Journal of Multidisciplinary Healthcare

Dovepress
Taylor & Francis Group

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ORIGINAL RESEARCH

Analyzing Maternal Needs for "Internet+ Nursing Service" After Hospital Discharge: A SERVQUAL-KANO Model Approach

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Purpose: The provision of postnatal continuity of care is of significant importance to new mothers. Given the prevalence of "Internet + Nursing Services", there has been a paucity of research exploring the internet-based home care needs of mothers following their discharge from hospital. This study employs a combination of the SERVQUAL and KANO models to investigate maternal requirements for Internet+ nursing services and to establish a foundation for enhancing the quality of postnatal nursing services.

Patients and Methods: A questionnaire was designed by combining SERVQUAL and KANO models, and a cross-sectional survey was conducted in the obstetrics department of a tertiary hospital in China after expert correspondence. The survey targeted 279 mothers about to be discharged after delivery, aiming to explore their demand for Internet+ nursing services post-discharge. Data were analyzed according to the KANO model.

Results: The better values (satisfaction coefficient) of Internet+ nursing services ranged from 42.91% to 78.46%, while the worse values (dissatisfaction coefficient) were 28.91% to 63.20%. The must-be and one-dimensional need attributes of maternity are mainly tangibility, reliability, responsiveness, and assurance dimensions, and empathy and economy are attractive attributes. Two items within the tangibles dimension, namely ease of operation of the platform and nurses' dress code, were deemed to be indifferent attributes. In the quadrant analysis diagram, the attributes of must-be, one-dimensional, attractive, and indifferent were 8(33.3%), 66(25.0%), 8 (33.3%), and 2(8.3%), respectively.

Conclusion: Attributes of Chinese mothers' needs for Internet+ nursing services after hospital discharge were defined, ranked, and categorized by the KANO model, providing a theoretical basis for the targeted design and improvement of care services. It is suggested that care managers consolidate must-be attributes and one-dimensional attributes, optimize attractive attributes, and transform indifferent attributes to better meet the multifaceted service needs of mothers.

Keywords: maternal, service needs, KANO model, SERVQUAL model, internet+ nursing service

Introduction

Maternal and child health represents a fundamental aspect of family health. In this regard, the Patient Safety Programme of the World Health Organization (WHO) has identified research on maternal and newborn care as one of the top 20 global research priorities.[1] The traditional obstetric care model is primarily situated within the hospital setting, with a notable deficiency in the provision of comprehensive health management and care for mothers following their discharge. The postpartum period is a particularly challenging time for new mothers, who often require a period of physical and psychological recuperation, as well as the acquisition of new roles and responsibilities in their lives, and who must cope with the needs of their newborns and their own care needs. A body of evidence indicates that postpartum continuity of care is associated with several benefits for mothers and infants. These include enhanced maternal recovery,

Received: 11 November 2024
Accepted: 21 January 2025
Published: 11 February 2025

reduced risk of postpartum depression and complications, increased exclusive breastfeeding rates, improved parenting cognition and psychology, and increased maternal satisfaction.[2–4] The traditional postpartum continuity of care model relies on regular home visits by community nurses. However, this approach often encounters limitations in terms of scheduling, service coverage, and care outcomes. Furthermore, it is unable to fully address the needs of mothers in the postpartum period. With the current progress in public health and healthcare awareness, the needs and expectations of mothers and their families for continuous postnatal care are also increasing. There is an urgent need to establish a new model of postpartum health management that meets the needs of the development of the times.

With the rapid development of science and technology, the application of information technology in the field of healthcare is gradually deepening, providing new ideas for postnatal care models. China's National Health Commission issued the Notice on the Pilot Work of "Internet+ Nursing Service (IPNS)" in February 2019,[5] and the innovative model of "Internet+ Nursing Service" has been created ever since, which refers to the model of "online application, offline service" in which medical institutions rely on the Internet and other information technology to enable registered nurses of their own institutions to provide services. These services include routine nursing operations such as blood sample collection, urinary catheterisation, intramuscular injections and intravenous injections, as well as specialised nursing services such as wound stoma care and neonatal check-ups.[6] Despite variations in the nomenclature of IPNS services across different countries, the concept has been extensively developed and implemented in numerous nations. Prominent examples include "Nurse Uber" in the United States,[7] "Care Visions" in the United Kingdom,[8] "Home Visiting Nursing System" in Japan,[9] and "Protea Medical" in India.[10] Since 2019, various provinces and regions in China have been applying "Internet+Nursing Services" to a variety of fields, mainly in the geriatric[11] and just starting in obstetrics. This model synergizes nursing services with Internet technology to provide cloud-based, online-to-offline and personalized services. Internet of Things technology, cloud computing and big data analytics are used to intelligently arranges nurses for home visits, thereby optimising resource allocation and meeting patients' diverse needs. Thus, it overcomes the drawbacks of traditional nursing, offers personalized and convenient care, and expands the communication channels between nurses and patients, enhancing the overall quality and accessibility of nursing services.

