

Classification and Prioritization of Health Education Needs Among HPV-Infected Patients in Chengdu: A KANO Model-Based Cross-Sectional Study

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Purpose: This cross-sectional study aimed to: (1) classify the health education demands of HPV-infected patients using the KANO model; (2) prioritize these demands to identify which quality attribute categories (must-be, one-dimensional, attractive, or indifferent) require the most urgent intervention; and (3) provide evidence-based recommendations for developing targeted health education programs.

Patients and Methods: A cross-sectional survey was conducted from June 1, 2024 to December 31, 2024 at West China Second University Hospital, Sichuan University, Chengdu, China. A convenience sample of HPV-infected patients was recruited. Health education demands were assessed using a two-dimensional KANO questionnaire (positive and negative items) with a 5-point Likert scale. The questionnaire was developed based on literature review and validated by an expert panel; internal consistency was acceptable (Cronbach's $\alpha = 0.940$). Each item was classified into one of four KANO quality attributes (must-be M, one-dimensional O, attractive A, or indifferent I) using the standard KANO evaluation table. Prioritization was determined using the better-worse coefficient method.

Results: A total of 428 valid questionnaires were analyzed. Among the 28 health education demand items, 3 were classified as must-be attributes, 9 as one-dimensional attributes, 5 as attractive attributes, and 11 as indifferent attributes. The better-worse coefficient analysis identified that one-dimensional attributes had the highest impact on patient satisfaction, while must-be attributes represented basic requirements whose absence would cause strong dissatisfaction.

Conclusion: HPV-infected patients have diverse and prioritized health education needs. Must-be attributes represent non-negotiable minimum standards that must be addressed first. One-dimensional attributes directly influence patient satisfaction and should be prioritized in intervention design. Attractive attributes can be incorporated to exceed expectations when resources allow. These findings provide a scientific basis for nursing managers to develop tiered health education strategies.

Keywords: KANO model, HPV, health education, demand

Introduction

Human papillomavirus (HPV) infection is closely associated with the development of reproductive system lesions and malignant tumors, especially high-risk HPV infection, which is an important cause of cervical cancer in women.¹ The infection rates of high-risk HPV types 16, 18, and 52 are relatively high across different disease stages, including normal cervical cytology, precancerous lesions, and cervical cancer.²⁻⁶ The latest research reports that the overall HPV infection rate among women in Chengdu is 22.03%. Among them, HPV52 (3.89%) is the most common high-risk HPV genotype, followed by HPV16 (3.11%) and HPV58 (2.58%).⁷

Advances in medical technology and treatment methods have increased the demand for health education services.⁸ Patients urgently need HPV-related health education to effectively support prevention and treatment efforts.⁹ Previous studies have shown that awareness of cervical cancer, HPV, and HPV vaccines among the Chinese population has increased over the past decade, particularly among young adults where 70.4% now know of HPV and 75.2% know of the HPV vaccine.¹⁰ However, relevant awareness remains limited, with HPV vaccine awareness rates in the general population reported between 15.95% and 31.00% depending on demographic factors.¹¹ Moreover, the awareness rate of cervical cancer among women infected with HR-HPV is only 42.5%.¹² Some studies have shown that most women have expressed a positive attitude towards HPV screening. And it is required to know more about cervical cancer and its preventive measures.¹³ Therefore, how to provide the health education that patients truly need warrants further exploration. This challenge is compounded by the HPV-related knowledge gaps and misconceptions documented above—including misunderstanding of asymptomatic infection, limited awareness of HPV vaccine benefits, and the gap between willingness and actual uptake—which highlight the critical need for a systematic and tailored approach to health education delivery. Conventional methods that treat all patients similarly and assume linear service-satisfaction relationships are ill-equipped to address such nuanced and varied needs.¹⁴

Despite the recognized importance of health education for HPV-infected patients, current approaches have several significant limitations. First, the delivery of HPV-related health education often follows a standardized, one-size-fits-all model that fails to account for the heterogeneity of patient needs. While general awareness campaigns may be appropriate for the broader population, HPV-infected patients require targeted information addressing their specific concerns—including transmission routes, treatment options, partner notification, and psychological coping strategies. However, little is known about which specific educational components patients prioritize as essential versus those they consider merely desirable. Second, existing needs assessments in HPV care typically employ traditional satisfaction surveys that ask patients to rate the importance of various services. These conventional methods assume a linear relationship between service provision and patient satisfaction—that is, the more of a service provided, the more satisfied the patient becomes. This assumption has been increasingly challenged in service quality research, as certain service attributes may generate satisfaction only when present (one-dimensional attributes), others are taken for granted and cause dissatisfaction only when absent (must-be attributes), and still others create unexpected delight (attractive attributes).¹⁵ Traditional satisfaction surveys are increasingly recognized as insufficient for capturing this nonlinear satisfaction structure.¹⁶ Without a nuanced understanding of how different educational needs impact patient satisfaction, healthcare providers risk allocating resources inefficiently—overinvesting in low-impact services while underdelivering on high-priority needs that directly affect patient outcomes. Moreover, to date, no study has systematically applied a demand-classification approach specifically to the health education needs of HPV-infected patients, leaving a critical gap in evidence-based health education design. Recent systematic reviews confirm that the KANO model offers a validated framework for classifying patient needs into distinct quality attributes and prioritizing service improvements in healthcare settings.¹⁴ Therefore, a structured demand-classification approach that can simultaneously identify, categorize, and prioritize health education needs is urgently needed for this population.

