levels, and various expenditure risks. To sum it up simply, it means “determine expenditure by revenue, balance revenues and expenditures, with a slight surplus” (Chen, 1998).

Specifically, the total amount of expenses in the Service Agreement of Medical Insurance Designated Institutions signed by the hospitals can be expressed by a formula: specific total prospective payment index = base * (1 + growth rate). The base refers to the annual medical insurance fund payment volume of the share year; the growth rate is based on factors such as hospital level, category, service scope, and service volume, including some city-wide total medical insurance fund volume and the proportion of outpatients and hospitalizations. In summary, the budget fund quota is calculated based on the hospital’s medical insurance expenses in the past three years, development trend (expense growth), new technology development and increase in beds. From this perspective, the consideration elements of the budget fund quota form a new incentive: higher investment in fixed assets to increase the development of new technologies, higher cost development trends and bed increase trends, in

order to win higher growth. As a result, the unspoken rule of playing a higher share of the total budget with an appropriate amount of losses has also led to the lack of active motivation for cost control by medical institutions. They are worried that the cost will be controlled. It seemed to benefit that year, and some of the surplus may be retained (in reality, the hospital does not have the full confidence to believe in the medical insurance department, and there is great uncertainty for the hospital to retain the possible balance), which brings the risk of a reduction in the total budget for the next year (X. Zhang & Xiao, 2014).

1.3.1.3 Prospective payment: capitation, DRGs, and DRGs-PPS

In addition to global budget, prospective prepayment also includes the fixed "bundled payment". The fixed payment means that the medical insurance adopts a fixed payment to the medical institutions according to capitation, disease, diagnosis-related groups, and total amount. Under the bundled prospective payment logic, the profit logic of medical institutions has to change from the original "increasing revenue line" to "reducing cost line" to ensure that the organizational benefits are maximized.

The first thing that medical institutions must do to reduce costs is to prevent medical staff from inducing demand to provide unnecessary services; that is, to curb moral hazard. Under the logic of the prospective payment system, it is inevitable that medical institutions choose to automatically reduce unnecessary medical services. Unnecessary medical services are no longer "income-generating" items but "cost". Therefore, in the management of medical insurance, the payment supervision of medical insurance institutions has changed from "preventing medical institutions from providing unnecessary medical services for the purpose of generating revenue" to 'preventing medical institutions from reducing necessary medical services for the purpose of reducing medical costs". If excessive medical treatment is an extreme caused by "exaggerated cure for minor illnesses", then "careless cure for minor illnesses" is the other extreme that may be brought about by the prospective payment system. The bottom line of medical cost control is medical quality, and cost control at the expense of medical quality is a risk that the prospective payment system must prevent.

Diagnosis Related Groups Prospective Payment System, or DRGs-PPS, is currently the most aggressive medical expense payment system promoted in China. DRGs use the principles of statistical control theory to classify inpatients to determine the payment quota according to the diagnosis related groups. Grouping is based on the patient's age, gender, length of stay in hospital, disease diagnosis, surgery, disease severity, comorbidities, complications, and disease prognosis to divide the disease into several groups, and each group

has a reasonable quota standard. DRG is highly recognized internationally. The challenges encountered at the actual implementation level are: 1) problems in diagnosis quality; 2) problems in informatization and data standardization; 3) problems in commodity price.

Excluding these challenges at the implementation level, the DRGs-PPS will also bring risks to the hospital finances. In the medical payment mechanism, more prospective elements mean greater economic risk of the payment mechanism transferred to the hospital. As for retrospective payment system, the greater the risk of the payment institution, the lower the financial risk of the hospital. If the global budget model is considered, the financial risk of the hospital will reach the maximum.

The reason why the DRGs-PPS payment gains popularity in China is that it theoretically achieves a balance between payment institutions and hospitals. The complexity of medical services is extremely high. Medical expense payment institutions have the power to pay expenses and controlling financial risks are their core function, but it is difficult to establish good monitoring and management of the quality and process of medical services that incur expenses. Thanks to the DRGs-PPS, the payment institutions (medical insurance administrative) transfer the responsibility of controlling expenses to the hospital. The communication mechanism established between the hospital and the medical insurance administration is to use statistical rules to form fixed bundled price after the clinical diagnosis and treatment services are standardized by the hospital. In simple terms, communication mechanism between hospital and the medical insurance administration has become the number of DRG groups, the number of cases in each group, and the price of each group. In this way, information symmetry can be realized between the hospital and medical insurance administration, so as to establish a balance between them. However, in the real scenario, as a provider of medical services, the hospital must undergo greater financial risks due to the uncertainty of the return of bonuses.

1.3.1.4 Retrospective payment

The retrospective payment system means that after the occurrence of medical services, the payment institutions conduct settlement and payment in a retrospective manner. The retrospective payment system basically appeared in the initial stage of the third-party payment of medical expenses (also called medical insurance). As the basic data is not yet mastered, the fee for service method is adopted. In this process, other payments and settlements are gradually studied and explored.

The retrospective payment system is related to fee for service and flat rate. Fee for service

has been implemented in China for a long time, and some places still retain this settlement mode. Fee for service refers to payment according to service item and quantity provided by the medical institution. Although the settlement is convenient and simple, the project incentives formed by it tend to promote the rapid rise of medical expenses and are difficult to control, thereby pushing up the financial risks of medical insurance institutions. Flat rate refers to payment according to the pre-defined average outpatient expenses or hospitalization expenses. The calculation standard is between fee for service and DRGs. The average payment standard is calculated by random inspecting a certain percentage of outpatient prescriptions and inpatient medical records and deducting unreasonable medical expenses. Although flat rate has a certain effect on the control of medical expenses, the establishment of the quota standard is too simple, which is not scientific. The random inspection process also lacks standards and cannot guarantee the quality and quantity of random inspections.

There is almost no prospective component in fee for service. Even in places where the government enforces strict price control, there is only certain prospective component of the price of service items, and the economic risk borne by medical institutions is basically zero. In the absence of medical quality supervision, medical institutions cannot avoid inducing an increase in the service volume to make profits. Prospective component in flat rate is generally the average cost of outpatients and hospitalizations. Medical institutions can make profits by saving the cost of average cost per time and increasing the volume of services. However, this payment mode can easily trigger medical institutions to select patients and refuse to receive severely ill patients, and the supervision and management of medical insurance institutions cannot bring about the connotative development of medical institutions. Therefore, it is inevitable that the retrospective payment system will gradually withdraw from the historical stage during the implementation, but it will still exist in the settlement and payment of a small number of disciplines and outpatient medical services under the premise of controlled proportion.

However, it is argued by some experts that due to the limitations of medicine itself and the uncertainty of treatment results, it is difficult to standardize medical output, and it is difficult to measure and verify treatment results, which makes it difficult to adopt payment based on treatment results. The high cost has given birth to a variety of payment methods such as capitation DRGs. Although there are many drawbacks in fee for service, under the precondition of medical limitations and treatment uncertainty, there is a living soil for fee for service (Lv, 2009).

1.3.2 Internal performance payment system

The performance payment of hospitals includes two levels. One is external performance payment. At present, it is limited to medical insurance payment in China, and the performance appraisal result data of public hospitals hosted by the state is not included in the payment; the other level refers specifically to internal performance payment, namely, payment of performance bonuses to hospital departments. The performance accounting of the hospital is divided into two levels, and the performance payment of the business departments (clinical departments and medical laboratories) is based on the performance down payment of the department, and the accounting method is the department's total income minus the total expenditure. Part of the net income goes into the general account of the hospital, and the remaining part goes to the department, which is distributed by the director of the departments (usually business departments). Part of the bonus of the general account is used to pay for the bonus distribution of non-business departments and auxiliary departments (logistics departments and administrative departments). This part of the bonus distribution is based on the position, rank, and professional title. The other part is left in the hospital to become the development fund. Internal performance payment usually belongs to the bonus part of hospital staff's income. In addition to bonus, it also includes basic salary and job allowances; among them, the bonus part is related to the "output value" of medical staff. In public hospitals, external payments, that is, changes in medical insurance payment policies, directly affect the effectiveness of the "output value" of medical staff. The biggest risk lies in the departmental income composed of doctors' output value, but it does not mean that this part of "output value" can be recognized by the medical expense payment institution and paid in full to become the hospital's income.

Therefore, the accounting logic conflict between the external payment system and the internal performance payment will be the challenge faced by the hospital's internal management transformation.

1.3.3 Impact of "third-party power" on doctors' "output value"

The reason for discussing the doctors' output value is that one of the important factors of the output value of doctors is related to the income of the hospital. In addition, doctors' output value is also the source of their performance (bonus).

In the medical service market, when sick, patients have medical needs to purchase medical services to restore their health. According to the assumption of economics rationality

patients will make their best to review and master all available information when purchasing medical services, so as to ensure the maximization of purchase benefits. However, because medical information has extremely high knowledge barriers, it is not easy for patients to obtain sufficient information to support their purchase decisions on medical service choices. Therefore, doctors with medical expertise appear, and doctors provide services while choosing services for patients. If the doctor meets the assumption of "rational economic man", he will naturally choose services with marginal benefits greater than marginal costs. As an employee in a hospital organization, when the performance management requirements in the hospital organization management overlap with the doctor's natural selection, it becomes inevitable for doctors to choose services for patients based on their own interests and the needs of the hospital. This behavior is also called "supplier-induced demand".

The complexity professional barriers of the role of doctor makes it very difficult to control the doctor's "inducing demand". It is not possible to simply rely on patients' satisfaction with doctors, as the satisfaction can only remain on the surface level of service attitude, and it is basically impossible to form judgments at the medical professional level. Even if patients have an inducing demand for doctors in the provision of medical services, and they express dissatisfaction, they lack effective communication channels, and in order to ensure the reliability of communication, patients need to collect doctors' medical records. Only when they meet the above conditions, is it possible to form a "reputation mechanism" game, so that others no longer choose the doctor's services; the whole process is full of high cost, high uncertainty, and information asymmetry, so it becomes difficult to form intervention control for doctor-induced demand.

In China, the National Healthcare Security Administration, as a third-party payment institution, is the payer of medical expenses and regulator of medical behaviors. The prerequisite for its payment of medical expenses is a high degree of prevention of capital risks and cost control, thus becoming the most important medical service authority in China. The introduction of third-party compulsory control authority to the medical market has great advantages: 1) Through the collection of electronic medical record data, it saves the cost of patients collecting medical records of doctors; 2) Compulsory authority increases the opportunity cost for medical institutions and doctors to induce demand, and payment deductions or additional penalties can be used for whose who induce demands. Even so, the problem of "difficult to discover after the event" caused by the high barriers to medical services is still not completely resolved, which explains from the other hand why the reform of the payment system has become more and more stringent in the management of the

medical process, and why payment has developed step by step from fee for service, capitation, pay per bed per day, to pay per disease, DRGs, and DIP.

Therefore, only when the essential attributes of the third-party compulsory authority of medical insurance are recognized, is it possible to establish a pre-judgment based on the effectiveness of the doctor output value" under the logic of medical insurance supervision.

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1.4 Research problem and dilemma

Under the background of the new medical reform, distribution of the balance of payments for public hospital doctors' salary affects the medical safety of patients, making clinical medical behaviors deviate from standard diagnosis and treatment. At the same time, as the medical insurance payment system shifts from fee for service to fee for result, and from retrospective payment to prospective payment, the doctors' salary accounting methods based on payment surplus intensify the uncertainty of doctors' medical behavior and increase the financial risk of hospitals.

The method of accounting for doctors' salary based on payment surplus has become a shackle that restricts the development of public hospitals. From the perspective of patient results, a new performance salary accounting method that balances medical insurance benefits, hospital benefits, and doctors' labor value benefits is the main research content of this project.

The expected objectives of this research are as follows.

1) Explore the impact of a performance accounting method for doctors within the hospital,

to different stakeholders, namely doctors, and patients;

2) Study the relationship between doctors' interests and medical quality.

1.5 Research method and process

1.5.1 Literature review

The literature research method is also called information research, data research or literature investigation. It refers to the method of searching, collecting, identifying, sorting out, and analyzing literature materials to form a scientific understanding of facts. The main function of the literature research method is to select data suitable for the research from a large amount of literature and conduct appropriate analysis to summarize the problems. Therefore, the literature research method is not only mere collection of data, but also analysis of the data (Du, 2013).

1.5.2 Case study

Case study is a significant form in the research of social science, which is commonly used by researchers in social science (Yin, 2012). Generally, case study consists of a set of complete procedures that is necessary in studying cases, including designing case study, collecting research data, analyzing data, composing and reporting the research results (Yin, 2012). All case studies clearly start from the identical purpose, which is to pursue an approach or a deeper understanding of one or a couple of cases in real life of the researchers. Case study is an empirical research based on the actual conditions, especially when there is no clear boundary between the phenomena and the actual case (Yin, 2012). Case study focuses on the present phenomena. The theoretical foundation on the methods of case study is two literatures composed by Dr. Yin, namely, Case Study Research: Design and Method, and Applications of Case Study Research.

Differences between case study and other research methods: (1) The key difference between case study and experimental method is whether the environment is controllable. Studies with experimental method will purposefully separate the phenomena from the general social backgrounds. For example, by controlling the environment set in the laboratory, the study will focus on a minority of variables. (2) The difference between case study and historical research is that the research objects live in different stages of history. Studies with historical research will focus in the past and relevant information along with events cannot be

acquired through direct interviews and observation (Yin, 2012).

1.5.3 Delphi method

The Delphi method, also known as the expert consultation method, was first implemented by the American RAND Corporation in 1946. It is essentially a feedback anonymous inquiry method. The general process is to obtain expert opinions on the problem to be predicted, analyze the feedback and get a consensus. The Delphi method is a process of collective anonymous thought exchange in the form of correspondence. The advantage of anonymity is that it can eliminate the influence of authority, which is also an important feature of the method (Liu et al., 2011).

1.5.4 Key informant interview

Since our goal is not to conduct extensive primary research, the research objects we select are domestic experienced performance managers or hospital managers who provide us with good direction and guidance based on their knowledge and experience. In addition, based on research needs, interviews with stakeholders are also very important to help us have a more comprehensive understanding of performance management related issues.

1.5.5 AHP analytic hierarchy process

Analytic Hierarchy Process (AHP) is a systematic and hierarchical analysis method that combines qualitative and quantitative analysis. The characteristic of this method is that on the basis of in-depth research on the nature, influencing factors and internal relationships of complex decision-making problems, it uses less quantitative information to mathematicise the thinking process of decision-making, so as to provide simple decision-making methods to solve complex decision-making problems with multiple objectives and multiple criteria or problems with no structural characteristics. It is a model and method for making decisions on complex systems that are difficult to quantify (Cheng, 2016).

According to the nature of the problem and the overall goal to be achieved, the Analytic Hierarchy Process decomposes the problem into different constituent factors and combines the factors at different levels according to the interrelationship between the factors and the affiliation relationship. A multi-level analysis structure model is formed, so that the problem is ultimately reduced to the determination of the relative importance weight or the arrangement of the relative order of superiority and inferiority of the lowest level (criteria, and alternatives

for decision-making) relative to the highest level (overall objective).

1.6 Research framework and contents

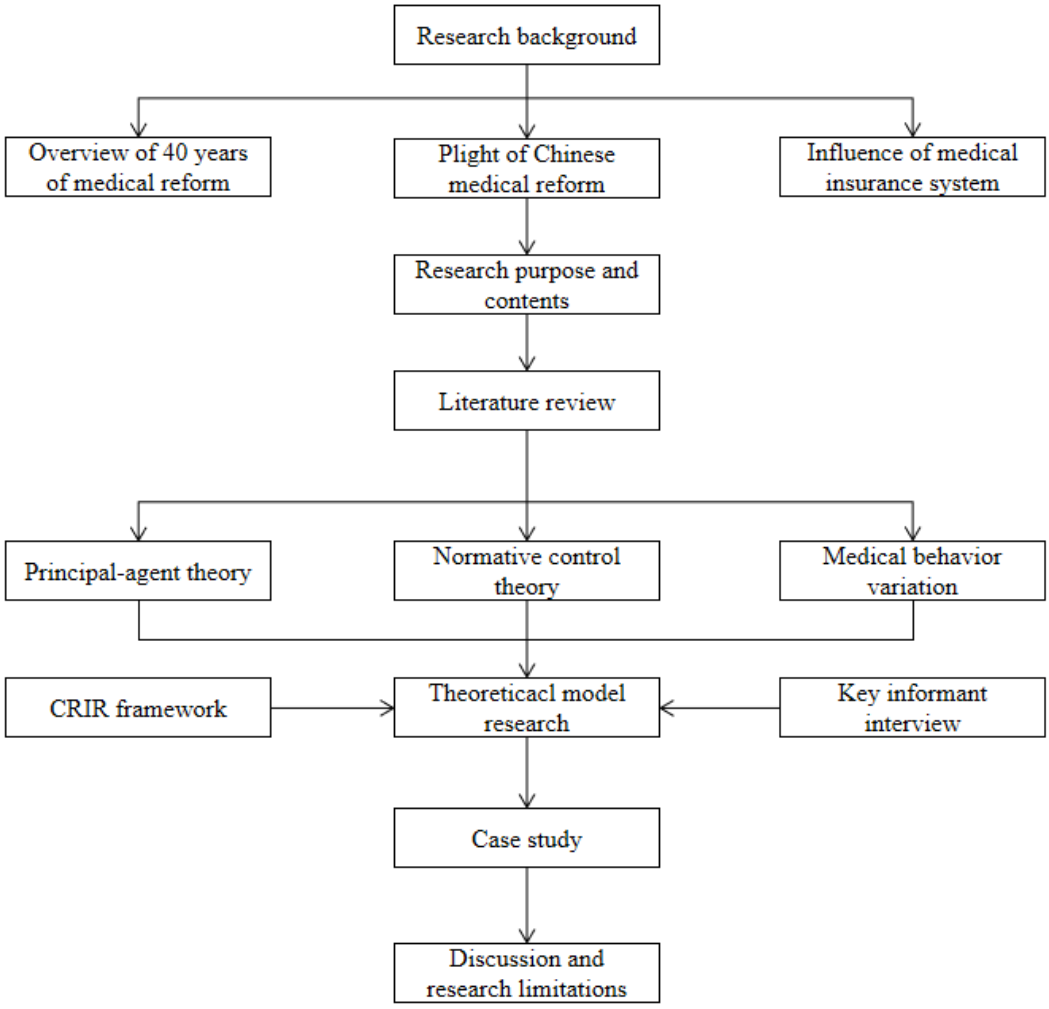


Figure 1.1 Research framework and contents

This thesis is composed of five chapters. In addition to the introduction of the reform background and significance in Chapter One, there are literature review, theoretical framework research and conceptual model design, practical process presented based on the case hospitals, discussion and prospects. The specific contents are as follows.

Chapter 1 Introduction: This chapter mainly discusses the reform background and significance. We sorted out the plight of the reform and development of public hospitals in China as well as the impact of the new medical reform policies on public hospitals. A systematic elaboration is given on the background and relevance of this research, and the research contents and framework are presented.

Chapter 2 Literature Review: This chapter presents the key theories addressed in this

study: principal-agent theory, including principal-agent relationship, transaction costs, and asymmetric information theory, relevant research on medical behavior variation, and normative control theory.

This chapter studies the theories, international debate, and some research practice cases related to incentive management. First, the theoretical literature review includes Taylor's scientific management theory, incentive theory, and principal-agent theory. Second, international experience includes relevant theories, concepts, frameworks, and international experience of payment performance. Finally, the loss of management and value of balance are reflected.

Chapter 3 Construction of Doctor Performance-based Payment Conceptual Model: This chapter analyzes the experience and dilemmas of performance management in Chinese public hospitals based on the CFIR research framework. Through key informant interview, the challenges and limitations faced by public hospitals in the real-life scenario of performance allocation is analyzed. This chapter integrates normative control theory and Donabedian's structure-process-outcome framework, designs the "Public Hospital Innovative Performance Payment-Normative Control Model", and identifies the key elements of the model at different levels. The focus is on the design of the incentive structure.

Chapter 4 Case Study: Taking the case of LL hospital, this part presents the whole practicing process of "Public Hospital Innovative Performance Payment—Normative Control Model", from the control model, to the definition and measurement of organizational goals. The incentive structure design and implementation process, and the data changes and data effects of the three-year operation are also presented. A questionnaire is used to investigate the effect of the incentive model of "effective service patient-times" throughout the hospital. In addition, we also present the data changes after application in three different hospitals. We investigate the formation of induced demands caused by incentive distribution in Chinese public hospitals.

Chapter Five Discussion and Limitations of Research: This chapter reviews the research process, sorts out the theoretical research, empirical literature research and conceptual model building process, summarizes the research results, and discusses the research limitations

Chapter 2: Literature Review

Based on the problem of doctor salary incentive dilemma, this chapter takes the view of Arrow (Cheng, 2016) that medical management is the most notorious model in the principal-agent theory as an entry, reviews principal-agent theory, incentive theory, as well as the domestic and foreign doctors' salary incentive systems for reference, hoping to provide a theoretical basis for the study of salary payment model in public hospitals.

2.1 Principal-agent theory

Agency Theory is a significant component of the theories of modern enterprises, which is first proposed in the *Theory of the firm: managerial behavior, agency cost and ownership structure* coauthored by Michael C. Jensen and William H. Meckling in 1976. In their book, Jensen and Meckling constructed a basic framework of agency theory to analyze the administration of the enterprise and proposed the Agency Cost Theory (Blomberg Jensen & Meckling, 1976). The authors defined the agent relationship as a kind of contrast, which later developed into the contracting cost theory. The contracting cost theory assumes that enterprises consist of a series of contracts, including the contractual relationships between the capital providers (shareholders and creditors) and capital managers (administrators), enterprises and suppliers, enterprises and customers, and enterprises and employees (Liu & Liu, 2000).

2.1.1 Principal-agent relationship

Agency theory mainly concerns the contractual relationship between the suppliers and the users of the enterprise resources. Under this contract, one (or more) individual(s), the principal(s), employ(s) other(s), the agents to perform some services on behalf of the former, the principal(s), including entrusting several decision-making powers to the latter, the agent(s). According to the agency theory, the owners of economic resources are principal(s) and the manager responsible to use and administrate these resources are agent(s) (Yu & Guan, 2005). Moreover, the agency theory believes that when administrators own the enterprise resources, they are entitled to all the residual claims. Therefore, the administrators will strive for themselves. Under such circumstances, there is no need to concern for the agent problems.

However, when administrators try to attract new external economic resources by issuing shares, they will have the impulse to increase perquisite consumption, relax themselves, and relieve their working stress. Apparently, if the administrator of the enterprise is a rational agent, he will act apparently differently compared with the time when he owns all the shares of the enterprise. If the enterprise borrows capital instead of issuing shares, the problem of agency remains in a slightly different manifestation. Under some conditions, to stop the administrators from breaking the rules of shareholders, administrators will pay earnest money to ensure that shareholders should be compensated. Therefore，in most agency relationships, principals and agents pay for supervisory costs and earnest money respectively. In addition, there are some differences between the decisions of the administrators and the decisions optimizing the benefits of the shareholders, which are considered as a residual loss. Therefore, proposed by Jenson and Meckling, the problem of agency occurs. They divided agency costs into supervisory cost, contracting cost, and residual loss (Blomberg Jensen & Meckling, 1976). To be more specific, supervisory cost refers to the expenditures spent by outside shareholders to prevent administrators from excessive consumption or lingering over their work. Contrasting cost is the cost of self-restraint of the agents to gain the trusts of the outsider shareholders (such as reporting to principals regularly on business conditions and employing external independent audits). Residual loss represents other losses occur when the benefits of principals and agents do not correspond with each other.

Generally, principal-agent relationship occurs in the following four conditions: (1) the separation of ownership and control powers (2) uncertainty and investment diversification (3) the asymmetry of benefits and information between principals and agents in organizations (4) bounded rationality and limits of individual competence (Yu & Guan, 2005).

2.1.2 Transaction costs

Transaction Costs refer to costs related to the transaction producing before and after the deal when closing a deal, which was proposed by R. H. Coase, winner of Nobel Memorial Prize in Economic Sciences in 1937 in his pioneering paper, The Nature of the Firm (Coase, 2010). In his paper, Coase stated that transaction cost is produced by organized value mechanisms. He also proposed that the most explicit costs are all the costs of finding relative prices, costs of negotiating and signing a contract in every transaction in the market, and other costs using price mechanisms (Coase, 2010) . The core concern of transaction cost theory is to interpret the nature of a firm.

Coase proposed the concept of transaction costs and Oliver Williamson, winner of the 2009 Nobel Memorial Prize in Economic Sciences systematically developed the concept. In 1975, Williamson categorized the transaction cost into searching cost, information cost, bargain cost, decision-making cost, cost to monitor the transaction, and default cost. In 1985, Williamson further improved his categories and divided transaction costs into ex ante costs (ink costs, negotiation costs, and enforcing contract costs), ex post costs (costs producing because of the inconsistency between the contract and the actual transaction), bargain cost, and bonding cost (Williamson, 1995) . In 1979, Dahlman categorized transaction and stated that transaction costs include cost of information search, cost of coordination and decision-making, contracting cost, monitoring cost, implementation cost, and transformation cost. In other words, Dahlman pointed out that transaction costs include costs caused by searching for information, negotiating terms, and implementing the contract in the transaction (Peng & Song, 2006).

Based on the theory of Coase, Williamson further conducted the analysis of the factors deciding transaction costs. He believes that transaction costs come from market failures which are influenced by the interaction between human factors and trading environment factors. To be more specific, there are the following six main reasons for producing transaction costs:

1. Bounded rationality. Limited by physical and mental conditions, intelligence, and emotions, individuals participating in the transaction will be limited by seeking for benefit maximization. In other words, the motivation of people's economic activities tends to be goal-directed and rational. However, the rationality in these activities is limited within certain conditions. Therefore, Williamson regarded the subjective rationality of the bounded rationality as the motivation to minimize transaction costs.

2. Opportunism. Williamson clearly pointed out that the core conception in the research of transaction costs is the opportunism behavior, which is especially essential in the economic activities dealing with exclusive human capitals and material capitals. Opportunism refers to the inappropriate methods which people use to gain benefits apart from optimizing their personal interests in the transaction, such as easily changing to adjust the circumstances, seizing every opportunity to gain advantage by trickery, providing uncertain information strategically and purposefully, and exerting pressure by using others' unfavorable situations. Meanwhile, opportunism will raise doubt and distrust, which will increase the supervisory costs in the transaction and reduce economic efficiency.

3. Uncertainty and complexity. These two reasons explain the bargain costs producing when adding extra contracts in the transaction when the two counter parties take the future

uncertainty and complexity into the contracts, which raises the difficulties of the transaction. These uncertainties include the uncertainty caused by accidents that can only be roughly assumed or even cannot be assumed before the transaction, the uncertainty caused by the information asymmetry between the two counter parties, and the uncertainty that the assumed costs of the problem are too unaffordable in the contract.

4. Small trade, special trade, and the trading partners have been reduced or the market has been controlled by the minority because of information heterogeneity or inaccessible resources, which causes the failure in market operation.

5. Information asymmetry. The two counter parties possess different information, plus the uncertainty in the market and opportunism pursuing self-interest, which makes the early comers of the market benefit from their more information, forming small trade.

6. Atmosphere. If the two counter parties are against and distrust each other, they cannot achieve a transaction that both parties are satisfied with. Therefore, the transaction will pay over attention to the superficial procedures, which increases the difficulties and costs of the transaction.

