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Status and analysis of Free Hospital-Based Internet + Nursing Health Consultation Services: a retrospective study

Yanfei Ma[1*†], Li Wan[1†], Rong Hu[1], Yang Yin[1], Huaping Huang[1*] and Xixi Li[1*]

Abstract

Background With the increasing demand for healthcare services, Free Hospital-Based Internet + Nursing Health Consultation Services have emerged as an innovative model to provide patients with timely and convenient nursing guidance.

Objective To comprehensively evaluate the implementation and effectiveness of Free Hospital-Based Internet + Nursing Health Consultation Services, identify existing challenges, and propose evidence-based optimization strategies to enhance the precision and efficiency of future services.

Methods A retrospective analysis was conducted based on the hospital information system, retrieving orders for Free Hospital-Based Internet + Nursing Health Consultation Services from Mianyang Central Hospital between 2021 and 2023. This analysis included the staffing structure on the nurse's side and details of patient orders. Statistical analyses were performed using SPSS 25.0 software.

Results Our hospital's talent pool for Free Hospital-Based Internet + Nursing Health Consultation Services comprises 128 nurses, with dynamic adjustments to the nurses and departments based on health consultation orders. From 2021 to 2023, the total number of consultations was 2,328, with a consultation time of 3,001,409 min. Among them, 2,203 consultations were accepted, 25 were declined, and 100 exceeded the time limit. The top three departments in terms of consultation volume were Obstetrics and Gynecology (25.78%), Pediatrics (23.92%), and Dermatology (20.96%). With the annual growth in the service, the total number of consultations, accepted consultations, declined consultations, and overdue orders increased each year, although the differences were not statistically significant ($P > 0.05$). The consultation waiting time showed a decreasing trend, recorded at 665, 356, and 404 min, respectively. The average consultation time remained stable at 1,414, 1,373, and 1,346 min.

Conclusion Nurse-led Free Hospital-Based Internet + Nursing Health Consultation Services provide patients with convenient and efficient health consultation channels, helping to meet the growing health demands of patients.

†Yanfei Ma and Li Wan contributed equally to this work and share first authorship.

*Correspondence:
Huaping Huang
jrzhou26@aliyun.com
Xixi Li
68218001@qq.com

Full list of author information is available at the end of the article

As the service has expanded over the years, the overall consultation volume has shown an upward trend while maintaining stable service quality and gradually reducing waiting times, offering more timely nursing health consultation services. Future recommendations include multicenter studies to explore the effectiveness and safety of Free Hospital-Based Internet + Nursing Health Consultation Services.

Keywords Internet, Telenursing, Nurse, Health services accessibility, Retrospective studies

Introduction

With the rapid development of information technology, the Internet has profoundly transformed the service model in the healthcare field, driving innovation and reform in healthcare services. Internet + refers to the new model that utilizes internet technology and platforms to deeply integrate with traditional industries, promoting industrial upgrades and socio-economic development. Its core goal is to enhance the efficiency and service quality of traditional industries through the innovative drive of the Internet. Currently, Internet + has been widely applied in various fields, including education, healthcare, finance, and transportation. In the healthcare sector, Internet + Healthcare serves to complement the traditional face-to-face doctor-patient interaction, providing patients with more convenient services. This new model effectively eliminates geographic and temporal barriers between doctors and patients, alleviates the imbalance in healthcare resource distribution, and reduces the burden on healthcare systems [1]. Particularly during the COVID-19 pandemic, Internet + Healthcare has been more widely applied, significantly meeting the health needs of patients [2–5].

