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## International Journal of Nursing Sciences

journal homepage: <http://www.elsevier.com/journals/international-journal-of-nursing-sciences/2352-0132>

## Original Article

## Knowledge, attitude and practice regarding nursing interruptions among Chinese nurses: A nationwide cross-sectional survey

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## ARTICLE INFO

## Article history:

Received 2 April 2019

Received in revised form

26 November 2019

Accepted 10 December 2019

Available online 16 December 2019

## Keywords:

Attitude  
Knowledge  
Nursing  
Nursing interruptions  
Practice  
Questionnaires

## ABSTRACT

**Objectives:** To explore the knowledge, attitude and practice of Chinese nurses regarding nursing interruptions and related factors.**Methods:** A total of 6,400 nurses from 31 hospitals in China were investigated by using the Knowledge, Attitude and Practice (KAP) Questionnaire of Nursing Interruptions. The questionnaire consists of three dimensions, knowledge, attitude and practice, containing 10, 9 and 7 items, with full score of 50, 45 and 28, respectively.**Results:** The mean overall KAP score regarding nursing interruptions of Chinese nurses was  $74.05 \pm 16.65$  (range: 26–123), with scores for the knowledge, attitude, and practice component being  $21.74 \pm 9.80$ ,  $34.83 \pm 6.98$ , and  $17.49 \pm 4.97$ , respectively. Among the nurses, 70.8% of them experienced an average level of KAP toward nursing interruptions while 15.5% were at a poor level. The knowledge, attitude, and practice of nursing interruptions were better in chief nurses, managers, nurses with a master degree or above, nurses ever received training, and nurses with a strong agreement to leadership compared to nurses in other groups ( $P < 0.05$ ). In addition, employment type, professional title, position, standardized training and leaders' attention were predictors of KAP in nurses.**Conclusion:** Chinese nurses have a moderate level of KAP regarding nursing interruptions. Leaders' attention, standardized training, position, professional title and employment type could predict nurses' KAP state of nursing interruptions. Thus, a targeted training program should be implemented for clinical nurses by nursing leaders, with a particular focus on feasibility and professionalism.© 2020 Chinese Nursing Association. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## What is known?

- Nursing interruptions are common during nursing and frequent nursing interruptions threaten patients' safety, as well as affect physical, and emotional health of nurses.
- The baseline knowledge, attitude, and practice (KAP) of nursing interruptions of the target population should be aware of before planning any training programs or educational activities.

- Few data is available in the literature highlighting the knowledge, attitude, and practice levels regarding nursing interruptions.

## What is new?

- The KAP regarding nursing interruptions was at a moderate level among Chinese nurses.
- The nurses' KAP regarding nursing interruptions was associated with leaders' attention, experience of standardized training, nurses' position, professional title, years of employment, employment type, age, shift work, and entry level of nursing education.

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Peer review under responsibility of Chinese Nursing Association.

- A targeted training program should be implemented for clinical nurses by nursing leaders, with a particular focus on feasibility and professionalism.

## 1. Introduction

Nursing interruptions are defined as unexpected events generally caused by a break in the primary nursing care task [1]. Nursing interruptions is common during nursing, and a previous study reported a high rate of over 6 interruptions hourly in clinical nurses [2]. Over 85% of nursing interruptions could lead to negative consequences because they can cause medication administration errors [3,4], surgical procedure errors [5], and slips and lapses in routine nursing tasks [6]. Therefore, nursing interruptions have brought huge security risks and harms to hospitalized patients. Thus, frequent nursing interruptions can increase the morbidity and mortality of patients, and the financial burden of the healthcare system, as well as cause professional, physical, and emotional affection in the nurses [7–9].

Although the resources and consequences of nursing interruptions have been widely investigated, knowledge, attitude, and practice (KAP) regarding nursing interruptions have not been deeply studied in nurses [10]. Inadequate knowledge and poor practices of nursing interruptions management among nurses can cause severe effects on a patient's health. Whether the nurses know how to effectively manage interruptions is also a critical issue. Nurses are the healthcare provider with the greatest amount of direct patient contact and are the major parties involved in nursing interruptions. Therefore, nurses deserve more attention during safety management. Thus, the baseline KAP of nursing interruptions of the target population should be aware of before planning any training programs or educational activities [11]. However, no data is available in the literature highlighting the knowledge, attitude and practice levels regarding nursing interruptions.

In this study, we assessed the knowledge and attitude regarding nursing interruptions in nurses, as well as their self-reported practices which are related to nursing interruptions management.

