

# BMJ Open Identifying organisational capability of hospitals amid the new healthcare reform in China: a Delphi study

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## ABSTRACT

**Objective** Since China launched its nationwide systemic healthcare reform in 2009, policies such as the elimination of drug markups and the reform of medical insurance payments have forced some hospitals into a crisis threatening their survival. Both public and private hospitals have been building and strengthening their capacity to achieve sustainable development. However, the existing research has not provided a comprehensive evaluation tool required to support this effort. Therefore, this study develops an organisational capability evaluation index system to help public and private hospitals assess their current conditions.

**Design** The Delphi method was used to construct a hospital organisational capability evaluation index system in conjunction with the boundary value method and an analytic hierarchical process. Then, a questionnaire survey was administered in 55 hospitals (32 non-profit and 23 for-profit hospitals), and Cronbach's  $\alpha$  and a factor analysis were used to verify the index system's reliability and validity.

**Setting and participants** A literature review and semistructured interviews with 23 hospital managers and scholars clarified the definition of hospital organisational capability and formed an indicator pool. Additionally, 20 hospital directors were selected from public and private hospitals to participate in two rounds of the Delphi consultation.

**Results** The Delphi consultation resulted in an index system including 12 primary and 40 secondary indicators demonstrated to be reliable and valid. The three indicators with the largest weights were 'regulation capability' (0.251), 'decision-making capability' (0.121) and 'executive capability' (0.105).

**Conclusion** This study constructed an index system based on theoretical and practical considerations, and is expected to be applied to quantitatively evaluate the organisational capability of both public and private hospitals in China, and support their adaptation to external environmental changes.

## INTRODUCTION

To address the lack of accessibility and low efficiency of public hospitals, China launched a nationwide systemic healthcare reform (called the 'new healthcare reform' to distinguish it from prior reforms) in 2009 that took actions such as separating drug sales from

## Strengths and limitations of this study

- This study was performed according to a theoretical basis and relied on an extensive literature review and scientific methods, and the study's method applied procedures that were widely used and proven to be reliable and valid.
- In this study, the Delphi method, the boundary value method and analytic hierarchy process were applied, combining subjective opinions and objective results and mixing qualitative and quantitative methods to build a more comprehensive evaluation index system.
- The evaluation index system constructed in this study is based on the background of China's new healthcare reform and, compared with other existing evaluation index systems, is complete in terms of content and feasible to some extent.
- Since most of the selected experts were from well-operated hospitals, their areas of concern may be different from those of other hospitals facing less advantageous conditions, which may to some extent have an impact on the resulting weights.

hospital revenues and reforming medical payments.<sup>1</sup> In China's medical system, hospitals are divided into public and private. All of public hospitals are non-profit hospitals owned by the government; they accounted for 36.5% of the total number of hospitals by the end of 2018, but the financial subsidy only accounted for less than 10% of the total revenue.<sup>2 3</sup> As a result, public hospitals still needed to earn revenue to maintain their operations, and the income from the sales of drugs and consumables had been an important part of hospitals' total income for a long time.<sup>4</sup> Due to the change of policy, the revenue sources shrank and the revenue structure changed, but unreasonable medical service charges and insufficient financial subsidies failed to bridge the resulting gap.<sup>5</sup> Additionally, the reform of medical insurance payments also imposed more stringent requirements for cost control within hospitals, and all of these factors led many hospitals



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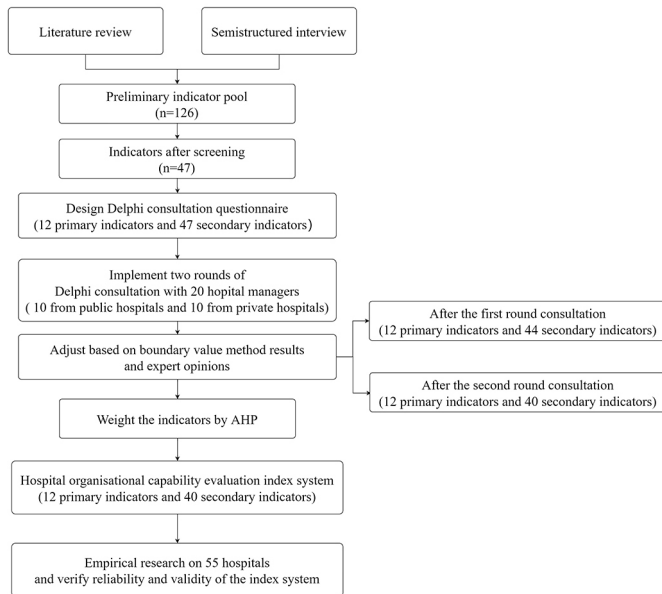
into a crisis threatening their survival.<sup>6 7</sup> Furthermore, to meet people's growing demand for multilevel healthcare services, China introduced a number of policies to encourage social capital-run hospitals, planned to increase the supply of healthcare services at the same time, and set up a competition mechanism in the medical market to improve the medical service efficiency and quality; as a result, the number of private hospitals has been rising year after year.<sup>8 9</sup> Private hospitals, however, lack financial support, unequal treatment as public hospitals and the same policy change; although the number of private hospitals exceeds that of public hospitals, the amount of private hospitals' resources and services is much lower than that of public hospitals, and private hospitals have struggled to develop, and remained mainly small and focused on specialised subjects.<sup>10</sup> Both public and private hospitals have thus been exploring their options with respect to the questions of how they can maintain their competitive advantage in the medical market and how they can develop sustainably. The theory of organisational capability provides answers to these questions.

Organisational capability is the focus of the enterprises' endogenous growth theory, which studies the growth of enterprises from the perspective of internal aspects. The theory suggests that internal factors (such as ability and knowledge) are the leading factors in enterprise growth and determine its degree and scope.<sup>11</sup> Several scholars have defined organisational capacity as 'the ability to anticipate and influence change; make informed, intelligent decisions about policy; develop programmes to implement policy; attract and absorb resources; manage resources and evaluate current activities to guide future action', while others define it as 'strategic ability'.<sup>12 13</sup> As a whole, organisational capability refers to the ability to achieve strategic goals through the use of resources to manage daily activities; it is the sum of various management capabilities, and it also reflects the maturity and development of the organisation, directly affects the efficiency of performing a series of coordinated tasks and can be described as a problem-solving capability. The organisational capabilities cultivated in the strategic process are the organisational skills, resources and functions formed within the enterprise to cope with changes in the external environment; they can only be bred within the enterprise and represent the internal basis of the enterprise's competitive advantage and the root of heterogeneity.<sup>14-16</sup> Related research also showed that the organisational capability and its segmentation ability can improve efficiency and performance. Using a questionnaire-based survey and interviews with nearly 100 enterprises, He verified that knowledge-management ability had a directly positive impact on organisational efficiency.<sup>17</sup> Wang constructed an index system of commercial banks' organisational capability, and then concluded that each index of organisational capacity had an impact on efficiency.<sup>18</sup> Alegre and Chiva discussed the mechanism by which learning ability affected product innovation performance, and defined organisational learning ability as encompassing