Double-edgedly, the IPNS model also adds new risks and challenges to home care. In contrast to the conventional practice of home visits, online platforms take orders on demand resulting in the creation of a new nurse-patient relationship with each IPNS, rather than an ongoing and stable nurse-patient relationship.[12] In addition, unlike in some countries,[7,10] the nurses who provide IPNS are registered nurses from professional healthcare organisations who arrange home visits as part of their daily routine, rather than nurses specialising in home care services.[13] The above factors may threaten the quality of nursing services. Studies have shown that factors such as usability, navigability, information accuracy, and security can affect users' experience and satisfaction with Internet+ nursing services.[14] While nursing services are developing in various forms in the Internet context, there are still difficulties in the acceptance of services by the patient.

In order to achieve universal acceptance and participation of women in Internet+ nursing service, it is first necessary to understand their actual needs, as proposed by the World Health Organization (WHO) to Elevate the Voice of Patients.[15] The assessment of the needs and expectations of women following their discharge from hospital regarding Internet-based care services represents a crucial stage in the development of bespoke and efficacious telecare models. While there have been studies conducted on the needs and experiences of postnatal home visits, they are mainly qualitative,[16] lacking the analysis of the specific attributes associated with these needs. Additionally, there is a notable absence of research exploring the potential of Internet+ in this context. The KANO model, as a theoretical tool for analysing customers' needs, can assist in the comprehension of the diverse levels of users' needs for a product or service. The model, developed by Professor Noriaki Kano in Japan, classifies needs into six categories: must-be attributes (M), one-dimensional attributes (0), attractive attributes (A), indifferent attributes (1), reversal attributes (R), and questionable answers (Q).[17] The classification thus provides insights into the actual needs and expectations of users, which can be used to optimise the design of services. The KANO model has been employed to evaluate healthcare service requirements among patients[18] and to improve the quality of telecare for empty nesters.[19] Applying the KANO model in obstetric care can help us to accurately identify the actual needs and potential expectations of mothers in post-discharge telecare services. Furthermore, the SERVQUAL model was proposed by American scholars Parasuraman, Zeithaml, and Berry as

a tool for assessing service quality.[20] The model is designed to assess the five key dimensions of service quality, namely tangibility, reliability, responsiveness, assurance, and empathy, from the customer's perspective. The SERVQUAL model has been widely employed to assess the quality of healthcare services[21] and telemedicine satisfaction surveys.[22] The application of the model can assist in the identification and improvement of problem in services, as well as in the comprehension of the actual needs and expectations of mothers, so as to optimise the service process and improve the overall service quality.

The aim of this study is to investigate the needs of post-discharge mothers for Internet+ nursing services. The authors have combined the KANO model with the SERVQUAL model to delineate the attributes and priorities of the needs, and have conducted a rigorous investigation to address the lack of quantitative research in this field. This endeavour has enabled the identification and resolution of problems and the optimisation of the quality of Internet+ postnatal nursing services for the health of mothers and infants.

Materials and Methods

Participants

A cross-sectional survey was utilized to assess the telenursing demands of obstetric discharges. Women who delivered at the Maternity Hospital of Nanjing Medical University from March to May 2024 were selected by the convenience sampling method. Included participants were (1) conscious and able to communicate, (2) ≥18 years of age, (3) volunteered to participate in this survey and (4) about to be discharged. Participants with cognitive deficits were excluded. Based on the guidelines for calculating sample size in medical statistics, the determination of sample size adhered to the principle of being 5 to 10 times the number of study variables. Considering a 10% loss rate, the minimum sample size required for this study was 264 cases. The final inclusion of 279 cases in this study fulfills the sample size requirement. The study was conducted in strict accordance with the principles of informed consent, confidentiality, and non-injury, and was approved by the Human Research Ethics Committee of the Hospital (No. 2022KY-060).

