# Knowledge, attitude, and practice of frailty management among clinical nurses: a cross-sectional study

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## Abstract

**Background** Frailty is a leading risk factor of falls, incapacitation, functional decline, and even death in aging populations globally. Clinical nurses play pivotal roles in screening, prevention, and intervention to reverse or slow the progression of frailty. The present study aimed to (1) understand the extent and influencing factors of knowledge, attitudes, and practices of clinical nurses for managing frailty, (2) elucidate the relationships of the knowledge, attitudes, and practices of clinical nurses for frailty management.

**Methods** This cross-sectional study was conducted from March to April 2024 on 524 clinical nurses in a tertiary hospital in Zhejiang Province, China. The survey instruments included a questionnaire inquiring about the knowledge, attitudes, and practices of nurses in terms of frailty management, a demographic data form, and a self-designed frailty educational information questionnaire. Data were analyzed by descriptive statistics, univariate analysis, multiple linear regression, and structural equation modeling.

**Results** Of 524 nurses, Only 37.2% were rated as good in terms of knowledge, attitude, and practice of frailty management, while 55.7% were rated as moderate. Among them, the proportion of nurses with good knowledge (10.3%) and practical skills (13.4%) is much lower than their attitude (65.3%). Structural equation modeling found that knowledge and attitudes were related to frailty management practices, with significant associations between knowledge and practices($\beta = 0.499$, $p < 0.001$). Of the total effect size of knowledge influencing practice (total effect = 0.624, 95% CI: 0.455,0.791), approximately 20.0% was mediated by attitudes (indirect effect = 0.125, 95% CI: 0.076,0.187). Multiple linear regression analysis showed that age, organizational support, familiarity with relevant guidelines, familiar with the term frailty, and department all had a significant effect on the total score(adjusted $R^2 = 0.264$, $p < 0.001$).

**Conclusions** Despite inadequate knowledge and limited experience in frailty management, clinical nurses' attitudes towards frailty management were positive, indicating potential for improvement. The model was useful to explain practices in frailty management, thereby providing a theoretical basis for development of targeted training programs.

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## Background

With the accelerated aging of global population, frailty has become an emerging public healthcare burden that poses a significant challenge to clinical practice [1]. Frailty is a state of increased vulnerability and reduced stress resistance due to deceased physiological reserves, affecting 26.8–47.4% of older adults [2, 3]. In addition, frailty is a predictor of negative clinical events, including falls, fractures, dementia, and disability, and has been strongly associated with adverse outcomes, such as incapacitation, depression, and sleep disorders [4, 5], thereby significantly increasing healthcare costs and socioeconomic burdens [6]. Multiple clinical practice guidelines have advocated timely identification of frail geriatric patientsand recommend management strategies that include exercise, nutrition, and polypharmacy interventions [7–9]. Therefore, timely screening and management of frailty by healthcare professionals is critical to maintaining the health of frail geriatric patients.

Due to frequent patient contact, nurses are in a strong position to perform frailty assessments and interventions [10]. A systematic review showed that nurse-led interventions reverse the progression of frailty and improved the health of older adults [11], but the literature included in this review was based on three empirical studies from developed countries. Despite expert consensus on frailty screening and management, the understanding of frailty in old age does not provide standard procedures in clinical settings, but the practical implementation of frailty screening and management remains limited [12]. As to the reasons, the possible obstacles are related to the lack of systematic expertise and technology [13]. A UK report reported that while primary health care professionals widely recognise the importance of management of frailty, they often lack confidence in treating frail older adults, which greatly affects the implementation of management strategies [14].

Clinical nurses have insufficient knowledge and practice in frailty management, but the exact extent is currently uncertain. Qualitative studies have shown that even when hospital systems implement frailty screening procedures, not all nurses are aware of the procedures, and nurses have insufficient awareness of frailty and need training [10, 15]. However, the survey population of quantitative studies is mostly health care personnel, and the knowledge level of clinical nurses has been rarely reported. A quantitative survey of healthcare professionals in Brazil revealed heterogeneity in faltering assessments and specific use of standard tools < 50% [16]. In addition, a Canadian research reported a higher use of general fateful screening tools in medical and/or surgical care. These studies either reported only on nurses' attitudes and perceptions or focused on reporting on the practice of frailty screening. However, the actual level of clinical nurses' knowledge, attitudes and practice of frailty management is less frequently reported in quantitative data.

International guidelines recommend frailty screening for all older adults, not just geriatric specialties [7–9]. In China healthcare system, not only do nurses in geriatric specialty clinics but also those in most clinical settings have contact with older inpatients in their daily work. However, one previous study by Chinese scholars [17] that assessed nurses' frailty knowledge utilizing the Knowledge, Attitude and Practice (KAP) model only included nurses who worked in a geriatric setting. Nurses in geriatric setting are more specialized and their KAP levels may be somewhat biased, and not representative of clinical nurses in general, which cannot represent the general level of clinical nurses. Therefore, there is a need to investigate the current status of KAP among nurses in all clinical setting, which not only adds to the broader nursing environment, but also expands the scope of research on geriatric nursing in settings other than geriatric setting.