In the current application of Internet + Healthcare, many services are still physician-led. For example, the process for online consultation typically involves patients logging into the service platform, selecting a health-related issue, filling out a symptom questionnaire, and finally receiving responses from a corresponding specialist. Additionally, online general practitioner consultations, as another important model of Internet + Healthcare, provide comprehensive primary healthcare consultation via telemedicine, relieving the pressure on traditional primary care services, and patients generally find it convenient and effective [6]. In Internet + Healthcare Consultation, physicians utilize their available time to provide high-quality consultation services based on the online information submitted by patients, including text, images, videos, and audio, focusing mainly on diagnosis and treatment [7]. Both hospitals and healthcare workers hope that this model will increase patient access to medical services and improve service efficiency [8].

In the field of nursing, Internet + Nursing integrates internet technology with nursing services, enhancing the efficiency, accessibility, and quality of nursing care through digital means [9–11]. By leveraging internet platforms and technologies, nurses can provide patients with more convenient and personalized nursing services. For example, combining Internet + with traditional nursing tasks, such as clinical nursing, health education, discharge follow-up, and rehabilitation guidance, and integrating technologies like mobile internet and big data [12, 13]. Moreover, based on internet platforms, home-based nursing services are provided, allowing patients to enjoy professional nursing care at home, effectively solving practical problems [14]. In this process, nurses, as core components of healthcare services, play an indispensable role. They are not only guardians of patient health but also disseminators of health knowledge.

In 2021, the Free Hospital-Based Internet + Nursing Health Consultation Services became an important component of our hospital's Internet + Healthcare services. This service is nurse-led, emphasizing the pivotal role of nurses in health consultation. With professional nursing knowledge and extensive practical experience, nurses are able to provide comprehensive health consultations, addressing a wide range of health-related questions, thereby enhancing the public's health literacy and self-management abilities. The Free Hospital-Based Internet + Nursing Health Consultation Services provides free consultation services, and this charitable nature ensures that more patients, even with limited financial resources, can still access professional health guidance. This model not only improves the accessibility of nursing services but also alleviates hospital pressures to some extent. However, research on nurse-led Internet + Health Consultation Services remains limited. After more than three years of practice, the Free Hospital-Based Internet + Nursing Health Consultation Services in our hospital has shown initial success, but there are still some issues during its implementation that need further exploration and optimization. Therefore, this study aims to deeply analyze the current status of the Free Hospital-Based Internet + Nursing Health Consultation Services in our hospital, optimize its structure and process, and provide more accurate and effective nursing health consultation services. The research results are presented as follows.

Methods

Design

A retrospective study was conducted using data from the hospital information system to comprehensively analyze

the Free Hospital-Based Internet + Nursing Health Consultation Services from 2021 to 2023.

Setting

Our hospital is located in Mianyang, Sichuan Province, China. As a medical center in the northwestern region of Sichuan, the hospital has 2,200 open beds, with an annual outpatient and emergency service volume of 2.336 million visits. The hospital handles more than 104,000 inpatient visits annually, performs over 44,000 surgeries, and has an average length of stay of 7.1 days. To meet the growing demand for health consultations, our hospital launched the Free Hospital-Based Internet + Nursing Health Consultation service, an important initiative provided through the hospital's WeChat official account. Patients can access the "Health Consultation" feature via the "Internet Hospital" page on the WeChat platform, where they can select an appropriate nurse for consultation based on their individual needs. This service aims to satisfy patient demands through multiple channels, promote the professional growth and overall development of nurses, and expand the scope of nursing services.

To ensure service quality, the hospital established a talent pool for the Free Hospital-Based Internet + Nursing Health Consultation service and implemented strict inclusion and exclusion criteria to select suitable nurses for providing nursing health consultations. Selected nurses serve as the core executors of the online nursing health consultations, directly providing free and professional consultation services to patients. They play a crucial role in health education, disease management, and rehabilitation support. During consultations, nurses not only answer health-related questions but also act as health management guides and supporters. Based on the specific needs of the patients, nurses offer personalized nursing advice, help patients better understand their conditions, optimize self-care measures, and, when necessary, guide patients to seek timely medical attention or further healthcare services.