In 1991, Williamson described transaction and measured transaction costs by asset specificity, transaction rate, and uncertainty. He also introduced comparative economic organization, or the analysis of discrete structural alternative (Williamson, 1995), which gradually develops transaction costs into a conception that can be confirmed or falsified. In addition, based on the conception of transaction costs, Williamson developed transaction cost economics (TCE), which is a new school on economic system that has been widely tested with experience. The basic logic of Williamson's TCE theory is to take a transaction as the basic unit of analysis and every transaction is regarded as a contract. Because of the bounded rationality of individuals, it is impossible for people to predict future accidents and conclude a written treaty confirmed by a third party without disputes. Therefore, it is natural for contract to be imperfect. All parties within the contracts have the tendency of opportunism and all of them will adopt various strategies to gain their own profits. Therefore, it is unavoidable that both parties of the contract will constantly renegotiate and adapt to the developing transaction since there will be situations of refusing cooperation, disorder, or expensive costs that endangers the contract relationship. Williamson believes that to support the valuable long-term contract, there should be an administration structure to implant orders, shift conflicts, and realize the mutual benefits of the two parties after signing the contract. Moreover, transactions or contracts with different natures should correspond with administration structure of various characters. The best administration structure is the one that can save the

most transaction costs before and after the transaction (Williamson, 1995, 2004).

2.1.3 Asymmetric information theory

As one of the main contents in contract theory of institutional economics, principal-agent theory mainly studies principal-agent relationship, in which one or more subjects, based on an explicit or implicit contract to appoint or employ other subjects to serve them and the former give certain decision-making powers to the latter. Moreover, the former will pay the latter based on the number and quality of the services provided by the latter. Therefore, the grantor is regarded as the principal and the grantee is considered as the agent (Sun, 2001).

The agent theory is developed based on the asymmetric information game theory. Information asymmetry means that some participants possess information that other participants do not possess. The information asymmetry can be divided by the time and content of the asymmetry. To subdivide the time type, asymmetry can be categorized as the one happens before signing the contract and the one happens after. Model of ex ante information asymmetry game is called adverse selection model while the model of ex post model is named as moral hazard model. To subdivide the content type, model of information asymmetry referring to the hidden behavior of some participants is called hidden action model while the model of information asymmetry studying the hidden knowledge of some participants is named as hidden knowledge model. Among these models, adverse selection models, adverse selection model and moral hazard model is more focused in the research of principal-agent relationship.

(1) Adverse Selection Model

In 1970, Goorge Akerlof published the most important groundbreaking paper in information economics, The Market for “Lemons”: Quality Uncertainty and the Market Mechanism (Kurlat, 2013). By explaining the process of transaction in the used car market, he interpreted the analytical value of general economics. In the transaction of used cars, adverse selection comes from the asymmetric information about the quality of the cars between the buyers and the sellers. Sellers know the real quality of the car while the buyers do not. Therefore, sellers will sell the used cars at the prices of the best quality. However, buyers are no fools. Although he does not know much about the real quality of the used cars, he knows the average quality of the cars. Therefore, he will offer the moderate price of the cars with the average quality. Gradually, used cars with high quality, which is better than the moderate quality, will quit the market. Eventually, the market of used cars is filled with cars of low

quality, which results in extreme cases that no cars will be sold. The volume of transaction is smaller than the actual balance. This process is summarized into adverse selection model (Kurlat, 2013).

Therefore, the basic meaning of adverse selection is:

With information asymmetry, the market operation may be inefficient. Although buyers are willing to buy cars of good quality at a high price, market, the invisible hand will not send these good cars to the buyers who need them. With market regulation, the economic theory does not work anymore, which indicates that supply and demand will satisfy both needs of the buyers and the sellers with a negotiated price.

This market failure has the features of adverse selection, that is to say, only defective products are left in the market, which is called as Bad Money Drives Out Good. However, the traditional competition in the market should be survival of the fittest, which is to select the superior and eliminate the inferior.

Goorge Akerlof changed our analytical perspective with adverse selection theory. The information asymmetry between the two counter parties with one party hides information, which results in bad money drives out of good, even paralyzing the market (DeMarzo, 2004).

(2) Moral hazard model

Moral hazard model is one of the key contents in the research of principal-agent theory. Moral hazard, also known as moral crisis, is often caused by information asymmetry. Possessing asymmetric information, first party of the contract (usually the agent) conduct invisible or hidden action or inaction from the second party of the contract (usually the principal), which causes the principal to lose or the agent to benefit. The research on moral hazard started in the insurance industry (Wang, 2000).

Generally, there are three following characteristics of moral hazard model. (1) Risks begin with economic agents consider and weigh their benefits and costs. The model is endogenous. (2) The profit-directed risk makers tend to fall into the temptation of interest. The model is tractive. (3) The risk returns of the risk makers are grabbed from the unfavorable party in information asymmetry improperly. The model is harming others to benefit oneself.

2.1.4 Application of principal-agent theory in doctors' incentive

Since 1973 when Rose first proposed the concept of principal-agent, the principal-agent theory has gone through a series of development. With the rapid development of economy and technology, principal-agent theory has been continuously developed in management practice,

and a principal-agent analysis framework has taken shape. Lafont divides private information of the agent into the following categories. From the perspective of the principal, 1) moral hazard (MH) or hidden action (HA) arising from the unobservable behavior of the agent), 2) private information owned by the agent that the principal cannot know, that is, adverse selection (AS) or hidden information (HI). From the perspective of result management after the event, there is no third party, for example an authority, that can observe the information in addition to the principal and the agent, which is also known as the phenomenon of unverifiable information ex-post (Lafont, 2002).

Zheng et al. conducted a systematic analysis of private information hidden action (HA) and hidden information (HI) from the perspective of agents who experienced information asymmetry. In addition, they systematically studied HA and HI information asymmetry according to the timing problem, thereby summarizing the main analysis framework of principal-agent problems (Zheng et al., 2013).

In medical services, the relationship between doctors and patients is a typical representation of the principal-agent theory. Medical services are different from other ordinary services and commodity services, since doctors are the irreplaceable and unique providers of medical services. What services provided by the doctors and how they provide these services determine the quality and efficiency of medical services, as well as the patient's health and the performance level of the medical service system, and even the total healthcare cost of the country. The professional behavior of doctors does not exist in isolation, and it is connected to the survival goals and needs of the individual. Even if affected by industry norms and policies, the medical service provided by the doctors has intricate relationships and behavioral influence mechanisms behind it. It plays a series of guiding, motivating, and restraining effects on doctors' behavior, and interventions on doctors' behavior are also full of uncertainty and complexity (Sun et al., 2018).

The core of the principal-agent theory lies in how to establish an incentive and restraint mechanism. With information asymmetry as the center, the agent can protect the interests of the principal as much as possible while realizing the maximization of his own interests, so as to ensure the consistency of the goals of the agent and the principal. In addition, the principal must have the enthusiasm to fully supervise the agent, so that the normal operation of the principal-agent relationship can carry on. The key to the principal's defense against the agent lies in how to define the scope of the agent's powers, responsibilities and interests, that is, it is either monitoring of the agent's behavior, or the effective control of the agent based on the behavioral outcome. The incentive and restraint mechanism of doctors in medical services

results in continuous game between concealment and defense, and between induced demand and restriction of induced demand.

The medical service itself is full of uncertainty. The uncertainty of treatment behavior and the uncertainty of treatment results are one of the most fundamental characteristics of the medical field (Arrow, 1978). Although doctors have the motivation to induce demand, they also can induce demand, and there is a "safe haven" for inducing demand, but doctors inducing patient demand will bring spiritual costs. The level of induced demand mainly depends on the price of treatment, the potential benefits, and the degree of difference in medical knowledge between doctors and patients, but the mental cost of doctors is a key factor that limits the emergence of induced demand. For example, induced demand may cause doctors Get the bad reputation of "over-medical treatment and over-prescribing". This price limits the amount of induction demand for doctors. In consideration of reputation, doctors will consciously limit induction demand. When the marginal benefit of induction demand equals the marginal cost, induce demand Reach the optimal level (Lv & Xue, 2008).

From the perspective of medical services, there is a huge information asymmetry between doctors and patients in the provision of medical services by doctors. In addition to the information asymmetry brought about by strong medical expertise, there is also information asymmetry brought by the huge uncertainty of the disease itself. The expectations of medical service providers are completely different from expectations of providers of other commodity services in general. On the one hand, consumers in medical services cannot achieve a product-like experience, and they cannot establish a good element of trust before consumption. Consumers cannot make theoretical judgment on the professionalism of service providers and the valence of medical decision-making. On the other hand, we cannot, like other in commercial services, require doctors to blindly please clients for good service experience. The society expects that the value of doctors is to convey the correct information, and morally speaking, the restrictions on the behavior of doctors are much higher than that of barbers. 1) There are basically no fully disclosed prices and advertisements among doctors. 2) The doctor’s further treatment recommendations for himself or others are completely correct. 3) The doctor must at least express that the treatment plan is determined by the patient’s objective condition and is not restricted by economic factors; the doctor is considered to be an expert who proves the existence of diseases and injuries (Arrow, 1978).

2.2 The normative-control theory

Henry Mintzberg proposed five models as for how should government be managed in Managing Government, Governing Management (Arrow, 1978), namely, the government-as-machine model, the government-as-network model, the performance-control model, the virtual-government model, and the normative-control model, as Table 2.1.

Mintzberg argued that there is no one best mode, but he did strongly recommend the normative-control model. Especially, he believed that the Japanese experience can show that the significance of spirit to mankind is irreplaceable. He stated that an organization without dedication is the same as an individual without a soul, who is lifeless although the skeleton, muscle, and blood may survive the basic body metabolism.

Control is normative - that is, rooted in values and beliefs. The motto of the normative model might be select, socialize, and judge. None of the above models has succeeded in structuring social authority adequately. Perhaps that is because social authority is hardly about structures. Exemplifying a different concept of the world, the normative-control model is not about systems but about soul. The normative-control model includes five key elements of "people are chosen by values and attitudes; insurance of a membership dedicated to an integrated social system; guidance by accepted principles; all members share responsibility; performance is judged by experienced people". It is attitudes that count, not numbers. Service and dedication muted the negative effects of bureaucracy.

The key of normative-control model is the proposition of dedication which occurs in two directions: by and for the providers of the service. The model allows for radically different microstructures: more missionary, egalitarian, and energized; less machinelike and less hierarchical.

Table 2.1 Comparison of governance models

Government Type	Motto	Features	Strengths	Weaknesses
Government-as-machine model	Control	Government is viewed as a machine dominated by rules, regulations, and standards of all kinds. Government takes on the form of a hologram: Examine any one piece and it looks just like the rest.	It offered consistency in policy and reliability in execution.	It lacked flexibility and responsiveness to individual initiative.
Government-as-network model	Connect, communicate and	This is the opposite of the machine model: loose instead of tight.	Work is organized around	The network model is also holographic in that the parts

	collaborate	Government is viewed as an intertwined system, a complex network of temporary relationships fashioned to work out problems.	projects in a swift and efficient manner.	function like the whole.
Performance-control model	Isolate, assign and measure	This model aims above all to make government more like business. The overall organization is split into "businesses" that are assigned performance targets for which their managers are held accountable. So the superstructure plans and controls while the microstructures execute.	The performance model decentralizes in order to centralize.	It is nothing more than the same old machine management-new labs on the old bottles.
Virtual-government model	Privatize, contract, and negotiate	In virtual government's perfect world, the microstructures would no longer exist within government. All that kind of work would take place in the private sector.	Perfect world	The model represents the great experiment of economists who have never had to manage anything.
Normative-control model	Select, socialize, and judge	Five key elements: Selection. People are chosen by values and attitudes rather than just credentials. Socialization. This elements ensures a membership dedicated to an integrated social system. Guidance. Guidance is by accepted principles rather than by imposed plans, by visions rather than by targets. Responsibility. All members share responsibility. Judgment. Performance is judged by experienced people, including recipients of the service.	Two-direction dedication. More missionary, egalitarian, and energized; less machine-like and less hierarchical, muted bureaucracy.	It is attitudes that count, not numbers.

Mintzberg believes that this conclusion applies especially to client-oriented professional services, such as health care and education, which can never be better than the people who

deliver them. It is necessary to free professionals from both the direct controls of government bureaucracy and the narrow pressures of market competition.

In his article, Mintzberg emphasized and recommended the value of balance. Managers should be concerned with the impact of balancing benefits of different institutions and political system and balancing the benefits of the institutions and personal interests. It should also be constantly focused to satisfy individual demands, cherish individual health, build a balance among personal interests, benefits of the institutions, and social benefits, and structure a balance of benefits among various stakeholders (Mintzberg, 1996b).

2.3 Medical behavior variation and correlation research

2.3.1 Medical behavior variation

Coupled with factor of doctor incentive, medical services have become more complex. Wennberg (1975)proposed the concept of variation in the delivery of healthcare. He believed that the occurrence of variation is related to the doctor's choice of treatment options, including difference in the perception of the effectiveness of treatment or doctor's opinion of health care demands. In some cases, the difference of opinions may be related to the different speed of dissemination of new knowledge in medical practice. Although the remunerations of the surgeons are probably the same, which are dependent on the time using the operating room, but it should be considered as for whether the economic factors exist or not. Jae-Young (2004)argues that the different ways for hospitals to pay salaries for the doctors have different effects on doctors' medical behaviors. Woodward and Warren-Boulton (1984) believe that the decision on the provision of appropriate amount of diagnosis and treatment service, that is, the right and medically appropriate amount of care provided by the doctor to the patient, is related to the doctor's leisure time. Doctors with longer leisure time can provide more effective medical services to patients.

The contradiction caused by the incentive of doctors has become a hot research issue in hospital management. The incentive pays given by hospitals to doctors is defined as various manifestations of currency and welfare that employees obtain from the hospital for providing labor and technical services (Hua et al., 2014).

The compensation system includes fixed income, time earnings and output income. The salary design of doctors includes the fixed salary system, service patient time-based salary system, service-item-based salary system (Jae-Young, 2004), salary system based on amount

of management personnel, salary system based on diagnosis related groups, and resource-based relative value salary system (Cui, 2008). Output-based income can provide doctors with incentives, thereby prompting doctors to bring more care to each patient than the "appropriate" amount, while fixed and time-based incomes can cause doctors to provide "inappropriate" amount of care (Woodward & Warren-Boulton, 1984). If the doctor is paid based on a fixed salary and service patient times, his medical expenses will be lower than the medical standard. If the doctor is paid based on service items, he may provide services that exceed the medical standard (Jae-Young, 2004). Cui (2008) believes that in addition to fixed salary and in-hospital rewards, the compensation of doctors in public hospitals also includes gray income, including kickback and red envelopes given by patients. This method of remuneration leads to the induced demands and excessive health care of doctors, the insurance fraud behavior caused by the joint fraud of doctors and patients, and other behaviors such as hints and inducements to obtain gray income. Korean scholar Jae-Young (2004) contends that in addition to the impact on doctor's medical behaviors, bonuses bring about a sharp rise in national medical expenses. Even if the government studies various schemes to control unnecessary medical services to stabilize sharp rise in medical expenses, as long as the doctor's bonus from economic inducement does not change, the service providers are still relatively active to do so. Jae-Young also pointed out the problem of patient opinion collection. The opinions or satisfaction of patients presented on paper are completely different from the opinions and feelings of patients in actual medical services.

Hua et al. (2014) used a level 3A hospital in Beijing as a case to study the effect of doctors' bonus on their medical behaviors and reached the following conclusions. (1) bonus plays a decisive role in behavior, because the basic salary is often relatively fixed, and the degree of education and professional title are almost the same, with no plenty of room for growth, but the fluctuation of bonus is relatively large, which is related to labor, that is, bonus is related to the workload of doctors or their income generation, so bonus has a huge incentive effect and plays a decisive role in doctor's behavior. (2) The bonus system has brought about a motivational effect for doctors. Under the incentives based on the number of patient admissions, efficiency incentives have been significantly changed. For example, the average hospital stay for appendicitis has been shortened from 7 days to 3 days, but the professionalism and quality have not been affected. However, if severely ill patients stay in the hospital for too long, doctors will adopt a balanced approach by admitting mildly ill patients. For example, admitting patients for inpatient physical examination is a common method in the department, and it is not ruled out that some doctors will use the method of

induced demands to encourage patients with mild illness to be admitted to the hospital for physical examination. (3) The use of drugs is not encouraged. In response to the country's drug control policies, hospitals often do not include the income of drugs in the doctor's bonus calculation, and hospitals also use control indicators such as the proportion of drug expenses to the whole expenditure to control the doctor's use of drugs, which solves the problem of excessive drug use to a certain extent. (4) The phenomenon of accelerating the turnover of patients is common. The accelerated turnover of patients here is not the discharge of patients out of medical needs. In this case, the patients are not discharged, and doctors use artificial discharge to turn 1 patient into 2 patients. (5) The evaluation effect of patient satisfaction is not obvious. Patient satisfaction deviates greatly from the actual situation, and doctors generally do not pay attention to the results of patient satisfaction. Patient satisfaction is considered to be a formality and cannot bring substantial influence on the doctor's bonus. From the perspective of the impact of bonus on medical behavior, the stronger the economic incentives provided to medical staff, the greater the possibility of providing unnecessary services, and the cost of motivating doctors to improve their work efficiency is likely to be a decline in service quality;

Therefore, in the face of medical services full of uncertainty, doctors inevitably have much more information about the consequences and possibilities of treatment than patients (Arrow, 1978). What needs to be done to reduce moral hazard as much as possible is not to use monetary rewards to achieve incentives, although people increasingly like to use economic incentives to improve the quality of medical care, there is no actual evidence proving that economic incentives bring about the improvement of medical quality (Christianson et al., 2008). The establishment of the incentive mechanism can be explored from two aspects: establishing the consistency of the interests between doctors and patients and promoting the symmetry of information between patients and doctors.

2.3.2 Influence of financial incentive on medical behavior

Marshall (2005) believes that only by understanding the impact of financial incentives on the internal driving force of health professionals can we maximize quality improvement.

Among them noteworthy concepts are the crowding-out effect and medical behavior variation. Wennberg (1975) proposed the concept of "medical behavior variation" and argues that medical behavior variation is related to the doctor's choice of treatment options, including the doctor's different cognition of treatment effect and health care needs, and

difference of doctors' cognition or treatment opinions may be related to their medical practice foundation, the speed of dissemination of new knowledge, and learning ability (Woodward & Warren-Boulton, 1984).

From observational studies, it is found that doctors' salary payment methods are related to specific clinical behavior patterns. Compared with doctors who get paid by capitation, doctors who get paid by fee for service prescribe more examinations and treatment items. The "crowding out" effect of incentive measures on medical behavior has not received attention. First, there is no linear relationship between the size of the incentive and its impact. In fact, there is some evidence that doctors may have a target income—perhaps a fixed sense of financial value—to which they are no longer motivated to respond once their actual income exceeds the target. Second, it seems that the economic component of financial-based incentive programs does not seem to motivate professionals.

In a local improvement project in the UK, it was touted as a "successful" example of motivating quality improvement. Some common practices involved in implementing a more effective chronic disease management system cost more than the financial return. This did not seem to curb the enthusiasm of the participants. Similarly, in a study conducted in Ireland, incentives to change prescription behavior were as effective in dispensing practice (there is an offsetting incentive to dispense expensive drugs) as in non-dispensing practice. The above examples show that it is not just personal financial interests that promote professional behavior.

When trying to explain this abnormal evidence, researchers often tend to focus on confounding variables, such as the doctor's age and gender, their previous experience with incentives and payment methods, the type and severity of incentives, activity volume and location and type of exercise. All these factors seem to be important, but together they do not explain the unpredictable and variable effects that have been observed. A more convincing explanation may lie in the relationship between external incentives such as material rewards and the internal "moral" motivations of health professionals (Marshall, 2005).

Frank defines moral motivation as a force that encourages people to do the right thing, even if it is not related to or even contrary to their interests. For example, medical staff who double their care for patients without considering financial returns. Evidence for the potential of external incentives to influence internal motivations, and ignorance of the influence of moral motivations can be found in the literature of economics, social psychology, and organizational sociology.

From an economic point of view, Frey described it as “crowding out”. The psychological process behind this phenomenon can be explained in two ways. First, external incentives may damage self-determination, leading to the transfer of control points and the loss of professional autonomy. Second, external drivers may damage self-esteem and cause professionalism to be no longer valued. When external incentives are related to perceived regulatory activities and are managed in a bureaucratic manner by people unknown to the incentive recipients, crowding out seems more obvious. In contrast, if people feel that they “own” these incentives, then they can play a role in enhancing intrinsic motivation (“crowding in” effect). Compared with creative tasks, more mechanical tasks seem unlikely to be crowded out.

From the perspective of social psychology, there is ample evidence proving that “crowding out” is a real phenomenon. For more than half a century, the literature of organizational sociology has recognized that incentives to rule-dominated behavior may lead to “objective replacement”. In this case, following rules becomes a means to achieve goals beyond the intentions of system designers. The current emphasis on the replacement of trust and moral motivation brought about by “management” of the performance of health and social care professionals also confirms the existence of “crowding out”.

Financial incentives will undoubtedly continue to play an important role in the tool arsenal for improving the quality of healthcare. However, only when we understand the impact of financial incentives on the internal drivers of health professionals, will their contribution be maximized. In this regard, the people who designed the incentive plan have some obvious results. If financial incentives are owned by the target audience and aligned with the professional values of that audience, it seems likely to be more effective. But over-bureaucratic plans may also be more likely to undermine professional motivations, and incentives should focus more on the technical aspects rather than the uncertain aspects of professional practice.

In addition, there is still many things unknown to us as for how to best use incentives to change the behavior of health professionals. In particular, we must have a deeper understanding of the relationship between motivating and non-motivating professional work. The new British GP contract provides a good example. On the one hand, incentives for a single chronic disease routine treatment indicator (consistent with the profession itself) do make sense in the context of evidence. On the other hand, as more and more people in the GP are motivated, the risk of crowding out of motivation to perform non-motivating more complex or simple nursing tasks seems to increase. This is a policy area that really needs

high-quality evidence to support.

Only when we understand their impact on the internal driving factors of health professionals, will the contribution of financial incentives to quality improvement be maximized, and the meaning of financial incentives is to stimulate the enthusiasm of medical staff through financial incentives to improve the quality of medical care, so as to ensure that the ideal services can be purchased from health professionals and beneficial results can be brought to patients.

Nantha (2013) explores the four dimensions of non-financial incentives, positive emotional state, organizational culture and prescription quality from the perspective of intrinsic motivation in the context of increasing medical burdens, aiming to change the behavior of doctors and promote the quality of medical services. Nantha believes that strengthening intrinsic motivation is insufficient as a measure to address the low morale of doctors, thereby exacerbating negative effects such as job dissatisfaction, decreased quality of care and poor doctor-patient relationship. The weakening of positive emotions among doctors is controlled by intrinsic motivation, which leads to strained communication between doctors and patients and a decline in the quality of care. The barriers of restricting autonomy and full authorization in the organizational culture of medical institutions directly undermine job satisfaction; getting rid of the traditional tangible financial and material rewards is crucial, and a more comprehensive approach should be found through research on how to improve intrinsic motivation., so as to formulate relevant policies to meet the current medical service needs.

2.4 Theories relevant to resource allocation

2.4.1 Principle of optimal allocation

According to Mao (1986), the principle of optimal allocation is an optimization concept derived from mathematical programming theory. The basic problem of mathematical norms is to find the value of each independent variable under a series of constraints, so that the objective function can reach the maximum or minimum. The optimal allocation method further interprets the key elements in the Lagrange Multiplier Method. When each independent variable interacts with micro-adjustments under the constraints, the marginal gains and losses for the target are offset. If increasing an independent variable makes the marginal benefit of the target exceed the marginal loss of the target due to the decrease of

another independent variable (this is necessary to meet the constraints), it means that the target can still be improved, and the optimal solution has not been reached. Therefore, the optimal solution can only be achieved when the marginal gains and losses are offset.

$$\begin{cases} maxG(x1, x2, \cdots x_n) = \sum_{i=1}^{n} g(x_i) \\ S \cdot t \sum_{i=1}^{n} x_i = X \\ x_i \geq 0 (i = 1, 2 \cdots, n) \end{cases} \quad \text{.....(2.1)}$$

The condition for satisfying the optimal allocation is that the resources allocated by each sector have the same marginal output; in a society with currency as the means of circulation, the condition for the optimal allocation of resources is the equilibrium of supply and demand, and the optimal allocation is the basis of microeconomics (Mao, 2008).

He (1988) believes that the principle of optimal allocation is an unproven idea. Starting from the Lagrange multiplier, the optimal point of various resource utilization is not that the marginal output of the input resource is equal to zero, but that there should be the same marginal output for the same resource when being used in different condition s. In the formula (1), the total output is not constrained by the total demand, the maximum value will either produce a surplus of commodities or deformed development, and the linear relationship between the total resources and the total output is inappropriate. That is to say, using the same resource with the same marginal output in different production processes in order to achieve the optimal resource allocation is not the result of the programming solution in the optimization technology, but a necessary condition for the programming to proceed. It is not the optimal state of the process itself, but the premise of manpower when the conditional extremum finds the optimal state. It is not the internal relationship of the Lagrange multiplier method to solve the conditional extremum, but the introduction of human factors into the programming problem to ensure the use of the Lagrange method. That is, it is not mathematics that is intended to prove results for economics, but rather that economics makes use of mathematical methods and exerts limits on them.

The limitation of resources and the optimal allocation of resources to maximize the benefit is the satisfactory result of the economic dynamic pursuit, and the most important factor to achieve the best effect is the marginal utility. According to the famous inference of the Hahn-Banaeh theorem, the distribution control of resources should be compressed as much as possible, and for the relevant resources, critical control can be provided on a large scale. More importantly, to achieve the goal in the shortest time, the optimal economic control

resource allocation is the only condition (He, 1988).

However, the resource allocation of public hospitals in China, to a large extent, ignores the basic principle of limited resources, especially the drawbacks of the internal resource allocation model in large public hospitals, which are profit-orientation and extensiveness. The profit-seeking internal resource allocation model of the public hospital brings continuous incentives for service volume and service income, so that internal resource allocation aims at profiteering, and prioritized allocation of medical items with high economic benefits, and low allocation of medical items with low economic benefits. As a result, it not only leads to insufficient not-for-profit nature of public hospitals, resulting in "expensive medical treatment", but also leads to excessive cross-configuration of public hospitals in terms of service items and functions because of profit-seeking, resulting in the inefficiency of the overall resource utilization in the health care system (S. Y. Zhang et al., 2014). As a result, the phenomenon of low efficiency in primary-level public hospitals in China has taken shape. Therefore, we should strengthen the refined management of hospitals and rethink the allocation of resources. Yan and Dong (2005) collected and analyzed the input and output data of 58 secondary and tertiary hospitals in Wuhan, and concluded that these hospitals have large specifications, technical scale and low efficiency, and the scale efficiency of these hospitals ranked from best to worst is: level 3A hospitals > level 2B hospitals > level 2A hospitals > level 3B hospitals. Specifically, among the 58 hospitals participating in the evaluation, 12 hospitals have achieved the optimal output in terms of personnel, housing area and business expenditure, and the output value has been fully utilized. However, the overall efficiency level of 14 hospitals is lower than 50%, which has a big gap compared with the overall efficient hospitals; 32 of the 58 hospitals have diminishing efficiency, and the output growth rate is lower than the input growth speed, which is manifested by large hospital scale but low production capacity. Wu et al. (2015) conducted a relative efficiency analysis of 29 county-level comprehensive public hospitals in Fujian Province, among which, 14 had unchanged returns to scale, 10 had increasing returns to scale, and 5 had diminishing returns to scale. X. T. Zhang et al. (2021) analyzed the diminishing returns to scale of the People's Hospital of Yixing in Jiangsu Province over the three years after its implementation of reform. The reason was that the returns to scale of the hospital decreased due to the expansion of the hospital scale. After timely adjustment, the diminishing returns to scale disappeared. The suggestion was that hospitals should rely on the environment to activate their own power to improve quality and efficiency, pay attention to internal governance, and ensure the effective use of resources. Li et al. (2021) measured and studied the resource efficiency of 141 sample

hospitals in three provinces, of which 41 were in a state of decreasing scale efficiency. Further research revealed that the GDP per capita, the bed utilization rate, the average length of stay in the hospital, and the average cost per outpatient visit had a significant impact on the cost efficiency of the sample hospitals. The technical efficiency affected the cost efficiency, and continuous improvement of the internal management level is the main and necessary approach to improve the technical efficiency.