five aspects: experimentation, risk-taking, interaction with the external environment, dialogue and participatory decision-making.<sup>19</sup> It is also concluded by Hsu and Fang that human capital and relational capital could improve the performance of new product development through organisational learning ability.<sup>20</sup> Chuang *et al* noted that human resource capacity, internal customer satisfaction and commitment had a positive impact on organisational efficiency, and decomposed human resource capacity into training, salary and teamwork.<sup>21</sup> Through a survey of 163 Turkish companies, Ali proved that the emotional ability of an enterprise affected its financial performance and market performance through its innovation.<sup>22</sup>

In an ever-changing climate, the survived organisations are those that can continuously transform and adapt to new circumstances, and this is equally true for hospitals.<sup>23</sup> To improve the capacity and efficiency of hospitals and gain sustainable competitive advantages, it is especially important to explore the organisational capability of hospitals by referring to the relevant theories of such capability in enterprises. The operations and management of hospitals are both similar to and different from those of enterprises. In particular, hospitals have their own characteristics and social responsibilities.<sup>24</sup> So, there are the questions, how to define organisational capability of hospitals, and what specific capabilities does it involve? Kerr and Trantow described health service capacity as the ability of hospitals and doctors to respond effectively to patients' needs.<sup>25</sup> Cooke constructed a framework for measuring medical research capabilities and performed empirical studies.<sup>26</sup> Burke and Menachemi created an evaluation index system to measure hospital information technology capability and conducted an empirical study.<sup>27</sup> Yang believed that the core competitiveness of a hospital should include learning ability, resources, hospital culture and management ability.<sup>28</sup> Leufvén *et al* used the Dimensions of Learning Organisations Questionnaire to evaluate the healthcare setting in Nepal.<sup>23</sup> Based on a literature review and expert suggestions, Xie *et al* built an index system to evaluate the governance ability of multidisciplinary hospitals using big data.<sup>29</sup> Zhu and Zhao explained the importance of improving the human resources management ability in hospitals from the perspectives of using concepts, management and quality.<sup>30</sup>

However, the existing literature on hospitals' organisational capability is mostly limited to specific abilities, such as medical service capacity, scientific research capacity and human resources management capacity, and there is a lack of comprehensive combined and integrated analyses that would allow effective exploration of the heterogeneity of hospitals' organisational capacity.<sup>31</sup> Therefore, the Delphi method was used in this study to build a hospital organisational capability evaluation index system suitable for China, providing a theoretical basis for realising the sustainable development of hospitals. Note that due to the characteristics of China's medical system, primary healthcare institutions, as an important part



**Figure 1** Study setting. AHP, analytic hierarchy process.

of the system, are special and different from hospitals. They are mainly responsible for the provision of public health services, have a relatively simple set-up of medical equipment and departments, and can provide limited medical services.<sup>32</sup> Therefore, we consider public and private hospitals in China as the objects of this study while excluding primary healthcare institutions.

## STUDY SETTING AND PARTICIPANTS

### Patient and public involvement

No patients or public were involved.

This study used the Delphi method and the analytic hierarchy process (AHP) to build an organisational capability evaluation index system for hospitals. The Delphi method is a structured process and a systematic, effective, reliable and comprehensive technique for collecting and distilling knowledge from a group of experts by means of a series of anonymous questionnaires interspersed with controlled feedback.<sup>33–35</sup> Therefore, this method is widely used for constructing index systems.

The procedure of this study is shown in [figure 1](#).

### Building the preliminary indicator pool

First, a literature review of organisational capability was performed by searching PubMed, CNKI and Wanfang databases to gather evaluation indicators and descriptions. We used (hospital[Title])\*((capability[Title])+(capacity[Title])+(organizational capability[Title]))\*((evaluation[Title])+(assessment[Title])) and (((capability[Title])+(capacity[Title])+(organizational capability[Title]))\*((evaluation[Title])+(assessment[Title]))\*(index system[Title/Abstract])) as the search strategy, gathered 446 papers, and set inclusion and exclusion criteria for the preliminary indicator pool. The inclusion criteria consisted of all indicators of organisational capability, and the exclusion criteria were

composed of indicators that were inapplicable to the evaluation of organisational capability of hospitals and indicators with repeated formulations or descriptions. After the duplicates and conference reports were removed, 266 papers were left, and then as a result of team members' intensive reading, 51 papers were considered and a total of 126 indicators were identified, resulting in 47 indicators after exclusion criteria's screening, and 12 primary indicators were further summarised and described.

At the same time, semistructured interviews with 23 experts (consisting of hospital managers and a scholar) were conducted with the following questions being asked: 'What do you think the definition of organisational capacity is for a hospital?' and 'What specific capabilities do you think should be included in a hospital's organisational capacity?' These questions' aim was to assess the respondents' understanding of the organisational capability of a hospital. Among 23 experts, 22 hospital managers were from three private hospitals with more than 500 beds in Beijing, 13 of them were the top managers of hospitals and the other 9 were middle managers; there was also a senior manager from a national industry association.

### Using the Delphi method to build an index system

In the first phase, the Delphi consultation questionnaire was designed to collect experts' opinions based on a previously formatted index system. It consisted of three parts: gathering the experts' basic information, assessing their familiarity with hospital evaluation and the estimation of the constructed index system. The estimation focused on the importance, feasibility and sensitivity of every hospital organisational capability indicator on a 1–10 scale. In addition, for each primary and secondary index there was a comment column used to collect experts' deletions, additions or opinions (shown in the online supplemental file 1).

In the second phase, 20 experts participated, namely, 10 presidents of public hospitals and 10 presidents of private hospitals, which reflected China's current health-care system's division of hospitals into public and private based on property rights. Public hospitals rely on financial support, while private hospitals are developed mainly through self-financing; the latter are further divided into for-profit and non-profit hospitals based on the distribution of residual income.<sup>36</sup> Therefore, for authenticity and comprehensiveness, we chose five presidents of non-profit private hospitals and five of for-profit private hospitals.

The inclusion criteria were as follows: (1) experience in medical practice, teaching, management or other related work, (2) having full understanding of hospital management, and (3) enthusiasm for this study, including providing comprehensive opinions from different evaluation perspectives and continuing to participate in the two rounds of consultations during the research period.