The inclusion criteria for selecting nurses are as follows: ① A minimum of 5 years of clinical experience with a fixed department; ② A nursing degree at the bachelor's level or higher; ③ Strong communication skills with patients; ④ Proficiency in using the Free Hospital-Based Internet + Nursing Health Consultation platform. The exclusion criteria include: ① Less than 5 years of experience or nurses currently undergoing rotation; ② Below a bachelor's degree in nursing; ③ Poor communication skills, failing to pass the hospital's communication skills assessment; ④ Inability to provide consistent consultation services due to personal reasons (e.g., extended leave, position changes); ⑤ Nurses who received patient complaints or low service quality ratings within the past year.

Furthermore, the hospital continuously optimizes the talent pool and service interface based on the operational performance of the Free Hospital-Based Internet + Nursing Health Consultation service. Regular training and assessments are conducted for the nurse team to ensure continuous improvement in their professional abilities and service quality, thereby better meeting patient needs.

Procedure

This study systematically reviewed and analyzed the Free Hospital-Based Internet + Nursing Health Consultation Services orders on the official WeChat platform of our hospital. The study subjects included data from both the nurse and patient sides. Initially, two members of the research team jointly extracted the relevant data from the hospital information system to ensure accuracy and completeness. The collected data encompassed various patient-side indicators from the Free Hospital-Based Internet + Nursing Health Consultation Services between 2021 and 2023, including consultation volume, accepted consultations, rejected consultations, the number of delayed orders, acceptance rate, rejection rate, delay rate, consultation waiting time, consultation duration, and total consultation time. Concurrently, nurse-side data were also retrieved, including nurses' gender, age, education level, and position information. The specific inclusion criteria for the data were as follows: ① The consultation orders were placed between 2021 and 2023; ② All orders were completed normally, with complete records of the consultation process; ③ The data were sourced from nurses who were included in the hospital's nursing talent pool between 2021 and 2023. The exclusion criteria were: ① Orders that were incomplete or canceled for any reason (e.g., patient-initiated cancellations); ② Orders containing anomalous data (e.g., missing or incorrect entries for key metrics such as consultation time and received consultation volume); ③ Orders related to internal hospital personnel used for system testing.To minimize potential errors, the data extraction process was conducted collaboratively by two team members to ensure maximum accuracy.

Following data extraction, the two research team members meticulously verified the data to ensure its completeness and consistency. Subsequently, the collected data underwent a rigorous cleaning and screening process, during which invalid data and outliers were removed to ensure the quality of the final dataset used for analysis.

Once data verification and cleaning were completed, the research team, under the guidance of a statistical expert, selected appropriate statistical methods for data description and analysis, tailored to the data type and research objectives. It is worth noting that any uncertainties or issues arising at any stage were resolved by

involving a third researcher, with decisions made collaboratively by the three-person team to ensure the accuracy of the data processing and analysis. Additionally, throughout the entire process, strict measures were implemented to protect data privacy and confidentiality. All personal information was anonymized, and access to sensitive data was restricted to authorized personnel only, in compliance with relevant ethical guidelines and data protection regulations.

Ethical considerations

Approval for this study was obtained from the Ethics Committee of Mianyang Central Hospital (S20220215-02). Due to the retrospective design of the study, informed consent was waived by the committee. All procedures were carried out in compliance with applicable guidelines and regulations.

Statistical analysis

Data analysis was conducted using SPSS 25.0 software. For continuous data that followed a normal distribution, descriptive statistics were presented as means ± standard deviations. The normality of the data was assessed using the Shapiro-Wilk test. For continuous data that did not follow a normal distribution, the median and interquartile range (IQR) were reported. Categorical data, such as consultation acceptance rate, rejection rate, and timeout rate, were analyzed using frequencies, proportions, or rates. Additionally, Excel software was utilized to visualize the composition or trends of certain indicators, providing a clearer presentation of the data characteristics. To compare the changes in consultation acceptance rate, rejection rate, and timeout rate across different years (2021–2023), chi-square tests (χ^2 test) were performed. Fisher's exact test was used when the expected frequency was small. A significance level of $\alpha = 0.05$ was set, with $P < 0.05$ considered statistically significant.