## 2. Materials and methods

### 2.1. Setting and sampling

This is a cross-sectional descriptive study. A multi-stratified grouping random sampling method was used to obtain the final samples. China was geographically divided into 7 regions of northeast, north, central, east, south, northwest, and southwest China. The number and proportion of RNs in each region were obtained from Chinese Health Statistics in 2012 which were released by the National Health and Family Planning Commission. The levels of hospitals (Hospitals in China are categorized into three levels.) in each region was obtained from the website of the National Health and Family Planning Commission of China. Totally 6400 nurses were recruited from 31 hospitals (Including 20 tertiary hospitals and 11 secondary hospitals) between July and December 2016. The 31 hospitals were located in 15 cities of 13 provinces in 7 geographical regions. We numbered each hospital and randomly selected 31 hospitals using SPSS software, then we emailed or called the hospital administrators and nursing managers of each selected hospital, informing them of the purpose and procedure of the investigation, and obtaining their consent and help. After that,

we numbered nurses in the lists of the selected hospitals, and 25% was randomly obtained from the total RNs in each of the selected hospitals through SPSS software. Then, head nurses and directors from each hospital invited nurses to participate in this study. The inclusion criteria were that: (1) the nurses were registered or licensed; and (2) the nurses provided direct care to patients. The nurses from drug distribution centers, central sterile supply departments, and so on were excluded. This study was approved by the Ethics Committee of the Third Xiangya Hospital of Central South University. The participants gave their consent before the survey.

### 2.2. Measurements

#### 2.2.1. General data questionnaire

General data questionnaire included information on gender, age, marital status, departments, years of employment, employment type, professional title, position, first degree, highest degree, monthly income, night shift, previous experience in standardized training of nursing interruptions, nursing interruptions experiences and leaders' attention (leadership attaches importance to nursing interruption management). In our study, professional titles were classified into five levels: Level 1-Junior Nurse, Level 2-Senior Nurse, Level 3-Supervisor Nurse, Level 4-Associate Chief Nurse and Level 5-Chief Nurse [12]. Level 1: Graduates of nurses with secondary or higher education. Level 2: Nurses with secondary school education have worked for 5 years; Nurses with junior college education have worked for 2 years; Graduates with a bachelor degree. Level 3: Senior nurses with secondary school education have worked for 7 years; Senior nurses with junior college education have worked for 6 years; Senior nurses with a bachelor degree have worked for 5 years; Senior nurses with a master degree have worked for 2 years; Nurses with doctoral degree. Moreover, they have published papers. Level 4: Supervisor nurses with bachelor degree or above have worked for over 5 years; Supervisor nurses with doctoral degree or above have worked for over 2 years. Meanwhile, they have published high-level papers and carried out scientific research. Level 5: Over 5 years working as an associate chief nurse. Moreover, they have published monographs and academic papers.

#### 2.2.2. The Knowledge, Attitude and Practice Questionnaire of Nursing Interruptions

Guided by the Knowledge-Attitude-Practice Theory, and combined with the practice of nursing interruption popularization in China, through literature review and panel discussion, the concept framework and of the questionnaire was determined, the dimensions of the scale were set up, and the item pool was established. The Knowledge, Attitude and Practice Questionnaire of Nursing Interruptions was evaluated by 12 experts and the content validity index was 0.83. The final version of the Questionnaire consisted of 26 items and three dimensions: knowledge, attitude and practice. Questions of knowledge regarding nursing interruptions mainly focused on the general concept of nursing interruptions, source, type, outcome, influence, and response. Each item was scored 1 (no understanding) to 5 (strong understanding). The knowledge dimension contained 10 items with a total score of 50. Questions of attitude towards nursing interruptions focused on nurses' general view regarding different aspects of nursing interruptions cognition and coping. Each item was scored 1 (strongly disagree) to 5 (fully agree). The attitude dimension contains 9 items with a total score of 45. The nursing interruption-related practice

dimension included nursing interruptions identification, treatment, training, and management, etc. Each item was scored 1 (never) to 4 (always). The practice dimension contains 7 items with a total score of 28 points. A high total score of the Questionnaire represents rich knowledge, a positive attitude and practice. We use exploratory factor analysis to test structural validity. Bartlett's test of sphericity and the Kaiser-Meyer-Olkin test were used to confirm that the measure was appropriate for exploratory factor analysis (Bartlett's test of sphericity = 20613.23, Kaiser-Meyer-Olkin value = 0.947;  $P < 0.01$ ). A three-factor structure was yielded, which accounted for 79.7% of the total variance, indicating that the structure was consistent with the theoretical hypothesis. Cronbach's  $\alpha$  coefficient of the Questionnaire content was 0.953, the retesting reliability coefficient was 0.85–0.89, and Spearman-Brown split-half value was 0.986. The Questionnaire demonstrated satisfactory reliability and validity in the Chinese nurses.

