Knowledge, Attitude, and Practice of Chinese Medical Staff for Common Resident Emergencies in Elder Care Facilities: A Structural Equation Model-Based Survey

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Abstract

Aims/Background Increasing population longevity poses challenges to health care for the elderly. Facility-based care is a primary approach to elder care, and medical staff in these settings must be skilled in managing emergencies, as the elderly are more likely to experience emergencies than those living in the community. To aid in developing first aid training, procedures, and regulations for medical staff in elder care facilities, we evaluated the knowledge, attitude, and practice (KAP) levels concerning commonly reported emergencies, as well as the correlations between these factors.

Methods The questionnaires were distributed among 1493 doctors and nurses within 258 residential facilities in Shanghai between 1 May 2023 and 31 October 2023. Of the 725 valid questionnaires, we obtained socio-demographic and KAP-related data. Structural equation modeling (SEM) was applied to determine associations between KAP elements.

Results Chinese medical staff in elder care facilities had relatively suboptimal knowledge regarding first aid for common resident emergencies, with only 41.7% rated as good. Their levels of attitude and practice were optimistic. The proportion of medical staff demonstrating a positive attitude and appropriate practice in first aid was 79.31% and 68.00%, respectively. Age, gender, educational level, experience with witnessing and dealing with emergencies were identified as factors influencing knowledge, attitude, and practice. Structural equation modeling revealed that attitude and knowledge could directly or indirectly affect management approaches for common elderly emergencies, with a correlation coefficient of 0.11 between knowledge and attitude and 0.66 between attitude and practice. The "first aid for nine preventions" and "cardiac arrest and cardiopulmonary resuscitation" substantially influenced knowledge acquisition, with correlation coefficients of 0.66 and 0.48, respectively. "Attitude toward emergency management" had a significant impact on the attitude of the medical staff, with correlation coefficients of 0.90.

Conclusion Knowledge, attitude, and practice are interconnected, with knowledge indirectly influencing behavior by shaping attitude. The medical staff in elder care facilities in Shanghai had a limited understanding of first aid for common resident emergencies. Targeted training and education are urgently required to enhance their knowledge and skills in managing common emergencies among elderly patients, while fostering a strong sense of responsibility. Such initiatives can ensure prompt and appropriate first aid actions, boosting their confidence and promoting a positive and harmonious environment for medical staff and elderly residents.

Key words: knowledge, attitudes, practice; residential facilities; emergencies; structural equation modeling; medical staff

How to cite this article:

Yu S, Tang H, Cao W, Gui L, Wang Y. Knowledge, Attitude, and Practice of Chinese Medical Staff for Common Resident Emergencies in Elder Care Facilities: A Structural Equation Model-Based Survey. Br J Hosp Med. 2025.

https://doi.org/10.12968/hmed.2024.0788

Introduction

Between 2015 and 2050, the population over 60 is expected to rise from 900 million to 2 billion worldwide, with a substantial increase in people aged 80 and above (World Health Assembly, 2020). Evidence suggests that these additional years are often not accompanied by "good health", and particularly in low- and middle-income countries, preparedness for the challenges of ageing has become a priority (Mitchell and Walker, 2020). Increasing population longevity poses challenges to elder care worldwide, especially in China. By 2021, there were 264 million people aged 60 and older in China, representing 18.7% of its total population. China is predicted to become a super-aged society by 2050, with elderly individuals comprising 34.1% of the total population (National Bureau of Statistics of China, 2021). The one-child policy in China significantly altered family structures from the previous century, resulting in smaller family sizes and an increased empty-nest households, which has increased elder care issues (Wei et al, 2022; Zhao et al, 2023). Despite the widespread promotion in community-based and home care, institutional care facilities equipped with professional medical staff and standardized equipment remain the primary form of elder care (Huang et al, 2022; Yuan et al, 2024).

In China, individuals living in residential care facilities tend to be older and have poorer health status and decreased self-care abilities than those residing in the general community (Qiao, 2022). Elderly people in residential facilities are more likely to experience medical emergencies than individuals living in the community. Research indicated that the elderly in residential facilities are four times more likely to require emergency services compared to those of the same age and gender living in the community (Dwyer et al, 2018). The most common emergencies in residential care facilities include falls, infections, cardiovascular events, central nervous system symptoms, acute abdominal pain, generalized weakness, shortness of breath, pain, and fever (Lemoyne et al, 2019).

To ensure the safety of elderly individuals in nursing facilities, the Chinese Ministry of Civil Affairs introduced regulations promoting the prevention of nine common emergencies, such as choking, food or medication errors, bedsores, burns, falls, falls from bed, injuries, wandering, and accidents during recreational activities, collectively referred to as the "nine preventions". In 2019, the Ministry of Civil Affairs of China issued basic safety standards for elderly care institutions, mandating that residential facilities implement daily measures to prevent these common emergencies (National Market Supervision Administration and Standardization Administration of China, 2020). However, these standards only address the prevention of typical elderly emergencies and lack official guidelines on how residential facilities should respond when such emergencies occur. Furthermore, the "nine preventions" cover only a limited range of elder emergencies, leaving residential facilities without scientific, up-to-date coping measures for other critical situations such as cardiac arrest, chronic disease attack, and trauma. The most commonly used strategy, such as assessing and maintaining vital signs, ensuring proper body alignment, and recording the preparation incident (Choi and Chang, 2022), is often inadequate in managing life-threatening situations.

