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Development of a questionnaire assessing nursing staff's knowledge, attitude, and practice on the prevention of the nosocomial infection in elderly patients: testing reliability and validity[†]

Original article

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Abstract: **Objective**: To develop a questionnaire assessing nursing staff's knowledge, attitude, and practice on the prevention of the nosocomial infection in elderly patients and test its reliability and validity.
Methods: After the drafted questionnaire was developed, two rounds of Delphi survey were conducted by consulting experts to improve the questionnaire. Subsequently, 700 copies of the questionnaire were distributed to nursing staff to assess its reliability and validity.
Results: Exploratory factor analysis (EFA) identifies 3 aspects, namely knowledge, attitude, and practice, with a total of 38 items. The Cronbach's α coefficients of the questionnaire and each of the aspects are 0.85, 0.80, 0.886, and 0.77 (>0.7), respectively. Confirmatory factor analysis (CFA) of each of the aspects are $c^2/df = 3.99, 2.26$, and 3.32; Goodness-of-fit index (GFI) = 0.91, 0.97, and 0.92; Root mean square error of approximation (RMSEA) = 0.06, 0.04, and 0.05; Comparative fit index (CFI) = 0.91, 0.96, and 0.90.
Conclusions: Through this study, it can be ascertained whether the developed questionnaire enjoys sound reliability and validity in assessing nursing staff's knowledge, attitude, and practice on preventing the nosocomial infection in elderly patients and thus has certain application value.

Keywords: *nurse • Delphi method • elderly patient • nosocomial infection • questionnaire*

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1. Introduction

According to statistics from the National Health Commission of the People's Republic of China, in 2014, there were 212.24 million elders in China, accounting for 15.50% of the total population. As of now, the number of China's elderly people over 60 years old has reached nearly 250 million. Among them, more than 40 million

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elderly people are disabled.[1] Elderly people, consequent to the growing life expectancy, changing population structure, and improved medical insurance policies, require a greater hospital capacity in terms of size and quality. Meanwhile, nosocomial infections are difficult to prevent.[2] Infections which occur in the respiratory tract, urinary tract, skin, and soft tissues remain the focus of geriatric care in hospitals and cause difficulties in hospital management in many countries.[3] As elders advance further in age, their immune systems undergo degradation, and this degradation, on some occasions, causes chronic diseases, frequently-occurring diseases, cancer, and immobility, thereby further increasing their chances of developing infections.[4] Being a main contributor to patients' physical deterioration and death,[5] infections consume more medical resources and make patients suffer both physically and financially.[6]

Every link involved in infection prevention and control including disinfection, quarantine, aseptic operation, rational use of antibacterial drugs, and monitoring,[7,8] according to the World Health Organization (WHO), is closely related to nursing work. Nurses are the most direct and continuous participants in the execution of nursing procedures, and they are responsible for the execution of every aspect of nursing work. Therefore, they are qualified to make recommendations and ought to be provided with adequate opportunities to contribute to the primary prevention of infections through evidence-based practices.[9] There are literature, home and abroad, assessing nurses' knowledge, attitude, and practice in relation to nosocomial infections.[10,11] There is, however, a severe limitation in the amount of literature which delves into nurses' knowledge and attitude on how to prevent nosocomial infections in elderly patients.[12] Besides, no questionnaires are found to evaluate nurses' performance in this regard. Yet, obtaining this information will help safeguard elderly patients from infections in hospitals. This study, therefore, aims to design a questionnaire assessing nurses' knowledge, attitude, and practice on nosocomial infections in elderly patients, inspire nursing educators and managers for their targeted key performance indicator (KPI) and, above all, reduce the incidence of nosocomial infections in elderly patients.

