

Developing a Service Quality Standard for Collaborative Integrated Healthcare Institutions in Guangdong, China: A Delphi-Analytic Hierarchy Process Study

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Background: To develop a service quality standard and provide a reference for standardizing the quality of integrated healthcare institutions cooperating between tertiary hospitals and pension institutions in China. The establishment of the scientific and quantifiable service quality standard for collaborative integrated healthcare institutions can provide clear guidance on service direction, content and processes for care institutions, ensuring the effective implementation and coordinated growth of healthcare services.

Methods: A preliminary service quality standard was developed through literature review and semi-structured interviews. Two rounds of Delphi experts' consultation were conducted, and the relative weights of indicators at each level were calculated by the Analytic Hierarchy Process.

Results: The service quality standard consists of 3 first-level, 14 second-level, and 63 third-level indicators. The coordination of experts' opinions, expressed by Kendall's W of Delphi methods, ranged from 0.209 to 0.252. And the highest weights by the Analytic Hierarchy Process were observed for: "Service process" (0.493) among first-level indicators; "Operational management of integrated healthcare services" (0.181) among second-level indicators; and "Establish a professional service team for integrated healthcare in tertiary hospitals including doctors, nurses, therapists, pharmacists" (0.066) among third-level indicators.

Conclusion: The service quality standard developed in this study is systematic and scientific. It incorporates multi-dimensional service quality indicators through rigorous design and weight allocation, providing both a theoretical foundation and practical guidance for evaluating service quality under the "integrated healthcare contract" model. There are also geographic limitations to this study, and the samples need to be expanded in the future to verify generalizability.

Keywords: institutional cooperation, healthcare integration, service quality, evaluation standard, Delphi method

Introduction

According to statistics, by the end of 2023, China's population aged 60 or above had reached 297 million, accounting for 21.1% of the total population, while the population aged 65 or above was 217 million, making up 15.4%.¹ It is predicted that by 2030, China will become the most aged society globally. Along with the aging process intensifies² and the family care function weakens, the demands for institutional elderly care in China continue to rise.³ As Guangzhou transitioned into an aging society in 1992, in response, the local government has actively developed elderly care services through a series of policy initiatives aimed at reforming the service industry and advancing healthcare integration. "Integrated healthcare", a new model combining medical, rehabilitation and pension services, is a key initiative to cope with the challenges of aging and promote the equalization of public services. In China, it is also referred to as "the integration of



health and social care” or “the combination of medical and elderly care” has become synonymous with comprehensive care for the elderly.⁴

Since 2013, the development of integrated healthcare had been incorporated into several key planning documents,⁵ becoming one of China’s primary strategies to address population ageing.⁶ The “Several opinions on further promoting the development of integrated healthcare”,⁷ issued in 2019, clearly advocated for closer integration of healthcare and elderly care services through enhanced contractual cooperation and strengthened information technology infrastructure.⁵ Guided and supported by the policy, localities had actively explored integrated healthcare service modes and gradually developed diverse modes such as “Medical-embedded Elderly Care”, “Care-embedded Medical Services” and “integrated medical-care contract”. By the end of 2023, 87000 pairs of elderly care and medical health institutions had established contractual partnerships nationwide, marking a 3.6% increase from the previous year.⁸ This signifies that the institutional cooperation model of “integrated medical-care contract” has become a key direction for advancing integrated healthcare development in China.

Collaborative cooperation between medical and pension institutions is a key mechanism for advancing the integrated healthcare model and achieve “healthy aging”. Tertiary hospitals, with their high-quality medical resources and regional influence, should serve as leading entities for health management services.⁹ Institutionally collaboration in integrated healthcare is primarily implemented through contract models and entrusted management. This approach promotes two-way referrals and resource integration through a division of labor and cooperation mechanism, led by hospitals and assisted by pension institutions. Institutional cooperation, being a complex model involving multiple stakeholders, is more challenging to implement. Therefore, the specificity and depth of research in this area need to be further developed.¹⁰

However, existing studies primarily focused on micro-level service evaluations of individual institution, with limited exploration of the synergistic roles of medical institutions and collaborative models. Our study was designed around the needs of the elderly, incorporating the concepts of “healthy and active aging”, applied the Structure-Process-Outcome (SPO) model and the Rainbow Model of Integrated Care (RMIC) as conceptual framework, developing a service quality standard for institutional collaborative healthcare based on literature review, field research interviews, Delphi method and the AHP. The goal was to explore the leading role of tertiary hospitals in integrated healthcare services, providing a scientific foundation and practical guidance for improving service quality.