During an emergency, elderly residents in care facilities are often shifted directly to hospital emergency departments. This practice causes overcrowding in emergency departments and elevates the risk of adverse events for the elderly, such as delirium and death during their hospital stay (Chen et al, 2022). To address these problems, various acute care models have been implemented in residential facilities to offer coordinated first aid services. Most of these models rely on support from external sources, like outreach medical teams comprising medical staff who provide on-site services in residential facilities (Kontunen et al, 2023; Udesen et al, 2023), or use remote communication technology to deliver emergency care (Hullick et al, 2022; Sunner et al, 2020). Evidence showed that visual telehealth consultations can reduce the rate of emergency department visits in residential facilities compared to standard care while also improving the decision-making abilities of medical staff in these facilities (Sunner et al, 2023). Nevertheless, identifying early signs of clinical deterioration remains critical in such scenarios.

Residential facilities provide daily living support and manage chronic diseases for residents, but their role in emergency care is often neglected. As the first place to contact during emergencies, these facilities are crucial in initial medical care, and their medical staff play essential roles in emergency management (O'Neill et al, 2015). Improving and assessing the first aid capabilities of the medical staff within the residential facilities, who act as internal responders, is crucial. Recent research has explored the impact of knowledge, skills and intent on first aid services in residential care settings. While medical staff admit the significance of knowledge and skills in managing emergencies (O'Neill et al, 2015), many staff feel unprepared for such tasks (Arendts et al, 2013). A study in Sweden investigated the elderly care capability of municipal healthcare professionals across various settings and observed that medical staff in residential facilities had the lowest score among all groups assessed (Vatnøy et al, 2020). However, research on nurses' intention to provide subacute care in nursing home settings shows that nursing staff had strong intent, and their attitude toward emergency care significantly improved when hospital avoidance programs were applied (O'Neill et al, 2018). These observations offer a foundation for further exploration into the impact of knowledge, skill, and intent on first-aid practice in residential care settings.

However, there is still insufficient data on the first aid capabilities of medical staff in residential facilities in middle-income countries such as China and the correlation between first aid knowledge, attitude, and practice (KAP) remains unclear. Before formulating an adequate first aid training program for elderly care institutions, it is necessary to clarify the interrelationship between these three factors to ensure training effectiveness. Therefore, to address this gap and provide a reference for improving first-aid capabilities in residential settings, we conducted a cross-sectional survey of all the residential facilities with infirmaries in Shanghai, China, assessing the first-aid knowledge, attitude, and practice of their medical staff.

According to the KAP theoretical framework, acquiring relevant knowledge and skills through learning can gradually develop a positive attitude and subsequently facilitate changes in practice. Knowledge and attitude may influence each

other and act as mediating factors during this process (Lv et al, 2024). However, the specific correlations between knowledge, attitude, and practice regarding first aid for common resident emergencies in residential facilities remain unknown.

It is challenging for staff to schedule time for knowledge acquisition, attitude cultivation, and practical training, which are essential for KAP development. To address this, we used structural equation modeling (SEM) to determine the associations among the elements of KAP, offering valuable insights for developing effective first-aid training programs for medical staff in residential care facilities. SEM is particularly suitable for exploring the interrelationship of variables, and previous study also used this method based on the theory of planned behavior to investigate the predictors of intent for subacute care in nursing homes (Wang et al, 2021). Guided on the KAP model, we assumed the following hypothesis: (1) Knowledge has a positive influence on attitude. (2) Attitude has a positive influence on practice. (3) Knowledge has a positive influence on practice.

Methods

Study Design and Participant Recruitment

This cross-sectional study, conducted between 1 May and 31 October, 2023, recruited medical staff working in residential facilities in Shanghai, China, employing a questionnaire survey. Shanghai, located on the east coast of China, has 729 residential facilities, of which 366 have infirmaries, providing an adequate pool of participant selection. Medical staff were included if they (a) had a valid doctor or nurse license, (b) had at least one year of work experience in a residential facility, and (c) voluntarily consented to participate. They were excluded if they had a history of language, cognitive, or mental impairments.

The sample size was determined using the following formula: $N = Z_\alpha^2 P (1 - P)/d^2$.

A 95% confidence interval with a $Z\alpha$ value 1.96 was used, with an acceptable error (d) set at 3%. Due to a lack of direct data, we followed the study by Vatnøy et al (2020) and estimated a mean first aid capability score of 81.93% for medical staff. Furthermore, considering the dropout rates and enabling subgroup analysis, a cohort of 725 doctors and nurses was finally selected.

