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# Construction of an Evaluation Indicator System for the Effectiveness of Integration of Medical Care and Preventive Services for Chronic Diseases at the Primary Care Level

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**Abstract:** China's primary healthcare system has vigorously promoted the integration of medical care and preventive services for chronic disease management, yet a mature and validated evaluation tool to quantify its operational effectiveness is still lacking. This study aimed to construct a scientific and practical evaluation indicator system to fill this research gap. Two rounds of Delphi expert consultation were conducted with 15 invited experts, and the Analytic Hierarchy Process (AHP) was applied to determine the weight of each indicator. The finalized system consists of six primary dimensions, including service team building, service facility configuration, service process implementation, medical service effectiveness, health behavior management effectiveness, and service cost control, along with 32 secondary indicators. The established indicator system can provide a methodological reference for researchers and policy-makers to scientifically assess the real-world performance of the integration of medical care and preventive services at the primary care level.

**Keywords:** Primary care; Chronic diseases; Integration of medical care and preventive services; Evaluation indicator system; Analytic Hierarchy Process; Delphi method

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## 1. Introduction

Chronic diseases pose a heavy disease burden in China. Hypertension and diabetes, collectively known as the two major chronic diseases, affect an enormous population, yet their rates of awareness, treatment, and control have long remained low, presenting a major challenge to the Healthy China initiative [1–2]. The Chinese government has taken the two major chronic diseases as a breakthrough to advance the reform of

integrating medical care and preventive services at the primary care level, aiming to build an integrated health service system [3–4]. However, in policy implementation, the links between medical care and prevention in terms of institutions, information systems, and incentive mechanisms are not smooth, and the phenomenon of "old practices under new policies" is common in primary care service models [5]. How to scientifically, systematically, and dynamically evaluate the implementation process and health outcomes of the integrated model, and form a continuous improvement closed loop of "practice–evaluation–feedback–optimization", has become a key issue of widespread concern.

For chronic disease management evaluation, the Chronic Care Model (CCM) and the WHO Innovative Care for Chronic Conditions (ICCC) Framework provide a theoretical basis for integrated management [6]. Martin et al., based on the UK Quality and Outcomes Framework (QOF), showed that the tool can effectively monitor patient health indicators but involves too many items and imposes a heavy operational burden [7]. Polanco et al. verified the practicality of a Spanish tool for assessing chronic care readiness in medical institutions, yet it has not formed a widely recognized evaluation framework [8]. Ku et al. established the Comprehensive Care Quality for Chronic Conditions (CCCQ) framework through a scoping review and Delphi method, covering measurable attributes of structure, process, and outcome [9].

In China, the evaluation framework for integrated health service systems constructed by Chen et al. is theoretically complete but lacks systematic consideration of data availability [10]. The performance index system for integrated health services, developed by Ren et al., shows insufficient applicability at the primary care level [11]. Some scholars have established an on-site evaluation indicator system for the quality of integrated medical care and preventive services for chronic diseases in primary facilities using the Delphi method and AHP, but it focuses mainly on organizational capacity and process evaluation, with insufficient attention to data availability and operability [12]. Based on the rainbow model, Li et al. used qualitative comparative analysis and found that service integration and functional integration are the core foundations for effective integration [13]. In short, existing studies still have obvious shortcomings in method integration, indicator practicality, and dynamic feedback. There is an urgent need to establish an evaluation indicator system for the effectiveness of integrated medical care and preventive services for chronic diseases at the primary care level that balances process and outcome, structure and effect, and is highly operable.

Based on the real-world practice of two major chronic disease management in primary care settings, this study combined literature analysis and expert consultation to construct an evaluation indicator system that balances process and outcome as well as structure and effect. The study strengthened indicator importance, data availability, and sensitivity, aiming to provide a scientific tool for objectively assessing the effectiveness of integrated medical care and preventive services and optimizing resource allocation.

## 2. Objects and methods

### 2.1. Preliminary determination of original indicators

Keywords including primary care, chronic diseases, integration of medical care and preventive services, integrated health services, medical-preventive collaboration, combination of prevention and treatment, chronic disease management, evaluation, and evaluation indicator system were used to search authoritative databases. The study systematically collected, reviewed, and analyzed domestic and international studies on the integration of medical care and preventive services for chronic diseases at the primary care level, and

summarized current research findings on relevant evaluation systems, providing a basis for constructing the theoretical and initial framework.

