Review

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The initiation, exploration, and development of hospital-based health technology assessment in China: 2005 – 2022

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SUMMARY A hospital-based health technology assessment (HB-HTA) can provide the evidence needed to inform clinical decisions at the administrative level. With the implementation of a new round of medical and health care system reforms in China, such as the abolition of medical mark-ups, adoption of modern hospital management systems, reform of diagnosis related groups (DRGs) payment, and performance evaluations for public hospitals, medical institutions increasingly need HB-HTA. The development of HB-HTA in China can be divided into three phases: An initiation phase (2005–2014), a preliminary exploratory phase (2015–2017), and a rapid development phase (2018–present). HB-HTA has been used to manage medical consumables, medical devices, and medicines, but there are still problems and challenges in terms of concept recognition, the mode of development, and limited professionals and data. To promote and use HB-HTA in developing countries, we have identifies the development paths and recommendations for implementation based on a case study in China, which can be summarized as follows: enhancing the top-level design of HB-HTA, formulating HB-HTA guidelines, further promoting the main ideas of HB-HTA, concentrating on the training of evaluation personnel, establishing an HB-HTA network and paying attention to the flexibility of HB-HTA in the application process, and multi- stakeholder participation.

Keywords hospital-based health technology assessment, health technology assessment, lean management, value-based healthcare, methods of payment, modern hospital management system

1. Introduction

Health technology refers to a specific product, commodity, treatment plan, or knowledge system used in the health care system. This includes drugs, medical devices, surgery, program plans, hospital management systems, and support systems. There are two sides to the development and use of health technology. On the one hand, its development has helped to improve diagnostic capabilities and the ability to prevent and treat disease and to improve the quality of life of patients. On the other hand, it has also had many negative impacts, such as the side effects of health technology, the unreasonable and rapid growth of medical costs, and ethical and moral issues (*1*). Health technology assessment (HTA) emerged in this context. HTA is a systematic and multidisciplinary evaluation of the characteristics of health technologies and interventions, including their direct and indirect consequences, that aims to determine the value of a health technology and to provide guidance on how these technologies can be used in health care systems. HTA is an important part of the international, national, and regional health care decision-making process. However, there are still some high-value innovative technologies that cannot be implemented in clinical practice in time. At the same time, there are some health technologies that have low value that are used in clinical practice. Hospitals are the main entryway for health technologies, but related knowledge and tools to evaluate these new technologies are insufficient in hospitals. Thus, hospitals have difficulty selecting and using these new technologies scientifically. In an era of relatively fixed

and diminishing hospital budgets, hospital administrators need to provide the best care at the lowest cost, which means they must maximize the value of hospital inputs (*2*). Hence, the use of HTA at the hospital level is becoming more widespread in the selection of, admission to, and use of new technologies (*3,4*). Hospitals increasingly want to use HTA to optimize their resources through systematic multidisciplinary evidence-based management of health technologies (*5*).

Since the introduction of the concept of HTA in the 1980s, a wealth of research has been conducted in China. However, most of the current HTA guidelines are formulated at the national or regional level. Hospitals of different levels, types, and scales have different information needs for HTA, the methods and tools for obtaining and utilizing technical information differ, and they follow different guidelines and make different decisions. A survey found that hospital administrators and clinicians generally believe that HTA reports from national or regional research institutes are not sufficiently relevant to hospitals' daily clinical management (*6*). Hospital administrators usually need faster access to HTA information to support decision-making, while HTA reports from national or regional research institutes often take a long time, so the hospitals' decision-making needs cannot be met in a timely manner (*7*).

Based on the hospital setting specifically, hospital-based HTA (HB-HTA) aims to help hospitals make decisions on various health technologies *via* HTA. It can provide hospital managers with evidence to assess whether the hospital needs to adopt a new technology, so that the hospital can avoid introducing inappropriate technology or reduce its unnecessary use, optimize purchasing decisions, improve the efficiency with which healthcare resources are allocated (*8*). With the continued progress of China's new round of medical and health care system reforms, compensation mechanism for public hospitals requires the control of the growth of unreasonable medical costs at medical institutions (*9*), and the creation of a hierarchical medical system requires the establishment of a framework for value-based care (*10*). In particular, "Healthy China 2030" proposes to create a modern system of public hospital management (*e.g.*, comprehensive budget management) (*11*). At the same time, the method of paying health insurance has changed from a post-payment system to a pre-payment system (such as a total prepayment system or individual payment) or a bundled payment system (such as payment by disease type or payment by diagnosis related groups (DRGs)) (*12*). Many profit centers in the former economic operation of hospitals have transformed into cost sources, requiring hospital managers to allocate resources based on evaluation of the value of a health technology in the hospital environment in order to effectively control costs and improve quality. At the same time, in the context of reforms to "streamline administration, delegate power, strengthen regulations, and improve care", hospitals have greater autonomy to make various decisions. In 2015, the former National Health and Family Planning Commission revoked approval for admission to clinical use of class-three medical technology, clearly indicating that "medical institutions have the main responsibility for the clinical use and management of their own medical technologies" (*13*). In this context, HB-HTA needs to be adopted to create an evidence-based management system for hospitals and to improve the scientific level of hospital decision-making. However, the implementation of HB-HTA in China is still in its development stage, and there are still many problems and challenges. This paper aims to systematically review the development process, current status, and challenges of HB-HTA in China and to summarize the development paths and suggestions for implementation of HB-HTA in order to serve as reference for the development of HB-HTA in developing countries.

