# Perception and Attitude of Specialist Nurses, Patients and their Families on Internet + Nursing Service in Yunnan Provence: A Mixed-method Study

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## *Abstract*

**Background:** "Internet + nursing service" is currently in full swing in China. Domestic scholars have also explored the perception and participation willingness of patients and nurses on "Internet + nursing service" successively, but few scholars start from the perspective of specialist nurses, who are the main implementers of "Internet + nursing service".

**Objective:** This study aims to understand the current situation of specialist nurses' perception and attitude towards "Internet+Nursing Service", and to explore its influencing factors.

**Methods:** A total of 1200 specialist nurses participated in the questionnaire survey. The survey collected their perception and attitude of the "Internet+Nursing Service" using a self-developed questionnaire.

**Results:** The 572 (47.7%) specialist nurses were aware of the "Internet+Nursing Service",they were willing to participate in "Internet+Nursing Service"(n=931,77.6%) ,and optimistic about the development prospect of "Internet + nursing service"( n=970,80.8%).They agreed with the government's attitude of vigorously promoting "Internet + nursing service" (n=1059,88.3%) , and believed that it was necessary to carry out "Internet + nursing service"( n=984, 82%).The results of logistic regression analysis showed that the number of years of working seniority, position, age, type of nurse specialists, whether the institution carrying out "Internet + nursing service", and whether they had participated in "Internet+Nursing Service" were the factors influencing the specialist nurses' perception of and attitude towards "Internet+Nursing Service"(P?0.05).

**Conclusions:** Specialist nurses have positive attitudes towards "Internet+Nursing Service", but their perception needs to be improved. It is suggested that the relevant departments should follow the national policy, penetrate the relevant perception in advance, and increase the publicity of "Internet+Nursing Service", so that more Specialist nurses can understand and participate in it.Meanwhile, optimising the access environment for specialist nurses, empowering and enabling them, and increasing the enthusiasm of specialist nurses to participate in "Internet + nursing service".

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# Original Manuscript

# Perception and Attitude of Specialist Nurses, Patients and their Families on Internet + Nursing Service in Yunnan Provence: A Mixed-method Study

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## Abstract
**Background:**"Internet+Nursing Service" is a positive product of multidisciplinary intersection in the era of information technology, which meets the needs of home nursing in China. Specialist nurses and patients/families as the providers and recipients of "Internet+Nursing Service" play a crucial role in the promotion of "Internet+Nursing Service" , but few studies have explored their attitudes and perceptions.
**Objective:** This study aims to understand the current perception and attitude of specialist nurses and patients/families towards "Internet+Nursing Service".
**Methods:** A convergent mixed method study were conducted between June and October 2023.
Cross-sectional surveys with specialist nurses (1138 female [94.8%]) and semi-structured interviews with patients/families(7female [58.3%]) were collected to gain insight into their perceptions and attitudes towards "Internet + nursing services".Data analysis used the single factor analysis, multiple linear regression analysis and qualitative content analysis.
**Results:** Quantitative results are shown that nurses' perception of "Internet+Nursing Service" was (43.7±16.10),average score was (3.31±0.64).And the attitude score was (39.05±6.85),average score was (3.90±0.69).The results of the multiple linear regression analyses showed that the position, educational level, whether the institution carrying out "Internet+Nursing Service" , and whether the specialist nurses participated in"Internet+Nursing Service"are the factors influencing specialist nurses' perception of "Internet+Nursing Service" (all $P$<.05).Nurses with high position and educational level have a higher perception for "Internet+Nursing Service". The institution carrying out "Internet+Nursing Service" and nurses have participated in"Internet+Nursing Service" have a higher perception for "Internet+Nursing Service" than those have not carry out or participated. The results of univariate analyses showed that the gender, hospital level and whether the institution carrying out "Internet+Nursing Service" are the factors influencing specialist nurses' attitude of "Internet+Nursing Service".Themes from the qualitative research encompassed ideas of the perception is limited,positive attitude, dilemmas and challenges.
**Conclusions:** Specialist nurses and patients/families have positive attitudes towards "Internet+Nursing Service", but their perception needs to be improved. It is suggested that the government and hospitals penetrate the relevant perception in advance, and increase the publicity of "Internet+Nursing Service", so that more specialist nurses and patients/families can understand and participate in it.Meanwhile, optimising the access environment for specialist nurses, empowering and enabling them, and increasing the enthusiasm of specialist nurses to participate in "Internet + Nursing Service".

