# A Survey Study on the Current Quality Status of "Internet Plus" Home Care in 60 Medical Institutions (Postprint)

**Authors:** Zhan Yang, Zhao Ruiyi, Sun Hongling, Jiangnan, Zi-Jun Ni, Zhu Lingli, Zhao Ruiyi

**Date:** 2025-03-26T00:00:00+00:00

## Abstract

Background: "Internet Plus" home-based nursing is an essential pathway to precisely address the diverse and multi-level health needs of service recipients, and will become an inevitable trend in achieving the Healthy China strategy; however, the current status of service quality remains unclear, hindering its vigorous development. Objective: To comprehensively understand the current quality status of "Internet Plus" home-based nursing in medical institutions through a quality survey, and to provide a reference basis for objective evaluation and quality improvement. Methods: From September to November 2022, using the "Internet Plus" home-based nursing quality scoring scale and convenience sampling method, a quality survey was conducted on 60 medical institutions of different levels across 11 cities in Zhejiang Province. The comprehensive scoring method was employed to calculate the total score and the scores of structure, process, and outcome dimensions for each institution. Results: The total average score of "Internet Plus" home-based nursing quality for the 60 medical institutions was $87.04\$\pm5.32(71.88\ 96.38)points, withaveragescoresof17.02\pm2.94(7.88\ 19.38)points, 26.70\pm3.31(20.00\ 31.00)po$ (71.88~85.39) points, respectively. There were 8 evaluation indicators with a score rate below 70%, primarily concentrated in information system construction and safety assurance indicators. Conclusion: The overall quality of "Internet Plus" home-based nursing in medical institutions of Zhejiang Province is acceptable, but several issues remain, including insufficient information platform construction, imperfect responsibility attribution mechanisms and safety management systems, inadequate self-protection awareness among nurses, and low follow-up rates for service recipients. These should be prioritized as key directions for future improvement.

## Full Text

# Investigation on the Status Quo of "Internet +" Home Care Quality in 60 Medical Institutions

Zhan Yang, Zhao Ruyi*, Sun Hongling, Jiang Nan, Ni Zijun, Zhu Lingli

Department of Nursing, The Second Affiliated Hospital of Zhejiang University School of Medicine, Hangzhou 310000, China

*Corresponding author: Zhao Ruyi, Chief nurse; E-mail: 2192028@zju.edu.cn

### Abstract

**Background:** "Internet +" home care represents an essential pathway for precisely addressing the diverse and multi-level health needs of service recipients, and will become an inevitable trend in realizing the Healthy China strategy. However, the current status of service quality remains unclear, which hinders its vigorous development.

**Objective:** To investigate the quality of "Internet +" home care in medical institutions, so as to provide a reference for objectively evaluating and improving the quality of "Internet +" home care.

**Methods:** From September to November 2022, 60 medical institutions of different levels across 11 cities in Zhejiang Province were investigated using convenience sampling and the "Internet +" home care quality rating scale. The comprehensive scoring method was used to calculate the total score of each institution and the scores of structure, process, and outcome dimensions.

**Results:** The overall average score of "Internet +" home care quality in the 60 medical institutions was 87.04$±5.32($range$ : 71.88 − 96.38).$Theaveragescoresforstructure, process, andoutcomedimensionswere$17.02±2.94(7.88−19.38), 26.70±3.31(20.00−31.00), $and$43.33±2.47(38.50−48.00), $respectively.Theoverallaveragescoresforterti$ 95.43), 87.13±6.48(76.03 − 96.38), $and$81.90±$4.76 (71.88-85.39), respectively. Eight evaluation indicators had scoring rates below 70%, mainly concentrated in information system construction and security guarantee indicators.

**Conclusions:** The overall quality of "Internet +" home care in Zhejiang medical institutions is acceptable, but several problems persist, including insufficient information platform construction, incomplete responsibility attribution mechanisms and safety management systems, inadequate self-protection awareness among nurses, and low follow-up rates for service recipients. These areas should be prioritized for future improvement.