Results

The talent pool for the Free Hospital-Based Internet + Nursing Health Consultation Services comprised 128 nurses, all managed under a dynamic management framework. These nurses were recruited from 32 distinct departments, spanning a diverse range of specialties. For additional details, please refer to Fig. 1.

Regarding the nurses who were online and accepted consultations, in 2021, a total of 25 nurses were online, with 21 nurses accepting consultations (84%). In 2022, 37 nurses were online, with 30 accepting consultations (81.08%). In 2023, 54 nurses were online, and 49 nurses accepted consultations (90.74%). The proportions of nurses accepting consultations from 2021 to 2023 were 84.00%, 81.08%, and 90.74%, respectively, with no statistically significant differences ($P > 0.05$).

Regarding the departments that were online and accepted consultations, in 2021, 18 departments were online, with 6 departments accepting consultations (75%). In 2022, 25 departments were online, and 22 departments accepted consultations (88%). In 2023, 32 departments were online, with 26 accepting consultations (81.25%). The proportions of departments accepting consultations from 2021 to 2023 were 75.00%, 88.00%,

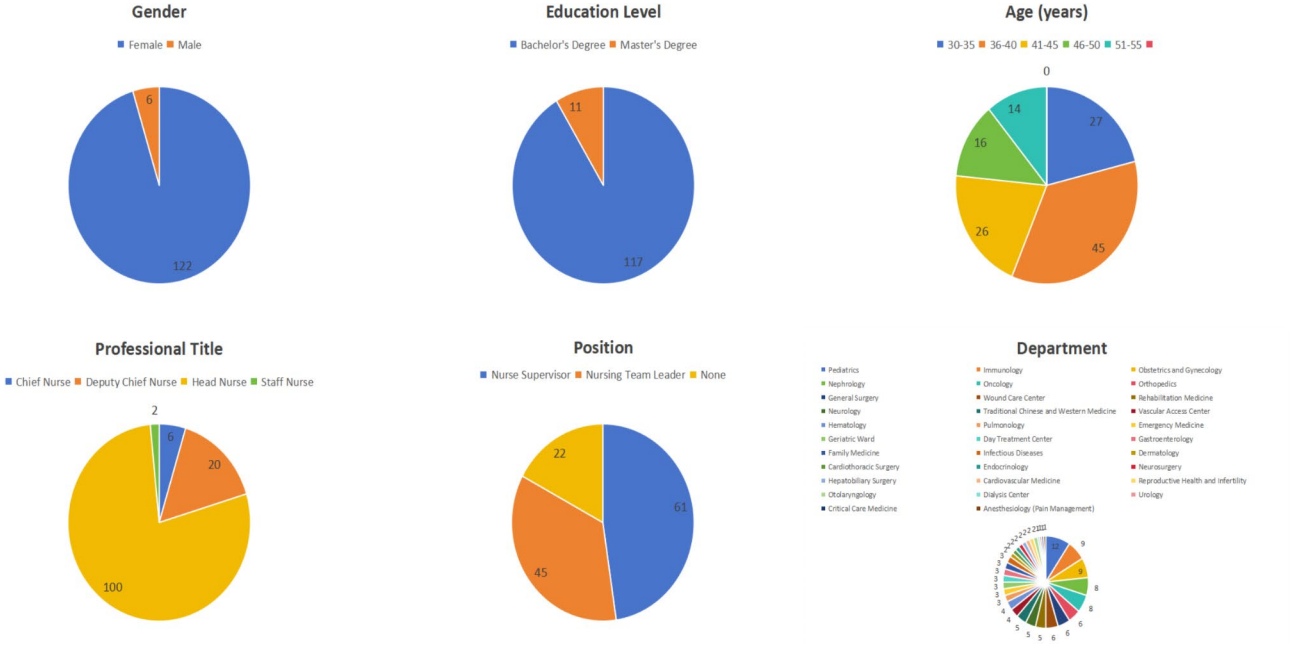

Fig. 1 Talent pool of Free Hospital-Based Internet + Nursing Health Consultation Services

and 81.25%, respectively, with no statistically significant differences ($P > 0.05$). For further details, please refer to Fig. 2.