Accompanying the low efficiency is the rapid expansion of public hospitals. Public hospitals at all levels continue to increase their investment in fixed assets, especially the expansion of houses and the purchase of high-yield equipment, thus driving the asset-liability ratio of public hospitals to continue to rise. Although it seems that the total assets and economic scale of the hospital are also increasing, the operating costs and risks of the hospital increase accordingly, which brings about the rapid growth of medical expenses, the excessively rapid growth of patient expenses, and heavier financial burden for patients. The social hazard and moral hazards of the hospital will gradually lead to the systemic risk of the industry (W. X. Yang et al., 2007).

In the operation of public hospitals, one of the most important resources is hospital bed resources. Based on the hospital bed resources, the work efficiency control index of each clinical department is considered as the control factor, and the average hospitalization days and bed utilization rate of each department are constrained and calculated in a standardized manner. Based on hospital beds, we carry out the coordinated allocation of related resources, so as to meet the needs of patients, so that the limited medical resources can be fully utilized and reasonably invested, and the annual business goals of the hospital can be made on a regular basis (W. X. Yang et al., 2007).

To solve the problem faced in achieving high-quality operation of public hospitals, the important value lies in controlling resource allocation, rather than blindly valuing high utilization rate. We should seek the result of minimum resource consumption and optimal allocation under the estimated business volume of market demand, so as to achieve “the same marginal product of the same resource in the same period in different productions”, and achieve the optimal balance of marginal utility.

2.4.2 DEA resource allocation evaluation method

Is more use of medical services better? Is higher efficiency better? Such issues have caused scholars to continue to reflect and discuss. DEA has become an important tool for efficiency

analysis in medical institutions around the world.

DEA (Data Envelopment Analysis), which has attracted the attention of the global academic community, is a comprehensive evaluation based on relative efficiency proposed by the famous operational research scientists Charnes and Cooper of the University of Texas, USA. It comprehensively evaluates the relative effectiveness of units of the same type (decision-making units) according to multi-indicator input and multi-indicator output (Färe, 1984).

Clement et al. (2008) used the DEA model to study discharge data from 10 US states to construct hospital quality indicators, and the data were from the Agency for Healthcare Research and Quality (AHRQ) and the Healthcare Cost and Utilization Project State Inpatient Database (HCUPSID), of which HCUP SID is the largest fully paid, unified, and state-based inpatient management data collection agency in the United States. The data is not collected by experts for quality assessment, but only for the collection and statistics of discharge data. The data variables include patient demographic data, including age, gender, expected source of payment, and patient care information (for example, principal diagnosis and treatment, secondary diagnosis and treatment, treatment process, and length of stay). Through the data, they jointly evaluate desirable patient output data (for example, patient hospitalization) and concurrent undesired outcomes (for example, patient mortality after risk adjustment). Through two different sets of assumptions, they use the DEA approach to take multiple quality indicators as the output. The findings show that low technical efficiency is associated with poor risk survey quality outcomes, and they agree that low quality outcomes lead to high costs.

O'Neill et al. (2008) developed the first classification technique for research on efficiency with DEA and conducted a study of 79 efficiency-related classifications in 12 countries from 1984 to 2004. Compared with the United States, Europe is more inclined to measure distributional efficiency rather than technological efficiency. In Europe, health insurance pays for the inpatients according to the DRG, and the system was first implemented in the United States. The DRG payment system is grouped based on diagnosis, and the variables for grouping include principal diagnosis, age, gender, surgery or not and whether there are morbidities or not. In European studies, it was found that the use of DEA to measure DRG payment had an impact on technical efficiency. However, data of a study of 22 hospitals in Austria found no significant change in efficiency. Judging from the research in which DEA is used to measure healthcare efficiency, the external environment has an important impact on DEA development. The DEA classification method can serve as a new analytical tool for decision makers, affecting selection of the optimal method, selection of input and output

categories, and finally the result. The input settings directly affect the analysis results. Especially when the definition of input standards and output goals is unclear, further breakthroughs still need to be made in supporting management decision-making within the organization by DEA.

In China, the method of DEA has also been recognized by a large number of scholars. In the previous section, DEA analysis method has been used in public hospital resource allocation (Fang et al., 2013; M. Li et al., 2020; Wu et al., 2015; Yan & Dong, 2005; X. T. Zhang et al., 2021). D. Wang and Xin (2013) further reviewed the literature on the application of DEA model to evaluate the efficiency of medical institutions in China. The input indicators include the total number of employees, total annual expenditure, total fixed assets, and total number of beds, while the output indicators include annual business income, annual discharges (or total visits) and bed occupancy rate. The DEA model is widely used in evaluating the efficiency of medical institutions, but at the same time, the selection of indicators in the DEA model is not clearly defined, and the standards are not uniform. In the reference to foreign experience, statistics methods such as cluster analysis, correlation analysis and coefficient of variation analysis, are used to fully describe the dimensions of the scale, efficiency, benefit, or quality of medical institutions, so as to screen indicators. The selection of indicators is not scientific and highly subjective.

Based on the DEA method and the analysis by Chinese and foreign scholars, the common problem is that when DEA is used to conduct efficiency analysis, the design of input indicators has a significant impact on the overall analysis, while the unclear definition of input indicators and output indicators is a common problem. For the efficiency analysis of medical institutions, in the classification analysis of technical efficiency and resource efficiency, foreign scholars have more comprehensive consideration of the impact of quality control elements than Chinese scholars, while Chinese scholars are more concerned with efficiency and benefit, and they pay more attention to the relationship between production capacity and efficiency, and efficiency and efficiency, and of course, they also pay attention to the correlation between low quality and high cost.

2.5 Comment on literature

After reviewing literature, we find that the main task of principal-agent theory is to study how to design an optimal contract to motivate the agent and to find a balance between the contract of principal and agent under various complicated conflicts of interests and information

asymmetry to reach the ideal state that no party can gain fortune by harming the benefits of others, which is called the Pareto Optimality. In our research, we start from principal-agent theory and explore existing problems in the performance incentive system of public hospitals, including the management on the profit-oriented agent with favorable information asymmetry. Moreover, our theoretical reference on adverse selection model and moral hazard model will provide further elaborated research boundary for our research.

As an important part in agent theory, the theory of transaction costs fully explains that every implementation of management in the principal-agent relationship produces transaction costs. Meanwhile, Williamson believes that transaction costs come from the six factors in the interaction of human factors and trading environment factors, including bounded rationality, opportunism, uncertainty and complexity, small trade, information asymmetry, and atmosphere, which provides theoretical support for designing our system.

Eventually, Mintzberg stated his reflection on the loss of management in Managing Government, Governing Management and proposed that the balanced value can guide the design of performance management systems. Human will be the key in organizational management eventually. Therefore, beliefs and values planted inside people's minds will play a more important role apart from management, which is more essential in the management of a hospital (Mintzberg, 1996a).

The management system in modern hospitals is promoted by performance accountability, strengthening external regulation, and the growing fierce competition among hospitals. It is hard to copy a successful and effective management mode from other hospitals. The way to solve the problems of management is to constantly improve based on the problems and implement more regular management (Alexander & Lee, 2006).

Public hospitals play an important role in safeguarding the health of the people in China. In medical services, there are relatively complicated multi-layered principal-agent relationships among the government, hospitals, and patients. The first level of principal-agent relationship occurs in the relationship between government and hospital management. In medical relations, the second level of principal-agent relationship presents between patients and doctors. In the organization and management in hospitals, the third level of principal-agent relationship forms between hospitals and doctors. These relationships are filled with complicated information asymmetry and complex conflicts of interests. It is difficult for us to find a simple mode of performance for motivation with the principal-agent relationship among the government, hospitals, and patients. Therefore, we need to find a balance among

these relationships and avoid agents to take advantage of their favorable information asymmetry to pursue benefits by harming the interests of the principals.

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Chapter 3: Doctors Performance-based Payment Conceptual Model

3.1 CFIR research framework

The impact of performance-based payment on medical institutions is becoming increasingly clear. In China, hospitals design performance plan to stimulate doctors to improve their performance. However, formulating an equitable and effective plan is a complex task. When studying the performance plan design of public hospitals in China, we referred to the framework of CFIR used by Kondo et al. (2016) and their experience in the medical payment system, and formulated the following performance implementation conceptual framework model to establish the performance plan design for public hospitals in China.

As one of the most widely used framework of influencing factors, the Consolidated Framework for Implementation Research (CFIR) is a meta-theoretical framework compiled by Damschroder et al. (2009) through review of more than 500 practical research documents covering 13 disciplines to find and screen 19 theories or models applied by health service research centers involving communication, innovation, organizational change, implementation, knowledge transformation, and applied research. It contains published general theoretical structures for implementation, including the PARiH model (Promoting Action on Research Implementation in Health Service), the Ottawa Model of Research Use (OMRU), and the Stetler Model of Research Utilization. CFRI provides an overall typology. CFIR consists of five main areas: intervention characteristics, outer setting, inner setting, characteristics of individuals, and implementation process. 8 constructs related to intervention (for example, strength and quality of evidence), 4 constructs related to the outer setting (for example, patient needs and resources), 12 constructs related to the inner setting (for example, culture, leadership participation), 5 constructs related to characteristics of individuals, and 8 constructs related to process (for example, plan, evaluation, and reflection) are identified. And each construct has a clear definition (Damschroder et al., 2009).

CFIR provides a practical structure to deal with the complex, interactive, multi-layered, and transient state of the structure in the real world by including, integrating, and unifying key structures from published realization theories. It can be used to guide formative assessment

and build a knowledge base for implementation in multiple studies and environments. CFIR extracts, analyzes, summarizes and integrates many published implementation research theories, frameworks and models, and provides a comprehensive and practical theoretical framework for researchers to explore the influencing factors in the implementation of evidence, as Figure 3.1.

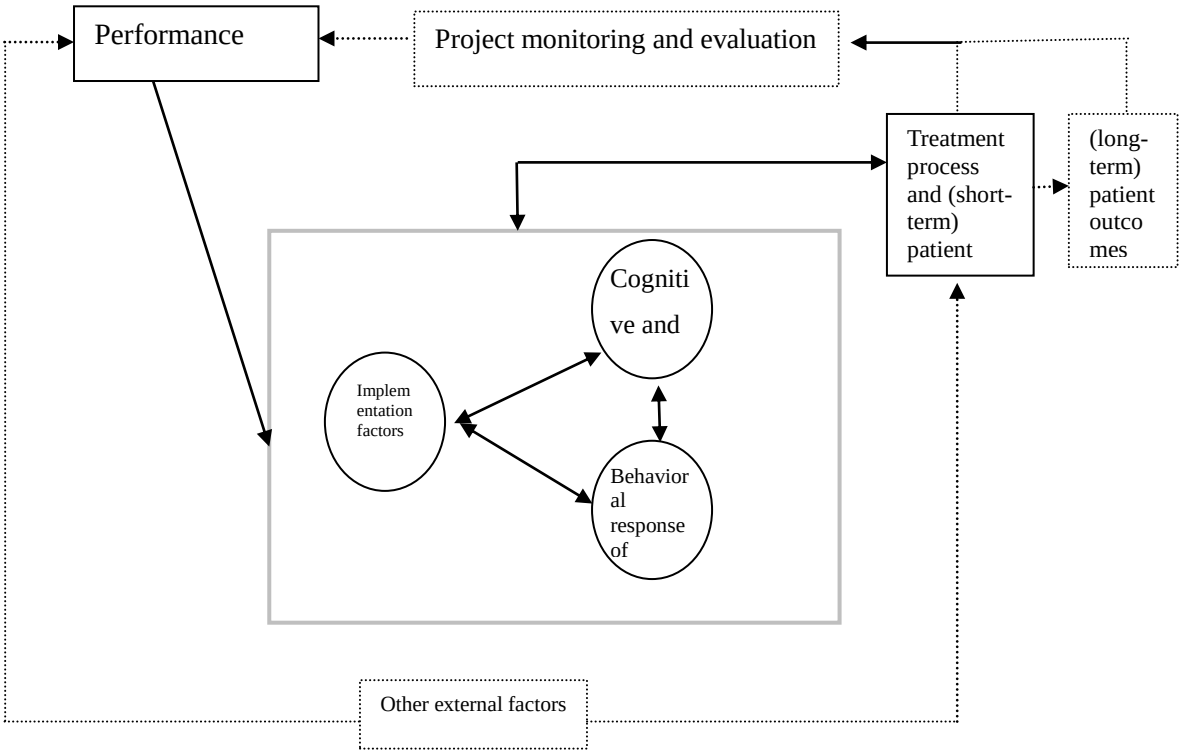


Figure 3.1 Conceptual framework model of performance implementation influence

3.1.1 Research method

Based on the CFIR framework, we describe the relationship between the characteristics of the performance plan, external factors, implementation factors, and the provider's perception of the treatment process and patient outcomes, emotional and behavioral responses, and then we describe the categories in the framework to conduct observational test and research, as Table 3.1.

Table 3.1 CFIR framework category description

Framework category	Description	
Program design function	Implementation process	Define attributes of intervention, for example, measure the types of quality or scale of financial motivation
Implementation factors	Outer setting	The actions taken to implement the performance plan, such as plans, stakeholder participation, academic details, audits and feedback, and whether the incentive object is a team or an individual Requirements of health policy documents at all levels to implement intervention measures, characteristics of patient groups, etc.
	Inner setting	Characteristics of the institution or organization itself
	Characteristics of individuals	Provider's demographic characteristics (such as age, gender, ethnicity), and other factors such as experience and profession
Cognitive, emotional and behavioral response of providers		The provider's beliefs and attitudes, including cognitive response structures, such as prejudice, professionalism, identification with organizational culture, and behavioral response structures: such as risk selection, gaming, and system improvement responses
Treatment process and the short-term outcomes of patients		Including the treatment and nursing process and outcomes, such as the examination prescribed by the doctor, the patient's outcomes, the patient's treatment goals and health outcomes

3.1.2 Research strategy

Based on the above framework, we conduct a literature study on the performance of Chinese public hospitals, with literature selected from the CNKI database. We design related keywords according to the CFIR framework and obtain the corresponding literature: Hospital Performance System Design, (164), Hospital Performance Implementation, (823), Hospital Bonus Design, (211), Doctor Bonus Design, (23), Doctor Performance Appraisal, (25), Hospital Performance Incentive, (81), Medical Insurance + Hospital Performance (318), with

a total of 1327 articles, including 468 academic dissertations. Considering that this research is based on practical research, academic dissertations are not included in this study. There are 540 journal articles, and based on these documents, we use the "best evidence rule" to guide the research design criteria. We extract data from research, including research design, sample size, project description, incentive structure, incentive goals, and outcome measurement.

Among the 1327 articles, 39 belonged to key research projects; among the invited persons, 14 participated in the interview (Please refer to Annex A for the interview outline).

3.1.3 Project design characteristics (13 studies)

We have determined the category research related to the project design. The third-party research perspective (Jiao, 2021; Su, 2021; Z. D. Wang & Guo, 2021) includes research on the performance management model design of public hospitals from the macro and policy levels, among which (Z. D. Wang & Guo, 2021) used a third-party consulting company to provide a performance consulting program for the hospital. The performance design of the hospital level is embodied in the establishment of a set of indicators system through tools to assess public hospitals. The tools used include balanced scorecards, RBRVS, and KPI. The hospital levels involved include secondary hospitals, tertiary hospitals, and ethnic hospitals. However, it does not reflect the difference in the establishment of index systems in performance design for hospital of different levels and categories; in the design of the performance appraisal system, departments in the hospital are classified by categories, and different types of departments have different evaluation indicators. The design dimensions of evaluation indicators include work quality, work efficiency, cost control, cost management, and patient satisfaction; in the performance distribution structure design, the first-level distribution is formed basically by the monthly two-level accounting of the hospital and the department, and the second-level distribution is carried out within the department. The hospital formulates a guidance plan, while the specific allocation is completed from the inside of the department. The difference in performance between departments is reflected in the evaluation of the difficulty coefficient of the department, and the difficulty coefficient is the result of scoring and expert weighting; the index completion results affect the distribution results of the accounting (Chen & Wang, 2021; Deng et al., 2020; Huang & Zhu, 2021; Jin et al., 2020; L. Yang et al., 2020; Xia et al., 2020; Zhou et al., 2015). In addition, it has also been proposed that in the performance design system of public hospitals, in view of the key role of the hospital director, his long-term incentive design should be emphasized; the basis of

the director's performance incentive mechanism is his responsibility taken in operating the hospital. Under the premise of maximizing the interests of the hospital owner, we should endeavor to meet the needs of the hospital and other stakeholders, so as to realize the comprehensive incentives of the director in economic benefits, career development, social reputation, power status and political promotion. The prerequisites for the implementation of the director's long-term incentive mechanism are to improve the corporate governance structure, clarify the responsibilities of the incentive subjects, straighten out the relationship between performance management stakeholders, and form an effective incentive and restraint mechanism to improve the motivation to perform decision-making and supervisory responsibilities (K. L. Wang et al., 2010).

Regarding the application of RBRVS (resource based relative value scale) method based on resource consumption in China, L. Yang and Ma (2020) conducted a systematic comparison and discussion. To be specific, in the practice of a hospital, the method of RBRVS is still based on the establishment of service item revenue, and then through the evaluation method, the difficulty and risk coefficient of the service item can be obtained to form a commission rate. That is, the value ratio of the non-monetary unit of RVS is still based on fee of medical services. The total annual RBRVS point value of the whole hospital = ∑ (single service item point value ◊ the number of the service item in the current year). The extraction of the point value of the service item depends on whether the hospital information system can support the accurate matching of the inspection item and the charging item. If there is strong information support, RBRVS can design RVS point value by calculating the doctor's bonus corresponding to each diagnosis and treatment item, so as to accurately benchmark the attending doctor and the operating doctor. In China, it is currently impossible to include physician ability, disease complexity, treatment results, and medical quality in the point design model. Unlike the United States where the labor pricing of doctors and the pricing of large-scale equipment inspections take into account the technical capabilities, labor volume, and risk levels of medical staff, in China, the reform of the doctor's compensation system cannot be related to the pricing of medical services. In other words, whether the service item point value method formed by the local application of RBRVS in China can serve as an incentive for doctors' behavior is still doubtful.

The main framework for discussing the bonus reform plan design directly from the perspective of the hospital is still the point value method with RBRVS. The performance calculation of the physician and technician is: work performance and the number of service items, the service item points and the point value (the point value here refers to the point and

currency exchange rate). In the service item design, the primary allocation accounting by the hospital and the guiding principle of secondary allocation by the department are reflected; the evaluation design has introduced the operation evaluation performance, and the key element of the operation performance evaluation is the proportion of controllable costs to medical income. To be specific, controllable costs mainly include the cost of consumables, equipment usage fees, house usage fees, equipment maintenance fees, sporadic maintenance fees, information maintenance fees, expendable drugs, water and electricity fees, telephone fees, laundry fees and photocopying fees that can be controlled by departments; the administrative and logistics departments are based on department coefficient and KPI assessment (Jiao, 2020). In this plan, the data source of the point value method is related to the charging items, and the point value design corresponds to each charging item, which is inconsistent with the conclusion mentioned by the author that this plan cuts off commission from the revenue.

Results of key informant interview: The informants emphasized that under the current system, the hospital performance design still does not jump out of the strong relevance of income accounting; the original accounting model of subtracting expenditure from the income has changed to the current commonly used point value method or RBRVS, in which the only available evidence supported is the list of charging items. However, there are phenomena of inconsistency between the charging items and the diagnosis and treatment items, as well as non-standard packaged items. Therefore, there is no sufficient evidence to reflect the technical difficulties or risks from the perspective of charging items, and performance accounting cannot be reflected from the perspective of quality outcomes. To extract the accounting data of RBRVS with the fee catalog is not as good as to extract the key clinical medical traces with key elements of the first page of medical record. The data on the first page of the medical record is more objective than the fee data. According to KIS, the design of the assessment system can reflect the priorities or strategic orientation of organizational management, and a visible and evidence-supported assessment management system should be established. They suggested that although it is important to consider the design of incentives, if there is no punishment mechanism, incentives will not have the desired effect and cannot play a demonstrative role. Therefore, the result of all undifferentiated incentives is the new egalitarianism. Incentives must be sufficient to strengthen behavior and the inevitable connection between incentives and results and achievements must be strengthened. In addition, team-based incentives are more effective than individual-based incentives to improve the team spirit and dedication of clinical and non-clinical personnel.

3.1.4 Implementation process: (10 studies)

Performance implementation runs through the entire performance cycle and is a continuous process of completing the performance plan. The implementation is directly related to the performance design and plan, and affects the success of performance management. In the implementation of hospital performance management, we have sorted out two types of research. One is strategy research on the elements of performance implementation. On the basis of a good system design, the key to hospital performance implementation from the perspective of the performance management process lies in 1) perfect performance organization structure; 2) efficient performance coaching; 3) continuous and effective performance communication; 4) meticulous and objective performance information collection and recording (Cang, 2021; Gu, 2021; Huang, 2006).

The other is the research on hospital performance implementation. 1) Simply using workload to assess medical staff cannot motivate their work enthusiasm; 2) The hospital and staff lack management consensus and communication, for instance, performance goals are inconsistent with staff's ideas; 3) Work performance of the management staff cannot be objectively reflected in the performance, but at the same time there are no effective measures for the performance management of the administrative staff; 4) The management evaluation index does not match the quality management, and the evaluation results cannot be reflected in the distribution; 5) There lacks core function design of hospital manpower resources (Gu, 2021; Hao, 2019; X. K. Li et al., 2019; Wei, 2011).

There are also scholars linking the relationship between national performance appraisal and hospital performance appraisal. The main points of implementing hospital performance based on the national performance appraisal include: build performance awareness; focus on the first page of medical records to ensure that the data is true and accurate; do a good job in link quality control, guide the decomposition of hospital performance indicators through the national appraisal indicators; continue to improve the design of indicators (Jiao, 2021; Qu, 2018). Through the comparison of the assessment subject, assessment indicators, and application of results in the implementation of performance management in public hospitals in Shanghai and Beijing, Gao et al. (2019) believe that the most important problems in the implementation of performance management are 1) Information support in the process of indicator results collection is insufficient. As indicator collection depends on human reporting and filling, it is impossible to avoid data falsification and filling errors; 2) The scale of experts involved in the assessment is large, and the standards among these experts are not consistent;

3) When responding to government performance assessment, public hospitals tend to directly decompose the indicators from the hospital to the departments and then further decompose them to the medical staff. The long-term burden of various assessment indicators on medical staff will lead to a decrease in concentration on medical services, which will lead to deviations from the original intention of performance management.

Results of key informant interview: According to KIS, the current performance implementation process generally lacks a transparent and open process. Most of our hospital performance implementation processes are still at the stage of calculation based on bonus accounting. The bonus accounting methods include quantitative tools such as RBRVS, but it is still in essence the revenue commission model. Similar to the findings in literature research, data objectivity is a key element for performance, and there is huge room for improvement of data objectivity. KIS further pointed out that although the problem of informatization is the reason why performance cannot be supported by data, the key lies in not whether there is informatization or not, but whether the hospital business process can be objectively presented in informatization. For example, accurate charging data related to performance data, whether the diagnosis and treatment items are complete and classification in a standardized manner, the statistical criterion of data between different information platforms, and classification standards are the deep-seated problems in the construction of hospital informatization. These problems are the management problems of the hospital and are no longer the problems at the informatization level. In addition, the management problems manifested in the informatization management further prove what has been repeatedly mentioned in literature research that the management performance of the hospital administrative departments cannot be reflected through performance, or the hospital administrative departments formulate evaluation indicators to the business departments, but it is difficult to implement, which leads to a series of related problems in the hospital performance implementation process.

3.1.5 Outer setting (5 studies)

We have identified the impact of retrospective studies related to the outer setting, including policy factors, public health events (H. X. Zhang & Chen, 2021; Zhao et al., 2020a), and the medical insurance payment system on the promotion of hospital performance reform. To be more specific, policy factors showed strong influence (Gu, 2021; Wang, 2021; Y. Y. Wang & Cai, 2021); the COVID-19 public health incident exposed an increase in epidemic prevention and control costs and operating and management costs, and a sharp drop in hospital revenue

and workload. As a result, the hospital's performance model based on business volume and workload is facing challenges (Zhao et al., 2020b).

Results of key informant interview: KIS bluntly stated that national policy pressures, especially changes in the medical insurance payment model, have played an important role in the distribution direction within the hospital, but when it comes to specific distribution, it is still inseparable from the incentives associated with income generation. The decline in hospital income caused by the global epidemic from 2020 to 2021, and the transfer of hospital doctors to outside the hospital, or even outside the province had exerted a significant impact on the hospital's business and performance. In addition, performance competition among peers has become one of the main factors of personnel mobility. Peer performance competition can be manifested among local peers and peers in different places. The impact on medical institutions in economically developed provinces cannot be completely attributed to performance competition. Instead, there are multiple factors.

3.1.6 Inner setting (6 studies)

We have sorted out the literature on case studies of performance management and the relationship between performance management and the inner setting. Among them, 6 studies believe that the important prerequisite for performance reform is that the development of the hospital should be transformed from extensive scale expansion to refined connotation construction (Huang, 2020; Zhang, 2018; Zhu & Liu, 2019). The intensive cultivation of internal management includes an organizational structure with clear division of labor, information foundation, quality supervision team with clear functions, and efficient internal collaboration mechanism. Especially, clinical quality supervision and humanistic care to patients play an important role in performance culture (Zhou, 2016). Performance communication lead to clarified performance management goals, fair process, and cohesion of employees (Zhang, 2020).

Results of key informant interview: KIS believes that performance management is only part of the overall hospital management system, but it is also the most critical part. It places high requirements on the infrastructure and continuous construction of hospital informatization, and more importantly, it puts forward new requirements on organizational coordination, division of labor, and implementation of hospital management. When talking about performance management, we usually focus on incentives, especially the distribution of performance bonuses. In fact, the connotation construction of the hospital is the basis of

performance. The performance culture, humanistic care to patients, communication, career development, and honor system all play an important role in performance management.

3.1.7 Characteristics of service providers (5 studies)

In the review of the literature, we found five studies focused on the impact of individual characteristics and individual decision-making choices of service providers in performance management. First, it is found that performance pay is mainly affected by marital status, gender and working age. In addition, performance pay satisfaction is affected by other factors such as experience and professionalism. It is manifested as the impact of the amount of difficult diseases and the workload of the medical service. Strengthening the fit between the quality of medical care and the diagnosis, treatment and distribution of difficult and critical diseases will effectively improve the initiative of clinicians as well as their satisfaction with the performance pay. More importantly, it can motivate their work enthusiasm, job pro-activity and teamwork awareness, thereby promoting them to improve their job performance in a lasting and effective manner (S. T. Gu et al., 2017). The impact on employee behavior is mainly reflected in the direction relationship between performance pay and employee satisfaction. High performance pay means high employee satisfaction, vice versa (G. L. Wang & Xiao, 2015; Guo, 2015; S. T. Gu et al., 2017). As for satisfaction, it includes understanding clinicians' satisfaction with performance-based compensation, job performance, and various influences from a humanistic perspective; individual dissatisfaction with compensation will cause employees to have behaviors with negative impact on organizational performance; in addition to paying attention to the impact of performance and compensation, employees also pay attention to whether performance is linked to job promotion; individual characteristics of clinicians and hospital cultural environment are also important (S. T. Gu et al., 2017).

Results of key informant interview: KIS clearly pointed out that the characteristics of doctors and the results of performance present conditionality and strong correlation when it comes to the impact of provider characteristics on performance. First of all, the impact between the performance policy and the doctor's professional decision-making is obvious; second, the doctor's personality characteristics, identity of the organizational culture, and the professional status also affect the performance; third, whether it is from the performance level or the individual level of the doctors, or the correlation between the two, the core is what treatment services can be provided to the patients. The level of clinical diagnosis and treatment, service procedures, and humanistic care all need to be reflected and supported in

the performance design process. The most fundamental thing is to encourage clinicians to give humanistic care other than treatment to patients from the performance design level. The overall cultural construction of performance should be improved from the perspectives of organizational culture, professional beliefs, ethical accomplishments, and respect for talents.