**Keywords:** Internet use; Internet +; Home care; Quality; Zhejiang Province; Cross-sectional study

Driven by social demand and accompanied by a series of policy initiatives, China' s "Internet +" home care model has emerged and developed rapidly. As a pilot province, Zhejiang has actively responded to national policies and achieved positive results in expanding service items, optimizing service processes, and implementing regionalized service models [1-4]. The introduction of this new "Internet +" home care model has added service providers, expanded service scope, and incorporated information media compared to traditional home care, representing an important turning point toward modernization and high-quality development of home care. However, out-of-hospital nursing faces challenges such as high autonomy and complex situations. Reports indicate that 13.2%-37.7% of patients receiving home care may experience adverse events [5]. Appointment platforms sometimes conduct insufficient qualification reviews of nurses, with some platforms operating independently without relying on physical medical institutions, which does not comply with policy requirements [6]. Additionally, while information technology improves efficiency, data security and privacy protection have become new challenges. Foreign surveys show that in 2021, U.S. healthcare data breaches exceeded the previous highest level by 23% [7], all of which increase the difficulty of quality control. Currently, China' s "Internet +" home care is still in its initial development stage, and the status of care quality remains unclear. Therefore, this study selected medical institutions of different levels for investigation to understand the current status of "Internet +" home care quality in China and identify existing quality problems and weak links from the structure, process, and outcome levels, thereby providing guidance for comprehensively improving "Internet +" home care quality.

### 1.1 Study Subjects

From September to November 2022, using convenience sampling, 60 medical institutions that had implemented the "Internet +" home care model were selected across 11 cities in Zhejiang Province, including 36 tertiary hospitals, 15 secondary hospitals, and 9 community health service centers. This study was approved by the Ethics Committee of The Second Affiliated Hospital of Zhejiang University School of Medicine (Research No. 2021-0646), and informed consent was obtained from the heads of the medical institutions before data collection.

### 1.2 Research Tools

The investigation was conducted using a quality rating scale developed from the "Internet +" home care quality evaluation index system previously constructed by the research team [8]. The standardized scores of the rating scale were derived from group and weight values [8], with a total possible score of 100 points. After conversion, the standardized scores for first-level indicators were: structure quality 20 points, process quality 31 points, and outcome quality 49 points. Higher scores indicated better "Internet +" home care quality in the institution.

Scoring criteria were divided into qualitative and quantitative approaches [9-

10]. For qualitative criteria, one method used a 5-level scale from "very compliant/satisfied" to "very non-compliant/dissatisfied," such as for indicators like "patient feedback channels are unobstructed" and "patient/family satisfaction with home service nurses' attitude." Level coefficients were set as 1, 0.75, 0.5, 0.25, and 0, respectively, with scores calculated as standardized value × level coefficient. Another approach used binary choice evaluation, such as for indicators like "Internet information technology platform qualification complies with national/provincial policies," where "yes" received the standardized score and "no" received 0 points. For quantitative indicators like "patient follow-up rate after case closure" (a positive indicator), the formula was: score = standardized value × (number of follow-ups/total number of served individuals). For negative indicators like " 'Internet +' home care-related adverse event incidence rate," the formula was: score = standardized value × (1 - incidence rate). For practical convenience, the rating scale was divided into three quality questionnaires: structure quality, process quality, and outcome quality.

**1.2.2 Reliability and Validity Testing** Reliability and validity were tested using 30 medical institutions of different levels. Since no gold standard currently exists for home care quality evaluation, this study evaluated criterion validity by calculating the correlation between comprehensive scoring method and rank-sum ratio method results [9,11]. The rating scale' s Cronbach' s $\alpha$ coefficient was 0.874 (>0.700). The average content validity measured by 15 experts was 0.913 (>0.780). Spearman rank correlation test results showed significant positive correlations between the two methods for tertiary hospitals, secondary hospitals, and community health service centers (P<0.05), with correlation coefficients of 0.921, 0.938, and 0.689, respectively, indicating good criterion validity and reliable research results.

**1.2.3 Data Collection Method** Data were collected using electronic questionnaires administered by three research team members (managers of "Internet +"home care). After unified training, team members contacted institution heads via WeChat to explain the survey's purpose, significance, and content, emphasizing strict confidentiality principles. Upon obtaining consent, questionnaire QR codes were sent one-on-one with instructions: (1) The structure quality questionnaire was completed by the head based on institutional documents, systems, and patient experiences. (2) The process quality questionnaire was completed by assessors (at least core members of the institution' s "Internet +" home care team), who organized the assessment by randomly selecting one home service nurse. (3) The outcome quality questionnaire was completed by five patients or family members who had received "Internet +" home care from the institution, with assessors sending the questionnaire via WeChat or the Internet platform. The final score was the average of the five responses. Two indicators—" 'Internet +' home care-related adverse event incidence rate" and "patient follow-up rate after case closure" —were attached to the structure quality questionnaire and completed by the head based on actual data.