From 2021 to 2023, the volume of consultations, accepted consultations, rejected consultations, and overdue orders in our hospital's Free Hospital-Based Internet + Nursing Health Consultation Services showed a year-on-year increase. The total number of consultations reached 2,328, with 2,203 accepted, 25 rejected, and 100 overdue orders. The acceptance rates for consultations over the years were 93.38%, 94.25%, and 95.05%, respectively, indicating a gradual upward trend; nevertheless, the differences were not statistically significant ($P > 0.05$). The rejection rates fluctuated slightly over the three years, at 1.47%, 0.91%, and 1.08%, with no significant differences ($P > 0.05$). The overdue rates showed a gradual decline, recorded at 5.15%, 4.84%, and 3.87%, respectively, with no statistically significant differences ($P > 0.05$).

The average waiting time for consultations decreased over the three years, with average waiting times of 665, 356, and 404 min in 2021, 2022, and 2023, respectively. The average consultation duration remained relatively stable at 1,414, 1,373, and 1,346 min, with slight fluctuations. The total accumulated consultation time reached 3,001,409 min, with 2023 accounting for 59.54% of the total consultation duration.

Examining the top three departments in terms of consultation volume each year, obstetrics and gynecology, pediatrics, and dermatology emerged as the primary consulting departments. In 2021, the leading departments were obstetrics and gynecology (24.02%), orthopedics (18.90%), and dermatology (17.32%). In 2022, obstetrics and gynecology (37.88%), pediatrics (26.32%), and dermatology (9.95%) had the highest consultation volumes. By 2023, the top departments were dermatology (28.96%), pediatrics (23.76%), and obstetrics and gynecology (20.44%). These consultation proportions reflect varying service demand preferences across different years. Table 1 presents the detailed information.

Discussion

Nurses are not only caregivers and educators for patients but also knowledge disseminators and managers [15]. However, the role of nurses in online health consultation has not been fully explored or developed. This

