Postprint: Construction of a Service Quality Evaluation Index System for Home-based Medical Care for Disabled Elderly in Beijing

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Abstract

Background As China's aging process continues to deepen, the demand for home-based medical services among disabled elderly individuals is increasing, and evaluation of their service quality serves as a powerful guarantee for high-quality implementation. Objective To develop a quality indicator system for home-based medical services for disabled elderly individuals in Beijing using the Delphi method, providing objective criteria for quality evaluation of home-based medical services delivered by community health service institutions to disabled elderly individuals. Methods An initial indicator system item pool was developed based on literature review and qualitative research, and an expert consultation questionnaire was designed. Twenty-one experts with extensive experience in home-based medical services and comprehensive geriatric assessment, including community nursing, general practice, and management research, were selected in the Beijing area. Expert consultation questionnaires were sent via email from June to October 2021 to conduct three rounds of Delphi expert consultation. Experts' personal information and authority-related indicators were collected, and a quality indicator system for home-based medical services for disabled elderly individuals in Beijing was established. Results All three rounds of expert consultation questionnaires were returned and valid, with an expert response rate of 100%. The authority coefficient of the 21 experts ranged from 0.700 to 1.000, with an average of 0.927, meeting acceptable standards. The coordination coefficients for indicator importance and feasibility were 0.170 and 0.140 in the first round (both $P<0.001$), 0.147 and 0.175 in the second round ($P<0.001$), and 0.231 and 0.208 in the third round (both $P<0.001$), indicating that expert opinions converged and the consultation results were reliable. The final constructed quality indicator system for home-based medical services for disabled elderly individuals included 3 first-level indicators (service conditions,

service process, and service outcomes), 9 second-level indicators, and 34 third-level indicators. Conclusion The indicator system constructed in this study is suitable for evaluating the implementation quality of single home-based medical service episodes and provides a reference for community health service institutions to formulate relevant policies and work plans.

Full Text

Development of a Quality Indicator System for Home-Based Medical Services for Disabled Elderly Individuals in Beijing

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Abstract

Background: As China's population aging deepens, demand for home-based medical services among disabled elderly individuals continues to grow. Evaluating service quality provides a critical guarantee for implementing high-quality services. **Objective:** To develop a quality indicator system for home-based medical services for disabled elderly individuals in Beijing using the Delphi method, thereby providing objective criteria for community health service institutions to evaluate service quality. **Methods:** An initial pool of indicators was developed through literature review and qualitative research, and an expert consultation questionnaire was designed. Twenty-one experts in community nursing, general practice, and healthcare management with extensive experience in home medical services and comprehensive geriatric assessment were selected in Beijing. From June to October 2021, three rounds of Delphi expert consultations were conducted via email, with experts' personal information and authority coefficients recorded to establish the quality indicator system. **Results:** All three rounds of consultation questionnaires were returned and valid, yielding a 100% response rate. The authority coefficients of the 21 experts ranged from 0.700 to 1.000, with a mean of 0.927, meeting acceptable standards. The coordination coefficients for indicator importance and feasibility were 0.170 and 0.140 in the first round (both $P<0.001$), 0.147 and 0.175 in the second round ($P<0.001$), and 0.231 and 0.208 in the third round (both $P<0.001$), demonstrating increasing consensus and reliable results. The final indicator system comprised three primary indicators (service conditions, service processes, and service outcomes),

nine secondary indicators, and 34 tertiary indicators. **Conclusion:** The developed indicator system is suitable for evaluating the implementation quality of single-visit home medical services and provides a reference for community health service institutions to formulate relevant policies and work protocols.