2. Methods

2.1. Sample

To ensure the reliability and validity of the questionnaire, interviewees should be 5–10 times[13] the number of questionnaire items. The sample size should be further expanded by 10.00%, given the possibility that there may be invalid responses and given the conduct of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). There are 38 items in the final version of the questionnaire. 700 copies are distributed and 692 (98.86%) collected. Excluding invalid questionnaires, 681 are left with an efficiency rate of 97.29%, which is in line with the designated sample size. The 681 copies are then randomly divided into two groups ($N1 = 341$, $N2 = 340$).

Sample inclusion criteria: (1) Nurses who have worked in the adult clinical department for >1 year and obtained the nursing qualification certificate, and (2) nurses who voluntarily participate in the study.

Sample exclusion criteria: (1) Interns, visiting students, students who have not passed the Standardized Training of Residents exam and those who have not yet obtained professional qualification certificates, and (2) nurses working in such departments as pediatrics, neonatology, obstetrics, and gynecology, without elderly patients.

2.2. Questionnaire design

2.2.1. Structure of the questionnaire

According to Ajzen's Health Belief Model[14] (Figure 1), nursing staff's knowledge and beliefs about nosocomial infections of elderly patients are shaped by cognition.[15] Nurses should know about basic nursing practice, clinical knowledge, compliance awareness, infection prevention, and control.[16] Obtaining knowledge and information about elderly patients constitutes their personal expertise and know-how. In this process, nursing staff's formed attitude towards the prevention of nosocomial infections and exercise of control over elderly patients helps form the latter's right infection-prevention behaviors such as good hand hygiene.[17]

2.2.2. Development of questionnaire items

Based on *Diagnostic Criteria for Nosocomial Infection* and *Standard Operation Procedures for Prevention and Control of Nosocomial Infection*, this paper searches for literature about nurses' knowledge, attitude, and practice on preventing nosocomial infections in elderly patients in databases such as PubMed, Medline, CNKI, CQVIP, and China info. Thereafter, it develops 68 items for the questionnaire, considering physical and psychological features of elderly patients and the fieldwork experience for infection prevention in elderly people. The items are categorized into three dimensions: 38 for knowledge, 14 for attitude, and 16 for practice.
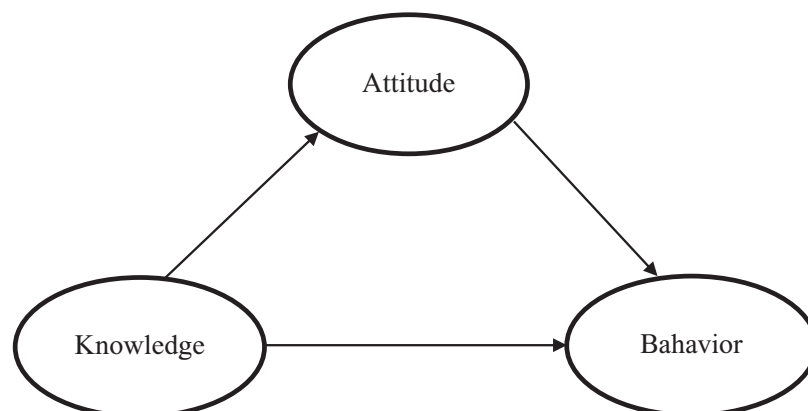
Figure 1. Health belief model.

2.2.3. Delphi method

From January to April, 2019, two rounds of expert inquiries were conducted via email and on-site investigation. The first round of inquiry focuses on the following aspects: (1) introducing the research question and significance of this study; (2) assessing the importance and feasibility of each item in the questionnaire with a 5-point scale (5 = very important, 1 = least important); (3) experts' suggestions towards each item; and (4) sociodemographic information associated with the experts (age, gender, professional title, years of service, etc.). After this, the second round of expert inquiry was conducted based on the revised inquiry from the first round. Ultimately, 20 items were deleted and 11 were revised. The final version of the questionnaire consists of 3 dimensions with 38 items: 18 for knowledge, 10 for attitudes, and 10 for practice.

