ORIGINAL RESEARCH

Investigation on Nurses' Willingness to "Internet + Nursing Service" and Analysis of Influencing Factors

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Objective: To investigate the willingness of nurses in Yichang to participate in "Internet plus nursing services" and analyze the influencing factors in order to provide reference for the implementation of "Internet plus nursing services".

Methods: Using the "Internet plus Nursing Service" questionnaire, a cross-sectional survey was conducted among 1447 nurses in Yichang by convenience sampling from July to September in 2022, and the related influencing factors were analyzed. The questionnaire was composed of two parts: the demographic characteristics and the questionnaire of nurses' willingness to participate in "Internet plus nursing service", including 4 dimensions: awareness, promoting factors, concern factors and training needs. Likert 5-point scoring method was used for scoring. Binary logistic regression was used to screen the variables, and the ROC curve and Nomogram risk prediction model were drawn.

Results: A total of 1233 valid questionnaires were collected. It shows that 76.07% of nurses in Yichang are willing to participate in "Internet plus nursing services". Among them, education background, specialist nurses, awareness, promotion factors, concerns and training needs are the independent influencing factors (all $P < 0.05$). The area under the ROC curve (AUC) of the prediction model is 0.802, and the consistency index (c-index) of nomogram is 0.800. The average absolute error of internal calibration is 0.014, and the model has good accuracy and discrimination.

Conclusion: Nurses in Yichang have a high willingness to participate in "Internet plus nursing services", a low awareness of the program and a high demand for relevant professional training. It is suggested that the government and hospitals should strengthen the publicity of "Internet plus nursing services", improve relevant laws and regulations and strengthen the construction of specialist nurses' team, so as to provide a good practice environment for nurses' door-to-door service.

Keywords: internet plus nursing services, willingness, influencing factors

Introduction

"Internet plus nursing service" is a nursing model that combines nursing profession and information technology. The "online application, offline service" nursing model is dedicated to meet the diverse and multi-level health needs of patients, overcome time and space limitations, and to provide on-site nursing services for special populations, such as patients who need nursing after discharge or are inconvenient to see a doctor.[1,2]

With the increase of aging people in China, the state statistic shows that by the time of 2021, people over 60 had reached to 264 million, taking 18.7% of the total population. There are 150 million people suffering from diabetes, hypertension and other chronic disease, 85% of the elderly have different degrees of home care needs, and the demand for home care services for the 44 million disabled or partially disabled elderly is increasing.[3] The population of the

elderly in China is expected to reach to 487 million by 2050.[4] There is an imbalance between the supply and demand of medical resources. The hospital-centered medical and health service model can barely meet the continuous health care needs of patients, thus making home care service a key demand gap.[5,6] In 2019, the National Health Commission issued the China pilots internet plus nursing program, and six provincial-level regions across the country had been chosen for the pilot program.[7] In 2020, the National Health Commission issued China to extend pilot program of "Internet Plus nursing service" nationwide on further promoting the pilot work of "Internet plus nursing services" in other cities nationwide.[8] Yichang had been chosen for the Internet Plus nursing program in Hubei Province. The research results of a number of domestic scholars have shown,[9–12] that the influencing factors of nurses' willingness to participate in "Internet plus nursing service" include age, gender, education level, specialist nurse, monthly income, professional title, marital status, nurse training needs, and awareness of "Internet plus nursing service", etc., but their integrations of individual research influencing factors is insufficient. This study investigated the "Internet plus nursing service" among nurses in Yichang area through a self-made questionnaire, aiming to further explore the willingness of nurses to participate in "Internet plus nursing service" and its influencing factors, so as to provide reference and suggestions for promoting the development of "Internet plus nursing service".

Subject and Method

Study Subject

From July to September 2022, cross-sectional survey by convenience sampling was used to select 5 Tertiary hospitals, 12 Second-class hospitals and a number of community medical institutions in Yichang City, and questionnaires were distributed through Wechat scanning code. Inclusion criteria: 1, Age >18 years old; 2, nurses with nurse practitioner qualification; 3, nurses engaged in clinical work; 4, nurses who can correctly understand the meaning of the items in the questionnaire; 5, Informed consent and willingness to participate in this study. Exclusion criteria: 1, vacation-taking personnel, such as sick leave, maternity leave, etc.; 2, Standardized training nurses and practice nurses. The questionnaire is shown in the Supplementary Material.

The sample size for this study was calculated according to Kendall's estimation method: the sample size should be 20 times the number of questionnaire items (53 items in total), and a 20% loss rate should be added to ensure the questionnaire recovery rate. Therefore, the sample size for this study was calculated as n=20×53× (1+20%) =1272.