Theoretical Models

SERVQUAL Model

SERVQUAL (Service Quality) model, a method to evaluate service quality from the customer's point of view, was developed by American scholars Parasuraman, Zeithaml, and Berry in 1985[20] and consists of five dimensions: tangibility, reliability, responsiveness, assurance, and empathy. The model conforms to the "patient-centered concept" of modern medicine, and has gained extensive application in assessing healthcare service standards.

KANO Model

Professor Noriaki Kano from Japan developed the comprehensive KANO model framework in 1984,[17] which categorizes product attributes into Must-be Quality(M), One-dimensional Quality(O), Attractive Quality(A), Indifferent Quality(I), and Reverse Quality(R), based on the relationship between the objective performance of the product and the subjective feelings of the customer.

M denotes a characteristic that can lead to significant customer dissatisfaction if absent, yet may not necessarily lead to satisfaction if present. O indicates that customer satisfaction will be high if the feature is provided, but low if it is not provided. A suggests that customer satisfaction remains unaltered when the feature is absent, but it shoots up when the feature is introduced. For I, customer satisfaction does not change when the feature is provided or not provided. R shows that customer satisfaction goes down when the feature is added, and the more of it is provided, the more satisfaction wanes.

Survey Tools

A self-designed questionnaire was used to assess maternal demand for the Internet+ Nursing Service. An initial version of the questionnaire was developed based on existing literature. The content of the questionnaire was modified through expert consultation and pre-survey results to form the final version of the questionnaire, comprising two parts. The initial part was a general information questionnaire, covering age, place of origin, occupation, education level, monthly family

income, maternal history, mode of delivery, child's gender, primary mother and child caregiver during the monthly period, feeding mode, and family distance from the hospital. The second part was a survey on the demand for telecare services for discharged obstetric patients designed based on SERVQUAL and KANO models. The SERVQUAL model's five dimensions[20] served as the theoretical framework for the questionnaire, with the KANO structured user questionnaire[17] providing the foundational basis.

Before the questionnaire was used, 17 experts who met the following criteria were invited to conduct two rounds of Delphi correspondence: (1) being a nursing staff of a tertiary hospital engaged in tele-nursing service; (2) possessing over 5 years of clinical experience in obstetrics; (3) having a bachelor's degree or above; (4) being in the title of intermediate or above. Basic information on the experts is provided in Table 1. The expert authority coefficients for the first and second rounds were 0.93 and 0.94, respectively. The degree of expert coordination is shown in Table 2.

Table 1 Basic Information on the Experts (n=17)

Characteristics	**($\bar{x} \pm s$)/n(%)**
Age(years)	37.24±4.549
Gender(female)	17(100%)
Years of clinical experience	15.06±5.043
Title	
Intermediate	11(64.7%)
Associate or above	6(35.3%)
Education level	
Bachelor	12(70.6%)
Master	4(23.5%)
Doctor	1(5.9%)
Specialization	
Obstetric nursing and obstetric continuing nursing	14(82.4%)
Obstetric critical nursing and obstetric continuing nursing	2(11.8%)
Obstetrics and gynecology nursing education and female reproductive medicine	1(5.9%)
Residence	
Intra-provincial	4(23.5%)
Extra-provincial	13(76.5%)

Table 2 Degree of Expert Coordination

Entries	**First Round**				**Second Round**			
	Numbers	***W***	**χ^2**	***P***	**Numbers**	***W***	**χ^2**	***P***
Primary indicators	6	0.32	27.238	<0.001	6	0.423	35.997	<0.001
Secondary indicators	24	0.384	150.191	<0.001	24	0.459	179.555	<0.001

Table 3 Kano Attribute Categorization

Answers to Functional Questions	Answers to Dysfunctional Questions				
	I Feel Very Satisfied	It Should be that Way	I do not Care	I can Live with it	I Feel very Dissatisfied
I feel very satisfied	Q	A	A	A	O
It should be that way	R	I	I	I	M
I do not care	R	I	I	I	M
I can live with it	R	I	I	I	M
I feel very dissatisfied	R	R	R	R	Q

Abbreviations: A, Attractive Quality; O, One-dimensional Quality; M, Must-be Quality; I, Indifferent Quality; R, Reverse Quality; Q, questionable result.