2.3. Pilot study

The feasibility of this questionnaire is determined by a pilot study of approximately 30 subjects.[18] The points to consider while determining feasibility include time taken to fill the questionnaire, simplicity of the format, clarity of the questions, ease of scoring, and result interpretation. Thirty copies of the questionnaire were distributed following a convenience sampling method to nursing staff for a pilot study with 14–17 min for filling-in. The preliminary survey turned out to be satisfying since all of the mentioned aspects were acceptable to participants.

2.4. Questionnaire survey

The questionnaire consists of two parts: participants' sociodemographic information (department, gender, age, education, professional title, years of service, etc.) and their knowledge, attitude, and practice in relation to the prevention of nosocomial infections in elderly patients. 18 items are designed for assessing nurses' knowledge in this regard (1 = right answer, 0 = unanswered or incorrect answer). 10 items review nursing staff's attitude through a Likert-4 scale (4 = very important, 1 = least important). For the rest of the 10 items, participants' practices are evaluated with "never," "sometimes," and "always." The three options are counted 1, 2, and 3 points, respectively. Notably, there are "reversed items" in this dimension, meaning the higher the score is, the better the nurse's practice is towards infection prevention in elderly patients.

2.5. Data collection

In this study, six trained investigators who were evenly grouped into 3 sub-groups, participated in distributing and collecting the questionnaires. When investigators handed out the questionnaires, they explained the purpose and precautions of the investigation to the respondents. After the respondents filled out the questionnaires, they recalled them on the spot, numbered each copy, and excluded invalid ones to ensure that the feasibility and validity of the data obtained from the survey were not adversely affected.

A total of 700 copies of this questionnaire were distributed following a convenience sampling method to clinical nurses simultaneously, and 692 were collected (98.86%). After excluding invalid ones, 681 (97.29%) valid questionnaires were studied. Of all the participants, 334 (49.04%) are from the department of internal medicine and 347 (50.96%) are from the department of surgery.

2.6. Data analysis

This study aims to test the reliability and validity of a designed questionnaire that assesses nurses' knowledge, attitude, and practice on preventing nosocomial infections in elderly patients. To this end, Epidata 3.1 is used to input data and SPSS22.0 and AMOS 22.0 are used to analyze them. The basic findings are described through the constituent ratio. Further, the reliability and validity of the questionnaire are observed through Cronbach's α coefficient, test–retest reliability, content validity index (CVI), EFA, correlation coefficient and CFA.[19]

3. Results

3.1. Experts inquiry

3.1.1. Sociodemographic information of the experts

The experts selected in this study come from nine first-class hospitals that are situated across three regions of Anhui Province. They are all experienced in the prevention and control of the nosocomial infection. The basic information pertaining to the experts is presented in Table 1.

Basic information	Total number ($n = 15$)	
	Number	Proportion (%)
Age		
<40	2	13.3
40–50	9	60.0
>50	4	26.7
Years of service		
10–20	2	13.3
>20	13	86.7
Educational background		
PhD	3	20.0
Master	4	26.7
Scholar	8	53.3
Professional title		
Professional	7	46.7
Associate	8	53.3
Field of work		
Clinical nursing	5	33.3
Clinical medical echnology	4	26.6
Nosocomial infection	6	40.0

Table 1. Experts' sociodemographic information.

Indicators	Expert inquiry		
	Ca	Cs	Cr
Result	0.9215	0.8895	0.9055

Table 2. Expert authority coefficient.

3.1.2. Experts' enthusiasm towards and the authority of the study

Experts' enthusiasm towards the study is shown by how many questionnaires are collected after being distributed.20 In this study, 15 questionnaires are distributed in each round. 15 (100.00%) copies, subsequently, in each round are found to be collected, suggesting a high level of zeal towards this study among all experts who participated in it. The authority of this study is notated by Cr, which is determined by the coefficient of determination (Ca) and experts' familiarity (Cs) in this field.21 The expert authority coefficient (Cr) is calculated with Cr = (Ca + Cs)/2, as is shown in Table 2.