The KANO model, originally proposed by Noriaki Kano in the 1980s, offers a two-dimensional quality-satisfaction framework that categorizes customer needs into distinct quality attributes: attractive (A), must-be (M), one-dimensional (O), indifferent (I), and reverse (R) attributes.¹⁷ Unlike traditional satisfaction surveys that assume a linear and unidimensional relationship between service provision and user satisfaction—a premise that has been increasingly challenged in service quality research—the KANO model captures the nonlinear and asymmetric nature of this relationship.^{17,18} Specifically, must-be attributes are basic requirements that patients take for granted; their absence causes strong dissatisfaction, but their presence does not proportionally increase satisfaction. One dimensional attributes follow a linear relationship: the better these features are provided, the more satisfied the patient becomes. Attractive attributes are unexpected features that, when present, generate significant satisfaction but whose absence does not cause dissatisfaction.¹⁷ This nuanced classification allows healthcare providers to move beyond simply asking which educational services patients want (a typical limitation of traditional needs surveys) to understanding how each service, if provided or withheld, will differentially affect patient satisfaction. Given that healthcare resources for health education are inherently limited, the KANO model's capacity to classify and prioritize needs—identifying which educational services

represent minimum standards, which drive satisfaction, and which provide added value—offers a clear methodological advantage over conventional needs assessment approaches.^{14,19}

In recent years, the KANO model has been increasingly applied in healthcare, such as health education for patients undergoing radiotherapy and chemotherapy for tumors,²⁰ the research and development of intelligent medication systems for the elderly,²¹ the optimization of nursing service measures for children and their families,²² and the design of new health education platforms and models based on the Internet.²³

Despite these applications, several important gaps remain.¹⁴ First, the vast majority of existing KANO model studies in healthcare have focused on general nursing services or hospital system quality, with very limited attention to health education as a distinct service domain. Health education differs fundamentally from other clinical services in that it involves knowledge transmission, patient comprehension, and behavioral change—factors that may influence how patients perceive and prioritize different educational attributes. Second, to the best of our knowledge, no study has systematically applied the KANO model specifically to the health education needs of HPV-infected patients. This patient population presents unique characteristics: HPV infection carries significant social stigma and psychological burden, and patients' information needs—ranging from basic virology and transmission dynamics to partner management and cancer risk communication—differ substantially from those of patients with non-sexually transmitted conditions. Third, existing applications in infectious disease contexts have rarely attempted to translate demand classifications into actionable, tiered implementation strategies for health education delivery. The present study therefore aims to address these gaps by applying the KANO model to classify and prioritize the health education demands of HPV-infected patients, and to develop a tiered, evidence-based framework for targeted health education interventions in this population.

Furthermore, HPV-infected patients constitute a demographically and clinically heterogeneous population. Systematic reviews have demonstrated that HPV knowledge levels among Chinese women vary significantly with age, education level, economic status, and geographic region.²⁴ For example, younger patients may prioritize information on HPV transmission dynamics and partner communication, while older patients may focus more on cancer risk progression and long-term surveillance. Similarly, patients newly diagnosed with HPV infection may have an urgent need for basic virology education and reassurance, whereas those undergoing colposcopic follow-up may require detailed procedural guidance. This heterogeneity further justifies the need for a differentiated demand-classification approach—one that can systematically identify and prioritize needs across diverse patient subgroups—rather than relying on one-size-fits-all health education models.

While a previous study by our team developed and validated a KANO model-based questionnaire for HPV-infected patients,²⁵ the present study extends this work by applying the questionnaire data to: (1) systematically classify each demand item into KANO quality attributes (must-be, one-dimensional, attractive, and indifferent), (2) prioritize demands using the better-worse coefficient method. To the best of our knowledge, this is the first study to provide a prioritized demand framework specifically tailored to HPV-infected patients' health education needs. Therefore, this study will analyze the health education service demand of HPV-infected patients and determine each demand attribute. Provide a basis for precise health education intervention for patients with HPV infection.

Methods

This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for cross-sectional studies. The STROBE checklist is provided as a [Supplementary File](#).

Study Design and Setting

A convenience sampling method was used to recruit participants from the outpatient clinics of the Department of VIP Clinic Nursing, West China Second University Hospital, Chengdu, China, between June 1, 2024 and December 31, 2024. Inclusion criteria were as follows: (1) aged ≥ 16 years; (2) patients diagnosed with HPV infection through liquid-based thin-layer cytology test (Thin-prep Cytology Test, TCT) combined with HPV-DNA testing; patients previously diagnosed with HPV infection and currently diagnosed with CIN1/CIN2/CIN3/cervical cancer (diagnosis criteria based on the 2014 WHO classification of female reproductive organ tumors); (3) Ability to communicate normally and cooperate with the investigation and evaluation; (4) Informed, voluntary participation with signed informed consent. Exclusion criteria were as follows: (1) Patients with other malignant tumors;

(2) coexisting AIDS, syphilis, or other sexually transmitted infectious diseases, or severe organ function impairment; (3) with fungal vaginitis, bacterial vaginitis and other cervical inflammatory diseases.