Research Tool

Through literature review,[9–15] referring to the relevant policy documents of the National Health Commission on the "Internet plus Nursing service" pilot project, combined with the purpose of this study, through group discussion and expert consultation methods, the questionnaire was designed. The final questionnaire is consisted of two parts: (1) general population information, including gender, age, education level, professional title, etc.; (2) the nurses to participate in the "Internet plus nursing services" intention questionnaire, a total of 53 items, including four dimensions of the popularity of 8 items, promoting factors of 11 items, concerns of 15 items and training needs of 19 items. Training needs include knowledge training demand, occupational safety education training needs, and humanistic care training needs. In the questionnaire, Likert 5-level rating method is used to score all single choice items. The overall Cronbach's α coefficient of the questionnaire is 0.964, and the Cronbach's α coefficients of the four dimensions of cognition, promotion factors, concern factors and training needs are 0.968, 0.975, 0.950 and 0.987, respectively. The questionnaire has good reliability and validity. After two rounds of expert review, the item-level content validity index (I-CVI) of the questionnaire ranged from 0.857 to 1.000. The scale-level content validity index (S-CVI) was 0.906.

Data Collection and Quality Control

From August to September 2022, the questionnaire was sent to the Wechat working group of the Yichang Nursing Association, and then the hospital nursing department and head nurse sent the questionnaire link to the staff of the relevant clinical departments. The questionnaire was filled out anonymously through mobile phones, computers and other equipment. In order to prevent repeated filling in, the same IP address or Wechat signal was set up to limit the submission

of the questionnaire to one time, and the questionnaire could not be submitted if any item is missing to ensure the integrity of the data. Before the official distribution of the questionnaire, at the end of July 2022, a pre-survey of 30 nurses was conducted, and the average time of filling the questionnaire was 321.10±90.199 seconds, the minimum value was 174 seconds, and the maximum value was 535 seconds. The Cronbach's α coefficient of the questionnaire was 0.954, and the reliability was good. To ensure the quality of the questionnaire data, questionnaires with a completion time of less than 180 seconds and those that did not conform to the logic of the response were excluded.

Statistical Method

SPSS 24.0 version (IBM, USA) was used for data analysis. The normal distribution of continuous data was expressed as mean ± standard deviation ($\overline{x}\pm S$), the data distribution was normal and the variance was equal. The t-test of two independent samples was used for comparison between groups, and the count data was expressed as percentage "%", the chi-square test was used for comparison between groups. Binary Logistic regression analysis was used to analyze the influencing factors of nurses' willingness to participate in "Internet plus nursing service". The receiver operating characteristic (ROC) curve was drawn by using MedCalc software, and the Area under the ROC curve (AUC) and its 95% CI were calculated. The Nomogram model and its calibration curve were established by RMS program package of R (R3.6.1) software. The consistency index (C-index) was calculated by Harrell's C statistic, and the Nomogram model was corrected by Bootstrap internal resampling for 1000 iterations. Two-sided $P < 0.05$ was considered statistically significant.

Results

General Information of Study Subjective

A total of 1447 nurses were investigated in this study, and 1447 questionnaires were distributed and 1447 were recovered with a recovery rate of 100%. After double checking the content of the questionnaire, 214 invalid questionnaires with the answer time less than 180 seconds were deleted, and 1233 valid questionnaires were collected, with an effective rate of 84.52%. Among them, the scores of awareness, promotion factors, concern factors and training needs were converted into a percentage system. The method and formula for conversion of hundred-mark system are: actual score divided by full score multiplied by 100 (actual score ÷ full score × 100). The results of the participants' willingness to participate in "Internet plus nursing service" showed that 938 (76.07%) nurses were willing to participate in, 295 (23.93%) nurses were not willing to participate in the program. There were statistically significant differences between the two groups in position, education background, whether they were specialist nurses, hospital grade, awareness, promotion factors, concern factors and training needs (all $P < 0.05$), That is, nurses with high position have higher willingness to participate, nurses with high education have higher willingness to participate, nurses with specialist nurse qualification have higher willingness to participate, and the higher the hospital level, the higher the willingness to participate. A higher Awareness score was associated with a higher willingness to participate, a higher Promotion factor score was associated with a higher willingness to participate, a higher Promotion factor score was associated with a lower willingness to participate, and a higher Promotion factor score was associated with a higher willingness to participate. There was no statistically significant difference in the remaining factors (all $P > 0.05$), but we found that married nurses and nurses with more children had a higher willingness to participate, which may be because participating in "Internet + nursing services" can obtain certain economic benefits, as shown in Table 1.