3.2. Reliability and validity tests

3.2.1. Cronbach's α coefficient

The questionnaire has high consistency and credibility if the Cronbach's α coefficient is >0.7. This study ($N = 681$) sees sound results as the Cronbach's α coefficient of the questionnaire and each of its three sub-dimensions (knowledge, attitude, and practice) exceed 0.7. Some of the respondents are randomly selected 3 weeks later to repeat the survey. The intraclass correlation coefficient (ICC) of the questionnaire and each dimension are >0.7 . The detailed results are shown in Table 3.

3.2.2. Exploratory factor analysis

The questionnaires are randomly divided into 2 groups, and the EFA ($N1 = 341$) and CFA ($N2 = 340$) are carried out. To test if the three factors are consistent with the general questionnaire, EFA is conducted on knowledge, attitude, and practice to compare the result with that of the questionnaire.

Knowledge

The Kaiser–Meyer–Olkin (KMO) statistic is 0.718 (>0.7) and Bartlett's test is <0.001 in this dimension, suggesting adequacy for factor analysis. Varimax with Kaiser normalization is thereafter applied to extract 5 factors from 18 items. The 5 factors are the basic knowledge

Items	Item number	Cronbach's α coefficient	ICC
Questionnaire	38	0.851	0.877
Knowledge	18	0.803	0.851
Attitude	10	0.886	0.899
Practice	10	0.774	0.801

ICC, intraclass correlation coefficient.

Table 3. Reliability-testing statistics ($N = 681$).

of nosocomial infection in elderly patients F1 (K1–K5), clinical knowledge F2 (K6–K9), infection prevention F3 (K10–K12), infection control F4 (K13–K15), and compliance awareness F5 (K16–18). According to our calculation, a total of 78.486% variance is explained. The detailed information regarding this is shown in Table 4.

Attitude

The KMO (0.906) and Bartlett's test ($P < 0.001$) in this dimension suggest a fit for factor analysis. One factor is extracted from 10 items through the varimax rotation. A total of 55.455% variance is explained in this aspect. The detailed information is shown in Table 5.

Practice

In terms of practice, factor analysis is also successfully carried out as the KMO (0.817) and Bartlett's test ($P < 0.001$). Two factors, subsequently, are extracted

from 10 items. They are standard prevention and control F6 (P1–P4) and hand hygiene F7 (P5–P10). A total of 62.974% variance is explained and detailed information is shown in Table 6.

Questionnaire

The nursing staff's KMO is 0.762 and Bartlett's test of the questionnaire is <0.001, and 8 factors are extracted from 38 items using varimax rotation. The 8 factors involve nursing staff's knowledge, attitude, and practice towards nosocomial infections in elderly patents. Among these factors, factor 1 pertains to attitude, factor 2 to basic knowledge (F1), factor 4 to clinical knowledge (F2), factor 6 to infection prevention (F3), factor 7 to infection control (F4), factor 8 to compliance awareness (F5), factors 5 to standard precaution (F6), and factor 3 to hand hygiene (F7). A total of 69.536% variance is explained in this regard. The dimensional structure constructed is consistent with the premeditated structure. For specific results, see Table 7.