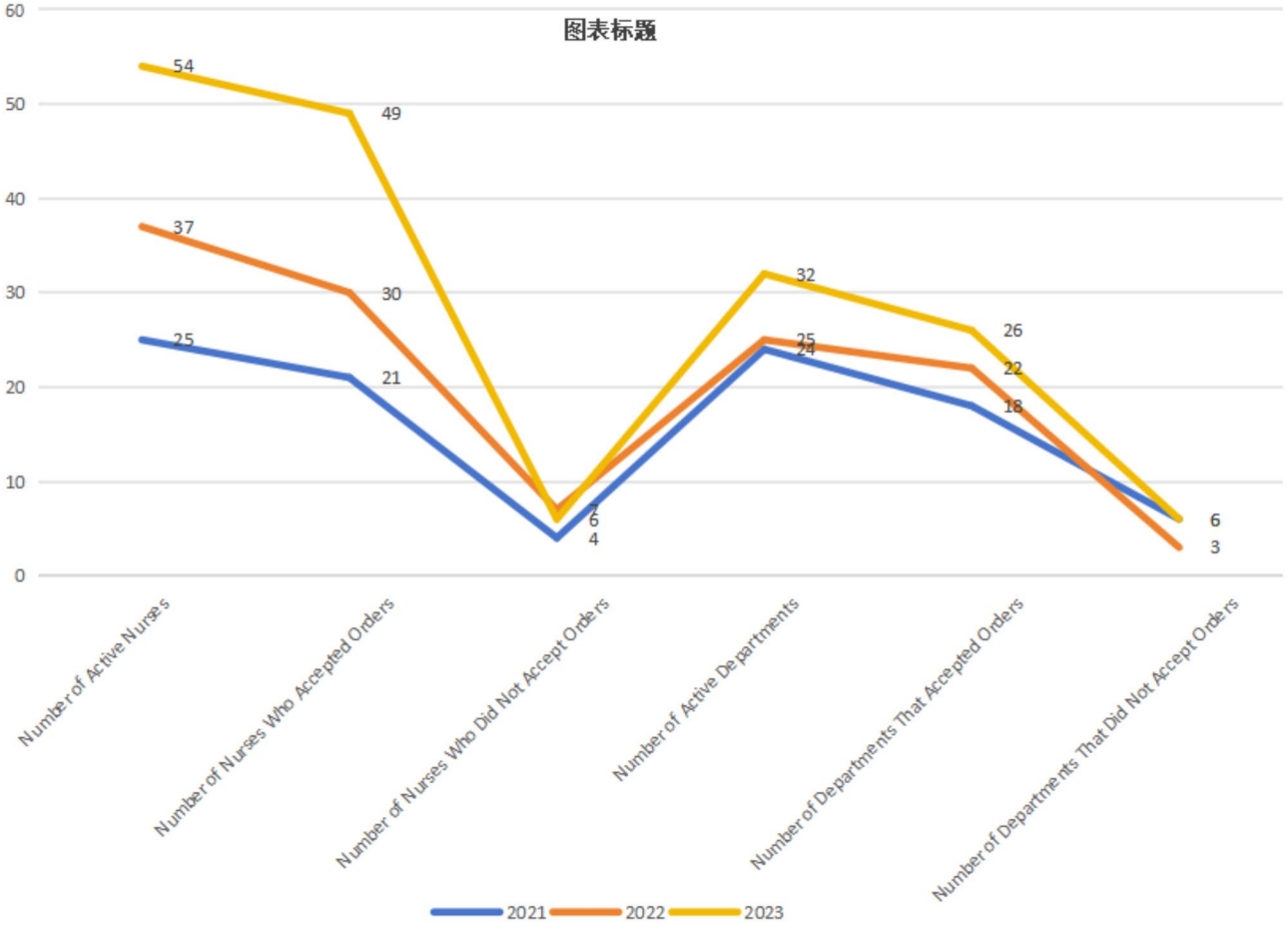

Fig. 2 Analysis of order acceptance for Free Hospital-Based Internet + Nursing Health Consultation Services

Table 1 Analysis of orders for Free Hospital-Based Internet + Nursing Health Consultation Services (2021–2023)

Year	2021–2023	2021	2022	2023	x^2	*P*
Consultation Volume	2328	272	661	1395		
Received Consultations	2203	254	623	1326		
Rejected Consultations	25	4	6	15		
Timeout Orders	100	14	32	54		
Consultation Acceptance Rate (%)	94.63	93.38	94.25	95.05	1.513	0.469
Rejection Rate (%)	1.07	1.47	0.91	1.08	0.575	0.750
Timeout Rate (%)	4.30	5.15	4.84	3.87	1.649	0.438
Average Consultation Waiting Time (minutes)	420	665	356	404		
Average Consultation Duration (minutes)	1362	1414	1373	1346		
Total Consultation Time (minutes)	3,001,409	359,348	855,941	1,786,120		
Top Three Departments by Consultation Volume (%)	Obstetrics and Gynecology (25.78%)	Obstetrics and Gynecology (24.02%)	Obstetrics and Gynecology (37.88%)	Dermatology (28.96%)		
	Pediatrics (23.92%)	Orthopedics (18.90%)	Pediatrics (26.32%)	Pediatrics (23.76%)		
	Dermatology (20.96%)	Dermatology (17.32%)	Dermatology (9.95%)	Obstetrics and Gynecology (20.44%)		

study analyzes data from the Free Hospital-Based Internet + Nursing Health Consultation Services at our hospital from 2021 to 2023. It demonstrates that nurses' active involvement in online nursing consultations not only extends the coverage of consultation services but also optimizes the allocation of resources in the hospital's internet healthcare services.