Official websites, including those of the Chinese government, the National Health Commission, and municipal government portals, were accessed to collect regulations, policy documents, and materials related to chronic disease management, integrated medical care, and preventive services. Based on Donabedian's structure–process–outcome framework, and following the principles of scientificity, representativeness, comprehensiveness, and practicality, combined with the characteristics of community health services and evaluation objectives, the study initially established an indicator system containing 6 primary indicators and 36 secondary indicators [14]. The primary indicators were: service team building (structure), service facility allocation (structure), service process implementation (process), medical service effectiveness (outcome), health behavior management effectiveness (outcome), and service cost control (outcome).

## 2.2. Selection of consultation experts

Experts were selected in accordance with the requirements of the Delphi method, using the following criteria: (1) Chronic disease comprehensive management experts (meet at least two): Bachelor's degree or above; or associate degree with ≥10 years of chronic disease management experience; Intermediate professional title or above; or junior title but presiding over a district-level or higher chronic disease project; Engaged in chronic disease management in community health centers for ≥5 years. (2) Health policy/health informatics experts (meet at least two): Master's degree or above; or bachelor's degree with ≥5 years of health informatics project management experience; Associate senior title or above; or intermediate title but participating in national health policy formulation; Worked in health policy/informatics for ≥10 years, or with ≥3 successful project cases. (3) Informed consent and voluntary participation.

Given the multidisciplinary nature of this study, 15 experts engaged in clinical medicine, public health, and health management were invited.

## 2.3. Conduct Delphi consultation

Two rounds of expert consultation were conducted via email questionnaires from October to December 2025. In the first round, experts were asked to score each indicator on a 5-point Likert scale across four dimensions: importance, data availability, sensitivity, and familiarity, based on their professional background and experience.

Indicators were screened using the following criteria (all three must be satisfied, or at least two; otherwise, deletion or revision): (1) Importance mean ≥ 4.0, coefficient of variation (CV) ≤ 0.3, full-score rate ≥ 20%; (2) Data availability mean ≥ 4.0, CV ≤ 0.3, full-score rate ≥ 20%; (3) Sensitivity mean ≥ 4.0, CV ≤ 0.3, full-score rate ≥ 20%.

Indicators failing two or more criteria were deleted; those failing only one were revised based on expert comments.

After screening and revision according to the first-round results and feedback, the indicator set for the second round was determined. In the second round, experts again scored the four dimensions, with a focus on revised indicators, and weights were determined based on importance scores.

Using the Analytic Hierarchy Process (AHP) with Yaahp software, a hierarchical model was established, dividing the system into goal layer, criterion layer, and alternative layer [11]. The goal layer was the evaluation

system; the criterion layer was primary indicators; the alternative layer was secondary indicators. Pairwise comparisons of indicator importance were performed, and relative importance was assigned numerically. The judgment matrix was constructed using the Saaty 1–9 scale (**Table 1**) [15].

**Table 1.** Saaty 1–9 scale and meaning

| Saaty scale | Mean difference | Saaty scale | Mean difference | Meaning |
|---|---|---|---|---|
| 1 | diff=0 | 1 | diff=0 | Equal importance |
| 2 | 0 < diff ≤ 0.25 | 1/2 | -0.25 < diff ≤ 0 | Equal importance |
| 3 | 0.25 < diff ≤ 0.50 | 1/3 | -0.50 < diff ≤ -0.25 | Slightly more important |
| 4 | 0.50 < diff ≤ 0.75 | 1/4 | -0.75 < diff ≤ -0.50 | Slightly more important |
| 5 | 0.75 < diff ≤ 1.00 | 1/5 | -1.00 < diff ≤ -0.75 | Moderately more important |
| 6 | 1.00 < diff ≤ 1.25 | 1/6 | -1.25 < diff ≤ -1.00 | Moderately more important |
| 7 | 1.25 < diff ≤ 1.50 | 1/7 | -1.50 < diff ≤ -1.25 | Much more important |
| 8 | 1.50 < diff ≤ 1.75 | 1/8 | -1.75 < diff ≤ -1.50 | Much more important |
| 9 | diff>1.75 | 1/9 | diff<-1.75 | Absolutely more important |

Original weights and combined weights were calculated using the product method. The maximum eigenvalue (λmax) and consistency ratio (CR) were computed. A CR < 0.10 indicated satisfactory consistency and reasonable weight assignment; otherwise, the judgment matrix required adjustment.

