Security Guards' Knowledge, Attitude and Practice of Cardiopulmonary Resuscitation - the Status Quo and Influencing Factors in China

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Abstract

Background: First aid provided in public places is life-saving when unexpected emergencies, such as cardiac arrests occur. Security guards who constantly patrol public places can perform or assist cardiopulmonary resuscitation (CPR) in cardiac arrest situations if they are appropriately trained. However, little is known about the status quo of the knowledge, attitude and practice (KAP) of CPR among the security guards in China .

Aims: This study aims to investigate the current status quo and explore the influencing factors of the KAP of CPR among security guards, and provide guidance for developing CPR training programs for them in China.

Methods: We conducted a convenience sampling on the security guards from 2 tertiary hospitals, 1 airport, 16 commercial buildings, 10 supermarkets and 14 residential complexes in China. Data was collected from the questionnaire about the KAP of CPR given to the security guards enrolled. Univariate analysis and multiple linear regression analysis were used to analyze the influencing factors of the KAP of CPR.

Results: The total scores of each element, the knowledge on CPR among security guards was (25.72±12.31), attitude (31.99±3.94), practice (20.89±4.54), and the total score (78.60±14.70). Multiple linear regression analysis showed that, the workplace of security guards, previous occupations, previous exposure, training and performance of CPR, age, and educational background were the main factors affecting the KAP of CPR of the security guards (all of the *P* values <0.05).

Conclusions: The KAP of CPR among the security guards in Shanghai needs further improvement. The training and intervention program should combine their cultural background, educational background and other influencing factors to improve the level of CPR and first aid ability of security guards.

Introduction

Sudden Cardiac Death (SCD) is usually defined as natural death caused by the heart within 1 hour after the onset of acute symptoms, which is sudden and unpredictable. The incidence of out-of-hospital cardiac arrest (OHCA) can reach 70%-80% [1,2], which is associated with a significant morbidity and mortality [3,4]. There were over 147.0/100,000 and 53.0/100,000 OHCA in the United States and United Kingdom each year [5,6], While in Beijing, China there are 80.6/100,000 cases annually [7]. Related literature reports that the high incidence of CA mainly occurs at public sports venues, transportation hubs (such as airports, railway stations, subway stations), large shopping malls and factories, communities, etc.[8] Some scholars [9,10,11] reviewed and found that the incidence of CA in public places is very high. For example, Qiu et al. [9] collected 5,425 (73.0%) cases of 7432 OHCA cases admitted to 5 regional representative hospitals in Dongguan that occurred in factories, entertainment venues and supermarkets. Li [10] and Zhao et al.[11] reviewed and sorted out OHCA cases, the incidence of CA in public places was 58.0% and 54.63%, respectively. In recent years, there have been 23 and 21 CA in the emergency center of Xianyang International Airport and Zhengzhou Xinzheng International Airport [12,13].

The 2020 guidelines emphasize: non-professional rescuers initiate cardiopulmonary resuscitation (CPR) for OHCA patients as soon as possible (recommendation level 1; level of evidence B-R) for that early CPR can reduce the mortality of OHCA patients and improve their neurological prognosis [14-16]. Some studies have shown that the implementation rate of CPR among the first witnesses had increased to 76% in Washington[17], and 70.7□% in Norway [18]. However, it was less than 5% [19] in China, and the resuscitation success rate was only 1.2-1.4% [20], which was far behind developed countries. According to reports [19], the average time for professional emergency personnel in China to arrive at the scene immediately after receiving the call for help was 16.22 minutes. While the professionals arrived at the scene of the incident, the patient had already missed the "golden 4 minutes" of CA, which results in a low success rate of treatment.

In recent years, the continuous occurrence of CA incidents in public locations in China has caused security guards to pay more attention to the identification of emergencies. Security guards who constantly patrol public places could perform or assist CPR in cardiac arrest situations, if they are appropriately trained. Being able to implement CPR for patients in the shortest time before the arrival of the professional rescue team will effectively improve the survival rate of patients. Literature review found that the current domestic research on the current situation of knowledge, attitude and practice (KAP) of CPR is mostly focused on the medical staff, college students and the public. However, little is known about the status quo of the KAP of CPR among the security guards.

This study aims to investigate the current status quo and explore the influencing factors of the KAP of CPR among security guards, and provide guidance for developing CPR training programs for them.

Methods

Study design and participants

We conducted a convenience sampling on the security guards from 2 tertiary hospitals, 1 airport, 16 commercial buildings, 10 supermarkets and 14 residential complexes from November 4, 2020 to December 28, 2020 in China. It included 600 security guards and we divided them into this study. We included security guides were : Meet the definition standards of security guards and national vocational qualification classification standards [21], and job experience in security was≥1 year; Age ≥20 years or ≤65

years; Able to complete the questionnaire independently; We excluded security guides were : Mental disorders (or cognitive impairment); Those who cannot cooperate to complete the questionnaire due to their physical conditions; Those who participate in the research involuntarily.