3.1.8 Discussion and summary

We identified 39 studies to examine factors related to the design and implementation of performance projects. The objectives of the research were to explore implementation characteristics related to performance design and clinical medical behavior processes and patient outcomes, as well as impact on the cognition, emotion, and behavioral response of medical service providers (doctors). Implementation characteristics include factors related to the design of the scheme, such as factors related to the design of incentive indicators; implementation process, such as updating or canceling measures, inner and outer settings, and the characteristics of providers. We explore the incentive structure and priority of measures, their impact on medical behavior, and challenges faced by the design of complex intervention measures in the performance incentives, so as to explore experience support that can be referred to and applied in practice and try to develop a new hospital performance measurement framework design.

First of all, although the literature does not provide strong evidence to clearly guide the implementation of doctor performance design, several themes of the KI interview are consistent with the published literature evidence. First, key elements that emphasize to take medical process or clinical results as the goal are all reflected in the evidence-based medical record first page, and these data are more valuable than the data of productive forces or economic data. These data can also reflect the transparency of the doctor’s medical process and the full disclosure of diagnosis and treatment information, so that the interests of patients can be protected. The literature on the provider and the results of KI interviews in the studies support the use of evidence-based evidence such as the first page of the medical record, and this evidence is consistent with the provider’s expectations of clinical quality, and KIS strongly agrees that this is crucially important.

Secondly, several factors should be carefully considered when designing performance incentives. The first is the design of the incentive structure, including the result perspective, the elements that reflect the clinical process, and how to reflect the clinical difficulty of the disease. The design of the incentive structure is to be established on the premise of normative

control. It should be transparent and open in terms of goals, performance budget scale, values, quantity, and quality process control to avoid excessive incentives that will lead to profit-seeking games and risks for patients.

Thirdly, the performance implementation process should carry out quality evaluation every year and carry out the quality monitoring of the performance implementation according to the development situation. Continuous and regular monitoring and evaluation should be carried out. What needs more attention is the impact of medical decision-making behaviors brought about by incentives.

Finally, the most important thing in hospital performance incentives is to avoid using income incentives to stimulate doctors' income-generating behaviors, and for the non-quantifiable part, including spirit, values, and culture, a full and three-dimensional overall performance culture is needed for supplement, Evidence and policy influence according to implementation framework category, as shown in Table 3.2.

Table 3.2 Evidence and policy influence according to implementation framework category

Implementation framework category	Research evidence	KI interview subject	Policy influence
Project design characteristics	13 studies investigated the project design characteristics and found that Third-party consulting companies provide hospitals with performance consulting services. The evaluation indicators are designed with balanced scorecards, RBRVS, KPI, etc., and the completed results are reflected in the score. In view of the key role of the hospital director, his long-term incentive design should be emphasized. The economic benefits, career development, social reputation, power status and political promotion of the director should be integrated. RBRVS is used as a bonus calculation tool for doctors. The most common method used in China is that the extraction of item value depends on whether the hospital information system can support the accurate matching of examination items and charge items, and does not include the ability of doctors, complexity of disease, treatment results, and medical quality. The point value method represented by RBRVS is a direct economic incentive.	Project design has not jumped out of the old approach of income incentives, and the use of fee-based items as the basis to measure performance bonuses cannot meet the management requirements from the perspective of quality results. The incentive system must reflect the priorities of the organizational management, and the openness, visibility and evidence support of incentives are very important. Although positive incentives are very important, if there is no punishment mechanism, the expected effect will not be achieved, and undifferentiated incentives are the new egalitarianism. Motivation reinforcement behavior, the inevitable connection between reinforced motivation and results and achievements； Motivating teams can better improve collaboration and professionalism compared with motivating individuals	Incentive project design: It is necessary to emphasize measures or key elements that target the clinical process or clinical results, and these key elements should be transparent, compatible with medical regulations and patient benefits, and charging items cannot be used as the key elements for incentives. The design of the incentive structure should take into account the medical results, clinical quality, clinical ability, as well as the objectives and other elements
Implementation process	10 studies investigated implementation process and found that ● Performance implementation is	● The performance implementation process generally lacks an open and transparent process. The performance implementation of	● The design of the performance implementation process should focus on prevention and

	directly related to performance design and planning, and affects the success or failure of performance management. The key point of hospital implementation lies in organizational structure, performance coaching, performance communication, and performance data collection; ● Merely assessing medical staff with workload cannot motivate doctors, and cognition and communication lacking management consensus are key factors; ● Insufficient informatization support during the collection of performance indicators, and data fraud is rampant; ● Participation in performance appraisal work and excessive reliance on fee-based data provided by informatization can easily motivate doctors to over treatment and reduce their focus on medical services; ● The functional departments of hospital performance appraisal, the competent departments of national appraisal and experts in the multi-level performance management all have inconsistent perceptions of the content and objects of the appraisal, which leads to deviation of performance work from the	most hospitals stays at the bonus calculation stage. Even if the bonus calculation uses RBRVS, it still cannot get rid of the revenue commission model; ● To extract the accounting data of RBRVS from the fee catalog is not as good as to extract the key traces of clinical medical treatment from the key elements on the first page of the medical record. The data on the first page of the medical record is more objective than the fee data ● Data objectivity is an important factor in performance work. Although informatization is the main reason for performance data, the problem behind informatization is the standardization of hospital process management and business management. It is a management problem rather than a technical problem. ● It is a hidden management problem existing behind the informatization problem. The administrative function department cannot effectively implement the appraisal work, and the performance of the administrative function department is completely irrelevant to its performance, which leads to a series of problems in the performance implementation process.	control in areas with poor implementation effect, especially the traditional method of scoring human quality management should be avoided to reduce the human factors in the performance implementation process.

	original intention.		
Outer setting	5 studies investigated implementation factors related to external environment and found that ● Policy factors, large-scale public health events, such as the COVID-19 pandemic and changes in medical insurance policies, have different impacts on hospital performance reforms. The COVID-19 event has caused an increase in epidemic prevention and control costs, a decline in business volume, and an increase in management costs. The COVID-19 epidemic prevention costs squeeze out medical insurance funds, thereby tightening medical insurance's management policies for hospitals and posing challenges to hospitals ● Affected by external factors, the performance model based on hospital income, business volume, and workload has been challenged, and has caused dissatisfaction among employees.	● KIS bluntly stated that national policy pressures, especially changes in the medical insurance payment model, have an important impact on the distribution within the hospital; however, when it comes to specific distribution, it is still related to income-generating incentives. ● The 2020-2021 COVID-19 global epidemic brought a decline of hospital revenue, and hospital doctors were transferred out of the hospital or even out of the province. When the hospital's business is affected, the doctor's performance is still linked to revenue generation ● Performance competition among peers has become an important incentive for competition among institutions and talent flow.	● Performance project design should have the design of anti-interference of external factors
Inner setting	6 studies reviewed correlation between performance management case studies and internal environment and found that ● An important prerequisite for cooperating with the hospital's performance reform is the refinement of hospital internal management and connotation	● KIS believes that performance ties together the infrastructure of hospital informatization and the collaborative value of hospital management, and performance management has become the most important part of the overall hospital management system; ● We refer to performance management based on incentives and fund allocation, and it is easy to overlook the connotation construction of	● The design of performance projects should focus on clinical quality. It is necessary to emphasize measures or key elements that target the clinical process or clinical results, and these key elements should be transparent and compatible with medical regulations and

	construction, including an organizational structure with clear division of labor, an information foundation, a supervisory team with clear functions, and an efficient internal collaboration mechanism. We should especially pay attention to the important role of clinical quality supervision and humanistic care to patients in performance culture. ● Performance communication is an important task in performance management, which not only clarifies goals, but also effectively unites employees.	hospitals. Concepts, culture, patient communication, performance communication and non-material career development, and honors all play an important role	patient benefits, and charged items cannot be the key elements of motivation
Characteristics of providers	5 studies have observed the research of the providers of performance management services. ● Performance pay is affected by marital status, gender and working age. ● Performance salary satisfaction is affected by other factors such as experience and professionalism. Strengthening the fit between medical quality and the diagnosis, treatment and distribution of difficult and critical diseases can effectively increase the enthusiasm and satisfaction of doctors. ● The impact on employee behavior is mainly reflected in performance satisfaction.	● KIS proposes that the characteristic factors and performance results of doctors present a systematic and strong correlation. ● The performance policy directly affects the doctor's professional decision-making ● Doctor's individual characteristics, identity with organizational culture, and professional status also affect performance ● The most important thing is that to provide patients with certain kind of medical services can reflect the microcosm of hospital performance policies	● From the perspective of performance design, we encourage clinicians to show humanistic care to patients other than diagnosis and treatment, and complete the overall performance system design from the perspective of organizational culture, information, ethics, and respect for talents.

3.2 Theoretical model and incentive structural design

Public hospitals, as the main body providing medical services to the masses and satisfying the health of residents are the core of medical reform. The public hospital reform and development has been affected by economic development and social management system reform in the same period. As of the end of 2019, there were 34,354 hospitals, 11,930 public hospitals, and 2,749 tertiary hospitals nationwide. There were a total of 7.782 million health professionals in hospitals across the country, of which public hospitals provided 72.5% of beds. The number of outpatient visits in public hospitals throughout the year reached 3.272 billion person times, accounting for 85.2% of all hospital treatment visits; the number of inpatients was 174.87 million, accounting for 82.6% of the total number of inpatients. The average daily patient service for doctors in public hospitals were 7.6 times. In 2019, the average outpatient cost of hospital visits was 290.8 yuan, 6.1% higher than that of the previous year based on the current year's price, and up 3.1% at a comparable price. The per capita hospitalization cost was 9848.4 yuan, 6.0% higher than that of the previous year and up 3.0% at a comparable price. The average daily hospitalization cost is 1079.1 yuan, and the total national health expenditure in 2019 was expected to reach 6519.59 billion yuan.

In China, public hospitals play the dominant role. Although public hospitals have made significant progress in the institutional reform, there is still a certain gap between hospital operation and service provision and the reform requirements and people's health expectations. Therefore, we must explore how to establish a more scientific operating mechanism, identify effective management methods, develop modern public hospitals with Chinese characteristics, and maintain the non-profit nature of public hospitals, so as to meet the primary requirement of the public to keep healthy. Therefore, as mentioned in Chapter 1, in modern hospital management system, the salary incentive mechanism is an important means of hospital internal management, especially how to calculate the performance of doctors. To establish a scientific accounting mechanism and establish a mechanism to balance the interests between doctors and patients can effectively benefit the interests of patients and ensure patient safety. It is the basis for the formulation of theoretical framework in this research.

3.2.1 Practical implications of the model building

Based on the CFIR research framework and the "normative control model" proposed by Mintzberg, we refer to Donabedian's three-tier model structure of structure-process-outcome

to build a "public hospital innovative pay for performance -normative control model". Then we endeavor to design the doctor's performance incentive structure accordingly.

1. Implications for the application of normative control model

The importance of norms cannot be overemphasized. What they do is to make social life possible. Without norms, we cannot understand (Hechter, 2008). Based on the five key elements of the "normative control model", from the five-dimensional system of value selection, collective awareness, vision guidance, responsibility awareness, and performance judgment, we build a standardized management model of hospitals cultivated by cultural values and ideology and take faith and values as guidance to form influence and cohesion.

In the normative control model, take a common case Arthur Andersen for example, in its early experience, its organizational culture and norm-based training system, new employee mentor system, accountability and assessment system formed a strictly hierarchical cultural system and standardized professional service capability, which helped Arthur Andersen achieve great success in the early days. Although Arthur Andersen failed, its failure cannot be attributed to the failure of normalization. On the contrary, its internal norms are contradictory to the integrity and social morality of the accounting industry, resulting in internal failures (Hechter, 2008). In other words, the input of normative control is certainly a prerequisite for the standardized management of enterprises, but normative control itself is based on the overall social public morality, which conforms to the public order and morality and common expectation for goodness. No company can succeed if it loses the normative socialization attribute.

In Japan, emotional management is also included in the scope of normative management in the workplace. In addition, the small quality management circle is also known as an important system for normative management. Through the small quality management circle, employees are constantly instilled corporate values and quality concepts, which is a strong cultural input (Ogasawara, 2003).

Therefore, in the normative control model of hospital performance, the basic mandatory bottom line of normative input established by the normative control model we established is "the principle of patient interests first", so as to establish a staff training system, a mentor system, and accountability system.

2. Implications for the application of "structure-process-outcome" model

Donabedian proposed three dimensions of medical quality in 1966: structure-process-outcome. In 1999, he was awarded the highest honor in the field of public health in the United States by the American Public Health Association. Donabedian is also known as the father of

American medical quality management (Li, 2003). Structure defines the static configuration relationship and efficiency of various resources in medical activities, including: staffing, number of beds, equipment and manpower configuration, basic management resource configuration, and scope and quantity of services; process includes the quality and efficiency of the dynamic operation of medical institutions, such as the presentation of the whole process of clinical treatment; outcome presents the final quality judgment of the medical institution operation, including patient satisfaction, the institution operation quality, some key indicators to express medical outcome, morbidity, re-hospitalization rate, mortality, and cesarean section rate (Donabedian et al., 1982).

In this research, we draw on the three dimensions of "structure-process-outcome" to establish a framework for the doctor's performance payment system. In this case, doctors would not lose control of their norms due to the simple financial incentive measurement of performance, thereby establishing a normative hospital management system.

At the structure level, complete the input of relevant normative elements, complete the mandatory input of goal programming, resource allocation, budget, culture and other elements, and establish management rigidity.

At the process level, the focus should be on the positioning of key elements such as objective data that can reflect the whole clinical process of the medical treatment based on the establishment of evidence-based medicine and front sheet of medical record.

At the outcome level, attention should be paid to changes in hospital patient quality and data, and doctors' satisfaction with and evaluation of performance.

Therefore, the "public hospital innovative pay for performance-normative control model" is constructed as follows, as Figure 3.2.

The focus of this research is the design of incentive structure at the process level. The goal dimension uses the "three-dimensional public hospital performance appraisal model" as a normative control indicator, and the necessary resources, configuration, and quality at the hospital organization level are used as control requirements. The outcome dimension is a closed-loop test of the basic framework of the hospital's normative control through key elements such as patient quality and doctor satisfaction, so as to realize the return of results to value orientation.

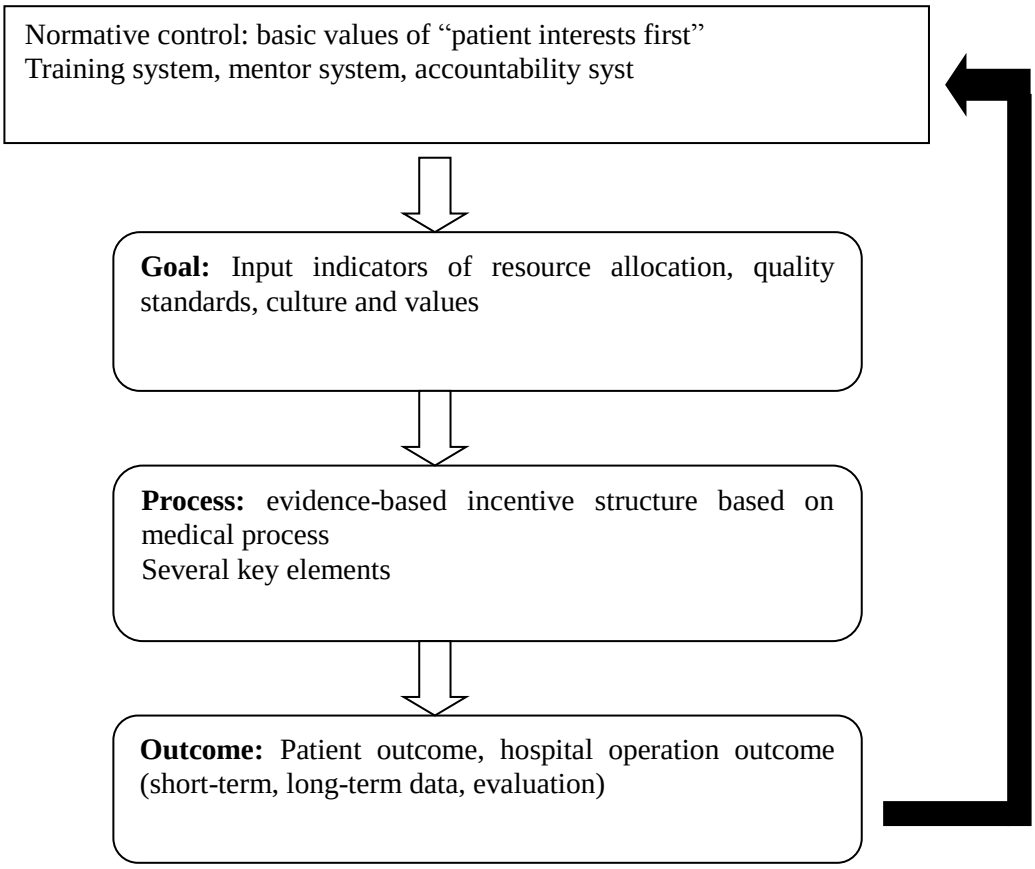


Figure 3.2 Public hospital innovative pay for performance-normative control model

3.2.2 Theoretical model hypothesis and framework analysis

Based on the design of "public hospital innovative pay for performance-normative control model", its structural design originates from the normative control theory as well as the normative values and cultural basis where public moral expectations are met. The establishment of a rigid normative control model can avoid continuous information asymmetry in medical services, which will bring the possibility of hiding information or pursuing profits. Therefore, it is particularly important to regard the public interests based on public moral expectations such as "patient interests first" as the basic values of public hospitals. However, in the large amount of literature research, we found a worldwide difficulty to include values in the evaluation, that is, it is difficult to quantify and evaluate. Therefore, for such subjective and non-quantitative indicators such as values, what we need is not an assessment, but a daily system integrated into the daily management, organizational structure, and management operation mechanism.

Therefore, in this study, we assume that input of values is the top-level design layer S of the medical institution. As the input requirement of normative control, the whole process of management and operation of the medical institution uses Donabedian's "structure-process-

outcome" to realize the closed-loop management, and this is the executive layer O. Layer S conducts normative input control over the entire operation process of layer O, corrects deviations from the direction of ethics, values, and ideology, and has the power to veto the systems and matters implemented in the operation process. The layer S has absolute guiding significance and mechanism of action for layer O.

In A1, as the main value in the normative setting, "patient interests first" has an impact on the allocation of resources and the establishment of quality standards in the target dimension at the executive level. It is the values at the strategic level and guides the goal of hospital operation.

In A2 goal-process, it must be clearly expressed that the important influencing factor of service quality, service capability, and service efficiency of the whole medical service process is whether the resource allocation meets the standard. In this study, the design of incentive items should be solved in the process. We know from literature that item-based incentives motivate doctors to go long, which may also be the origin of excessive treatment.

Therefore, when considering integrating the medical process in the design of an evidence-based incentive structure in this study, we take the risk that incentives will lead to over treatment and make an innovation to refer to the Episode-Based Payment Approach (EBPA) to establish a new measurement structure: service patient-times method. The traditional EBPA is an overall packaged payment method based on the treatment process, in which the treatment event is a series of medical services provided by a single or multiple doctors in a treatment cycle. EBPA focuses on treatment outcome rather than service quality. On the one hand, it promotes communication and cooperation between doctors based on "treatment events". On the other hand, it encourages providers to provide more effective and reasonable medical services through different payment ratios. The service patient-times method measurement structure in this research is centered on patients, with their hospitalization period as the treatment period. It is defined as the treatment events that occur during the patient's treatment period, and these treatment events are used as the basis for performance payment. It is expected to establish discussion, communication and cooperation based on a patient-centered treatment event, or quality management and control in the communication between doctors. In this logic, we identify the key elements in the design of the incentive structure.

When meeting the above hypothetical design, we expect to express that the "one patient-centered treatment event package performance method"-effective service patient-times can bring predictable and quantifiable medical outcome, rather than non-quantifiable service

quality and patient satisfaction. Of course, we are not saying that service quality and patient satisfaction are not important, but we are deeply aware that in the process of medical services, due to the persistent information asymmetry, measurable medical outcome is more important than pleasing patients and discussing service quality, and this is the cornerstone of service quality and patient satisfaction. This part is A3, the relationship between the process and outcome.

A4 is the result of layer O —feedback and response to the control of layer S, from the A1 normative control input to the resource setting norms of the target dimension, to the incentives disclosed in the whole process of the treatment event in the process of A2, and then to the medical outcome and hospital operation results in A3. The closed-loop test of the outcome dimension is whether it can respond to and conform to the basic value of "patient interests first" at the normative control level of layer S, so as to avoid deviation of the hospital by important incentive activities in the hospital operation and management.

Because of its special attributes, medical service bears people's basic rights of survival, birth, old age, sickness and death as well as expectations of public interest of the majority of the public on the one hand. On the other hand, medical service, affected by the uncertainty and dynamic development of diseases, is full of uncertainty and information asymmetry. This uncertainty and asymmetry will continue to exist, and only a normative control model can bring certainty to this uncertainty. Only when the basic ethics of the public and the public expectation of "patient interests first" become the input of normative control, and are continuously optimized and corrected in daily management, can we achieve balanced development in the rapidly developing medical technology and the patients' continuously growing demands for health and disease treatment and not be constrained by interests.

This research must take into account the ideals of adhering to values, but also face the challenges of insufficient incentives for doctors in the current reform of public hospitals in China, or improper incentives, insufficient disclosure of the treatment process, and non-standard coexistence. It warns us that this research is not full of sunshine and snow; instead, we must always be alert to the incentive damage caused by excessive incentives. This is also why we take how to realize normative control "values" which is difficult to quantify and measure as the strategic dimension. We believe that in the management process, the construction of non-quantifiable beliefs, values, and cultural systems is the soul that an organization should have, as Figure 3.3.

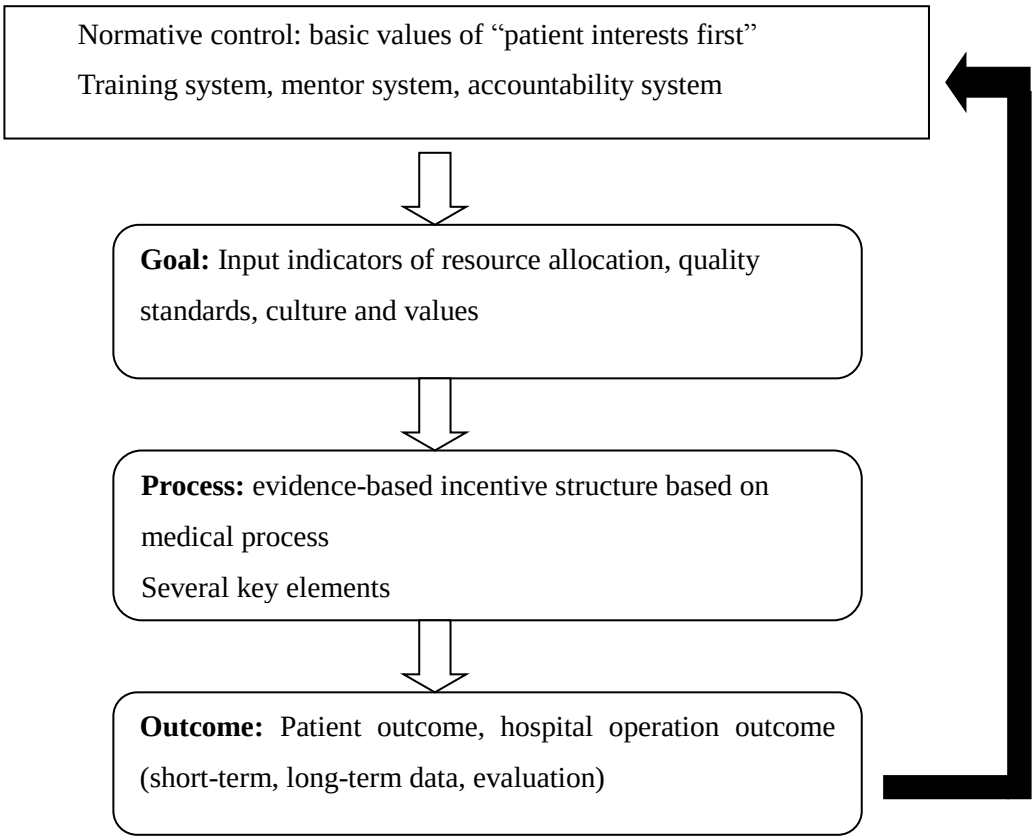


Figure 3.3 Theoretical model hypothesis and framework

3.3 Research design

Based on the conceptual model of "public hospital doctor performance-based payment - normative control", we will analyze the important relationship constructed by the integration of "normative control theory" and "structure-process-outcome" theory, and further identify how, in the relationship of "structure-process-outcome", to avoid the deformed behavior of doctors caused by incentives in the research of principal-agent theory, how to establish a mechanism of action between normative control and goal setting, and how to avoid the excessive incentive exacerbated by hidden behaviors caused by "information asymmetry" during the goal setting and design of incentive process. This shows that the focus of the incentive process design will be "how to promote the full disclosure of the doctor's treatment process", so as to achieve the conduction relationship between process and outcome. In addition, the presentation of outcome and the input of normative control also need the establishment of relevant interaction mechanisms, so as to realize the continuous normalization and operability of the conceptual model constructed aforementioned.

3.3.1 Research procedure

First of all, in this research model, the key to the influence of the layer S in the "normative control model" on the organizational operation lies in the strengthening and shaping of the "patient interests first" values in the control paradigm, as well as the implementation system of the core system that strengthens the implementation of values, including the implementation path of the training system, the mentor system, and the accountability system.

Second, based on the normative control model of "patient interests first", we refer to the optimal allocation theory and DEA influencing factors, establish a coordinated goal measurement method of resources, quality, technology, and efficiency, and formulate the hospital goal.

Third, in the organizational process, the key lies in how to integrate the "objective disclosure of the whole medical process" with the research design of incentive factors to form an incentive structure. The design of the incentive structure is the core link of this study, which is fed back upward to the design of the goal and conducted downward to the medical outcome.

Therefore, the design of performance-based incentives in further subdivided organizations includes incentive structure design, incentive factor selection, formation of medical record factors, and further study of factor weights. The research part of the incentive concept model completes the design of incentive structure. The medical record front sheet, as an important document of medical process records, carries the interests of patients and the responsibility of doctors. Therefore, inclusion of the medical record front sheet in the incentive factor design has become inevitable. We extract key factors from the medical record front sheet, and use the Likert analysis method to conduct the survey on cognitive attitudes of incorporating medical record front sheet into performance measurement items to further demonstrate the feasibility of incorporating the medical record front sheet into performance measurement, which lays the foundation for the establishment of medical case factors.

In order to further explore the practical application of medial case factors in the design of incentive factors, we selected grass-roots hospitals for case study, started from normative control and relied on resource-based target calculation to further study the medical record factors and factor weights. We used the questionnaire survey method to verify the model and carried out further comparative analysis on the operation data of the case hospital.

3.3.1.1 Concept of normative control

The normative control model is usually defined as the organization's humanities, values, and management control systems and the corresponding organizational design, talent selection, training, ideology shaping, and organizational performance evaluation processes and evaluation application. The strong control of humanistic spirit and behavior is usually expressed in attitude rather than numerical evaluation. However, the evaluation of attitudes is difficult to quantify, and it also brings difficulties in management with indicators and data.

Therefore, in the establishment of the normative control model, the first thing is the mandatory input of values. We consider the public expectation of the society for medical services, namely, "taking the interests of patients as the center" as the basic value of the hospital. Based on the practice of hospital application and drawing on the experience of Arthur Andersen, we have constructed the "training system, tutor system, and accountability system" of the hospital support control model from concept to implementation. We promote the implementation of the system in consideration of the specific situation of the hospital.