### 2.3. Procedure

The study team was comprised of 38 nurse managers and 12 nursing postgraduates. The team members explained the purpose of the study and associated concepts before the survey. 30–45 minutes were given to participants to fill out the questionnaires. All questionnaires were filled in anonymously.

### 2.4. Data analysis

All information from the questionnaires was typed into a computer according to the serial numbers. Forms with more than 20% missing data were excluded from the final analyses. SPSS 23.0 was used for data analysis. Frequency, percentage, mean, and standard deviations were used to present descriptive data. ANOVA and  $t$ -test were applied to examine the difference of KAP among socio-demographic variables. Multiple linear regression analysis was used to explore the predictors of KAP of nursing interruptions. A  $P < 0.05$  was considered statistically significant. An  $\alpha$  of 0.05 was determined a prior.

## 3. Results

### 3.1. General characteristics of the participants

A total of 6400 questionnaires were spread out and 6105 (95.4%) effective questionnaires were received. Among the participants, 5154 (84.4%) were from tertiary hospitals and 951 (15.6%) were from secondary hospitals. The basic characteristics of participants are shown in Table 1. The majority of the participants were females (97.3%), aged between 26 and 30 years old (36.0%), married (59.3%), formal employed (44.9%), with a low professional title (79.0%). In addition, 92.1% experienced nursing interruptions and 89.1% will require nursing interruptions management training.

### 3.2. Dimensions evaluation of KAP regarding nursing interruptions

The mean scores of knowledge, attitude, and practice toward nursing interruptions were  $21.74 \pm 9.80$ ,  $34.83 \pm 6.98$ , and  $17.49 \pm 4.97$ , respectively. Among the items regarding the knowledge of nursing interruptions, the five items with lower mean score were Item 3 (the types of nursing interruptions), Item 1 (the understanding of nursing interruptions), Item 2 (the sources of nursing interruptions), Item 4 (the consequences of nursing interruption) and Item 5 (the common types of interruptions during nursing work). 40.8% of nurses didn't know nursing interruptions

and the sources of nursing interruptions. More than 50% had inadequate knowledge about consequences of nursing interruptions, its impact on patient safety and nurses' emotions, and how to cope with them (Table 2). For the attitude about nursing interruptions, the three items with relatively low score are Item 7 (I think reducing nursing interruption events will improve my mood), Item 8 (I want to change the working environment of nursing to reduce nursing interruption events), Item 9 (I always deal with nursing interruption events actively). Most nurses had a positive attitude toward nursing interruptions (Table 3). Regarding the practice of nursing interruptions, the response to the statement showed that the three items with lower scores were Item 1 (accurate identification of nursing interruptions at work), Item 2 (report nursing interruptions to superiors in time), and Item 5 (response to nursing interruptions according to the requirements of superiors). Only 25.9% of nurses could usually or always accurately identify nursing interruptions, and less than 50% could usually or always timely report and respond to them as required when nursing interruptions occur (Table 4).

### 3.3. Overall evaluation of KAP regarding nursing interruptions

The overall score of KAP of nursing interruptions in the participants was  $74.05 \pm 16.65$ . A normal distribution of the overall score KAP of nursing interruptions was shown using the normality test, and the score range was from 26 to 123. The KAP total scores of nursing interruptions were categorized into levels of poor ( $< 58$ , 15.5%), average (59–91, 70.8%), and good ( $> 92$ , 13.8%). The results showed that the total score of KAP toward nursing interruptions was significantly different among nurses with different ages, lengths of service, employment types, professional titles, positions, first degrees, shift work, standardized training, and leaders' attention ( $P < 0.01$ ). The total score of KAP towards nursing interruptions was better among chief nurses, managers, nurses with master degree and above (entry level of nursing education), having received standardized training, and those had more leaders' attention compared to nurses in other groups ( $P < 0.05$ ), except for the practice score of nursing interruptions in the nurses with a first degree of master and above ( $P > 0.05$ ). Nurses aged 41–45 years showed better knowledge and attitude towards nursing interruptions compared to other nurses ( $P < 0.01$ ). The nurses with a length of service above 16–20 years showed a better attitude and practice towards nursing interruptions compared to other nurses ( $P < 0.01$ ). Formally employed nurses showed a higher score in the attitude of nursing interruptions compared to other groups ( $P < 0.01$ ). The score was found higher among nurses without night shift work compared to nurses with night shift work ( $P < 0.01$ ) (Table 5). The result of multiple linear regression showed employment type, professional title, position, standardized training and leaders' attention were the predictors of KAP regarding nursing interruptions in nurses (Table 6).