### 1.2.4 Quality Control

(1) Preferred contacts were managers or those in primary "Internet +" home care positions to ensure smooth survey implementation. (2) To prevent score influence, indicator scores and rating criteria were hidden in the questionnaire, with indicators converted into clear, understandable questions. Two nursing managers, two nurses, and two patients were invited for pilot testing to ensure no ambiguity before distribution. After collection, two primary researchers statistically scored and entered the data. (3) All personnel involved in distribution and completion received unified training, with respondents able to consult via WeChat, phone, or Internet platform. Outcome quality questionnaire QR codes were sent by assessors to patients with explanations to avoid direct contact with service nurses and improve information authenticity. (4) All questions were mandatory, allowing resumable completion with a maximum of one submission. (5) Returned questionnaires were carefully reviewed; questionable responses were verified by recontacting heads, and those with obvious logical errors were excluded. (6) Original data materials from 10.0% of randomly selected medical institutions were submitted for review [11] to ensure data accuracy.

### 1.3 Statistical Analysis

Data were entered and calculated using Excel 2019 software, and analyzed using SPSSAU and SPSS 25.0 software. Count data were expressed as relative numbers; normally distributed measurement data were expressed as ($\bar{x}\pm s$). Scoring rates were used to represent indicator performance, calculated as: scoring rate = (actual indicator score/standardized value) × 100% [12].

### 2.1 Basic Information

Survey results were collected from 60 medical institutions, with effective recovery rates of 100.0% (60/60) for structure and process questionnaires, and 97.7% (293/300) for outcome questionnaires. The 60 institutions were distributed across 39 counties and districts in 11 cities of Zhejiang Province: 17 in Hangzhou (28.3%), 8 in Ningbo (13.3%), 6 in Shaoxing (10.0%), 5 each in Jiaxing, Jinhua, Lishui, and Taizhou (8.3% each), 2 each in Huzhou and Wenzhou (3.3% each), and 1 in Zhoushan (1.6%). Among contacted institution heads, 22 (36.7%) were nursing directors/deputy directors, 24 (40.0%) were department/head nurses, and 14 (23.3%) were specialist nurses or nursing backbones, all holding management or quality control positions in their institutions' "Internet +" home care work, ensuring data authenticity and reliability. Data review was conducted for six randomly selected medical institutions, with consistent results.

### 2.2 "Internet +" Home Care Quality Scores

**2.2.1 Total and Dimension Scores** The "Internet +" home care quality scores of the 60 medical institutions are detailed in .

**2.2.2 Structure Quality Evaluation Indicator Scores** Among 17 structure quality evaluation indicators, two achieved 100.0% scoring rates: "Medical institution qualification complies with national/provincial policies" and "Home service nurse qualification complies with national/provincial policies." Four indicators with lower scoring rates were concentrated in information system construction and security guarantee, specifically: " 'Internet +' home care information security guarantee system is complete (65.8%)," "Medical institution-family care information sharing platform (64.2%),""Service recipient information database is complete (63.8%)," and "Nurse-patient personal safety guarantee system is complete (55.4%)," as shown in .

**2.2.3 Process Quality Evaluation Indicator Scores** Process quality results were generally favorable, with 5 of 15 evaluation indicators achieving 100% scoring rates. Two indicators scored below 70.0%: "Location monitoring system activated during service process, fully traceable" and "Nurse-patient signing of home care confirmation after service completion," as shown in .

**2.2.4 Outcome Quality Evaluation Indicator Scores** Among eight outcome quality evaluation indicators, " 'Internet +' home care-related adverse event incidence rate" achieved a 100.0% scoring rate, indicating no related adverse events occurred. "Patient self-care/family care ability improvement" and "Patient follow-up rate after case closure" had lower scoring rates, with the latter below 70.0%, as shown in .

### 3.1 Scientific Evaluation Method

The quality evaluation indicators used in this study were constructed based on the Structure-Process-Outcome model as the theoretical framework, using policy analysis, literature review, qualitative interviews, expert meetings, and expert consultation [8]. This rigorous construction process ensures reliable survey results. The evaluation indicators involve multiple stakeholders including medical institutions, Internet platforms, home service nurses, patients, and families, enhancing the comprehensiveness of quality evaluation results. To ensure reliability, the research team held meetings to clarify questionnaire completion methods and established corresponding quality control protocols, providing a reference for objectively evaluating and improving "Internet +" home care quality. To our knowledge, this study represents the first systematic investigation of "Internet +" home care quality in China.

### 3.2 Guidance of Evaluation Results

Overall, through nearly four years of effort and active exploration, Zhejiang' s "Internet +" home care model has achieved remarkable results. Surveyed institutions have strictly implemented qualification reviews, ensured basic information platform functions and related systems, and service nurses have demonstrated good professional competence, receiving widespread recognition from service recipients. However, several weak links remain that require prioritized development, as analyzed below.