## KEYWORDS
Internet+Nursing Services; home nursing;specialist nurses; perception; attitude;mixed methods design

## Introduction
Aging has become a common global public health concern owing to the dramatic increase in the number of older adults[1].According to the most recent census of China in 2020, the proportion of Chinese older individuals aged 65 years old and above has approached nearly 14 percent, suggesting China is becoming an aged society[2]. China’s ageing burdens will increase further as the "second baby boomers" (those born between 1962 and 1975) start to enter retirement in 2022[3]. The proportion of older people is projected to increase to 26% by 2050, exceeding that of most European countries[4]. According to the United Nations' classification standard, Yunnan Province has entered the aging society in 2002[5]. As of March 2024, there were 7.92 million people aged 60 and above in Yunnan Province, accounting for 16.95 percent.

One of the problems associated with aging is high rates of disability and chronic disease. China has a large population of aging chronic diseases, and the number of elderly chronic patients is as high as 2.1million, 80.1% of the elderly population, there is a huge risk of disability[6].And at present, there are about 4 million chronically ill elderly people, about 1.1 million partially disabled elderly people and about 0.26 million totally disabled elderly people in Yunnan Province[7].Aging not only brings a heavy burden of old-age care,it also brings great pressure on individuals, families and society to care for the elderly, to our country pension, medical, health and social security systems pose serious challenges and become more stringent. It affects the population quality of our country and the full play of human capital[8].

Against this background, in February 2019, China officially issued the "Pilot Work Programme on Carrying Out "Internet + Nursing Service" , and started the pilot work in six economically more developed provinces in China (included Beijing, Shanghai, Tianjin, Jiangsu, Zhejiang and Guangdong)[9]. "Internet+Nursing Service" refers to the nursing service provided by medical institutions to discharged patients or special groups of people suffering from illnesses and mobility problems by using nurses registered with the institutions in the mode of "online application and offline service"[9]. Other countries also call it "home care".Since 2019, China has issued a number of policies to encourage and support "Internet+Nursing Service", which improves nurses' sense of self-worth and professional identity while meeting the needs of discharged patients for continuous nursing care.

"Internet + Nursing Services" has been carried out in China for four years, and some economically more developed coastal cities have also achieved remarkable results[10,11,12].However, Yunnan Province as an economically underdeveloped and ethnic minority region, the development of "Internet+Nursing Service" is even weaker, and the problems of lack of nursing human resources, low business and technical level of nursing staff, and insufficient perception of nurses on "Internet+Nursing Service" are even more obvious, which is detrimental to the development of "Internet+Nursing Service" in Yunnan Province in the long run.
Some study shows that nurses who have received professional training are more competent in providing care to patients [13]. Nurses' attitudes are considered to be effective indicators for evaluating nurses' career development and professional competence [14], and positive attitudes are conducive to helping individuals obtain self-directed and personalised career paths, which in turn promotes the successful development of their careers [15]. Specialist nurses are the forerunners and the main force of "Internet+Nursing Service", and their positivity and initiative towards "Internet+Nursing Service" will determine the development and advancement of "Internet+Nursing Service". In addition, we believes that patient/family as the main recipients of "Internet+Nursing Service", their perceptions and attitudes may also determine the fate of "Internet+Nursing Service".

Therefore, this study adopts quantitative research to understand the perception and attitude of specialist nurses towards "Internet + Nursing Service". Adopts a qualitative research to explore perception and attitude of patients and their family members towards "Internet+Nursing Service". The results of our study can provide reference value for the development of "Internet+Nursing Service", and provide ideas for the government and administrators to formulate policies that will ultimately promote the development of "Internet+Nursing Service" in Yunnan Province.

# Methods

## Design and sample

A convergent mixed method design, with mixing occurring at the objective and inference stages[16].Study structure see Multimedia Appendix 1. We used a combination of qualitative and quantitative methods to explore the perceptions and attitudes of both parties involved in the "Internet+Nursing Service". We conducted a cross-sectional survey of specialist nurses in Yunnan Province from June to October 2023 and conducted semi-structured interviews with patients/families during this period.The reason for this is that "Internet+Nursing Service" is not mature in Yunnan Province, the number of patients or their family members receiving the service is small, and it is difficult to conduct home services to obtain a large sample of data.
After obtaining informed consent, the specialist nurses first completed a structured online questionnaire. specialist nurses who met the inclusion and exclusion criteria were recruited. The inclusion criteria were:
(1) Registered nurses (RNs) ; (2)In-service nurses at all levels of medical institutions; (3)Obtaining a provincial or higher specialist nurse qualification certificate; (4)After a training in "Internet+Nursing Service", and can use "Internet+Nursing Service" software to take orders;(5)Informed consent and voluntary participation in the survey. Exclusion criteria: (1) Specialist nurses on medication for mental illness; (2) Specialist nurses absent from work due to sick leave, personal leave, study abroad, or other reasons.