In the third phase, the designed questionnaires were distributed to 20 experts by mail to gather advice and feedback. After the first survey round, SPSS V.23.0 was used to compute the positive coefficient, degree of authority and

**Table 1** Results of the two rounds of the boundary value method

Round	Dimension	Importance			Feasibility			Sensitivity		
		M	S	BD	M	S	BD	M	S	BD
First	Full score frequency	0.37	0.15	0.23	0.17	0.10	0.07	0.15	0.06	0.09
	Arithmetic mean	8.86	0.43	8.43	8.09	0.38	7.70	7.71	0.35	7.35
	Coefficient of variation	0.12	0.03	0.15	0.16	0.02	0.18	0.20	0.03	0.23
Second	Full score frequency	0.30	0.11	0.19	0.18	0.09	0.10	0.15	0.06	0.09
	Arithmetic mean	8.59	0.39	8.20	8.03	0.39	7.64	7.72	0.42	7.30
	Coefficient of variation	0.14	0.03	0.17	0.17	0.03	0.20	0.18	0.03	0.21

M represents arithmetic mean, S represents SD and BD represents the boundary value.

coordination coefficient of participants, demonstrating the validity of the Delphi process. Subsequently, based on the expert feedback and the boundary value method, substandard indicators were modified or deleted, and the AHP questionnaire was added to form a second round of assessment for the revised consultation questionnaires (shown in the online supplemental file 1). After this cycle, the above steps were repeated, and the weights of indicators were calculated according to the results of the AHP questionnaire, forming the final hospital organisational capability evaluation index system.

#### Using the boundary value method to screen the indicators

To screen the index, we used the boundary values of three important statistics, namely, the full score frequency, arithmetic mean and coefficient of variation for the importance, feasibility and sensitivity of all indicators. In calculations of the full score frequency and arithmetic mean, the boundary value was set to 'mean-SD', and the index with the higher score was preserved. For the value of the coefficient, the boundary value was set to 'mean+SD', and the index with the lower value was preserved. The results of the two rounds are shown in table 1.

Principles of index screening:

1. To evaluate importance, if none of the three statistics' boundary values meets the requirements, the indicators are deleted.
2. If an indicator has two aspects for importance, feasibility and sensitivity, and each aspect has two or more boundary values that do not meet the requirements, then the indicator is deleted.
3. If all three boundary values for an indicator meet the requirements, the research group discusses the modification feedback from the experts and determines whether it should be applied.

#### Using the AHP to assign weights

To ensure the scientific foundation of the index system, this study calculates the weights of primary indicators using AHP and those of secondary indicators using the percentage weight method. AHP constructs a pairwise comparison judgement matrix to collect multiple preferences and estimations for each indicator based on the experts' evaluation.<sup>37 38</sup> The Yaahp software V.12.2 was used to generate the AHP questionnaire, and the structured framework of the

AHP method was used to set priorities on each level of the hierarchy using pairwise comparisons that were quantified using the scale of 1–9 to calculate the weights.<sup>39</sup>

#### Reliability and validity analysis

To verify reliability and validity, we adapted the established evaluation index system into a self-assessment questionnaire based on a 5-point Likert scale, and a questionnaire survey was administered in China. This study chose private hospitals or member hospitals in hospital groups with good and stable operations. Ten staff representatives from each hospital who were middle or senior managers were asked to complete the questionnaire to evaluate the organisational capability of the hospital.

The Cronbach's  $\alpha$  reliability coefficient method was used to measure the internal consistency of the questionnaire, as it measured the overall correlations between items within a scale. Reliability is considered acceptable if Cronbach's  $\alpha$  exceeds 0.7.<sup>40</sup> Factor analysis was used to assess structural validity. SPSS V.22.0 was used for data processing and analysis.<sup>41</sup>

#### Data analysis

To ensure the scientific soundness and rationality of the Delphi method, the experts' positive coefficient, authority coefficient and coordination coefficient are calculated, leading to the following results.

#### Experts' positive coefficient

In the application of the Delphi method, the experts' positive coefficient reflects the positive input from the experts, representing the effective response rate to the expert consultation questionnaire and determining the credibility and scientific basis of the results. American sociologist Earl Babbie believed that an effective response rate of 50% was the minimum acceptable value for analysis and reporting, 60% could be considered good and 70% reached a very good standard.<sup>42</sup>

In both the first and second rounds of the Delphi consultations, all 20 questionnaires were recovered, leading to 100% response rate. The experts' feedback was clearly very positive.

#### Expert authority coefficient (Cr)

No expert can be an absolute authority on every question, and the degree of authority has a considerable influence

**Table 2** Judgement basis and the degree of influence

Judgement basis	Degree of influence		
	Low (0)	Medium (0.5)	High (1)
Practical experience (0.4)	0	0.20	0.40
Theoretical analysis (0.3)	0	0.15	0.30
Knowledge from domestic and foreign counterparts (0.2)	0	0.10	0.20
Intuition (0.1)	0	0.05	0.10
<b>Total</b>	0	0.50	1.00

on the reliability of the evaluation that must be considered before data analysis. The expert authority coefficient is generally determined by two factors: the judgement coefficient, denoted by Ca, that represents the evidence on the basis of which the expert makes a judgement, and the familiarity coefficient, denoted by Cs, that represents the degree of the expert’s familiarity with the problem.<sup>43</sup>

The judgement coefficient (Ca) is calculated, considering the basis used by the experts when making a judgement, in the order of ‘practical experience’ (0.4), ‘theoretical analysis’ (0.3), ‘knowledge from domestic and foreign counterparts’ (0.2) and ‘intuition’ (0.1); the extent of its influence may be high, medium or low, and the influence degree of the expert evaluation is assessed in accordance with these rankings. The judgement coefficient and the average judgement coefficient are calculated according to the evaluation criteria shown in table 2. If Ca=1, experts make judgements based on scientific evidence; if Ca=0, such evidence has no effect.<sup>44</sup>

A Likert scale was used to divide values of the degree of familiarity (Cs) into five levels: very familiar (1), more familiar (0.75), average (0.5), less familiar (0.25) and unfamiliar (0). The familiarity coefficient of each expert (the average familiarity of each indicator) was calculated, and then the average familiarity coefficient could be computed.

The degree of authority was represented by Cr, calculated as  $Cr = \frac{(Ca+Cs)}{2}$ . Generally, the higher Cr is, the higher the prediction accuracy. A Cr value greater than 0.7 is considered to indicate acceptable reliability.