To better understand the current status of frailty management among Chinese clinical nurses in a broader context, we used the KAP model to understand and hypothesize the relationship between knowledge, attitude, and practice. First proposed in the 1960s, the KAP model is widely used to assess behavioral changes. This theoretical model classifies changes in human behavior into three stages: acquiring knowledge, generating beliefs, and forming behaviors. In this model, "knowledge" refers to understanding and cognition, "attitude" specifies beliefs and approaches, and "practice" indicates behaviors [18]. As a general rule, attitudes mediate translation of knowledge into practice [19]. Accordingly, the success of frailty management is dependent on the knowledge and attitudes of nurses, although the specific relationship remains unclear. Therefore, there is a need for a path analysis of the relationship between nurses' knowledge, attitudes, and practice through structural equation modeling.

To the best of our knowledge, no previous study has applied the KAP model to assess the practices of nurses for managing frailty in older adults. Therefore, the present study aimed to fulfil two objectives: (1) Understand the extent and influencing factors of knowledge, attitudes, and practices of clinical nurses in Hangzhou,

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China, for managing frailty, (2) Elucidate the relationships of the knowledge, attitudes, and practices of clinical nurses for frailty management.

## Methods
### Design
A cross-sectional observational study was conducted in accordance with the STROBE (strengthening the reporting of observational studies in epidemiology) statement (Online Supplementary File 1) [20].

### Setting and participants
Nurses employed in a tertiary hospital in Hangzhou, China, from March to April 2024 were requested to participate in an online questionnaire survey. The inclusion criteria were (1) more than 1 year of experience in clinical nursing, (2) a certificate of nursing practice from the Chinese Ministry of Health, and (3) voluntary participation in the study. The exclusion criteria were (1) nurses not affiliated with this hospital and (2) nurses who were not on duty during the survey. Since the questionnaire included 44 observed variables and was based on structural equation modeling, the minimum sample size was 305 as calculated using G*Power software (version 3.1) [21].

### Instruments
#### Demographic data form
The sociodemographic data of the participating nurses included the department, sex, age, education, job title, years of work experience, and years of experience in geriatric nursing.

#### Knowledge, attitude, and practice of frailty management questionnaire
A Chinese version of the frailty management questionnaire was developed to assess the knowledge, attitudes, and practices of nurses for care of frail geriatric patients [17]. The questionnaire was developed in several stages including literature screening, semi-structured interviews, designing the questionnaire, reviewing the texts, examining the experts' opinions, pre-test, and pilot test. The questionnaire consisted of 31 items and three dimensions: knowledge, attitude, and practices. Knowledge was assessed using six subjective questions ("know", "know a little" or "don't know") and eight objective questions ("correct", "uncertain", or "incorrect"). Attitude was assessed using eight statements that were scored with a 5-point Likert scale (from "strongly disagree" to "strongly agree"), where a higher score indicates a more positive attitude. Practice was assessed using nine statements that were scored with a 5-point Likert scale, ranging from 1 (never) to 5 (frequently). The total score of the questionnaire ranged from 31 to 127, where a higher score

indicates a more optimal overall level of knowledge, attitudes, and practices. The average score rate (%) for each dimension = average score for that dimension/theoretical maximum × 100%, with scores < 60%, 61−79%, and > 80% considered poor, moderate, and good, respectively [22]. The same scale was also applied to the total and entry scores. The Cronbach's alpha value of the questionnaire was 0.845 and the re-test reliability was 0.990. Regarding the pilot data involving 20 randomly selected clinical nurses, the Cronbach's alpha coefficient for the domains of knowledge, attitude, and practice were 0.752, 0.873, and 0.915, respectively, and the Cronbach's alpha coefficient was obtained as 0.846 for the whole tool.

### Educational information of frailty management questionnaire
The educational information of frailty management questionnaire was designed based on a review of the literature. The questionnaire contained six items to assess knowledge with frailty management. The response option for each item was "yes" or "no". The Cronbach's alpha value of the questionnaire was 0.874.

### Data collection and quality control
Members of the research team contacted the head nurse of each unit by telephone to explain the purpose and methodology of the study. Then, the head nurses sent the survey instrument electronically to the study participants. The electronic questionnaire was filled out independently and anonymously by the participants after receiving an explanation of the purpose of the survey questionnaire, the requirements for completion, and related matters. All participants were informed that the survey was voluntary. At the end of the survey, the data were exported using the survey distribution and data collection tool Questionnaire Star [23]. Two researchers checked the data to eliminate non-compliant questionnaires. Notably, there were no missing data in that this survey was conducted through an electronic questionnaire with all items marked as mandatory. Questionnaires that were completed in less than 5 min or included illogical responses were excluded.