## Quantitative data collection

The online survey was conducted using a self-developed questionnaire.The questionnaire was developed by the researcher in accordance with the research objectives, based on the interpretation of the national policies and

guidelines, combined with the current situation of the development of "Internet+Nursing Service"in Yunnan Province, and through the consensus reached by the research team. This is a closed-ended survey, which can only be accessed by those who are eligible through a protected link. The questionnaire was distributed and collected using the "Questionnaire Star" platform.

With the consent of the directors of the nursing departments of hospitals in 16 cities and towns in Yunnan Province, the hospitals' nursing departments and chief nurses sent the questionnaire link and instructions to those who met the requirements to fill in the questionnaire. The directors were provided with unified training,which included an explanation of study purpose, significance,methods, and inclusion and exclusion criteria for the participants. The directors then assisted with the recruitment of all potential eligible participants within their hospitals, ensuring adherence to principles of informed consent and voluntary participation to validate the data. A pre-survey involving 30 nurses was conducted,with a Cronbach'sα coefficient of 0.925 and content validity index of 0.950, which was confirmed to have good reliability and validity.It can be used in relevant research and practice.

The questionnaire consists of two sections. Section one is the General Information Collection Form, including gender, age, years of work experience, professional title, position, education level,hospital type, hospital level, and so on. Section two measures nurses' perception and attitude to "Internet + Nursing Service".This section has two dimensions: perception and attitude. The perception has 15 items, such as the development of "Internet+Nursing Service", related policies, access qualification, service content and service process. The attitudes has 10 items, such as the willingness to become an "Internet+Nursing Service" nurse, the development prospect, necessity, advantages, and influencing factors of "Internet+Nursing Service".Likert 5-level scoring was adopted for all items in this section, with a score from 1–5 (from "disagreed" to "very agreed"). The higher the score was, the higher the perception or attitude was.

### Quantitative data analysis

Categorical variables were described as frequency (proportion); continuous variables were described as mean (standard deviation[SD]) .SPSS 26.0 version (IBM, USA) was used for data processing and statistical analysis. We used the chi-square test ($\chi^2$) and Welch t test to analyze the differences in nurses'perceptions and attitudes for "Internet+Nursing Service". Multiple linear regression analysis was used to analyze the influencing factors of nurses' perception . Before the multiple linear regression, univariate analysis, including analysis of variance, was used to screen the independent variables. The test level was $\alpha=0.05$, and $P<.05$ was considered statistically significant. For the flowchart of collecting questionnaires, see Multimedia Appendix 2.

### Qualitative data collection

Qualitative interviews were completed from June to October in 2023 and patients/families were purposely recruited in Yunnan Province for in-depth discussions based on research accessibility and hypotheses.The inclusion criterion for patients/families: (1)Have received "Internet+Nursing Service"; (2)Have normal thinking ability, able to communicate in writing or language; (3)Have used the "Internet + Nursing Service" order software and the operation is smooth.Exclusion criteria: Not willing to participate in this researcher. A priori developed interview guides were used,such as (1)What do you think about "Internet+Nursing Service"? (2)How do you think the "Internet+Nursing Service" has helped you? (3)What are your views or suggestions on "Internet + Nursing Service"?(4)What do you think are the dilemmas facing the development of "Internet+Nursing Service" at present?" Interviewees were encouraged to fully express their thoughts and opinions during the interviews. Interviews were stopped when the sample reached saturation, ensuring theoretical saturation of the Saunders criteria[17].Eligible respondents were first contacted by email with a brief description of the study objectives, and after informal consent, face-to-face interviews were conducted.All interviews were conducted in Mandarin and each interview lasted 30-40 minutes.