The values of the expert authority coefficient Cr from the two rounds of expert consultations are 0.76 and 0.77, respectively, and both of them are greater than 0.7, indicating that the expert consultation results are accurate and reliable (the detailed figures are shown in table 3).

**Coordination coefficient**

The consistency of evaluation of all experts also guarantees the scientific basis of the index system. Therefore, in this study the Kendall’s W concordance coefficient test was used to assess the coordination of the experts’ estimates of importance, feasibility and sensitivity of each indicator, and the results showed that the three dimensions of each indicator in the two rounds were all effective ( $p < 0.01$ ), suggesting that the experts’ scores were consistent. The results are shown in table 4.

**RESULTS**

**Basic information on the participants**

Among the experts who participated in the Delphi consultation, the majority had a master’s degree or above, accounting for 80% of the total of 20; 85% of them held senior professional titles, and 95% had been engaged in the field of hospital management for 10 years or more. Thus, they had authoritative opinions on hospital management. More details are shown in table 5.

**Index definition**

Based on interviews, the organisational capability of a hospital was defined as follows: by adapting to the external market and policy environment, the hospital organises internal resources to manage daily medical activities and

**Table 3** Expert authority coefficients

Dimension	First round			Second round		
	Ca	Cs	Cr	Ca	Cs	Cr
Positioning capability	0.72	0.90	0.81	0.68	0.89	0.78
Regulation capability	0.71	0.89	0.80	0.68	0.91	0.80
Integration capability	0.60	0.84	0.72	0.68	0.89	0.78
Decision-making capability	0.70	0.88	0.79	0.69	0.93	0.81
Execution capability	0.69	0.88	0.78	0.69	0.95	0.82
Monitoring capability	0.66	0.83	0.74	0.58	0.85	0.72
Marketing capability	0.56	0.79	0.68	0.53	0.75	0.64
Cohesion capability	0.66	0.80	0.73	0.63	0.88	0.75
Risk-management capability	0.64	0.84	0.74	0.66	0.86	0.76
Innovation capability	0.66	0.84	0.75	0.65	0.80	0.72
Learning capability	0.75	0.88	0.81	0.72	0.89	0.80
Leadership	0.73	0.89	0.81	0.75	0.90	0.82
<b>Total</b>	0.67	0.85	0.76	0.66	0.87	0.77

Ca represents the judgement coefficient, Cs represents the degree of familiarity and Cr represents the degree of authority.

**Table 5** Delphi participants' information

Participants' information	N	%
<b>Gender</b>		
Male	17	85
Female	3	15
<b>Age (years)</b>		
36–45	1	5
46–55	10	50
56–65	9	45
<b>Occupation</b>		
Hospital manager	15	75
Both hospital manager and doctor	5	25
<b>Education</b>		
Bachelor's degree and below	4	20
Master's	14	70
PhD	2	10
<b>Professional title</b>		
Junior	2	10
Middle	1	5
Senior	17	85
<b>Years worked</b>		
<10	1	5
11–15	2	10
16–20	7	35
21–25	3	15
26–30	2	10
>30	5	25

administrative work to effectively operate the hospital and provide healthcare services to patients.

'Positioning capability' is the ability to develop strategic plans based on an analysis of the internal and external environments and the hospital's strengths and weaknesses. 'Integration capability' is consistent with the Penrose's theory of enterprise growth that posits that the growth of an organisation depends not only on the resources available but also on the ability to allocate resources reasonably in accordance with applications; this latter ability is called integration capability. 'Regulation capability' is the ability to promote a sound development of the hospital through normative rules and regulations, as these determine its stability.<sup>45</sup> 'Decision-making capability' refers to the ability to make correct and effective decisions based on a judgement of the existing environment and resources and is the key to the success or failure of an organisation. 'Executive capability' is the ability to achieve goals and enhance value creation based on the systems and norms established after making decisions and fully analysing the external and internal environments.<sup>46</sup> 'Supervision capability' is an ability to use effective supervision to guarantee a smooth performance of various procedures in daily work. 'Marketing capability' refers to the ability to plan and provide medical products and services more effectively to patients than do

competitors by adopting appropriate products, services, projects, prices, promotions, channels and processes to meet the needs of patients seeking medical treatment.<sup>47</sup> 'Cohesion capability' is the ability to build the employees' sense of belonging and shared values. 'Risk management capability' refers to the ability to avoid risks through daily management and correctly and effectively manage the risks that emerge. 'Innovation capability' is the ability to recognise developments in science and technology and constantly innovate in systems and technology. 'Learning capability' refers to the ability to continuously absorb external knowledge, establish a learning organisation and promote medical quality. 'Leadership' refers to the ability of leaders to positively influence the hospital's atmosphere and staff's enthusiasm by improving their own behaviours.

### Index screening

The boundary values of the three statistics of all indicators were calculated. According to the rules of index screening, the primary indexes met the retention criteria, and the second-level indicators were deleted, as shown in table 6. Three indicators were deleted in the first round, and four were deleted in the second round. A total of seven indicators were removed.

### Indicator weights

After two rounds of consultations, 12 primary and 40 secondary indicators were included. Based on the results of the AHP questionnaire in the second round of consultations, the weights calculated using AHP and the percentage weighting method formed the evaluation index system of hospital organisational capability, as shown in table 7. The distribution diagram of primary indicators is shown in figure 2.

### Information of the empirical study

A total of 564 questionnaires were issued at 57 hospitals in China. After elimination of invalid questionnaires, there was a total of 55 surveyed hospitals and 550 returned questionnaires, so the effective response rate was 97.52%. Among 55 hospitals, there are 5 hospitals with fewer than 100 beds, 32 hospitals with 100–500 beds and 18 hospitals with more than 500 beds. Additionally, 32 hospitals among them were mainly non-profit hospitals, and 37 hospitals were mainly general hospitals spread around 11 provinces (data are shown in detail in table 8).

### Organisational capability indicator validation

In the reliability analysis, the Cronbach's  $\alpha$  coefficient of 40 secondary dimensions is 0.987, and the respective coefficient of all 12 primary dimensions is above 0.9, which can be considered to indicate good reliability (results are shown in detail in table 9).

The principal component analysis was used through orthogonal rotation, and factors with  $\lambda > 1$  were extracted. The results showed that the Kaiser-Meyer-Olkin value was 0.980, and the  $\chi^2$  value of the Bartlett's sphericity test was 26992.439,  $p < 0.001$ , which was suitable for factor analysis.