In the process of internet-based consultations, factors such as the knowledge base, coping ability, and communication skills of service providers are crucial [16, 17]. A study by Yuting Zhang et al. [18] indicates that patients' consultation behaviors reflect their recognition of healthcare providers. Therefore, it is recommended that healthcare workers strive to enhance their professional competencies and attain higher professional titles to increase patient recognition and trust. Zhu Chen et al. [19] also found that patients tend to pay more attention to the titles and professional backgrounds of healthcare workers. Based on this, our hospital has developed strict inclusion and exclusion criteria for nursing consultation service providers through evidence-based literature and group discussions. Currently, the talent pool for the Free Hospital-Based Internet + Nursing Health Consultation Services includes 128 nurses.

Regarding personnel management, the nursing department is responsible for overseeing the Free Hospital-Based Internet + Nursing Health Consultation Services and implements a dynamic adjustment mechanism. To ensure the quality of consultation services, the nursing department regularly provides theoretical knowledge and communication skills training to staff, with sessions held every two weeks. Six months after the service was launched, we conducted data analysis on the nurses and departments actively receiving consultations and dynamically adjusted the deployment of online and offline nurses and departments based on demand. On the one hand, we ensured that high-demand nurses and departments participated in more consultations, and on the other hand, we appropriately retained and reduced manpower for departments with lower consultation volumes, optimizing resource allocation. As the service stabilizes, we conduct at least one regular training every four weeks, combined with assessments and continuous tracking measures, to enhance the professional competence of nursing staff. Since the service is provided by nurses during their off-hours, they must balance their primary duties with consultation services, making patient safety and work quality in their primary roles our top priority [20].

Additionally, the intelligent information platform is fundamental to nursing health consultation services [21, 22]. Our hospital's information system regularly monitors the platform's usage to promptly identify issues and continuously optimize interfaces and workflows. Increasingly, studies show that carefully designed machine learning algorithms can learn the underlying relationships between patients' self-descriptions and the specific information required by doctors from doctor-patient dialogues, providing relevant suggestions. This method not only enriches the information in patients' self-descriptions but also enables more effective disease prediction, thereby improving the efficiency of online consultations and reducing the number of doctor-patient exchanges [1]. When implementing online consultations, it is essential to simplify the user interface to facilitate patient navigation [6]. Future research should focus more on understanding patients' true needs and behaviors [23, 24].

From 2021 to 2023, the cumulative consultation time for the Free Hospital-Based Internet + Nursing Health Consultation Services at our hospital reached 3,001,409 min, with the volume of consultations

increasing year on year. The refusal rate remained relatively stable over the three years. However, it is important to note that a refused consultation does not mean that the nurse refused to provide service to the patient. This study extracted 25 consultation orders that were refused over three years and found that these orders involved mismatched professional expertise, such as a dermatology nursing inquiry being directed to an orthopedic nurse. When nurses identified such mismatches, they promptly recommended an appropriate specialist to ensure that patients' issues were addressed in a timely manner. Timeout orders refer to consultations that were not accepted by nurses within 24 h of the patient creating a health consultation order. With continuous improvement, the proportion of timeout orders has gradually decreased over three years. Consultation wait time refers to the time between a patient creating a health consultation order and the nurse actually accepting it. The average consultation wait time has decreased over three years. Although rapid acceptance can reduce wait times and potentially increase patient engagement with online consultations [25], the service is provided by nurses during their off-hours, who must balance their primary work with consultation duties. Therefore, patient safety and work quality in their main roles are always our top priority. Thus, the hospital does not place excessive pressure on this metric. Additionally, before patients enter the consultation page and create an order, the system automatically pops up a reminder, informing them that the consultation will be resolved within 24 h and recommending offline visits for urgent situations. After all, online consultations cannot fully replace face-to-face consultations [26].

