

# Redefine the Value of High-End Medical Equipment in the Construction of High-Level Hospitals

Huang Xiaoping<sup>1</sup>, Guo Zhanxiong<sup>2</sup>, Mai Dacheng<sup>3</sup>, Li Guiming<sup>1</sup>, Chen Guangyuan<sup>1,\*</sup>

<sup>1</sup>Equipment Department, Panyu District Central Hospital, Guangzhou, China

<sup>2</sup>Finance Department, Panyu District Central Hospital, Guangzhou, China

<sup>3</sup>Medical Device Management Branch, Guangdong Primary Medical Association, Guangzhou, China

## Email address:

280368463@qq.com (Chen Guangyuan)

\*Corresponding author

## To cite this article:

Huang Xiaoping, Guo Zhanxiong, Mai Dacheng, Li Guiming, Chen Guangyuan. Redefine the Value of High-end Medical Equipment in the Construction of High-level Hospitals. *World Journal of Public Health*. Vol. 8, No. 2, 2023, pp. 103-107. doi: 10.11648/j.wjph.20230802.19

Received: March 9, 2023; Accepted: April 20, 2023; Published: April 24, 2023

**Abstract:** *Background:* Guangdong Province of China has started the construction of high-level hospitals, and Guangdong Province has started to build the Nogan as a national medical center and a national regional medical center, with the implementation of high-level hospital construction as the traction, to enhance the overall strength of medical and health services in Guangdong Province, and to provide higher quality medical and health services for the people. *Objective:* The introduction of high-end medical equipment in high-level hospitals is one of the important inputs. The high-level development of hospitals in the new form is inseparable from the configuration of high-end medical equipment. This paper takes the construction of high-level hospitals in Guangdong Province as an example, combined with the significance of the development of high-level hospitals, and repositions the value evaluation of high-end medical equipment. *Methods:* This study shows the importance of DRG index of high-end medical equipment. Focus on scientific evaluation of the social value of high-end medical equipment, high-end medical equipment continues to play a positive role, especially in promoting hospital teaching, medical treatment and scientific research work, has an irreplaceable role, and it is of great strategic significance to improve the core competitiveness of hospitals. *Conclusion:* In the construction of high-level hospitals, the social benefits of introducing high-end medical equipment are greater than the economic benefits.

**Keywords:** High-Level Hospital, High-End, Medical Equipment, Evaluation, Value

## 1. Introduction

High investment, high quality, strong momentum to promote the construction of high-level hospitals, the introduction of high-end medical equipment in high-level hospitals is one of the important investment [1]. Therefore, in the evaluation of the comprehensive benefits of high-end medical equipment, it is necessary to consider the economic benefits of high-end medical equipment, analyze the cost input and economic benefits of hospital high-end medical equipment and make scientific evaluation. However, it should be pointed out that if only a single index is used to evaluate the economic benefits of high-end medical equipment, there may be some one-sided [2]. When evaluating the economic benefits of high-end medical equipment, this study evaluates

the economic benefit indicators of profitability, operation ability, cash flow status, scientific research ability, high-edge technology, performance ranking, regional influence, development level and other aspects.

In 2020, Guangdong Provincial Health Commission released the 2020 Comprehensive Evaluation and Analysis Report of Guangdong Province. DRG is short for disease diagnosis related groups. It is a powerful tool to promote the reform of public hospitals, which is mainly used in two aspects of medical service performance management and medical cost management. The DRG evaluation index system of Guangdong Province consists of three dimensions: DRG capacity index, service efficiency and medical safety, DRG

group number, case portfolio index (CMI), discipline construction index, and discharge time index of remote (difficult and critical), which is used to evaluate the comprehensive service level of regions and medical institutions [3].

The evaluation index included some indicators based on disease diagnosis related groups (Diagnosis-Related Groups, DRG), including: medical quality index in terms of "capacity improvement", including case portfolio index (CaseMix Index, CMI), case mortality and time consumption index in low-risk group; and the cost consumption index was added to "innovation efficiency". These indicators reflect the three aspects of capacity, safety and efficiency in the process of medical service [4].

The CMI value is obtained by calculating the case average weight of the patients admitted to hospitals, which reflects the structure of the diseases admitted to hospitals, and is usually used to judge the technical difficulty of medical services. The more cases with high weight, the higher the proportion of DRG cases with high weight over 1, the higher the CMI value; the lower the CMI value. The high-quality development of

public hospitals is a kind of development in the pursuit of "quality". Public hospitals should improve their medical level and service ability around their own functions, while CMI value is the index to evaluate and reflect such situations [5].