### Statistical analysis
All statistical analyses were performed using IBM SPSS Statistics for Windows (version 27.0; IBM Corporation, Armonk, NY, USA). Measured data are presented as the mean ± standard and counted data as frequencies and percentages. Data comparisons were conducted with the independent samples *t*-test and one-way analysis of variance. Statistically significant variables identified by univariate analyses were included in multivariate linear regression analyses to assess the influences of factors affecting the knowledge, attitudes, and practices of

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nurses for frailty management. Spearman correlation analysis was used to analyze the correlation between KAP scores. A probability (*p*) value < 0.05 was considered statistically significant.

R 4.3.3 software [24] was used to construct a structural equation model of the knowledge, attitudes, and practices of nurses for frailty management, choosing a method with the greatest likelihood for parameter estimation, and using the bias-corrected nonparametric percentile bootstrap method to test the mediation effect. A two-sided test was used with a test level of α = 0.05.

### Ethical considerations

The study protocol was approved by the Institutional Review Committee of Hangzhou Hospital of Traditional Chinese Medicine, affiliated with Zhejiang University of Traditional Chinese Medicine (approval no. 2023KL111) and conducted in accordance with the ethical principles for medical research involving human subjects described in the Declaration of Helsinki. Prior to inclusion in this study, informed consent was obtained from all participants. In this study, the informed consent form and questionnaire were adapted into an electronic format. The

initial page of the online survey featured a comprehensive consent statement, which outlined the voluntary nature of participation and the participants' unconditional right to withdraw from the study at any point without incurring any penalties. It was clearly stated that the act of completing and submitting the online questionnaire would serve as an indication of the participants' consent to engage in the research. Following this, a unique link was distributed to a total of 550 potential participants. Of these, 542 individuals chose to provide their informed consent and successfully completed the survey on the dedicated online platform. The survey was conducted anonymously and the collected data were strictly managed by the researchers for the sole purpose of this study and to ensure the privacy of the participants. In addition, the developer of the questionnaire authorized use of the instrument in this study [17].

## Results

### Demographic characteristics of the study participants

Anonymous questionnaires were sent to 550 nurses, of which 542 were returned. Of these, 18 were further excluded, and therefore resulting in a final number of 524 valid questionnaires included for data analysis with an effective return rate of 95.27%. The sociodemographic data of the participants are provided in Table 1. A majority of the study participants were female (98.1%), with bachelor's degrees (90.3%), mean age of 36.47 ± 6.64 years, and 13.68 ± 7.76 years of experience. Most clinical nurses (60.9%) had no experience in geriatric care and only 9.7% worked in geriatric specialty units.

### Knowledge, attitude, and practice of frailty management among clinical nurses

The mean total score of frailty management was 96.17 ± 12.32. The average score of knowledge was 24.48 ± 3.72, of attitude was 34.61 ± 5.54, and of practice was 33.07 ± 7.32. The scores for each dimension and item are shown in Table 2. Based on their self-assessments of the overall score, only 37.2% of the respondents rated themselves as good, while the majority, 55.7%, classified their performance as moderate. As shown in Fig. 1, the proportions of clinical nurses who were rated "good" were much lower for knowledge (10.3%) and practice (13.4%) than attitudes (65.3%).

### Training in frailty management

Only 41.8% of nurses were familiar with the term "frailty", 10.5% were trained in frailty care, 17 0.0% were familiar with guidelines related to physical activity for frail older adults, 17.2% had participated in continuing education or were geriatric specialists, 52.1% received organizational support in geriatric care, and 66.4% had experience in caring for geriatric patients (Table 3).

**Table 1** Participants' demographic information (*n* = 524)

| Items | Categories | N | % |
|---|---|---|---|
| Gender | male | 10 | 98.1 |
| | female | 514 | 1.9 |
| Age group (years) | ≤ 30 | 119 | 22.7 |
| | 31–40 | 274 | 52.3 |
| | 41–50 | 116 | 22.1 |
| | 51–60 | 15 | 2.9 |
| Years of service | 1–10 | 227 | 43.3 |
| | 11–20 | 207 | 39.5 |
| | ≥ 21 | 90 | 17.2 |
| Years of geriatric nursing | 0 | 319 | 60.9 |
| | 1–5 | 68 | 13 |
| | 6–10 | 28 | 5.3 |
| | 11–20 | 88 | 16.8 |
| | ≥ 21 | 21 | 4 |
| Professional title | Junior nurse | 207 | 39.5 |
| | Supervisor nurse | 234 | 44.7 |
| | Chief nurse | 83 | 15.8 |
| Highest education | Associate degree, vocational high school | 11 | 2.1 |
| | Bachelor's degree | 473 | 90.3 |
| | Master's degree, Doctoral degree | 40 | 7.6 |
| Department | Internal medicine | 214 | 40.8 |
| | General Surgical | 165 | 31.5 |
| | Geriatrics | 51 | 9.7 |
| | ICU or Emergency | 38 | 7.3 |
| | Orthopedics or Traumatology | 12 | 2.3 |
| | Others | 44 | 8.4 |