The required sample size was estimated based on the common rule of thumb for exploratory questionnaire-based studies, which recommends 5 to 10 participants per questionnaire item.^{26,27} The “KANO Model HPV Infection Patient Health Education demand Attribute Questionnaire” developed by our research team was used in this study, which had a total of 28 items. We adopted the more conservative 10:1 ratio,²⁶ and considering a 20% loss to follow-up rate, determined the final sample size to be 336 cases.

Data Collection and Procedure

Eligible patients were identified through the hospital's big data system. With the assistance of the hospital's follow-up platform, questionnaires were distributed via the hospital public account and short message service. The investigation was conducted using the “KANO Model Questionnaire on Health Education Demand of HPV Infection Patients” developed by Zhang et al²⁵ Our initially developed Kano questionnaire had 28 items in 5 factors: disease information demand, social support, emotional demand, family support and health education style demand. Cronbach's alpha was 0.940 for the entire scale and ranged from 0.763 to 0.908 for the five positive-item subscales; for reverse items, Cronbach's alpha was 0.955 for the entire scale and ranged from 0.739 to 0.946 for the five subscales. The content validity index of the scale was as follows: S-CVI/UA = 0.91, S-CVI/Ave = 0.98. Confirmatory factor analysis showed that after four model modifications, the positive items yielded $\chi^2/df = 3.650$, RMSEA = 0.067, CFI = 0.901, TLI = 0.888, and SRMR < 0.001, indicating good fit of the five-factor model.

The KANO questionnaire employed a two-dimensional format, with each item comprising a functional (positive) question: “If [feature] is provided, how would you feel?” and a dysfunctional (negative) question: “If [feature] is not provided, how would you feel?”. Responses were recorded on a standard 5-point Likert scale with the following options: (1) “Like it that way”, (2) “It must be that way”, (3) “I am neutral”, (4) “I can live with it that way”, and (5) “I dislike it that way”. The responses for each pair of functional and dysfunctional questions were cross-referenced against the traditional KANO evaluation table ([Supplementary Table S1](#)), which contains $5 \times 5 = 25$ possible response combinations. Based on the response combination, each demand item was classified into one of six possible KANO categories: attractive (A), one-dimensional (O), must-be (M), indifferent (I), reverse (R), or questionable (Q). In our analysis, no items fell into the reverse (R) or questionable (Q) categories. Classification was performed independently by two research assistants; any disagreements (which were rare, <2% of all classifications) were resolved by discussion with a third researcher (the corresponding author).

Given that the questionnaire had been validated in a similar Chinese HPV-infected population in our prior study, the instrument was considered culturally appropriate for the current sample, and the layout was reviewed by clinical experts. No additional cultural adaptation or pilot testing was deemed necessary beyond the prior validation.

Quality Control

In this study, two managers of the follow-up platform were uniformly trained to modify the contents requiring adjustment in the online questionnaires and to set the timing for questionnaire distribution and collection. The platform managers exported data monthly. For patients who had not completed the questionnaires, the system resent the questionnaires weekly. For patients with missing items in the questionnaires, researchers conducted telephone follow-up to obtain the missing responses. Meanwhile, two staff members screened out questionnaires that took less than 5 minutes to complete or contained missing or incomplete items; these were considered invalid. These questionnaires were regarded as invalid questionnaires. All patients signed written informed consent forms and completed questionnaires on the follow-up platform.

Statistical Analysis

Data were statistically analyzed using SPSS version 22.0, and demand attributes were analyzed using the KANO attribute classification method. Descriptive analysis primarily employed frequency, percentage, mean, and standard deviation.

The KANO model analysis method was used to analyze the Kano attributes of the items of patients' health education demand. According to the Kano quality attribute classification method, the characteristics of each item are classified as

positive questions and reverse questions. The attribute with the highest proportion was identified as the KANO attribute of that item. Among them, “A” represents attractive attributes, “M” represents must-be attributes, “O” represents one-dimensional attributes, “I” represents indifferent attributes, “R” represents reverse attributes, and “Q” represents questionable attributes. The attribution of the KANO model is shown in [Supplementary Table S1](#).