Univariate and Multivariate Binomial Logistic Regression Analysis

The willingness of nurses to participate in "Internet plus nursing service" (willing =0, unwilling =1) was used as the dependent variable, and the position, education background, whether they were specialist nurses, hospital grade, awareness, promotion factors, concern factors and training needs were used as independent variables to carry out univariate and multivariate binomial Logistic regression analysis. In the model, nurse group was used as the reference for position, technical secondary school as the reference for educational background, and third level hospital as the reference for hospital level.

Table 1 General Information of Study Subjective

Items	Total (1233)	Willing (938)	Unwilling (295)	Statistics	P value
Age	34.57±7.808	34.53±7.551	34.72±8.587	$t = -0.346$	0.729
Gender				$\chi^2 = 3.582$	0.058
Male	48 (3.89%)	42 (87.50%)	6 (12.50%)		
Female	1185 (96.11%)	896 (75.61%)	289 (24.39%)		
Title				$\chi^2 = 0.774$	0.679
Primary	550 (44.61%)	412 (74.91%)	138 (25.09%)		
Intermediate	593 (48.09%)	456 (76.90%)	137 (23.10%)		
Senior	90 (7.30%)	70 (77.78%)	20 (22.22%)		
Position				$\chi^2 = 9.990$	0.007
Nurse	1086 (88.08%)	811 (74.68%)	275 (25.32%)		
Head nurse	126 (10.22%)	108 (85.71%)	18 (14.29%)		
Chief nurse and over	21 (1.70%)	19 (90.48%)	2 (9.52%)		
Education background				$\chi^2 = 11.751$	0.001
Undergraduates and below	252 (20.44%)	171 (67.86%)	81 (32.14%)		
Undergraduates and over	981 (79.56%)	767 (78.19%)	214 (21.81%)		
Working time (years)				$\chi^2 = 0.203$	0.977
0<Y≤5	195 (15.82%)	146 (74.87%)	49 (25.13%)		
6≤Y≤10)	353 (28.63%)	270 (76.49%)	83 (23.51%)		
11≤Y≤15)	355 (28.79%)	270 (57.06%)	85 (23.94%)		
Y>15	330 (27.76%)	252 (76.36%)	78 (23.64%)		
Marriage				$\chi^2 = 5.545$	0.103
Unmarried	180 (14.60%)	131 (72.78%)	49 ((27.22%))		
Divorce/Death of a spouse	31 (2.51%)	28 (90.32%)	3 (9.68%)		
Married	1022 (82.89%)	938 (91.78%)	295 (28.86%)		
Specialist nurse				$\chi^2 = 6.568$	0.010
Yes	388 (31.47%)	313 (80.67%)	75 (19.33%)		
No	845 (68.53%)	625 (73.96%)	220 (26.04%)		
Children				$\chi^2 = 4.571$	0.102
No child	280 (22.71%)	201 (71.79%)	79 (28.21%)		
One child	791 (64.15%)	607 (76.74%)	184 (23.26%)		
Two children and more	162 (13.14%)	130 (80.25%)	32 (19.75%)		
Hospital level				$\chi^2 = 10.701$	0.005
Third-level hospital	473 (38.36%)	377 (79.70%)	96 (20.30%)		
Second-level hospital	654 (53.04%)	492 (75.23%)	162 (24.77%)		
First-level hospital	106 (8.60%)	69 (65.09%)	37 (34.91%)		
Awareness	57.27±14.033	59.24±13.88	51.03±12.650	$t = 9.484$	<0.001
Promotion factor	66.55±14.601	69.43±14.065	57.41±12.357	$t = 14.077$	<0.001
Concern factor	59.71±12.834	58.83±12.877	62.54±12.300	$t = -4.360$	<0.001
Training needs	70.31±15.191	72.69±14.693	62.74±14.262	$t = 10.374$	<0.001

Using Backward: LR method, the entry level of variables into the equation is α = 0.05, and the excluding level is α = 0.1, therefore the regression model is established. The results showed that position, education background, whether to be a specialist nurse, hospital grade, awareness, promotion factors, concern factors and training needs were statistically significant in multivariate analysis, which were independent risk factors for nurses to participate in "Internet plus nursing service" (all P <0.05), as shown in Table 2.