# 3. Results analysis

## 3.1. Introduction to the basic information of experts

A total of 15 experts were enrolled in the two rounds of correspondence consultation in this study. All selected experts have long been engaged in the management of integration of medical care and preventive services for chronic diseases, and are well acquainted with relevant policies, theories, and practical operations, which enables them to offer direct and authoritative professional insights for the scientific construction of the evaluation indicator system (**Table 2**).

**Table 2.** Expert characteristics (*n*=15)

| Characteristic | Category | Number | Percentage (%) |
|---|---|---|---|
| Gender | Male | 10 | 66.67 |
| | Female | 5 | 33.33 |
| Age (years) | <40 | 4 | 26.67 |
| | ≥40 | 11 | 73.33 |
| Education | Bachelor | 11 | 73.33 |
| | Master | 2 | 13.33 |
| | Doctor | 2 | 13.33 |
| Professional title | Intermediate | 2 | 13.33 |
| | Associate Senior | 10 | 66.67 |
| | Senior | 3 | 20.00 |
| Years of work | <10 | 1 | 6.67 |
| | 10–19 | 8 | 53.33 |

| Characteristic | Category | Number | Percentage (%) |
|---|---|---|---|
| Field | ≥20 | 6 | 40.00 |
| | Clinical medicine | 6 | 40.00 |
| | Public health | 4 | 26.67 |
| | Health management | 5 | 33.33 |

## 3.2. Reliability of the expert consultation

### 3.2.1. Expert enthusiasm

Two rounds of Delphi questionnaires achieved an effective response rate of 100%. The proportion of experts putting forward revision suggestions was 73.33% and 26.67%, respectively, indicating that the participating experts maintained a high level of interest and attention to the research topic.

### 3.2.2. Expert authority coefficient

The expert authority coefficient (Cr) is determined by two factors: judgment basis (Ca) and familiarity degree (Cs). The calculation formula is expressed as: Cr=(Ca+Cs)/2.

In general, an authority coefficient (Cr>0.7) indicates a high level of expert authority. The Cr values of both rounds of expert consultation were greater than 0.7, suggesting that the selected experts had good authority, and the research results are of high reliability (**Table 3**).

**Table 3.** Authority coefficients

| Round | Judgment basis | Familiarity | Authority (Cr) |
|---|---|---|---|
| 1 | 0.940 | 0.850 | 0.895 |
| 2 | 0.920 | 0.820 | 0.870 |

### 3.2.3. Degree of expert opinion coordination

The Kendall's W coefficients for the scores of primary indicators in terms of importance, data availability, and sensitivity in the second round of expert consultation were all higher than those in the first round. Meanwhile, the Kendall's W coefficient for the importance scores of secondary indicators in the second round was also higher than that in the first round. All differences were statistically significant ($P < 0.05$), which indicated a high degree of expert opinion coordination and reliable research results (**Table 4).**

**Table 4.** Kendall's W coefficients

| Round | | 1 | | 2 | |
|---|---|---|---|---|---|
| Parameter | | Primary Indicator | Secondary Indicator | Primary Indicator | Secondary Indicator |
| Importance | w | 0.214 | 0.196 | 0.253 | 0.255 |
| | $x^2$ | 16.019 | 102.772 | 18.953 | 118.527 |
| | P | 0.007 | <0.001 | 0.002 | <0.001 |
| Data availability | w | 0.311 | 0.391 | 0.354 | 0.296 |
| | | 23.301 | 205.187 | 26.634 | 137.677 |
| | P | <0.001 | <0.001 | <0.001 | <0.001 |
| Sensitivity | w | 0.244 | 0.218 | 0.257 | 0.185 |
| | $x^2$ | 18.316 | 106.834 | 19.278 | 86.007 |
| | P | 0.003 | <0.001 | 0.002 | <0.001 |

## 3.3. Consultation results

### 3.3.1. Results of the first round of expert consultation

In the first round of expert consultation, the mean score of indicator importance ranged from 3.93 to 5.00, with a standard deviation of 0.00–1.34, a coefficient of variation of 0.00–0.34, and a full-score ratio of 40%–100%. The mean score of data availability ranged from 3.40 to 5.00, with a standard deviation of 0.00–1.36, a coefficient of variation of 0.00–0.38, and a full-score ratio of 7%–100%. The mean score of indicator sensitivity ranged from 3.20 to 4.73, with a standard deviation of 1.00–1.49, a coefficient of variation of 0.20–0.41, and a full-score ratio of 7%–93%.