Since each demand item was classified using the maximum-frequency rule, whereby the KANO category with the highest frequency count (among A, O, M, I, R) determined the item’s classification. This rule is the most commonly used method in KANO-based studies due to its simplicity.^{14,28} However, it has limitations: it ignores the magnitude of frequency differences and may be unstable when two categories have similar counts.²⁹ In this study, Better-worse coefficient analysis and four-quadrant graphs are used to describe satisfaction and importance, and the demand attributes are quantitatively analyzed. The better coefficient (satisfaction coefficient) was calculated as: $(A+O)/(A+O+M+I)$. The closer it is to 1, the greater the impact of this item on patient satisfaction and the stronger the effect of improving satisfaction. The worse coefficient (dissatisfaction coefficient) was calculated as: $-(O+M)/(A+O+M+I)$. The closer it is to -1, the greater the impact of the item on the patient’s dissatisfaction and the stronger the effect of the reduction in satisfaction.²⁹ The absolute value of the worse coefficient is the importance. With the absolute value of the worse coefficient (importance) as the abscissa and the better coefficient (satisfaction) as the ordinate. With the mean values of importance and satisfaction as the dividing lines, the scatter plot is divided into four quadrants. The first, second, third, and fourth quadrants respectively represent one-dimensional attributes (O), attractive attributes (A), indifferent attributes (I), and must-be attributes (M). This mean-based approach is widely adopted in KANO research as it provides a data-driven reference point. We acknowledge that this choice is somewhat arbitrary, and this limitation is discussed in the Discussion section.

This study primarily aimed to classify and prioritize health education demands using the KANO framework. Therefore, inferential analyses (subgroup comparisons or multivariable regression) to examine potential influencing factors were not performed. Descriptive statistics and KANO attribute classification were the main analytical approaches.

Ethical Considerations

The study was carried out in accordance with the principles of the Declaration of Helsinki. This study was approved by the Medical Ethics Committee of West China Second Hospital of Sichuan University (No. 230 of the 2023 round of medical research approval).

Results

Participant Sociodemographic Characteristics

A total of 428 patients with HPV infection completed the questionnaire survey, with a mean age of 40.49 ± 10.56 years. The majority had a bachelor’s degree, accounting for 158 patients (36.9%), and 27.6% had a household monthly income of more than 10,000. More than 50% of the patients underwent cervical cancer screening once a year. Among married patients, the majority (77.8%) lived with their spouses, and 83.9% reported a sexual frequency of 1 to 3 times per month. Currently, more than 60% of unmarried patients have sexual partners. Their lifestyle with partners is mostly cohabitation (49.3%), and the frequency of sexual intercourse is mostly 1–3 times per month (59.7%). A total of 86.7% of patients had their first sexual intercourse between the ages of 26 and 35. Among contraceptive measures, the usage rate of condoms reached 72.4%. Of the patients, 45.3% had been pregnant ≥ 3 times, and 58.9% had two or more sexual partners. Detailed characteristics are shown in [Supplementary Table S2](#).

As the primary aim of this study was to classify and prioritize health education demands using the KANO model rather than to examine associations with demographic variables, no inferential analyses were performed. This is acknowledged as a limitation in the Discussion section.

KANO Model Attribute Classification of Health Education Demand for Patients with HPV Infection

As shown in [Supplementary Table S3](#). The health education demands of patients with HPV infection included 23 one-dimensional demands and 5 attractive demands, The Cronbach's α coefficient of the questionnaire was 0.952, the KMO value was 0.951, and the Bartlett sphericity test value was <0.001 , which had good reliability and validity.

The Importance of Health Education Demand for Patients with HPV Infection - Satisfaction

The importance and satisfaction of health education demand of patients with HPV infection were calculated according to the formula. A scatter plot was drawn with the importance as the horizontal axis and the satisfaction as the vertical axis. The scatter plot was divided into four quadrants respectively with the mean importance (0.513) and the mean satisfaction (0.768) of the 28 items as the dividing lines. Obtain the demand attributes of health education demand for patients with HPV infection: The attractive demand consists of 5 items, namely items 16, 23, 25, 26, and 27; The one-dimensional demand consist of 9 items, namely items 3, 5, 6, 7, 9, 10, 11, 12 and 13. The must-be demand consist of three items, namely items 4, 8 and 17. The indifferent demand consist of 11 items, namely items 1, 2, 14, 15, 18, 19, 20, 21, 22, 24 and 28. ([S1 Figure](#)).

Discussion

This study employed the KANO model combined with better-worse coefficient analysis to systematically categorize the health education demands of patients with HPV infection. The quadrant analysis used mean values as cut-offs, a conventional but arbitrary choice.¹⁸ While such practice is widely accepted, alternative cut-off definitions (medians, percentiles, or theory-driven thresholds) could produce different quadrant assignments. We recommend that future studies examine the robustness of our priority classification using alternative threshold definitions. In this study, the results revealed that among the 28 demand items, 3 were classified as must-be demands, 9 as one-dimensional demands, 5 as attractive demands, and 11 as indifferent demands. This hierarchical classification provides a clear priority framework for clinical nurse-patient communication.