### Qualitative data analysis

After the interviews, the audio recordings of the interviews were transcribed verbatim to ensure that there were no artificial deletions. Each transcript was independently coded by two analysts using content analysis. Meaningful statements were collated and extracted; ideas were distilled and pooled; common ideas were searched for to suggest themes; synthesised and parsed for accurate representation; and descriptive statistics were kept on coding frequency. The results of the analyses were fed back to respondents to ensure that their views were adequately and accurately expressed.

### Ethical considerations

This study complied with the Declaration of Helsinki. Prior to the commencement of this study, approval was obtained from the Ethics Review Committee of the First People's Hospital of Yunnan Province (KHLL2023-KY013). Written informed consent was obtained from all participants. They were told that they could withdraw at any time, even after the survey or interview had begun.

## Results

### Participant characteristics

From a possible population of 1292, 1200 surveys were received (estimated response rate of 92.9%[1200/1292]).Shows the results of descriptive statistics of the sample. Participants were predominantly female 94.8%(1138/1200); the average age is (35.83±6.50), working experience is (13.25±7.76) years. Professional title is in supervisor nurse 60.2%(722/1200) , educational level is bachelor's degree 91.9%[1103/1200]), see Table 1.
There were 12 participants across the interview of whom 58.3%(7/12) were female,with age (40.92±14.77) .Three study themes were extracted.

## Quantitative Results

## Descriptive Analysis

The total score of perception for specialist nurses is 15~75 (43.7±16.10), average score is (3.31±0.64). The results of univariate analyses showed statistically significant differences in perception scores by position, educational level, whether the institution carrying out "Internet+Nursing Service" and whether specialist nurse had participated in"Internet+Nursing Service".(all *P*<.05, Table 1).The total score of attitude for specialist nurses is 10~50 (39.05±6.85), average score is (3.90±0.69).The results of univariate analyses showed statistically significant differences in attitude scores by gender, hospital level and whether the institution carrying out "Internet+Nursing Service".(all *P*<.05, Table 2).

**Table 1.Specialist nurses' perception to "Internet+Nursing Service" by different demographic characteristics(n=1200)**

| Characteristic | Results ,n (%) | Mean perception score | *t/F* test | *P* value |
|---|---|---|---|---|
| **Gender** | | | -1.56 | .119 |
| Male | 62（5.2） | 3.19±0.74 | | |
| Female | 1138（94.8） | 3.32±0.63 | | |
| **Age(years)** | | | 1.139 | .191 |
| 20-29 | 183（15.3） | 3.30±0.59 | | |
| 30-39 | 703（58.6） | 3.27±0.64 | | |
| 40-49 | 276（23） | 3.38±0.66 | | |
| 50-59 | 38（3.2） | 3.50±0.61 | | |
| **Working experience** | | | 1.175 | .141 |
| ≤4 | 51（4.3） | 3.15±0.52 | | |
| 5~10 | 241（20.1） | 3.28±0.63 | | |
| 10~20 | 658（54.8） | 3.28±0.63 | | |
| >20 | 250（20.8） | 3.46±0.67 | | |
| **Professional title** | | | 1.249 | .069 |
| Nurse | 41（3.4） | 3.44±0.64 | | |
| Senior nurse | 335（27.9） | 3.32±0.63 | | |
| Supervisor nurse | 722（60.2） | 3.28±0.63 | | |
| Co-chief nurse | 97（8.1） | 3.45±0.70 | | |
| Chief nurse | 5（0.4） | 3.16±0.52 | | |
| **Position** | | | 1.424 | .009 |
| Nurse | 988（82.3） | 3.28±0.62 | | |
| Head nurse | 211（17.6） | 3.44±0.69 | | |
| Director of nursing | 1（0.1） | 3.52 | | |
| **Educational level** | | | 1.301 | .04 |
| Junior college or lower | 72（6） | 3.42±0.70 | | |
| Bachelor's degree | 1103（91.9） | 3.30±0.63 | | |
| Master's degree or higher | 25（2.1） | 3.52±0.61 | | |
| **hospital type** | | | -1.384 | .167 |
| General hospital | 1058（88.2） | 3.30±0.63 | | |
| Other specialist hospitals | 142（11.8） | 3.38±0.71 | | |
| **Hospital level** | | | 1.21 | .102 |
| Tertiary hospital | 964（80.3） | 3.02±0.63 | | |
| Secondary hospital | 231（19.3） | 3.28±0.69 | | |
| Primary hospital | 5（0.4） | 3.32±0.62 | | |
| **Hospital nature** | | | 0.812 | .417 |
| Public hospital | 1177（98.1） | 3.31±0.64 | | |
| Private hospital | 23（1.9） | 3.20±0.63 | | |
| **Authorized strength** | | | 0.462 | .644 |
| Yes | 323（26.9） | 3.32±0.66 | | |
| No | 877（73.1） | 3.30±0.63 | | |
| **The institution carrying out "Internet + Nursing Service"** | | | 0.124 | <.001 |
| Yes | 482（40.2） | 3.56±0.60 | | |
| No | 718（59.8） | 3.14±0.60 | | |
| **Specialist nurse participated in"Internet+Nursing Service"** | | | 0.095 | <.001 |
| Yes | 121（10.1） | 3.92±0.65 | | |
| No | 1079（89.9） | 3.24±0.60 | | |