According to the expert comments in the first round and the established indicator screening criteria, the adjustments to the evaluation indicators were as follows. A total of 5 secondary indicators were deleted: proportion of medical staff with college education or above, proportion of information technology personnel, alcohol cessation rate among chronic disease patients, average awareness rate of chronic disease health knowledge among patients, and growth rate of medical income for chronic diseases.

Six secondary indicators were revised: (1) A1 The number of general practitioners per 10,000 population at the primary care level was revised to the number of doctors per 10,000 population at the primary care level; (2) A3 The daily number of chronic disease patients treated by general practitioners was revised to the daily number of chronic disease patients treated by physicians; (3) The expression in the calculation formula of B3 Essential medicine availability rate for the two major chronic diseases was modified; (4) C9 The fixed community visit rate of enrolled patients with the two major chronic diseases was revised to the fixed primary care visit rate of enrolled patients with the two major chronic diseases; (5) D1 The detection rate of the two major chronic diseases was revised to the case discovery rate of patients with the two major chronic diseases; (6) D4 The screening rate of chronic disease complications was revised to the discovery rate of chronic disease complications.

One secondary indicator was newly added: E3 Weight control rate among chronic disease patients. Finally, the evaluation indicator system in the second-round questionnaire consisted of 6 primary indicators and 32 secondary indicators.

### 3.3.2. Second round

In the second round of expert consultation, the mean score of indicator importance ranged from 4.17 to 5.00, with a standard deviation of 0.00–0.81, a coefficient of variation of 0.00–0.19, and a full-score ratio of 27%–100%. The mean score of data availability was 3.85–5.00, with a standard deviation of 0.00–1.188, a coefficient of variation of 0.00–0.29, and a full-score ratio of 13%–100%. The mean score of indicator sensitivity ranged from 3.70 to 4.71, with a standard deviation of 0.85–1.26, a coefficient of variation of 0.21–0.33, and a full-score ratio of 20%–87% (**Table 5** and **Table 6**).

**Table 5.** Scores of primary indicators in the second round of consultation

| Primary Indicator | Importance | | | | Data Availability | | | | Sensitivity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Full-score Ratio | Mean | SD | CV | Full-score Ratio | Mean | SD | CV | Full-score Ratio | Mean | SD | CV |
| A | 4.860 | 0.350 | 0.072 | 80.00% | 4.720 | 0.452 | 0.096 | 66.7% | 3.976 | 1.230 | 0.309 | 40.0% |
| B | 4.670 | 0.617 | 0.132 | 73.30% | 4.930 | 0.258 | 0.052 | 93.3% | 4.020 | 1.256 | 0.312 | 46.7% |
| C | 4.708 | 0.585 | 0.124 | 66.70% | 4.465 | 0.899 | 0.201 | 60.0% | 4.263 | 1.147 | 0.269 | 53.3% |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D | 4.987 | 0.052 | 0.010 | 93.30% | 4.558 | 0.506 | 0.111 | 53.3% | 4.707 | 1.031 | 0.219 | 86.7% |
| E | 4.853 | 0.350 | 0.072 | 80.00% | 3.847 | 0.702 | 0.182 | 13.3% | 4.367 | 1.106 | 0.253 | 53.3% |
| F | 4.400 | 0.604 | 0.137 | 40.00% | 4.320 | 0.806 | 0.187 | 46.7% | 4.020 | 0.849 | 0.211 | 33.3% |