3.3.1.2 Impact of normative control model on organizational objective design

Hospital objective is directly related to the design of hospital performance incentives, which affects the success or failure of performance management, and more importantly, the direction of hospital operation. The importance of the design of organizational objective in this study is manifested in the following aspects. (1) Guided by values, it is a specific quantitative indicator of hospital strategy. (2) It balances the relationship between resources and demand, and while taking into account the optimal allocation of resources, it also takes into account the constraints of technical resources, asset resources and quality factors.

Therefore, we first draw on the concept of optimal resource allocation method and the method of DEA to quantify the input of various resources in the hospital. The most important resources are bed resources, personnel resources, and fixed asset allocation resources (examination items and quantity released by inspection equipment and business volume released by business housing area). Based on the data of the past three years and the average change, the target measurement of the output is carried out, including the number of diagnosis and treatment, the utilization rate of beds, the average hospitalization days, the total hospital income, average inpatient/outpatient cost, and drug ratio. The medical quality is included as the constraint index, and the hospital objectives are formed through the step-by-step calculation of each item.

3.3.2 Theoretical research of incentive factors

3.3.2.1 Design of incentive structure

Countries around the world have made different attempts in the design of doctor incentives. The incentive payment refers to out-of-hospital payment, but in this research, we study in-hospital incentives to doctors. When establishing in-hospital incentives, the most prominent problem encountered in China is the relationship between establishment of doctor's incentives and whether their medical behaviors are normative. The front sheet of the medical record is important data with legal effect as a record of medical information and contains the demands of medical stakeholders in the medical service including the whole process of doctor's diagnosis and treatment, a complete picture of the patient's condition, and the occurrence of expenses. It is also the most effective entry for effective supervision of the entire process of doctor's diagnosis and treatment. Therefore, to promote doctor's due diligence disclosure and complete the submission of a completed medical record in a timely manner has become the starting point to establish supervision on doctor's medical behavior.

Therefore, the design of incentive structure is based on the clinical evidence-based and disclosed information and strikes a balance among the interests of doctors, medical insurance, and patients. In the design of the key elements of doctor's incentives, the front sheet of medical record is selected as the starting point for information capture. Data identification and classification are based on data on the front sheet. First, from the perspective of patient discharge, each patient discharged from the hospital achieves a count of 1, and then we record the main disease type. With the ICD-10 code as the basis, we select three digits as a classification to form the weight. The key element information point of the whole clinical diagnosis and treatment process can be presented to form a complete data link that can describe the patient's treatment process and assign the weight.

Formation:

Step 1: data identification: extract relevant information from the medical record front sheet (2016 version) (see Annex B), establish a data list, and perform data identification.

Step 2: data classification according to the identified data, divide the front sheet information of the hospitalization cases into four categories: basic patient information, hospitalization process information, diagnosis and treatment information, and cost information, and select data items that can be included in the accounting and can express the key factors of clinical diagnosis and treatment.

Step 3: data verification. Select sample hospitals with sufficient conditions for hospital

informatization and conduct verification on the candidate items on the medical record front sheet and remove relevant items that cannot be extracted.

Step 4: Complete the conceptual model design of "effective service patient times":

Number of effective service patient times = 1 (number of discharged patient times) + disease weight + medical record factor

Total workload of the department = ∑ Effective service patient times

It should be emphasized that the effective service patient times is the specific manifestation of the patient service point value for objective evaluation of each patient, which is formed by integration of number of discharges, patient diseases, and the treatment process corresponding to the diseases and individual differences of the patients. The effective service patient times reflects the point value of the patient service, which is the payment basis for the performance-based compensation for the doctors' performance and effort.

The disease entity is classified according to the first three codes of ICD, and the calculation method is consistent with the DRG weight calculation method:

Annual total cost of disease entity/annual total cases of disease entity = average annual cost of disease entity

Total annual hospitalization expenses of the whole hospital/ total annual hospitalizations = annual per capita hospitalization expenses

Annual average disease entity fee/annual hospital per capita fee = annual disease entity weight

The weight of the disease entity reflects the resources consumed in the diagnosis and treatment of the disease. The higher the resource consumption, the higher the weight. However, we need to be vigilant about the diagnostic upgrade behavior caused by weight incentives. Therefore, we carry out normative control.

3.3.2.2 Research on the medical record factor

1. Questionnaire design

We define the medical record front sheet as the data source of the medical record factor. We extract relevant information from the medical record front sheet (2016 version) and classify the data, including basic patient information, hospitalization process information, diagnosis and treatment information, and cost information. After the classification of data on the medical record front sheet, the Likert scale method is used to give five choices to determine whether the items are included in the performance measurement (1 stands for strongly disagree, 2 stands for disagree, 3 stands for neutral, 4 stands for agree, and 5 stands

for strongly agree), and 1-5 points are assigned to the 5 answers. After adding up the scores of each item in a scale, the total attitude score can be obtained, which can reflect the overall attitude of the respondents on the matter or subject. The higher the total score of the scale, the more positive the respondent's attitude towards the matter or subject.

This round of questionnaire research on medical record factor aims to conduct an attitude survey on the items included in the performance measurement on medical record front sheet, with a view to gaining recognition for the items included in measurement. The questionnaire "A Survey of Cognitive Attitudes towards the Items of Medical Record Front Sheet Included in Performance Measurement" is designed, and the specific questionnaire is shown as per Annex C.

2. Research sample identification

We conduct research and investigation on doctor incentive projects based on primary hospitals, and the sample size is no less than 370 according to the sample calculation formula. Based on the fact that county-level public hospitals account for the largest s in China, and county-level public hospitals have generally low awareness of the quality of medical records, this study selects one county-level public hospital in Qinghai and one in Zhejiang as the target case of the questionnaire to investigate the attitudes of the employees of primary hospitals in provinces with large gap in economic development towards the inclusion of the medical record front page items in the performance appraisal project.

3. Research preparations

First, the pre-training work of the questionnaire survey. We carried out basic training on the framework and items of the medical record front sheet, especially to non-clinical administrative personnel. We carried out basic training on the requirements and significance to fill in items on the medical record front sheet so as to help respondents understand the meaning of the medical record front sheet.

Secondly, the initially designed items were revised. A pre-survey was conducted with 10 doctors in two hospitals, focusing on identifying whether the questionnaire items were easy to understand and whether there were ambiguities, so that we can discover low-level errors or other problems that may occur in the formal survey. After repeated revisions of the questionnaire items, "Survey on Cognitive Attitudes towards the Items of Medical Record Front Sheet Included in Performance Measurement" was formulated.

4. Questionnaire collection

A total of 397 valid questionnaires were collected. It took an average of 80 seconds to fill in the questionnaire for the respondents. Among them, three were not working in the hospital.

We believe that the feedback from the retired who have worked in the hospital or medical staff who are currently working in the hospital is more valuable, so we selected 394 questionnaires for further analysis. 41% of the respondents were clinicians, 37% were medical staff, 17% were administrative staff, and about 4% were hospital manager. This sample can perfectly reflect the opinions of relevant personnel on related issues in the current hospital work, and the questionnaire sample is fairly representative.

In the questionnaire design, we conducted a preliminary quantification of whether the relevant items should be included in the performance indicators. The respondent's choice of strongly agree was assigned 5 points, and strongly disagree 1 point. Therefore, the arithmetic mean of the opinions from all respondents on the item represents the degree of agreement for the item to be included in the evaluation indicators. High score indicates that the inclusion of the item in performance measurement has obtained the approval of most people. The simple calculation process is as follows.

$R_i = \frac{1}{m}\sum_{j=1}^{m} r_j$. m refers to the number of respondents, that is, the number of valid questionnaires. r_j refers to the score given by No. j respondent on whether the No. i item should be included in the performance indicator. R_i is the comprehensive score of the No. i item? A total of 37 items were designed in the survey, and the comprehensive scores obtained by these items were as follows Table 3.3:

Table 3.3 Item comprehensive scores

Item comprehensive scores							
4.19797	4.185279	4.416244	4.408629	4.385787	4.408629	4.238579	4.27665
4.269036	4.378173	4.390863	4.413706	4.388325	3.86802	4.187817	4.329949
4.312183	4.42132	4.314721	4.274112	4.208122	4.395939	4.327411	4.36802
4.337563	4.256345	4.365482	4.28934	4.296954	4.238579	4.35533	4.352792
4.236041	4.350254	4.329949	4.340102	4.281726			

Except for item 14 "Is there a plan of re-hospitalization within 31 days" scoring 3.8, the average scores of other items were all more than 4 points. On average, the surveyed items received high support and approval for inclusion in the performance measurement.

Respondents were mainly from four groups of hospitals, and the opinions of these four groups on various items were counted. The results were as follows Table 3.4 included in performance measurement.

Table 3.4 The results of measurement

Items	Hospital management	Clinical	Nursing	Administrative
1	4.3125	4.092593	4.285714	4.208955
2	4.4375	4.061728	4.272109	4.208955
3	4.5625	4.419753	4.414966	4.358209

Items	Hospital management	Clinical	Nursing	Administrative
4	4.4375	4.432099	4.408163	4.343284
5	4.625	4.401235	4.367347	4.328358
6	4.6875	4.425926	4.387755	4.343284
7	4.625	4.141975	4.285714	4.298507
8	4.5	4.283951	4.265306	4.253731
9	4.5	4.283951	4.197279	4.328358
10	4.4375	4.388889	4.367347	4.358209
11	4.5	4.388889	4.380952	4.38806
12	4.6875	4.407407	4.380952	4.432836
13	4.4375	4.395062	4.360544	4.432836
14	3.8125	3.87037	3.891156	3.865672
15	4.125	4.117284	4.265306	4.19403
16	4.25	4.345679	4.346939	4.298507
17	4.3125	4.308642	4.340136	4.283582
18	4.625	4.41358	4.435374	4.358209
19	4.625	4.228395	4.367347	4.358209
20	4.3125	4.216049	4.340136	4.253731
21	4.3125	4.135802	4.265306	4.253731
22	4.75	4.351852	4.435374	4.328358
23	4.75	4.228395	4.380952	4.343284
24	4.3125	4.296296	4.435374	4.402985
25	4.4375	4.283951	4.387755	4.328358
26	4.4375	4.197531	4.29932	4.283582
27	4.5625	4.37037	4.346939	4.343284
28	4.1875	4.234568	4.326531	4.358209
29	4.125	4.253086	4.333333	4.358209
30	4.25	4.203704	4.265306	4.283582
31	4.3125	4.32716	4.387755	4.358209
32	4.3125	4.290123	4.414966	4.373134
33	4.125	4.197531	4.265306	4.313433
34	4.375	4.333333	4.353741	4.373134
35	4.3125	4.283951	4.367347	4.358209
36	4.375	4.265432	4.421769	4.373134
37	4.25	4.216049	4.360544	4.313433

We further conducted a correlation analysis on opinions of the four types of medical staff on whether each item should be included in the performance indicators, and the results were shown in the following Table 3.5.

Table 3.5 Correlation analysis of opinions of different departments on inclusion of items in the performance measurement

	Hospital management	Clinical	Nursing	Administrative
Hospital management	1	0.59	0.58	0.55
Clinical	0.59	1	0.77	0.80
Nursing	0.58	0.77	1	0.87
Administrative	0.55	0.80	0.87	1

We found that nursing staff, administrative logistics staff, and clinicians have a greater correlation with whether the relevant items should be included in the performance indicators. In particular, the correlation coefficient between the administrative staff and the nursing staff reached 0.87 (Pearson correlation coefficient).

The respondents of the questionnaire mainly came from two regions, Zhejiang and Qinghai, about 46% were from Zhejiang, and nearly 54% were from Qinghai. The two regions represent the developed regions in the east and the relatively backward regions in the west, and their significant difference was shown in the following table. The statistical results found that there was no significant difference in the opinions of the two groups of respondents on whether the relevant items should be included in the performance measurement, as Table3.6.

Table 3.6 Difference comparison between respondents from different regions

Method	df	Value	Probability
t-test	72	0.535541	0.5939
Satterthwaite-Welch t-test*	71.02241	0.535541	0.5939
Anova F-test	(1, 72)	0.286804	0.5939
Welch F-test*	(1, 71.0224)	0.286804	0.5939

*Test allows for unequal cell variances

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Chapter 4: Case Study

4.1 Brief introduction of the case

LL County is located in the eastern part of YN Province, on the upper reaches of the Nanpan River, with a total area of 2,096 square kilometers. It is the first flat dam in YN Province and is known as the "Pearl of East Yunnan". With a total population of 660,000, it is a big agricultural county. It is 129 kilometers away from Kunming and 65 kilometers from Qujing. The permanent population of LL County is 599,000. The per capita GDP in 2020 was 41,405 yuan, with an annual growth rate of 9.8%, and an average annual growth rate of 10.2% during the 13th Five-Year Plan period.

Established in 1941, LL County People's Hospital is located in Wentan Street, southeast of the county. After 74 years of hard work and accumulation, it has gone through a road of hard work, and reform and development, and has now developed into a county-level general public hospital integrating medical care, emergency, teaching, preventive health care, and rehabilitation. In 2013, it was assessed as the level 2A hospital, becoming the first batch of county-level hospitals in YN Province to pass the assessment. It has been designated as the clinical teaching and internship hospital by Kunming Medical University and Qujing Medical College, the first batch of designated hospitals for AIDS clinical treatment and designated medical institutions for basic medical insurance for urban employees and urban residents, industrial injury insurance, and new rural cooperative medical insurance. It has established a long-term strategic partnership with many tertiary hospitals inside and outside the province and is assisted by Qujing First People's Hospital and Qujing Maternity and Child Care Hospital.

The hospital currently covers an area of about 77 acres (excluding the 19.13 acres of Huaqiao Farm branch hospital). There are 400 approved beds and 566 open beds. It is divided into outpatient department, inpatient department, and Huaiqiao farm branch, with 19 clinical departments, 12 functional departments, and 4 medical laboratories. Emergency medicine and obstetrics and gynecology are YN provincial key clinical specialties. In July 2012, the second phase of the extension project officially started. The newly built surgical inpatient building of 19,356 square meters, the medical technology building of 10,327 square meters, and the

basement of 4,245 square meters will be put into use at the end of this year. 8 new departments will be added, as well as 300-400 hospital beds.

Existing major medical equipment include Japanese-made 0.4T MRI, Japanese-made spiral CT, American Beckman fully automated immune integrated machine, American GE Definiumn multifunctional DR, Shimadzu multifunctional digital X-ray machine, automatic biochemical analyzer, Siemens G50 color B-ultrasonic equipment.

Main medical technology: artificial total hip arthroplasty surgery, posterior spinal laminectomy and pedicle internal fixation, minimally invasive urological surgery, pancreaticoduodenectomy, blood pneumothorax thoracotomy; complex hysterectomy, uterine myomectomy, and the application of colposcopy technology; ultra-emulsified cataract lens implantation and nasal deformity correction; temporary cardiac pacemaker installation, blood dialysis, myocardial infarction and cerebral infarction thrombolytic therapy.

In 2018, the hospital's medical income reached 162.57 million yuan, with its total assets reaching 292.623 million yuan. Its outpatient and emergency treatment patient times reached 495,019, its discharged patient times reached 30,807, its number of surgeries reached 8,194, its hospital bed utilization rate reached 80.81%, the per capita outpatient cost was 88.08 yuan, and the per capita hospitalization fee was 3,861.36 yuan.

In terms of infrastructure, the surgical inpatient building and the medical technology building were fully put into use in 2015, the logistics complex was officially put into use in July, and the renovation project of the internal medicine inpatient building was expected to be completed in October 2016. The construction of the LL County Mental Health Center had been initiated.

In recent years, the payment of employee endowment insurance and occupational annuities has led to a substantial increase in personnel expenditures. The hospital has increased its investment in infrastructure and encountered a large funding gap. Therefore, it is facing funding difficulties in its development.

The hospital has established three new independent specialties including endocrinology, anorectal medicine, and neonatology. After emergency medicine, obstetrics and gynecology, orthopedics has become a provincial key speciality. It focused on developing respiratory medicine, ophthalmology, liver disease, and anorectal departments. A leading group for the development of traditional Chinese medicine has been established to improve the hospitalization conditions of the Chinese medicine department. It is estimated that 2 to 3 specialized outpatient clinics will be added to highlight the characteristics of traditional Chinese medicine and strengthen the development of specialties.

In 2015, it received pair-up assistance from Shuguang Hospital Affiliated to Shanghai University of Traditional Chinese Medicine. In addition to be the Strategic Alliance Hospital of the First Affiliated Hospital of Kunming Medical University, it became a member of the health alliance of the First People's Hospital of YN Province (Kunhua Hospital).

In 2018, there were more than 520,000 outpatient visits, an increase of 5% compared with the previous year. There were more than 33,000 hospital discharges, an increase of 7% compared with the previous year. The length of hospital stay was controlled within 8 days, and the growth rate of hospitalization expenses per visit was controlled within 7%. The growth rate of average cost per outpatient visit was controlled within 5%, the growth rate of surgeries was more than 10%, the business revenue was 190 million yuan, and the growth rate of employee income was over 8%.

At present, the obstetrics and gynecology department, emergency department and orthopedics department are relatively well developed. Among them, the orthopedics department actually occupies the greatest number of bed days, the number of emergency department outpatient visits ranks third in the hospital, the obstetrics and gynecology department has the best operating capacity, with the highest medical income, and its actual number of bed days occupied and the number of outpatient visits are also among the best in the hospital.

The hospital currently has 693 employees, including 389 permanent staff, 298 contract workers, and 6 rehired employees. In 2015, the hospital publicly recruited 9 university graduates and 36 contract personnel.

In terms of personnel training, the hospital selects 29 clinical medical staff to study in hospitals inside and outside the province each year and selects 8 key business personnel to work in Shanghai Shuguang Hospital on a temporary basis. 12 nursing staff went to hospitals inside and outside the province for training and study. Experts from inside and outside the province were invited to the hospital to give 7 special lectures, and the hospital organized the medical backbones to give 19 special training lectures for the medical staff and interns.

Over the past three years, the per capita business income of the on-the-job employees has reached 303,000 yuan. The doctor-to-nurse ratio is 1:1.6. Among clinical departments, the orthopedics has the highest doctor-to-nurse ratio, which is 1:3, followed by pediatrics, which is 1:2.6. The lowest doctor-to-nurse ratio occurs in stomatology, which is 1:0.6, followed by rehabilitation of traditional Chinese medicine, which is 1:1.2. The hospital's physicians have an average daily service patient time of 9.1 visits, among which doctors in emergency and pediatrics departments have the highest patient times, being 21.5 and 20.9 respectively. The

average daily hospitalization is 4.7 bed days, in which anorectal surgery department doctors have the highest of 10.8 bed days, followed by orthopedics department doctors of 8.1 bed days. The TCM rehabilitation department doctors have the lowest of 2.1 bed days.

In recent years, thanks to the strong leadership of party committees and governments at all levels, under the guidance and help of health authorities, and with the understanding and support of all sectors of the society, the hospital's leading team has led the entire staff to unite and work hard, be enterprising, pioneering and innovative, and center on the goals and tasks of the new medical reform. Together, the whole staff gradually promotes hospital reform, improves the level of medical services, and provides fast, convenient, and high-quality medical services to the people of the county.

4.2 Status quo of management of LL County People's Hospital

In the development of LL County People's Hospital, because the traditional income minus expenditure model cannot adapt to the DRG medical insurance payment reform in the province, the hospital has suffered a loss of medical insurance during the operation and development. On this basis, we carried out investigation and research on performance management within the hospital through department seminar and data review, and summarized the following problems in the operation of the hospital.

1. First, the problems of hospital bonus management are manifested in the following aspects. There are artificial adjustment factors in performance bonus accounting, and the bonus distribution is not transparent and not open. The bonus distribution has no obvious relationship with workload and quality of work, and bonuses of medical and nursing staff in each department are basically divided equally by head, so the employees are not motivated.

2. Secondly, the reasons behind the hospital bonus dilemma are as follows. 1) The basic data is unreliable. For example, in the human resources data, the permanent staff and contract staff are mixed, the doctors and nurses are mixed, and it is common in the division of departments that many staff will work between different departments. It reflects the chaos of hospital organization and management, and the lack of basic norms in department setting and human resource management. 2) The performance of functional departments is not directly related to the performance of their duties. There is lack of sufficient management and it cannot directly affect the quality operation and management of the hospital. 3) Because of the excessive number of systems in the hospital, the data classification and statistical criteria are confusing. The reason behind is directly related to the standardization of hospital management.

3. Thirdly, hospital bonus management is directly related to the external pressure of the hospital. As YN Province strengthens the reform of the medical insurance payment system, medical insurance payment is paid based on DRGs. The medical insurance payment to the hospital has changed from the original fee-for-service payment to medical record front sheet-based DRG payment. Hospital clinical management has always lacked quality system management based on the quality of medical records. In addition, the quality of medical records is poor, they cannot be filed in time, and there are missing items or even diagnosis omissions. Clinical quality problems such as the non-standardized filling of surgery level are all exposed, and medical insurance losses in hospital financial income are formed through medical insurance deductions, non-payments, and penalties, thereby forcing the hospital to reform.

In addition, the deep-seated problem faced by the hospital is the lack of awareness of the hospital's overall values and strategic goals, the lack of employee awareness of the hospital's in-depth culture and values, and the lack of recognition of the hospital's development goals. The definition and delivery of the hospital's business goals have been based on the scale of revenue and the efficiency of admissions and treatments. The clinical business has become mechanical diagnosis and treatment items, pursuing the large number and high revenue of diagnosis and treatment items. According to the employees' understanding, medical business is about generating revenue from medical service items. The hospital has therefore been trapped in operational difficulties.

4.3 Applied research of "public hospital innovative pay for performance-normative control model"

4.3.1 Application of normative control

Based on the model design of "public hospital innovative pay for performance-normative control" in this research, the common problem encountered by LL hospital and Chinese public hospitals in the literature research in performance reform is that on the surface it is the issue of the hospital's performance bonus distribution. However, in the deep level, it is a problem of the hospital's standardized management paradigm. The hospital lacks empathy with employees and patients in terms of culture and value, and basic norms and mandatory management in terms of management standards. The normative control of public hospitals is not to establish a set of control systems mechanically, but to establish a "talent view with the

same value selection, a consensus on responsibility for all employees, a sense of dedication for all employees, a continuous value guidance model, and a compulsory judgmental decision-making model of the experiencer". The central value of the normative model is not the number, but the attitude. Values and beliefs that are rooted in ideology and reached a high degree of consensus are the soul of normative control. In other words, the core of the normative control model of medical services is to strengthen the spirit, values and beliefs of the people who provide medical services. "Patient interests first" is the bottom line that meets the common moral expectations and interest requirements of most people.

Therefore, the approach adopted in LL Hospital is that first the whole hospital reshapes the values of "patient interests first". Based on this foundation, without changing the hospital's existing management structure and operating system, a cultural discussion activity is held to discusses "patient interests first" and "employee interests first" in the form of debate competition. The 10 prohibitions red line of the principle of "patient interests first" is collected throughout the whole hospital. Nine members of the hospital's ethics committee are publicly selected by employee representatives, and violation of the red line will be vetoed by one vote. This system is set as the top-level system of all hospital systems, especially the judgment results of the ethics committee, which affects the promotion, professional title, bonus, and honor of the employees.

Second, in accordance with the principle of "Priority of Patient Benefits and 10 No Red Lines", the hospital selects lecturers, develops training handouts, establishes a training system, and regularly conducts training activities for new recruits and current employees.

Third, the implementation of a mentor system, the hospital's public selection, employee recommendation, etc., select candidates who are recognized as mentors in the hospital. New employees are required to choose mentors within 3 years, and the ethics committee will evaluate the guidance of mentors based on the performance of employees, so as to continuously optimize the influence of mentors on employees' values.

The normative control model is not a provision, but a value guiding hospital operation to gradually return to the normative operation track. The public hospital management system and the humanistic value of medical services have provided sufficient institutional framework for the daily management of public hospitals. In specific management application, what we lack is not the system itself, but the continuous and optimized values.

4.3.2 Goal setting based on organizational resources

Based on the principle of optimal allocation, the value of each independent variable is obtained under a series of constraints (Mao, 2008). The search for the optimal solution of allocation is based on the law of diminishing returns. Through rational calculation, the input is rationalized and made explicit, and the income curve is found. The largest target incentive is transformed into the minimum constraint to determine the matching of input and production capacity, so as to establish a method to determine the optimal point by offsetting the marginal profit and loss and find a rational distribution model. Thus, uncertain medical production requirements and production processes are transformed into relative certainty factors of input and production processes, thereby reducing the damage of incentive amplification. After applying the principle of optimal allocation to the setting of hospital resource goals, a series of basic concepts can become clear.

The main focus of the organization level is the goal setting of the business volume, efficiency, and cost control of each clinical department in the hospital based on the existing resources of the hospital. In addition to the following quantifiable indicators, the hospital also sets non-quantifiable indicators: such as the qualitative goal of zero disputes in medical services.

The goal setting is to make comprehensive calculations based on hospital bed resources, human resources, equipment and technical resources, and patient resources, to formulate quantifiable goals for the development of the hospital's business, and at the same time define the normative goals of diagnosis and treatment, including clinical pathways and preponderant disease groups, to promote the orderly and standardized development of clinical practice.

In LL Hospital, measurement of target is based on its existing clinical human resources input, per capita burden of diagnosis and treatment, and its previous three-year data to roughly determine the outpatient and discharge times. As for the ability of the department to treat different disease types, we establish the average CMI value of the department, to calculate the average cost of each disease and form the obligatory targets of the department's average outpatient and emergency expenses. The proportion of surgical patients in the departments and the proportion of third level and fourth-level operations are identified based on the disease type of previous patients of the departments as well as the input of surgical resources. Based on the core system and disease performance of each clinical department, we formulate the clinical efficiency standard to establish obligatory targets on the average hospitalization days and other indicators, to determine the bed resources to release hospitalization bed days.

The comprehensive goal setting is shown as per Table 4.1.

We believe that, as a provider of medical services, in addition to the economy of resource input, what is more important for the hospital is the appropriate ratio and boundary of medical services objectively based on quality treatment requirements and patient safety requirements, and this is the constraining factor of the hospital goal setting and input. To be precise, the setting of hospital goals should not be dominated by hospital profits but should be based on reasonable constraining factors for clinical treatment needs and patient safety to measure resource input and business volume, to avoid waste of resource consumption or incentive damage events caused by stimulation of greater utilization of resources.

4.3.3 Process: Establishment of medical record factor

4.3.3.1 Delphi analysis

After completing the first phase of the survey on the inclusion of the medical record front sheet into the performance accounting project, we obtained from the survey results that the investigated items received high support and approval for inclusion in the performance measurement. In order to further study the operability of the calculation factors, we further screened the relevant indicators, using the questionnaire method of Delphi expert consultation for further investigation.

We selected 15 experts in the medical field to obtain their opinions on whether the above items can be included in the performance measurement system through the Delphi method. The experts have an average work experience of more than 8 years. The experts come from different departments, including hospital-level managers, hospital administrative and logistics staff, clinical managers and front-line clinical medical staff, of which 60% are front-line clinical medical staff. We collected the following related attributes of the experts on the above-mentioned items: delete or not, importance, sensitivity, operability, familiarity, and whether obtained directly from the system. Importance means that the lack of a certain indicator will greatly affect the completion of the hospital's performance evaluation. Sensitivity refers to the degree of influence of a change in an indicator on hospital performance. Operability refers to whether the data is easy to obtain. Due to the particularity of the attribute of "delete or not", we put the items in lexicographic order.