Assessment of Study Participants

Participants were assessed using a questionnaire based on clinical experience, the KAP theoretical framework, and an extensive literature and policy review. After three rounds of expert consultation, a questionnaire was developed, consisting of sections on general information and first aid capability. A panel of 15 geriatric nursing and emergency medicine experts, each with five years of experience in their fields, was invited to the consultation process.

The general information section included 11 items, mainly covering demographic data and professional backgrounds, such as age, education level, hospital-level work experience, prior department affiliation, and experience in handling emergencies. The first aid capability section included three dimensions: knowl-

Table 1. Classification of knowledge, attitude, and practice (KAP) items.

Variables	Sub-dimensions	Number of items	Content of each sub-dimension
Knowledge	Knowledge 1 (K1)	5	Knowledge of cardiac arrest and cardiopulmonary resuscitation
	Knowledge 2 (K2)	8	Knowledge of first-aid for "nine preventions"
	Knowledge 3 (K3)	4	Knowledge of first-aid for chronic disease attack
	Knowledge 4 (K4)	3	Knowledge of first-aid for other common emergencies
Attitude	Attitude 1 (A1)	2	Awareness of the role of first aid
	Attitude 2 (A2)	5	Attitude toward emergency management
	Attitude 3 (A3)	3	Recognition of first aid training
Practice	Practice 1 (P1)	6	Daily monitoring and identification of emergencies
	Practice 2 (P2)	5	First aid response and behavior during emergencies

edge, attitude, and practice regarding first aid for common emergencies in residential facilities. The internal consistency reliability (Cronbach's α) for the knowledge dimension was 0.618, deemed acceptable. Additionally, the attitude and practice dimensions showed excellent reliability, with Cronbach's α scores of 0.911 and 0.866, respectively.

The knowledge dimension consisted of 20 items, with each correct response scoring 1 point and incorrect responses awarded 0 points. The attitude dimension comprised 10 items, each scored on a five-point Likert scale to measure the level of participant agreement. Similarly, the practice dimension consisted of 11 items, using the same Likert scale scoring methods as the attitude dimension. Furthermore, the knowledge, attitude, and practice dimensions were further classified into four, three, and two sub-dimensions, respectively, as outlined in Table 1. The complete version of the questionnaire is available on the following website: https://www.wjx.cn/vm/mlzPPbp.aspx.

Based on the modified Bloom's cutoff criteria, knowledge scores were divided into three levels: poor (<60%), moderate (60–79%), and good ($\geq$80%). Similarly, attitude scores were categorized as positive ($\geq$80%), neutral (60–79%), and negative (<60%). Practice scores were categorized as appropriate ($\geq$80%), acceptable (60–79%), and inappropriate (<60%).

Data Collection

Questionnaires were sent to 366 residential facilities asking permission to participate in this study, and 258 facilities granted approval. Of the responses obtained, 1493 questionnaires were returned, with 725 found valid. A double entry was implemented to ensure data quality. Questionnaires with more than 20% missing data or response patterns showed a lack of reliability were considered invalid and excluded.

All the participants provided informed consent. Strict confidentiality principles were followed, and data were used only for this study. All participants were informed of their right to withdraw at any time, and all survey questions were non-mandatory.

Statistical Analysis

Data were documented in Microsoft Excel 2021 (Version 16.0, Microsoft Corp., Redmond, WA, USA) and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Missing values were addressed by calculating the average of other responses for numerical variables and the mode for non-numerical ones. Demographic information and categorical variables associated with knowledge, attitude, and practice were analyzed using frequency distributions. The scores for the knowledge, attitude, and practice dimensions, along with their sub-dimensions, were considered continuous variables. As confirmed by the Quantile-Quantile Plot, these variables followed a normal distribution and were analyzed using mean scores.

A Pareto chart was created using Microsoft Excel 2021 to illustrate the frequency of emergencies encountered by participants. Statistical tests, including t-tests and a one-way analysis of variance (ANOVA) with least significant difference (LSD) post hoc test, were utilized to identify factors affecting knowledge, attitude, and practice scores. Furthermore, structural equation modeling was performed using Amos 24.0 (IBM Corp., Armonk, NY, USA) to analyze the data structure. An equation model was developed and validated, and its parameters were estimated using the maximum likelihood method. The model was considered acceptable if it met the following thresholds: $\chi^2/df < 3$, comparative fit index (CFI) >0.90, incremental fit index (IFI) >0.90, Tucker-Lewis index (TLI) >0.90, and root mean square error of approximation (RMSEA) <0.05 (He et al, 2023). Consequently, the SEM was used to identify factors affecting medical staff's first aid practices for common emergencies and to further elucidate the relationships between the KAP elements and their influence. The significance level of $p < 0.05$ was set for all statistical tests.

Results

Baseline Characteristics

Of the 1493 questionnaires distributed, 725 (48.6%) were valid included in the analysis. Among the participants, 29.52% were males and 70.48% were females. The mean age of the respondents was 46.72 ± 18.05 years. The demographic details are presented in Table 2.