Items	Component				
	1	2	3	4	5
K1. What's the definition of nosocomial infection?	0.872				
K2. What's the definition of the outbreak of nosocomial infection?	0.834				
K3. How do multiple drug-resistant organisms transmit?	0.873				
K4. What's the definition of occupational exposure?	0.859				
K5. What's the bed space of elderly patients infected with the same pathogen?	0.735				
K6. Elderly patients will not develop nosocomial infection when going out for physical checks.		0.864			
K7. Elders who cannot take care of themselves are prone to nosocomial infections.		0.914			
K8. Elders with diabetes are prone to nosocomial infections.		0.727			
K9. Bedridden elders are not prone to hypostatic pneumonia.		0.909			
K10. What are the external factors causing nosocomial infections in elders?			0.975		
K11. What are measures to prevent elders from nosocomial infections?			0.962		
K12. What are elders' own factors contributing to nosocomial infections.			0.976		
K13. What are quarantines measures for seriously-ill elderly patients?				0.938	
K14. Elderly patients' wards should open windows regularly for ventilation.				0.829	
K15. Ensuring their skin, mouth, eyes, perineum, and anus are clean can prevent the occurrence of nosocomial infections in elderly patients.				0.848	
K16. Elderly patients attach great importance to hygiene and they are not prone to nosocomial infections.					0.915
K17. Elderly patients have deep dependence on disposables.					0.890
K18. Elderly patients understand quick and well, and educating them about nosocomial infection knowledge is effective.					0.954
Eigenvalue	3.551	3.002	2.893	2.844	2.623
Total variance explained (%)	18.691	15.798	15.228	14.966	13.803

Note: Extraction method: principal factor analysis; Rotation method: varimax with Kaiser normalization.
*rotation converges in 5 iterations.

Table 4. Component matrix* of knowledge.

Items	Component
A1. Is it important to prevent nosocomial infections in elderly patients?	0.745
A2. Is it important to implement a management system to prevent nosocomial infections?	0.805
A3. Is it important to timely report elderly nosocomial infection cases?	0.779
A4. Is the right use of antibacterial drugs important to prevent nosocomial infections in elderly patients?	0.710
A5. Is the right implementation of hand hygiene important to prevent nosocomial infections in elderly patients?	0.809
A6. Is it important to keep elderly patients' skin, mouth, eyes, perineum, and anus clean?	0.799
A7. Is multidisciplinary cooperation important to prevent nosocomial infections in elderly patients?	0.720
A8. Is knowing hospital infection and preventive measures important to prevent nosocomial infection in elderly patients?	0.777
A9. Is it important to strengthen the knowledge and education of nosocomial infection among elderly patients and their families?	0.740
A10. Is avoiding falling over in elderly patients important for preventing nosocomial infections?	0.519
Eigenvalue	5.545
Total variance explained (%)	55.455

Note: *rotation converges in 3 iterations.

Table 5. Component matrix* of attitude.

Items	Component	
	1	2
P5 You will wear masks and other protective gears when performing nursing operations on elderly patients.	0.772	
P6 You will encapsulate with single-layered packaging medical wastes of patients suspected of infectious disease or with non-infections disease but under quarantine.	0.815	
P7 You will observe cleaning standard when the ward is occupied with multiple elderly patients.	0.640	
P8 You will arrange patients with open wounds or immune suppression to be placed in the same ward when the ward is insufficient.	0.808	
P9 For elderly patients with respiratory symptoms (cough, runny nose, stuffy nose), visitors and medical staff need to observe respiratory etiquette.	0.703	
P10 If your hand skin is damaged, you will wear single-layered gloves amidst treating and caring for elderly patients, during which you are likely to contact their blood and other body fluid.	0.698	
P1 You will not wash or sanitize your hands after the treatment and care of elderly patients are completed.		0.813
P2 You will point out their mistakes when your colleagues don't wash hands before treating patients.		0.865
P3 You will repeatedly teach hand hygiene and other knowledge to elderly patients and their families.		0.869
P4 you will attach greater importance to hand hygiene when caring for elderly patients.		0.859
Eigenvalue	3.332	2.966
Total variance explained (%)	33.318	29.656

Note: Extraction method: principal factor analysis; Rotation method: varimax with Kaiser normalization.
*rotation converges in 3 iterations.

Table 6. Component matrix* of practice.