Materials and Methods

Construction of the Conceptual Framework

The SPO model has been widely used in healthcare quality evaluation, introduced by Donabedian, the father of American healthcare quality management in 1966,¹¹ encompasses three dimensions of healthcare quality: S (structure), P (process), and O (outcome). The model focuses on patient safety, with the S-dimension addressing the static configuration and efficiency of resources, the P-dimension evaluating the quality and efficiency of dynamic operations, and the O-dimension assessing the effectiveness of structural and process elements. Previous versions of the standard system of integrated healthcare service were mostly developed according to the SPO model, which comprehensively evaluates the effectiveness of implementation and its impact on the improvement of elderly health from the perspectives of institutional safeguards, resource allocation, goal achievement, and client satisfaction.

The RMIC model, introduced by Valentijn in 2013,¹² integrating primary care principles into the Rainbow Model, also provides guidance. This framework helps researchers understand integrated healthcare from a primary care perspective, enabling the scientific conception, planning, implementation and management of practice programs.¹³ RMIC describes the role of integration at the micro (clinical integration), meso (professional and organizational integration), macro (system integration) levels for building a scientific service quality standard of collaborative healthcare integration institutions. The model emphasizes that structural support and the establishment of normative systems should be prioritized when designing the standard system. It also highlights the importance of interrelated triple-objective outcome levels—population health, care experience, and cost/utilization—in enhancing the quality and efficiency of care services.

The RMIC-SPO integration will enhance elder care by combining SPO's systematic framework with RMIC's dynamic adaptability, enabling coordinated, patient-centered services across medical and long-term care settings (Figure 1).

Selection of Consulting Experts

Purposive sampling method was used to select experts from tertiary hospitals, managers of elderly care institutions and universities in Guangdong Province. According to the Kendall's W convergence criterion, the number of experts needed to be ≥ 15 . It is well-established in methodological literature that Delphi panels are typically small and homogeneous. For highly specialized domains, panels between 15 and 20 experts are common and are considered sufficient to achieve reliable consensus and data saturation.^{14,15} A panel of 16 experts with healthcare experience were included in this study to provide valid completed questionnaires in two rounds. They were rigorously chosen based on pre-defined criteria including extensive professional experience, recognized leadership in relevant fields, and significant scholarly contributions. The inclusion criteria were as follows: (i) experts engaged in the management of elderly care institutions, nursing management, community nursing or nursing education; (ii) at least 8 years of work experience; (iii) a bachelor's degree or higher; (iv) a middle management or higher professional title; (v) informed consent, a rigorous scientific research attitude and willingness to participate.