Two primary indicators were modified, three secondary indicators were deleted and three new secondary indicators were added on the basis of expert opinion. The questionnaire finally includes 24 pairs of questions, each pair of questions contains a functional and question and a dysfunctional question (Supplement Table 1). After testing the questionnaire, the Cronbach's alpha coefficient of the forward question is 0.87, and the Cronbach's alpha coefficient of the reverse question is 0.86, and the content validity is good. As shown in Table 1, answer options for each question were "I feel very satisfied", "It should be that way", "I don't care", "I can live with it" and "I feel very dissatisfied". There are 5×5 possible scenarios where each coordinate point is mapped to a Kano attribute (Table 3).

The questionnaire was pre-tested by 20 mothers, and modifications were made based on their feedback to ensure the readability of the questionnaire. This process resulted in a final version of the questionnaire.

Survey Methodology

The survey was conducted by a researcher who had undergone unified training. It is imperative that the research subjects are fully informed of the purpose of the study, the research methodology, and so forth, prior to the commencement of the survey. Furthermore, their consent and cooperation must be obtained. The paper or electronic version of the questionnaire was distributed. In the event that any individual encountered difficulty in understanding the questionnaire, it was permissible for the distributor to complete it on their behalf. At the data entry stage, questionnaires that were incomplete or for which the answers were inconsistent were excluded. Subsequently, double-checking was employed to ensure that the data had been entered correctly.

Statistical Methods

The IBM SPSS software program, version 26.0, was employed for the statistical analysis of the data. Normally distributed data were expressed as mean ± standard deviation ($x \pm s$). In instances where the data did not conform to a normal distribution, the median and interquartile range [M (P25, P75)] were employed. Count data were described using the frequency (n) and percentage (%). This study employs the Kano model to describe the attributes of maternal demand for "Internet+ nursing services" following hospital discharge. The test levels were two-sided probability, $\alpha = 0.05$, and differences were considered statistically significant at $P < 0.05$.

Results

General Characteristics of the Participants

A total of 290 maternal participants completed the questionnaire survey, of which 279 questionnaires were valid, with a valid recovery rate of 96.21%. The mean age of all participants was 32.03 ± 4.38 years, of which 216 (77.4%) were primigravid women and 63 (22.5%) were menstruating women. Of these participants, 189 (67.7%) were physiologic births and 90 (32.3%) were cesarean deliveries. The full distribution of participants' socio-demographic details is displayed in Table 4.

Table 4 Distribution of Participants' Sociodemographic Characteristics (N=279)

Characteristics	**($\bar{x} \pm s$)/n(%)**
Age(years)	32.03±4.38
Number of childbirths	
1	216(77.4%)
2	59(21.1%)
≥3	4(1.4%)
Household registration in this city	
Yes	210(75.3%)
No	69(24.7%)
Occupation	
Current employee	263(94.3%)
Part-time job without regular work	4(1.4%)
Out of work	12(4.3%)
Education level	
High school and lower	4(1.4%)
Bachelor's degree/college	237(84.9%)
Postgraduate and above	38(13.6%)
Monthly per capita household income (yuan)	
≤4000	1(0.4%)
4001–8000	45(16.1%)
8001–12,000	103(36.9%)
>12,000	130(46.6%)
Type of this delivery	
Normal delivery	189(67.7%)
Cesarean section	90(32.3%)
Infant sex this time	
Male	143(51.3%)
Female	136(48.7%)
Primary postnatal caregivers	
Oneself	8(2.9%)
Mate	15(5.4%)
Spouse	42(15.1%)
Parents and Spouse	118(42.3%)
Confinement nurse	95(34.1%)
Other relatives	1(0.4%)

(*Continued*)

Table 4 (Continued).

Characteristics	$(\bar{x} \pm s)$/n(%)
Type of feeding	
Exclusive breastfeeding	90(32.3%)
Artificial feeding	15(5.4%)
Mixed breastfeeding and formula feeding	174(62.4%)

Attributes of Obstetric Discharge Telenursing Needs Assessed Using the Kano Model

As illustrated in Table 5, according to the Kano model, 5 (20.8%) functions fell under the "attractive quality" category, 10 (41.7%) were classified as "one-dimensional quality", 7 (29.2%) telenursing services were identified as "must-be quality", and a smaller portion, 2 (8.3%), were deemed "indifferent quality". The Better value (satisfaction coefficient) refers to the satisfaction index with the addition of this demand element, ranging from 0 to 1. Values closer to 1 indicate