The index of DIP score payment greatly improves the importance of CMI medical technology difficulty score. The higher the difficulty of CMI technology is, the higher the reimbursement ratio of medical insurance and the better the benefit. From the perspective of development, hospitals are more inclined to develop towards advanced medical technology. As can be seen from Table 1, the proportion of CMI medical technical difficulties has increased, and hospitals are encouraged to carry out difficult medical technologies such as core diseases, third-level surgery, fourth-level surgery and minimally invasive surgery. The development of these highly difficult medical technologies must be matched with the corresponding advanced equipment. This will help to promote the hospital to strengthen the discipline construction and improve the concentration of DIP diseases [6].

*Table 1. Comparison of hospital service capacity before and after the DIP reform.*

project	CMI	Core diseases proportion /%	The proportion of tertiary surgery was /%	The proportion of fourth IV surgery is /%	Minimally invasive surgery is a proportion of /%
Before the reform	0.869	91.24	24.24	8.70	5.37
After the reform	1.313	88.13	27.39	17.55	7.58
Growth / percentage point	0.444	-3.11	3.15	8.85	2.21
x <sup>2</sup>	-	324.140	77.6000	930.872	115.001
P	-	<0.001	<0.001	<0.001	<0.001

The DRG capacity index is the embodiment of the hospital's comprehensive service capacity level. The high-level hospitals in Guangdong comply with the requirements of national medical reform, solve the difficulties and points of medical treatment for the masses, constantly improve the level of medical services, improve the provision of hardware facilities, increase the strength of software and technology, and build high-level hospitals to improve the comprehensive medical service capacity [7].

## 2. High-End Equipment Promote the High-Level Construction

In 2018, Guangdong province launched the construction of high-level hospitals. Guangdong province focused on establishing a national medical center and a national regional medical center. With the construction of high-level hospitals, it will improve the overall strength of medical and health services in Guangdong province and provide higher quality medical and health services to the people. Each high-level hospital has received the construction fund support of 300 million yuan from the provincial finance, and has taken the initiative around the six tasks of "technology, scientific research, talent, discipline, system and demonstration", and entered the "fast track" of development. Hospital high level

development will be heavily in the introduction of high-end medical equipment, with large investment amount, long use time, advanced technology, wide and a series of characteristics, high-end medical equipment representative of one of the high level, so the high-end medical equipment usage evaluation and analysis of value evaluation is particularly important. At present, the problem that needs to be solved in hospital equipment management is how to improve the economic and social benefits of these high-end medical equipment. The hospital can introduce the equipment use benefit evaluation system, strengthen the management of equipment, improve the utilization rate of equipment, reduce the idle condition of equipment, reduce the failure rate, improve the comprehensive benefit of the hospital, but also provide a scientific basis for the subsequent purchase of equipment [8].

From high level hospital of Guangdong province DRG ability top 20 performance: table 2 tertiary general hospital DRG ability index of the top 20 institutions, these hospitals have always hardware investment is in place, vigorously introduce advanced medical equipment to play advanced medical technology do precision medical treatment, the medical service efficiency and service quality can provide first-class service, four years in advance of Guangdong province to achieve the goal of the national "not out of the county" health reform, out of the characteristics of Guangdong classification [9].

Table 2. Top 20 institutions in the DRG capacity index of tertiary general hospitals in 2020.

order number	Organization name	DRG ability Force index	Total weight (ten thousand)	DRG group count	CMI	discipline construction	Remote (difficult and critical) discharged patients (ten thousand)
1	The First Affiliated Hospital of Sun Yat-sen University	5.35	19.06	736	1.58	8.11	2.01
2	Guangdong Provincial People's Hospital	5.31	21.33	735	1.74	6.82	2.55
3	Nanfang Hospital of Southern Medical University	5.27	19.13	754	1.60	7.51	2.07
4	The Sun Yat-sen Memorial Hospital, Sun Yat-sen University	4.75	13.60	688	1.54	6.25	1.45
5	Zhujiang Hospital, Southern Medical University	4.68	13.68	719	1.39	5.97	1.61
6	The Third Affiliated Hospital of Sun Yat-sen University	4.64	10.80	710	1.41	6.85	1.00
7	Meizhou City People's Hospital	4.48	17.73	724	1.41	6.71	0.30
8	Shenzhen Municipal People's Hospital	4.33	13.34	711	1.27	7.01	0.22
9	Dongguan City People's Hospital	4.31	13.40	723	1.25	6.79	0.24
10	The First Affiliated Hospital of Guangzhou Medical University	4.28	9.45	656	1.38	5.43	0.92
11	The Affiliated Hospital of Guangdong Medical University	4.24	11.36	737	1.31	6.80	0.13
12	Jiangmen City Central Hospital	4.23	10.87	708	1.30	6.47	0.26
13	North Guangdong People's Hospital	4.23	14.53	742	1.19	6.46	0.21
14	Zhongshan City People's Hospital	4.20	10.89	707	1.51	6.19	0.12
15	Guangzhou First People's Hospital	4.19	9.61	730	1.23	6.28	0.35
16	Foshan First People's Hospital	4.19	11.53	707	1.38	5.89	0.28
17	Peking University, Shenzhen Hospital	4.15	9.73	686	1.38	6.02	0.24
18	Gaozhou City People's Hospital	4.13	13.22	718	1.15	6.25	0.20
19	The First Affiliated Hospital of Jinan University	4.11	6.97	695	1.37	5.24	0.65
20	The Second Affiliated Hospital of Guangzhou Medical University	4.06	9.26	694	1.20	5.50	0.49