Priority Framework Based on KANO Attributes

A key contribution of the KANO model is its ability to inform priority setting based on demand categories. We propose the following three-tiered framework for health education implementation:

Tier 1 – Must-be demands (non-negotiable minimum standards): It is essential to provide guidance on HPV-related screening and prevention for sexual partners, offer relevant information on the treatment of both the individual and their sexual partners, and inform family members to jointly participate in the management of the disease. Such demands are the ones that need to be satisfied first and are of the highest importance. The main transmission route of HPV is sexual transmission. A meta-analysis including 65 global studies showed that the overall infection rate of any type of HPV in men worldwide was 31%, the infection rate of HR-HPV was 21%, and the most common HPV genotype for infection was HPV16 (5%, 95% CI: 4% - 7%). The overall infection rate is relatively high.³⁰ On January 2, 2025, the National Medical Products Administration of China officially approved the quadrivalent HPV vaccine for use in men aged 9 to 26 and began vaccinations in multiple provinces and cities.³¹ This indicates that HPV infection is no longer a disease for which only women require intervention; intervention for men is equally important. Studies have found that spousal participatory health education can more effectively enhance women's awareness of HPV-related knowledge and promote the joint formation of good preventive behaviors among couples.³² In terms of social support, a qualitative study found that respondents faced heavy psychological pressure, believing that HPV infection had a negative impact on their sexual, family, and social relationships.³³ They needed support from relatives and longed to be respected,³⁴ and actively provided health education and guidance related to their sexual partners. Advocating the joint management of the disease by the family is the most important need for patients with HPV infection.

Comparisons with international studies reveal both similarities and differences. Studies from other countries have reported comparable KANO-based demand patterns in various patient populations.^{35,36} For instance, research on patient education needs in chronic disease management has similarly identified must-be attributes as foundational requirements.¹⁶ However, cultural and healthcare system differences may influence specific demand priorities. The high priority placed on partner-related guidance in our sample—reflecting concerns about HPV transmission and relationship management—may be particularly salient in contexts where HPV infection carries significant social stigma, which has been documented across multiple Asian populations but may differ in Western settings. Future cross-cultural comparative studies would help elucidate these contextual variations.

Recent advances in therapeutic HPV vaccines offer new perspectives for HPV-infected patients.^{37,38} Unlike prophylactic vaccines, therapeutic vaccines aim to eliminate existing HPV infections and HPV-induced lesions. As these treatments become available, health education needs may evolve—patients may require information about vaccine eligibility, treatment mechanisms, and post-vaccination follow-up. Our KANO-based demand framework can be adapted to incorporate these emerging needs.

Tier 2 – One-dimensional demands (high-impact satisfaction drivers): These demands directly influence patient satisfaction in a linear manner. They should be prioritized for targeted intervention because improvements in these areas will yield immediate gains in patient satisfaction. Examples of one-dimensional demands identified in our study include: provide disease information related to HPV, including how HPV is prevented, screened and prognostic, inform the latest developments in HPV infection treatment and offer ways to understand the doctor's areas of expertise in the disease. These demands are also the ones that medical staff need to prioritize in the health education process, as cognition of disease-related information is the basis for effective disease management. Studies have shown that the awareness rate of HPV-related knowledge in various regions of China is only 0%-45.81%, and the awareness rate of HPV vaccines is only 8%-28.83%.³⁹ Women most desire to obtain disease information related to HPV, including transmission routes, prevention, detection, treatment, disease progression without treatment, and risk factors for cervical cancer, as well as the duration of HPV infection, regression status, and the possibility of disease progression.³⁹ Online community question records also reveal urgent public demand for knowledge about HPV-related diseases, covering how to prevent HPV and its impact on pregnancy.⁴⁰ Patients are eager to receive guidance and assistance from professional doctors and nurses.⁴¹ Therefore, we recommend that nursing managers allocate dedicated resources to develop and deliver a structured health education curriculum addressing these nine one-dimensional demands, using a combination of individual counseling, printed take-home materials, and nurse-led Q&A sessions.

Tier 3 – Attractive demands (value-added features): These demands have the greatest impact on patient satisfaction when provided, but their absence does not cause dissatisfaction. In our study, attractive demands included providing professional psychological counseling and support, doctors participating in the publicity and education of HPV-related knowledge, and conducting health education services online, including pushing articles and short videos. Currently, medical and health institutions seldom pay attention to the psychological changes of patients with HPV infection. However, a qualitative meta-integration found that HPV infection can cause negative emotions, affecting marital relationships and physical and mental health; patients need disease knowledge, support from medical staff, and care from family and friends.⁴² If medical staff can provide professional psychological counseling and support, patient satisfaction can be greatly improved. Meanwhile, patients have a strong demand for knowledge such as early symptoms of cervical cancer (100.0%) and prevention (79.89%), and they prefer to obtain health education through television/radio/the Internet (91.74%), health education prescriptions issued during diagnosis and treatment (83.47%), and face-to-face consultations (70.8%).⁴³ Providing online health education services makes access more convenient. Attractive demands should be implemented as value-added features after Tiers 1 and 2 are adequately addressed.