## 4. Discussion

Nurses' competency directly influences patient safety and the quality and effectiveness of patient care [13]. Frequent interruptions are known to compromise patient safety from minor slips to major mistakes [3,14]. However, the study on the KAP of nurses on interruptions is lacking, particularly in China. This study found that 92.1% of nurses experienced nursing interruptions and nearly 90% of nurses needed nursing interruptions management training. Only 27.7% of nurses ever received a standardized training about nursing interruptions, and over 15% of clinical nurses had a

**Table 1**  
General characteristics of participants (n = 6105).

Variables	n (%)	Variables	n (%)
<b>Gender</b>		<b>Hospital level</b>	
Male	163 (2.7)	Secondary	951 (15.6)
Female	5942 (97.3)	Tertiary	5154 (84.4)
<b>Age</b>		<b>Position</b>	
≤25	1618 (26.5)	General nurse	4634 (75.9)
26–30	2197 (36.0)	Quality control group leader	780 (12.8)
31–35	1147 (18.8)	Nursing training group leader	186 (3.0)
36–40	619 (10.1)	Head nurse	470 (7.7)
41–45	330 (5.4)	Manager	35 (0.6)
>45	194 (3.2)	<b>Entry level of nursing education</b>	
<b>Marital status</b>		Below junior college	1533 (25.1)
Married	3623 (59.3)	Junior college	2815 (46.1)
Windowed	13 (0.2)	Undergraduate	1712 (28.0)
Divorced or separated	103 (1.7)	Master and above	45 (0.7)
Single	2366 (38.8)	<b>Highest level of education</b>	
<b>Departments</b>		Below junior college	107 (1.8)
Medical	1805 (29.6)	Junior college	1750 (28.7)
Surgical	1518 (24.9)	Undergraduate	4116 (67.4)
Gynecology	320 (5.2)	Master and above	132 (2.2)
Pediatric	405 (6.6)	<b>Income per month (CNY)</b>	
ICU	644 (10.5)	<4000	1401 (22.9)
Operation room	413 (6.8)	4000–5999	2418 (39.6)
Emergency departments	295 (4.8)	6000–7999	1351 (22.1)
Others	705 (11.5)	8000–10000	629 (10.3)
<b>Years of employment</b>		10000–12000	213 (3.5)
<3	1480 (24.2)	>12000	93 (1.5)
3–5	1203 (19.7)	<b>Night shift work (above 4 per month)</b>	
6–10	1586 (26.0)	Yes	4707 (77.1)
11–15	801 (13.1)	No	1398 (22.9)
16–20	496 (8.1)	<b>Standardized training</b>	
>20	539 (8.8)	Yes	1689 (27.7)
<b>Employment type</b>		No	4416 (72.3)
Temporary nurse	2178 (35.7)	<b>Leaders' attention (leadership attaches importance to nursing interruptions management)</b>	
Contract employed nurse	1185 (19.4)	Fully agree	1416 (23.2)
Formal employed nurse	2742 (44.9)	Agree	2021 (33.1)
<b>Professional title</b>		Not sure	2217 (36.3)
Level 1	1963 (32.2)	Disagree	386 (6.3)
Level 2	2860 (46.8)	Strongly disagree	65 (1.1)
Level 3	1095 (17.9)	<b>Nursing interruptions experiences</b>	
Level 4	170 (2.8)	Yes	5622 (92.1)
Level 5	17 (0.3)	No	483 (7.9)
<b>Requirement for nursing interruptions management training</b>			
Yes	5439 (89.1)		
No	666 (10.9)		

Note: 1000 CNY = 142 US\$.

poor level of KAP regarding nursing interruptions, suggesting a great concern regarding nursing interruptions among Chinese nurses. In our study, for the knowledge regarding nursing interruption, nurses knew little about the general information of nursing interruptions, including the general concept, source, type, outcome and common types in nursing work. Meanwhile, more than 50% of nurses didn't know the consequences of nursing interruptions, its impact on patients and nurses, and how to cope with it. Moreover, the study also showed that nursing interruptions knowledge was positively associated with attitude and practice, suggesting that it is important for the hospital administrators and nursing managers to train nurses regarding nursing interruptions regularly and the basic knowledge of nursing interruption, its consequences and how to deal with them should be emphasized in the curriculum of nursing interruption training.