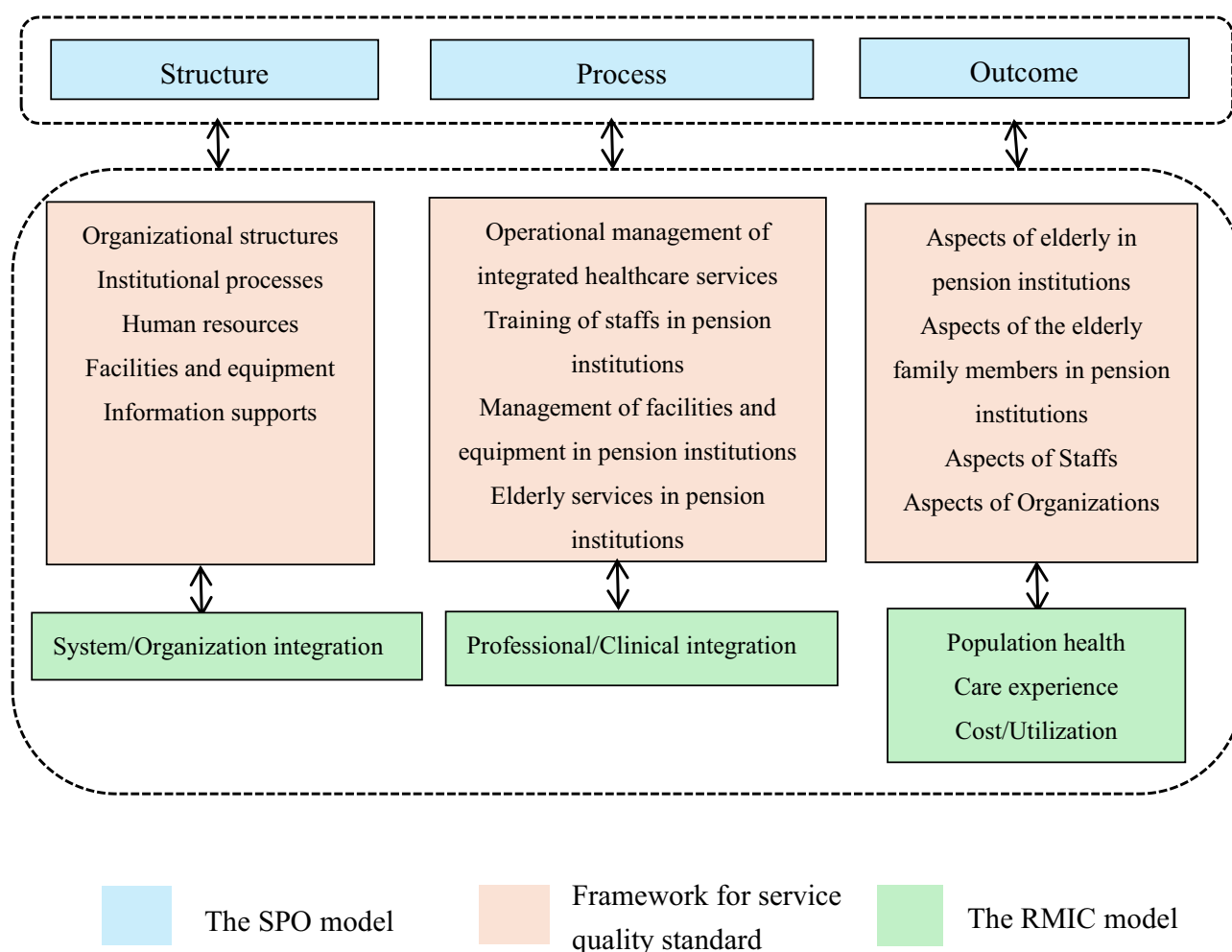


Figure 1 Conceptual framework for service quality in collaborative-integrated healthcare institutions. Based on SPO and RMIC models, it covers core dimensions (eg, organizational structure, staff) and links structure, process, outcome to form a service quality evaluation basis.

Study Design

This study adopted a methodological analytical study design aimed at developing and validating a set of service quality standard for collaborative integrated healthcare institutions. A modified Delphi with AHP was used in this study to examine data in two phases: the Delphi process and the AHP phase. The Delphi process includes a preparatory phase and the implementation of Delphi consultation, intermediate data processing and analytical procedures, as well as finalizing steps. First, in the preparatory phase, based on a literature review, semi-structured interviews and group discussion between researchers, a framework was built (Figure 1) to guide the development of the Delphi questionnaire. By synthesizing the findings from literature reviews and qualitative research, a preliminary draft of the service quality standard was developed following the principles of scientific rationality and systematically. In the implementation of the Delphi Consultation, the two-round Delphi survey was conducted via email from August to October in 2024. During the first round of surveys, we set open-ended questions to elucidate the rationale behind expert amendments and appraise the need for supplemental indicator Pools. Adjustments were made based on expert consensus and threshold analysis. After the second round of the survey, a panel discussion which decided on the outcome of the second-round indicators was performed to achieve a final consensus. In the AHP phase, weights were calculated to understand the importance of each service quality standard for collaborative integrated healthcare institutions. The flowchart of this study is shown in Figure 2.