ROC Curve Analysis on Factors of "Internet Plus Nursing"

The ROC curve analysis was conducted on education background, specialist nurses, awareness, promoters, concerns, training needs and the total probability of the model. The results showed that the sensitivity (Se) was 74.24%, specificity

Table 2 Univariate and Multivariate Binomial Logistic Regression Analysis

Items	Univariate Analysis		Multivariate Analysis	
	OR [95% CI]	*P* value	OR [95% CI]	*P* value
Position		0.009		
Nurse	1.000			
Head nurse	0.492[0.293–0.825]	0.007		
Chief nurse and over	0.310[0.072–1.341]	0.117		
Education background	0.589[0.434–0.799]	0.001	0.567[0.400–0.802]	0.001
Specialist nurse	0.681[0.507–0.914]	0.011	0.695[0.498–0.971]	0.033
Hospital level		0.005		
Third-level hospital	1.000			
Second-level hospital	1.293[0.972–1.721]	0.078		
First-level hospital	2.106[1.332–3.329]	0.001		
Awareness	0.954[0.944–0.965]	<0.001	0.925[0.896–0.956]	<0.001
Promotion factor	0.915[0.901–0.930]	<0.001	0.900[0.872–0.929]	<0.001
Concern factor	1.022[1.012–1.033]	<0.001	1.075[1.051–1.099]	<0.001
Training needs	0.948[0.937–0.959]	<0.001	0.915[0.88–0.943]	<0.001

(Sp) was 71.22% and area under the ROC curve (AUC) was 0.802. All risk factors were statistically significant ($P < 0.01$), as shown in Figure 1 and Table 3.

Draw the Prediction Nomogram and Correct the Model

Using the willingness of nurses to participate in "Internet plus nursing service" as the dependent variable and the variables screened by multivariate Logistic regression analysis as the predictor variables, the (value) C-index of the Nomogram model was 0.800 when drawn by R software, and the model had good discrimination. In the nomogram, each variable is given a certain score, and the point of each variable corresponds to the position of the axis, and the corresponding quantity of a vertical line drawn from the point to the axis is the score of the variable. The Total score is obtained by the score of each variable, and the Total score corresponds to the Total Points on the risk axis, that is the
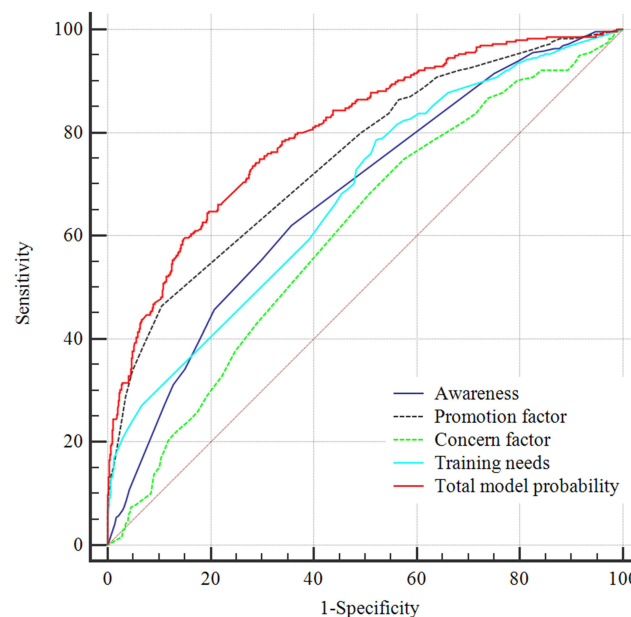

Figure 1 Model ROC curve analysis.

Table 3 Model ROC Curve Analysis

Items	AUC	Se(%)	Sp(%)	AUC[95% CI]	Z Statistics	P value
Education background	0.546	27.46	81.77	0.518–0.574	3.190	0.001
Specialist nurse	0.540	74.58	33.37	0.511–0.568	2.675	0.008
Awareness	0.674	62.03	64.29	0.647–0.700	10.115	<0.001
Promotion factor	0.750	46.44	89.45	0.725–0.774	15.514	<0.001
Concern factor	0.606	74.92	42.43	0.578–0.633	5.759	<0.001
Training needs	0.678	78.64	47.87	0.651–0.704	10.136	<0.001
Total model probability	0.802	74.24	71.22	0.779–0.824	20.289	<0.001