Keywords: Disability; Aged; Delphi Method; Home care service; Quality evaluation

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1.1 Initial Construction of Indicators

The indicator system development process involved establishing a project coordination team, creating an initial indicator pool for evaluating the quality of home-based medical services for disabled elderly individuals in Beijing, and refining the system through the Delphi method. The research team consisted of one doctoral supervisor, one master's supervisor, and four graduate students from the general practice specialty. Supervisors were responsible for overall research design, expert selection, and liaison, while graduate students handled literature review, interviews, questionnaire development, and data analysis. The initial indicator pool was developed through literature research and qualitative studies, with the qualitative research process detailed in a previously published paper by the team.

The literature review process was conducted as follows: (1) Using Chinese full-text databases (CNKI, VIP, Wanfang) with keywords including "disabled elderly," "elderly living alone," "home care," "home nursing," "long-term care," "home service," "quality," "effect," "outcome," "evaluation," "indicator," "scale," and "tool," and searching PubMed with English terms such as "home care," "home nursing," "primary care," "primary nursing," "community care," "community nursing," "quality," "evaluation," "assessment," "standards," and "assurance," ultimately 10 articles were selected for indicator development. (2) Indicators from these articles were extracted and organized using the Structure-Process-Outcome (SPO) quality evaluation framework. For structural quality, three secondary indicators were extracted: healthcare staff configuration, equipment and medications, and regulations. For process quality, four secondary indicators were identified: patient status assessment, medical operation standardization, comprehensiveness of medical guidance, and home-based rehabilitation therapy. For outcome quality, two secondary indicators were extracted: patient outcomes and caregiver outcomes, totaling 57 tertiary indicators. Qualitative research was conducted to understand implementation challenges in Beijing's home medical services, leading to the addition of a secondary indicator for "family caregiver capacity" under structural quality, "initial assessment protocols" under regulations, and "caregiver capacity" under caregiver outcomes.

Based on these findings and the SPO framework, after multiple internal discussions and thematic meetings with experts, a preliminary evaluation indicator

pool and expert consultation questionnaire were developed. The initial draft comprised three primary indicators (service conditions, service processes, and service outcomes), eight secondary indicators, and 27 tertiary indicators. The expert consultation questionnaire included background and objectives, basic expert information, authority assessment scales, and indicator evaluation forms. Expert authority was quantified based on familiarity with indicators and four factors: theoretical analysis, practical experience, peer knowledge, and intuition. The indicator evaluation form included names and definitions of primary, secondary, and tertiary indicators, with importance and feasibility assessed using a 5-point Likert scale (1="very unimportant/very poor feasibility" to 5="very important/very good feasibility").

1.2 Expert Selection

To meet the requirements of the Delphi method, the research team established inclusion criteria: (1) working in Beijing; (2) engaged in community general practice, community nursing management, or healthcare quality research; (3) at least 10 years of relevant work experience; (4) deep understanding of home medical services and comprehensive geriatric assessment. Exclusion criteria were inability to participate continuously throughout the study period.

1.3 Expert Consultation

From June to October 2021, the research team conducted three rounds of Delphi consultations via email. In the first round, experts received the consultation questionnaire and reference materials, rating indicator importance and feasibility and providing comments on indicator names and scoring methods. After analyzing results and consulting with experts who provided feedback, indicators were revised. The second-round questionnaire was then distributed, and after receiving responses, some indicator names and definitions were adjusted. Based on second-round results, the third-round questionnaire was designed, asking experts to rate the importance and feasibility of all revised indicators and provide final comments. After the third round, data analysis showed expert opinions had converged, establishing the Beijing home medical service quality indicator system.