Table 4.1 Comprehensive goal setting

Department	Outpatient and emergency visits	Discharge patient times	Share surgeries of discharged patients	Number of tertiary operations of discharged patients	Number of quaternary operations of discharged patients	Department CMI	Average length of hospitalization stay	Average outpatient and emergency expenses	Average discharge expenses	Share of western medicine
A1	1021	142	27.81%	0.06%	0.00%	1.00	7.59	161.05	4429.69	35.59%
A2	902	204	20.65%	0.16%	0.21%	1.00	8.66	119.01	5140.89	20.85%
A3	1378	225	29.59%	2.13%	3.32%	1.00	9.10	159.39	7084.88	31.99%
A4	288	198	10.61%	0.00%	0.04%	1.29	9.60	106.91	6256.50	35.65%
A5	308	168	49.57%	0.77%	0.23%	0.85	7.37	166.51	4746.72	21.85%
A6	431	141	60.28%	1.54%	0.05%	0.68	8.86	344.43	12045.22	65.33%
A7	2532	109	12.79%	0.00%	0.00%	1.02	9.62	84.02	4846.78	26.67%
A8	570	157	73.12%	27.36%	2.01%	1.05	8.34	116.60	7277.13	27.54%
A9	2486	252	81.88%	30.98%	5.89%	1.43	9.79	107.86	11535.61	8.92%
A10	962	137	60.46%	24.45%	2.09%	0.97	8.21	163.27	5181.06	19.98%
A11	413	83	94.76%	4.58%	1.52%	0.88	9.93	49.78	4441.91	10.88%
A12	505	100	31.22%	6.18%	1.31%	1.09	11.32	179.18	7360.07	15.66%
A13	4045	189	76.36%	23.62%	0.08%	0.84	5.46	90.46	3355.85	15.94%
A14	436	163	92.21%	3.74%	0.30%	1.03	10.85	129.03	6078.67	16.09%
A15	1994	187	79.48%	5.96%	0.29%	0.54	5.71	175.48	3115.42	17.43%
A16	1969	240	89.29%	32.52%	0.35%	0.97	4.50	255.99	2835.41	10.67%
A17	4269	358	63.10%	0.00%	0.00%	0.75	5.58	64.84	1907.75	21.75%
A18	1263	275	98.78%	0.00%	0.00%	0.99	6.01	67.80	2874.59	21.52%
A19	5195	68	91.92%	0.11%	0.55%	1.47	8.59	245.59	5778.66	25.57%

The statistical results showed that 10 of the items got voted by more than 60% of experts, and the votes for other items were all less than 33%. Therefore, we first deleted the above 10 items, and then comprehensively made choices in the remaining 27 items. Items with more than 60% of votes suggested to be deleted, the result as Table 4.2.

Table 4.2 The votes result

Item	Votes suggesting deletion
Injury (poisoning) external cause and disease code, pathological diagnosis and code and medical record number, history of drug allergy, autopsy record, blood type and Rh identification, surgical level, surgeon, first assistant.	9
Admission conditions	10
Wound healing level	10
Date of birth	11
Health card number, place of birth, place of origin, nationality, ID number, occupation, marital status, current address, phone number, zip code, household address and zip code, employer and address, workplace phone and zip code, contact name, relationship, address, telephone number.	11
Departure approach	11
Admission approach	11
Coma time for patients with craniocerebral injury	11
Admission weight of newborn	12
Birth weight of newborn	12

In the remaining 27 items, in terms of whether the data is directly obtained, more than 60% of the experts believe that the item "injury (poisoning) external cause" is not available and has been deleted in the previous round of screening, and the remaining items can all be obtained. All item (indicator) data can basically be obtained from theoretical analysis and work experience, so there is basically no difference in the operability of each item. Therefore, we comprehensively considered the other attributes: importance, sensitivity and familiarity to sort the items.

$$R_j = \frac{1}{n}\sum_{i=1}^{n}(Z_{ij} + M_{ij}) * W_{ij} \quad \text{.....(4.1)}$$

R_j is the comprehensive score of the No. j item (indicator), n is the number of experts, Z_{ij} is the score of importance given by the No. i expert to the No. j item, M_{ij} is the score of sensitivity given by the No. i expert to the No. j item, W_{ij} is the score of familiarity given by the No. i expert to the No. j item. The following table is the selection of indicators when items deleted are not considered， as Table 4.3 and when items deleted are considered.

Table 4.3 Sequence of indicators with deleted items not considered

Item	score
Principal surgery or operation code	100.3571
Medical record number	98.71429
Principal surgery or operation name	95.78571
Actual hospitalization days	94.92857
Anesthesia method	94.71429
Outpatient (emergency) diagnosis	94.42857
Discharge department	88.64286
Pathological diagnosis	86.21429
Admission department	85.92857
Whether there is a plan of hospitalization within 31 days	85.28571
Discharge time	85
Principal diagnosis code	82.71429
Pathological diagnosis code	80.28571
Secondary diagnosis code	79.64286
Comprehensive medical services, diagnosis, treatment, rehabilitation, traditional Chinese medicine, western medicine, Chinese patent medicine, blood and blood products, consumables, and others.	78.07143
Admission time	72.85714
Outpatient (emergency) diagnosis code	72.14286
Surgery or operation date	72.07143
Transfer department	70.57143
Secondary diagnosis	66.21429
Secondary surgery or operation code	63.64286
Secondary surgery or operation name	61.64286
Medical payment method	61.07143
Age	60.85714
All-in cost	60.07143
Gender	50.35714

The sequence is as follows Table 4.4 if items deleted are considered.

Table 4.4 Sequence of indicators with items deleted considered

Original sequence number	Item	Number of experts suggesting to delete	Comprehensive score
18	Principal discharge diagnosis	0	101.1429
23	Principal surgery or operation code	0	100.3571
3	Medical record number	0	98.71429
22	Principal surgery or operation name	0	95.78571
34	Anesthesia method	0	94.71429
32	Outpatient (emergency) diagnosis	0	94.42857
13	Discharge department	0	88.64286
16	Admission department	0	85.92857
11	Discharge time	0	85
19	Principal diagnosis code	0	82.71429
10	Admission time	0	72.85714
20	Secondary diagnosis	0	66.21429
7	Medical payment method	0	61.07143
6	Age	0	60.85714
36	All-in cost	0	60.07143
12	Actual hospitalization days	1	94.92857
25	Pathological diagnosis	1	86.21429
21	Secondary diagnosis code	1	79.64286
37	Comprehensive medical services, diagnosis,	1	78.07143

	treatment, rehabilitation, traditional Chinese medicine, western medicine, Chinese patent medicine, blood and blood products, consumables, and others.		
33	Outpatient (emergency) diagnosis code	1	72.14286
31	Surgery or operation date	1	72.07143
17	Transfer department	1	70.57143
26	Pathological diagnosis code	2	80.28571
30	Secondary surgery or operation code	2	63.64286
29	Secondary surgery or operation name	2	61.64286
4	Gender	3	50.35714
14	Whether there is a plan of hospitalization within 31 days	5	85.28571

4.3.3.2 Item classification

According to the results obtained by the expert consultation method, we organized meetings and discussions in the hospital attended by the directors of medical affairs department, clinical department, performance office, and information center to further categorize the core items on the selected medical record front sheet. During the meeting, the participants reached a consensus on the item classification and formed an item factor classification table as follows Table 4.5.

Table 4.5 Item factor classification table

Serial Number	Item Category	Item
1	Basic individual information	Medical record number Gender
2	Age	Age
3	Length of hospitalization stay	Actual hospitalization days Discharge time Admission time
4	Principal diagnosis	Principal discharge diagnosis Principal diagnosis code Outpatient (emergency) diagnosis Outpatient (emergency) diagnosis code
5	Secondary diagnosis	Secondary diagnosis Secondary diagnosis code
6	Surgery or operation	Principal surgery or operation code Principal surgery or operation name Surgery or operation date
7	Other surgery	Secondary surgery or operation code Secondary surgery or operation name
8	Anesthesia method	Anesthesia method
9	Pathological diagnosis	Pathological diagnosis Pathological Principal diagnosis code
10	Treatment category	Comprehensive medical services, diagnosis, treatment, rehabilitation, traditional Chinese medicine, western medicine, Chinese patent medicine, blood and blood products, consumables, and others.
11	Cost	Payment method All-in cost

12	Transfer	Admission department Discharge department Transfer department
13	Outcome	Whether there is a plan of hospitalization within 31 days

4.3.3.3 Analytic hierarchy process (AHP) to study weight of items

In the "incorporation of the medical record front sheet into the performance accounting item", after the first round of attitude research, the second round of Delphi expert consultation and further discussions by the hospital's medical affairs and functional departments, "whether there is a plan of re-hospitalization within 31 days" became a qualitative indicator rather than a quantitative indicator, and a total of 12 indicators were included in the quantitative accounting. Next, we selected a total of 9 experts in the hospital including 5 clinical department directors, 2 medical management directors (medical affairs department, performance office), 2 hospital performance management experts to carry out further AHP analysis of the 12 indicators. This allows us compare the importance of factors at various levels in pairs, and grade them according to their importance.

(1) Establish an AHP analysis model

1) Formulate judgment matrix

$$A=\begin{bmatrix} a_{11} & a_{12} & \cdots & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & \cdots & a_{2n} \\ \cdots & \cdots & a_{ij} & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & \cdots & a_{nn} \end{bmatrix} \quad \text{.....(4.2)}$$

The a_{ij} indicates the relative importance of A_j compared with A_i. If the former is more important, then $a_{ij} > 1$. If the two are equally important, then $a_{ij} = 1$.

2) Judgment of importance of matrix elements, as Table 4.6

Table 4.6 Scale standard for relative importance

Scale	Meaning
1	By comparison, the two elements are equally important
3	By comparison, the former element is slightly more important than the latter
5	By comparison, the former element is obviously more important than the latter
7	By comparison, the former element is strongly more important than the latter
9	By comparison, the former element is extremely more important than the latter
2、4、6、8	Intermediate values
Reciprocal of the above number	The reverse comparison of the two elements leads to the reciprocal of the original comparison value

3) Calculate the weight vector and check consistency

Vector product normalization steps:

First, use normalization to deal with the matrix, using the following formula:

$$\overline{a_{ij}} = a_{ij} / \sum_{k=1}^{n} a_{ij} (i, j = 1, 2, \cdots n) \quad \text{.....(4.3)}$$

Second, add the elements in the matrix:

$$\overline{w_i} = \sum_{j=1}^{n} a_{ij} (i, j = 1, 2, \cdots n) \quad \text{.....(4.4)}$$

Third, conduct normalization to the $\overline{w_i}$:

$$w_i = w_i / \sum_{j=1}^{n} \overline{w_i} (i, j = 1, 2, \cdots n) \quad \text{.....(4.5)}$$

4) Perform operations on the matrix vector to determine the weight and order of each element. Suppose the matrix is composed of several different weighted elements: A1 Criterion layer, A2 Scheme layer, and H Target layer. Then the vector can be calculated according to the following formula, where w_1 and w_2 represent the weight of each layer.

$$W = \left(w_1, w_2, w_3, w_4, w_5 \right) \quad \text{.....(4.6)}$$

5) Consistency check. For the previously obtained vectors and eigenvalues, the consistency check is carried out. If the check passes, it means that the matrix is valid, that is, there is explanatory value.

Assuming that CI represents the consistency index, the following is the calculation method:

$$CI = \frac{r - n}{n - 1} \quad \text{.....(4.7)}$$

Table 4.7 Random index (RI)

N	RI
1	0
2	0
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49
11	1.51
12	1.54

Through the value of n, the RI value can be obtained, and thus the consistency ratio can be estimated, namely $\mathrm{CR} = \mathrm{C}I/\mathrm{RI}$.

When CR<0.1, the test meets the requirements.

Construction of judgment matrix and calculation of the weight

According to the index system, using the above-mentioned scaling method, through the questionnaire survey of the expert consultation method, 9 experts in the field were selected to score the importance of the indexes, and then the scoring results are averaged to obtain the pairwise judgment matrix as follows Table 4.8.

Table 4.8 Judgment matrix and calculation of the weigh

	Age	Length of hospitalization stay	Principal diagnosis	Secondary diagnosis	Surgery or operation	Secondary surgery	Anesthesia method	Pathological diagnosis	Treatment category	Cost	Transfer
Age	1.0000	0.1996	0.1111	0.1847	0.1259	1.4833	1.6653	2.3003	0.7034	2.1586	1.1611
Length of hospitalization stay	5.0088	1.0000	0.5250	1.4349	0.1486	1.3519	1.0153	4.4984	2.1214	2.2603	4.2963
Principal diagnosis	9.0000	1.9048	1.0000	7.3333	0.5556	8.0000	7.4444	6.9012	7.6667	7.2222	8.4444
Secondary diagnosis	5.4155	0.6969	0.1364	1.0000	0.2167	4.6111	2.6806	4.9048	3.1852	1.6744	2.7722
Surgery or operation	7.9440	6.7300	1.8000	4.6154	1.0000	7.5556	6.8889	4.8272	4.9630	5.7937	5.4444
Secondary surgery	0.6742	0.7397	0.1250	0.2169	0.1324	1.0000	1.9530	3.7398	4.1926	3.9495	2.4028
Anesthesia method	0.6005	0.9849	0.1343	0.3731	0.1452	0.5120	1.0000	0.7259	1.0593	0.4522	0.6852
Pathological diagnosis	0.4347	0.2223	0.1449	0.2039	0.2072	0.2674	1.3776	1.0000	1.7854	1.6682	2.0093
Treatment category	1.4218	0.4714	0.1304	0.3140	0.2015	0.2385	0.9441	0.5601	1.0000	1.6312	2.0556
Cost	0.4633	0.4424	0.1385	0.5972	0.1726	0.2532	2.2116	0.5994	0.6131	1.0000	1.0494
Transfer	0.8612	0.2328	0.1184	0.3607	0.1837	0.4162	1.4595	0.4977	0.4865	0.9529	1.0000

First, we calculated the maximum eigenvalue of the judgment matrix $\lambda_{\max} = 12.4196$. Then the consistency checks, and the consistency index CI were calculated:

$$CI = \frac{\lambda_{\max} - n}{n-1} = \frac{12.4196 - 12}{12-1} = 0.1420 \quad \text{.....(4.8)}$$

An average random consistency index $RI = 1.54$ was obtained. The consistency ratio CR was calculated as follows.

$$CR = \frac{CI}{RI} = \frac{0.1420}{1.54} = 0.0940 < 0.10 \quad \text{.....(4.9)}$$

Since CR is less than 0.1, it can be considered that the construction of the judgment matrix is reasonable. Therefore, we calculated the weights of the indicators as per the following Table 4.9.

Table 4.9 The weights

Indicator level	Weight
Age	0.0390
Length of hospitalization stay	0.0916
Principal diagnosis	0.2700
Secondary diagnosis	0.0998
Surgery or operation	0.2812
Secondary surgery	0.0616
Anesthesia method	0.0309
Pathological diagnosis	0.0334
Treatment category	0.0342
Cost	0.0313
Transfer	0.0270

4.4 Model verification

With the case of LL hospital, this study completed the establishment of normative control in layer S, determination of hospital objective in layer O and design of hospital incentive structure in the process of the "public hospital innovation performance-based payment - normative control model". The most important part of this study is the in-depth research on the incentive structure. In the case study of the LL hospital, based on the research results in the previous chapter, we first built the accounting framework by incorporating medical record front sheet into performance calculation, and second we form medical record factor by incorporating medical record front sheet into calculation. We solicited opinions through a questionnaire survey, to obtain the attitude feedback of the medical workers on the inclusion of the medical record front sheet into the performance accounting. On this basis, we further used the Delphi consultation method to complete research on the design of performance items. We deleted unnecessary items with 27 items remained. Next, we classified the 27 items and grouped and merged the same data with different expressions according to their attributes, obtaining a total of 12 categories. The remaining 12 categories of items were formed into

medical record factors, and then we used the AHP method to perform weight analysis on the medical record factors.

So far, the construction of the incentive structure in the process has been completed, and the indicators of the outcome part are put into the application of the model. Especially we use the data changes after performance incentive measurement to evaluate the strengths and weaknesses of the outcome.

Therefore, in this part, we use the methods of questionnaire survey and regression analysis to verify whether the model is established.

4.4.1 Questionnaire distribution and analysis

In this survey, a total of 750 questionnaires were distributed, and 603 were collected. From the perspective of gender, 302 were males and 301 were females. From the perspective of age distribution, 136 respondents were under the age of 30, accounting for 22.6%, 152 respondents were from 31 to 40 years old, accounting for 25.2%, 154 respondents were between 41 and 50 years old, accounting for 25.5%, 161 respondents were over 50, accounting for 26.7%. As for management level, 142 were hospital-level administrators, accounting for 23.5%, 148 were in-hospital administrative management, accounting for 24.5%, 137 were front-line doctors/nursing/medical technicians, accounting for 22.7%, and 176 were clinical managers (department directors), accounting for 29.2%. From the perspective of educational background, those with doctoral degrees accounted for 4.8 %, those with master's degree accounted for 45.9%, those with undergraduate degree accounted for 43.1%, those with junior college degree accounted for 2.8%, those with high school and technical secondary school degrees accounted for 3.3%. The specific analysis results are as follows.

4.4.2 Factor analysis

Before doing factor analysis, it is necessary to measure whether the items are related to each other. Here, Bartlett's test of Sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy is used. A measure of sampling adequacy of 0.827 with a value of Bartlett's Test of Sphericity (3854.746) with a highly significant level ($p < 0.001$), indicates the suitability of factor analysis, and the results are presented in the table below.

Table 4.10 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.827
Bartlett's Test of Sphericity	Approx. Chi-Square	3854.746
	df	28
	Sig.	.000

Eigenvalue greater than one suggests that the three factors explain a sizable variation contained in the data. The following table represents these results. Since these factors have eigenvalues greater than one, which together explains variance of 87.555%; therefore, the factors confirmed the factorial validity.

Table 4.11 Table Results of principal component analysis

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.416	55.201	55.201	4.416	55.201	55.201	2.729	34.112	34.112
2	1.585	19.817	75.019	1.585	19.817	75.019	2.544	31.798	65.911
3	1.003	12.536	87.555	1.003	12.536	87.555	1.732	21.644	87.555
4	.305	3.813	91.368						
5	.257	3.208	94.577						
6	.174	2.179	96.755						
7	.144	1.798	98.553						
8	.116	1.447	100.000						

Extraction Method: Principal Component Analysis.

There are three factors in the data, which is consistent with previous research. Additionally, the loadings of all the factors are higher than 0.50, confirming the validity of the data.

Table 4.12 Table Rotated Component Matrix

	Component		
	1	2	3
Normative control 2	.928		
Normative control 3	.923		
Normative control1	.921		
Objective 3		.890	
Objective1		.878	
Objective 2		.871	
Medical outcome 2			.882
Medical outcome1			.868

4.4.3 Correlation analysis

Since all the variables are continuous variables, a Pearson Correlation was conducted to test the relationships among these variables. According to the results, we found that 1) there is a positive correlation between Normative control and Objective management, 2) there is a positive correlation between Objective management and Process management, 3) there is a positive correlation between Process management and Medical outcome, and 4) there is a positive correlation between Medical outcome and Normative control.

Table 4.13 Table Results of correlations

		Normative control	Objective management	Medical outcome	Process management
Normative control	Pearson Correlation	1	.488**	.592**	.468**
	Sig. (2-tailed)		.000	.000	.000
	N	603	603	603	603
Objective management	Pearson Correlation	.488**	1	.906**	.543**
	Sig. (2-tailed)	.000		.000	.000
	N	603	603	603	603
Medical outcome	Pearson Correlation	.592**	.906**	1	.507**
	Sig. (2-tailed)	.000	.000		.000
	N	603	603	603	603
Process management	Pearson Correlation	.468**	.543**	.507**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	603	603	603	603

**. Correlation is significant at the 0.01 level (2-tailed).

4.4.4 Regression analysis

Regression analysis was conducted to test the causal relationship between the correlated variables. There are four regression models in our testing.

First, with Objective management as the dependent variable, and Normative control as the independent variable, we found that Normative control has a positive influence on Objective management (Model 1). Second, with Process management as the dependent variable, and Objective management as the independent variable, we found that Objective management has a positive influence on Process management (Model 2). Moreover, with Medical outcome as the dependent variable, and Process management as the independent variable, we found that Process management has a positive influence on Medical outcome (Model 3). Finally, with Normative control as the dependent variable, and Medical outcome as the independent variable, we found that Medical outcome has a positive influence on Normative control (Model 4).

Table 4.14 Results of regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.842	.098		18.878	.000
		.407	.030	.488	13.707	.000
2	(Constant)	2.402	.041		58.560	.000
	Objective	.199	.013	.543	15.865	.000
3	(Constant)	-.722	.256		-2.818	.005
	Process	1.216	.084	.507	14.425	.000
4	(Constant)	.610	.139		4.388	.000
	Medical outcome	.807	.045	.592	18.021	.000

4.5 Research summary

4.5.1 "Effective service patient-times" performance and implementation rules

Based on the incentive structure design framework in Chapter 3, in this chapter we described the construction of the medical record factor. (1) We incorporated the medical record front sheet into the attitude survey of the performance measurement project to understand employees' attitude towards incorporation of the medical record front sheet into performance calculation. (2) For the enforceability of the incorporation, we adopted the Delphi expert consultation method and conducted further research on the deletion of indicators and exploration of data sources. (3) We categorized the items after screening and deletion according to "different expressions of the same item", for example, the principal diagnosis and the principal diagnosis code were classified into one item-the principal diagnosis, and the main diagnosis code was used as the identification number of data sources. (4) In order to further promote the application, the weight distribution of the related items included in the performance accounting was determined by the AHP method in the case hospital. We invited the hospital business manager, clinical director, and performance experts to compare the items, and finally obtained the item weight. Through the above research process, we applied the accounting model of "service patient-times method" to complete the calculation of "effective service patient-times = 1 + disease weight + factor".

The accounting example is as follows:

1. Monthly statistics of patient service value corresponding to each medical case number

Through the calculation rule of "effective service times = 1 + disease weight + factor", we calculated the patient service value of each medical record, so as to obtain the different patient service value of each medical record, that is, effective service patient times point value.

(1) In the application of the weight of the operation factor, the weight of the operation was further divided into the weight of the level 4 operation, the level 3 operation, the level 2 operation, and the level 1 operation according to the operation difficulty at 1:0.8:0.5:0.2, so as to distinguish the difficulty of different surgical grades. 2) The age factor has been re-adjusted in the application, with a weight of 0.1 for 0 years old and 65 years old or older, and a weight of 0.5 for 75 years of age or older, so as to reflect the relationship between patients with different ages (mainly covering newborns and the elderly) and the disease as well as the difference in investment in medical and clinical services.

2. Thus, based on the statistics unit of department, the monthly statistics of patient service

value of departments are formed

As shown in Table 4.15 we used department as a unit to summarize the effective service patient times point value of each department. The monthly discharge number of each department reflects its business volume, and the effective service patient time total point value reflects the work value of the department.

Table 4.15 Monthly statistics of service value of patients from different departments

Department	Discharge person	Effective service patient-times	Disease entity and case factor influence rate	Amount of job positions	Target of monthly service patient-times
A1	185	268.70	45.24%	33	201
A2	118	164.57	39.47%	25	116
A3	84	122.42	45.74%	26	111
A4	136	193.09	41.98%	24	144
A5	133	182.34	37.10%	24	152
A6	179	265.04	48.07%	24	152
A7	156	209.26	34.14%	25	137

Among them, with regard to the impact rate of disease types and medical history factors, the evaluation of the type of patients admitted to the department and the impact of the comprehensive factors of treatment input, the number of discharges can reflect the basic efficiency of the department, and the amount of effective service patient-times can more comprehensively reflect the integrated clinical value, and the total number of effective service patient-times of the department will also become an important factor affecting the performance of the department. The basic accounting principle is as follows.

Department performance income = $\sum$ Effective service patient times of department $\times$ patient time performance-based rate

4.5.2 Influence on the operational data of LL hospital by "effective service patient-times" performance accounting

After three and a half years of operation in LL Hospital, we collected and monitored the following related data (as shown in Table 4.16). According to the data, in 2019, the hospital business volume increased by 9.31% compared with 2018, and the number of discharged patients dropped significantly in 2020, and the reason for the decline is that COVID-19 has directly affected the hospital's inpatient business and the outpatient business which were shut down for three months. In 2021, the business volume rebounded and exceeded the business volume in 2019. From 2018 to 2021, the number of outpatient visits in 2020 was significantly lower than that in 2019 due to the epidemic in 2020. In 2021, the number of outpatient visits basically returned to the normal figure at same period of the previous year. The ratio of

outpatient visits to inpatient visits in four years has dropped from 15:1 in 2018 to 13:1 in 2021.

Table 4.16 Three-year operational data pf LL hospital

Item	2018	2019	2020	2021
Outpatient service patient-times	551773	551393	518003	549690
Discharge service patient-times	37041	40488	39733	42266
Age	15963	16906	16195	17576
Emergency treatment	2961	2519	2241	2220
Level 1 operation	3066	3425	5848	16524
Level 2 operation	5081	5544	4939	5386
Level 3 operation	1864	3009	3537	3794
Level 4 operation	223	182	393	480
Dominant disease	13568	16146	16040	17130
Critically ill	6948	5605	3263	3634
Seriously ill	3882	5641	7498	7702
Number of group consultation	5959	7022	8427	7626
ICU transfer patient times/department transfer	118	139	166	174
Intensive care/critical care	9188	8624	7580	6182
Level 1 nursing	39460	42463	42689	44203
Level 2 nursing	236523	259007	257969	277910

In addition to changes in business turnover, we have observed data of the share of level 3 and level 4 operations in the number of discharged patient times over the four years, and the figures are 5.63%, 7.88%, 9.89%, and 10.11% respectively. The data shows that the share of critically ill and seriously ill patients are 29.2%, 27.78%, 27.08%, and 26.82%. It is commonly acknowledged that the share of level 3 and level 4 operations reflects the clinical ability and technical level of a hospital, At the same time we also need to be wary of changes in the share of level 3 and level 4 operations and changes in the share of critically ill patients caused by upgrades in diagnosis and surgical types due to incentives. This change will also be directly related to changes in nursing-related data.

In addition, the data also shows that the share of dominant diseases in the hospital over the four years are 36.63%, 39.88%, 40.37%, and 40.53% respectively.

The above data shows that the surgical capabilities of LL hospital and its diagnosis and treatment capabilities of dominant diseases have been steadily improved, and its diagnosis and treatment capabilities and levels have been improved to a certain extent.

4.5.3 Comparative analysis of LL hospital data and national data from 2018 to 2020

We compared the three-year operating quality data of LL hospital with the national average and county-level counterparts, (see Table 4.17). (1) The LL hospital personnel costs during the

three years tend to decline every year, 110,353,300 yuan in 2018 and 99,982,800 yuan in 2020, but higher than the national level. The personnel cost of LL hospital in 2020 is significantly higher than that of its county-level counterparts of 67,871,000 million yuan;

2) The average cost per outpatient visit reflects the burden level of outpatients. From the data point of view, the average costs of outpatient visit in LL hospital in the three years present an upward trend, with an increase of 15.02% from 114.21 yuan per visit in 2018 to 131.37 yuan per visit in 2019, and an increase of 13% from 131.37 yuan per visit in 2019 to 148.86 yuan per visit in 2020. However, compared with the national average and county-level counterparts within the province, the average outpatient cost of LL hospital is at a low level.

3) The average cost per hospitalization stay reflects the burden level of hospitalized patients. From the data point of view, the hospitalization costs of LL hospital in the three years are basically stable, and it is also far below the national average. The cost is also somewhat lower than the hospitalization costs of county-level counterparts within the province.

4) The average length of stay reflects the efficiency level of the hospital. From the data point of view, the length of hospitalization stay operation of LL hospital in the three years is basically stable. In comparison with the national average level, LL hospital has a clear advantage in efficiency, and it still has certain advantage compared with county-level counterparts within the province.

Table 4.17 Comparative analysis of LL hospital data and national data from 2018 to 2020

Time	2018			2019			2020		
	LL hospital	National average	County-level counterparts	LL hospital	National average	County-level counterparts	LL hospital	National average	County-level counterparts
Personnel expenditure	11,035.33	8092.3	——	10077.49	9448.8	——	9998.28	9663.2	6787.1
Drug share	24.20%	28.20%	28.00%	25.20%	27.50%	27%	25.50%	26.22%	26%
Average cost per outpatient visit	114.21	274.10	191.70	131.37	286.40	203.70	148.86	319.60	225.00
Average cost per hospitalization stay	4947.86	9976.40	5401.40	4934.14	10484.30	5715.50	5414.28	11364.30	6246.60
Average length of stay	7.53	9.3	8.7	7.55	9.1	8.6	7.94	9.50	9.20

4.5.4 Employee feedback survey after the implementation of the "service patient-times performance" accounting method in LL hospital

In order to further analyze the impact of the reform of the performance accounting method and establish a three-dimensional and more objective evaluation perspective, in addition to comparative analysis from the data point of view, we designed a questionnaire and launched the effect evaluation after implementation of "service patient-times" performance.