**Table 2** Results for participants' practices related to frailty management in the hospital (*n* = 524)

| Item | Score(M ± SD) | Grade [Person (%)] | | |
|---|---|---|---|---|
| | | Good | Medium | Bad |
| **knowledge** | 28.48 ± 3.72 | 54(10.3) | 344(65.6) | 126(24.0) |
| 1.Do you know the concept of frailty? | 1.57 ± 0.52 | 9(1.7) | 281(53.6) | 234(44.7) |
| 2.Do you know the clinical signs of frailty? | 1.72 ± 0.47 | 6(1.1) | 365(69.7) | 153(29.2) |
| 3.Do you know how frailty is diagnosed? | 1.76 ± 0.46 | 8(1.5) | 384(73.3) | 132(25.2) |
| 4.Do you know how to evaluate a frailty patient? | 1.65 ± 0.49 | 5(1.0) | 331(63.2) | 188(35.9) |
| 5.Do you know what the risk factors for frailty are? | 1.52 ± 0.55 | 16(3.1) | 238(45.4) | 270(51.5) |
| 6.Do you know what the preventive measures for frailty are? | 1.57 ± 0.55 | 17(3.2) | 265(50.6) | 242(46.2) |
| 7.Frailty is the most common risk factor for declining physical function and incapacitation. | 2.34 ± 0.57 | 205(39.1) | 293(55.9) | 26(5.0) |
| 8.Frailty increases the rate of re-morbidity, and unplanned re-hospitalization, increases pain, and reduces the quality of life of patients. | 2.57 ± 0.49 | 297(56.7) | 227(43.3) | 0 |
| 9.Internationally recognized methods of assessment are the Fired Diagnostic Criteria for Frailty and Frailty Index (FI)of accumulative deficits. | 2.04 ± 0.73 | 152(29.0) | 244(46.6) | 128(24.4) |
| 10.The clinical manifestations of frailty patients are mainly fatigue and a sense of resistance; decreased free movement; coexistence of multiple illnesses; and weight loss, with > 10% weight loss in 1 year. | 1.80 ± 0.43 | 7(1.3) | 407(77.7) | 110(21.0) |
| 11.Early identification, intervention, and prevention of the progression of frailty can improve the quality of life of older persons, with significant benefits to older persons, their families, and society. | 2.37 ± 0.48 | 196(37.4) | 328(62.6) | 0 |
| 12.The incidence of frailty afflictions increases with age. | 2.48 ± 0.51 | 254(48.5) | 267(51.0) | 3(0.5) |
| 13.Good management of co-morbidities is one of the measures in the integrated management of frailty in old age. | 2.52 ± 0.50 | 273(52.1) | 251(47.9) | 0 |
| 14.Early promotion of sound nutrition and exercise in older adults is an effective intervention to prevent or minimize senile decline. | 2.56 ± 0.46 | 296(56.5) | 228(43.5) | 0 |
| **Attitude** | 34.61 ± 5.54 | 542(65.3) | 177(33.8) | 5(1) |
| 15.You believe that your knowledge of age-related frailty needs to meet clinical needs. | 3.77 ± 1.23 | 218(14.6) | 215(41.0) | 90(17.2) |
| 16.You believe that nurses should dynamically observe the frailty conditions of elderly patients. | 4.62 ± 0.67 | 374(71.4) | 145(27.7) | 5(1.0) |
| 17.You believe that nurses should receive formal training in geriatric frailty. | 4.48 ± 0.83 | 335(63.9) | 179(34.2) | 10(1.9) |
| 18.You believe that nurses should take on the role of assessing geriatric frailty care. | 4.14 ± 1.02 | 264(50.4) | 229(43.7) | 31(5.9) |
| 19.You believe that early functional exercise is important for prevention and recovery from age-related frailty. | 4.60 ± 0.69 | 357(68.1) | 162(30.9) | 5(1.0) |
| 20.Do you think healthcare professionals should pay as much attention to the prevention of age-related frailty as they do to other symptoms (e.g., DVT)? | 4.44 ± 0.79 | 316(60.3) | 202(38.5) | 6(1.1) |
| 21.You believe that there is a need to educate patients or families about geriatric frailty in your clinical practice. | 4.51 ± 0.74 | 329(62.8) | 190(36.3) | 5(1.0) |
| 22.You think that the frailty condition of older patients should be included in the clinical work of handoffs. | 4.07 ± 1.10 | 258(49.2) | 230(43.9) | 36(6.9) |
| **Practice** | 96.17 ± 12.32 | 195(37.2) | 292(55.7) | 37(7.1) |
| 23.Do you communicate with patients about limb muscle strength in clinical practice? | 4.01 ± 0.98 | 189(36.1) | 296(56.5) | 39(7.4) |
| 24.Do you instruct family members and help patients to do appropriate activities to relieve symptoms such as weakness? | 3.96 ± 0.94 | 166(31.7) | 329(62.8) | 29(5.5) |
| 25.Do you provide effective early functional exercise for older patients? | 3.92 ± 0.97 | 158(30.2) | 337(64.3) | 29(5.5) |
| 26.Do you proactively focus on patients' frailty conditions in your clinical work? | 3.85 ± 1.11 | 185(35.3) | 293(55.9) | 46(8.8) |
| 27.Do you evaluate your patients following nutritional interventions? | 3.83 ± 0.99 | 145(27.7) | 330(63.0) | 49(9.4) |
| 28.Do you evaluate your patients promptly after early activity? | 3.81 ± 0.99 | 138(26.3) | 342(65.3) | 44(8.4) |
| 29.Are you working on frailty knowledge in the course of your job? | 3.52 ± 1.05 | 99(18.9) | 356(67.9) | 69(13.2) |
| 30.Do you conduct frailty assessments of older patients in your clinical work? | 3.19 ± 1.32 | 106(20.2) | 284(54.2) | 134(25.6) |
| 31.Do you promptly report the patient's frailty condition to the physician? | 2.98 ± 0.91 | 35(6.7) | 359(68.5) | 130(24.8) |
| **Total score** | 96.17 ± 12.32 | 195(37.2) | 292(55.7) | 37(7.1) |