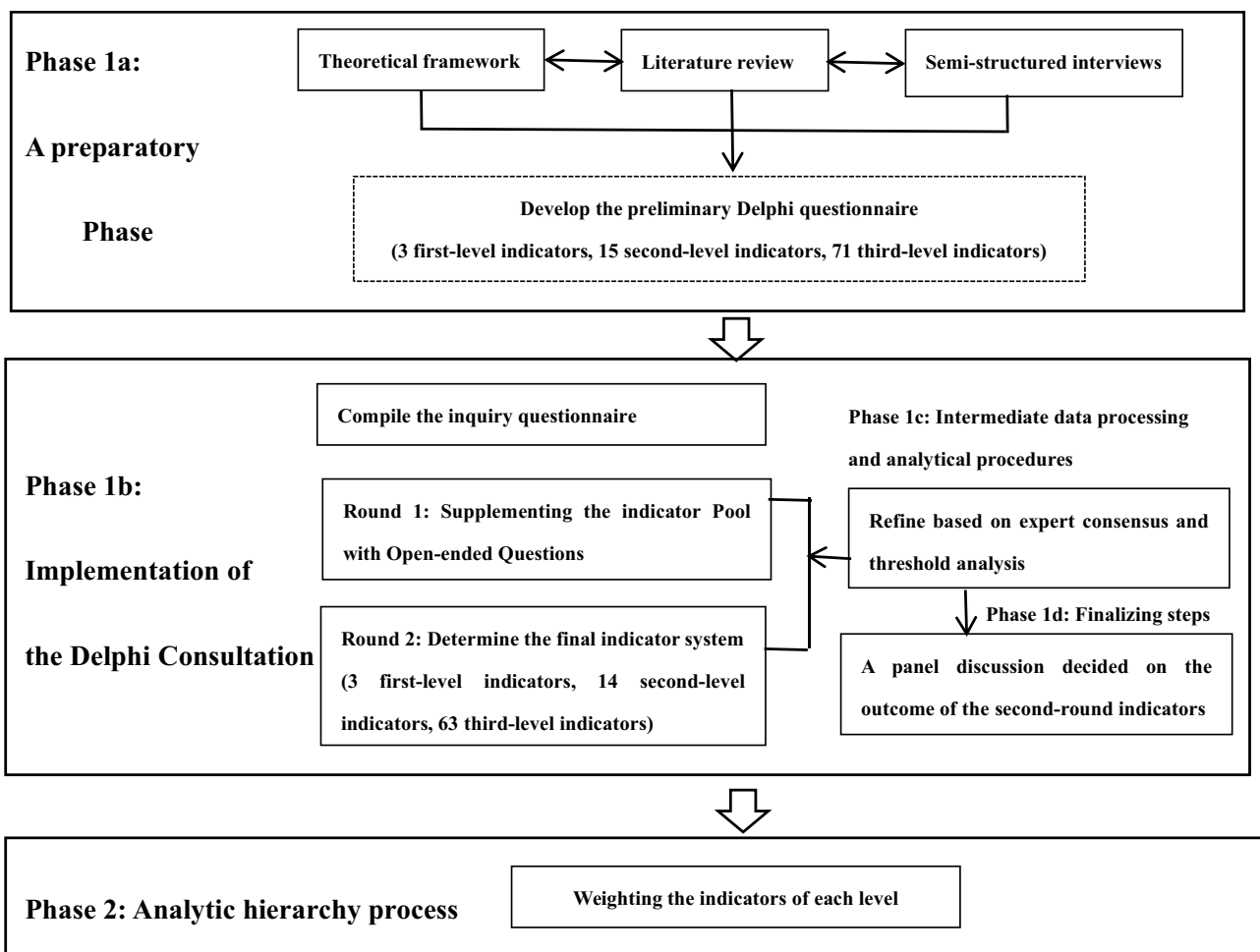


Figure 2 Study flowchart for service quality indicator system in collaborative integrated healthcare institutions. Phase 1 (preparatory): build framework, review literature, interview. Phase 1a: develop preliminary Delphi questionnaire. Phase 1b: 2-round Delphi consultation. Phases 1c-1d: process data, finalize steps. Phase 2: weight indicators via analytic hierarchy process.

Formulation of the Expert Consultation Questionnaire

A literature review method was employed to systematically collect research on service quality standard for healthcare integration institutions. The time frame of the search was 2010/1/1-2024/7/31, Chinese/English literature was included, and duplicated, non-empirical studies were excluded. “long-term care facilities, nursing homes, homes for older people, elderly care institutions, nursing institutions for the elderly”; “institutional cooperation, medical contract, integrated care, medical care combination, healthcare integration”, and “quality evaluation, service quality, quality standard, quality indicator system” were used as the search terms and extracted databases from CNKI, WanFang, VIP, PubMed, Cochrane Library, Web of Science and Embase. The results of the reviewed literature were organized and analyzed to create a repository of evaluation standard.

Based on the literature review, semi-structured interviews about service benchmarks, gaps and implementation challenges in integrated healthcare were conducted with staff and elderly residents at three institutions in Guangzhou, China. Field investigations and research revealed that no matter what form of medical and elderly care integrated institution it was, the development of integrated healthcare models in China remained underdeveloped. Based on observations from the three surveyed institutions above, it was evident that integrated healthcare services had encountered numerous challenges in their development. Challenges such as misaligned operational philosophies, incomplete regulatory frameworks, shortages of professional talent, outdated infrastructure, and the lack of service evaluation systems had hindered the sustainable improvement of service quality. By synthesizing the findings from literature reviews and qualitative research, a preliminary draft of the service quality standard was formulated.

Implementation of the Expert Delphi Round

From August to October 2024, expert consultation questionnaires were distributed via email, followed by two rounds of correspondence, each lasting 1–2 weeks. We developed an expert correspondence questionnaire consisting of three parts: The letter to experts introduced the current status, purpose, methodology, and significance of the study. In the expert letter inquiry form, the importance evaluation of indicators at each level adopted Likert 5-level scoring method, from “unimportant” to “very important”, assigning 1–5 points, respectively, and each indicator was followed by options to add, modify or delete comments. The expert information sheet showed their self-evaluation about the basis of judgement and familiarity with the content. The screening criteria for indicators in this study were: importance score mean ≥ 4.0 , full score rate $\geq 20\%$, and variation coefficient < 0.2 . After each expert consultation round, the research team reviewed feedback, adjusted the indicators and prepared the questionnaire for the next round. Simultaneously, experts received statistical results from the previous round for reference and re-evaluated the revised indicators. The process ended when expert opinions converged. After two rounds, no new themes emerged, indicating that thematic saturation was achieved, and adding more panelists would not have yielded new insights. Therefore, while the sample size was compact, it was consistent with best practices for the Delphi method and was robust for achieving the study’s aim of deriving expert consensus.