Between 2021 and 2023, the top three departments by consultation volume were obstetrics and gynecology, pediatrics, and dermatology. To gain a deeper understanding of the health-related concerns of patients, this study conducted interviews with nurses from these departments with high consultation volumes. In obstetrics and gynecology, consultations mainly involve abnormal indicators in prenatal checkup reports for pregnant women, postpartum breast issues (such as swelling and inflammation), and common issues for newborns like eczema and abnormal stools. In pediatrics, health consultations often focus on children's fever, cough, diarrhea, etc., with parents frequently attaching images to better describe the symptoms. Regarding medication use, especially pediatric medications, although nurses cannot prescribe, they usually advise patients to seek professional medical assistance. In dermatology, consultations mainly concern symptoms like itching and pain, with patients often providing images to describe their conditions. Based on these common consultation topics, the hospital can further optimize nursing staff allocation and adjust training content to better meet patient needs.

Limitation

This study provides a status analysis of order details from the Free Hospital-Based Internet + Nursing Health Consultation Services between 2021 and 2023. However, the data were limited to a single hospital, which might have affected its representativeness. Furthermore, although patients are prompted to use their medical card numbers when seeking consultation information, some inquire on behalf of others, particularly elderly individuals and their children. Therefore, a more in-depth analysis would require the identification of the actual patient population.

Conclusion

Nurse-led Free Hospital-Based Internet + Nursing Health Consultation Services provide patients with a convenient and efficient channel for health consultations, helping to meet the growing demand for healthcare. The results of this study indicate that despite an annual increase in the number of consultations and the rate of accepted consultations, the overall service quality has remained stable, with significantly reduced waiting times, offering patients more timely health advice. More advanced intelligent platforms that leverage machine learning and data analytics should be introduced to enhance the user experience and identify patient needs accurately. Additionally, multicenter studies should be conducted to explore the effectiveness and safety of nurse-led Internet + nursing health consultation services. In summary, Free Hospital-Based Internet + Nursing Health Consultation Services improve the efficiency of healthcare resource utilization and lay the foundation for a more patient-centered healthcare system.

Relevance to clinical practice

This study demonstrates the potential of Free Hospital-Based Internet + Nursing Health Consultation Services in significantly improving the accessibility and efficiency of nursing consultations. By leveraging internet technology to provide timely and convenient services, this model effectively addresses the increasing demand for healthcare and nursing services, particularly in situations where there is a large patient volume and limited healthcare resources. The findings suggest that nurse-led online consultation models can serve as an effective complement, alleviating the burden on traditional in-person consultations, potentially enhancing patient satisfaction, and optimizing resource utilization. This model provides a new pathway for improving patient care quality, especially in environments with limited medical and nursing resources or high demand, effectively addressing the growing need for healthcare and nursing services.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12912-025-02973-6.

Supplementary Material 1

Supplementary Material 2

Supplementary Material 3

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Author contributions
Yanfei Ma was responsible for drafting the manuscript; Rong Hu and Yang Yin were responsible for data extraction and processing; Li Wan contributed to revising the manuscript; Huaping Huang and Xixi Li were responsible for reviewing and proofreading the paper.

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Data availability
Data is provided within the manuscript or supplementary information files.

Declarations

Human ethics and consent to participate
Approval for this study was obtained from the Ethics Committee of Mianyang Central Hospital (S20220215-02). Due to the retrospective design of the study, informed consent was waived by the committee. All procedures were carried out in compliance with applicable guidelines and regulations.

Consent to publish
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]Mianyang Central Hospital, School of Medicine, University of Electronic Science and Technology of China, Mianyang, PR China

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