The participants (n = 725) experienced 4538 emergencies within residential facilities. The Pareto chart (Fig. 1) illustrates the frequency distribution of the most commonly encountered emergencies. Notably, fever, low blood sugar, falls, airway obstruction, dyspnea, burns, cardiac arrest, stroke, falls from beds, myocardial infarctions, and acute abdominal pain collectively accounted for 83.58% of all reported emergencies.

Overall First Aid Knowledge Acquisition Among Medical Staff in Residential Facilities

Table 3 displays the overall and sub-dimension scores for knowledge, including the mean score, standard deviation, and the percentage of participants at each level. The overall knowledge acquisition was suboptimal, with only 41.7% of participants

Table 2. Baseline characteristics of participants.

Variable	Categories	Number of participants (n = 725)	Percentage (%)
Age (years)	≤25	81	11.17
	26–35	167	23.03
	36–45	97	13.38
	46–55	118	16.28
	56–65	134	18.48
	≥66	128	17.66
Gender	Male	214	29.52
	Female	511	70.48
Education	Junior middle school or below	131	18.07
	Senior middle school or polytechnic school	30	4.14
	Junior college	365	50.34
	Bachelor's degree or above	199	27.45
Occupation	Doctor	311	42.90
	Nurse	405	55.86
	Other	9	1.24
Professional title	Junior	471	64.97
	Medium	221	30.48
	High	33	4.55
Years of working	≤5	457	63.03
	6–10	161	22.21
	≥10	107	14.76
Whether participants had witnessed emergencies in residential facilities	Yes	641	88.41
	No	84	11.59
Whether participants had dealt with emergencies in residential facilities	Yes	663	91.45
	No	62	8.55
Previous working institution (multiple choices)	Tertiary hospital	175	24.14
	Secondary hospital	296	40.83
	Community hospital	236	32.55
	Other	85	11.72
Previous working department (multiple choices)	EMSS	29	4.00
	Emergency department	160	22.07
	Intensive care unit	71	9.79
	Cardiology department	164	22.62
	Neurology department	106	14.62
	Respiratory medicine department	158	21.79
	Other	150	20.69

Note: EMSS, Emergency Medical Service System.
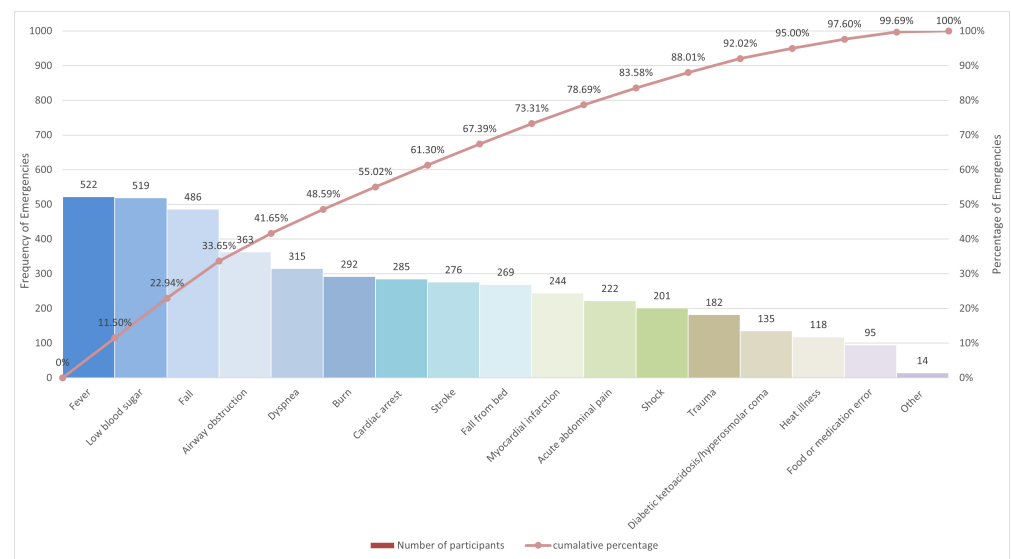
Fig. 1. Frequency distribution of medical emergencies in residential facilities.

securing a satisfactory level of knowledge (good level of overall knowledge). Medical staff demonstrated the highest level of competency in the "nine preventions" first aid, with only 18.76% categorized as having a poor level of knowledge 2. However, 76.41% of medical staff had a lowest level of knowledge (poor level of knowledge 3) regarding first aid for acute attacks of chronic diseases such as coronary heart disease, diabetes, chronic obstructive pulmonary disease, and stroke.

Table 3. Acquisition of first aid knowledge among medical staffs.