Note. M, mean; SD, standard deviation

## Mediation analysis of knowledge, attitudes, and practices of frailty management

Spearman correlation results showed a weak positive correlation (*p* < 0.01) among practice, knowledge, and attitude (Table 4).

As shown in Fig. 2, a path analysis plot was generated. The results show that the model fitted the data ($\chi^2 = 0$, degrees of freedom = 0, goodness-of-fit index = 1, comparative fit index = 1, corrected goodness-of-fit index = 1, and standardized root-mean-square residuals = 0). Path
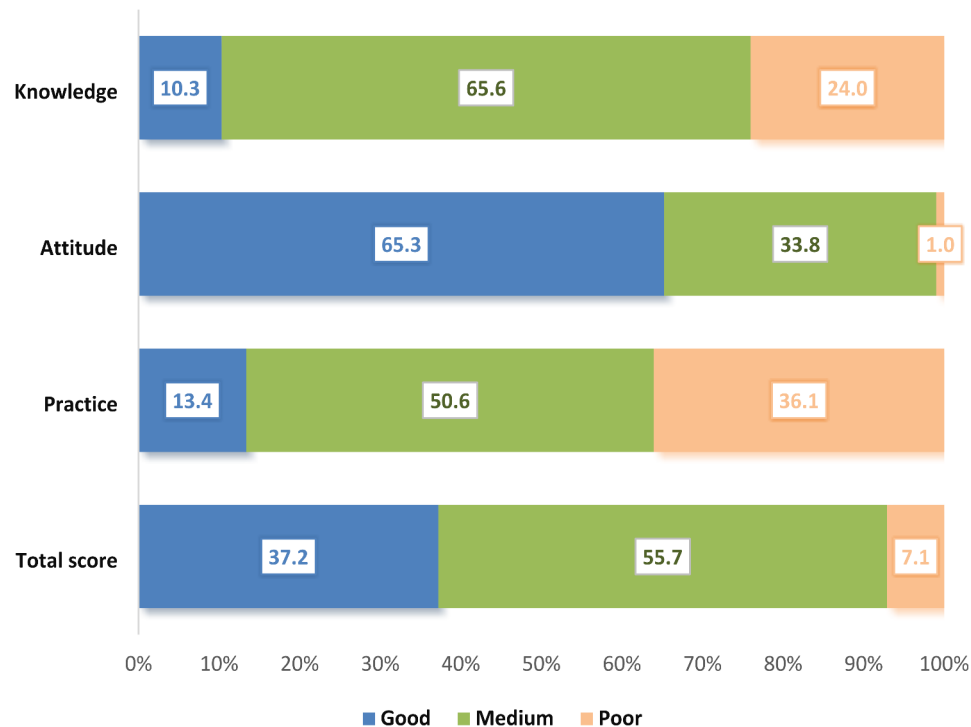
**Fig. 1** Score grades of clinical nurses' knowledge, attitudes, practice, and total scores on the frailty management

**Table 3** Participants' educational information (*n* = 524)

| Items | Categories | N | % |
|---|---|---|---|
| Heard of frailty | Yes | 219 | 41.8 |
| | No | 305 | 58.2 |
| Frail training experience | Yes | 55 | 10.5 |
| | No | 469 | 89.5 |
| Studied relevant guidelines | Yes | 89 | 17.0 |
| | No | 435 | 83.0 |
| Continuing education or specialist nurses in geriatric | Yes | 90 | 17.2 |
| | No | 434 | 82.8 |
| Organizational support | Yes | 273 | 52.1 |
| | No | 251 | 47.9 |
| Care experience of caregivers in elderly patient care | Yes | 348 | 66.4 |
| | No | 176 | 33.6 |

**Table 4** Correlations among participants' KAP

| Items | *r*-Value | *P*-Value |
|---|---|---|
| Practice vs. Knowledge | 0.321 | < 0.001 |
| Practice vs. Attitude | 0.365 | < 0.001 |
| Attitude vs. Knowledge | 0.205 | < 0.001 |