2. Literature search strategies and methods

2.1. Data sources and search strategy

The databases searched included: PubMed, Web of Science, EMBASE, CNKI, CQVIP, WanFang, as well as the websites of government agencies such as the National Health Commission and the National Healthcare Security Administration, HTA institutions and medical institutions. The search strategy for each database was devised by combining subject terms and free words. The search strategy for PubMed was as follows: ((health technology assessment) OR (HTA) OR (the ambassador model) OR (the internal committee) OR (the mini-HTA) OR (the HTA unit) OR (HTA)) AND ((decision making) OR (decision support techniques) OR (decision aid) OR (health system)) AND ((hospital) OR (health facility) OR (medical institution)) AND China. The most recent search was conducted on October 31, 2022. Since we only searched literature in English and simplified Chinese, HB-HTA studies in Taiwan, Hongkong and Macao are less likely to be included apart from those published in English. Moreover, all references in relevant studies were reviewed in the event that eligible studies were not identified.

2.2. Inclusion and exclusion criteria

Inclusion criteria: *i*) From the research perspective of hospital management in China; *ii*) The research includes the HB-HTA evaluation of a specific health technology; *iii*) Evidence-based hospital decision-making research; Research about how to conduct a hospital health technology assessment or evidence-based in-hospital decision-making research (process, quality assessment and control, report of results, decision application, *etc*.); and *iv*) HB-HTA related policy research.

Exclusion criteria: *i*) HTA research not including hospital management; *ii*) The abstract or full text could not be obtained by contacting the authors; and *iii*) A source with duplicate content or duplicate publication.

2.3. Literature screening process

Titles and abstracts were evaluated by 2 authors independently. Potentially relevant studies were reviewed in a full paper by 2 scholars, with any disagreement resolved by consensus by a third author. The flow chart for literature screening is shown in Figure 1.

3. History of the development of HB-HTA in China

Based on the year of publication, content of the literature, and website materials, the development of HB-HTA in China can be divided into three phases: An initiation phase (2005–2014), a preliminary exploratory phase (2015–2017), and a rapid development phase (2018–present).

3.1. Initiation phase (2005–2014)

HTA was first introduced in China in the 1980s and evidence-based medicine in the 1990s (*14*), Xia *et al*. published "Health Technology Assessment and Hospital Management" in 2005, the first Chinese source related to HB-HTA (*15*), which analyzed the relationship between HTA and management of medical technology management, drug and medical devices in the hospital settings. Although the concept of HB-HTA was not mentioned in the paper, as a pioneer in exploring the application of health technology assessment in hospitals in China, it is of great significance for the beginning of HB-HTA in China (*16*). In August of the same year, Zhao *et al*. emphasized in their article that clinical management decisions in hospitals should be based on high-quality research evidence (*17*). Evidence-based ideas began to sprout in hospitals. Since 2006, the Consumables Management Department of the Sixth People's Hospital affiliated to Shanghai Jiao Tong University School of Medicine has started to implement an evidence-based management system for the entire procurement and supply chain management system of medical consumables (*18,19*). With the development of HB-HTA in the world, the mini-HTA tools are emerging and gradually becoming an important tool for healthcare decision-making at the global hospital level. In 2014, Huang *et al*. presented in detail the evaluation elements and application scenarios of mini-HTA tool in detail in a Chinese journal (*20*), which can be used as a tool for HB-HTA in China. At this phase, the concept of HB-HTA has not yet been officially proposed in China, but the idea of evidence-based decision-making, which is related to HB-HTA, has already gained acceptance in hospitals.

3.2. Preliminary Exploratory Phase (2015–2017)

From 2015 to 2017, the former National Health and Family Planning Commission of China issued a series of policies to guide and strengthen the implementation of HTA in China, and also began to include HTA in process of formulating specific policy. The Ministry of Human Resources and Social Security of the People's Republic of China also included HTA evidence as one of the criteria to determine whether a drug should be included in the national drug reimbursement list. The demand for HTA-related decisions in China increased (*21*). As the reform of the payment method of health insurance and the reimbursement mechanism of public hospitals progressed, China's health administration department

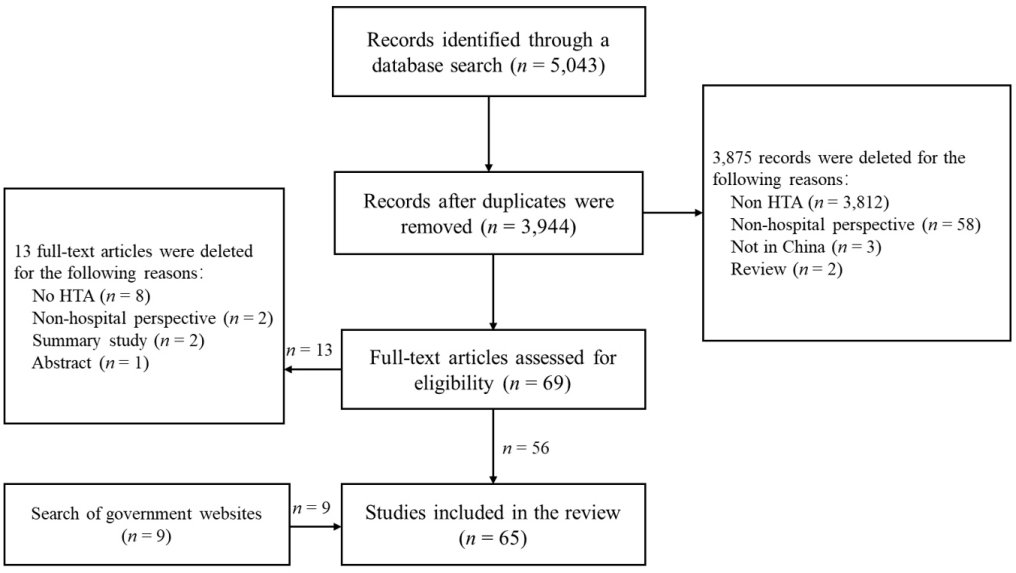

Figure 1. Flow chart for literature screening.