risk probability that nurses are not willing to participate in "Internet plus nursing service". The higher the total score, the higher the risk, as shown in Figure 2. After sampling, the internal data for 1000 times by Boot-strap correction method, the Mean absolute error was 0.024, and the mean squared error was 0.00089. The calibration degree of the actual prediction curve and the bias-corrected curve of the model are good, as shown in Figure 3.
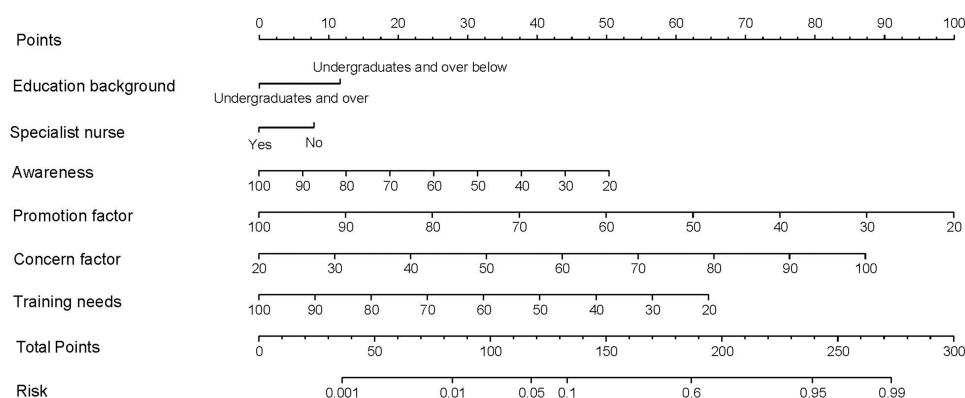
Figure 2 Nomogram for prediction of nurses' willingness.
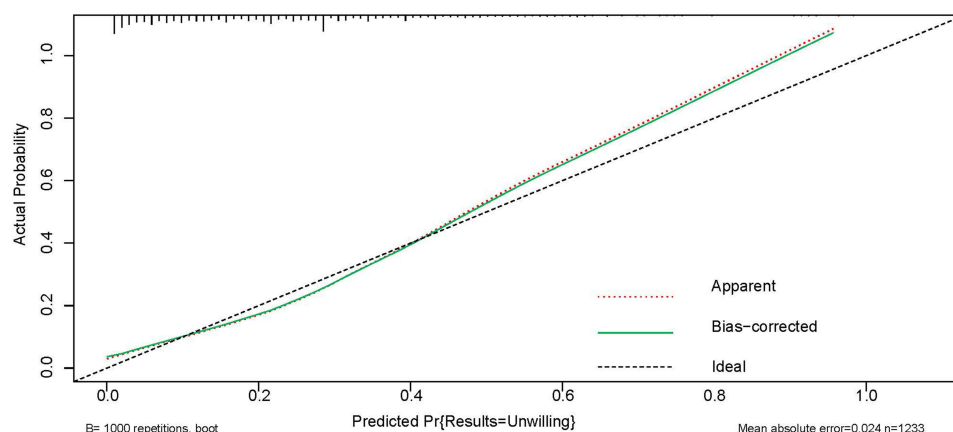
Figure 3 Calibration curve of the nomogram.

Discussion

Give Publicity to "Internet Plus Nursing", Raise the Awareness of Nurses

The results of this study showed that 76.07% of the surveyed nurses were willing to participate in "Internet plus nursing service", with a high willingness to participate. This is similar to the research results of Sheng et al.[16] Nurses in Yichang had a low awareness of the relevant documents, service objects, service contents and nurse qualifications of "Internet plus nursing service", with an average score of 57.27±14.033. This was similar from the research results of Ma et al,[15] which may be related to the fact that "Internet plus nursing service" started late in China and mainly concentrated in the first-tier cities with more developed economy. For example, in Hubei Province, only Wuhan and Yichang are taken as pilot cities. Therefore, some nurses may have little knowledge of "Internet plus nursing service", especially if there is no relevant publicity and promotion work in the hospital. The results of regression analysis in this study showed that awareness and promoting factors were independent influencing factors of nurses' participation in "Internet plus nursing service" [(OR=0.969, 95% CI: 0.9577–0.982), (OR= 0.941, 95% CI: 0.925–0.957)]. The higher the awareness score and promoting factor score of clinical nurses, the higher the probability of being willing to participate in "Internet plus nursing service". Studies have shown that the higher the awareness of the policy among nurses and the public, the more advantageous the regional "Internet plus nursing service" development will be.[9,17] As a pilot city, the government departments and hospital managers in Yichang should give more publicity to the policy through varieties of approaches, propagate its' advantages in nurses' professional identity, optimize the allocation of medical resources and improve service needs. Raise nurses' awareness of the policy and promote the popularization of knowledge related to "Internet plus nursing service" in the region, so as to facilitate the active development of "Internet plus nursing service".