3.2.3. Confirmatory factor analysis

Structural Equation Modeling (SEM) is essentially a path analysis on latent variables.[21] Each variable in the path model is measured by multiple indicators to evaluate the effectiveness and reliability of the structure. Taking F1–F5 (knowledge), F6 (attitude), and F7 (practice) as latent variables, 38 items as observed variables, this study, using AMOS 22.0, draws a second-order equation path diagram and compares it to the data of the other group ($N2 = 340$) to verify the theoretical structure of EFA. The loading of each item under the relevant factor exceeds 0.4 and the difference is statistically significant ($P < 0.050$), as shown in Figure 2.

Items	Component							
	1	2	3	4	5	6	7	8
A1	0.740							
A2	0.796							
A3	0.779							
A4	0.686							
A5	0.793							
A6	0.801							
A7	0.709							
A8	0.773							
A9	0.747							
A10	0.532							
K1		0.866						
K2		0.823						
K3		0.868						
K4		0.853						
K5		0.729						
P5			0.740					
P6			0.800					
P7			0.670					
P8			0.812					
P9			0.717					
P10			0.673					
K6				0.863				
K7				0.910				
K8				0.903				
K9				0.721				
P1					0.805			
P2					0.839			
P3					0.842			
P4					0.859			
K10						0.950		
K11						0.933		
K12						0.953		
K13							0.714	
K14							0.820	
K15							0.846	
K16								0.901
K17								0.880
K18								0.946
Eigenvalue	5.623	3.648	3.358	3.036	3.018	2.915	2.899	2.622
Total variance explained (%)	14.419	9.354	8.610	7.784	7.738	7.474	7.433	6.724

Note: Extraction method: principal factor analysis; Rotation method: varimax with Kaiser normalization.
*rotation converges in 6 iterations.

Table 7. Component matrix* of the questionnaire.
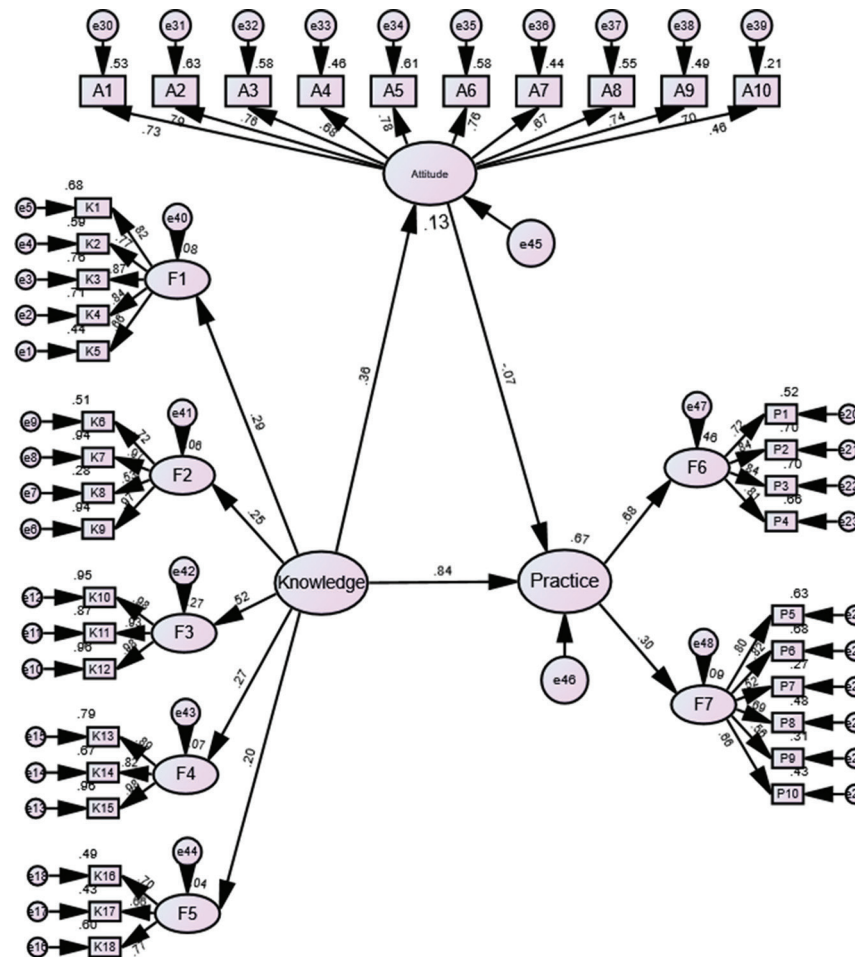
Figure 2. Path diagram of nursing staff's knowledge, attitude, and practice on nosocomial infections (*N2* = 340).