Indifferent Demands and Contextual Considerations

Regarding HPV prevention, vaccines, fertility decisions, as well as external conditions such as health education venues and environments, these were classified as indifferent demands in this study. Indifferent demands refer to needs without clear preferences, which are dispensable for patients. However, this classification should be interpreted with caution. Indifferent responses may reflect not that these items are truly unimportant, but rather that patients have limited

awareness or understanding of the topic, or that the wording of certain items failed to capture their concerns. For example, items related to HPV prevention knowledge may be perceived as already well understood or as less relevant due to prior education. Therefore, indifferent attributes should not be automatically dismissed as low priority; instead, they warrant further investigation using qualitative methods or refined survey instruments to better understand patient perspectives. Since 2018, China has started HPV vaccination for women, and the vaccination rate among women aged 9–45 has been increasing year by year. The public's understanding of cervical cancer vaccines has gradually deepened. Compared with other demands, the importance of this demand is relatively low, which also indicates that health education on HPV prevention and vaccines has been relatively well implemented in recent years. Regarding fertility decision-making, the average age of participants in this study was 40.49 years, and the likelihood of desiring additional children was relatively low, so such demands were not rated as essential. However, other researchers analyzing public HPV-related question records through online platforms still found many queries about the impact of HPV infection on pregnancy.⁴⁰ Therefore, such demands should also consider the patient's age and actual reproductive needs. Regarding the environment for health education, as well as external conditions such as venues for expressing emotions, online psychological counseling, and case management platforms, patients may pay more attention to the professional competence and communication skills of medical staff⁴⁴ rather than external conditions. As for allowing family members to accompany patients during medical consultations when necessary, patients may need more the joint participation of spouses in disease management. Spousal participatory health education has been shown to better promote the formation of good preventive behaviors among couples.³²

Practical Recommendations for Clinical Practice

Based on the classification and prioritization results, we propose the following concrete, evidence-based recommendations for nursing managers and health educators:

Ensure universal coverage of must-be items: Develop a standardized “HPV basics” fact sheet or digital presentation covering transmission, natural history, partner management, and cancer risk. This should be provided to every patient at first diagnosis.

Prioritize one-dimensional items in health education programs: Design and implement a structured health education curriculum that addresses the one-dimensional demands such as clear follow-up schedules, treatment options, screening guidance. Consider using a combination of individual counseling, printed materials, and group sessions.

Supplement with attractive items where resources exist: Create online resources (hospital website or WeChat public account) with frequently asked questions, educational videos, and psychological support articles. These can be offered as optional add-ons. Provide training for medical staff on basic psychological counseling skills.

Monitor and evaluate: Use patient satisfaction surveys to assess whether improvements in one-dimensional items lead to higher satisfaction, and adjust resource allocation accordingly. Consider periodic re-assessment of demand classifications as public awareness and clinical practices evolve.

Limitation

The population in this study is only focused on one region, which is limited and the representative sample is insufficient and convenience sampling may introduce selection bias. Participants were recruited specifically from the VIP outpatient clinic. And patients attending VIP clinics typically have higher socioeconomic status, better health literacy, and possibly greater access to health information compared to the general HPV-infected population. This recruitment strategy may have introduced selection bias and limits the generalizability of our findings to the broader HPV-infected population, particularly those in lower socioeconomic strata or rural healthcare settings. Furthermore, the use of an online follow-up platform and recurring reminders may have introduced response biases, particularly social desirability bias (participants may have endorsed items they perceived as socially acceptable rather than their true needs) or acquiescence bias (tendency to agree rather than disagree with statements). To mitigate these risks, we emphasized the anonymity and confidentiality of responses in the survey instructions and explicitly stated that there were no right or wrong answers. Future studies should consider using mixed-mode data collection (combining online and offline methods) to reduce the potential impact of mode-specific biases. Therefore, our results should be interpreted with caution and validated in multi-

center studies with more diverse patient populations. Furthermore, no inferential statistical analyses were conducted to compare demand attributes across different demographic or clinical subgroups. Future studies should incorporate such analyses to identify factors influencing patients' health education needs.

Conclusion

Based on the KANO classification and prioritization results, we propose the following tiered health education implementation strategy: (1) must-be attributes (provide guidance on HPV-related screening and prevention for sexual partners, offer relevant information on the treatment of both the individual and their sexual partners, and inform family members to jointly participate in the management of the disease) represent non-negotiable minimum standards that must be addressed first. We recommend developing a standardized "HPV and partner management" fact sheet to be provided to every patient at first diagnosis. (2) one-dimensional attributes (disease information, inform the latest developments in HPV infection treatment and offer ways to understand the doctor's areas of expertise in the disease) directly influence patient satisfaction and should be prioritized as high-impact areas for immediate improvement. We recommend designing a structured health education curriculum that covers these topics, delivered through a combination of individual counseling and printed take-home materials. (3) Attractive attributes (providing professional psychological counseling and support, doctors participating in the publicity and education of HPV-related knowledge, and conducting health education services online) can be incorporated when resources permit to exceed patient expectations. For example, hospitals may create a WeChat public account with educational articles and videos, or provide basic psychological support training for nursing staff. These should only be implemented after must-be and one-dimensional demands are adequately met.

This framework offers nursing managers a practical, evidence-based approach to allocate health education resources rationally across competing demands—ensuring that basic needs are met first, satisfaction-drivers are prioritized next, and value-added features are added as capacity allows. Future research should use longitudinal designs with large sample sizes to confirm these results.