We observed that most nurses had a positive attitude towards nursing interruptions. However, only 25.9% could often identify nursing interruptions accurately, and less than 50% of nurses could often report and respond to nursing interruptions in time,

indicating that nurses are not good at identifying nursing interruptions in work and most nurses don't know how to cope with nursing interruptions. Therefore, nursing managers should provide targeted nursing interruption training for nurses, and use methods such as case analysis and scenario simulation to improve nurses' practice regarding nursing interruptions.

KAP of nursing interruptions regarding clinical management level among nurses vary greatly depending on socioeconomic conditions, clinical unit experiences, working environments, and training experiences [15,16]. Thus, understanding these variables is important in designing strategies to prevent and manage nursing interruptions for clinical nurses. In the present study, the total score of KAP was highest in nurses aged 41–45 years, with 16–20 years of service, no night shift, received standardized nursing interruption training, and had leaders' attention, as well as formal employed nurses, chief nurses, nursing managers, and nurses with a first degree of master or above. In contrast, the KAP score was lowest in nurses aged 26–30 years, with 6–10 years of service, night shift, not received standardized nursing interruption training, and

**Table 2**  
Response to statements regarding knowledge of nursing interruptions [n (%)].

Knowledge Statement	Mean ± SD	Do not know	Have heard	Generally understand	Comparatively understand	Well understand
1. The understanding of nursing interruption.	1.99 ± 1.00	2480 (40.6)	1694 (27.8)	1523 (25.0)	320 (5.2)	88 (1.4)
2. Sources of nursing interruption.	2.04 ± 1.03	2488 (40.8)	1463 (24.0)	1696 (27.8)	363 (5.9)	95 (1.6)
3. Types of nursing interruption.	1.96 ± 1.04	2855 (46.8)	1170 (19.2)	1657 (27.1)	338 (5.5)	85 (1.4)
4. Consequences of nursing interruption.	2.07 ± 1.09	2575 (42.2)	1203 (19.7)	1750 (28.7)	449 (7.4)	128 (2.1)
5. Common types of nursing interruption in nursing work.	2.20 ± 1.08	2169 (35.5)	1327 (21.7)	1954 (32.0)	536 (8.8)	119 (1.9)
6. What nursing work is affected by nursing interruption.	2.28 ± 1.09	2032 (33.3)	1218 (20.0)	2112 (34.6)	610 (10.0)	133 (2.2)
7. The relationship between nursing interruption and medical outcomes.	2.23 ± 1.10	2170 (35.5)	1196 (19.6)	2033 (33.3)	575 (9.4)	131 (2.1)
8. Effect of nursing interruptions on patient safety.	2.37 ± 1.15	1930 (31.6)	1171 (19.2)	2049 (33.6)	736 (12.1)	219 (3.6)
9. How to cope with nursing interruptions?	2.22 ± 1.10	2240 (36.7)	1137 (18.6)	2033 (33.3)	560 (9.2)	135 (2.2)
10. Effect of nursing interruptions on nurses' emotion.	2.39 ± 1.18	1965 (32.2)	1075 (17.6)	2037 (33.4)	763 (12.5)	265 (4.3)

**Table 3**  
Response to statements regarding attitude toward nursing interruptions [n (%)].

Attitude Statement	Mean ± SD	Strongly disagree	Disagree	Generally agree	Comparatively agree	Strongly agree
1. I think the management of nursing interruptions events is very important for patient safety.	3.91 ± 0.87	177 (2.9)	123 (2.0)	1197 (19.6)	3195 (52.3)	1413 (23.1)
2. I think managing nursing interruptions can demonstrate my ability to work.	3.89 ± 0.87	175 (29.0)	132 (2.2)	1229 (20.1)	3218 (52.7)	1351 (22.1)
3. I believe that preventing nursing interruptions can improve the quality of nursing work.	3.88 ± 0.91	189 (3.1)	195 (3.2)	1219 (20.0)	3062 (50.1)	1440 (23.6)
4. Nursing managers should be fully aware of the importance of managing nursing interruptions.	3.93 ± 0.88	173 (2.8)	114 (1.9)	1207 (19.8)	3098 (50.8)	1513 (24.8)
5. I think every nurse should learn how to deal with nursing interruptions.	3.95 ± 0.86	160 (2.6)	108 (1.8)	1150 (18.8)	3134 (51.3)	1553 (25.4)
6. Nurses should set aside some time for learning about nursing interruptions events.	3.88 ± 0.84	135 (2.2)	141 (2.3)	1332 (21.8)	3235 (53.0)	1262 (20.7)
7. I think reducing nursing interruptions will improve my mood.	3.80 ± 0.88	155 (2.5)	227 (3.7)	1502 (24.6)	3045 (49.9)	1176 (19.3)
8. I want to change the nursing environment to reduce nursing interruptions.	3.73 ± 0.89	159 (2.6)	283 (4.6)	1705 (27.9)	2885 (47.3)	1073 (17.6)
9. I always actively deal with nursing interruptions.	3.87 ± 0.89	151 (2.5)	203 (3.3)	1326 (21.7)	3034 (49.7)	1391 (22.8)