Table 5 Attribute Analysis of Telenursing Needs for Obstetric Hospital Discharge

Functions	Number						Category	Better	Worse
	A	O	M	I	R	Q			
1	84	53	21	98	1	22	I	53.52%	−28.91%
2	81	50	92	49	1	6	M	48.16%	−52.21%
3	116	62	15	68	0	18	A	68.20%	−29.50%
4	75	72	15	91	4	22	I	58.10%	−34.39%
5	68	52	105	35	4	15	M	46.15%	−60.38%
6	85	57	96	30	2	9	M	52.99%	−57.09%
7	77	116	20	40	2	24	O	76.28%	−53.75%
8	60	61	94	54	2	8	M	44.98%	−57.62%
9	61	57	101	31	5	24	M	47.20%	−63.20%
10	66	100	48	29	2	34	O	68.31%	−60.91%
11	45	98	47	56	1	32	O	58.13%	−58.94%
12	67	106	13	61	0	32	O	70.04%	−48.18%
13	67	92	34	58	3	25	O	63.35%	−50.20%
14	80	103	26	41	2	27	O	73.20%	−51.60%
15	51	124	9	66	2	27	O	70.00%	−53.20%
16	65	41	89	52	2	30	M	42.91%	−52.63%
17	68	51	89	39	2	30	M	48.18%	−56.68%
18	69	103	37	36	2	32	O	70.20%	−57.14%
19	75	93	14	66	2	29	O	67.74%	−43.15%

(*Continued*)

https://doi.org/10.2147/JMDH.S505926

Table 5 (Continued).

Functions	Number						Category	Better	Worse
	A	O	M	I	R	Q			
20	99	64	25	60	2	29	A	65.73%	−35.89%
21	91	89	10	56	2	31	A	73.17%	−40.24%
22	94	101	12	47	2	23	O	76.77%	−44.49%
23	114	79	6	47	2	31	A	78.46%	−34.55%
24	101	86	7	52	2	31	A	76.02%	−37.80%

Abbreviations: A, Attractive Quality; O, One-dimensional Quality; M, Must-be Quality; I, Indifferent Quality; R, Reverse Quality; Q, questionable result.

a greater increase in the satisfaction of telenursing for discharged obstetric patients. The Worse value (dissatisfaction coefficient) takes values between −1 and 0, and the closer the value to −1, the greater the decrease in satisfaction caused by the absence of this demand element. The formula for calculating it is as follows:

$$Better = (A + O)/(A + O + M + I)$$

$$Worse = (O + M)/(A + O + M + I)$$

Attributes on the Better-Worse Plot

As illustrated in Figure 1, service quality attributes are plotted with worse values on the x-axis and better values on the y-axis, depicted as points on the graph. Figure 1 shows that functions 1 and 4 belong to the indifferent attribute, which is in perfect agreement with the results of the KANO model. For the must-be attributes, 8 (33.3%) functions fall into this