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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.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Song D, Li H, Li H, Dai JR. Effect of human papillomavirus infection on the immune system and its role in the course of cervical cancer. *Oncol Lett*. 2015;10(2):600–606. doi:10.3892/ol.2015.3295
2. Bruni L, Diaz M, Castellsagué X, Ferrer E, Bosch FX, Sanjosé SD. Cervical human papillomavirus prevalence in 5 continents: meta-analysis of 1 million women with normal cytological findings. *J Infect Dis*. 2010;202(12):1789–1799. doi:10.1086/657321
3. Wang HQ, Wang Y, Wang ZH, Wang YM, Sun XD, Xu DS. Expert consensus on immunoprophylaxis of human papillomavirus-related diseases (abridged). *Chin J Vaccin Immun*. 2019;(6):718–735.
4. Zhang R, Velicer C, Chen W, et al. Human papillomavirus genotype distribution in cervical intraepithelial neoplasia grades 1 or worse among 4215 Chinese women in a population-based study. *Cancer Epidemiol*. 2013;37(6):939–945. doi:10.1016/j.canep.2013.10.005

5. Zhang L, Bi QQ, Chen W, Mou XF. Human papillomavirus genotype prevalence and attribution in patients with cervical intraepithelial neoplasia and cancer. *Chin Gen Pract.* 2019;22(17):2042–2046.
6. Shan W, Zhang T, Zhang TJ, Zhao GM. The epidemiological situation of human papillomavirus infection among women in China. *Chin J Dis Control Prev.* 2017;21(1):89–93.
7. Wang W, Zhang J, Mei C, et al. Prevalence and genotype distribution of human papillomavirus infection among women in Chengdu, China between 2020 and 2024. *Front Public Health.* 2025;13:1740177. doi:10.3389/fpubh.2025.1740177
8. Iova CF, Daina LG, Daina MD, Ghitea TC. The effectiveness of interventions targeting adolescents in HPV Vaccination-A scoping review. *Medicina.* 2024;60(9):1550. doi:10.3390/medicina60091550
9. Li M, Liang L, Chen X, Zhu Z, Fang C, Zhou R. Bridging knowledge gaps: an observational study on HPV awareness and misconceptions among young adults in China. *PLoS One.* 2025;20(12):e0337518. doi:10.1371/journal.pone.0337518
10. Zhao FH, Tiggelaar SM, Hu SY, et al. A multi-center survey of HPV knowledge and attitudes toward HPV vaccination among women, government officials, and medical personnel in China. *Asian Pac J Cancer Prev.* 2012;13(5):2369–2378. doi:10.7314/apjcp.2012.13.5.2369
11. Hu S, Wang H, Yuan M, et al. A nationwide survey on knowledge, attitude and practice regarding human papillomavirus (HPV), HPV-related disease and HPV vaccine among young adults in China. *Vaccine.* 2026;79:128473. doi:10.1016/j.vaccine.2026.128473
12. Zheng RS, Sun KX, Zhang SW, et al. Report of cancer epidemiology in China, 2015. *Zhonghua Zhong Liu Za Zhi.* 2019;41(1):19–28. doi:10.3760/cma.j.issn.0253-3766.2019.01.008
13. Borrull-Guardaño J, Sebastiá-Laguada C, Donat-Colomer F, Sánchez-Martínez V. Women's knowledge and attitudes towards cervical cancer prevention: a qualitative study in the Spanish context. *J Clin Nurs.* 2021;30(9–10):1383–1393. doi:10.1111/jocn.15687
14. Materla T, Cudney EA, Antony J. The application of Kano model in the healthcare industry: a systematic literature review. *Total Qual Manag Bus Excell.* 2019;30(5–6):660–681. doi:10.1080/14783363.2017.1328980
15. Hu L, Wang L, Wang Y, Huang J, Dong P, Luo C. Demand analysis of perioperative nursing service needs for patients with cervical spondylosis based on the Kano model: a cross-sectional study. *BMC Nurs.* 2025;24(1):1103. doi:10.1186/s12912-025-03764-9
16. Tang Y, Deng X, Chen C, et al. Analysis of health information needs of elderly patients with chronic diseases based on Kano model: a descriptive cross-sectional study. *BMC Geriatr.* 2025;25(1):449. doi:10.1186/s12877-025-06106-1
17. Kano N, Seraku N, Takahashi F, et al. Attractive quality and must-be quality. *J Jpn Soc Qual Control.* 1984;14(2):39–48.
18. Mikulić J, Prebežac D. A critical review of techniques for classifying quality attributes in the Kano model. *Manag Serv Qual.* 2011;21(1):46–66. doi:10.1108/09604521111100243
19. Berger C, Blauth R, Boger D, et al. Kano's methods for understanding customer-defined quality. *Cent Qual Manag J.* 1993;2(4):3–36.
20. Bian LJ, Yuan L, Wang J, et al. Application effect evaluation of KANO-based health education model in tumor patients with chemotherapy. *J Changchun Univ Chin Med.* 2021;(2):338–341.
21. Mao JY, Xie LL, Zhao Q, et al. Demand analysis of an intelligent medication administration system for older adults with chronic diseases based on the Kano model. *Int J Nurs Sci.* 2022;9(1):63–70. doi:10.1016/j.ijnss.2021.12.012