Statistical Analysis

Descriptive statistical was used to analyze the experts’ basic information by SPSS Statistics 27.0. Expert engagement was measured by the questionnaire response and suggestion rate. The expert authority coefficient (Cr) was calculated as the arithmetic mean of judgement coefficient (Ca) and familiarity degree (Cs); the degree of expert opinion coordination was assessed by coefficient of variation (CV) and Kendall’s W. Meanwhile, the degree of concentration of expert opinion was represented by the mean importance score and the full score rate of the indicator items.

The weight of indicators at each level was calculated by AHP. The analysis steps involved constructing hierarchical analysis structure based on the final results of the Delphi method. The Saaty scale method¹⁶ was then adopted to formulate judgment matrix, and the weights coefficients of the indicators were calculated.¹⁷ The consistency test for the judgment matrix was conducted using the Consistency Ratio (CR = Consistency Index/Random Index). If $CR \leq 0.1$, the judgment matrix was considered consistent. Finally, the comprehensive weights of indicators across all levels were determined.

Results

The Characteristics of Delphi Participants

According to the established Delphi criteria, a total of 16 consulting experts were identified prior to the formal distribution of the expert consultation questionnaire. The experts represented diverse sub-fields including nursing management, clinical nursing/medical care, community care, nursing education, and pension institution management, with equal representation in nursing management and clinical roles. Table 1 presented the characteristics of Delphi participants: The average age of experts was (46.31 ± 6.07) years, with an average work experience of (24.44 ± 8.85) years, 7 with bachelor's degree (43.75%), 9 with master's degree or above (56.25%); 14 with associate senior title or higher (87.50%), and 11 (68.25%) with more than 20 years of working experience (details in [Supplementary Tables 1–4](#)).

Key Coefficients of the Delphi Method

A total of 16 expert consultation questionnaires were distributed across the 2 rounds, with effective response rates of 100% and 93.75%, respectively; During the first round, 9 experts (56.25%) submitted thirty comments, while in the second round, 6 experts (40%) proposed twelve opinions. In this study, the first-round values for Cr, Ca, and Cs were 0.828, 0.925, and 0.731; the second-round values were 0.823, 0.920, and 0.726, reflecting high levels of expert involvement and authority. The degree of experts' concentration opinions was expressed by the importance value, full score rate, and CV (details in [Supplementary Tables 5–10](#)), which results were presented in Table 2. The coordination degree of experts' opinions, which was expressed by Kendall's W, ranged from 0.209 to 0.252 ($p < 0.001$), indicating that expert opinions were relatively concentrated and highly coordinated.

Table 1 The Characteristics of Delphi Participants

Basic Information	Number (%)	Basic Information	Number (%)
Age (years)		Working experience	
31-40	3 (18.75%)	<10 years	1 (6.25%)
41-50	8 (50%)	10-20 years	4 (25%)
>50	5 (31.25%)	>20 years	11 (68.25%)
Gender		Sub-fields	
Female	15 (93.75%)	Nursing management	4 (25%)
Male	1 (6.25%)	Clinical Nursing/Medical	4 (25%)
Education		Community care	3 (18.75%)
Bachelor's degree	7 (43.75%)	Nursing education	2 (12.50%)
Master's degree or above	9 (56.25%)	Pension institution management	3 (18.75%)
Professional title			
Middle	2 (12.50%)		
Associate senior	6 (17.50%)		
senior	8 (70%)		

Table 2 Key Coefficients of the Delphi Method

	Hierarchical Level	Importance value	CV	Kendall's w	χ^2	Full Score Rate (%)
Round 1	First level	4.81–5	0-0.084	0.146	4.667	81.25~100
	Second level	4.31–5	0-0.219	0.186	41.773**	50~100
	Third level	3.63–5	0-0.247	0.209	234.416**	12.50~100
Round 2	First level	4.87–5	0-0.072	0.100	3	86.67~100
	Second level	4.33–5	0-0.142	0.216	42.133**	40~100
	Third level	4.27-5	0-0.142	0.252	245.489**	33.3~100

Note: χ^2 , Chi-square value; ** $p < 0.01$.

Abbreviation: CV, coefficient of variation.

Indicator Screening and Modification

After the first round of correspondence, adjustments were made to the indicators based on the screening criteria and discussions with experts. One second-level indicator was deleted (due to content duplication and a high coefficient of variation), 8 third-level indicators were removed (due to high coefficients of variation), three indicators were added, two were merged, and fourteen were modified, as detailed below: The second-level indicator “Education and training” was eliminated. Among the third-level indicators, three items related to “Free clinic activities”, three items linked to “Education and training”, along with “Organize health and recreational activities” and “Employee resignation rate in pension institutions” were removed. Process indicators “Provide emergency green channels for elderly in pension institutions” and outcome indicators “Operational cost control in pension institutions” and “Medical expenditure control in pension institutions” were included. Following the second round of consultation questionnaire, no modification was proposed by experts for the first or second-level indicators, but 1 third-level indicator was removed (due to its importance mean did not satisfy the inclusion criteria), and six were modified. The final service quality standard for collaborative integrated healthcare institutions consisted of 3 first-level indicators, 14 second-level indicators, and 63 third-level indicators.