**Table 6** Indicators deleted in the two rounds of consultations

Indicators deleted	Description	Importance			Feasibility			Sensitivity		
		F	M	CV	F	M	CV	F	M	CV
Constitutional normative capability*	Ability to be a positive normative force and a binding force	<b>0.15</b>	<b>8.15</b>	<b>0.16</b>	0.15	8.10	0.18	0.15	<b>7.25</b>	<b>0.25</b>
Organisational flexibility†	Ability to cope with environmental uncertainty	0.20	7.65	<b>0.23</b>	<b>0.05</b>	<b>7.00</b>	<b>0.21</b>	<b>0.05</b>	<b>6.60</b>	<b>0.24</b>
Resource-acquisition capability†	Ability to obtain sufficient resources through a variety of ways, such as raising funds for the construction and development of hospitals	0.05	<b>8.10</b>	<b>0.17</b>	<b>0.00</b>	<b>7.15</b>	<b>0.19</b>	<b>0.20</b>	<b>7.05</b>	<b>0.23</b>
Planning capability*	Ability to develop and implement hospital marketing strategies	<b>0.10</b>	<b>7.80</b>	0.15	0.10	<b>7.25</b>	<b>0.19</b>	0.10	<b>7.10</b>	<b>0.24</b>
Institutional adaptability*	Ability to follow the current policy and develop a marketing plan to ensure a smooth operation	<b>0.25</b>	<b>8.43</b>	<b>0.18</b>	0.15	7.80	0.18	0.25	<b>7.30</b>	<b>0.25</b>
Resource-support capability†	Ability to support innovation, including the quality of R&D personnel, the intensity of R&D investment, the acquisition and utilisation of resources, etc	0.20	<b>8.10</b>	0.17	0.20	<b>7.60</b>	<b>0.23</b>	0.15	7.25	<b>0.23</b>
Innovative output capability†	Ability to effectively put innovative technologies or products into use and facilitate the provision of existing medical services	0.25	<b>8.15</b>	<b>0.18</b>	0.15	<b>7.55</b>	<b>0.22</b>	<b>0.15</b>	7.20	<b>0.23</b>

The numbers in bold are those that do not meet the threshold standard.

\*Indicators that were deleted in the first round of consultations.

†Indicators that were deleted in the second round of consultations.

CV, coefficient of variation; F, full score frequency; M, arithmetic mean; R&D, Research and Development.

While there were three factors with characteristic values greater than 1 (as shown in [table 10](#)), the cumulative variance contribution rate was 73.742%. Although these three factors were different from the definition of 12 primary indicators of this study, they could be summarised as ‘basic ability’, ‘core ability’ and ‘sustainable development ability’ based on the dynamic capability theory, so validity was good.

## DISCUSSION

In this study, the Delphi method was used to construct an evaluation index system for organisational capability that would be suitable for hospitals; this index provides a scientific basis for the evaluation of organisational capability, further improving performance and maintaining the sustainable competitiveness of hospitals. This study also provides a theoretical reference to help hospitals adapt and develop amid medical market competition in the context of China’s new medical reform.

### Index weight analysis

The weights of the hospital organisational capability index reflect the priorities assigned to strengthening capacity building. The results of this study showed that the values with the top three weights in the index system were ‘normative capability’ (0.251), ‘decision-making capability’ (0.121) and ‘executive capability’ (0.105).

Regulation capability determines the stability of an organisation, and one of the most important capabilities in this group is the formulation of constitutions and institutions.<sup>36</sup> A constitution is the outline and code of a hospital, and safe and well-ordered medical processes also require standardised institutions so that all activities are performed according to established rules, which the interviewed Chinese scholars referred to as the ‘soul’ and which is a priority in capacity building in China’s hospitals.<sup>48–49</sup> China has recently implemented a reform that affects drugs and consumables, namely, the ‘separation between drug sales and hospital revenues’ and ‘the joint reform of medical supplies’. The separation between drug sales and hospital revenues aims to reduce unreasonable increases in medical expenses and unjustified use of drugs caused by a tendency toward ‘drugs-subsidising treatment’ in public hospitals due to insufficient subsidies. This reform eliminates the drug markup and curbs the price through public tenders and centralised procurement.<sup>50–51</sup> The medical consumption reform aims to better reflect the value of medical personnel’s technical services and improve medical quality to meet people’s ever-growing needs for quality medical care by eliminating the markup of medical consumables and regulating the price of medical service items.<sup>52</sup>

These two reforms diminished hospital incomes, resulting in hospitals further reducing medical costs by

**Table 7** Hospital organisational capability evaluation index system

Primary indicator	Secondary indicator	Description	Weight
1. Positioning capability (0.065 )	1.1 Reasonable positioning capability	Ability to precisely define the functional orientation and development process of the hospital according to the internal and external environment	0.033
	1.2 Strategic management capability	Ability to effectively formulate and implement the strategic management of the hospital	0.032
2. Regulation capability (0.251 )	2.1 Regulation-making capability	Ability to formulate sophisticated regulations	0.085
	2.2 Institutional updating capability	Ability to effectively and timely formulate and update various rules and regulations based on the actual conditions (policy changes, etc)	0.083
	2.3 Institutional normative capability	Ability to establish the rules and regulations that represent a positive normative force and a binding force	0.082
3. Integration capability (0.088 )	3.1 Human resources management capability	Ability to rationally allocate human resources and maximise their effectiveness	0.018
	3.2 Financial management capability	Ability to effectively mobilise funds, conduct financial management and maximise the utility of financial resources	0.018
	3.3 Information-management capability	Ability to strengthen data management to improve the hospital-management capacity	0.018
	3.4 Equipment-management capability	Ability to purchase and maintain medical equipment at minimal cost and make it available for clinical use	0.017
	3.5 Resource-integration capability	Ability to effectively integrate the human, financial and material resources of the hospital	0.018
4. Decision-making capability (0.121 )	4.1 Decision-making capability	Ability to efficiently make correct major decisions using effective decision-making systems and mechanisms	0.061
	4.2 Strain capability	Ability to identify the uncertainty of the external environment and make correct and effective decisions based on changes in the external and internal environments	0.060
5. Execution capability (0.105 )	5.1 Decision-execution capability	Ability to effectively implement major decisions through effective internal management	0.037
	5.2 Process-optimisation capability	Ability to facilitate the implementation of decisions made through effective process management (including the effectiveness of the decision-making process, the modularity of the process and the flexibility of the workflow)	0.035
	5.3 Standard compliance capability	Ability to effectively implement the rules and regulations of the hospital and to offer medical services and engage in management activities under the guidance of standard procedures	0.034
6. Monitoring capability (0.058)	6.1 Monitoring and coordination capability	Ability to coordinate the activities of various departments and facilitate reaching the overall goals through effective monitoring	0.019
	6.2 Process-monitoring capability	Ability to ensure that the hospital's daily work is carried out well through an effective monitoring system using the available means and abilities	0.019
	6.3 Total quality control capability	Ability to achieve total quality control in daily medical activities to ensure the quality and safety of medical service delivery	0.021
7. Marketing capability (0.040)	7.1 Environmental identification capability	Ability to actively understand the changes in demand in the medical market, as well as external policy and other environmental changes	0.010
	7.2 Technical support capability	Ability to use modern technology to assist in the management of all aspects of the hospital, including the electronic level, the use of Internet platforms and other marketing applications	0.010