**Table 4**  
Response to statements regarding practice of nursing interruptions [n (%)].

Practice Statement	Mean ± SD	Never	Sometimes	Usually	Always
1. Accurate identification of nursing interruptions at work.	2.17 ± 0.72	848 (13.9)	3673 (60.2)	1270 (20.8)	314 (5.1)
2. Report nursing interruptions to superiors in time.	2.40 ± 10.94	1004 (16.5)	2529 (41.4)	1608 (26.3)	964 (15.8)
3. Guiding patients and family members to participate in nursing interruptions management.	2.56 ± 0.87	590 (9.7)	2469 (40.4)	2073 (34.0)	973 (15.9)
4. Assist other colleagues in handling nursing interruptions.	2.52 ± 0.85	588 (9.6)	2616 (42.9)	2048 (33.6)	853 (14.0)
5. Response to nursing interruptions according to the requirements of superiors.	2.46 ± 0.89	773 (12.7)	2605 (42.7)	1868 (30.6)	859 (14.1)
6. Participate in training related to nursing interruptions.	2.73 ± 0.86	406 (6.7)	2106 (34.5)	2342 (38.4)	1251 (20.5)
7. Participation in Management Intervention of Nursing Interruptions.	2.63 ± 0.86	490 (8.0)	2330 (38.2)	2228 (36.5)	1057 (17.3)

strongly disagreeing with the item of leaders' attention, as well as temporary employed nurses, senior and general nurses, and nurses with a first-degree of undergraduate. Thus, the nursing managers should pay more attention to the nurses who may have lower KAP scores of nursing interruptions.

Evidence shows that a high level of education may positively influence nurses' work attitudes and engagement [17]. In this study, the entry level of nursing education was not positively related to the KAP scores, but the scores of overall KAP and three dimensions among nurses with a master and above degree were at a higher level compared with others ( $P < 0.05$ ). Night shift work and interruptions were significantly associated with medical error [18]. A recent systematic review found that a higher risk of mistakes occurred when working a 12-hour shift compared to shorter shifts [19]. In the present study, the total score and score for each dimension of KAP regarding nursing interruptions were

significantly lower in the nurses who had night shift work ( $P < 0.05$ ). It indicated that nursing managers need to pay more attention to interruption management training in nurses undertaking night shift work.

A better understanding of what the nurses know and believe about the issues of nursing interruptions can assist us in planning and devising an effective educational intervention for them. In addition, Employer support, economic reward, and opportunities for upward mobility were the significant influencing factors of nurses' participation in continuous education [20]. Therefore, protection of the rights and interests and support and rewards programs for academic achievements are required to promote enthusiasm in temporary nurses.

Leaders determine a mission, vision, and strategy and aims for knowledge management and practice [21]. Nurse leaders can support infrastructures that facilitate the learning and