Strengthen Specialist Nurse Construction, Implement Specialized "Internet Plus Nursing Service"

In this study, the results of multivariate Logistic regression showed that specialist nurses were an independent influencing factor of nurses' willingness to participate in "Internet plus nursing service" (OR=1.441, 95% CI: 1.032–2.0113), and specialist nurses had more willingness for the program. This is consistent with the research results of Cao et al and Fang et al[18,19] reflecting the positive role of specialist nurses in promoting the development of "Internet plus nursing service". Andrade et al[20] believe that, as service providers, the ability of nurses is crucial to ensure the medical safety of these services. Medical institutions should review the qualification and ability of family nurses strictly, select excellent nursing talents according to the admission system, establish the elimination mechanism, and enhance the sense of responsibility of family nurses. "Internet plus nursing service" has always advocated diversified, multi-level and all-round home care services. Specialist nurses have rich clinical experience, excellent specialist technical level and strong ability to deal with emergencies. When constructing "Internet plus nursing service", specialist nurses should be given priority so that they can give play to their professional ability, which is conducive to improving the satisfaction of home nursing.[21] To strengthen the cultivation of specialist nurses, build a regional "Internet plus nursing service" platform with specialist nurses as the main body, and carry out a full-cycle and high-quality "Internet plus nursing service" in a specialized manner, which can not only meet the nursing service needs of patients, but also improve the quality of nursing service of primary medical institutions.

Conduct Vocational Education and Training, Improve Nurses' Post Competency

The results of univariate and multivariate analysis in this study showed that training demand was an independent influencing factor of nurses' willingness to participate in "Internet plus nursing service" (OR=0.961, 95% CI: 0.947–0.976). In this study, training needs included professional knowledge training needs, occupational safety education training needs and humanistic care training needs. The overall score of training needs was 70.31±15.191, the demand rate was more than 70%, and the relative demand for professional knowledge training was (68.95±15.459). Occupational safety training (72.28±16.575) and humanistic care training (71.58±16.180) had higher training needs. It indicated that nurses in Yichang area had a high demand for training, especially nurses who were willing to participate in "Internet plus nursing service", which was consistent with the research results of Lawn et al and Li et al[22,23] "Internet plus nursing

service" puts a higher request for the comprehensive quality of nursing personnel. Because plus of the environment and the change of the practice, prior knowledge and skills is difficult to meet the needs of "Internet plus nursing service", vocational education and training should be conducted to prepare for "Internet plus nursing service" program, which can also promote nurses' development and enhance their sense of career benefits.[24]

This study showed that the proportion of nurses with bachelor's degree in Yichang district was 79.56%, and the degree was an independent influencing factor of nurses' willingness to participate in "Internet plus nursing service". Cho et al[25] obtained a result consistent with this study that the higher the education level of nurses, the higher their expectations and enthusiasm for themselves. In the process of carrying out "Internet plus nursing service", nurses are involved in multi-party communication with patients, family members and working staff, and the new service form puts forward higher requirements on nurses' communication skills and ethics.[26] Ethics education and communication skills training have been part of the continuing education of home care services in Korea and Japan.[20] Give full play to the role of third-level hospitals and nursing associations, establish nursing talent pool, establish skill training centers, and unify training content and standards to ensure the homogeneity of nursing quality inside and outside the hospital.[27,28] Therefore, it is necessary to improve the "Internet plus nursing service" program knowledge training system, do a good job in nurses' vocational education and training so as to improve their post competency.

Establish and Improve the Relevant Laws and Regulations, Eliminate Relevant Concerns

The results of this study shows that the concern factor is an independent influencing factor of the willingness of nurses to participate in "Internet + nursing service". The higher the score of nurses' concern is, the lower the willingness to participate in "Internet + nursing service" is. And Nomogram shows that the score weight of concern factor is high. At present, nurses in China have no prescription right, and there is no medical risk prevention, workflow, medical waste management and other regulations and systems of "Internet + nursing service", which makes the development of "Internet + nursing service" face greater medical risks. Home care service is faced with a variety of environment, population, and working time. However, more than 97% of the nursing staff in China are female, who will face greater personal safety risks. "Internet + nursing service" is based on information platform, and nurses and patients will have information security and privacy protection risks. At the same time, "Internet + nursing service" may increase the nursing manpower and management resources of the hospital to a certain extent, and increase the strain of hospital human resources and the difficulty of supervision under the environment of insufficient medical resources in China.[10,29] It is suggested that relevant government departments, while vigorously promoting and pilot "Internet + nursing service", should accelerate the establishment and improvement of relevant laws, regulations and medical insurance policies, including the comprehensive opening of nurses' multi-site practice policy, opening of nurse prescription rights, the protection law of nurse on-site service safety, nurse practice norms, medical fee standards, medical insurance system, etc. Make sure that "Internet + nursing service" practice is carried under the law. At the same time, it is recommended that managers standardize the performance appraisal system of "Internet + nursing service", allocate orders reasonably, and improve nurses' remuneration. Gradually eliminate the relevant concerns of nurses, provide a safe and good practice environment for nurses' on-site services, and actively promote the development of Internet + home care services.