cancelled the approval for admission to the third type of medical technology for clinical use, and medical institutions took primary responsibility for managing the clinical use of their own medical technology. Medical institutions began to explore the use of HB-HTA to assist management and improve the level of scientific decision-making. HB-HTA in China has begun to enter the preliminary exploratory phase.

The literature during this period mainly focused on the study of relevant international experiences, and cases from hospital practices were rare. In 2015, Zhang *et al*. first introduced the international concept of HB-HTA in China and the basic methods of HB-HTA, laying a theoretical foundation for HB-HTA in China (*22*). In 2016, Lv *et al*. discussed the path for introducing HTA into management of medical technology in China by referring to the process and methods of HTA used to manage medical technology in the UK (*23*). In September 2017, the Shanghai Health Development Research Center compiled the Hospital Health Technology Assessment Manual and Toolkit, a research and development result of the European Union HB-HTA Project (AdHopHTA), which provided information and tools for the establishment and implementation of HB-HTA in hospitals and conducted extensive academic exchanges(*24*). At this stage, most scholars are disseminating concepts related to HB-HTA and reviewing the methods and tools of HB-HTA. HB-HTA has not yet been promoted, used, or transformed into policies in Chinese hospitals.

3.3. Rapid Development Phase (2018–present)

With the rapid development of HTA in China, China issued a series of policy documents (*25-28*) from 2018 to 2019 (Table 1) that have created a good policy foundation for the development of HB-HTA, and HB-HTA has entered a phase of rapid development.

At the national level, from 2018 to 2019, National Center for Medical Service Administration of the National Health Commission (hereinafter referred to as the National Medical Management Center) consecutively conducted two sets of HB-HTA pilot projects in 12 public tertiary hospitals in China (*29,30*), significantly improving the pilot hospitals' knowledge of and emphasis on HB-HTA. In April 2019, the National Health Commission's department of drug policy and essential medicine began to promote nationwide monitoring of drug use and comprehensive clinical evaluation, and it proposed that medical institutions should make full use of the HTA methods and routine drug monitoring tools to assist them in drug procurement and use according to their actual needs. In July 2021, the National Center for Medicine and Health Technology Assessment published a management guideline (*31*) and three technical guidelines (*32*) for comprehensive clinical evaluation of drugs. To date, comprehensive clinical evaluation of medicines has been widely conducted as an application of HB-HTA to the clinical use of medicines in Chinese hospitals.

At the local level, China's developed areas such as Shanghai and Shenzhen have taken appropriate action regarding HB-HTA. In September 2018, the Shanghai Hospital Association and Shanghai Medical Device Industry Association presented an expert consensus on the development of HB-HTA in Shanghai to specify the direction for the development of HB-HTA in Shanghai (*33*). Implementation of the "Shenzhen Model" of HB-HTA was proposed by the Zhongxing Telecom Equipment (ZTE) Foundation HTA Center. In August 2020, the Shenzhen Municipal Health Commission appointed 7 hospitals as pilot hospitals, and the ZTE Foundation HTA Center collected the drug evaluation requirements at the pilot hospitals. After a drug evaluation report was

Table 1. HB-HTA-related policies in China from 2018 to 2019

Date of Publication	Issuing agency	Name of Publication	Related Content
July 2018	The State Council of the P.R.C.	Regulations on the Prevention and Handling of Medical Disputes.	Medical institutions adopting new medical technologies shall conduct a technical evaluation and ethical review.
August 2018	The State Council of the P.R.C.	Guidelines of the General Office of the State Council of the P.R.C. on Reforming and Improving the Comprehensive Supervision System of the medical and health industry.	A health technology assessment should be conducted to support decisions regarding clinical admission, standardized application, and discontinuation and elimination of medical technologies, drugs, and medical devices.
June 2019	National Health Commission	Administrative Measures for Medical Consumables in Medical Institutions.	Management of medical consumables should be patient-centered and based on medicine, and the entire process of purchasing, storing, using, tracking, monitoring, evaluating, and supervising medical consumables should be effectively organized, implemented, and managed.
December 2019	The Standing Committee of the N.P.C.	Law of the P.R.C. on the Promotion of Basic Medical Care and Health.	To organize the assessment of the quality of care and the use of medical technology, drugs, and medical devices in medical and health care institutions.

P.R.C. : People's Republic of China; N.P.C. : National People's Congress.

prepared, the pilot hospitals used it as a reference for the admission of new drugs to hospitals (*34*). This provides evidence for the admission of new drugs by other hospitals that have not yet implemented HB-HTA, and it greatly improves the efficiency of decision-making for HB-HTA research.

Since 2018, with policy support, the path of HB-HTA has been explored at the national and local levels, focusing on the implementation and application of HB-HTA. Many hospitals in China have reported the use of HB-HTA (*35-40*). In the process of practical application, some new theoretical methods, such as multiple-criteria decision analysis (MCDA), have been gradually integrated into HB-HTA (*41*), and HB-HTA has been gradually improved in the process of practical application.