In terms of goodness of fit, the absolute fit index is adopted for the structural evaluation of knowledge, attitude, and practice. The following is what the study finds: $\chi^2/df < 5$, goodness-of-fit index (GFI)>0.8, adjusted goodness-of-fit index (AGFI)>0.9, root mean square error of approximation (RMSEA)<0.08, normed fit index (NFI)>0.8, and comparative fit index (CFI)>0.9. These indicators suggest that the model fits fairly well (Table 8).

Indicators	χ^2/df	GFI	AGFI	CFI	RMSEA
Knowledge (CFA)	3.986	0.911	0.903	0.901	0.061
Attitude (CFA)	2.262	0.969	0.946	0.958	0.043
Practice (CFA)	3.322	0.918	0.898	0.902	0.059

Note: AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; CFA, confirmatory factor analysis; GFI, goodness-of-fit index; RMSEA, root mean square error of approximation.

Table 8. GFI indicators for confirmatory factors (*N* = 681).

3.2.4. Correlation analysis

Correlation analysis reflects the degree of correlation among dimensions and between each dimension and the questionnaire. It can be seen from that the correlation coefficient among dimensions is 0.09–0.34, which is lower than the coefficient between each dimension and the questionnaire (0.42–0.68). All dimensions have a weak or moderate correlation with each other, while each dimension also has a high correlation with the questionnaire. The correlation coefficient is 0.18–0.48 between knowledge, attitude, and belief, showing a moderate degree of correlation. The correlation coefficient between each dimension and the questionnaire is 0.67–0.69, suggesting a high degree of correlation (Table 9 and Table 10).

3.2.5. Content validity index

CVI evaluates whether the designed item can accurately describe the content or theme to be measured.[22]

Item	F1	F2	F3	F4	F5	F6	F7	Attitude	Score
Basic knowledge F1	1	0.093	0.094	0.144**	0.143**	0.188**	0.054	0.106	0.451**
Clinical knowledge F2		1	0.097	0.212**	0.111	0.099	0.095	0.103	0.422**
Infection prevetion F3			1	0.115*	0.104**	0.092**	0.337**	0.159**	0.482**
Infection control F4				1	0.144*	0.119*	0.154**	0.101	0.487**
Compliance awareness F5					1	0.055	0.039	0.135*	0.424**
standard precaution F6						1	0.182**	0.116*	0.489**
Hand hygiene F7							1	0.131*	0.544**
Attitude								1	0.686**
Score									1

Note: *Significantly correlated at the 0.05 level (both sides).
**Significantly correlated at the 0.01 level (both sides).

Table 9. Correlation analysis between each variable and the questionnaire (*N* = 681).

Items	Items	Knowledge	Attitude	Practice	Score
Knowledge	Pearson	1	0.177**	0.475**	0.683**
	sig		0.001	0.000	0.000
Attitude	Pearson		1	0.249**	0.686**
	sig			0.006	0.000
Practice	Pearson			1	0.673**
	sig				0.000
Score	Pearson				1

Note: **Significantly correlated at the 0.01 level (both sides).

Table 10. Correlation analysis between each dimension and the questionnaire (*N* = 681).