Variable	Mean scores (Mean ± SD)	Level	Number of participants (n = 725)	Percentage (%)
Knowledge 1	3.01 ± 1.18	Poor	232	32.00
		Moderate	236	32.60
		Good	257	35.40
Knowledge 2	5.57 ± 1.40	Poor	136	18.76
		Moderate	398	54.90
		Good	191	26.34
Knowledge 3	1.48 ± 0.85	Poor	554	76.41
		Moderate	135	18.62
		Good	36	4.97
Knowledge 4	1.90 ± 0.91	Poor	364	50.21
		Moderate	279	38.48
		Good	82	11.31
Overall knowledge	11.97 ± 2.88	Poor	76	10.50
		Moderate	347	47.90
		Good	302	41.70

Table 4. Medical staff's attitude towards first aid services within residential facilities.

Variable	Mean scores (Mean ± SD)	Level	Number of participants (n = 725)	Percentage (%)
Attitude 1	8.82 ± 1.48	Negative	30	4.14
		Neutral	51	7.03
		Positive	644	88.83
Attitude 2	21.56 ± 3.34	Negative	27	3.72
		Neutral	109	15.03
		Positive	589	81.24
Attitude 3	12.59 ± 1.97	Negative	29	4.00
		Neutral	123	16.97
		Positive	573	79.03
Overall Attitude	42.88 ± 6.10	Negative	25	3.45
		Neutral	125	17.24
		Positive	575	79.31

The First Aid Attitude Among Medical Staff in Residential Facilities

The majority of medical staff (79.31%) showed a positive overall attitude towards providing first aid in residential facilities. A substantial proportion (88.83%) of medical staff agreed that residential facilities have the responsibility to provide first aid services to residents (Attitude 1). However, the proportion of those with a positive attitude towards participating in first aid training (Attitude 3) was relatively low at 79.03%. Table 4 shows additional details about first-aid attitudes among medical staff.

Table 5. First aid practice among medical staff in residential settings.

| Variable	Mean scores (Mean ± SD)	Level	Number of participants (n = 725)	Percentage (%)
Practice 1	24.17 ± 3.95	inappropriate	44	6.07
		acceptable	223	30.76
		appropriate	458	63.17
Practice 2	21.24 ± 2.98	inappropriate	19	2.62
		acceptable	140	19.31
		appropriate	566	78.07
Overall practice	45.30 ± 6.28	inappropriate	24	3.31
		acceptable	208	28.69
		appropriate	493	68.00

The First Aid Practice Among Medical Staff in Residential Facilities

Over half of the medical staff claimed appropriate actions in first aid situations, while only 3.31% admitted engaging in inappropriate practices (overall practice). However, the ability to monitor and identify emergencies in daily work needs en-

hancement, with an appropriate practice rate of 63.17% (Practice 1). The first aid practice among medical staff is detailed in Table 5.

Demographic Factors Affecting KAP

Demographic data analysis revealed that age, gender, education level, and emergency witnessing experience were significantly affected knowledge. Female respondents scored significantly higher than male respondents and healthcare professionals above 66 had the lowest scores among all age groups. Medical staff with bachelor's degrees demonstrated a relatively better understanding of first aid knowledge, and those with prior emergency witnessing experience showed higher knowledge levels. Regarding attitude, age was found to be the only significant predictor. Additionally, both age and previous emergency dealing experience within the facility were observed to be significant predictors of first aid practice. Additional details are presented in Table 6.
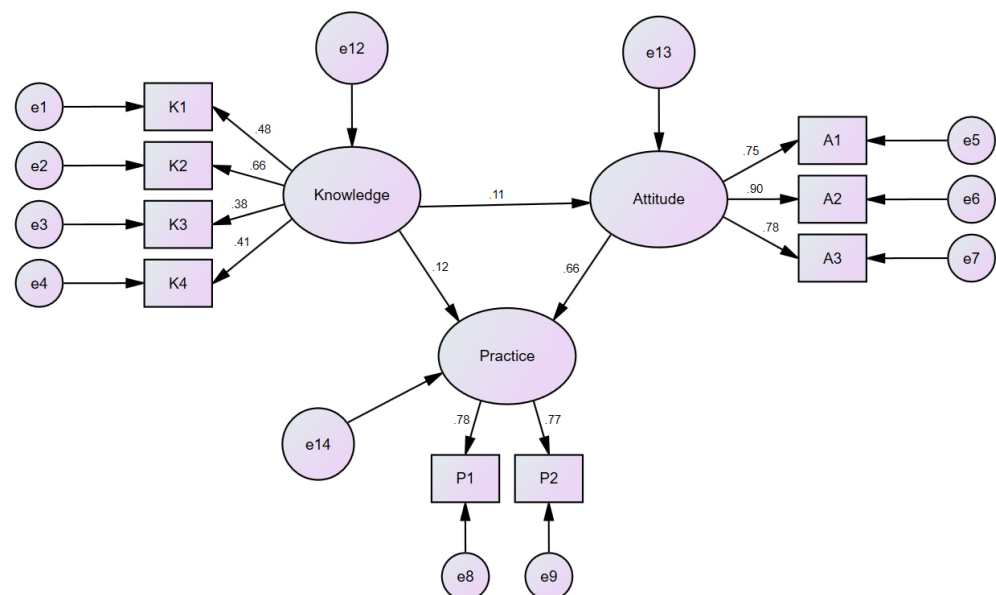
Fig. 2. The final structural equation model for first aid KAP elements of medical staff in residential facilities.