1.4 Statistical Methods

Data were organized using Excel 2016 and analyzed using SPSS 19.0. Expert engagement, authority, coordination coefficients, and importance/feasibility ratings were calculated. Response rate and authority coefficients reflected expert engagement and authority. Higher authority coefficients indicate more reliable results, with >0.70 considered acceptable. Authority coefficients were calculated as the sum of scores for judgment basis and familiarity divided by 2. Judgment basis included theoretical analysis, practical experience, peer knowledge, and intuition, with influence levels (large, medium, small) assigned different quantitative values . Familiarity was rated on a 5-point scale: very unfamiliar (0.2),

unfamiliar (0.4), moderately familiar (0.6), familiar (0.8), and very familiar (1.0). Kendall's coordination coefficient and coefficient of variation reflected expert consensus, with smaller variation indicating higher consistency. A coefficient of variation >25% was used as the criterion for indicator elimination. Coordination coefficients range from 0 to 1, with higher scores indicating better consensus. Chi-square tests compared coordination coefficients (α=0.05). Importance and feasibility were represented by arithmetic means, with >3.5 used as the indicator screening criterion. Based on expert feedback and internal discussions, indicators were added, removed, or modified while considering scientific rigor and comprehensiveness.

2.1 Expert Characteristics

The 21 experts had an average work experience of (17.1$±$4.9) years. Two held intermediate professional titles, eight held associate senior titles, and eleven held senior titles. Two had bachelor's degrees, and 19 had graduate degrees (14 master's and 5 doctoral degrees). Seven worked in community nursing, eight in general practice, three in geriatrics, and three in related research fields. Among the 18 clinical experts (general practice, community nursing, and geriatrics), 12 focused primarily on clinical practice, while six plus the three university researchers focused on theoretical research. Basic expert information is shown in .

2.2 Expert Engagement and Authority

All three rounds distributed 21 questionnaires, with 21 valid responses returned each time, achieving a 100% response rate. Authority coefficients for all three primary indicators exceeded 0.70 .

2.3 Expert Consensus

The coordination coefficient for indicator importance decreased from the first round (0.170, P<0.001) to the second round (0.147, P<0.001), then increased in the third round (0.231, P<0.001). Feasibility coordination coefficients increased across all three rounds (0.140, 0.175, and 0.208, respectively, all P<0.001) .

2.4.1 First-Round Consultation Results and Indicator Adjustments

In the first round, importance scores averaged 3.955, with coefficient of variation ranging 0-29%. Feasibility scores averaged 3.68-4.86, with coefficient of variation ranging 7-32%. Based on expert feedback and internal discussions, modifications included: (1) Adding secondary indicator "1.4 Emergency Configuration" with tertiary indicators "1.4.1 Emergency medications and supplies" and "1.4.2 Emergency support team" under primary indicator "1 Service Conditions"; adding secondary indicator "3.3 Home medical service staff satisfaction" with tertiary indicators "3.3.1 Staff satisfaction with patients/families" and "3.3.2 Staff professional satisfaction" under primary indicator "3 Service

Outcomes"; plus adding eight additional tertiary indicators. (2) Modifying five indicator names. (3) Although secondary indicator "3.2 Patient caregiver outcomes" and tertiary indicators "1.2.1 Transportation for home visits," "1.3.2 Patient family relationships," "1.3.3 Patient caregiver capacity," and "2.1.6 Patient hygiene assessment" should have been eliminated based on screening criteria, the research team retained them after discussion due to their significant relevance to overall service quality.

2.4.2 Second-Round Consultation Results and Indicator Adjustments

In the second round, importance scores averaged 4.23-5.00 (coefficient of variation: 0-25%), and feasibility scores averaged 4.19-4.95 (coefficient of variation: 4-26%). Based on expert feedback and internal discussions, three indicator names were modified. Multiple experts recommended deleting certain indicators, leading to the removal of five indicators: "1.1.3 Staff adaptability," "2.1.5 Patient psychological status assessment," and "3.3 Home medical service staff satisfaction" with its subordinate indicators. No indicators were added in this round.

2.4.3 Third-Round Consultation Results and Indicator Adjustments

In the third round, importance scores averaged 4.14-5.00 (coefficient of variation: 0-18%), and feasibility scores averaged 4.14-5.00 (coefficient of variation: 0-15%), indicating expert consensus. No new modifications were proposed, so all indicators were retained. The final indicator system comprised three primary indicators, nine secondary indicators, and 34 tertiary indicators .