Note. $P < 0.01$; there were significant differences between the correlations

analysis structural equation modeling showed that the paths from knowledge to attitude ($\beta = 0.306$, $p < 0.001$) and practice ($\beta = 0.499$, $p < 0.001$), and from attitude to practice ($\beta = 0.408$, $p < 0.001$) were all statistically significant and in the predicted direction. The results of the mediation effect test using the bootstrap method (200 trials) showed that the 95% confidence intervals for the

direct(95% CI: 0.310 to 0.675), indirect(95% CI: 0.076 to 0.187), and total effects(95% CI: 0.455 to 0.791) of the pathway were not 0, indicating a significant mediation effect ($p < 0.001$). Knowledge influences both the practices of frailty management directly (direct effect = 0.499, $p < 0.001$,) and indirectly through the mediating effect of attitude (indirect effect = 0.125, $p < 0.001$), with the total effect was 0.624 ($p < 0.001$). The results showed that attitudes exerted a partial mediating effect on the pathway from knowledge to practice among nursing staff, with a mediating effect of 20.03% of the total effect.

### Univariate analysis of the total KAP questionnaire score

Univariate analysis was conducted using sociodemographic and educational data of the surveyed nurses as independent variables and total KAP score as dependent variables. As shown in Table 5, age, service years, geriatric nursing years, highest education, department, heard of frailty, frail training experience, familiarity with relevant guidelines, organizational support, and experience in geriatric care affected the performance of the respondents in the the total KAP score.

### Multiple stepwise linear regression analyses of the total questionnaire score

In Table 6, multiple stepwise linear regression model 5 identified five significant predictors that explained 26.4% of the KAP scores. Among these variables, increasing age($\beta = 5.344$), organizational support($\beta = 7.383$),
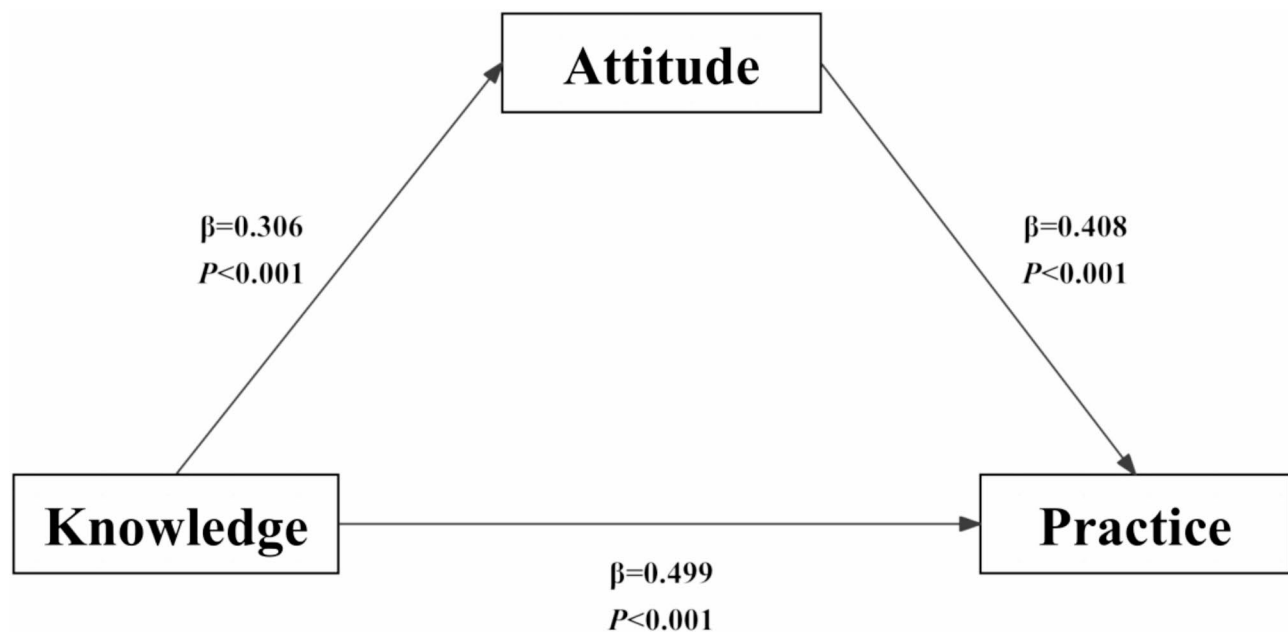
**Fig. 2** Estimation of the modified KAP model of nurse frailty management practice

**Table 5** Results of univariate analysis of nurse frailty management KAP score (n = 524)

| Item | Statistics | p-value |
|---|---|---|
| Gender | 0.629* | 0.53 |
| Age | 27.038# | <0.001 |
| Service Years | 31.246# | <0.001 |
| Geriatric nursing years | 7.983# | <0.001 |
| Highest education | 41.587# | <0.001 |
| Professional title | 2.142# | 0.118 |
| Department | -12.846# | <0.001 |
| Heard of frailty | 6.908* | <0.001 |
| Frail training experience | 6.837* | <0.001 |
| Studied relevant guidelines | 8.361* | <0.001 |
| Specialist or refresher | 2.884* | 0.056 |
| Organizational support | 7.905* | <0.001 |
| Care experience for the elderly | 4.063* | <0.001 |

Note.*t-test;#F test

familiarity with relevant guidelines($\beta = 7.413$), and familiarity with frailty($\beta = 4.139$) were protective factors for the level of KAP in clinical nurses, while department($\beta$=-0.866) was a risk factor.