Structural Equation Model of First Aid KAP

The residual term "e" indicates the difference between the observed and estimated (fitted) values. The chi-square fitting statistics/degrees of freedom (CMIN/DF) was 2.266, and the root mean square error of approximation (RMSEA) was 0.042, indicating an excellent model fit. The parameters of the final adjusted model are presented in Fig. 2 and Table 7.

The hypothesis testing results, presented in Fig. 2 and Table 8, support all three hypotheses: (1) Knowledge has a positive influence on attitude. (2) Attitude has a positive influence on practice. (3) Knowledge has a positive influence on practice. The standardized regression coefficients for these correlations are 0.11, 0.66, and 0.12, respectively.

Table 6. Univariate analyses of factors affecting KAP.

Variable		Number of participants (n = 725)	Knowledge			Attitude			Practice		
			Mean ± SD	F/t	p-value	Mean ± SD	F/t	p-value	Mean ± SD	F/t	p-value
Age	≤25	81	12.01 ± 2.78^a	F = 2.633	0.023	44.02 ± 4.71^a	F = 2.958	0.012	44.99 ± 6.37^{bc}	F = 4.097	0.001
	26–35	167	12.17 ± 2.75^a			41.78 ± 7.77^c			44.19 ± 7.58^c		
	36–45	97	12.14 ± 2.89^a			43.92 ± 5.15^a			46.37 ± 5.31^{ab}		
	46–55	118	12.31 ± 2.85^a			43.71 ± 5.44^{ab}			47.07 ± 5.18^a		
	56–65	134	12.04 ± 2.76^a			42.64 ± 5.55^{abc}			45.37 ± 5.83^{bc}		
	≥66	128	11.16 ± 3.15^b			42.31 ± 6.10^{bc}			44.45 ± 6.03^c		
Gender	Male	214	11.41 ± 3.31	t = −3.140	0.002	42.20 ± 6.90	t = −1.841	0.066	44.92 ± 7.12	t = −1.153	0.249
	Female	511	12.16 ± 2.70			43.14 ± 5.76			45.54 ± 5.98		
Educational level	Junior middle school or below	131	11.32 ± 3.04^c	F = 6.187	<0.001	42.08 ± 6.42	F = 1.233	0.297	44.63 ± 6.93	F = 1.722	0.161
	Senior middle school or polytechnic school	30	11.07 ± 3.55^{bc}			43.99 ± 4.62			46.96 ± 5.12		
	Junior college	365	11.95 ± 2.67^b			43.09 ± 5.44			45.13 ± 6.25		
	Bachelor's degree or above	199	12.57 ± 2.88^a			42.84 ± 7.12			45.81 ± 6.66		
Occupation	Doctor	311	11.75 ± 3.21	F = 2.266	0.105	42.74 ± 6.23	F = 0.166	0.847	45.31 ± 6.40	F = 0.608	0.545
	Nurse	405	12.16 ± 2.56			43.01 ± 6.01			45.33 ± 6.10		
	Other	9	11.00 ± 4.12			42.89 ± 6.10			43.00 ± 9.96		
Professional title	Junior	471	11.83 ± 2.95	F = 2.140	0.118	42.96 ± 6.18	F = 0.127	0.881	45.03 ± 6.51	F = 1.537	0.216
	Medium	221	12.15 ± 2.69			42.73 ± 6.02			45.68 ± 5.88		
	High	33	12.73 ± 3.11			42.69 ± 5.60			46.30 ± 6.28		
Years of working	≤5	457	11.98 ± 2.79	F = 0.620	0.538	42.66 ± 6.25	F = 0.790	0.454	45.11 ± 6.52	F = 0.877	0.417
	6–10	161	11.78 ± 3.10			43.31 ± 5.70			45.40 ± 6.04		
	≥10	107	12.18 ± 2.96			42.88 ± 6.10			45.99 ± 5.54		
Whether participants had witnessed emergencies in residential facilities	Yes	641	12.05 ± 2.84	t = 2.003	0.045	42.85 ± 6.15	t = 0.045	0.964	45.50 ± 6.25	t = 0.643	0.521
	No	84	11.37 ± 3.17			42.91 ± 6.11			43.15 ± 6.24		
Whether participants had dealt with emergencies in residential facilities	Yes	663	12.02 ± 2.83	t = 1.690	0.091	42.87 ± 6.14	t = −0.046	0.963	45.51 ± 6.25	t = 2.857	0.004
	No	62	11.38 ± 3.32			42.91 ± 6.10			43.15 ± 6.28		

Note: Mean values are superscripted with letters a, b and c and groups that do not share the same letter are significantly different ($p < 0.05$) from each other according to the least significant difference (LSD) test.

Table 7. Model fitness indices for the modified model.