Study Limitations

This study has certain limitations. In this study, convenience sampling was used to make the determination of the research objects, and stratified random sampling was not performed within the range of Yichang. Therefore, there may be some bias in the representativeness of the sample size, and the overall inference effect is poor. In the stage of sample size calculation, the number of study variables and the size of sample loss were fully considered to ensure adequate sample size. At the same time, this study formulated strict quality control procedures to make up for the shortage of convenient sampling as much as possible.

Conclusion

The result of this study shows that nurses in Yichang have a high willingness (76.07%) to participate in "Internet + nursing services". At the same time, on the basis of previous studies, this study innovated that the main factors affecting the willingness of nurses to participate in "Internet + nursing service" are educational background, whether they were specialist nurses, awareness scores, promoting factor scores, barrier factor scores and training needs scores. In the initial development stage of "Internet + nursing service" in China, there are new inspirations and constructive opinions. It is recommended that medical institutions at all levels carry out extensive publicity of "Internet + nursing service", establish and improve the "Internet + nursing service" vocational education and training system, improve the core competence of nursing staff, and administrative departments strengthen the construction of laws and regulations. So that we can build a safe working environment and ensure the personal safety of nurses. These measures help to improve nurses' awareness and trust in "Internet + nursing service", so as to improve nurses' willingness to participate. This study only conducted a sampling survey of nurses in Yichang. In the future, it is necessary to expand the sample size and cross-regional research to provide reliable basis and reference for the implementation of the "Internet + nursing service" project in China.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of Department Yichang Central People's Hospital (Approval number: 2022-076-01).

Author Contributions

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

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Disclosure

The authors report no conflicts of interest in this work.

References

1. Tian YT, Zhang Y, Hou XH, et al. Research on the construction and application of internet nursing service platform. *Chin J Nurs*. 2020;55 (10):1537–1542. doi:10.3761/j.issn.0254-1769.2020.10.017
2. Xj W. Status quo and thinking on the cross-age development of "Internet + nursing service" in China. *J Nurs Adm*. 2020;20(05):305–308. doi:10.3969/j.issn.l671-315x.2020.05.001
3. Seventh national population census bulletin (No. 5) [EB/OL]. Available from: http://www.stats.gov.cn/tjsj/tjgb/rkpcgb/qgrkpcgb/202106/ t20210628_1818824.html. Accessed November 7, 2022.
4. China Gerontology Research Center. National health commission: by 2035, the population aged 60 and above will exceed 400 million, accounting for more than 30%. [EB/OL]. Available from: http://www.crca.cn/index.php/13-agednews/765-2035-60-4-30.html. Accessed January 18, 2023.
5. Gong Y, Zhou J, Ding F. Investigating the demands for mobile internet-based home nursing services for the elderly. *J Investig Med*. 2022;70 (3):844–852. doi:10.1136/jim-2021-002118
6. Tarver WL, Haggstrom DA. The use of cancer-specific patient-centered technologies among underserved populations in the United States: systematic review. *J Med Internet Res*. 2019;21(4):e10256. doi:10.1080/02701960.2015.1116070
7. National health commission of the People's Republic of China, China pilots internet plus nursing program [EB/OL]. Available from: http://www. nhc.gov.cn/yzygj/s7657g/201902/bf0b25379ddb48949e7e21edae2a02da.shtml. Accessed January 18, 2023.
8. National Health Commission of the People's Republic of China, China to extend pilot program of 'Internet Plus nursing service' nationwide [EB/ OL]. Available from: http://www.gov.cn/zhengce/zhengceku/2020-12/16/content_5569982.htm. Accessed January 18, 2023.
9. Han MD, Zhao ML, Zhang XW, et al. Investigative on nurses, knowledge of and willingness to participate in internet plus nursing service. *J Nurs Sci*. 2020;35(04):53–56. doi:10.3870/j.issn.1001-4152.2020.04.053
10. Ju YY, Gao WJ. Survey on willingness of nurses to participate in "internet plus nursing service": the influencing factors. *J Nurs Sci*. 2022;37 (06):88–91. doi:10.3870/j.issn.1001-4152.2022.06.088