## Discussion
### Key findings
The study participants had medium levels of knowledge and practices with regard to frailty management with positive attitudes, but relatively few attained an excellent level (37.2%), indicating that clinical nurses still have many doubts or misunderstandings about frailty. There was a weak positive correlation of practices and knowledge with attitudes. Attitude exerted a partial mediating effect on the pathway from knowledge to practice for nursing staff. Meanwhile, the level of frailty management was influenced by age, organizational support, familiarity with relevant guidelines, familiar with the term frailty, and department. These results provide important

**Table 6** Multiple linear regression analysis of factors affecting nurses KAP total score of frailty management

| Variates | β | SE | β′ | t-Value | P-Value | 95%CI lower | upper |
|---|---|---|---|---|---|---|---|
| Constant terms | 104.066 | 3.707 | | 28.075 | <0.001 | | |
| Age | 5.344 | 0.650 | 0.325 | 8.217 | <0.001 | 0.899 | 1.112 |
| Organizational support | 7.383 | 0.987 | 0.300 | 7.479 | <0.001 | 0.876 | 1.141 |
| Studied relevant guidelines | 7.413 | 1.267 | 0.226 | 5.850 | <0.001 | 0.941 | 1.062 |
| Heard of frailty | 4.139 | 1.374 | 0.127 | 3.012 | 0.003 | 0.793 | 1.261 |
| Department | -0.866 | 0.309 | -0.106 | -2.801 | 0.005 | 0.974 | 1.026 |

Note.$\beta$ = Regression coefficient; SE = Standard errors; $\beta'$=Standardized regression coefficient; 95%$CI$ = 95% confidence interval; $R^2$=0.271, After adjustment $R^2$ = 0.264; F = 38.506, $P$ < 0.001

information to develop targeted measures to improve the knowledge and practices of nurses in frailty management.

### Knowledge of clinical nurses about the management of frailty

The results of this study showed that only 10.3% of the nurses had good knowledge of frailty, which is slightly lower than that of a multicenter study of nurses in geriatric-related departments [17]. This difference may be due to the representativeness of the sample, as this study not only surveyed geriatric specialty nurses, but also included nurses from medical, surgical, emergency, intensive care, and other departments who lack experience in geriatric assessment and frailty management. Frailty management is in preliminary stages in China, as there are currently no established criteria for screening, diagnosis, and management [1]. It is worth noting that Gobbens et al. showed that nurses often confuse the concept of frailty with sarcopenia, aging, disability, and loss of function in a variety of complex diseases [10]. The lack of criteria hinders the ability of nurses to care for frail geriatric patients, as knowledge of frailty is critical for implementation of assessment and intervention strategies [25]. A Chinese survey showed that older adults at high risk of frailty are more likely to lack knowledge about frailty [26]. Clinical nurses, who are the primary professionals in screening and managing frailty, should have sufficient frailty-related knowledge to provide effective advice to geriatric patients. Therefore, raising awareness is crucial for nurses to correctly identify and manage frail geriatric patients.

### Nurses' attitudes toward managing frailty

This study revealed that the majority of nurses showed positive attitudes toward frailty and performed best on all three KAP dimensions. Not coincidentally, the Ji et al. study reported similar results with positive attitudes despite nurses having little knowledge about sarcopenia [22]. Most nurses recognize that frailty is reversible [27] and acknowledge the roles and functions of nurses in frailty screening and management [15]. A systematic review showed that positive attitudes and beliefs about the benefits of frail screening among health care providers facilitated its implementation [28]. A prior survey of emergency department nurses revealed a strong interest in learning about frailty management [29]. Therefore, nursing administrators should consider the psychoemotional factors of clinical nurses when planning frailty management clinical practice strategies and training programs.

### Clinical nursing practices applied in the management of frailty

In this study, fewer nurses had a good practice grade, but was slightly higher than that of a prior survey [17]. The reason for this difference may be related to the title and years of experience of the participants. More than half of this study participants had supervisor or chief level positions with an average of more than 10 years of experience in caring for frail older inpatients [15]. Therefore, the clinical nurses were able to perform well on the muscle strength assessment and activity instruction entries for older inpatients. However, there was still a large discrepancy between the level of practice and good attitudes of the nurses in this study, demonstrating the need for further improvement. Research by Yan et al. noted the need for comprehensive exercise and nutritional interventions in addition to medications to minimize the development and progression of frailty [30]. As shown in Table 2, the lowest ranking survey question were "Do you assess frailty in geriatric patients in your clinical practice?" and "Do you report your patients' frailty status to your physician promptly?", which is consistent with recent reports of inadequate frailty screening [15, 31]. This practice-guideline discrepancy highlights the importance of educational programs to improve frailty management.