Indices	Ideal standards	Measured values
CMIN/DF	<3	2.266
RMSEA	<0.05	0.042
IFI	>0.9	0.983
TLI	>0.9	0.974
CFI	>0.9	0.983

CMIN/DF, chi-square fitting statistics/degrees of freedom; RMSEA, root mean square error of approximation; CFI, comparative fit index; IFI, incremental fit index; TLI, Tucker-Lewis index.

Table 8. Hypothesis testing results.

Hypothesis	Path	Path coefficient	p-value	Result
H1	Knowledge→Attitude	0.11	0.031	Supported
H2	Attitude→Practice	0.66	0.000	Supported
H3	Knowledge→Practice	0.12	0.012	Supported

Discussion

This study is the first to assess the current levels and interrelationships of first aid knowledge, attitude, and practice among medical staff in Chinese residential facilities with infirmaries. These findings provide valuable information regarding the first-aid capabilities of the medical staff and offer significant implications for optimizing first-aid training, procedures, and regulatory frameworks in residential facilities.

Current Knowledge of Medical Staff Regarding First Aid Services for Common Elderly Emergencies

We observed that medical staff in residential facilities generally had poor knowledge acquisition, which aligns with previous research findings. Zhou et al (2021) conducted a survey on the first aid capability of caregivers in residential facilities and found that these caregivers demonstrated insufficient first aid skills for cardiac arrest, burn and scald, accidental injuries, and other emergencies. Age, gender, education level, and emergency witnessing experience were significant factors influencing knowledge. Educational level demonstrated an urgent need for skilled professionals in this field, underscoring a growing concern as brain drain continues to affect the first aid capabilities of residential facilities (Lee, 2022). Given these concerns, integrating practical training programs focused on knowledge and skill enhancement could be an alternative solution.

Among the common emergencies faced in elderly care, medical staff exhibited the best first aid knowledge in the "nine preventions", while their understanding of first aid for acute attacks of chronic diseases remained inadequate. This discrepancy may be attributed to the emphasis placed by government agencies on the "nine preventions". Additionally, knowledge of cardiac arrest and cardiopulmonary re-

suscitation ranked second, may be due to the frequent participation of medical staff working in the residential care facilities in basic life support training programs. Research has indicated knowledge and skills related to cardiac arrest, demonstrating a strong focus on its management. Residential facilities also receive more cardiopulmonary resuscitation training through programs provided by American Heart Association training centers, Shanghai Medical Emergency Center, and the Red Cross. Other than training, research has demonstrated higher usage of automatic external defibrillator (AED) in residential facilities than other areas, indicating an increased frequency of AED in elderly residents experiencing cardiac arrest (Sarkisian et al, 2021).

However, the healthcare professionals showed insufficient knowledge of first aid for other common emergencies among the elderly, including fever, sprains, nosebleeds, and electrical shocks. This may be attributed to their limited involvement in implementing immediate on-site first aid during these emergencies. Furthermore, the medical staff exhibited a poorer understanding of first aid for chronic disease attacks due to inadequate training and exposure to relevant knowledge. Instead, they mainly relied on experiential knowledge to identify high-risk residents in nursing homes. Research has revealed that nurses face substantial challenges in offering emergency care in such facilities, such as a lack of resources and limited authority (Park et al, 2016). Elderly residents in healthcare facilities are often diagnosed with multiple chronic diseases, and acute symptoms such as fever, nervous system impairments, and acute abdominal pain frequently require emergency management (Cantwell et al, 2017; Chen et al, 2022; Dwyer et al, 2021; Heinold et al, 2021). Therefore, medical staff in residential facilities must be well-equipped to manage emergencies stemming from acute attacks of chronic diseases.

Current Attitude and Practice of Medical Staff Regarding First Aid Services for Common Elderly Emergencies

Unlike the level of knowledge, medical staff in residential facilities demonstrated a positive attitude and appropriate first-aid practices. They admitted the crucial role of first aid in residential facilities, highlighting that healthcare facilities should provide immediate on-site acute care during an emergency. Emergency management for elderly care was considered essential, and the necessity of first aid training was strongly affirmed. This shows the importance placed on an organizational emergency response system, which relies not only on the available resources within residential facilities but also on regulatory restrictions imposed by government authorities (McCloskey, 2011).

The majority of medical staff asserted implementing appropriate acute care and daily preventive measures for elderly individuals. However, this assertion does not agree with prior evidence. Zhou et al (2021) reported that most caregiver staff mainly focused on meeting the basic health needs of the elderly, often overlooking the importance of first aid. They further observed that only a small proportion of caregivers considered first-aid skills essential to their work (Zhou et al, 2021).