The characteristics of HB-HTA in all three phases of development in China are summarized in Figure 2.

4. Current status of HB-HTA development in China

The current status of hospitals that have conducted HB-HTA in China from 2005 to 2022 is as follows:

4.1. Institutions conducting HB-HTA

Based on the status of the HB-HTA pilot hospitals selected by the National Medical Management Center and the literature, the current HB-HTA institutions in China are shown in Supplemental Table S1 (*https://www.biosciencetrends.com/supplementaldata/135*) (*29,36,38-54*). The medical institutions are located in 16 provinces/municipalities/autonomous regions, with the largest number being located in Guangdong Province, Beijing, Shanghai, and Jiangsu Province. Currently, the medical institution conducting HB-HTA are mainly concentrated in the developed regions of China (Figure 3), which are mainly public tertiary general hospitals.

4.2. Organizational management of HB-HTA

In 2008, the HTA international (HTAi) Hospital Based Health Technology Assessment Sub-Interest Group divided HB-HTA into four modes, *i.e.*, an internal committee mode, an ambassador mode, a mini-HTA mode, and an HB-HTA unit mode, depending on the organizational complexity and focus of action (*55*). Most of China's HB-HTA activities were still based on expert opinions or committee decisions, and no HB-HTA units were internationally recognized (*56*). Lin *et al*. surveyed 30 public hospitals in China in 2018 and found that all of the surveyed hospitals had established health technology assessment systems in forms, mainly with the internal committee mode and mini-HTA mode, and that about 1/3 of admission to hospital devices was determined *via* a model similar to mini-HTA (*57*). In general, the Expert Committee is chaired by the director or deputy director of a hospital, and the members include experts in clinical medicine, clinical pharmacy, biomedical engineering, evidence-based medicine, health economics, health care management, ethics, library and information science, and other relevant fields (Figure 4). In some hospitals, the committee to manage medical technology assumes the role of an HB-HTA committee. For example, Shanghai Sixth People's Hospital affiliated to Shanghai Jiao Tong University School of Medicine explored and adopted a method of voting by committee based on a simple assessment, which is similar to an internal HB-HTA committee. Later, an HB-HTA interest group was established, involving biomedical engineering, health economics, health policy, hospital management, *etc.* (*56*).

China has not yet developed a uniform HB-HTA assessment procedure. Different hospitals have different procedures for different evaluation contents, but generally there are key steps such as application, evaluation, and voting. Taking the mini-HTA of medical devices at the Aviation General Hospital of China Medical

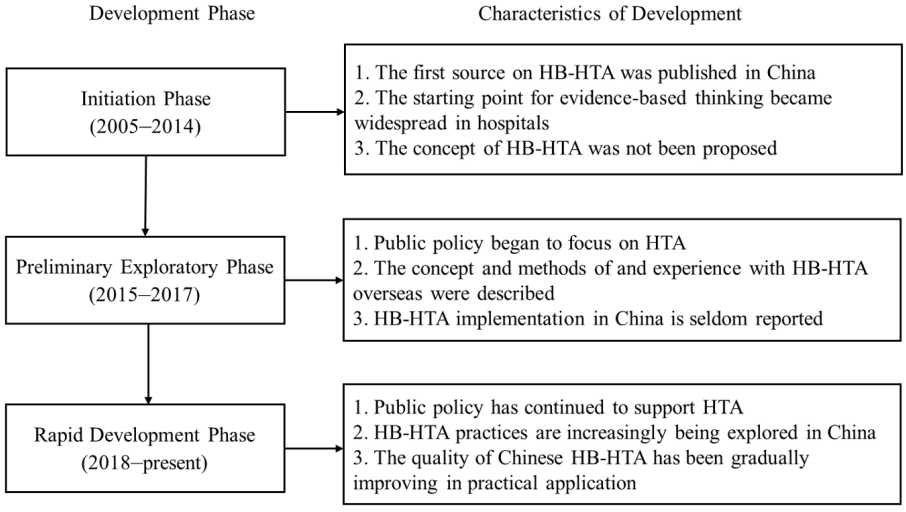

Figure 2. History of HB-HTA development in China.

University as an example, first, a clinical department makes an application, a medical department conducts the evaluation, and then the Medical Devices Committee makes the final decision by voting. Subsequently, the Medical Department and the Purchasing Center take action together (Figure 5) (*44*). HB-HTA usually uses intermediate indices as measurement standards, and the evaluation cycle is about 1-6 months. For example, the mini-HTA of an intermittent pneumatic compression device at a tertiary hospital in Shanghai took 2.5 months (*47*) and the mini-HTA of a special anti-magnetic anesthesia machine in West China Hospital of Sichuan University took only 1 month (*58*). A mini-HTA report is usually submitted in addition to the full assessment report and the rapid assessment report.

4.3. Scope of application of HB-HTA

HB-HTA in China is most often conducted for medical devices (*59*), followed by drugs. However, it can be applied to diagnosis and treatment technology (*60*), medical or surgical disposal, support systems,

Figure 3. Distribution of HB-HTA institutions in China.