**Table 6.** Scores of secondary indicators in the second round of consultation

| Primary Indicator | Importance | | | | Data Availability | | | | Sensitivity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Full-score Ratio | Mean | SD | CV | Full-score Ratio | Mean | SD | CV | Full-score Ratio | Mean | SD | CV |
| A1 | 4.800 | 0.414 | 0.086 | 80.0% | 4.933 | 0.258 | 0.052 | 93.3% | 4.013 | 1.196 | 0.298 | 40.0% |
| A2 | 4.720 | 0.452 | 0.096 | 66.7% | 4.800 | 0.414 | 0.086 | 80.0% | 3.953 | 1.104 | 0.279 | 33.3% |
| A3 | 4.620 | 0.723 | 0.156 | 73.3% | 4.767 | 0.563 | 0.118 | 80.0% | 3.953 | 1.037 | 0.262 | 26.7% |
| B1 | 4.933 | 0.258 | 0.052 | 93.3% | 4.933 | 0.258 | 0.052 | 93.3% | 4.167 | 1.129 | 0.271 | 46.7% |
| B2 | 4.933 | 0.258 | 0.052 | 93.3% | 5.000 | 0.000 | 0.000 | 100.0% | 4.100 | 1.228 | 0.300 | 46.7% |
| B3 | 5.000 | 0.000 | 0.000 | 100.0% | 4.933 | 0.258 | 0.052 | 93.3% | 4.293 | 1.161 | 0.270 | 60.0% |
| C1 | 4.507 | 0.732 | 0.162 | 60.0% | 5.000 | 0.000 | 0.000 | 100.0% | 3.607 | 1.124 | 0.312 | 20.0% |
| C2 | 4.667 | 0.617 | 0.132 | 73.3% | 4.787 | 0.410 | 0.086 | 73.3% | 3.900 | 1.072 | 0.275 | 26.7% |
| C3 | 4.733 | 0.458 | 0.097 | 73.3% | 4.713 | 0.589 | 0.125 | 73.3% | 4.093 | 1.036 | 0.253 | 33.3% |
| C4 | 5.000 | 0.000 | 0.000 | 100.0% | 4.533 | 0.640 | 0.141 | 60.0% | 4.300 | 1.222 | 0.284 | 60.0% |
| C5 | 5.000 | 0.000 | 0.000 | 100.0% | 4.600 | 0.507 | 0.110 | 60.0% | 4.300 | 1.222 | 0.284 | 60.0% |
| C6 | 4.913 | 0.264 | 0.054 | 86.7% | 4.733 | 0.458 | 0.097 | 73.3% | 3.967 | 1.232 | 0.311 | 40.0% |
| C7 | 4.867 | 0.516 | 0.106 | 93.3% | 4.493 | 0.627 | 0.140 | 53.3% | 4.240 | 1.149 | 0.271 | 53.3% |
| C8 | 4.920 | 0.260 | 0.053 | 86.7% | 4.433 | 0.623 | 0.141 | 46.7% | 4.367 | 1.043 | 0.239 | 53.3% |
| C9 | 4.653 | 0.612 | 0.132 | 66.7% | 4.293 | 0.700 | 0.163 | 40.0% | 4.100 | 1.168 | 0.285 | 46.7% |
| C10 | 4.307 | 0.800 | 0.186 | 46.7% | 4.173 | 0.752 | 0.180 | 33.3% | 3.687 | 1.056 | 0.286 | 20.0% |
| C11 | 4.440 | 0.730 | 0.164 | 53.3% | 4.173 | 0.752 | 0.180 | 33.3% | 3.820 | 1.153 | 0.302 | 26.7% |
| D1 | 4.700 | 0.592 | 0.126 | 73.3% | 4.367 | 0.719 | 0.165 | 46.7% | 4.220 | 1.081 | 0.256 | 46.7% |
| D2 | 4.567 | 0.729 | 0.160 | 66.7% | 4.153 | 0.916 | 0.221 | 40.0% | 4.087 | 1.034 | 0.253 | 40.0% |
| D3 | 4.633 | 0.719 | 0.155 | 73.3% | 4.153 | 0.916 | 0.221 | 40.0% | 4.153 | 1.060 | 0.255 | 46.7% |
| D4 | 4.933 | 0.258 | 0.052 | 93.3% | 4.033 | 0.855 | 0.212 | 26.7% | 4.387 | 1.115 | 0.254 | 60.0% |
| D5 | 5.000 | 0.000 | 0.000 | 100.0% | 4.653 | 0.612 | 0.132 | 66.7% | 4.520 | 1.055 | 0.233 | 66.7% |
| D6 | 5.000 | 0.000 | 0.000 | 100.0% | 4.587 | 0.625 | 0.136 | 60.0% | 4.520 | 1.055 | 0.233 | 66.7% |
| D7 | 4.860 | 0.350 | 0.072 | 80.0% | 4.433 | 0.729 | 0.164 | 53.3% | 4.373 | 1.044 | 0.239 | 53.3% |
| D8 | 4.860 | 0.350 | 0.072 | 80.0% | 4.500 | 0.627 | 0.139 | 53.3% | 4.373 | 1.044 | 0.239 | 53.3% |
| E1 | 4.780 | 0.411 | 0.086 | 73.3% | 3.933 | 0.884 | 0.225 | 33.3% | 4.233 | 1.083 | 0.256 | 46.7% |
| E2 | 4.913 | 0.264 | 0.054 | 86.7% | 3.933 | 0.799 | 0.203 | 26.7% | 4.367 | 1.109 | 0.254 | 60.0% |
| E3 | 4.867 | 0.352 | 0.072 | 86.7% | 4.653 | 0.481 | 0.103 | 60.0% | 4.387 | 1.049 | 0.239 | 53.3% |
| E4 | 5.000 | 0.000 | 0.000 | 100.0% | 4.233 | 0.776 | 0.183 | 40.0% | 4.400 | 1.056 | 0.240 | 60.0% |
| E5 | 4.653 | 0.812 | 0.175 | 73.3% | 4.153 | 1.187 | 0.286 | 53.3% | 4.113 | 1.233 | 0.300 | 46.7% |
| F1 | 4.167 | 0.645 | 0.155 | 26.7% | 4.520 | 0.632 | 0.140 | 53.3% | 3.753 | 1.230 | 0.328 | 33.3% |
| F2 | 4.233 | 0.678 | 0.160 | 33.3% | 4.520 | 0.632 | 0.140 | 53.3% | 3.887 | 1.251 | 0.322 | 40.0% |