**Table 2.Specialist nurses' attitude to "Internet+Nursing Service" by different demographic characteristics(n=1200)**

| Characteristic | Results ,n (%) | Mean attitude score | *t/F* test | *P* value |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **Gender** | | | -2.42 | .016 |
| Male | 62（5.2） | 3.7±0.70 | | |
| Female | 1138（94.8） | 3.92±0.68 | | |
| **Age(years)** | | | 1.225 | .183 |
| 20-29 | 183（15.6） | 3.84±0.68 | | |
| 30-39 | 703（58.6） | 3.89±0.7 | | |
| 40-49 | 276（23） | 3.99±0.66 | | |
| 50-59 | 38（3.2） | 3.95±0.61 | | |
| **Working experience** | | | 1.295 | .127 |
| ≤4 | 51（4.3） | 3.68±0.62 | | |
| 5~10 | 241（20.1） | 3.85±0.74 | | |
| 10~20 | 658（54.8） | 3.9±0.67 | | |
| >20 | 250（20.8） | 4.03±0.65 | | |
| **Professional title** | | | 0.815 | .758 |
| Nurse | 41（3.4） | 3.84±0.66 | | |
| Senior nurse | 335（27.9） | 3.87±0.71 | | |
| Supervisor nurse | 722（60.2） | 3.9±0.68 | | |
| Co-chief nurse | 97（8.1） | 4.08±0.65 | | |
| Chief nurse | 5（0.4） | 3.54±0.7 | | |
| **Position** | | | 1.303 | .122 |
| Nurse | 988（82.3） | 3.88±0.68 | | |
| Head nurse | 211（17.6） | 4.03±0.69 | | |
| Director of nursing | 1（0.1） | 3.52 | | |
| **Educational level** | | | 1.332 | .104 |
| Junior college or lower | 72（6） | 4±0.61 | | |
| Bachelor's degree | 1103（91.9） | 3.9±0.69 | | |
| Master's degree or higher | 25（2.1） | 3.94±0.73 | | |
| **Hospital type** | | | -1.754 | .08 |
| General hospital | 1058（88.2） | 3.89±0.68 | | |
| Other specialist hospitals | 142（11.8） | 4±0.74 | | |
| **Hospital level** | | | 1.78 | .005 |
| Tertiary hospital | 964（80.3） | 4.02±0.54 | | |
| Secondary hospital | 231（19.3） | 3.94±0.71 | | |
| Primary hospital | 5（0.4） | 3.9±0.68 | | |
| **Hospital nature** | | | -0.827 | .408 |
| Public hospital | 1177（98.1） | 3.9±0.69 | | |
| private hospital | 23（1.9） | 4.02±0.63 | | |
| **Authorized strength** | | | 1.825 | .068 |
| Yes | 323（26.9） | 3.96±0.65 | | |
| No | 877（73.1） | 3.88±0.7 | | |
| **The institution carrying out "Internet + Nursing Service"** | | | 2.243 | .025 |
| Yes | 482（40.2） | 3.96±0.67 | | |
| No | 718（59.8） | 3.87±0.69 | | |
| **Specialist nurse participated in"Internet+Nursing Service"** | | | 1.027 | .305 |
| Yes | 121（10.1） | 3.97±0.74 | | |
| No | 1079（89.9） | 3.9±0.68 | | |

## Results of multiple Regression

The four variables that were statistically significant in the one-way analysis were used as independent variables, and the perception score was used as the dependent variable. Assignment of independent variables See Table 3.The results of the multiple linear regression analyses showed that the position, educational level,whether the institution carrying out

"Internet+Nursing Service", and whether specialist nurse participated in"Internet+Nursing Service"are the factors influencing specialist nurses' perception of "Internet+Nursing Service" (all *P*<.05, Table 4).