4.5.4.1 Questionnaire design

The dimensions in the design of the questionnaire include the influencing factors of performance reform in the CFIR framework, and the possible impact that may be brought performance payment reform concerned by scholars when reviewing performance payment reform literature in China. The dimensions include (1) doctor's professional quality; (2) quality of medical care; (3) patient safety; (4) medical technology; (5) organizational operation and other open questions. Please refer to Annex F for the questionnaire design

4.5.4.2 Questionnaire analysis report (Statistical results are shown in Annex G)

1.Regarding the question of "What should be considered first in the hospital's performance interest's system?", the perceptions of the management and the front-line employees are inconsistent (p <0.05). Specifically, the management generally believes that the interests of patients should be prioritized, while front-line employees have no significant differences in the three options of doctor's interests first, patient's interests first, and equally important.

2.Regarding the question of "Does the income-oriented bonus design of clinicians conform to the professional ethics of doctors?", the management and the front-line employees have fairly consistent perceptions ($p > 0.05$), basically believing that it is in line with the professional ethics of doctors.

3.Regarding the question of "Does the income-oriented bonus design of clinicians affect their medical record writing quality?", the perceptions of the management and the front-line employees are inconsistent ($p < 0.05$). Specifically, the management generally believes that the income-oriented bonus design of clinicians will affect the reduce quality of medical record writing, but front-line employees do not think so. Nearly one-third of the employees believe that there is no necessary connection between the two.

4.Regarding the question of "Does the income-oriented bonus design of clinicians prevent them from paying attention to the safety of patients?", the perceptions of the management and the front-line employees are inconsistent ($p < 0.05$). Specifically, the front-line employees

believe that the income-oriented bonus design of clinicians do not prevent them from paying attention to patient safety, while the management believe that the two are not necessarily related.

5.Regarding the question of "Does the income-oriented bonus design of clinicians make them ignore the upgrading of technical capabilities?", the perceptions of the management and the front-line employee are inconsistent ($p < 0.05$). Specifically, the management team believes that the income-oriented bonus design makes doctors ignore the upgrading of technical capabilities, while front-line employees hold a neutral attitude.

6.Regarding the question of "Does the service patient-times method help doctors pay attention to disease types and improve the admission and treatment of severe diseases?", the management and the front-line employees have consistent perceptions ($p > 0.05$), basically believing that the service patient-times method facilitates doctors to pay attention to disease types.

7.Regarding the question of "Can the service patient-times method help the hospital improve the income structure?", the management and the front-line employees have inconsistent perceptions ($p < 0.05$). Specifically, the management team believes that the service patient-times method helps the hospital to improve the income structure, while a considerable number of front-line employees believe that the two are not necessarily connected, and some even do not believe that the service patient-times method helps the hospital to improve the income structure.

8.Regarding the question of "Can the service patient-times method help the hospital improve employee satisfaction?", the perceptions of the management and the front-line employees are inconsistent ($p < 0.05$). Specifically, the front-line employees do not believe that the service patient-times method can help the hospital improve employee satisfaction, but most of the management believe that the two are not necessarily related.

9.Regarding the question of "Can the service patient-times method help the hospital improve patient satisfaction?", the perceptions of the management and the front-line employees are relatively consistent ($p > 0.05$). Most people express a neutral attitude towards the statement that "the service patient-times method help the hospital improve patient satisfaction."

10.Regarding the question of "Can the service patient-times method help the hospital effectively control medical insurance costs?", the perceptions of the management and the front-line employee are relatively consistent ($p > 0.05$). Most people express a neutral attitude toward the statement that "the service patient-times method helps the hospital effectively

control medical insurance costs".

11.Regarding the question of "Can the service patient-times method help doctors pay attention to the quality of patient diagnosis?", the perceptions of the management and the front-line employee are inconsistent ($p < 0.05$). Specifically, the front-line employees believe that the service patient-times method helps doctors pay attention to the quality of patient diagnosis, but the management hold vague attitudes towards the role of the service patient-times method.

12.Regarding the question of "Can the service patient-times method effectively improve the quality of medical records?", the perceptions of the management and the front-line employees are relatively consistent ($p > 0.05$), holding a neutral attitude.

4.5.4.3 Sample description

A total of 761 questionnaires were collected, with 48.2% males and 51.8% females; ; from the perspective of age, the percentages of those aged below 30, 31-40; 41-50, and over 50 were 28.8%, 21.6%, 25.6%, and 24% respectively; from the perspective of job positions, the percentages of the three groups of managers, front-line employees, and clinical managers were similar; from the perspective of educational background, those with bachelor degree and above accounted for 62.6%, of which 40.2% had bachelor degree.

4.5.4.4 Survey summary

Judging from the overall survey result, managers and front-line employees have different perceptions in terms of the values and the impact of different funding methods on management, and a considerable part of the results differ from previous empirical studies.

To be specific, managers have unanimously recognized that the doctor's performance-based benefit system should be based on the principle of "patient benefits first"; to motivate doctors according to income conforms to the doctor's professional ethics, but it will affect the quality of medical records and affect the doctor's technical performance. However, for potential patient safety issues, managers do not recognize the negative impact of income incentives.

Managers consider that the "service patient-times method", can help doctors pay more attention to the patients, and both managers and employees believe that the "service patient-times method" can help doctors pay attention to disease types and improve the treatment of severe diseases.

In addition to helping to improve the income structure of hospitals, which is recognized

by managers, most people hold a neutral attitude towards “service patient-times method” in terms of improving employee satisfaction, patient satisfaction, and medical insurance cost control.

As for front-line employees, they do not think believe that the doctor’s income-based incentive model will affect the quality of medical records, let alone patient safety. Instead, it will guide doctors to pay attention to patient safety. In addition, the managers and front-line employees reach a consensus that it is consistent with the professional ethics of doctors to motivate them based on income.

According to the statistics of this questionnaire, what we need to pay attention to is as follows. There is a big gap between the management and employees regarding motivating employees based on income, and this is different from the views we have obtained in the literature research. We believe that the income pressure, operating pressure, and management pressure burdened by managers are far greater than those of front-line employees. In addition, as for the approach of performance incentives, managers tend to select direct bonus stimulus methods, hoping that this direct stimulus can reduce the pressure on management and operation.

Hospitals still need to be systematically strengthened in the training and guidance of normative control modes such as value input, especially there should be strengthened training and guidance for mid-level managers in terms of the management ideas and concepts in the hospital operation and management. It reflects huge pressure and challenge faced in the level of normative control mode.

4.5.5 Comparative analysis with three different hospitals

From 2019 to 2021, during the same period, we tried to explore doctor performance-based payment based on “effective service patient-times” in different hospitals, so we had the opportunity to further observe the data changes of three different types of hospitals, including traditional Chinese hospital (The local population is 1.2 million, and there are people’s hospital at the same level in the county. The patients are mainly rural patients), municipal secondary primary hospitals (a hospital in an administrative district of a prefecture-level city, serving a population of about 300,000, covering common and frequently occurring diseases. There are four tertiary hospitals in the local area, so it is not the prioritized hospital for patients), and a provincial-level tumor hospital (covering cancer patients in the GS province, and this is the highest-level tumor hospital in the province).

Table 4.18 Three-year data of the three hospitals of YY, ZZ, and GS

Item	YY County TCM Hospital			ZZ City No.6 Hospital			GS Provincial Tumor Hospital		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
Outpatient visits	190351	207357	225448	35585	31994	36970	375481	389458	409610
Discharges	17661	23432	24556	2517	2202	2540	36250	35762	34680
Emergency rescue	131	145	156	583	1176	849	92	56	76
Level 1 operation	956	1137	1666	62	63	40	908	6974	26276
Level 2 operation	1742	1935	2038	88	74	104	1151	1251	1052
Level 3 operation	1412	1747	2526	67	67	62	3369	2856	2568
Level 4 operation	101	192	200	1	3	20	3573	3633	3992
Dominant disease	6733	9029	11912	1067	1022	1062	4734	4619	4934
Number of group consultation	385	437	326	98	114	326	4256	2795	2024

From the data point of view (Table 4.18), in the three years from 2019 to 2021, the changes in the proportions of the level 3 and level 4 operations are 8.57%, 8.28%, and 11.1% in the YY County Hospital of Traditional Chinese Medicine; t2.70%, 3.18%, and 3.23 % in the ZZ No.6 Hospital; and 19.15%, 18.14%, and 18.92% in the GS Provincial Tumor Hospital. The inclusion of surgical weights into the performance accounting did not cause the upgrade of the hospital's surgical level due to incentives. The change in the number of group consultations refers to the implementation of the MDT multidisciplinary consultation system in the hospital and the inclusion of consultations as an element in the accounting for data monitoring. Through our in-depth research and interviews in the hospital, we found that the barriers between the disciplines of clinical departments are deep and non-standard admission of patients is prominent. The promotion of consultation activities between departments can firstly bring better treatment services to patients, and secondly achieve supplementation to clinical diagnosis as well as peer supervision of medical quality, so as to improve the quality of diagnosis. The data shows that the promotion of consultation in the ZZ City No. 6 Hospital is relatively obvious, and the promotion of consultation in the GS Provincial Tumor Hospital is weak. We come to understand in the subsequent interview that this is related to the strong specialty features of the three hospitals, but the profound reason is still the stubbornness of the doctors in the diagnosis rights and the lack of the "patient health-centered" diagnosis and treatment philosophy. The number of group consultations in the YY County TCM Hospital

has an obvious change in 2020, increasing from 385 cases to 437 cases, and declining to 326 cases in 2021. It not only reflects the awareness of controlling diagnosis rights by the clinical departments that are generally consistent with other hospitals, but also is linked to the fact that the scope and habit of Chinese medicine diagnosis and treatment is from a holistic perspective, and the classification of diseases in Chinese medicine is vague, which is completely inconsistent with the classification of diseases in Western medicine. However, there is an obvious change in the consultation data of the ZZ City No. 6 Hospital. Its group consultation volume increased by 214 cases in 2021 compared with that of 2020, reaching 2.86 times. We conducted a follow-up survey and found that on the one hand the ability and level of diagnosis and treatment of the doctors in the hospital is relatively low, and on the other hand, the hospital mainly treats elderly patients. The phenomenon of multiple diseases is obvious in elderly patients, and the advancement of multidisciplinary participation in diagnosis can improve diagnosis and treatment as well as patient experience to some extent.

The inclusion and promotion of dominant diseases indicator have helped hospitals to seize the characteristics of disease types. YY County TCM Hospital has a relatively good performance and GS Provincial Tumor Hospital has slight improvement.

Based on the application of the “effective service patient-times” performance accounting method, in the data collection and data tracking, we focus on changes such as the share of level 3 and level 4 operations and the share of critically ill patients. These data changes are what we believe to be diagnostic upgrades. The diagnostic upgrade brought about by incentives is our primary concern.

4.5.6 Comparison and contrast of operation data of LL hospital and three other hospitals

We further compared the data of the case hospital, LL Hospital, with three other hospitals including YY Hospital (X), ZZ Municipal Sixth Hospital (Y), and GS Provincial Cancer Hospital (Z), and the results were as shown in Table 4.19.

LL hospital is a county-level tertiary hospital, which is the same as X hospital. Y hospital is a secondary hospital, and Z hospital is a provincial-level specialized hospital. Through data comparison, we can identify the performance of LL hospital and the three other hospitals in terms of efficiency and other aspects.

There is no necessary relationship between the numbers of doctors and the average annual output value of doctors. The number of doctors in LL hospital is slightly lower than that of X

hospital and significantly higher than that of Z hospital, but the average annual output value of doctors in LL hospital is significantly lower than that of Z hospital, but higher than that of X hospital. The amounts of employees in LL hospital and X hospital are basically the same, with basically no difference in terms of number of doctors is, but there is a significant gap between the number of discharges and outpatient visits. In terms of proportion of performance in the two hospitals, the figure in LL hospital is 3% higher than that of X hospital, but from the perspective of doctor's performance level, although the annual performance of LL hospital is higher than of X hospital, the annual average output value of doctors in LL hospital is significantly higher than that of doctors in X hospital. In addition, the proportion of doctor performance in LL hospital is significantly lower than that in X hospital. Therefore, the efficiency of LL hospital is obviously better than that of X hospital. As for LL hospital and Z hospital, the proportion of doctors in LL hospital is obviously better than that of Z hospital in terms of personnel structure. LL hospital doctors account for more than 25%, while Z hospital doctors account for less than 10%. From the perspective of output value, the per capita output value of Z hospital is significantly higher than that of LL hospital, and the annual performance of doctors in Z hospital is higher than that of LL hospital. However, in terms of the doctor performance proportion, the performance of doctors in Z hospital accounts for less than 4% of the annual average revenue, which is significantly lower than the figure, 5.47%, of LL Hospital. In terms of the performance ratio of the two hospitals, the performance ratio of Z hospital is as high as 18.95%, which is much higher than the 14% of LL hospital. It can be seen from the data that the operational efficiency and financial burden of LL Hospital is better than that of Z hospital. The high per capita output value of doctors in Z hospital is related to the patient disease types and the specialty of its tumor treatment.

As for comparison between LL hospital and Y hospital, Y hospital is a secondary hospital. From the perspective of personnel structure, the proportion of doctors in Y hospital is slightly lower than that in LL hospital. Y hospital has the lowest average annual output value of doctors among the four hospitals. Performance income of doctors in Y hospital is also the lowest. However, from the perspective of performance ratio, the performance ratio of Y hospital is slightly lower than that of LL hospital, and the proportion of doctor performance is slightly higher than that of LL hospital. Data show that the two hospitals have similar efficiency. The average turnover and business volume of doctors in Y hospital are related to the hospital level and positioning.

Table 4.19 Comparison of operation data of LL hospital and three other hospitals (data of 2021)

Hospital	Number of employees	Revenue (RMB 10,000 yuan)	Number of doctors	Number of nurses	Outpatient visits	Number of discharges	Proportion of doctor's floating performance	Annual average performance of doctors	Proportion of performance	Annual average turnover of doctors (RMB 10,000 yuan)
LL	799	34,467.70	204	358	549690	42266	5.47%	9.24	14.00%	168.96
X	878	24,850.50	226	380	225448	24556	7.20%	7.92	11.00%	109.96
Y	334	3,539.65	79	90	36970	2540	5.89%	2.64	13.00%	44.81
Z	1425	45,536.75	142	342	409610	34680	3.97%	12.72	18.95%	320.68

We further analyze the per capita burden of doctors (number of annual discharges/number of doctors) and their performance-based income in the four hospitals. It can be concluded that the annual performance-based income of doctors in the four hospitals is positively related to their per capita burden, and their per capita output value. The proportion of doctors' floating salary is related to the hospital's personnel structure, and it also reflects the objective fact that doctors move from clinical front-line to administrative logistics. How to stimulate enthusiasm of front-line doctors, cut down the flow of doctors to the logistics administrative department and ensure the stability of the proportion of front-line doctors is a huge challenge for hospital management. Obviously, among the four hospitals, pressure of medical personnel shortage is greatest in the Z hospital, while the personnel burden and efficiency is optimal in the LL hospital.

Chapter 5: Discussion and Research Limitations

5.1 Research review

The attempt to overcome the "difficult access to medical services and expensive medical bills" has been the main motivation for the systemic reform of Chinese public hospitals. A potential conflict of interests between doctors and patients can be triggered by the doctor's income calculation and floating rewarding performance, which has been denounced since a long time ago. Since 2009, documents on the reform of doctor salary system have been issued frequently, but in all the previous reform attempts, no significant results have been achieved as for the reform of the doctor's salary system. This research sheds new light on the perception of performance-based compensation by hospital managers and other professionals. To integrate the doctor's performance salary calculation with the important record of the medical process, namely, medical record front sheet items, is full of risks and challenges. The biggest question is whether the integration of medical record front sheet items into performance accounting will lead to the dissimilation of important items on the front sheet and upgraded diagnosis due to profit-seeking in accounting. With caution and respect for China's real dilemma, we launched this research, and the review of this research is as follows.

5.1.1 Overall review

This thesis studies the most challenging and controversial issue of doctor performance-based payment in Chinese public hospitals. In the first chapter, starting from the 40-year history of China's medical reform, we sort out the origin of the "income-based" incentives in doctor's performance payment, and the real dilemma in the new medical reform period that lack of non-profit nature has become the most prominent contradiction. Then, we further sort out the plight of the reform and development of public hospitals in China. Based on the characteristics of medical services, the contradiction between "non-profit nature" and "profit-seeking nature" in the reform of public hospitals in China has become a hot spot. Next we review the revenue-generation background of public hospitals, including the impact of the new medical reform policies on the financial structure of hospitals, the exploration of government financial compensation for public hospitals, and the actual problem of "induced

demands" caused by the existing distribution system of public hospitals. With the gradual deepening of the reform of the national medical insurance payment system, the logic and methods of medical insurance payment to hospitals have become the main factors affecting the performance within the hospitals, thus challenging the effective output value created by doctors for hospitals.

The first chapter review helps us construct the scenario of why we should study "doctor performance payment" and the challenges we face. Based on the first chapter, we have established a basic framework for literature research.

In the second chapter, we mainly review the principal-agent theory (Arrow, 1984), including basic concepts such as principal-agent relationship, transaction costs, and asymmetric information theory and its application in doctor's incentive relationships. We also conduct research on the impact of financial incentives on medical behavior. In addition, as medical services face a high level of information asymmetry, we have included the normative control mode and balance from Mintzberg's research. In the context of information asymmetry, the importance of norms cannot be overstated. However, the concept of normative control lies in the humanities, beliefs and values, while Hechter (2008) believes that the effective implementation of normative control mode is internalization, that is, to establish a mandatory sanction system within the organization to promote employees to establish normative behaviors, promote enterprises to establish normative reputation, and promote the whole industry to form a benign environment.

To solve the problem of persistent information asymmetry, in addition to discussion from the perspective of interests, it is particularly important to use basic normative control to establish rules and adjust personal expectations. Especially in the medical industry, the behavior of doctors should be different from that pf businessmen. Businessmen can be motivated by maximizing self-interest, while the regulation of doctors should strengthen their perception of "putting the welfare of patients above personal interests, whether it is economic interests or other interests". This kind of normative motivation is the most important element.

In the third chapter, we build a conceptual model of doctor's performance payment. In order to further study the influencing factors on performance payment design, we use the CFIR framework review literature on public hospital performance, and focus on the research design, incentive structure, incentive methods, and target design. 1) Performance design and application are still not out of the strong relationship of revenue accounting. Even if the RBRVS method is applied, it is still based on the design associated with the building blocks. In addition to association of charging items, the design of the assessment system and the

organizational management objectives and outcome still have no strong relationship. Performance management does not reflect the results of reinforced behavior and norms. 2) In addition to bonus based accounting, the implementation process is not open, as the performance accounting process is separated from the diagnosis and treatment process. The administrative functional departments cannot bring positive promotion effect to the performance implementation, due to lack of data and absence of link control. 3) The external policy environment and internal management environment have brought tremendous pressure to the performance payment reform. Absence of honor system and non-material incentives other than bonus incentives has been repeatedly mentioned. How to make good use of performance management to achieve clear goals and open processes plays an important role in the cohesion of staff. When using the CFIR framework in analysis, the gains from interviews with key informants help us understand the actual dilemmas in the real environment more clearly. It also helps us clarify the design direction of the theoretical framework and model, and in particular strengthens our understanding of the value of the normative control model.

Therefore, based on the normative control model and Donabedian's structure-process-outcome model, we build the "public hospital innovative performance payment-control" model that combines the normative control layer and the organizational executive layer. We use the normative control layer to realize basic consistency between the organizational control boundaries and values and calculate the basic quantifiable business goals of the year without damaging the overall balance of the hospital resources. Next, we promote the integration of the medical record front sheet and performance accounting to build the "medical record factor" and the conceptual model of measurement and calculation to solve the basic needs of doctor's performance accounting. The doctor performance payment model design based on "control-organizational goals-accounting" is realized. We cautiously conduct relevant data analysis and questionnaire surveys for the feedback of the results for continuous follow-up studies.

The case study is based on LL hospital. We have conducted multiple quantitative analyses and studies in the construction of control model, goal measurement and calculation, incorporation of the medical record front sheet into the performance appraisal, and establishment of the measurement process. We finished the weighting of medical record factors and form a medical record factor database. Next, we designed the performance accounting method of "effective service patient-times". In addition, we compare the data of the LL hospital for three years in the longitudinal direction with its own data and in the horizontal direction with hospitals across the country, so as to carefully monitor the data

changes brought about by new incentives. At the same time, we also compare the data of the three similar public hospitals.

5.1.2 Model design survey and review

Due to information asymmetry the special attributes of medical services determine those economic incentives alone cannot contribute to the goal of "patient interests first". Instead, it will trigger the phenomenon of induced demand in the principal-agent relationship. How to balance the interest relationship between patients and doctors? Based on Mintzberg's research, we tried to assess the value of balance and normative control model. Mintzberg's observed that "an organization without dedication is like a human without soul, bones, muscles, and blood. It may be enough to maintain the metabolism but has no vitality at all". Based on this view, we proposed a conceptual model of "Public Hospital Innovative Performance Payment —Control".

The design of the control model faces the dilemma that indicators such as organizational culture and values are unquantifiable. With reference to Arthur Andersen's method, based on the five key elements of the "normative control model" including choice of values, awareness of collectivization, vision guidance, sense of responsibility, and performance judgment, we built a normative hospital management model cultivated with cultural values and ideology. In the hospital performance normative control model, the fundamental bottom line of input is "patient interests first". The employee training, mentor, and accountability system are established on this basis. In the case LL hospital, we tried to reshape the value of "patient interests first", through organizational construction: the establishment of the hospital committee, and institutional construction: "patient interests first and 10 red lines of prohibitions", one-vote veto measures, and mentor system, to reshape the hospital's management and control system and continuously cultivate employees' values.

The incentive structure design is based on evidence-based clinical service and considers the interests of doctors, medical insurance, and patients. To the key elements of doctors' incentives, the medical record front sheet is the starting point for information capture, Then each patient discharged from the hospital counted The main disease type is recorded, with the ICD-10 code of the principal diagnosis. The key element information points that can present the entire clinical diagnosis and treatment process are integrated to form a complete data chain that can describe the patient's treatment process and assigned weights.

We have conducted several rounds of survey, including the second, third and fourth

rounds of questionnaire survey activities in LL hospital.

The first round was the "Survey of Cognitive Attitudes on the Items of Medical Record Front Sheet". A total of 397 questionnaires were collected. Apart from the 14th item "whether there is a plan of re-hospitalization within 31 days" scoring 3.8, the average scores of other items were all above 4 points. On average, the surveyed items received high support and approval for inclusion in the performance measurement. We selected two primary hospitals in the economically developed eastern province Zhejiang and the economically underdeveloped western province Qinghai for comparison. About 46% replies to the questionnaire were obtained in Zhejiang, and nearly 54%in Qinghai. No significant differences between the two groups were obtained on the question on whether the relevant items should be included in the performance measurement.

The second round: We used the questionnaire method of Delphi expert consultation for further research. We selected 15 experts to obtain their opinions on whether the above items should be included in the performance measurement system. With an average work experience of more than 8 years, the experts came from different departments of the hospital, including hospital-level managers, hospital administrative logistics staff, clinical managers and front-line clinical medical staff, of which 60% were front-line clinical medical staff. We collected the following relevant attributes of the experts on the above items: which should be deleted, importance, sensitivity, operability, and familiarity. After the results of the 26 items to be selected, we invited the directors of the medical affairs department, clinical department, performance office, and information center to a meeting to discuss further classification. The accounting items were classified into 12 types of factors, which constitute the medical record factor table.

The third round was carried out in the specific application to the case hospital. Based on the AHP analysis method, we carried out weight analysis on the final 12 types of factors. We selected five clinical department directors, two medical affairs management directors (medical affairs department, performance office), and two hospital performance management experts to complete the final evaluation and thus formed the weight table of the factor database.

In the fourth round, we chose the questionnaire survey at the end. A questionnaire survey was conducted across the case hospital from five perspectives of doctor's professional quality, medical quality, patient safety, medical technology, and organizational operation. In this survey, 761 questionnaires were collected. The results of the survey diverged from previous research. We found different perceptions between managers and front-line employees on values, and attitude towards quality, which also reveals the continuous influence of the

"income incentive" model, as well as the difficulties and challenges brought about by the normative control model. In the promotion of the "service patient-times method", it was revealed that the managers and the employees unanimously recognized that this method could draw doctors' attention to the quality of patients, strengthen the focus on disease groups, and improve the admission and treatment of severe diseases.

In addition to the survey, we also tracked the three-year data of the LL hospital. The three-year data showed that the LL hospital's surgical capabilities and the diagnosis and treatment capabilities of advantageous diseases have been steadily improved, and the hospital's diagnosis and treatment capabilities and levels have improved to a certain extent. Compared with the average operating level of hospitals across the country and the county-level counterparts, the indicators such as personnel expenditure, average outpatient cost, average hospitalization cost, and average hospitalization days of LL hospital had obvious advantage in terms of both absolute value and growth rate. In addition, we also observed three similar hospitals that adopt the "effective service patient-times method", and the data of these three hospitals showed that this method helped the three hospitals to a certain degree in terms of disease treatments. The diagnostic upgrade and share of critically ill patients that may be brought about by incentives should be their key concern. However, we found no evidence of this in these hospitals.

5.2 Research conclusion and reflection on limitations

China's medical industry is based on public hospitals, and the healthcare industry is a complex and special service industry. This study endeavors to assess the "Public Hospital Innovative Performance Payment-Control" model, with a focus on the "effective service patient-times method" incentive measurement model. Following the existing literature, we gradually deepen and explore the ability of Chinese public hospitals to establish the doctor's incentive distribution accounting method that balances the interests of doctors and patients.

5.2.1 Research conclusion

In retrospect, this research has made the following achievements.

1) We assessed the "Public Hospital Innovative Payment-Control" model. Before performance distribution, we constructed an output control system based on the normative control model, a target measurement framework based on organizational resources, and then a doctor performance incentive measurement framework: effective service patient-times

method. In the promotion of the overall process, the doctor incentive must be established under the premise of the normative control of behavior and values as well as the target allocation of organizational resources. Only in this way, will the constructed incentive measurement method be possible not to deviate due to incentives, which will cause incentive damage.

2) We have abandoned the performance accounting method based on incentive by service fee commission, established a system where the doctor's performance matches the clinical process, and realized the promotion of the doctor's accountability for the medical record. We have taken a difficult step in the intervention of medical behavior variation caused by income incentives which has been denounced in the literature research.

3) As for incorporation of the medical record front sheet items into the doctor's performance accounting elements, we have established completed survey procedures, from attitude research to Delphi method for screening of executable items and classification of items, to APH method for weight assigning, to the formation of a medical record factor database, and finally to application to the calculation of the effective service patient-times method. Judging from the application data of the case LL hospital and the other three hospitals, the "effective service patient-times method" has a certain positive effect on the discipline capacity building and improvement of medical record quality for the hospitals. But at the same time, it can also reflect that the income incentive model still has a strong impact.

5.2.2 Research limitations and reflection

We are still aware of some shortcomings and limitations as follows.

1) Information asymmetry cannot be fully avoided. Design based on performance accounting methods and the application of specific projects as well as the weights will inevitably lead to new incentive orientations. When we establish a normative control model for input, the goal setting is taken as a prerequisite. However, in actual practice, we can still see that the implementation of the normative control model is directly related to the pressure of hospital managers on operation. The "effective service patient-times method" can help hospitals solve the problem of the completeness of medical records in a short period of time to cope with the DRG payment reform that will be faced by public hospitals.