Based on the expert comments in the second round and the established indicator screening principles, only one secondary indicator was revised: E5 Patient satisfaction with chronic disease management was adjusted to D9 Patient satisfaction with chronic disease management.

The second-round results showed that the coefficient of variation of each indicator decreased, and the number of expert revision suggestions declined. Meanwhile, Kendall's W coefficients for the importance scores of both primary and secondary indicators increased accordingly. Therefore, the expert consultation procedure was terminated.

### 3.3.3. Determination of the final evaluation indicator system

After two rounds of expert consultation, the final evaluation indicator system for the effectiveness of integration of medical care and preventive services for chronic diseases at the primary care level was established. The system consists of 6 primary indicators and 32 secondary indicators (**Table 7**).

**Table 7.** Evaluation indicator system for the effectiveness of integration of medical care and preventive services for chronic diseases at the primary care level

| Primary indicator | Secondary indicators |
|---|---|
| A. Service Team Building | A1 Number of physicians per 10,000 population at the primary care level |
| | A2 Completion rate of chronic disease management training for medical staff |
| | A3 Daily number of chronic disease patients treated by each physician |
| B. Service Facility Allocation | B1 Availability rate of diagnostic equipment for hypertension |
| | B2 Availability rate of diagnostic equipment for type 2 diabetes |
| | B3 Essential medicines allocation rate for the two major chronic diseases |
| C. Service process implementation | C1 Filing rate of electronic health records |
| | C2. Coverage rate of standardized electronic health records |
| | C3 Utilization rate of electronic health records among chronic disease patients |
| | C4 Outpatient follow-up rate of hypertension patients |
| | C5 Outpatient follow-up rate of type 2 diabetes patients |
| | C6 Firstvisit blood pressure screening rate among residents aged 35 and above |
| | C7 Enrollment rate of newly detected patients with the two major chronic diseases |
| | C8 Compliance rate of enrolled patients with the two major chronic diseases |
| | C9 Fixed primary care visit rate of enrolled patients with the two major chronic diseases |
| | C10 Proportion of chronic disease patients referred to higherlevel hospitals |
| | C11 Proportion of chronic disease patients referred downward from higherlevel hospitals |
| D. Medical Service Effectiveness | D1 Case discovery rate of patients with the two major chronic diseases |
| | D2 Qualified rate of laboratory examination frequency for hypertension patients |
| | D3 Qualified rate of laboratory examination frequency in type 2 diabetes patients |
| | D4 Discovery rate of chronic disease complications |
| | D5 Blood pressure control rate |
| | D6 Blood glucose control rate |
| | D7 Standardized management rate of hypertension patients |
| | D8 Standardized management rate of type 2 diabetes patients |
| | D9 Satisfaction degree of chronic disease patients |
| E. Health Behavior Management Effectiveness | E1 Smoking cessation rate |
| | E2 Compliance rate of exercise frequency |
| | E3 Weight control rate |
| | E4 Medication adherence rate |
| F. Service cost control | F1 Decline rate of average outpatient cost per visit for chronic diseases |
| | F2 Decline rate of average outpatient drug cost per visit for chronic diseas |