3.1 Reliability and Scientific Validity of the Indicator System

Home-based medical services represent a crucial approach to improving healthcare accessibility for disabled elderly individuals. Currently, these services are primarily provided by community health service institutions, making practical and comprehensible service process indicators essential for quality evaluation. This study systematically and comprehensively identified factors affecting service quality through literature review and non-participant observation, understanding both mature international evaluation tools and real-world provider behaviors documented through firsthand observation. Using the Delphi method, we constructed an indicator system to evaluate implementation quality of home medical services for disabled elderly individuals in Beijing, providing a reference for community health institutions.

Expert representativeness, engagement, and authority directly affect the scientific validity and reliability of consultation results. This study employed a modified Delphi method to avoid the decreased expert engagement caused by cumbersome procedures in the classical Delphi approach. The 21 experts represented community nursing, general practice, and geriatrics, meeting sample size requirements. Some experts also had management research backgrounds,

providing rich clinical and administrative experience in geriatric assessment and home medical services, ensuring reliability. The 100% response rate across three rounds, combined with qualitative comments from experts and an average authority coefficient exceeding 0.9, demonstrated high expert engagement and authority, guaranteeing predictive accuracy.

Although the coordination coefficient for indicator importance decreased in the second round, likely due to increased items (from 38 to 51) and greater disagreement on specific items, the third round showed significant improvement. Final coordination coefficients increased from 0.170 and 0.140 in the first round to 0.231 and 0.208 in the third round (both $P<0.001$), indicating convergent expert opinions and reliable results.

3.2 Significance of the Home Medical Service Quality Indicator System

This study constructed the indicator system from an implementation perspective. Compared with other domestic systems, it similarly evaluates preconditions, operational processes, and outcomes for patients and caregivers. However, this system emphasizes assessment of patient families, particularly potential resources including family economic status, availability of community volunteer services, and long-term care insurance coverage. In families with disabled elderly individuals, these resources significantly influence family environment, relationships, and caregiver capacity. For instance, long-term care insurance can substantially alleviate caregiving pressure for severely disabled elderly individuals, thereby improving family relationships and creating favorable conditions for service implementation.

The process component emphasizes comprehensive initial assessment to understand patients' medical history and develop personalized service plans while identifying potential risks. It also stresses medical documentation to promote standardization and proceduralization among service providers, ensuring implementation quality. The outcome component highlights improvement in caregiver capacity, as medical care for disabled elderly individuals cannot rely entirely on healthcare professionals. High-quality home medical services serve as a demonstration for caregivers, making caregiver capacity improvement a reflection of service quality.

Given the unique nature of home medical services, patients' long-term outcomes are heavily influenced by family environment, disease conditions, and caregiver capacity rather than directly reflecting service quality. Therefore, this system excludes distal outcome indicators such as falls, new fractures, and readmissions. Additionally, based on Beijing's current implementation status where services are provided as a specialty with varying volumes across community health centers and limited standardization, this system evaluates single-visit implementation quality rather than using rate-based indicators requiring historical data.

3.3 Limitations of This Study

While this indicator system aims to evaluate implementation quality of home medical services for Beijing's community health institutions, several limitations exist. The indicators focus primarily on clinical practice with limited connection to management and policy content. Experts from government departments were not included. Operability is limited as a scoring measurement tool has not yet been developed. Future research will further refine this quality evaluation system.

Author Contributions: ZHU Chenli and ZHANG Tiancheng conceptualized the study, designed the research, and drafted the manuscript. LI Hui, FENG Zhengwen, and CHEN Xiaolei collected and organized data and performed statistical analysis. SHAO Shuang revised and reviewed the manuscript. DU Juan was responsible for quality control, overall manuscript supervision, and project management.

Conflict of Interest: The authors declare no conflicts of interest.

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Note: Figure translations are in progress. See original paper for figures.