Note: The number of remote discharged patients (difficult and critical) is only listed in tertiary medical institutions.

### 3. Scientific Evaluation of High-End Equipment

According to China's ministry of health on large medical equipment configuration license management directory (2023), greatly reduce the threshold of high-end equipment procurement, let go of the high-end equipment procurement authority, this see the high-end medical equipment of medical technology application more and more widely, the advancement of medical technology plays a very important role, so China in terms of economic benefits of high-end medical equipment procurement.

In terms of scientific evaluation of high-end medical equipment, repositioning value assessment, not pure benefit analysis, also join the horizontal comparison of equipment, innovation in the conventional method, should join the social benefit, social benefit is often larger than economic benefits, economic efficiency, more intuitive, social benefits in the overall hospital status and business development has a far-reaching influence, thus scientific evaluation of high-end medical equipment operation benefit [4]. Specifically, for, high-end medical equipment comprehensive benefit reasonable evaluation, should join the social benefits, such as scientific research development, advanced technology, improve the national performance appraisal scores, improve the regional core competitiveness, listed in high level hospital construction index, to promote the overall hospital overall

status and business development has important positive influence [10].

### 4. The Importance of Social Benefits

An important trend in the development and construction of hospitals is to introduce high-end medical equipment. If there is a lack of high-end medical equipment, a lot of high-edge medical work can not be effectively carried out, which will have a serious adverse impact on its development. Hospitals need these expensive equipment, and the higher costs will bring great economic pressure to doctors. In this case, how to give full play to the benefits of high-end equipment has become a positive problem for many hospital decision makers to think about, but simply considering the economic benefits will evaluate the value of the equipment unscientific. In the construction of high-level hospitals, the social benefits of introducing high-end medical equipment are greater than the economic benefits.

(1) Increase the score of various reviews and ratings

High-end equipment has a far-reaching influence in the national performance appraisal indicators, performance assessment of provincial public hospitals, evaluation of third-grade hospitals, the number of fourth-level surgeries, scientific research achievements, the competitive ranking of Alibi hospitals, the number of national and provincial key specialties, and regional influence. In terms of scientific evaluation of high-end medical equipment, innovative methods are combined with conventional methods, including

scientific research development, development of high-edge technology, improvement of national performance appraisal and high-level hospital construction, so as to promote the overall status and business development of hospitals [11].

(2) Medical technology to promote the construction of high-level hospitals

With the goal of getting better quality, efficient and safe medical services for patients, it introduces advanced equipment and creates a new technology service platform, which provides high efficiency, high quality and strong technical guarantee for doctors' diagnosis and treatment, improves the medical environment, improves the level of medical service, and enhances the comprehensive strength of the hospital development. At the same time, advanced equipment helps promote the construction of domestic first-class and internationally renowned high-level research hospitals, which is conducive to the upgrading of national medical center, high-level hospital construction, clinical medical research center and regional medical center. At the same time, it is the supporting force to promote the extraordinary, leapfrog and high-quality development of hospitals [12].

(3) Medical science and technology to cultivate life science talents

Improve scientific and technological innovation ability is to improve the medical technology and service ability, an important means of cultivating high quality excellent medical talents, advanced medical instruments is to solve difficult severe "diamond", with the help of these advanced instruments, before bad, dare not do, can not do, make the diagnosis and treatment level and treatment ability significantly improved, is conducive to the cultivation of talent [13].