**Table 5**  
Levels of knowledge, attitude and practice regarding nursing interruptions among participants (Mean ± SD).

Variables	Knowledge score	Attitude score	Practice score	Overall score of KAP
<b>Age</b>				
≤25	22.29 ± 9.92	34.56 ± 7.23	17.68 ± 5.06	74.54 ± 17.16
26–30	21.16 ± 9.64	34.56 ± 6.95	17.26 ± 4.95	72.98 ± 16.29
31–35	21.21 ± 9.59	34.87 ± 6.89	17.31 ± 5.04	73.39 ± 16.35
36–40	22.21 ± 9.91	35.44 ± 6.98	17.52 ± 4.84	75.17 ± 16.68
41–45	23.21 ± 9.93	36.32 ± 6.05	18.12 ± 4.50	77.65 ± 15.64
>45	22.93 ± 10.74	34.83 ± 6.98	18.18 ± 5.07	76.41 ± 18.24
F	5.61	5.30	3.52	6.93
p <sup>a</sup>	<0.001	<0.001	0.004	<0.001
<b>Years of employment</b>				
<3	22.03 ± 9.65	34.71 ± 7.10	17.69 ± 4.93	74.43 ± 16.49
3–5	21.74 ± 9.77	34.32 ± 7.23	17.45 ± 5.04	73.51 ± 16.77
6–10	20.97 ± 9.76	34.55 ± 6.91	17.16 ± 4.99	72.68 ± 16.62
11–15	21.03 ± 9.64	35.02 ± 6.75	17.20 ± 4.97	73.24 ± 16.33
16–20	23.28 ± 9.96	35.69 ± 7.03	17.94 ± 4.93	76.91 ± 16.73
>20	22.89 ± 10.22	35.99 ± 6.31	18.00 ± 4.80	76.87 ± 16.63
F	7.06	6.50	4.40	9.03
p <sup>a</sup>	<0.001	<0.001	0.001	<0.001
<b>Employment type</b>				
Temporary nurse	21.56 ± 9.80	34.25 ± 7.12	17.36 ± 4.93	73.18 ± 16.75
Contract employed nurse	21.68 ± 9.66	35.09 ± 6.76	17.51 ± 4.90	74.28 ± 16.29
Formal employed nurse	21.94 ± 9.86	35.17 ± 6.93	17.54 ± 5.03	74.65 ± 16.69
F	0.97	11.69	1.12	4.82
p <sup>a</sup>	0.379	<0.001	0.327	0.008
<b>Professional title</b>				
Junior nurse	22.51 ± 9.87	34.11 ± 7.14	17.64 ± 5.10	74.25 ± 17.11
Senior nurse	20.99 ± 9.66	34.91 ± 6.98	17.24 ± 4.98	73.14 ± 16.39
Supervisor nurse	21.73 ± 9.78	35.58 ± 6.72	17.68 ± 4.68	74.99 ± 16.14
Associate chief nurse	24.81 ± 10.17	36.63 ± 5.81	18.21 ± 4.75	79.65 ± 16.67
Chief nurse	30.00 ± 8.13	36.88 ± 5.23	20.47 ± 5.01	87.35 ± 16.68
F	14.52	11.79	5.10	10.67
p <sup>a</sup>	<0.001	<0.001	<0.001	<0.001
<b>Position</b>				
General nurse	21.53 ± 9.82	34.54 ± 7.10	17.43 ± 5.05	72.50 ± 16.79
Quality control group leader	21.85 ± 9.72	35.23 ± 6.65	17.39 ± 4.80	74.48 ± 16.13
Nursing training group leader	20.31 ± 8.84	34.85 ± 7.14	17.23 ± 4.77	75.39 ± 15.74
Head nurse	23.92 ± 9.78	36.80 ± 5.85	18.15 ± 4.38	78.87 ± 15.24
Manager	25.77 ± 10.04	37.37 ± 6.30	19.40 ± 5.66	82.54 ± 18.65
F	8.89	13.34	3.74	14.12
p <sup>a</sup>	<0.001	<0.001	0.005	<0.001
<b>Entry level of nursing education</b>				
Below junior college	22.17 ± 10.02	35.16 ± 6.39	17.57 ± 4.97	74.90 ± 16.53
Junior college	22.11 ± 9.89	34.59 ± 7.17	17.58 ± 5.09	74.28 ± 17.04
Undergraduate	20.73 ± 9.44	34.88 ± 7.12	17.24 ± 4.80	72.85 ± 16.09
Master and above	22.80 ± 8.09	36.11 ± 8.02	17.91 ± 3.92	76.82 ± 13.65
F	8.53	2.77	1.97	4.88
p <sup>a</sup>	<0.001	0.040	0.116	0.002
<b>Night shift work</b>				
Yes	21.63 ± 9.74	34.63 ± 7.03	17.43 ± 4.99	73.68 ± 16.57
No	22.13 ± 10.00	35.48 ± 6.77	17.67 ± 4.90	75.29 ± 16.83
t	-1.71	-4.02	-1.59	-3.16
p <sup>a</sup>	0.088	<0.001	0.111	0.002
<b>Standardized training</b>				
Yes	28.55 ± 9.12	35.61 ± 6.68	19.40 ± 4.68	83.56 ± 16.15
No	19.14 ± 8.75	34.53 ± 7.06	16.75 ± 4.88	70.42 ± 15.35
t	37.15	5.46	19.17	29.50
p <sup>a</sup>	<0.001	<0.001	<0.001	<0.001
<b>Leaders' attention</b>				
Fully agree	27.02 ± 10.58	36.71 ± 7.27	20.00 ± 5.02	83.72 ± 17.33
Agree	23.01 ± 9.05	34.90 ± 6.15	18.07 ± 4.50	75.98 ± 14.46
Not sure	18.29 ± 8.27	33.60 ± 6.90	15.91 ± 4.53	67.80 ± 14.54
Disagree	16.58 ± 8.05	34.90 ± 8.13	15.01 ± 4.59	66.49 ± 15.68
Strongly disagree	15.85 ± 8.21	33.03 ± 9.88	13.03 ± 5.20	61.91 ± 18.58
F	246.54	45.22	217.36	274.86
p <sup>a</sup>	<0.001	<0.001	<0.001	<0.001