Procedure

The study was approved by the Institutional Review Board of Shanghai General Hospital (process number 2018ylk41). All questionnaires were anonymous. The purpose of the study and the voluntary nature of completing the questionnaires were stated in the questionnaires. All participants willing to complete the questionnaires indicated their consent to the study. Strict confidentiality was maintained throughout the process of data collection and analysis.

We first informed all the leaders of the security guards in each workplace about the study before data collection. Afterwards, the leaders selected qualified participants and informed the purpose as well as the procedure of the study to every participants. All the participants willing to participate in the study signed consent forms after the announcement. Then, the KAP of CPR questionnaires were given and instructed by the researchers to complete the questionnaires if he/she chose to be in the study. Each respondent was asked to complete questionnaires individually in his/her own time. For those who could not complete the questionnaires on their own, the two researchers helped them to finish the questionnaires. The completed questionnaires were deposited anonymously in a sealed mailbox. After all questionnaires were collected, data were input and exported into a spreadsheet for further analysis.

Measures

The questionnaire about the KAP of CPR in this study was based on the theoretical guidance of the KAP model [22], and questions were developed from review of literature, and referring to the "2020 AHA Cardiopulmonary Resuscitation and Cardiovascular First Aid Guide Update" [23]. It took approximately 15-20 minutes to complete the questionnaire which included 39 items, and divided into 2 sections: socio-demographic characteristics, and the questionnaire about the KAP of CPR for the security guards.

Socio-demographic characteristics

It included gender, age, educational status, marital status, religious belief, monthly household income, workplace, job title and level of employment, the number of years of job, etc.

The questionnaire about the KAP of CPR for the security guards

The Professional Classification Ceremony of the People's Republic of China (2015 Edition) defines security guides in public places refer to "persons who are employed by security companies to protect certain objects and targets and provide security services", and defines the national professional qualification classification standard on security guards [21].

It included three dimensions of KAP. In this study, knowledge dimension was assessed by 25 items, attitude dimensions were assessed by 7 items, and behavior dimensions were assessed by 7 items.

For knowledge dimension 2 points for correct answers; no points for wrong answers; a total score of 50 points.

For attitude dimensions and behavior dimensions, Likert 5-level scoring method were used, attitude dimensions from "very unwilling"to"very willing", and were given 1-5 points respectively, for a total score of 35 points; the behavioral dimensions from"never","occasionally","general","always"and"always"were respectively assigned 1-5 points, for a total score of 35 Points; the higher the score, the more positive it is. The total score of KAP was 120 points. The overall Cronbach's α coefficient of the questionnaire was 0.911, the overall half-coefficient of the questionnaire was 0.712, the content validity (S-CVI) of the questionnaire is 0.85 on average, and the content validity (I-CVI) of each item is 0.938-1.00, indicating that the questionnaire was good reliability and validity.

Study size

The study size was based on the number of items. Since there were 39 items in this study, the sample size should be 5-10 times the number of items. Considering the dropout rate of 20%, the sample size in this study was set as 468 cases.

Statistical analyses

All statistical analyses were undertaken using IBM SPSS Statistics Version 21.0, tests were two-sided and a p-value of 0.05 or lower were considered statistically significant. We conducted the following analyses.

- Descriptive statistics were presented as frequencies and proportions for

categorical data, and median and mean±standard deviation (SD) for continuous variables.

- Categorical variables were analyzed using two independent sample t-

tests, and one-way ANOVA.

- Multiple linear regression analysis was performed to analyze the

influencing factors of the KAP of CPR. A backward variable selection approach was used to construct the final regression model for the prediction of influencing factors. In particular, all statistically significant variables in the univariate analysis were included in the initial model. At each iteration, the least significant variable was removed, and the model was refitted using the remaining variables. The above procedure was repeated until all remaining variables were significant.

Results

Demographics characteristics of participants (Table 1)

A total of 600 security guards were eligible, 4 were excluded because of missing data for age, educational background ,or previous occupations. Finally, 596 security guides were included in our analysis.The sample was predominantly male (96.6%). The mean age was 38.85 years old (standard deviation [SD] 0.38). More than one third of the participants were Security guards of Hospitals. More than two thirds of the participants had 1-4.9 years of job experience. The majority of participants completed Junior high school education and had annual household income less than 4999RMB/per month.The results were given in Table1.