The Final Standard System with Indicator Weights

In this study, the Saaty scale was determined by calculating the difference in mean importance scores from the second round of the Delphi method. For example, a mean difference in importance scores ranging from 0.25 to 0.5 corresponded to a Saaty scale of 3, while ranging from -0.5 to -0.25 corresponded to $1/3$; which formed a three-layer hierarchical model, including the target, guideline and scheme layer. Then the model and judgement matrix were inputted into the Spssau software to derive the weights of each index. [Table 3](#) presented the final standard system with indicator weights. The CR value for the first-level indicator was 0.052 (<0.1). While the CR values for the second-level indicators of structure, process, and outcome were 0.008, 0.019, and 0.027 respectively (all <0.1). The effect on institutionally collaborative integrated healthcare services, ranked from largest to smallest, was service process (0.493), service structure (0.311) and service outcome (0.196). The combined weights of the second-level indicators were 0.021–0.181, among which institutional processes and human resources had the greatest impact on service structure, the operational management of integrated healthcare services exerted the most significant influence on service process, and elderly in pension institutions contributed most to service outcomes. The combined weights of the third-level indicators were 0.002–0.066, with the establishment of a professional service team for integrated healthcare in tertiary hospitals being most influential (details in [Supplementary Table 13](#)).

Reliability and Validity Analysis

The reliability of the evaluation criteria system was assessed using Cronbach’s α coefficient. Content validity was measured based on ratings from 15 experts who participated in both rounds of the Delphi survey, using a 4-point Likert scale to evaluate the relevance of each indicator. The scale-level content validity index (S-CVI) and the item-level content validity index (I-CVI) were calculated accordingly. The overall Cronbach’s α for the system was 0.861, with values of 0.780, 0.787, and 0.822 for the structure, process, and outcome dimensions, respectively. All Cronbach’s α values exceeded 0.7, indicating excellent internal consistency among the items. The S-CVI was 0.900, and I-CVI values ranged from 0.800 to 1.000, demonstrating good overall validity of the system (details in [Supplementary Tables 11–12](#)).

Discussion

During the standard screening stage of this study, a systematic review of domestic and international guidelines, policy documents combined with qualitative interviews, were conducted to extract and integrate high-quality data. This process facilitated the development of a preliminary framework, ensuring comprehensive and objective indicator screening. During the standard optimization stage, two rounds of expert correspondence consultation were conducted by the Delphi method. Most experts held a master’s degree and associate senior title or higher, with solid theoretical foundations and extensive practical experience, ensuring high representativeness. The positive response rate of the experts in the two

Table 3 The Final Standard System with Indicator Weights

First-Level Indicators	Second-Level Indicators	Combined Weight	Third-Level Indicators	Combined Weight
A. Structure (0.311)	A1 Organizational structures (0.184)	0.057	A11 Formulate collaboration agreements between institutional parties (0.125)	0.007
			A12 Formulate special service projects for healthcare integration (0.250)	0.014
			A13 Institute the organizational structure of integrated healthcare services (0.250)	0.014
			A14 Formulate the division of tasks and responsibilities for healthcare integration (0.250)	0.014
			A15 Establish the special fund and usage mechanism for healthcare integration (0.125)	0.007
	A2 Institutional processes (0.320)	0.099	A21 Establish a reward and punishment incentive system of personnel for integrated healthcare service (0.066)	0.007
			A22 Establish a system of ward rounds for integrated healthcare services (0.090)	0.009
			A23 Establish a two-way referral system for integrated healthcare services (0.143)	0.014
			A24 Establish a consultation system for integrated healthcare services (0.143)	0.014
			A25 Establish a disease health education framework for integrated healthcare services (0.066)	0.007
			A26 Establish an adverse event reporting system for integrated healthcare services (0.066)	0.007
			A27 Establish a management system for complaint events relating to integrated healthcare services (0.143)	0.014
			A28 Establish an information security system for integrated healthcare services (0.143)	0.014
	A3 Human resources (0.320)	0.099	A29 Establish a training system of employees for integrated healthcare services (0.143)	0.014
			A31 Set up qualification requirements for integrated healthcare service in tertiary hospitals and select personnel based on pension institutional needs (0.333)	0.033
	A4 Facilities and equipment (0.068)	0.021	A32 Establish a professional service team for integrated healthcare in tertiary hospitals, including doctors, nurses, therapists, dieticians and pharmacists (0.667)	0.066
			A41 Ensure availability of facilities and equipment allocation in pension institutions (0.500)	0.011
A5 Information supports (0.109)	0.034	A42 Establish maintenance protocols for facilities and equipment in pension institutions (0.500)	0.011	
		A51 Develop an internet work exchange platform for integrated healthcare services (0.196)	0.007	
		A52 Develop an information technology platform for integrated healthcare services (0.493)	0.017	
			A53 Establish an information-based service model for integrated healthcare (0.311)	0.011