11. He XF, Wu ZH, Yang DY, et al. Willingness of nurses in Guangzhou and Foshan to "internet + nursing service" and its influencing factors. *Chin J Mod Nurs*. 2020;26(29):4047–4052. doi:10.3760/cma.j.cnl15682-20191227-04812

12. Li JJ, Gou JX, Zhou Q, et al. Investigation and analysis on willingness of nurse to use internet + nursing services in non-pilot provinces. *Chin J Nurs*. 2020;55(12):1825–1830. doi:10.3761/j.issn.0254-1769.2020.12.012

13. Xu B, Zhang Y, Wu SM, et al. Training needs of core knowledge and skills "regardingInternet + nursing service" among nurses working in tertiary hospital. *J Nurs Sci*. 2020;35(12):90–93. doi:10.3870/j.issn.1001-4152.2020.12.090

14. Bu W, Xing L, Xiao M, et al. A survey on the willingness of Guangzhou residents to participate in "internet + nursing services" and associated factors. *J Multidiscip Healthc*. 2022;15:897–906. doi:10.2147/JMDH.S351071

15. Ma G, Hou J, Peng S, et al. Nurses' Willingness and demand for internet +home care services and its influencing factors in different levels of hospitals in China - a nationwide survey. *Risk Manag Healthc Policy*. 2022;15:1395–1405. doi:10.2147/RMHP.S367412

16. Sheng Z, Wang J, Sun K, et al. Nurses' attitudes toward internet-based home care: a survey study. *Comput Inform Nurs*. 2020;39(2):97–104. doi:10.1097/CIN.0000000000000670

17. Liu SY, Li ZN, Luo HF, et al. Investigation on the awareness and willingness of "Internet + nursing service" in the nurse of traditional Chinese medicine hospital in Guangzhou and Shenzhen. *Soft Sci Health*. 2021;35(12):8–11+16.

18. Cao HO, Li HY. Investigation of nurses' cognition of multi-site practice in the affiliated hospital of a university. *Hosp Adm J Chin PLA*. 2018;25(12):1177–1181. doi:10.16770/J.cnki.l008-9985.2018.12.025

19. Fang Y, Shao LW. The management of float nurse in American hospitals and its implications to the management of multiple sites nurse practitioners in China. *Chin J Nurs Educ*. 2022;19(09):857–860. doi:10.3761/j.issn.1672-9234.2022.09.017

20. Andrade AM, Silva KL, Seixas CT, et al. Nursing practice in home care: an integrative literature review. *Rev Bras Enferm*. 2017;70(1):210–219. doi:10.1590/0034-7167-2016-0214

21. Zhuang YY, Feng JE, Sui WJ, et al. Review on the establishment and development of advanced practice nurses. *Chin Nurs Manage*. 2021;21(09):1372–1376.

22. Lawn S, Westwood T, Jordans S, et al. Support workers can develop the skills to work with complexity in community aged care: an Australian study of training provided across aged care community services. *Gerontol Geriatr Educ*. 2017;38(4):453–470. doi:10.1080/02701960.2015.1116070

23. Li X, Qin YL, Hu WQ, et al. Qualitative study on the willingness to and needs for providing internet + nursing services among nurses in tertiary hospitals. *J Nurs Sci*. 2019;34(20):61–64.

24. Li DP, Zhou XM, Chen ZH, et al. Evaluation of core competence of 215 intravenous therapy specialized nurses in Guangdong province and analysis of its influencing factors. *J Nurs Train*. 2021;36(23):2160–2166.

25. Cho E, Park J, Choi M, et al. Associations of nurse staffing and education with the length of stay of surgical patients. *J Nurs Scholarsh*. 2018;50(2):210–218. doi:10.1111/jnu.12366

26. Morowati Sharifabad MA, Rafati Fard M, Fattahi Ardakani M, et al. Determinants of effective nurse-patient communication based on the health action process approach in Yazd hospitals. *Horm Mol Biol Clin Investig*. 2019;40(3). doi:10.1515/hmbci-2019-0026

27. Bi DJ, Feng J, Shi HH, et al. The practice of "internet+nursing service" model in implementing hierarchical diagnosis and treatment. *Chin Nurs Manage*. 2021;21(01):8–11. doi:10.3969/j.issn.l672-1756.2021.01.003

28. Chiou CJ, Wang HH, Chang HY. Development and testing of a scale for assessing the quality of home nursing. *Geriatr Gerontol Int*. 2016;16(3):358–364. doi:10.1111/ggi.12478

29. Zhang YY, Zhu CH. Problems and countermeasures of medical waste management in the context of "internet+ nursing service". *Chin Nurs Manage*. 2019;19(7):972–974.