### 3.3.4. Indicator weight values and consistency test results

According to the weight values and consistency test results of primary indicators, the ranking of weights of the six primary indicators was D, E, A, C, B, and F. All consistency ratios (CR) were less than 0.10, indicating favorable consistency and reliable research results (**Table 8**).

**Table 8.** Weight values and consistency test of primary indicators

| Primary Indicator | Original Weight | λmax | CR |
|---|---|---|---|
| A. Service Team Building | 0.2226 | 6.4264 | 0.0677 |
| B. Service Facility Allocation | 0.0996 | | |
| C. Service process implementation | 0.1249 | | |
| D. Medical Service Effectiveness | 0.2673 | | |
| E. Health Behavior Management Effectiveness | 0.2316 | | |
| F. Service cost control | 0.0540 | | |

In terms of the weight values and consistency test results of secondary indicators, the top five weights among 32 secondary indicators were E4, E3, D5, D4, and D6. All CR values were below 0.10, which proved good consistency and credible findings (Table 9).

**Table 9.** Weight values and consistency test of secondary indicators

| Primary indicator | Secondary indicators | Original Weight | Combined Weight | λmax | CR |
|---|---|---|---|---|---|
| A (0.2226) | A1 | 0.4934 | 0.1098 | 3.0536 | 0.0516 |
| | A2 | 0.3108 | 0.0692 | | |
| | A3 | 0.1958 | 0.0436 | | |
| B (0.0996) | B1 | 0.2500 | 0.0249 | 3.0000 | 0.0000 |
| | B2 | 0.2500 | 0.0249 | | |
| | B3 | 0.5000 | 0.0498 | | |
| C (0.1249) | C1 | 0.0430 | 0.0054 | 11.5324 | 0.0350 |
| | C2 | 0.0619 | 0.0077 | | |
| | C3 | 0.0755 | 0.0094 | | |
| | C4 | 0.1754 | 0.0219 | | |
| | C5 | 0.1576 | 0.0197 | | |
| | C6 | 0.1365 | 0.0170 | | |
| | C7 | 0.0971 | 0.0121 | | |
| | C8 | 0.1393 | 0.0174 | | |
| | C9 | 0.0527 | 0.0066 | | |
| | C10 | 0.0265 | 0.0033 | | |
| | C11 | 0.0346 | 0.0043 | | |
| D (0.2673) | D1 | 0.0765 | 0.0205 | 9.3274 | |
| | D2 | 0.0422 | 0.0113 | | |
| | D3 | 0.0534 | 0.0143 | | |
| | D4 | 0.1799 | 0.0481 | | |
| | D5 | 0.1998 | 0.0534 | | |
| | D6 | 0.1709 | 0.0457 | | |
| | D7 | 0.1074 | 0.0287 | | |

| | | | | | |
|---|---|---|---|---|---|
| D (0.2673) | D8 | 0.1074 | 0.0287 | 9.3274 | 0.0280 |
| | D9 | 0.0625 | 0.0167 | | |
| E (0.2316) | E1 | 0.1381 | 0.0320 | 4.1213 | 0.0454 |
| | E2 | 0.1953 | 0.0452 | | |
| | E3 | 0.2761 | 0.0640 | | |
| | E4 | 0.3905 | 0.0905 | | |
| F (0.0540) | F1 | 0.3333 | 0.0180 | 2.0000 | 0.0000 |
| | F2 | 0.6667 | 0.0360 | | |

# 4. Discussion

## 4.1. Methods selection

Both the Delphi method and the Analytic Hierarchy Process (AHP) are widely used structured approaches, each with unique strengths in systematic framework building. In the initial stage, the study used the Delphi method to collect expert opinions and finalize the evaluation indicator system. Then the study applied AHP to calculate the weight of each indicator.