4. Discussion

4.1. Validity of the questionnaire content

Nursing staff's knowledge, attitude, and practice on the prevention of the nosocomial infection in elderly patients is designed based on the principles of objectivity and completeness, and has a guiding value. The questionnaire also considers the physiological and psychological characteristics of elderly patients, focusing on the knowledge nursing personnel need to master to prevent nosocomial infections in elderly patients. Finally, 38 items are designed to cover knowledge, attitude, and practice after modifying items in processes such as 2 rounds of Delphi expert consultation and pilot study. The final version of the questionnaire is distributed to 700 clinical nurses, and 681 (97.29%) copies are collected. The questionnaire is completed within 17 min. CVI is an important indicator reflecting the extent to which a variable measures the parameters which it is intended to measure. In this study, the results of the experts' inquiry are used as a benchmark for content validity. The expert authority coefficient is 0.91; I-CVI 0.73–1.00, and S-CVI 0.88, suggesting this study is highly scientific.

4.2. Reliability and validity of the questionnaire

The reliability of this study is observed through Cronbach's α coefficient and test–retest reliability, and the validity mainly through CVI and factor analysis. The Cronbach's α coefficient of knowledge, attitude, practice, and the questionnaire surpass 0.7, indicating a good internal consistency. The retest is conducted 3 weeks later and the Cronbach's α coefficient of the questionnaire exceeds 0.7, showing sound stability and reliability.[24] The higher the cumulative variance contribution rate of common factors, the greater the accuracy with which the total variance can be explained.[25] The variance contribution rate of the questionnaire and each dimension is between 55.455% and 78.486%, indicating that the variation of variance can be explained effectively. The factor loading of each item in each dimension exceeds 0.4 after factor analysis. The KMO and Bartlett's test of each dimension and the questionnaire are >0.7; the correlation coefficient among dimensions and between each dimension and the questionnaire >0.3, suggesting a high degree of correlation.

Typically, the validity is based on expert comment. CVI is sub-categorized into item-level CVI (I-CVI) and scale-level CVI (S-CVI). I-CVI = the number of the experts scoring 4 or 5 for the importance of the research/total number of the experts. S-CVI = the number of items with a 4 or 5 scores/total number of items.[23] In this research, the I-CVI is 0.73–1.00 and the S-CVI is 0.88.

CFI is applied to verify the theoretical structure of the exploratory factors. The following is what the study

finds: c2/df <5, GFI>0.8, AGFI>0.9, RMSEA<0.08, NFI>0.8, and CFI>0.9. These indicators corroborate the assumption that the model will fit well.[26]

To summarize, the designed questionnaire has good reliability and validity, and can reflect nurses' knowledge, attitude, and practice on preventing and controlling nosocomial infections in elderly patients. Future studies can enlarge the sample size and use the questionnaire after testing its content and structure.

4.3. Feasibility of the questionnaire

As the risk of nosocomial infections in elderly patients increases, higher demands are placed on nurses in the prevention and control aspects of nursing work. The implementation of these requirements is inseparable from the nurses' knowledge of nosocomial infections. This questionnaire is constructed by following the Knowledge–Attitude–Practice (KAP) model for measurement. The layout and content of the questionnaire is reasonable and stable. For example, the filling-in time spans 14–17 min. The assessment of nursing staff's knowledge about nosocomial infections of elderly patients can be identified without taking too much time because the options available are plain and clear. This questionnaire is a practical and convenient evaluation tool that should be accessible to hospital infection managers.

5. Conclusions

As elders advance further in age, their body functions and immunity decline, in consequence making them targeted groups for nosocomial infections. Nursing staff face a more daunting task and should meet higher requirements when caring for elderly patients.[27] *Nursing staff's knowledge, attitude, and practice on the prevention of the nosocomial infection in elderly patients* has been developed to investigate nurses' knowledge, attitude and practice on nosocomial infection in elderly patients to inspire hospital managers in their teaching and evaluation work and prevent the occurrence of nosocomial infections.

Acknowledgments

Ethical approval

Ethical issues are not involved in this paper.

Conflicts of interest

All contributing authors declare that no conflicts of interest exist.

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