**3.2.1 Weaknesses and Recommendations for Structure Quality** In structure quality, the four lowest-scoring indicators (<66.0%) concerned information and security system construction, including information sharing platforms, service recipient databases, and personal safety and information security guarantee systems. Platform functions such as data storage, information sharing, location tracking, and background monitoring ensure the convenience and safety of "Internet +" home care, and their completeness is an important prerequisite for efficient operation [6]. However, effectively integrating information technology into home care is extremely challenging, requiring consideration of complexity, technical adaptability, and value to stakeholders [13-14]. Platform construction also requires substantial human, material, and financial resources, and medical institutions are constrained by their own conditions, affecting function development and improvement—likely the main reason for lower structure-level scores in community health service centers. Additionally, although most platforms have implemented basic functions such as service recipient identity authentication, medical record collection and storage, and service personnel location tracking, the lack of unified platforms across institutions and the complex Internet environment with ineffective regulation still pose significant security risks [6]. Therefore, we recommend that institutions continue strengthening information system establishment and management to ensure high-quality "Internet +" home care delivery. Notably, some security functions may involve privacy issues for nurses or patients, such as information sharing and video recording [15]; medical institutions should carefully weigh pros and cons and use them reasonably. Relevant departments should increase support for information construction, particularly for community health service centers, and propose optimal platform optimization solutions based on practical experience. Furthermore, unified information platforms could be implemented according to "Internet +" home care service regions [16] to facilitate real-time service data monitoring and reduce information leakage during data exchange.

**3.2.2 Weaknesses and Recommendations for Process Quality** Process quality evaluation results were generally favorable, indicating good execution by nurses during home services, likely due to most institutions implementing high-standard qualification reviews, unified training and assessment, and standardized process management for visiting nurses [17]. However, deficiencies remain: (1) The scoring rate for "location monitoring system activated during service

process" was 65.0%, indicating weak safety awareness among nurses during service. A meta-analysis showed that home healthcare professionals experienced physical and non-physical violence at rates of 11.3% and 34.9%, respectively, throughout their careers [18]. We recommend that nurses fully utilize available means to reduce safety risks and enhance self-protection awareness, while institutions should strengthen safety training and increase protective equipment. (2) Signing informed consent and confirmation documents is crucial for clarifying responsibility and reducing medical disputes [17,19]. The survey found a scoring rate of only 51.7% for "nurse-patient signing of home care confirmation after service completion." We recommend that institutions strengthen responsibility allocation, clarify rights and responsibilities of service providers and recipients, and implement online signing for easier recording and storage. Related policies should clarify principled requirements for signing to prevent misuse.

**3.2.3 Weaknesses and Recommendations for Outcome Quality**
Among the 60 surveyed medical institutions, no " 'Internet +' home care adverse events" were found—a rate lower than similar reports [20-21], possibly related to improved nurse configuration, low reporting rates by nurses or patients, and insufficient data collection methods. Therefore, future research should improve data collection methods for this indicator. Results showed large variation in patient follow-up rates (0-100.0%), possibly due to busy hospital schedules. Follow-up is an effective means of high-quality care, and we recommend that institutions increase follow-up rates through online-offline integration or by leveraging community resources. Additionally, "patient self-care/family care ability improvement" had a scoring rate of 78.6%, indicating that some patients perceived limited improvement in self-care or family care abilities from "Internet +" home care, possibly related to elderly patients' weak learning abilities, caregivers' limited time investment, inadequate nurse empowerment education, and service item characteristics. We recommend that nurses improve communication skills with elderly patients and combine Internet + nursing online consultation to enhance patient and family health management capabilities.

### 3.3 Study Limitations

Due to constraints of manpower, cost, distance, and the pandemic, this survey sample was limited to Zhejiang Province, and quality surveys were conducted through institutional self-assessment. Although multiple quality control measures were implemented to improve reliability, this may affect result generalization. More objective evaluation methods should be used for verification in the future.

In summary, this study can identify existing quality problems and weak links from structure, process, and outcome levels, providing guidance for comprehensively improving "Internet +" home care quality.

**Author Contributions:** Zhan Yang was responsible for manuscript writing

and revision; Zhan Yang and Zhao Ruyi were responsible for conceptualization, design, results interpretation, quality control, and final approval, and take overall responsibility for the manuscript; Zhao Ruyi, Sun Hongling, and Jiang Nan were responsible for survey implementation and data collection; Zhan Yang, Ni Zijun, and Zhu Lingli were responsible for data entry, review, and analysis.

**Conflicts of Interest:** None declared.

**ORCID iDs:** Zhan Yang https://orcid.org/0009-0001-4428-6448 Zhao Ruyi https://orcid.org/0000-0002-3551-7275

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(Received: May 15, 2023; Revised: November 27, 2024) (Editor: Wang Shiyue)

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