22. Wu XQ. Analysis of the demand attributes of pediatric nursing services based on the kano model. *Health Med Res Pract.* 2017;(6):91–93.
23. Fan ZN, Yin WQ, Wang DD, et al. Research on functional requirements of Internet-based health education platform using Kano model. *Chin J Hosp Adm.* 2020;36(3):202–205.
24. Sun J, Dong S, Gong J, Xie J, Yan H. Human papillomavirus vaccination willingness and influencing factors among women in China: a systematic review and meta-analysis. *Prev Med Rep.* 2025;58:103215. doi:10.1016/j.pmedr.2025.103215
25. Zhang Y, Luo L, Du S, et al. Development and validation of the health education demand scale for HPV infected patients based on KANO model. *PLoS One.* 2025;20(1):e0309630. doi:10.1371/journal.pone.0309630
26. Nunnally JC, Bernstein IH. *Psychometric Theory*. 3rd ed. New York: McGraw-Hill; 1994.
27. Wilson Van Voorhis CR, Morgan BL. Understanding power and rules of thumb for determining sample sizes. *Tutor Quant Methods Psychol.* 2007;3(2):43–50. doi:10.20982/tqmp.03.2.p043
28. Witell L, Löfgren M, Dahlgaard JJ. Theory of attractive quality and the Kano methodology – the past, the present, and the future. *Total Qual Manag Bus Excell.* 2013;24(11–12):1241–1252. doi:10.1080/14783363.2013.791117
29. Lee HJ, Chung YB. Development of potential customer demand improvement index based on Kano model: focused on educational service. *J Korean Soc Ind Syst Eng.* 2018;41(1):118–128. doi:10.11627/jkise.2018.41.1.118
30. Bruni L, Alberio G, Rowley J, et al. Global and regional estimates of genital human papillomavirus prevalence among men: a systematic review and meta-analysis. *Lancet Glob Health.* 2023;11(9):e1345–e1362. doi:10.1016/S2214-109X(23)00305-4
31. Li MZ, Zhao FH, Yin RT, et al. Preventive human papilloma virus vaccine guidelines for clinical use in China (2025 edition). *Chin J Clin Obstet Gynecol.* 2025;(2):350–360.
32. Bi FX, Wu LL, Yan Y. Effect of participation health education of spouse on the knowledge and behavior of female with human papilloma virus infection preventing and treating female HPV infection. *Chin J Fam Plann.* 2022;30(4):805–809.
33. Liu C, Wang FL, Zhao QH, et al. Experience among HPV infected patients in childbearing age: a qualitative study. *J Nurs Sci.* 2021;36(9):30–32,36.
34. Rask M, Oscarsson M, Lindell G, Swahnberg K. Women with abnormal Pap smear result: a qualitative study of Swedish healthcare professionals' experiences. *Eur J Cancer Care.* 2016;25(6):980–991.
35. Chen Z, Yin A, Wang Y. Demand analysis of general practice patients for teaching clinic based on Kano model. *Front Public Health.* 2024;12:1336683. doi:10.3389/fpubh.2024.1336683
36. El-Sayed AAI, Abdelaliem SMF. Application of Kano model for optimizing the training system among nursing internship students: a mixed-method Egyptian study. *BMC Nurs.* 2023;22(1):316. doi:10.1186/s12912-023-01485-5
37. Gardella B, Gritti A, Soleymanejad E, et al. New perspectives in therapeutic vaccines for HPV: a critical review. *Medicina.* 2022;58(7):860. doi:10.3390/medicina58070860
38. Mo Y, Ma J, Zhang H, et al. Prophylactic and therapeutic HPV vaccines: current scenario and perspectives. *Front Cell Infect Microbiol.* 2022;12:909223. doi:10.3389/fcimb.2022.909223
39. Zeng J, Guo QY. Cognitive situation and health education demand of Chinese women to human papillomavirus and its vaccine. *Chin Nurs Res.* 2013;27(17):1673–1674.

40. Zhang YY, Zhou LH. Analysis of information demand for human papillomavirus infection among network community users based on the LDA model. *Chin Gen Pract Nurs*. 2025;23(5):949–952.
41. Liu X, Gao FL. The cognitive and psychological experience of in pregnant women with HPV infection: a qualitative study. *Chin Nurs Res*. 2019;33(4):717–720.
42. Hong SS, Hu HT, Xu YH, Pan HY. Meta synthesis of qualitative researches on disease experience and needs of patients with human papilloma virus infection. *J Nurses Train*. 2024;39(21):2306–2311.
43. Cheng YH, Fu QQ, Hu LY. Analysis of the screening results of 363 cases of cervical cancer prevention and investigation of health education needs. *Heilongjiang Med Pharm*. 2024;47(6):136–137.
44. Qaderi K, Geranmayeh M, Farnam F, Hasani SS, Mirmolaei ST. Understanding HPV-positive women's needs and experiences in relation to patient-provider communication issues: a qualitative study. *BMC Health Serv Res*. 2021;21(1):286. doi:10.1186/s12913-021-06265-4

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