### Positive correlations and action paths of knowledge, attitudes, and practices

In this study, the knowledge, attitudes, and practices of nurses were positively correlated to frailty management, which is consistent with previous studies [18, 19, 32, 33]. These findings suggest that good attitudes based on adequate knowledge can motivate nurses to change their behaviors [22]. Futhermore, the results of equation modeling showed that a positive attitude can mediate the translation of knowledge into practices, in agreement with the results of previous studies confirming the important role of a positive attitude [18, 19]. Notably, knowledge can influence the practice of frailty management both directly and indirectly through the mediating effect of attitudes, implying that knowledge can improve practices in frailty management [34].

### Influencing factors of nurses' knowledge, attitudes, and practices

Multifactorial analysis showed that nurses with older age in a geriatric-related unit achieved higher scores for frailty management, similar to the findings of a prior study [17]. Older nurses tend to have more clinical experience and assume roles in nursing education, management, and research. As a result, older nurses have the opportunity to acquire cutting-edge knowledge in geriatric care and have more experience in frailty screening and management to address related complications

[35]. Notably, nurses in the orthopedics and traumatology department, who frequently encounter patients with fragility fractures, may possess more specialized knowledge and practical skills in managing frailty. This could be attributed to their regular exposure to frailty-related conditions. However, due to the limited sample size of this subgroup, further studies are needed to explore these differences in greater depth.

Educational experience in frailty and familiarity with relevant guidelines enhances performance in frailty management. As compared to nurses with education and experience in frailty management, the accuracy of frailty assessment by untrained nursing staff is inferior, with an accurate assessment rate of about 60% [36]. Meanwhile, other than nurses, administrators should also organize educational programs for other healthcare providers [37, 38]. Additionally, organizational support was found to improve frailty management of nurses and clarify the relevance of frailty screening in daily work [15]. As a prior study suggested [39], routine frailty assessment requires resources for frontline staff, including clinical guidance and targeted education to ensure accurate frailty assessment and management.

### Implications for clinical practice

The findings of this study offer important theoretical and practical implications for educating and training nurses, to facilitate the implementation of frailty management in clinical settings. First, the relationship between the three components of the KAP suggests to clinical managers that in order to improve the clinical practice of frailty management, clinical nurses need to be equipped with appropriate knowledge and skills and their positive attitudes need to be enhanced. Second, the lack of knowledge and practice scores provides detailed information for clarifying the training program, which needs to be detailed in a practical continuing education program and a corresponding operation manual. Researchers can develop localized implementation programs based on evidence-based guidelines, which will help promote frailty management and further improve the frailty status and quality of life of older inpatients. Finally, the discovery of KAP influences informs management strategies. Hospital administrators should underscore clinical nurses' role to gain knowledge and take action in frailty management through training, optimization of procedures, and rational allocation/provision of resources to enhance clinical practice and facilitate rehabilitation of frail geriatric patients to improve the life quality.

### Limitations of the study

There were limitations to this study. First, convenience sampling of nurses from one hospital in this study creates sampling bias that may limit the generalizability of the results. In addition, there were intentional and unintentional biases in the willingness of nurses to participate in the survey, which may have led to overestimation of the results [40]. Further studies with random sampling methods and larger samples are needed to improve accuracy and confirm the reported results. Second, the use of cross-sectional data restricts the ability to establish causality [41]. This study was a cross-sectional design and therefore the causal relationships among knowledge, attitudes, and practices cannot be directly inferred. Therefore, longitudinal studies are needed to explore the specific influences of pathways and mechanisms. Third, this study investigated the current status of attitudes and practices of frailty management from the perspective of individual nurses through quantitative research methods only, which did not allow for an in-depth understanding of respondents' perceptions and comments. The results of the study do not reflect the views and opinions of the subjects from a deep perspective, nor do they represent the attitudes of organizational managers and the public towards faltering management. Future research using a mixed-methods design is warranted to explore the perceptions and impacts of frailty management from individual, organizational, and societal perspectives.

### Conclusion

The results of this study suggest that although clinical nurses have positive attitudes towards frailty management, their knowledge and practice are inadequate and need to be improved. Managers need to emphasize the importance of frailty management in the older inpatients, thus further strengthening the positive attitudes of clinical nurses. Clinical nurses' knowledge of frailty screening and assessment, nutritional exercise interventions, and health education can be improved through training programs. Future research could also potentially improve clinical practice of frailty management by providing frailty management specialty consultations and conducting geriatric specialty rotations for advanced training.

### Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12877-025-05776-1.

Supplementary Material 1

Supplementary Material 2

curation; Software. Wenhui Jiang: Conceptualization; Funding acquisition; Paper revision.

## Data availability
The datasets generated and analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

## Declarations

### Ethics approval and consent to participate
This study was approved by the Ethics Board of Hangzhou TCM Hospital Affiliated to Zhejiang Chinese Medical University (NO. 2023KL111). All participants gave written informed consent. The research protocol was established according to the ethical guidelines of the Declaration of Helsinki.

### Consent for publication
Not applicable.

### Competing interests
The authors declare no competing interests.

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