Continued

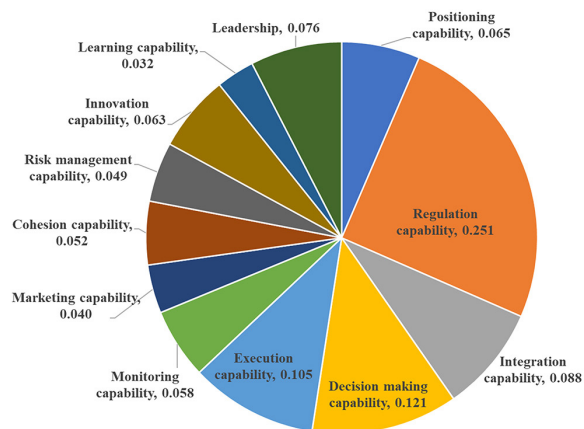


Table 7 Continued

Primary indicator	Secondary indicator	Description	Weight
	7.3 Generalisation capability	Ability to establish a good brand image for public recognition	0.010
	7.4 Information-acquisition capability	Ability to obtain all types of information in the market and maintain unobstructed access to information	0.009
8. Cohesion capability (0.052)	8.1 Teamwork capability	Employing staff characterised by a good degree of cooperation, trust and responsibility	0.018
	8.2 Organisational culture-building capability	Ability to build a good organisational culture in the hospital, including the practice and advancement of the organisational culture and the establishment of a common vision, mission and values	0.017
	8.3 Organisational coordination capability	Ability of all departments to cooperate effectively during daily work so that the hospital is run well	0.017
9. Risk-management capability (0.049)	9.1 Crisis-warning capability	Ability to actively formulate risk-prevention measures and early warning mechanisms for medical safety, hospital operations and other aspects	0.012
	9.2 Crisis-awareness capability	Ability to assess the existence of risk and to accurately perceive risk through the acquisition and analysis of information	0.012
	9.3 Accurate crisis-assessment capability	Ability to accurately judge the degree of a crisis and the scope of risk when a crisis occurs	0.012
	9.4 Crisis-management capability	Ability to take effective measures to properly handle hospital crises to minimise losses when risks arise	0.013
10. Innovation capability (0.063)	10.1 Sustainable innovation capability	Ability to recognise the novelty of innovative technology, apply it effectively and provide a complete development strategy plan	0.031
	10.2 Scientific research capability	Ability to organise medical staff to engage with all kinds of subjects and encourage staff to carry out scientific research	0.032
11. Learning capability (0.032)	11.1 Resource support capability	Ability to provide high-level training, incentive mechanisms and high-quality human resources and the ability to absorb knowledge	0.011
	11.2 Learning output capability	Ability to encourage medical staff to recognise applicable scientific research achievements and apply them in the clinic and to serving patients	0.010
	11.3 Learning organisation-building capability	Ability to build a learning organisation, establish a good learning atmosphere in the hospital and improve the quality of medical care	0.011
12. Leadership (0.076)	12.1 Public relations capability	Hospital leaders' effective management and communication skills and ability to establish harmonious interpersonal relationships	0.012
	12.2 Motivation capability	Hospital leaders' ability to motivate staff to work hard and promote the development of the hospital	0.013
	12.3 Performance-oriented capability	Hospital leaders have formulated a scientific and reasonable performance appraisal system that effectively motivates the staff	0.013
	12.4 Monitoring capability	Hospital leaders can effectively monitor daily medical activities and accurately grasp the hospital's operational situation	0.013
	12.5 Authorisation capability	Hospital leaders can authorise the staff to improve their work efficiency under appropriate conditions	0.012
	12.6 Influence capability	Hospital leaders possess good personality and charm that influence the hospital staff to work hard	0.013

regulating the use of drugs and consumables to increase profits. Diagnosis-related Groups based Prospective Payment Systems (DRG-PPS) was implemented as a component of a medical security programme that pays for medical services based on the difficulty of treatment

and regulates doctors' diagnosis and treatment processes with guidelines ranging from specifying which patients should be treated to how should they be treated; all of these factors should meet the requirements of DRG-PPS. External regulation has an impact on the development of



**Figure 2** Weights of primary indicators.

hospitals, urging hospitals to optimise the management process to provide standardised medical services.

‘Decision-making capability’ is the key to success in management.<sup>53</sup> At present, competition in China’s medical market is growing increasingly fierce. Although public hospitals represent the majority of the market, with the encouragement of social medical policies both the number and scale of private hospitals are rising rapidly. According to the China Health Statistics Yearbook, the number of public hospitals declined from 13 000 in 2015 to 12 000 in 2019, while that of private hospitals increased from 15 000 to 22 000. This trend, combined with the practice of physicians working at multiple facilities and the rise of medical groups, has accelerated the development of private hospitals, thereby threatening public hospitals.<sup>54 55</sup> To address the problem of non-standard decision-making procedures and mechanisms, China’s public hospitals have explored the implementation of a corporate governance mechanism, while private hospitals have improved efficiency by optimising the decision-making process.<sup>56 57</sup> In this context of increasing competition between public and private hospitals, what should hospitals do? What business should they be in? What strategy should they choose? These factors require hospitals to make decisions.

**Table 8** Information of the empirical study

Hospitals’ information		N	%
Beds	<100	5	9.09
	100–500	32	58.18
	>500	18	32.73
Management category	Non-profit	32	58.18
	For-profit	23	41.82
Hospital category	General	37	67.27
	Specialised	18	32.73
Total		55	100

**Table 9** Result of reliability analysis

Primary dimension	Number of items	Cronbach’s $\alpha$	Overall Cronbach’s $\alpha$
1	2	0.906	0.987
2	3	0.885	
3	5	0.922	
4	2	0.891	
5	3	0.905	
6	3	0.916	
7	4	0.901	
8	3	0.917	
9	4	0.937	
10	2	0.906	
11	3	0.905	
12	6	0.960	

‘Executive capability’ is the ability to achieve organisational goals and enhance value creation, which is mainly reflected in the management process. The traditional medical management mode, such as the department director responsibility system, has many drawbacks, including more routine work for the department director, which makes it difficult to be responsible for every patient.<sup>58</sup> To resolve this issue, public hospitals have shifted to having the attending physician in charge, which compensates for the unclear division of labour and imperfect incentive measures. Private hospitals have not only implemented the attending-physician-in-charge system but also streamlined administration, reducing costs to ensure efficiency.<sup>59</sup> It is worth noting that execution capability is a crucial link in standardised management. As the terminus of the administrative cycle, it is an important way to enhance competitiveness and cohesion, and it guarantees other benefits such as improved quality and motivation.<sup>60–62</sup> Therefore, improving the execution ability plays a significant role in hospital development.