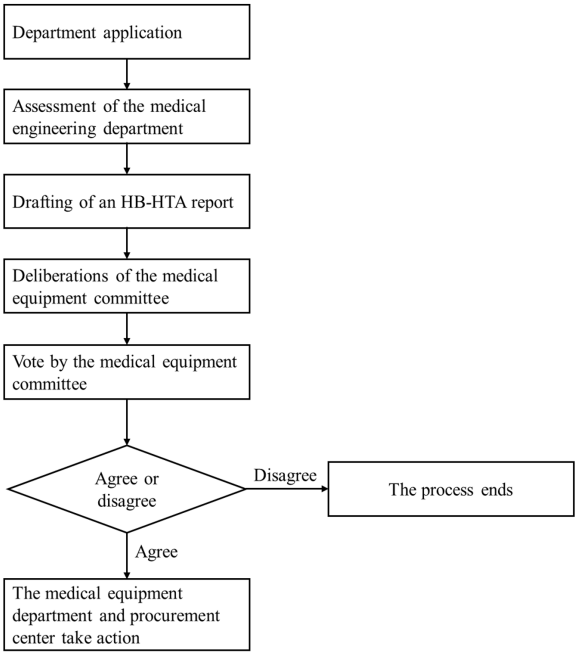

Figure 5. Mini-HTA flow for medical devices at the Aviation General Hospital, China Medical University.

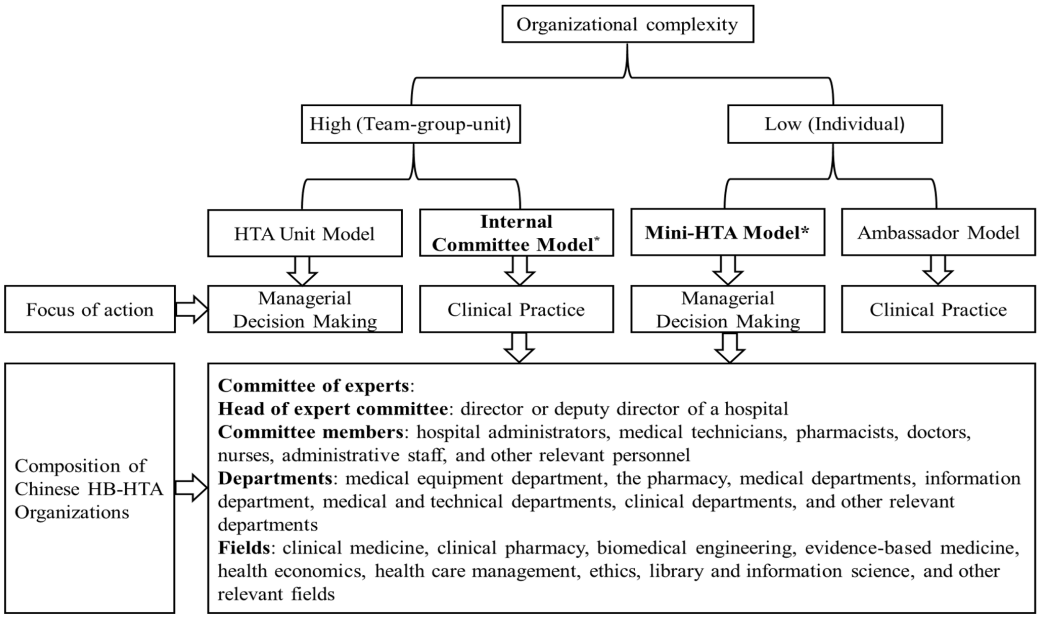

Figure 4. Organizational management of HB-HTA departments in China.

organizational management systems, and other aspects, though the scope of application is still relatively limited (*49*). In the area of medical devices, diagnostic equipment (such as Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) machines and doppler ultrasound diagnostic apparatus), treatment equipment (such as intra-aortic balloon counterpulsation pumps, temperature-maintaining devices during the perioperative period, intermittent pneumatic compression devices, and high-frequency thermotherapy ablation machines), auxiliary devices (such as robots for intravenous drugs allocation) and medical consumables (such as dressings and materials for the repair of peripheral nerve defects) have been evaluated. Some hospitals use the mini-HTA assessment list to conduct HB-HTA, and some develop their own HB-HTA tools depending to their situation. They have evaluated the technical level, patient level, hospital level and economic level. The HB-HTA activities of most hospitals mainly play a decision support role in the admission management of medical devices, and a small number of hospitals also conduct HB-HTA to support decision-making in the use of medical devices (Table 2, Online Table, *https://www.biosciencetrends.com/supplementaldata/135*) (*36-39,42,44,47,48,51-53,58,61-66*). This improves the scientificity and refined management level of medical devices admission and use, and helps hospitals control costs sensibly and reduces the burden on patients. HB-HTA of pharmaceuticals focuses mainly on drugs of antineoplastic and immunomodulating agents, cardiovascular system, alimentary tract and metabolism, musculo-skeletal system, anti-infectives for systemic use, nervous system and blood and blood forming organs. Most hospitals use self-made evaluation tools. One hospital uses an evidence and value: impact on decision-making (EVIDEM) framework to evaluate. They have evaluated drug safety, effectiveness, economics, innovation, suitability, and other aspects. The HB-HTA activities in hospitals play a decision-supporting role in the admission management and use management of drugs (Table 3) (*34,40,41,43,54,67-70*), and improves the scientificity of hospital selection of drugs and the level of clinical safety and rational drug use (Figure 6).