A. Process (0.493)	B1 Operational management of integrated healthcare services (0.367)	0.181	B11 Hold regular joint meetings between tertiary hospital and pension institution (0.125)	0.023
			B12 Promote the provision of integrated healthcare services by multidisciplinary teams. (0.250)	0.045
			B13 Follow the principle of respecting and safeguarding the rights and interests of the elderly to provide integrated healthcare services (0.250)	0.045
			B14 Conduct regular quality monitoring for integrated healthcare services in pension institutions (0.250)	0.045
			B15 Conduct regular satisfaction evaluation of integrated healthcare services quality (0.125)	0.023
	B2 Training of staffs in pension institutions (0.223)	0.110	B21 Conduct lectures on specialized theoretical knowledge online or offline (0.333)	0.037
			B22 Conduct medical care operation skills training online or offline (0.333)	0.037
			B23 Provide opportunities of visiting and advanced training for staff in pension institutions (0.333)	0.037
	B3 Management of facilities and equipment in pension institutions (0.059)	0.029	B31 Provide tailored recommendations to enhance environmental facilities in pension institutions (0.667)	0.019
			B32 Provide tailored recommendations to improve the optimization of facilities and medication configuration in pension institutions (0.333)	0.010
	B4 Elderly services in pension institutions (0.223)	0.110	B41 Conduct care needs assessment for elderly in pension institutions (0.196)	0.022
			B42 Formulate a nursing care plan for the elderly in pension institutions (0.058)	0.006
			B43 Enhance the list of services for the elderly in pension institutions (0.058)	0.006
			B44 Provide regular medical rounds for the elderly in pension institutions (0.117)	0.013
			B45 Provide consultation services for the elderly in pension institutions through online or offline methods (0.117)	0.013
			B46 Provide emergency green channels for the elderly in pension institutions (0.196)	0.022
			B47 Provide assistance when the elderly in pension institutions need to be referred (0.117)	0.013
			B48 Provide physical examination services for the elderly in pension institutions (0.058)	0.006
			B49 Conduct health education seminars for the elderly in pension institutions (0.086)	0.009
			B5 Information linkage of integrated healthcare services (0.128)	0.063
	B52 Share internal information of the elderly between institutions (0.235)	0.015		
	B53 Carry out telemedicine and schedule medical appointment (0.235)	0.015		
	B54 Ensure the accessibility of information for consultations, referrals and medical rounds (0.377)	0.024		
	B55 Conduct regular maintenance of the internet information platform and ensure its smooth operation (0.062)	0.004		

(Continued)

Table 3 (Continued).

First-Level Indicators	Second-Level Indicators	Combined Weight	Third-Level Indicators	Combined Weight
A. Outcome (0.196)	C1 Aspects of elderly in pension institutions (0.420)	0.082	C11 Satisfaction evaluation of the elderly in pension institutions with integrated healthcare services (0.250)	0.021
			C12 Complaint events of the elderly in pension institutions about integrated healthcare services (0.250)	0.021
			C13 Adverse events about integrated healthcare services for the elderly in pension institutions (0.250)	0.021
			C14 Mental and physical health of the elderly in pension institutions (0.250)	0.021
	C2 Aspects of the elderly family members in pension institutions (0.121)	0.024	C21 Satisfaction evaluation of the elderly family members with integrated healthcare services (0.667)	0.016
			C22 Complaint events of the elderly family members about integrated healthcare services (0.333)	0.008
	C3 Aspects of Staffs (0.190)	0.037	C31 Satisfaction evaluation among staff with integrated healthcare services in tertiary hospitals (0.196)	0.007
			C32 Satisfaction evaluation among staff with integrated healthcare services in pension institutions (0.311)	0.012
	C4 Aspects of Organizations (0.269)	0.053	C33 The enhancement of staff service capabilities in pension institutions (0.493)	0.018
			C41 Events of two-way referrals for integrated healthcare services (0.168)	0.009
			C42 Number of follow up visits and medical rounds of integrated healthcare services (0.069)	0.004
			C43 Number of consultations of integrated healthcare services (0.042)	0.002
			C44 Handling of complaint events related to integrated healthcare services (0.168)	0.009
			C45 Contract maintenance for integrated healthcare services (0.114)	0.006
			C46 Operational efficiency of pension institutions (0.114)	0.006
	C47 Optimization of the environment and facilities in pension institutions (0.069)	0.004		
	C48 Operational cost control in pension institutions (0.091)	0.005		
	C49 Medical expenditure control in pension institutions (0.168)	0.009		

Notes: The bold text indicates that in this dimension it has the highest weigh.

rounds of consultation was higher, with authority coefficient exceeding 0.8, and the experts' opinions showed highly concentration, low divergence and good coordination, indicating a high level of expert engagement and strong credibility of the consultation results. During the weight determination phase, all indicator weights passed the consistency test, confirming the rationality of the weight allocation. In summary, the service standard for institutionally collaborative integrated healthcare institutions developed in this study demonstrated high scientific validity and reliability.