2) The objective fact that can be reflected from the effect evaluation questionnaire of the case hospital is that the impact of income incentives is still far-reaching. In the reform of public hospitals in China, government regulations have not been in place, and there is huge

uncertainty in the medical insurance payment system, which are both important factors to undermine the stability of medical services. The "Public Hospital Innovative Performance Payment-Control" model will be difficult to implement without the background of reform and the overall atmosphere of medical humanities.

3) Even if we have tracked the three-year data of the case hospital and the other hospitals, we can prove that the "effective service patient-times method" does not bring excessive incentives, but we are unable to help the hospital achieve rapid growth. During the two years of 2019 and 2020, in face of huge epidemic challenges, hospitals have all experienced closures, but in the data performance of the case hospital and the other three hospitals, there is no significant business decline. Under the condition that all the resources of the primary-level public hospitals in China remain unchanged, we believe that stable operation and structural optimization is also a kind of improvement. However, when applied in different hospitals, in addition to resonance and recognition, our opinions will also face challenges and conflicts, especially when we are unable to help hospitals double their income.

In summary, when it comes to the design of performance incentives in public hospitals, it is always full of hardships and challenges. On the one hand, we recognize that the interests of patients are the maximization of public interests. Medical service requires dedication, and the deformation of medical behavior caused by economic incentives will affect the vital interests of every one of us. On the other hand, hospitals and doctors are trapped in the income-generation incentive model and are unable to extricate themselves. At the same time, with the promotion of the medical insurance payment system with the medical record front sheet quality as the main data source, the medical record quality becomes increasingly low. In this predicament, we have promoted doctors to disclose the treatment process to reduce the asymmetry of medical service information and include the medical record front sheet in the performance accounting, which is the original intention for our research. In this attempt, we have seen a possible direction, but also felt the hardship.

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Annex A: Performance Implementation Framework Interview Guideline

1. Performance project design:
    a) In the current hospital performance method design, has the hospital performance and income been disconnected? What is your understanding of RBRVS?
    b) What is the impact of performance management on hospital goals? In performance incentives, should rewards be the mainstay or should punishment be included?
    c) As for motivation, what is more important? To motivate the individual or to motivate the team?

2. Performance implementation process:
    a) Do you think your hospital's performance implementation process is open and transparent?
    b) What do you think is the most important performance data? What do you think is the data that reflects the whole clinical process besides charging items? Does the data on the first page of the medical record count?
    c) What is the value of informatization in performance management? Can good informatization solve the problems in the performance implementation process?

3. External factors:
    a) What are the influences of external factors on hospital performance?
    b) What is the impact of the medical insurance payment system on the performance obtained from revenue-generating commission?
    c) What do you think of the impact of COVID-19 on doctors' performance? During the epidemic, hospital income has declined, and doctors' performance has also declined. Do you think it is reasonable?

4. Internal factors:
    a) What is the focus of performance management? Is it data, informatization or management?

b) What are the functions of organizational management in performance management?

c) Which aspects should be the important focus of hospital performance management?

5. Characteristics of providers:

a) What factors affect doctors' satisfaction with salary?

b) What can stimulate the enthusiasm of doctors for work? Is the doctor's sense of identity with organizational culture and professional attributes related to performance?

c) Do you believe that the incentive scheme will affect the doctor's clinical decision?

Annex B: Medical Record Front Sheet

Medical institution_____ (Healthcare institution (organization) code:_____ _____)
Medical payment method：

Medical Record Front Sheet

Medicare card number: Hospitalization for the time Medical record number:

Name _____ **Gender** ☐ 1.Male 2.Female **Date of birth**___Year__Month__Day **Age** (Y/M/D)
Nationality____**Ethnicity**____**Birth weight of newborn**____grams **Admission weight of newborn**___grams
Birthplace_____Province___City___County(district)
Native place_____Province(Autonomous region, Municipality)____City
ID number_____**Occupation**
Marriage ☐ 1.Unmarried 2.Married 3.Widowed 4.Divorced 9.Other
Present address___Province__City__County(district)_____ **Tel No.**_____ **Postcode**
Registered address ___Province__City__County(district)_____ **Postcode**
Place of work and address_____ **Tel No.**_____ **Postcode**
Contact name_____ **Relationship**_____ **Address**_____ **Tel No.**
Admission approach ☐ 1.Emergency 2.Outpatient 3.Transfer from other medical institutions 9.Other
Admission time_____Year__Month__Day__Hour **Admission department**____**Ward**
Transfer department 1.__Year__Month__Day__Hour transferred to____department
2.__Year__Month__Day__Hour transferred to____department
3.__Year__Month__Day__Hour transferred to____department
Discharge time__Year__Month__Day__Hour **Discharge department**____**Ward**
Actual length of stay____**days**
Outpatient(emergency) diagnosis_____**Disease code**
Outpatient(emergency) doctor

Discharge diagnosis	**Disease code**	**Admission conditions**			
		Yes	**Clinically undetermined**	**Unclear situation**	**No**
Principal diagnosis:					
Secondary diagnosis:					

Case category☐ A. Common B. Acute C. Intractable D. Critical **Clinical pathway case**☐ 1.Yes 2.No
Emergency rescue___ times Success___times

External causes for injury or poisoning_____**Disease code**

Pathological diagnosis:_____**Pathological number**_____**Disease code**

Drug allergy ☐1. No 2. Yes, allergic drug:_____ Died patient autopsy ☐ 1. Yes 2. No

Blood type ☐ 1. A 2. B 3. O 4. AB 5. Unclear 6. Not checked
Rh ☐ 1. Negative 2. Positive 3. Unclear 4. Not checked

Department director _____ **Chief (associate chief) physician** _____ **Attending physician**
Resident
Charge nurse _____ **Visiting physician** _____ **Intern physician** _____ **Coder**

Medical record quality ☐ 1. A 2. B 3.C

Quality control physician___**Quality control nurse**___**Quality control date**___Year__Month__Da

Surgery or operation date	Surgery or operation name	Surgery level	Surgery or operation doctor			Wound healing	Selective operation	Anesthesia method	Anesthetist	Surgery or operation code
			Surgeon	Surgical assistant Ⅰ	Surgical assistant Ⅱ					
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				

Departure approach □ 1. Departure on medical advice 2. Transfer on medical advice, name of the medical institution to be transferred:_____3. Transfer to community health service institution/township health centers, name of the medical institution to be transferred:_____4. Departure not on medical advice 5. Death 9.Other

Whether there is a plan of re-hospitalization within 31 days: □ 1. No 2. Yes, purpose:

Coma time for patients with craniocerebral injury: Before admission__Day(s)__Hour(s)__Minute(s)
After admission__Day(s)__Hour(s)__Minute(s)

Hospitalization cost (yuan): All-in cost_____(Out-of-pocket payment:_____)

1. Comprehensive medical service	（1）General medical service fee:	（2）General treatment fee:
	（3）Nursing fee:	（4）Other fee:
2. Diagnosis	（5）Pathological diagnosis fee:	（6）Laboratory diagnosis fee:
	（7）Imaging diagnosis fee:	（8）Clinical diagnosis item fee:
3. Treatment	（9）Non-surgical treatment item fee:_____(Clinical physiotherapy fee:___)	
	（10）Operative treatment fee:_____(Anesthetic fee:_____ Operation fee:___）	
4. Rehabilitation	（11）Rehabilitation fee:	
5. Traditional Chinese medicine	（12）TCM treatment fee:	

6. Western medicine	（13）Western medicine fee:____(Antibacterial agents fee:___)
7.Chinese patent medicine	（14）Chinese patent medicine fee: （15）Chinese herbal medicine fee:
8. Blood and blood products	（16）Blood fee: （17）Albumin products: （18）Globulin product: （19）Blood coagulation factor product fee: （20）Cytokines product fee:
9. Consumables	（21）Disposable examination medical consumables fee: （22）Disposable treatment medical consumables fee: （23）Disposable operation medical consumables fee:
10. Others	（24）Other fee:

Illustration:

1. Medical payment method (1) Basic medical insurance for urban employees (2) Basic medical insurance for urban residents (3) New rural cooperative medical system (4) Poverty relief (5) Commercial medical insurance (6) Fully free medical service (7) Fully self-funded medical service (8) Other social insurance (9) Other
2. If the hospital information system can provide a list of hospitalization expenses, the "hospitalization cost" on the medical record front sheet does not need to be filled up, but electronic data based on fee classification of the medical record front sheet must be provided.

Attachment: Records of infants delivered in obstetrics: (optional)

Infant serial number	Gender		Delivery outcome			Infant weight (g)	Infant prognosis			Respiration			Rescue times	Successful rescue times
	M	F	Live birth	Stillbirth	Stillborn foetus		Death	Transfer	Discharge	Natural	Asphyxia Ⅰ	Asphyxia Ⅱ		
1														
2														
3														
4														

Medical record of oncology patients: (optional)

Neoplasm staging type□ 1.P pathological 2.C clinical **T** □ 0/ 1/ 2/ 3/ 4 **N** □ 0/ 1 /2 /3 **M**□ 0/ 1 **Neoplasm staging**				
Ⅰ. **Radiotherapy Way**：□1. Radical 2. Palliative 3. Adjuvant **Pattern**：□1. Continuous 2. Intermittent 3. Segmented **Device**：□1. Cobalt 2. Directly added 3. X ray 4. Afterloading				
1．Primary lesion (first, second) dose: CY/ time(s)/ day(s): Beginning and ending dates: Year Month to Year Month Day				
2．Regional lymph nodes (first, second) dose: CY/ time(s)/ day(s): Beginning and ending dates: Year Month to Year Month Day				
3．Metastasis dose: CY/ time(s)/ day(s): Beginning and ending dates: Year Month to Year Month Day				
Ⅱ. **chemotherapy** 方式：□1. Radical 2. Palliative 3. Neo-adjuvant 4. Adjuvant 5. New drug trial 6. Other **Approach:** □1. Systemic chemotherapy 2. Arterial cannula 3. Intrathoracic injection 4. Intraperitoneal injection 5. Intramedullary injection 6. Other				
Start date	Ending date	Drug name (dose)	Course of treatment	Curative effect (CR, PR, SD, PD, NA)
				CR、PR、SD、PD、NA
				CR、PR、SD、PD、NA
				CR、PR、SD、PD、NA

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Annex C: A Survey of Cognitive Attitudes towards the Items of Medical Record Front Sheet Included in Performance Measurement

A Survey of Cognitive Attitudes towards the Items of Medical Record Front Sheet Included in Performance Measurement

Dear colleagues, thank you very much for participating in this 3-minute survey in your busy schedule!

In order to better optimize the relationship between performance-based income and the quality of medical records, and to seek the best resonance point between hospital development and personal value realization, we specially organized this cognitive attitude survey, and classified common items on the medical record front sheet. Would you please, from your personal point of view, evaluate whether the items should be included in performance measurement.

It is an anonymous survey, and the relevant conclusions only represent personal choices, not as a basis for qualitative analysis. Please feel free to answer.

Thank you again for your great support for this survey!

Category	Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Basic patient information	Admission weight of newborn					
	Birth weight of newborn					
	Medical record number					
	Gender					
	Date of birth					
	Age					
	Medical payment method					
	Health card number, place of birth, place of origin, nationality, ID					

	number, occupation, marital status, current address, phone number, zip code, household address and zip code, employer and address, workplace phone and zip code, contact name, relationship, address, telephone number					
Hospitalization process information	Departure approach					
	Admission time					
	Discharge time					
	Actual hospitalization days					
	Discharge department					
	Whether there is a plan of hospitalization within 31 days					
	Admission approach					
	Admission department					
	Transfer department					
Diagnosis and treatment information	Principal discharge diagnosis					
	Principal diagnosis code					
	Secondary diagnosis					
	Secondary diagnosis code					
	Principal surgery or operation name					
	Principal surgery or operation code					
	Admission conditions					

	Pathological diagnosis					
	Pathological diagnosis code					
	Wound healing level					
	Coma time for patients with craniocerebral injury					
	Secondary surgery or operation name					
	Secondary surgery or operation code					
	Surgery or operation date					
	Outpatient (emergency) diagnosis					
	Outpatient (emergency) diagnosis code					
	Anesthesia method					
	Injury (poisoning) external cause and disease code, pathological diagnosis and code and medical record number, history of drug allergy, autopsy record, blood type and Rh identification, surgical level, surgeon, first assistant.					
Cost information	All-in cost					
	Comprehensive medical services, diagnosis, treatment, rehabilitation, traditional Chinese medicine,					

	western medicine, Chinese patent medicine, blood and blood products, consumables, and others.					
Basic information	Your age group:	18～25	26～30	31～40	41～50	51～60
	Your job position in the hospital	Hospital management	Clinician	Nursing staff	Administrative and logistics staff	Retired

Annex D: Questionnaire of expert consultation of core indicators of medical record front sheet

Dear experts:

Greetings! In view of your academic achievements in hospital performance management and your rich clinical experience, we sincerely invite you to be a consultant for "Public Hospital Performance Evaluation Index-Medical Record Front Sheet Incorporated into Performance Accounting System Design". Please provide us with valuable opinions and suggestions out of your tight schedule.

We aim to conduct an in-depth study on incorporation of the medical record front sheet into the performance accounting system, in order to establish a set of highly operable indicator system that can "objectively present clinical medical behavior and promote the balanced development of clinical medical quality and performance quality". The main contents of this expert consultation are to evaluate and score the initially selected indicators from the three aspects of importance, sensitivity, and operability, and attach the basis for judgment. Please complete the survey according to the questionnaire. Thank you for your contribution.

Core indicator expert consultation questionnaire

Instruction

1. Score the importance, sensitivity and operability of indicators, with 10 being the most important and sensitive and the best operability; A score of 1 means unimportant, least sensitive and least operable. Importance refers to the absence of a certain index will greatly affect the completion of hospital performance evaluation. Sensitivity refers to the degree to which changes of a certain index affect hospital performance. Operability is the ease with which data can be obtained.
2. Judge according to and be familiar with the procedure.
3. If you want to delete an indicator, enter X in the Delete or Not column. Reservation does not mark; To modify, delete indicators first, and then add new indicators;

Category	**No.**	**Item**	**Delete or not**	**Importance**	Sensitivity	Operability	Familiarity	Whether obtained directly from the system
				（1-10 points）	（1-10 points）	1. Theoretical analysis; 2. Work experience; 3. Understanding of domestic and foreign counterparts; 4 intuition	（1-10 points）	1. Direct acquisition; 2. Indirect acquisition; 3. It cannot be obtained
Basic patient information	1	Admission weight of newborn						
	2	Birth weight of newborn						
	3	Medical record number						
	4	Gender						
	5	Date of birth						
	6	Age						

	7	Medical payment method						
	8	Health card number, place of birth, place of origin, nationality, ID number, occupation, marital status, current address, phone number, zip code, household address and zip code, employer and address, workplace phone and zip code, contact name, relationship, address, telephone number						
Hospitalization process information	9	Departure approach						
	10	Admission time						
	11	Discharge time						
	12	Actual hospitalization days						
	13	Discharge department						
	14	Whether there is a plan of hospitalization within 31 days						
	15	Admission approach						
	16	Admission department						
	17	Transfer department						
Diagnosis and treatment	18	Principal discharge diagnosis						
	19	Principal diagnosis code						

information	20	Secondary diagnosis						
	21	Secondary diagnosis code						
	22	Principal surgery or operation name						
	23	Principal surgery or operation code						
	24	Admission conditions						
	25	Pathological diagnosis						
	26	Pathological diagnosis code						
	27	Wound healing level						
	28	Coma time for patients with craniocerebral injury						
	29	Secondary surgery or operation name						
	30	Secondary surgery or operation code						
	31	Surgery or operation date						
	32	Outpatient (emergency) diagnosis						
	33	Outpatient (emergency) diagnosis code						
	34	Anesthesia method						

	35	Injury (poisoning) external cause and disease code, pathological diagnosis and code and medical record number, history of drug allergy, autopsy record, blood type and Rh identification, surgical level, surgeon, first assistant.						
Cost information	36	All-in cost						
	37	Comprehensive medical services, diagnosis, treatment, rehabilitation, traditional Chinese medicine, western medicine, Chinese patent medicine, blood and blood products, consumables, and others.						

In order to facilitate the statistics of this questionnaire, please give a brief answer on your personal information. The following questions do not include sensitive personal information.

1. Your gender:

A. male B. female

2. Your age:

A. 30 years old and below B. 31-40 years old C. 41-50 years old D. 50 years old and above

3. The category of job posts you are engaged in:

A. Hospital-level management B. In-hospital administrative personnel C. Front-line doctors/nurses/medical technicians D Clinical managers

4. The number of years you have worked in this major: [Enter a number from 1 to 40] *

()

6. Your highest education:

A. Doctor B. Master C. Bachelor D. Junior college graduate E. High school or technical secondary school graduate F. Below E

Annex E: Influence of incentives on medical behavior and management process

Dear friends in the medical industry,

This research is designed to 1) further study the possible impact of performance-based incentives on medical behavior; 2) study the impact of management processes on incentive projects, so as to explore a more standardized and humanized process of hospital management. This questionnaire is an anonymous survey, and relevant conclusions are only used for management research, and we will strictly keep the security of the data, please feel free to answer.

Thank you again for your strong support of this research!

Normative control

The hospital's training system focuses on the cultivation of the values of "patient-centered"

(1) strongly disagree (2) somewhat disagree (3) neutral (4) somewhat agree (5) strongly agree

The hospital's mentor system advocates the values of "patient-centred"

(1) strongly disagree (2) somewhat disagree (3) neutral (4) somewhat agree (5) strongly agree

The hospital's accountability system is implemented with a patient-centered approach

(1) strongly disagree (2) somewhat disagree (3) neutral (4) somewhat agree (5) strongly agree

Objective

The allocation of hospital resources mainly prioritizes the interests of patients

(1) strongly disagree (2) somewhat disagree (3) neutral (4) somewhat agree (5) strongly agree

Hospital quality standards are judged mainly based on the patient side

(1) strongly disagree (2) somewhat disagree (3) neutral (4) somewhat agree (5) strongly

agree

The cultivation of hospital cultural values mainly serves the patients

(1) strongly disagree (2) somewhat disagree (3) neutral (4) somewhat agree (5) strongly agree

Process

Intensity of the incentive factors

Item		1. Weak 2. Relatively weak 3. Neutral 4. Strong 5. Very strong
Discharges		
Age		
Length of stay in hospital		
Principal diagnosis		
Secondary diagnosis		
Surgery or operation	Level 1	
	Level 2	
	Level 3	
	Level 4	
Other surgeries		
Pathological diagnosis		
Treatment category		
Expenses		
Department transfer		

Medical outcome

Patients are satisfied

(1) strongly disagree (2) somewhat disagree (3) neutral (4) somewhat agree (5) strongly agree

Hospital operating results are good

(1) strongly disagree (2) somewhat disagree (3) neutral (4) somewhat agree (5) strongly agree

Personal information

In order to facilitate the statistics of this questionnaire, please answer simple questions about your personal information. The following questions do not cover sensitive personal

information.

Basic Information

1. Your gender:

A. male B. female

2. Your age:

A. 30 years old and below B. 31-40 years old C. 41-50 years old D. 50 years old and above

3. The category of job posts you are engaged in:

A. Hospital-level management B. In-hospital administrative personnel C. Front-line doctors/nurses/medical technicians D. Clinical managers

4. The number of years you have worked in this job: [Enter a number from 1 to 40] *

( )

5. Your highest education:

A. Doctor B. Master C. Bachelor D. Junior college graduate E. High school or technical secondary school graduate F. Below E

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Annex F: Questionnaire on effect evaluation after implementation of service patient-times performance

Questionnaire on Service Count Method Post-Implementation Effect Evaluation

Dear doctor and nurse colleagues, leaders of functional departments of the hospital,

Firstly, I would like express our gratitude to all of you for your inclusiveness and contribution to Service Count Method Performance System. Thanks to your trust and support, it can get close to you and become an important tool involving everyone's performance management. Therefore, we are here to listen to your comments with wholehearted gratitude and prudence, with the hope to know your feedback and authentic assessment of the application of Service Count Method. We will treasure every piece of advice from you and appreciate your support.

(Note: you may fill in the following questionnaire by name or by anonymity.)

I. Doctor’s professional quality:

1. Do you think that whether it conforms with the doctor's professional ethic if hospital motivates doctors to generate revenue as the bonus design objective?

(1) Yes (2) No (3) There is no necessary connection between both

2. The first thing that hospital should consider for hospital's performance benefit system is:

(1) Priority of doctors' benefits (2) Priority of patients' interests (3) Balance of medical and patient benefits

II. Quality of medical care:

1.Clinician’s bonus design is income-oriented. Does it affect the medical record writing quality?

(1) Yes (2) No (3) There is no necessary connection between both

2. Service Count Method uses the first page of the medical record as performance design. Will this effectively improve the quality of medical case?

(1) It will bring significant changes (2) It will not bring change (3) Not sure

III. Patient safety

1.The clinician's bonus design is income-dominated. Will this prevent doctors from concerning patient safety?

(1) Yes, this will prevent their attention

(2) No, this will not prevent their attention and they can still pay attention

(3) There is no necessary connection between both

2.Does Service Count Method help doctors pay attention to the quality of patient diagnosis?

(1) Yes (2) No (3) There is no necessary connection between both

IV. Medical technology:

1.The clinician's bonus design is income-dominated. Does this cause doctor's ignorance of upgrading their technical skills?

(1) Yes (2) No (3) There is no necessary connection between both

2.Does Service Count Method help doctors to focus on disease category and improve the admission rate of severe diseases?

(1) Yes (2) No (3) There is no necessary connection between both

V. Organizational operation performance

1. Service Count Method helps to mobilize the hospital to improve following hospital operation indicators:

Improvement of income structure: (1) Yes (2) No (3) Not sure

Improvement of employee satisfaction: (1) Yes (2) No (3) Not sure

Improvement of patient satisfaction: (1) Yes (2) No (3) Not sure

Effective control of medical insurance costs: (1) Yes (2) No (3) Not sure

VI. Others. Please list the inadequacies and defects of performance implementation of Service Count Method for our correction and improvement.

VII. Personal data (for statistical purposes only)

1.Your education background:

(1) High school and below (2) Technical secondary school (3) Junior college (4) Undergraduate (5) Master degree (6) PhD student and above

2. Your age:

(1) Under 25 years old (2) 25-34 years old (3) 35-44 years old (4) 45-54 years old (5) 55 years old and above

3. How long have you been working?

(1) 3 years or less (2) 3-5 years (3) 5-10 years (4) 10-20 years (5) 20 years or more

4.Your title:

(1) Senior professional title (2) Deputy senior professional title (3) Intermediate professional title (4) Junior professional title (5) No title

5.You are a:

(1) Leader of the hospital (2) Middle management personnel in clinical business (3) Middle management personnel in administration management logistics (4) Medical personnel (5) Medical technicians (6) Nursing staff (7) Administrative basic staff

6.The hospital you are working:

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Annex G: Result of Questionnaire on Effect Evaluation After Implementation of Service Patient-Times Performance

1. Problems of statistical

Table 1 Perceptions of different groups on "what should be considered first in the hospital's performance interests system?"

		Position Management	Front-line employee	Total
What should be considered first in the hospital's performance interests system?	Doctor's interests first	43	204	247
	Patient's interests first	71	195	266
	Equally important	42	206	248
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		9.639	2	.008

Table 2 Perceptions of different groups on "Does the income-oriented bonus design of clinicians conform to the professional ethics of doctors?"

		Position Management	Front-line employee	Total
Does the income-oriented bonus design of clinicians conform to the professional ethics of doctors?	Yes	57	211	268
	No	49	206	255
	No necessary connection	50	188	238
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		.393	2	.822

Table 3 Perceptions of different groups on "Does the income-oriented bonus design of clinicians affect their medical record writing quality?"

		Position Management	Front-line employee	Total
Does the income-oriented bonus design of clinicians affect their medical record writing quality?	Yes	76	207	283
	No	38	205	243
	No necessary	42	193	235

	connection			
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		11.534	2	.003

Table 4 Perceptions of different groups on "Does the income-oriented bonus design of clinicians prevent them from paying attention to the safety of patients?"

		Position		Total
		Management	Front-line employee	
Does the income-oriented bonus design of clinicians prevent them from paying attention to the safety of patients?	Yes	37	172	209
	No	59	263	322
	No necessary connection	60	170	230
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		6.345	2	.042

Table 5 Perceptions of different groups on "Does the income-oriented bonus design of clinicians make them neglect the upgrading of technical capabilities?"

		Position		Total
		Management	Front-line employee	
Does the income-oriented bonus design of clinicians make them ignore the upgrading of technical capabilities?	Yes	62	201	263
	No	33	217	250
	No necessary connection	61	187	248
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		12.254	2	.002

Table 6 Perceptions of different groups on "Does the service patient-times method help doctors pay attention to disease types and improve the admission and treatment of severe diseases?"

		Position		Total
		Management	Front-line employee	
Does the service patient-times method help doctors pay attention to disease types and improve the admission and treatment of severe diseases?	Yes	58	233	291
	No	53	180	233
	No necessary connection	45	192	237
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		1.112	2	.573

Table7 Perceptions of different groups on "Can the service patient-times method help the hospital improve the income structure?"

		Position	Total

		Management	Front-line employee	
Can the service patient-times method help the hospital improve the income structure?	Yes	71	216	287
	No	36	201	237
	Not clear	49	188	237
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		7.269	2	.026

Table 8 Perceptions of different groups on "Can the service patient-times method help the hospital improve employee satisfaction?"

		Position		Total
		Management	Front-line employee	
Can the service patient-times method help the hospital improve employee satisfaction?	Yes	54	151	205
	No	45	271	316
	Not clear	57	183	240
Total		156	605	761
		Value	df	Asymptotic Significance(2-sided)
Pearson Chi-Square		13.445	2	.001

Table 9 Perceptions of different groups on "Can the service patient-times method help the hospital improve patient satisfaction?"

		Position		Total
		Management	Front-line employee	
Can the service patient-times method help the hospital improve patient satisfaction?	Yes	47	198	245
	No	53	196	249
	Not clear	56	211	267
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		.391a	2	.822

Table10 Perceptions of different groups on "Can the service patient-times method help the hospital effectively control medical insurance costs?"

		Position		Total
		Management	Front-line employee	
Can the service patient-times method help the hospital effectively control medical insurance costs?	Yes	53	196	249
	No	47	209	256
	Not clear	56	200	256
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		1.111a	2	.574

Table 11 Perceptions of different groups on "Can the service patient-times method help doctors pay attention to the quality of patient diagnosis?"

	Position	Total

		Management	Front-line employee	
Can the service patient-times method help doctors pay attention to the quality of patient diagnosis?	Yes	46	282	328
	No	52	163	215
	No necessary connection	58	160	218
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		15.219a	2	.000

Table 12 Perceptions of different groups on "Can the service patient-times method effectively improve the quality of medical records?"

		Position		Total
		Management	Front-line employee	
Can the service patient-times method effectively improve the quality of medical records?	Yes, it will bring significant change.	49	198	247
	No, it will not bring any change.	46	195	241
	Not sure	61	212	273
Total		156	605	761
		Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square		.931a	2	.628

2. Sample

Table13 Sample description

		Frequency	Percent	Valid Percent	Cumulative Percent
gender	male	367	48.2	48.2	48.2
	female	394	51.8	51.8	100
	Total	761	100	100	
age	below30	219	28.8	28.8	28.8
	31-40	164	21.6	21.6	50.3
	41-50	195	25.6	25.6	76
	above50	183	24	24	100
	Total	761	100	100	
position	Vice President	5	0.7	0.7	0.7
	Administrator	239	31.4	31.4	32.1
	First-line employee	265	34.8	34.8	66.9
	Clinical Manager	252	33.1	33.1	100
	Total	761	100	100	
education	PHD	91	12	12	12
	master	78	10.2	10.2	22.2
	bachelor	306	40.2	40.2	62.4

Junior college	97	12.7	12.7	75.2
high school	89	11.7	11.7	86.9
below high school	100	13.1	13.1	100
Total	761	100	100	