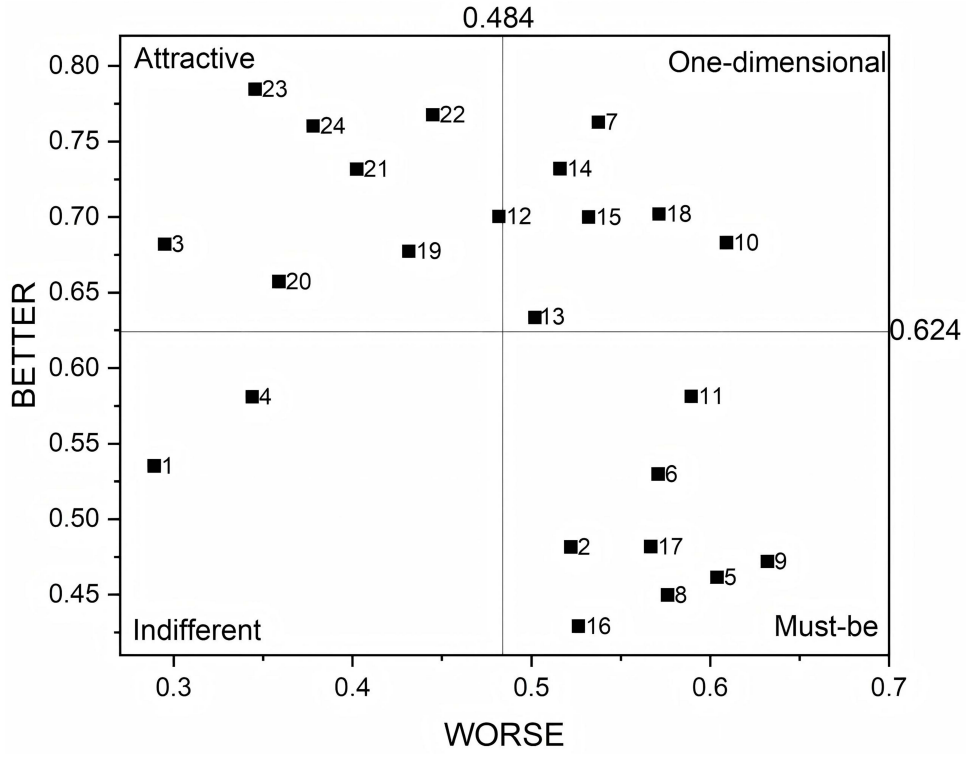

Figure 1 Attributes on the better-worse plot.

 https://doi.org/10.2147/JMDH.S505926

quadrant, indicating that these functions are essential and if they are not provided, maternal satisfaction decreases significantly. For one-dimensional attributes, 6 (25.0%) features fall in this quadrant and these features should be fulfilled as much as possible. For attractive attributes, 8 (33.3%) features fall into this quadrant. Among these services, feature 23 has the highest better value. This indicates that maximum satisfaction is achieved when packages or discounts are available when booking multiple items.

Differences exist between the Kano model and the analysis outcomes using better-worse plot, primarily due to two main aspects. First, there are differences in the calculation methods. The Kano model and the better-worse coefficient analysis employ distinct approaches when evaluating and categorizing needs, thereby leading to variations in classification outcomes. Second, their focus areas are distinct. While the Kano model concentrates on categorizing need attributes without considering the relationships between data points, the better-worse coefficient analysis takes a broader approach. It evaluates all service functions in a comprehensive manner across both horizontal and vertical dimensions, taking into account the interactions between diverse attributes.

Discussion

The results of this survey indicate that maternal post-discharge needs are characterised by a preponderance of must-be, one-dimensional, and attractive attributes, while the indifferent attribute is accorded less attention. There are a number of potential explanations for these findings. Firstly, women's diminished physical capabilities and self-care abilities following childbirth, particularly during the initial postpartum period, and their elevated care requirements for themselves and their newborns result in an increased reliance on healthcare services. Prior research has underscored the significance of self-care capacity in shaping patient care requirements.[23] The rapid transformation of women's physical, mental and social roles after childbirth brings with it a multitude of challenges and care needs. Furthermore, with the increased publicity of healthcare services in the postpartum period, people seek more scientific and professional postpartum recovery and childcare. The integration of internet+ nursing services can facilitate the provision of guidance on postnatal recovery and newborn growth and development, which aligns well with the needs of mothers. This not only emphasizes customizing postpartum care for specific demands but also indicates that different regions' healthcare policies should allocate resources to improve such services. For example, in rural/remote areas with scarce in-person healthcare, governments could subsidize expanding internet+ nursing services. In competitive urban centers, institutions can use these findings to create appealing service packages based on key attributes, attracting more mothers.

Must-Be and One-Dimensional Attributes of Internet+ Nursing Services Needs Should Be Consolidated

The most fundamental attributes are those functions that are perceived as essential or taken for granted by maternity, therefore classified as must-be attributes. The must-be requirements of patients should be accorded priority status.[24] The one-dimensional attribute has a substantial influence on the patient's perceived satisfaction, with its presence enhancing satisfaction and its absence reducing it.[25] The findings of this study indicate that a total of 14 (58.3%) must-be and one-dimensional functions were identified as significant among post-discharge mothers. The tangibility, reliability, responsiveness and assurance dimensions were found to account for the majority. This is likely due to the fact that these dimensions are directly related to the fundamental service needs and expectations associated with maternity care.

The concept of tangibility is addressed in a multitude of ways. Loy et al[26] defined tangibility as ease of use, user support and adapting to different users. Cruz Zapata et al[27] defined it as style, behaviour and structure. In this study, the term "tangibility" is used to describe a woman's initial perception of tangible objects, such as the platform, equipment and personnel involved in Internet+ Nursing Service. In accordance with the tenets of service quality theory,[20] the tangible factors are frequently regarded as fundamental prerequisites, given their capacity to directly influence the initial perception and comfort of the woman. A study conducted in Ghana demonstrated that the ease of access to care has a direct impact on maternal satisfaction with services.[28] The provision of a clear, functional online platform and modern medical equipment can facilitate maternal confidence in the healthcare delivery process.[14] Good tangibility is therefore seen as a key factor in meeting basic needs of maternity. This understanding can guide healthcare providers globally to

invest in service physical aspects. In developed regions, focus on digital platform upgrades; in developing ones, ensure basic equipment.[29,30]