Note:<sup>a</sup> For categorical variables. P-values were obtained by doing independent samples *t*-test or ANOVA where appropriate.

development of nurses' attitudes, and practice competencies [22]. In this study, the total score and each dimension scores of KAP regarding nursing interruptions were significantly lower in the

nurses who did not agree or strongly disagree with enough leaders' attention. Hence, change in the KAP of nursing interruptions will guarantee the success of any educational intervention [23].

**Table 6**  
Associated factors of overall score of KAP regarding nursing interruptions of participants.

Variables	B	SE	$\beta$	t	P
Constant	94.56	1.31	–	72.21	<0.001
Age	–0.02	0.35	–0.002	–0.06	0.955
Years of employment	–0.11	0.33	–0.01	–0.323	0.744
Employment type	0.81	0.24	0.04	3.36	0.001
Professional title	1.12	0.39	0.05	2.85	0.004
Position	1.87	0.27	0.10	7.07	<0.001
Entry level of nursing education	–0.03	0.33	–0.001	–0.09	0.927
Night shift work	–0.11	0.52	–0.003	–0.21	0.834
Standardized training	–8.73	0.47	–0.24	–18.54	<0.001
Leaders' attention	–5.48	0.23	–0.31	–23.78	<0.001

Note: Adjusted  $R^2 = 0.209$ ,  $F = 180.63$ ,  $P < 0.001$ .

## 5. Limitation

We acknowledge that the findings in this study must be interpreted with caution. First, despite the good reliability and validity of the Knowledge, Attitude and Practice Questionnaire of Nursing Interruptions shown in this study, it is only validated in secondary and tertiary hospitals in China. Therefore, caution should be exercised in investigating nurses in community hospitals and township hospitals. Second, despite the large sample size of this study, all participants came from tertiary and secondary hospitals, while nurses from community or township hospitals were not included in the study. The KAP regarding nursing interruptions in nurses from these hospitals may be different. Third, a cross-sectional study design also limits the power of this study. Using randomized sampling and selecting a sample from every hospital level should be adopted to guarantee a better representation. Third, longitudinal research methods should be used to capture more information about the relationships among these variables. Despite the limitations described above, to our knowledge, there are rarely studies that explore the state of KAP regarding nursing interruptions in Chinese nurses.

## 6. Conclusion

In conclusion, this study reveals that nurses have a moderate level of KAP of nursing interruptions. Leaders' attention, standardized training, position, professional title and employment type can predict nurses' KAP state regarding nursing interruptions. Thus, a targeted training program should be implemented for clinical nurses by nursing leaders, with a particular focus on feasibility and professionalism.

## Conflicts of interest

No conflict of interest has been declared by the authors.

## CRediT authorship contribution statement

**Jianfei Xie:** Conceptualization, Methodology, Writing - original draft. **Qian Sun:** Investigation, Visualization. **Siyan Tang:** Supervision. **Siqing Ding:** Supervision. **Zhuqing Zhong:** Validation, Software. **Sainan Zeng:** Data curation, Resources. **Yinglong Duan:** Investigation, Formal analysis. **Xiangyan Zhang:** Project administration, Writing - review & editing. **Andy SK. Cheng:** Writing - review & editing.

## Funding

Paper extracted from The New Xiangya Talent Projects of the Third Xiangya Hospital of Central South University (NO: JY201720).

## Conflicts of interest

No conflict of interest has been declared by the authors.

## Acknowledgements

We thank all the research participants for their kind cooperation.

## Appendices. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2019.12.004>.

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