**Table 3. Table of independent variable assignment**

| Variable | Assignment Method |
|---|---|
| **Position** | Nurse=1,Head nurse=2,Director of nursing=3 |
| **Educational level** | Junior college or lower=1,Bachelor's degree=2,Master's degree or higher=3 |
| **The institution carrying out "Internet+Nursing Service"** | Yes=1,No=2 |
| **Specialist nurse participated in"Internet+Nursing Service"** | Yes=1,No=2 |

**Table 4. Comparison of the scores of specialist nurses' perceptions of "Internet+Nursing Service" by different characteristics (n=1200)**

| Variable | β | SE | β′ | t/F test | *P* value | 95%CI |
|---|---|---|---|---|---|---|
| (constant) | 4.814 | 0.172 | | 28.033 | 0 | 4.477~5.151 |
| **Position** | 0.134 | 0.044 | 0.081 | 3.03 | .003 | 0.047~0.221 |
| **Educational level** | -0.119 | 0.06 | -0.053 | -1.978 | .048 | -0.238~-0.001 |
| **The institution carrying out "Internet+Nursing Service"** | -0.321 | 0.037 | -0.247 | -8.633 | <.001 | -0.394~-0.248 |
| **Specialist nurse participated in"Internet+Nursing Service"** | -0.483 | 0.06 | -0.228 | -7.987 | <.001 | -0.601~-0.364 |

Note: $R^2$ = 0.162, adjusted $R^2$= 0.159, F =57.760, P < 0.001; "—" indicates not applicable.

**Table 5.**The factors that specialised nurses considered to be obstacles to the promotion and development of "Internet+Nursing Service" (n=1200)

| Variable | Value |
|---|---|
| Relevant laws are not perfected and policy support is insufficient | 987(82.3) |
| Lack of uniform industry standards, fee schedules, performance evaluation mechanisms and a sound medical insurance system | 814(67.8) |
| Nursing human resources are in short supply and multi-practice nursing has not yet been fully opened up | 1130(94.1) |
| Multiple risks associated with home-based services (e.g. medical risks, personal accident risks, medical disputes, etc.) | 1005(83.8) |
| Low motivation of caregivers to participate in "Internet+Care" home services | 859(71.6) |
| Patients' traditional attitudes (to hospitals) are difficult to change for a while | 566(47.2) |
| Most of the service users are elderly people, who are less capable of accepting new things and do not apply on-line | 912(76) |
| other | 116(9.7) |

## Qualitative Results

By looking at the joint display of data pertaining to patients/families perceptions and attitudes towards "Internet+Nursing Service",three themes can be evidenced in the following quotes included perception is limited, positive attitudes, dilemmas and challenges .

**1.Perception is limited.**

**Low risk perception.**

"It's not just nursing, the people who come to the home are professionals, surely nothing can go wrong. "(ID: B3, 61 years old, family member)

"I don't think there should be any special requirements for home nursing, as long as you have a nursing licence." (ID: B11, 65 years old, patient)

**Connotation needs to be improved.**

"Nowadays the word 'sharing' is kind of hot, so patients can make an appointment and then a nurse will come to their home. Apart from newborn care, what other services do you offer?" (ID: B6, 33 years old, family member)

**2.Positive attitude.**

**Providing convenience.**

"Since the State launched the "Internet + Nursing Service", we no longer need to personally go to the hospital to wait in line, which saves us a lot of time and energy, and greatly facilitates our lives." (ID: B8, 56 years old, patient)

**Meeting caregiving needs.**

"I am really grateful for the 'Internet + Nursing Service', which is a matter of great merit. With this service, my mother has suffered a lot less, and we have also suffered a lot less. In the past, we had to look for 120 every time we went to the hospital, but now with this service, we don't have to run around so much, and it's hard to take care of the elderly every day." (ID:B9, 52 years old, family member)

**Realize the value of life.**

"Home nursing provide a great opportunity for nurses' future nursing enthusiasts to use their skills and realize their self-worth." (ID:B1, 39 years old,patient )

**Meeting expectations.**

"Before I saw the news reports of other countries to carry out nurse home nursing service I was very excited, very much looking forward to the home nursing policy came to their own side, I did not expect really realized." (ID: B4, 64 years old, patient)