Qualitative studies (Francis-Coad et al, 2019; Stokoe et al, 2016) have shown that medical staff in residential facilities often fail to recognize their role in pre-

venting and managing emergency events. The disparity between these results and our findings may be attributed to the increased empowerment of medical staff in residential facilities during the COVID-19 pandemic. Empowerment is a key determinant of attitude, according to the theory of planned learning. Qualitative research demonstrates that the lockdown policies during the pandemic made medical staff as the primary healthcare providers within residential facilities, as external support became limited. This shift in responsibility increases the sense of duty, promoting healthcare professionals to assume both professionals and personnel accountability for the wellbeing of elderly individuals (Birt et al, 2023; Hung et al, 2022; Sweeney et al, 2022). Consequently, medical staff were empowered to administer more complex management, typically provided by specialist external professionals. Ultimately, this elevated sense of responsibility impacted their role in emergencies. As caregivers for the elderly, medical staff in residential facility are attuned to the needs of the elderly and are committed to providing healthcare requirements for elderly residents.

The Correlation Between Knowledge, Attitude, and Practice Based on SEM

The structural equation model revealed that knowledge affects practice by directly impacting it or indirectly by shaping attitude, which in turn influences practice. This result support our initial hypothesis and is consistent with existing literature on KAP, suggesting knowledge alone does not always translate into practice (Liao and Yang, 2023). Through SEM, it was identified that knowledge of "first aid for the nine preventions" and "cardiac arrest and cardiopulmonary resuscitation" has the most significant contributions to the model predicting first aid knowledge in residential facilities. This highlights the significance of targeted training of medical staff in these domains, which could facilitate the adoption of appropriate first aid practice.

Moreover, apart from knowledge, attitude towards first aid plays a crucial role in guiding medical staff to appropriate first aid practice. Previous KAP study has demonstrated a strong predictive effect of attitude on practice (Lv et al, 2024), and another study showed that the moral responsibility of medical staff to care for residents may facilitate their engagement in first aid practice (Birt et al, 2023). Among various aspects of attitude, emergency management demonstrated the highest impact on attitude formation, indicating a strong correlation. Since attitude can be influenced by knowledge acquisition, it is advisable for health educators and infirmary administrators to implement first aid education and training through diverse methods and formats. This approach can help foster a positive first-aid attitude among medical staff, ultimately encouraging them to respond promptly and effectively during emergencies.

Despite some promising findings, this study has some limitations that must be acknowledged. First, the sample size did not meet the standard required for subgroup analysis, which may affect the reliability of the results. Second, there is no widely accepted scale for a comprehensive and quantitative evaluation of the knowledge, attitude, and practice levels of medical staff in residential facilities. This study primarily relied on a self-designed questionnaire, which may have resulted

in inflated attitude and practice scores, possibly due to the subjectivity inherent in the attitude and practice dimensions for social desirability bias. Furthermore, the Cronbach's α coefficient for the knowledge dimension was marginally acceptable, potentially compromising the internal consistency of the data. Future research should focus on refining and improving the questionnaire. Third, the response rate was less than half, potentially leading to selection bias. Nevertheless, variations in age, education level, length of service, and the type of nursing institution among the respondents suggest a diverse cohort. Finally, since the study was conducted among healthcare professionals in residential facilities in Shanghai, the external validity of the SEM was limited when applied to medical staff in other areas.

Conclusion

Knowledge, attitude, and practice are strongly interconnected, with knowledge impacting behavior indirectly by shaping attitude. Medical staff in Shanghai residential facilities displayed a relatively limited understanding of first aid for common resident emergencies, particularly in treating acute attacks of common chronic diseases, representing a crucial gap in their first aid skills. Our findings warrant extensive attention and should serve as key evidence for guiding education, training, and assessment standards in elder care. Enhancing first-aid training will not only provide skilled medical staff with essential first aid knowledge but also improve their motivation and commitment to the well-being of elderly residents. By strengthening the necessary skills and confidence to manage emergencies effectively, such training and education can ensure prompt and appropriate first-aid actions, ultimately boosting a positive and harmonious environment for staff and residents.

Key Points

- This is the first study in China focusing on the first aid capability of medical staff in residential facilities from the perspective of KAP theory.
- Compared to positive attitude and appropriate practice scores for first aid, the knowledge score of Chinese medical staff for common elderly emergencies in nursing facilities remains inadequate.
- Attitude towards first aid plays a crucial role in guiding appropriate practice, and knowledge can influence behavior directly or indirectly by shaping attitude.
- The intricate interplay of knowledge, attitude, and practice for common elderly emergencies within residential facilities underscores the significance of training programs to improve knowledge and boost positive attitudes among healthcare professionals.

Availability of Data and Materials

All data included in this study are available from the corresponding authors upon reasonable request.

Author Contributions

SY implemented the study and drafted the manuscript. HT implemented the study. WC performed the statistical analysis and revised the manuscript. LG designed and implemented the study, and reviewed the manuscript. YW designed the study, supervised the entire process, edited and reviewed the manuscript. All authors contributed to important editorial changes of important content in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee on Academy of Nursing and Health Management, Shanghai University of Medicine and Health Sciences (Approval No.: 2023-xwcykt-02-342524198707240548) and the study was conducted in accordance with the Declaration of Helsinki. All the participants provided informed consent.

Acknowledgement

Funding

Conflict of Interest

The authors declare no conflict of interest.

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