The results show that the three indexes with the lowest weights are ‘risk capability’ (0.049), ‘marketing capability’ (0.040) and ‘learning capability’ (0.032). ‘Risk capability’ mainly refers to the ability to identify and address risks. Its low weight may be related to, first, a mismatch between supply and demand. Patients have rigid demand for health services, that is, there is a lack of demand elasticity.<sup>63 64</sup> However, with China’s vast territory and large population, there is an ever-growing need for healthcare that cannot be met by the current overall medical resources, with high-quality healthcare services lacking in particular, even as supply exceeds demand.<sup>65 66</sup> Second, the recognition of risk continues to focus on the treatment of a prognosis rather than on engaging in an active defence.<sup>67</sup> Therefore, the lack of cognition leads to a reduction in attention to risks.

A hospital’s ‘marketing capability’ is different from that of an enterprise because of the uncertainty of medical services and the asymmetric information between supply and demand; thus, there are some limitations in

**Table 10** Result of validity analysis

	Factor coefficients of individual items after rotation		
	Factor1	Factor2	Factor3
<b>Positioning capability</b>			
Reasonable positioning capability	0.429	<b>0.638</b>	0.251
Strategic management capability	0.438	<b>0.679</b>	0.225
<b>Regulation capability</b>			
Regulation-making capability	<b>0.580</b>	0.548	0.175
Institutional updating capability	<b>0.582</b>	0.561	0.154
Institutional normative capability	0.552	<b>0.574</b>	0.260
<b>Integration capability</b>			
Human resources-management capability	0.358	<b>0.672</b>	0.326
Financial-management capability	0.197	<b>0.752</b>	0.342
Information-management capability	0.224	<b>0.695</b>	0.443
Equipment-management capability	0.335	<b>0.723</b>	0.309
Resource-integration capability	0.372	<b>0.645</b>	0.450
<b>Decision-making capability</b>			
Decision-making capability	0.346	<b>0.741</b>	0.320
Strain capability	0.422	<b>0.699</b>	0.333
<b>Execution capability</b>			
Decision-execution capability	0.481	<b>0.675</b>	0.318
Process-optimisation capability	0.511	<b>0.519</b>	0.438
Standard compliance capability	0.532	<b>0.558</b>	0.328
<b>Monitoring capability</b>			
Monitoring and coordination capability	<b>0.623</b>	0.517	0.282
Process-monitoring capability	<b>0.599</b>	0.522	0.321
Total quality control capability	<b>0.601</b>	0.492	0.355
<b>Marketing capability</b>			
Environmental identification capability	0.486	<b>0.507</b>	0.406
Technical support capability	0.183	0.497	<b>0.589</b>
Generalisation capability	0.449	0.483	<b>0.534</b>
Information-acquisition capability	0.399	0.465	<b>0.615</b>
<b>Cohesion capability</b>			
Teamwork capability	<b>0.584</b>	0.433	0.410
Organisational culture-building capability	<b>0.55</b>	0.417	0.525
Organisational coordination capability	<b>0.608</b>	0.464	0.362
<b>Risk-management capability</b>			
Crisis-warning capability	<b>0.601</b>	0.417	0.406

Continued

**Table 10** Continued

	Factor coefficients of individual items after rotation		
	Factor1	Factor2	Factor3
Crisis-awareness capability	<b>0.551</b>	0.375	0.548
Accurate crisis-assessment capability	0.535	0.358	<b>0.537</b>
Crisis-management capacity	<b>0.595</b>	0.384	0.435
<b>Innovation capability</b>			
Sustainable innovation capability	0.306	0.304	<b>0.806</b>
Scientific research capability	0.351	0.292	<b>0.780</b>
<b>Learning capability</b>			
Resource-support capability	0.401	0.316	<b>0.763</b>
Learning output capability	0.356	0.276	<b>0.800</b>
Learning organisation-building capability	<b>0.592</b>	0.372	0.435
<b>Leadership</b>			
Public relations capability	<b>0.783</b>	0.344	0.271
Motivation capability	<b>0.786</b>	0.306	0.304
Performance-oriented capability	<b>0.714</b>	0.291	0.406
Monitoring capability	<b>0.770</b>	0.305	0.379
Authorisation capability	<b>0.756</b>	0.280	0.352
Influence capability	<b>0.754</b>	0.302	0.321

The number in bold is the maximum of the factor load of the indicator in the three factors.

marketing tools and methods.<sup>68 69</sup> Patients often appraise the quality of a hospital through their treatment process and its effects, which depends on the quality of medical services, so most hospitals focus on improving the quality of their medical services rather than on the marketing strategy used to build their brand, which is likely to be one of the reasons for the lower weights assigned to marketing ability.<sup>69</sup> Moreover, China's public hospitals are relatively lacking in awareness, and so awareness of service initiatives is more likely to be weak, and the majority of hospital managers still adhere to the belief that they should focus on simply doing the doctor's job well.<sup>70</sup> Private hospitals have the problems of a weak foundation and poor social influence,<sup>71</sup> which could be another reason marketing is ignored. In addition, due to the negative impact of unacceptable marketing methods such as illegal advertising and artificially changing the rankings to manipulate winning bids for service contracts in recent years, there has been a shift in the perception of hospital marketing, resulting in a low appreciation of marketing.<sup>72 73</sup>

'Learning capability' is the ability to learn and apply scientific research inputs and outputs. This capability features intangible and lagging effects, and cannot provide results in the short term but benefits sustainable development in the long run and is an additional source of strength allowing hospitals to gain a

**Table 4** Kendall's W concordance coefficient test results

	First round			Second round		
	Importance	Feasibility	Sensitivity	Importance	Feasibility	Sensitivity
Kw	0.388	0.499	0.58	0.495	0.582	0.549
$\chi^2$	346.428	445.751	517.509	413.79	475.268	448.812
P value	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

competitive advantage.<sup>19 74</sup> China's hospitals started late in constructing learning hospitals, and few have focused their improvements by applying the theory of a learning organisation to daily work; thus, it is unknown whether hospital managers recognise that learning ability can play a role in performance.<sup>75</sup> In addition, most of hospitals in China are small and medium-size; due to their size and other constraints, they prioritise the provision of medical services and neglect the development of learning ability.