Reliability reflects the ability of service providers to deliver promised services accurately, safely and reliably.[31] It has been found to have a strong impact on overall patient satisfaction and trust building, especially in medical and nursing services.[32] A number of studies have indicated that reliability is the most significant aspect of patient perception, with reliability gaps identified as a key area of focus for healthcare managers in their improvement programmes.[33] In addition, the results of a systematic review indicate that security and privacy are among the primary considerations when evaluating mHealth applications.[34] It is imperative that mothers can place their trust in the safety and security of healthcare services, in order to avoid any potential risks to their health and personal information. This has far-reaching implications for healthcare policies. Governments and regulatory bodies need to enforce strict standards for data protection and service reliability to safeguard the interests of mothers. A common system of accreditation is needed in this context.[35]

Responsiveness refers to the speed and flexibility with which a provider responds to the needs of patients. Qolipour et al identified the ability to provide timely services, arrange appointments for tests, and ensure that tests are completed as key factors affecting the responsiveness.[36] During the COVID-19 pandemic, there was a significant positive correlation between the perceived responsiveness of elderly patients and their ratings of service quality.[37] The timeliness and efficiency of care services are central to maternal satisfaction, with efficient responsiveness having the potential to significantly increase overall maternal satisfaction and reduce anxiety during the treatment process.[38] This highlights the need for streamlined processes, flexible scheduling and departmental coordination.[39] There is a need to set up a rapid response team for emergencies and to optimise the online booking system in routine care.

Assurance refers to the ability of the service nurse's knowledge, skills, and attitude to generate trust in the service user. Medical risk is a primary concern for patients regarding Internet+ nursing services.[6] The proficiency of nurses is essential as service providers to guarantee the safety of these medical services. Traditional postnatal home care is mainly done by community nurses, and the expertise of this group needs to be improved.[40] Therefore, the professional qualification of the nurses providing the service is key to attracting mothers to utilise the Internet+ nursing services. Furthermore, as posited by Aghamolaei et al, the considerable discrepancy in the assurance gap can be attributed to the suboptimal communication between doctors, psychologists, nurses and medical staff and patients.[41] Consequently, positive attitudes and effective communication skills also facilitate the fulfilment of reassurance.

In light of the aforementioned analyses, it is recommended that care managers prioritise the fulfilment of the four core needs of tangibility, reliability, responsiveness and assurance. The fulfilment of these needs will facilitate a systematic improvement in service quality and a further enhancement in overall maternal satisfaction.

Attractive Attributes of Internet+ Nursing Services Needs Should Be Optimised

The main feature of the significant development of Internet+ nursing services, the attractive attribute, is an attribute that surprises patients. It is characterised by a minimal impact on patient importance but a significant impact on satisfaction.[42] According to Kamijo et al, if patients' attractive attribute can be fully satisfied, their satisfaction will increase significantly.[43] The results of this study showed that the mothers identified 8 (33.3%) attractive features, mainly in the empathy and economy dimensions. The reasons for this may be as follows: Firstly, empathy refers to the level of understanding, sympathy and empathy demonstrated by medical staff, which often leads to a significant increase in satisfaction when services exceed basic expectations[44] People are particularly sensitive to the emotional support of caregivers after a major life event, such as childbirth.[45] Empathy, as a fundamental skill in patient-centred communication, not only helps to relieve their psychological stress, but also effectively improves overall satisfaction with the service.[46] However, as online home care services cannot substitute the emotional comfort offered by family members, their joint participation should be encouraged. In addition, affordability is an important consideration for patients when choosing healthcare services. Baosheng et al[47] highlighted that the elevated expenses of Internet-based home care significantly impede its widespread adoption. Unlike in the United States,[48] Australia,[49] and Japan[50] where long-term care insurance covers home care costs, in China, nearly all existing Internet-based home care services are paid for by patients out-of-pocket, leading to a conflict between residents' service demands and their payment capabilities.