This study adopts SPO and RMIC as the primary conceptual frameworks for developing standard system. Considering macro-level structural design, meso-level organizational coordination, and micro-level service delivery—along with service outcome evaluations—this study systematically examines the construction and delivery of institutionally collaborative integrated healthcare services, addressing gaps in existing research on macro and meso level service delivery in China. The study finds that among the first-level indicators, the service process has the highest weight (0.493), consistent with the findings of Ju M¹⁸ and Tao SM et al.¹⁹ Then followed by service structure, while service outcome has the lowest weight. This suggests that process control plays a crucial role in quality management when evaluating institutional performance.²⁰ Specifically, meso-level indicators (eg, two-way referral, multidisciplinary team building) serves as a bridge, facilitating service coordination and extension, and exerts the most significant impact on the indicator system. The macro-level indicators (eg, policy formulation, resource allocation) defines the top-level design of the service system, influencing resource integration at the meso-system and the service delivery at the micro-level, exerting a secondary impact. The micro-level indicators (eg, operational effectiveness, elderly experience) directly represents service outcomes and has the least influence.

Among the secondary indicators, “Human resources” and “Institutional processes” receive maximal weighting in structure indicators which is consistent with the findings of Pan AH²¹ and Zhu L.²² Therefore, integrated care requires strong safety systems for dependent elderly and optimal staffing to ensure effective service delivery and maximize benefits.²³ Meanwhile, Operational management metrics scores the highest weight value in process indicators, which enhances service quality, efficiency, and coordination in integrated healthcare institutions to ensure standardized delivery and optimal resource utilization. The structural quality indicators provide a material foundational basis for service delivery, and the process quality indicators emphasizes the entire process, guaranteeing the implementation of service measures. Ultimately, outcome quality indicators employee multi-dimensional quantitative measures to comprehensively assess the content, quality, efficiency and accessibility from the perspective of user satisfaction,^{24,25} offering a scientific basis for evaluating goal attainment.

Building on China's existing policy initiatives, including long-term care insurance pilots and integrated elderly healthcare programs,²⁶ the establishment of evidence-based quality standards for collaborative integrated healthcare institutions has become a critical next step. These scientifically grounded standards serve three key policy objectives: Protecting elderly residents' safety and rights through standardized care protocols, optimizing the allocation of high-quality medical resources across institutions and supporting the hierarchical medical care system through measurable performance benchmarks. To ensure policy alignment and implementation, we propose incorporating these standards into Guangdong Province's medical institution grading system, where they could inform both quality assessment frameworks and health insurance payment reform parameters.

Strengths and Limitations

Drawing on literature research and field investigations, this study enriches the evaluation standard for the service quality of collaborative integrated healthcare institutions by examining service organizational structure, delivery processes and outcomes, demonstrating its significant value in service optimization, resource integration, cost control, rights protection and industry development. Compared to community-based integration models in Western countries, this study focuses on tertiary hospital-led healthcare integration with Chinese characteristics, filling the gap of localized service quality standards. However, the following limitations also exist: First, as the invited experts are mainly from Guangdong province, the standard system is more applicable to cities or regions with similar healthcare systems, which restricts the universality of the results to other areas. For instance, in rural China, some structural indicators may need to be modified. Second, the quality standard identified in the study have not yet been verified for reliability, validity or feasibility by multiple institutions. Verification and testing are necessary before the standard can be widely implemented.

The research team will subsequently test the practicality of the standard in practice, continuously revising and improving the standards to ensure that integrated healthcare institutions can consistently deliver high-quality care services.

Conclusion

The development of integrated healthcare services is essential for addressing health governance challenges associated with aging while also driving structural reforms in elderly care service supply, making it a key component of the Healthy China strategy. Therefore, studying its development trajectory is highly significant. Through two rounds of Delphi expert consultation, this study has developed a service quality standard for institutionally collaborative integrated healthcare institutions based on the SPO and RMIC models. The final system consists of 3 first-level, 14 second-level, and 63 third-level indicators, ensuring scientific validity, reliability and comprehensiveness. In the next phase, we will implement the standard, focusing on empirical research and evaluating service quality through institutional self-assessments and third-party inspections. The standard system will undergo continuous optimization, refinement, and improvement to provide theoretical support and practical guidance for enhancing the quality of institutionally collaborative integrated healthcare services.

Ethics

The study protocol was reviewed and approved by the ethic committee of The First Affiliated Hospital of Jinan University (Approval no: KY-2024-028). All participants were authorized before starting the interview.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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