### Index deletion analysis

Among the deleted indicators, some were reported as 'repeated expressions'; examples include 'constitutional normative capability', 'organisational flexibility' and 'planning capability'. The deletion of 'resource-support capability' and 'innovative output capability' can be attributed to the characteristics of the medical system in China: most hospitals concentrate on clinical diagnosis and treatment, supplemented by scientific research and teaching, and few need physicians to engage in innovative production or research and development.

The reason for removing 'institutional adaptability' could be that it is the prerequisite for normal operations: legitimate marketing practices and healthcare service provision should be based on the correct interpretation of policies and strict compliance rather than on a process evaluation indicator.

'Resource-acquisition capability' may be associated with the current change of the healthcare system; since the new reform, the elimination of profits brought by the markups of drugs and consumables means that hospitals need to obtain resources and capital through various channels. China's public hospitals are government-funded through financial subsidies; in other words, given the new regulations, they have little access to finance and are less liquid. However, introducing the use of social capital to restructure and reorganise the hospitals to solve funding problems has multiple risks, and practical successes are not very common, so it is not broadly considered to be a significant practice.<sup>76–78</sup> For private hospitals, although the issued documents encourage solutions through a variety of financing channels, the legal authority of these norms and documents is low, given a lack of flexibility.<sup>79</sup> In practice, problems such as insufficient liquidity and a lack of public welfare often arise.<sup>80</sup> The lack of legal norms and possible financial risks may be the reason for the removal of this indicator.

### Comparison with other index systems

Hospital evaluations commonly adopt international evaluation standards, such as JCI and ISO9001, but the core of these judgements is mainly based on 'patient-centred' and continuous quality control, which places more emphasis on the process of medical quality and safety and less on evaluating hospitals' internal management. In addition, the majority of these are standard indicators and lack procedural heuristic evaluation.

The World Management Survey (WMS) by Bloom and Reenen was launched in 2002 and improved in 2011, with an expanded version developed for the study of hospitals that would be suitable for developing and developed countries (Development WMS); it had 21 questions, and each question included 2–4 exact descriptions of management practices. A Chinese scholar localised the questionnaire, summarised it in four dimensions—operational management, target management, performance management and talent management—and conducted an empirical study through telephone interviews for evaluation.<sup>81 82</sup> However, some weaknesses of this tool have been observed. First, with respect to the evaluation content, the questionnaire is only used to evaluate hospital-management ability and not for an overall evaluation of the hospital. In the evaluation mode, third-party interviews can eliminate the preconception bias, but if the researcher lacks a complete and in-depth understanding, the evaluation performed through an interview will, to a large extent, depend on the interviewee's preferences. Furthermore, this process consumes both capital and time.

Similarly to the index system constructed in this study, the Organizational Capacity Assessment Tool User Guide (V.2.0 2016), funded by the European Union, divides organisational capacity into six aspects: governance/leadership, organisational management, human resources capacity, financial management capacity, programme/project management and external relations. Each indicator is divided into three level-2 indicators, and each level-2 indicator is subdivided into two practical aspects, graded on the scale of 1–4. This tool is easy to operate and feasible to apply.

However, these two evaluation systems have few indicators, and thus cannot fully reflect the overall organisational capacity of a hospital. Moreover, each dimension has the same weight, failing to highlight the priority areas in management.

Scholars have also built organisational capability evaluation index systems that are suitable for enterprises and developed based on the results of literature reviews and by weighing the indicators using AHP. One such index also divides abilities into six dimensions: environment perception ability, learning and assimilation ability, organisation and coordination ability, organisational process re-engineering ability, organisational innovation ability and the economic performance of the organisation. The method used to construct this index system is less scientifically sound than that of this study and relatively subjective. As to content, the index is set at only one level, without a refinement to account for bias, and hence it lacks operability and reliability.

The evaluation index system built in this study, from the perspective of content, combined with the background of China's new healthcare reform, considers the specific aspects of medical institutions and more comprehensively reflects a hospital's organisational capability; it sets two levels for the index, and the secondary index descriptions make it more usable. A scientifically determined and reasonable weight is assigned to each indicator, identifying the areas that need greater focus and giving priority to certain improvements. In addition, because the index development starts by considering the improvement of a hospital, it can be better understood and recognised by the respondents. For the evaluation, the method of self-assessment was adopted, and respondents were selected from hospital management who had a big-picture understanding of overall operations to ensure that the results were reliable and could be used as a reference.

## STRENGTHS AND LIMITATIONS

In constructing this study, we widely read the related research at local and global sites as a reference to establish a pool of variables as the index, developed a process based on scientific methods, solicited the opinions of experts with related experience, and validated the index as having good reliability and validity. The index system covers various areas of hospital organisational ability and evaluates by the means of self-assessment, which is more feasible in practice. Therefore, the evaluation of hospitals can be more complete and scientifically sound and have wide-ranging applicability to some extent. Countries with medical and healthcare systems similar to that of China can directly use the developed index for reference or can modify it based on their own conditions.

To guarantee the scientific soundness of the index system, this study chose experienced directors of hospitals as participants. They were mainly from well-run public and private hospitals, which might cause bias, as well-run hospitals would already have a good reputation and a stable customer base compared with fledgling hospitals, and this would reduce the need for marketing and might affect the weights of the final evaluation index system.

## CONCLUSIONS

Organisational capability plays an essential role in obtaining a sustainable competitive advantage in the market, and can be improved through internal cultivation. Hospitals can not only benefit from providing good-quality medical services but also gain competitiveness by improving organisational capability, while the precondition is to clarify the abilities a given hospital needs. In this study, the scientific method was used, both Chinese and worldwide studies were considered, and the resulting index system provided a quantitative basis for evaluating hospitals' organisational capacity and for further studies, as well as a practical basis for determining priority areas and directions for improving the development of hospitals. Furthermore, the index system built in this study is of general interest for popular use. For countries with healthcare systems similar to China's, it can be applied directly or after revising the descriptions or weights based on the specifics of each case.

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**Patient consent for publication** Not required.

**Ethics approval** This study was approved by the Medical Ethics Committee of Capital Medical University based on a review of the study design and the relevant materials; it was deemed appropriate and assigned serial number Z2019SY056. All 20 experts who participated in the Delphi consultation, as well as the hospitals and employees who were involved in the preliminary survey, signed an informed consent form and voluntarily joined the study. Participants' data were kept confidential, and participants were allowed to withdraw at any time during the study.

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