The success of the Delphi method largely depends on expert selection. The number of experts is usually determined by the complexity of the research topic, with 10–30 experts recommended for most studies. After strict screening, this study selected 15 experts covering clinical medicine, public health, and health management. Among them, 86.67% held associate senior or higher professional titles, with an average working experience of 18.73 years, ensuring strong representativeness in their academic and professional fields. The experts actively participated in the questionnaire survey and provided abundant, valuable comments. The entire consultation process lasted more than two months, with an effective response rate of 100%, which further guaranteed the quality of the research results.

## 4.2. Interpretation of results

After two rounds of expert consultation, experts reached a high consensus on the six primary indicators: service team building, service facility allocation, service process implementation, medical service effectiveness, health behavior management effectiveness, and service cost control.

Among them, medical service effectiveness had the highest weight (0.2673), followed by health behavior management effectiveness (0.2316), service team building (0.2226), service process implementation (0.1249), service facility allocation (0.0996), and service cost control (0.0540) as the lowest. This ranking shows that under the policy of integrating medical care and preventive services for chronic diseases at the primary care level, improving patients' health outcomes is the core goal, promoting healthy behavior change is the key pathway, and strengthening the primary workforce is the essential prerequisite for service implementation.

Within medical service effectiveness, blood pressure control rate (0.0534), blood glucose control rate (0.0457), and discovery rate of chronic disease complications (0.0481) carried relatively high weights, reflecting experts' strong emphasis on clinical outcome indicators, which is consistent with the health-centered direction of healthcare reform.

Health behavior management effectiveness ranked second. Its secondary indicator, medication adherence rate (0.0905), had the highest combined weight among all secondary indicators, followed by weight control

rate (0.0640) and exercise frequency compliance rate (0.0452). This means experts widely agree that long-term effective chronic disease control can only be achieved through sustained behavioral interventions that help patients maintain regular medication use and healthy lifestyles.

In service team building, the number of physicians per 10,000 population at the primary care level (0.1098) had a significantly higher weight than other indicators in the same dimension, indicating that primary health workforce allocation is a decisive factor for the implementation of integrated medical care and preventive services.

In service process implementation, outpatient follow-up rates for hypertension and type 2 diabetes patients had relatively high weights, reflecting the process value of standardized follow-up management in chronic disease prevention and control.

Although service facility allocation had a low overall weight, the essential medicine allocation rate for the two major chronic diseases (0.0498) was the highest within this dimension, suggesting that medicine accessibility remains a basic guarantee for primary chronic disease management.

Service cost control had the lowest weight (0.0540), and the weight of the decline rate of the average outpatient drug cost per visit was higher than that of the decline rate of the average outpatient cost per visit. This may reflect that current policies focus more on the reasonable reduction of drug costs while taking a prudent attitude toward overall cost control.

In summary, the current evaluation of the effectiveness of integrated medical care and preventive services for chronic diseases at the primary care level shows a phased characteristic: outcomes first, behaviors emphasized, and workforce supported. In the next 2–3 years, the study should further strengthen patient behavioral interventions, improve primary care physician staffing standards, and gradually explore the role of information technology in optimizing service processes, so as to promote the deep transformation of integration evaluation from “structureprocess” oriented to “outcomevalue” oriented.

## 5. Summary

Based on Donabedian’s structure-process-outcome framework, this study combined literature analysis, two rounds of Delphi expert consultation, and the Analytic Hierarchy Process to construct an objective and systematic evaluation indicator system for the effectiveness of integrated medical care and preventive services for chronic diseases at the primary care level. The final system includes 6 primary indicators and 32 secondary indicators. During indicator screening, the study fully considered importance, data availability, and sensitivity, making the system highly applicable and operable in primary care settings.

However, the Delphi method is susceptible to subjective factors and may carry risks of systematic bias. Although the 15 experts in this study covered clinical medicine, public health, and health management, their geographic distribution was limited, so the generalizability of the conclusions needs further verification.

Future research will develop a quantitative scoring tool based on this indicator system, conduct empirical evaluations in primary healthcare institutions of different regions and levels, test its discrimination, sensitivity, and effectiveness, and dynamically optimize indicators based on practical feedback. This will enhance the robustness of the findings and provide a scientific basis for the accurate evaluation and continuous improvement of policies for integrating medical care and preventive services for chronic diseases in primary care settings in China.

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## Disclosure statement

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