Table 3. Typical examples of HB-HTA application to pharmaceuticals in China

Lead author (year)	Site	Scenario for application	What is assessed	Assessment tool	Assessment dimensions
Yun B (*41*) (2020)	Gansu Province	AM	Drugs (alimentary tract and metabolism drugs)	The MCDA method and the EVIDEM framework.	Clinical need, clinical comparative results, type of clinical benefit, economics, intervention background, normative criteria, feasibility criteria, opportunity cost
ZTE Public Welfare HTA Center (*34,43*) (2020-present)	City of Shenzhen	AM	Drugs (antineoplastic and immunomodulating agents drugs, cardiovascular system drugs, alimentary tract and metabolism drugs, musculo-skeletal system drugs, anti-infectives for systemic use drugs, nervous system drugs, blood and blood forming organs drugs, *etc.*)	The "Operating Code for Dynamic Adjustment of Hospital Drug Lists Based on HTA" was developed by the ZTE Public Welfare HTA Center, including 10 sets of assessment forms.	Relative safety, relative effectiveness, innovative value and suitability of drugs, economic value of drugs
Wang Q (*54*) (2021)	City of Chongqing	AM, UM	Drugs (alimentary tract and metabolism drugs)	Rapid scoring system established by the hospital	Necessity of clinical use, effectiveness, safety, economics, attributes of national essential medicines, attributes of medical insurance, quality level, packaging attributes, nature of pharmaceutical companies, market attributes, *etc.*
Qiu B (*40,67,68*) (2021)	Hebei Province	AM, UM	Drugs (anti-infectives for systemic use drugs, alimentary tract and metabolism drugs)	Based on "Guidelines for the Assessment and Management of Drug List Selection in Public Medical Institutions in Hebei Province"	Safety, effectiveness, economics, innovation, suitability, accessibility
Duan BJ (*69*), Ren BN (*70*), (2020-2021)	Hebei Province	AM, UM	Drugs (nervous system drugs, antineoplastic and immunomodulating agents drugs)	The Mini HTA Scale developed by the hospital	Pharmaceutical properties, effectiveness, safety, economics, attributes of national insured drugs, attributes of national essential drugs, storage attributes, market attributes, attributes of companies

AM, Admission management; UM, Usage management.

5. Challenges in the development of HB-HTA in China

Although HB-HTA in China has made some progress, it is still in its early developmental stage compared to other developed countries and regions. There are still some challenges in terms of concept recognition, the model of development, limited professionals, and data source on HB-HTA in China.

5.1. Lack of recognition of HB-HTA

Although China has introduced a series of policies to

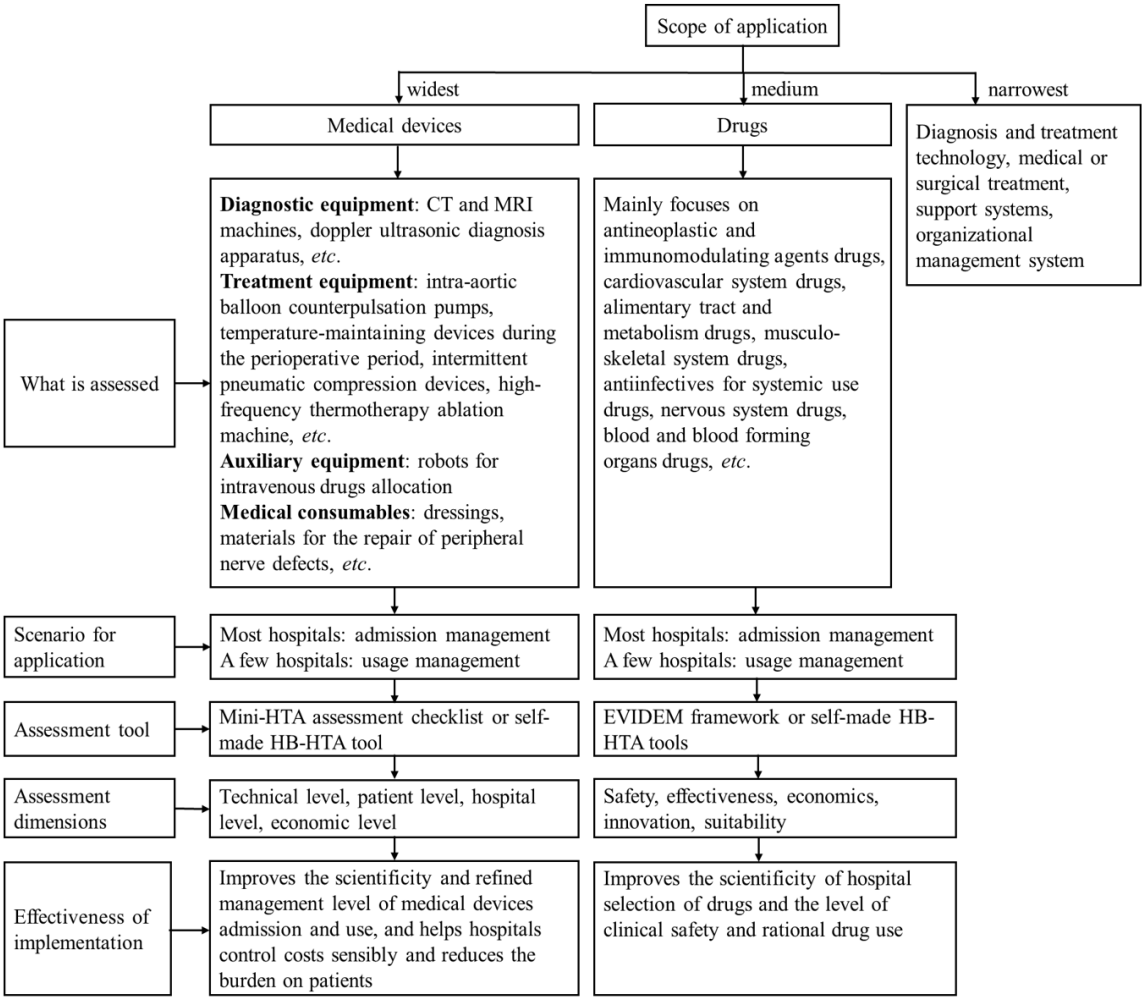

Figure 6. Application of HB-HTA in China.