Hence, it is recommended that care managers optimise the attractive attributes of Internet+ care services after maternal discharge by focusing on "empathy" and "economy". Through empathy training, caregivers can improve their communication skills and emotional support for mothers. Enhance the psychological comfort of mothers by providing personalised and detailed care. In addition, develop reasonable pricing schemes for care services, provide cost-effective service options, and consider introducing flexible payment methods or financial subsidy policies[51] to reduce the financial pressure and improve service accessibility and satisfaction. By making improvements in these key areas, not only will the overall maternal experience be enhanced, but also the attractiveness of Internet+ care services will be effectively strengthened so as to stand out in a competitive market.

Indifferent Attributes of Internet+ Nursing Services Needs Should Be Transformed

Indifferent attributes are service characteristics that have the least impact on patient importance and satisfaction. Research has shown that such attributes are no longer considered necessary to improve the quality of care.[24] In this study, "online platform for telecare services met the needs of users and is easy to operate" and "nurses providing the service were uniformed in their work permits and uniforms" in the tangibility dimension were perceived as indifferent attributes, indicating that these two functions had a minimal impact on maternal satisfaction. This may be primarily attributable to the fact that the study population consisted of women with a mean age of 32.03 ± 4.38 years, the majority of whom were experienced in the use of electronic devices, unlike the older age group who have a high demand for ease of use.[47] Furthermore, as time progresses and inclusivity increases, there may be a greater emphasis on occupational requirements, such as knowledge and expertise, as opposed to external forms of appearance, such as uniform attire. As postulated by Maslow's theory of the hierarchy of needs, aesthetic desires often emerge after the satisfaction of fundamental needs, such as physiology, safety, belonging, and love.[52]

It is important to note that the need categories in Kano's model are not fixed and unchanging. Through gradual adaptation, initially surprising or astonishing attractive attributes may shift into one-dimensional and eventually must-be attributes. And as time and the service environment change, indifference attributes may evolve into attractive attributes, must-be attributes, or one-dimensional attributes.[53] For example, in regions with rapid tech adoption, once-indifferent tech attributes can quickly turn attractive or must-be attributes. Healthcare providers must stay aware and adapt service offerings. Such changes require service providers to dynamically monitor changes in mothers' demand for Internet+ care services, and to adjust service content in a timely manner to meet their latest needs.

Limitations

The study is not without limitations, which are outlined below: (1) Firstly, the study is a single-center research project, with samples sourced from a tertiary hospital in China. This may result in a lack of representativeness and some bias in the results, and thus the findings are not generalizable. Further research with diverse populations is needed. (2) Secondly, this study relied on convenience sampling, potentially limited in generalisability to a wider population, as it tended to select participants who were more easily accessible. In future studies, stratified random sampling or multi-stage sampling methods are proposed to improve the representativeness of the sample and generalisability of the findings. (3) The study is only a short time cross-sectional quantitative study and lacks qualitative, longitudinal, and intervention research to further validate these findings. Nevertheless, this study offers a valuable methodology for evaluating the necessity of Internet+ nursing services following maternity discharge.

Conclusion

In this study, a combination of the KANO and SERVQUAL models was employed to ascertain the demands for Internet+ nursing services following maternal discharge from the hospital. The results demonstrated that the items within the "tangibility", "reliability", "responsiveness" and "assurance" dimensions mainly consist of must-be and one-dimensional attributes, whereas the items within the "empathy" and "economy" dimensions are predominantly attractive attributes. Nursing managers should optimize the attractive attributes through regular caregiver empathy training and flexible local customized payment plans. Additionally, they should transform the indifferent attributes by monitoring maternal preferences and making timely adjustments. Through platform upgrades, equipment enhancements, rigorous personnel

training, and multi-departmental collaboration, the must-be and one-dimensional attributes can be consolidated. Ultimately, this will lead to improved service quality and higher patient satisfaction. Despite a Chinese hospital context and convenience sampling limitations, core service quality attributes were cross-culturally relevant. Future research could employ random sampling to validate these findings across diverse populations and explore longitudinal changes in maternal needs.

Ethics Statement

The study complies with the Declaration of Helsinki and was reviewed and approved by Human Research Ethics Committee of the Hospital (No. 2022KY-060). Informed consent was obtained from participants in this study.

Acknowledgments

Xianwen Li and Ying Liu contributed equally to this work as corresponding authors. The authors would like to thank all members who participated in this work.

Funding

This work was supported by Science and Technology Development Fund of Nanjing Medical University (No. NMUB20210098) and Medical Science and Technology Development Projects of Nanjing Health Commission (No. YKK24149).

Disclosure

The authors report no conflicts of interest in this work.

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