" 'Internet + Nursing Service' is a blessing for the mobility-impaired elderly at home, and I hope this service can be carried out for a long time." (ID: B7, 43 years old, family member)

**3.Dilemmas and challenges.**

**Concerns about security.**

"Treatment at home is not the same as in a hospital; there is no resuscitation equipment and it can be dangerous if something happens in the middle." (ID:B2, 52 years old, family member)

"Safety is our main concern because patient can't talk and it can be dangerous if something goes wrong."(ID:B10, 54-year-old,family member)

**Inadequate fee collection system.**

"I hope the charges will be included in the health insurance, if the price is high, the average family can not accept it, I hope it will be good for a common price" (ID: B4, 64 years old, patient)

"I paid 177 RMB for this order(glanced at my mouth), I think it is a little bit expensive, and then the waiting time is a little bit long, it could have been a little bit faster."(ID:B5, 66-year-old,patient)

**Lack of social support.**

"I usually take care of myself, but I'm not educated enough and it took me long time to learn how to get service. "(ID: B12, 66years old, patient)

In fact, nearly half (n=5, 41.7%) of the 12 participants who provided interviews were unable to respond appropriately when asked probing questions about specific strategies for "Internet + Nursing Service". All of them showed a positive attitude towards "Internet + Nursing Service" and were willing to support the development of "Internet + Nursing Service". Others raised the dilemmas and challenges they are currently facing and hoped that the state would be able to address them proactively.

# Discussion

## Principal Findings

Understanding the perceptions and attitudes of nurses and patient/family is a fundamental step in advancing its development. We targeted specialist nurses who are the largest workforce of "Internet + Nursing Service", and patient/family who are the main recipients of "Internet + Nursing Service".The reason why we used a convergent mixed method design is because their perceptions and attitudes are the vital importance to policy makers and for the effective implementation of the program.In our study, both specialist nurses and patient/family had positive attitudes towards "Internet+Nursing Service", with an average score of (3.90±0.69). But their perception of the service was insufficient, with an average score of (3.31±0.64), which is similar to the research results of Li et al[18].

The results of univariate analysis showed that nurses' position, educational level, whether the institution carrying out "Internet + Nursing Service", and whether the specialist nurse participated in "Internet + Nursing Service" are affect nurses' perception. Previous studies also found that nurses with high position and high educational level have a higher perception for "Internet + Nursing Service"[19].It is recommended that government and hospitals prioritize the development of nurses with high education and high professional title to provide "Internet + Nursing Service", then observe the results and take some action to promote the development of "Internet + Nursing Service"[20].Our study also found that the institution carrying out "Internet + Nursing Service" and the nurse have participated in "Internet + Nursing

Service" always have a higher affect for "Internet + Nursing Service". Reasons may be related to the following concept of early penetration[21], nurses have a strong sense of active learning and the hospital actively respond to the national health policy[22]. Studies have shown that the higher the awareness of the policy among nurses and the public, the more advantageous the regional "Internet + Nursing Service" development will be[23]. Hospital administrators and related media should increase the publicity of the policy of "Internet+Nursing Service" and the interpretation of related contents. At the same time, strengthen the learning and training of nurses on new knowledge, new technologies and new developments in disciplines to ensure that nurses of different perceptional levels can understand the relevant contents of the policy, and carry out stratified and focused training to improve perception according to cultural level[24].

Specialized nurses have higher achievement expectations for themselves due to deeper learning. According to previous studies, specialist nurses attach more importance to the satisfaction of inner spiritual needs than to objectively acquired needs[24].Both nurses and patients/families believe that participation in "Internet + Nursing Service" can realize the professional value of nurses[25].Our study showed that gender, hospital level and the institution carrying out "Internet + Nursing Service" affect nurses' attitude. Specifically, male attitudes were less positive than female , which is different from the results of other studies. Male and female tend to have different communication styles, which may stem from different socio-demographic characteristics, regional cultures and questionnaire designs[26,27].And the higher the hospital level, the more positive the attitude of the nurses to provide "Internet + Nursing Service".The reason may be that hospitals with a higher level tend to have a higher allocation of resources, such as a high-quality nursing workforce with a strong nursing ability to deal with complex situations in-home nursing[28].Furthermore, when the institution carrying out "Internet + Nursing Service",nurses will then have more opportunities to provide "Internet + Nursing Service" and will be more confident.