(4) Promoting the intensity and level of scientific research

Promoting the research and development of medical and industrial crossover and medical artificial intelligence, sophisticated medical equipment is the result of the high integration of medical and industrial crossover and the latest concepts and methods in natural science with medicine and life science. Modern medical technology depends on engineering technology. In the process of cultivating talents, it attaches importance to the cultivation of engineering science and technology talents and medical talents who understand engineering, which is conducive to the sustainable development of medical technology and advanced medical equipment innovation [14].

## 5. Conclusion

In recent years, especially since the 19th and 20th National Congress of the Communist Party of China, major progress has been made in medical technology. Medical technology has played an important role in promoting the high-quality development of public hospitals, preventing and controlling COVID-19 and other major epidemics, and ensuring people's lives and health. Medical equipment is an important part of China's medical technology system, and advanced medical equipment is a powerful technical guarantee for the construction of a healthy China.

A craftsman who wishes to do good work must first sharpen his tools. Promoting precision medicine, improving the level of diagnosis and treatment, and the introduction of sophisticated medical equipment are the first priority of building a high-level hospital. Powerful performance, complete functions, high precision of advanced instruments and equipment, for clinical precision navigation, not only greatly improve the level of hospital diagnosis and treatment, but also represents the current level of medical technology. At the same time, with the reform of the medical system, the competition among medical institutions is becoming more and more fierce. In order to improve their medical service level and obtain a larger medical market share, the demand for high, sophisticated and sophisticated high-end medical equipment is also increasing. Building a nest attracts phoenix, promoting the construction of high-level hospitals, and high-end medical equipment has a far-reaching and important role in promoting the construction of high-level hospitals.

## Acknowledgements

- i Scientific Research Project of Guangdong Provincial Finance Department in 2021 (9-8).
- ii Scientific Research Project of Guangdong Economic Health Society in 2022 (2022-WJMF-73).

## References

- [1] In the crystal. Risk analysis and control strategy of fixed asset management in public hospitals [J]. Accounting study, 2019 (17). 206-208.
- [2] Wang Haining, Zhang Ping, Liu Ye. Study on the performance evaluation index design of single-machine management of large medical equipment [J]. Chinese Contemporary Medicine, 2021 (27). 198-201.
- [3] Yan Jianming, Liu Jieyun, Lin Xiandong, He Shuaiquan, Fuzhou Bin. Research on the management of medium and large medical equipment in the construction of smart hospitals [J]. China New Communications, 2022 (21). 116-118.
- [4] Zhang Ying, Xia Zhenwei, Chen Haitao. Economic benefit analysis of the operation of large-scale medical equipment under the digital intelligent management mode [J]. Chinese Medical Equipment, 2021 (05). 188-191.
- [5] Han Liangbin, Pan Li. Tracking and analysis of the purchase demonstration and use of large-scale medical equipment [J]. Jiangsu Health Service Management, 2021 (12). 1619-1623.
- [6] Han Liangbin, Jing Weiyong. Multi-parameter benefit analysis method based on the target achievement rate of medical devices [J]. Jiangsu Health Service Management, 2021 (11). 1499-1502+1522.
- [7] Zhou Wensheng. Evaluation of the application effect of cost-effectiveness analysis in the management of large medical equipment [J]. Medical Device Information in China, 2021 (07). 164-166.
- [8] Yuan Qikun. Application of medical equipment cost-benefit analysis in device management [J]. Medical equipment. 2019. 12 (32). 53-54.

- [9] Zha Lei, CAI Jun. Application of cost-effectiveness analysis in medical equipment management [J]. Chinese medical equipment. 2016. 1 (13). 50-52.
- [10] Hou Le. Application of cost-effectiveness analysis in the management of large medical devices [J]. Chinese medical equipment. 2018. 2 (15) 104-107.
- [11] Zhao Shu, Liu Zhiwei. A Medical Device Configuration Evaluation Study based on Evidence-based and Decision Tree Analysis [J]. Medical Equipment in China, 2018, 15 (2): 108-109.
- [12] Zhou Deqing, Wang Binyuan. Research on budget Management of Public Hospitals under the New Situation of Medical Reform [J]. Research on Health Economy, 2018 (10): 70-71.
- [13] Tang Guoping, Hu Liang, Xu Huajian, strong square quality. Information practice of cost-benefit analysis of medical equipment [J]. 2016. 10 (31). 116-118.
- [14] Zhu Yiheng, Liao Yunlei. Cost-benefit analysis of large-scale medical equipment based on social benefits and economic benefits [J] Chinese medical equipment. 2017. 5 (14). 38-40.