support the development of HB-HTA in recent years, the policy documents are mainly guidelines, and HB-HTA has not been deemed a requirement. Therefore, the attitude of hospital decision-makers towards HB-HTA will influence the development of HB-HTA. However, hospital decision-makers currently have an insufficient understanding of the value of using HB-HTA and its importance in guiding clinical decision-making (*29,49*), so they rarely consider the results of HB-HTA as an important basis for their decisions. At present, most clinical decisions still depend largely on expert opinions and experience rather than HB-HTA evidence. Patients, companies, and other stakeholders are less likely to be involved.

5.2. The model of HB-HTA development is not standardized

China has not yet established a national HTA organization to formulate and implement standards for HB-HTA and to coordinate and supervise the implementation of HB-HTA. Although the National Medical Management Center has conducted two sets of HB-HTA pilot projects, the use of HB-HTA in China is still mainly considered independently by a few hospitals, and it has not been implemented on a large scale (*29*). There are no official HB-HTA operating guidelines (*57*). As a result, the process of evaluating HB-HTA is relatively arbitrary and the relevant knowledge of evaluators is also insufficient. Reports are of low quality.

5.3. Lack of professionals and unbalanced development among medical institutions

At present, Chinese medical institutions have no mandatory policy documents requiring them to conduct HB-HTA and there is no special financial support for HB-HTA. Therefore, medical institutions do not have sufficient motivation to conduct HB-HTA. In most cases, there is no full-time HB-HTA staff. Most hospital staff participating in HB-HTA belong to the medical equipment department, a medical department, a performance management department, or other specialized departments such as medicine, management, engineering, or library and information science. Researchers with professional HTA backgrounds are

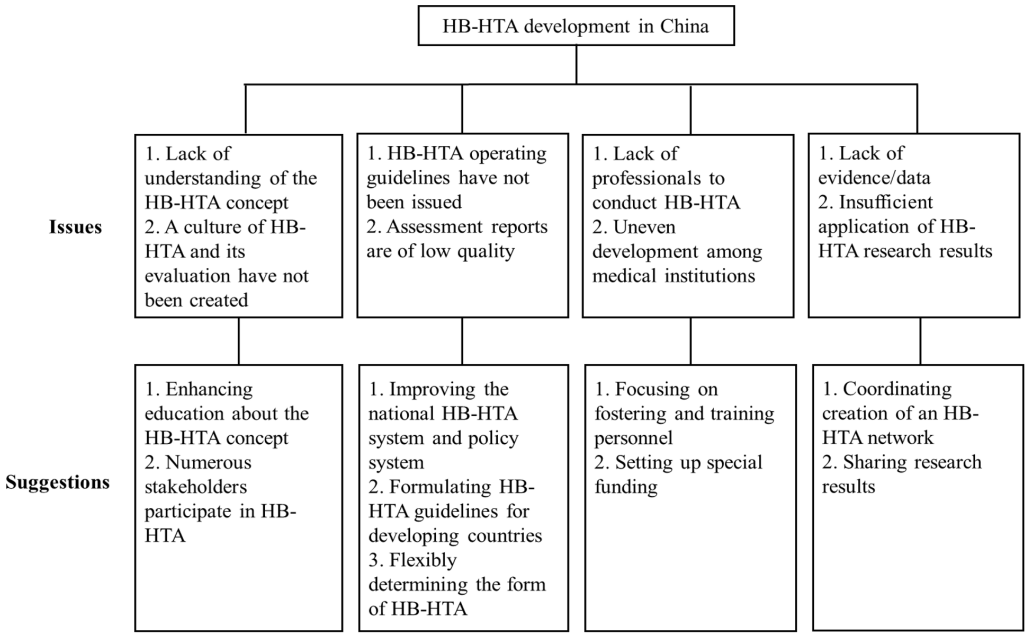

Figure 7. Problems with the development of HB-HTA in China and corresponding solutions.

very rare. Lin *et al*. also found that the shortage of HTA personnel was a relatively common problem among surveyed hospitals (*29,57*). Medical institutions that frequently conduct HB-HTA in China are mainly concentrated in top medical institutions in economically developed regions such as Guangdong, Beijing, Shanghai, and Jiangsu. This is due to the differences in medical resources, human resources, and management skills among medical institutions in different regions. There is still a big gap in the development and use of HB-HTA in primary medical institutions or economically underdeveloped areas (*16*). Some tertiary hospitals in China conduct assessments based on their own specialties and have continued to develop a sophisticated assessment system (*49*), but most hospitals do not have HB-HTA standards and a complete process.

5.4. Lack of evidence/data and insufficient application of results

When implementing HB-HTA, the lack of evidence/data is also one of the main difficulties (*56*). Taking medical devices as an example, evidence of their effectiveness is quite limited. Moreover, there are few comparisons of similar products. The quality of research reports is generally not high (*71*). Decision-making in hospitals is usually very timely. In practice, reports from HB-HTA are often too time-consuming to keep up with the demands of decision-makers (*29*), or the lack of communication with the evaluators leads to an asymmetry between the content of the evaluation reports and the information needs of the decision-makers. At the same time, the wording of research reports is too technical, making them difficult for decision-makers to read and understand the results of the HB-HTA research. This leads to insufficient application of findings from HB-HTA research.