Despite mutual satisfaction with "Internet + Nursing Service", participants reported a number of financial barriers and unmet social needs that limited their participation in "Internet + Nursing Service".At present, internet-based home nursing is paid completely out of pocket by patients and services are not reimbursed by medical insurance, which also led to a low supply of services even though there was demand from clients[29]. The results of quantitative research also show that 82.3% (987/1200,Table 5) of specialist nurses believe that the lack of relevant laws and insufficient policy support is an important factor to hindering the development of "Internet+Nursing Service". So there is a contradiction between residents' demand for services and their ability to pay. We can learn from Japan, Germany, and other ageing countries that incorporate home nursing into a separate long-term care insurance system[30].This needed the state to expand coverage in accordance with national conditions and to include more programs for home health care in the reimbursement[29].

Safety is a central concern in home nursing[31,32].In the interview, some patients/families mentioned that they were worried about the safety of home nursing service. The results of quantitative research also show that 83.8% (1005/1200,table 5) of specialist nurses believe that there are multiple risks in Internet + nursing services. Huang R found that more than two-thirds of nurses were concerned about their personal safety[33]. Therefore, safety in home nursing is not only a concern for patients/families but also for nurses.And some relevant studies had also reported the need to enhance the safety management of home care[34,35]. It has been noted that safety training is an effective strategy for promoting a home nursing work environment[36,37]. Primary health care institutions can organize regular training and assessment related to the operational skills and theories needed for common service items of home health nursing. At the same time, drills are conducted for common emergency resuscitation and adverse events to ensure the safety of home nursing services.In addition, some patients mentioned that due to their own educational level and physical factors, there are difficulties in the use of mobile phones, computers or other electronic equipment, unable to successfully access the "Internet + Nursing Services", which was consistent with the results reported by Miyatake et al[38].It is recommended that healthcare organizations develop ageing reforms in accordance with national conditions and adopt a diversified, multi-channel approach to popularize the use of "Internet + Nursing Service" among the general public[39,40].

## Strengths and Limitations

The limitations of this study cannot be ignored.First, the respondents in this study were all from Yunnan Province, and convenience sampling and the local level limit the generalisation of the findings to the national level; future studies could consider expanding the scope of the survey to include a more diverse range of hospitals and regions, and increasing the sample size to improve the representativeness of the findings. Second, the cross-sectional approach limited our ability to make assertions about changes over time. Third, due to time and manpower constraints, this study did not carry out a large sample survey of patients/family members, but adopted a purposeful sampling method to conduct qualitative research, and the research results can only represent the experience of some patients, and cannot infer the overall situation. In the future, there will be more focus on the patient/family perspective to reveal the voice of this key stakeholder.

## Conclusions

This study adopts a convergent mixed methods approach to explore the perceptions and attitudes of both specialist nurse and patient/family towards "Internet+Nursing Service", complementing both quantitative and qualitative research.Generally speaking, specialist nurses and patients/families have a positive attitude towards "Internet+Nursing Service", but their perception needs to be further improved.It is suggested that the government should strengthen the publicity of "Internet + Nursing Service" to improve the awareness level of specialist nurses and patients/families on "Internet + Nursing Service". At the same time, improve the relevant laws and regulations, especially in terms of medical insurance payment system , and strengthen the construction of specialist nurses. In addition, it is necessary to fully consider the willingness of both nurses and patients to participate in the service, and formulate practical management mechanisms and implementation plans, so as to provide efficient and convenient nursing services for patients with a new service model under the premise of ensuring the safety of both nurses and patients.

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## Data Availability

The data sets generated or analyzed during the current study are not publicly available due to the terms of consent and assent to which the participants agreed but are available from the corresponding author upon reasonable request.

## Conflicts of Interest

The authors report no conflicts of interest in this work.

## Multimedia Appendix 1

Study structure of this study.

## Multimedia Appendix 2

Flow diagram of the participants recruitment and questionnaires screening.

## Multimedia Appendix 3

“Questionnaire star” platform link and screenshots of the intervention

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# Supplementary Files

# Multimedia Appendixes

Study structure of this study.
URL: http://asset.jmir.pub/assets/a13dff0f066a2664d2a39a129d540377.docx

Flow diagram of the participants recruitment and questionnaires screening.
URL: http://asset.jmir.pub/assets/82ecf4803fb09304dd4bfd8b4c1e50a5.docx

."Questionnaire star" platform link and screenshots of the intervention.
URL: http://asset.jmir.pub/assets/48e75d28add640953d0af4b748c68162.docx