6. Suggestions for the development of HB-HTA

HB-HTA concepts and methods are effective means of supporting hospital management. Based on China's experience with problems promoting and developing HB-HTA, we have tentatively proposed a development path and suggestions for implementation of HB-HTA in line with those in developing countries (Figure 7).

6.1. Enhancing the top-level design of HB-HTA and issuing national HB-HTA guidelines

Several studies have pointed out that the main reasons for the limited use of HTA in low-income and middle-income countries are: lack of official HTA institutions, political factors, and lack of resources (*72*). A national HB-HTA system, including specialized HB-HTA agencies and organizations, needs to be established and budgetary resources need to be allocated in accordance with national goals for development of HB-HTA (*73*). We strongly recommend that special HB-HTA departments be established in hospitals. An internal committee and mini-HTA are preferred for the time being (*74*). However, the current HB-HTA guidelines, manuals, and toolkits are all from developed countries and may not be fully transferable to developing countries (*75*). The experiences of HB-HTA pilot projects need to be summarized and combined with internationally recognized or verified HB-HTA manuals, toolkits, or experiences from other countries. Further development

of HB-HTA requires established HB-HTA procedures and methods at the national level, as well as HB-HTA guidelines and tools that reflect current medical realities in developing countries.

6.2. Raising awareness of HB-HTA and encouraging a wide range of stakeholders to participate in HB-HTA efforts

The basic ideas of HB-HTA need to be promoted at medical institutions and empirical cases needed to be given to decision-makers and heads of relevant departments in order to enhance the concept of evidence-based management and to promote the awareness of evidence-based decision-making (*76*). Decisions about health technologies in hospitals involve many stakeholders with different interests, including the hospital, the pharmaceutical industry, the public, and patients. Early and broad stakeholder participation is particularly important for the implementation of HB-HTA. However, most hospitals make their own decisions about access to new technologies and other stakeholders are rarely involved. The process of technology assessment should not ignore the values of patients and other stakeholders (*73,77*).

6.3. Enhancing the fostering of evaluation personnel

Studies have indicated that lack of expertise and related training are barriers to the development of HB-HTA (*78*). The implementation of HB-HTA requires the joint participation of multidisciplinary teams from medicine, economics, management, sociology, law, and other disciplines. A system for training HTA personnel should be created and development strategies should be formulated (*23*). More attention should be paid to the training of evaluation personnel in hospitals, and especially in health economics (*57*). To alleviate the shortage of professionals, evaluation personnel in medicine at all levels, at research institutes, at colleges and universities, and in associations should be involved in the short term.

6.4. Establishing an HB-HTA network to share research results

HB-HTA is an important part of an HTA network. The most common difficulty in evidence-based work is the lack of high-quality evidence and timely research results (*71,79*). Global HTA institutions are exploring the use of real-world data to complement and enrich evidence related to health technologies (*74*). Establishing a common database will allow the development of a three-tier HTA network – the nation, region, and hospital – to be coordinated (*80,81*). Health agencies and national and regional HTA institutions should support the establishment and development of HB-HTA departments (*73*). Through the HB-HTA network, the latest results from HB-HTA research should be shared in a timely manner and theoretical knowledge should be disseminated. Mutual acceptance of assessment results among medical institutions should be promoted based on a transparent assessment process, scientific methods of assessment, and credible assessment results. Hospitals should increase the dissemination and sharing of assessment results and assessment reports through the HB-HTA network to avoid duplication. Evidence/data on HB-HTA should be continuously updated through the network for the future.

6.5. Flexibly determining the form of HB-HTA

There is no model that is universally applicable to hospitals (*82-84*). The type of HB-HTA to be undertaken depends on the external policy environment, the specific hospital culture, the stage and sophistication of health technology development, the type of technology, the use of resources, the quantity and quality of evidence, the requirements for quality and completeness of reports, the demand for timeliness, and other factors (*85*). For example, the evaluation of consumables and devices is easier to quantify and the evaluation process is more repeatable and versatile, whereas the quantitative assessment of new clinical technologies in diagnostics and surgery is more difficult (*29*). If the quality of the available evidence is low or even missing, the HB-HTA report is presented in the form of a checklist. In practice, the form of HB-HTA can be flexible, depending on the technical assessment requirements and the resources available to decision-makers.

7. Conclusion

Improving the rational allocation of medical resources is an urgent need under the status quo of the irrational and rapid growth of medical expenses, meanwhile, it is also a higher realistic requirement for hospitals in terms of expense control, quality improvement, and scientific management under the background of new healthcare system reform. As a tool to effectively control medical costs and improve quality, HB-HTA can help medical institutions achieve scientific management and decision-making, improve the allocation efficiency of health care resources, and ensure medical quality and safety. In the context of comprehensively promoting the construction of a healthy China and deepening the reform of the medical and health care system, it has become an appropriate strategy for Chinese medical institutions to carry out HB-HTA activities. From 2005 to 2022, the development of HB-HTA in China has gone through the initiation phase and the preliminary exploratory phase, and now it has entered a period of rapid development. China basically has the foundation for the development of HB-HTA, and has accumulated some application

cases. In order to further promote the application of HB-HTA in developing countries, it is necessary to solve the core problems in terms of concept recognition, the mode of development, and limited professionals and data based on a case study in China, formulate a integrated development strategy in line with national conditions, establish the application mechanism and the implementation roadmap of HB-HTA, and promote the sustainable development of HB-HTA.

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