Table 1 Participant demographics (n = 596)

Factor	Category	Frequency (Percentage)(%)	Factor	Category	Frequency (Percentage) (%)
Gender	Female	20（3.4）	History of heart disease with Family members	No	558（93.6）
	Male	576（96.6）		Yes	38（6.4）
Age Range	20-39	202（33.9）	Heard of CPR	No	132（22.1）
	40（49	164（27.5）		Yes	464（77.9）
	50-59	207（34.7）	Training of CPR	No	344（57.7）
	60-70	23（3.9）		Yes	252（42.3）
Educational background	Elementary school and below	38（6.4）	Health status	Very bad	16（2.7）
	Junior high school	300（50.3）		Bad	6（1.0）
	High school	181（30.4）		General	75（12.6）
	Community college	58（9.7）		Better	214（35.9）
	Bachelor degree	19（3.2）		Very well	285（47.8）
Marital status	Single	99（16.6）	Job experience (Years)	1-4.9	360（60.4）
	Married	486（81.6）		5-10	134（22.5）
	Divorced	11（1.8）		（10	102（17.1）
Religious belief	Yes	24（4.0）	Rescue experience in CPR	No	568（95.3）
	No	572（96.0）		Yes	28（4.7）
Monthly household income (RMB [a])	≤4999	270（45.3）	Technical title	Junior Security Guard	535（89.7）
	5000~9999	316（53.0）		Intermediate Security Guard	40（6.7）
	≥10000	10（1.7）		Senior Security Guard	13（2.2）
previous occupations	Doctor	4（0.6）		Security Officer	4（0.7）
	Security	105（17.6）		Senior Security Officer	4（0.7）
	soldier	31（5.2）	performance of CPR	No	419（70.3）
	Firemen	12（2.0）		Yes	177（29.7）
	driver	26（4.4）	Work place	Security guards of residential complex	99（16.6）
	Fitness coach	4（0.6）		Security guards of Airport	66（11.1）
	Armed police	4（0.6）		Security guards of commercial building	163（27.3）
	farmer	116（19.5）		Security guards of supermarket	92（15.5）
	service personnel	83（14.0）		Security guards of Hospital	176（29.5）
	Self-employed	78（13.1）			
	Technical staff	71（11.9）			
	other	62（10.5）			
Sum		596（100.0）			

The scores of KAP on CPR

The total scores of each element, the knowledge on CPR among security guards was (25.72±12.31), attitude (31.99±3.94), practice (20.89±4.54), and the total score (78.60±14.70). Among the scores of KAP on CPR , the scores of attitude is the highest, the scores of knowledge is lower, and scores of practice is the lowest.The total scores of KAP were given in Table 2.

Table 2 the total scores of KAP

items	full marks	lowest score	highest score	median	±s
the scores of Knowledge	50	0	48	27.0	25.72±12.31
the scores of Attitude	35	7	35	34.5	31.99±3.94
the scores of Practice	35	7	35	20.0	20.89±4.54
the total scores of KAP	120	14	116	75.0	78.60±14.70

Univariate analyze the influencing factors of the KAP of CPR

Subjects from different work place differed significantly in KAP in CPR, and it showed that age, education background marital status, monthly household income, health status, workplace, previous occupations, technical title level, heard of CPR, training of CPR, performance of CPR, rescued experience of CPR were the factors affecting the KAP of CPR of the security guards , the difference is statistically significant (P<0.05). The results were given in Table 3.

Table 3 A Single Factor Analysis of Security guard's Score 〔±s〕

Factor	Total(n=596)	The total scores of KAP	Factor	Total(n=596)	The total scores of KAP	Factor	Total(n=596)	The total scores of KAP
Gender			Technical title			Heard of CPR		
Female	20	73.35±20.09	Junior Security Guard	535	77.93±13.86	yes	464	81.67±13.17
Male	576	78.78±14.46	Intermediate Security Guard	40	85.63±16.86	no	132	67.83±14.76
t value		1.199	Senior Security Guard	13	83.77±19.19	t value		10.368
P-value		0.245	Security Officer	4	93.00±20.45	P-value		0.000**
Age Range			Senior Security Officer	4	67.00±41.83	Training of CPR		
20-39	202	82.84±13.92	F value		4.660	yes	252	85.92±10.79
40-49	164	79.81±14.47	P-value		0.001**	no	344	73.24±14.87
50-59	207	74.79±13.92	Previous occupations			t value		11.503
60-70	23	67.09±15.93	Doctor	4	77.75±42.91	P-value		0.000**
F value		16.531	Security	105	81.64±15.67	Performance of CPR		
P-value		0.000**	soldier	31	90.29±12.15	yes	177	85.68±10.24
Educational background			Firemen	12	85.92±9.77	no	419	75.61±15.27
Elementary school and below	38	75.58±12.73	driver	26	80.12±12.37	t value		8.045
Junior high school	300	75.20±14.23	Fitness coach	4	90.00±16.75	P-value		0.000**
High school	181	82.36±13.04	Armed police	4	82.75±20.07	Rescue experience in CPR		
Community college	58	83.31±16.14	farmer	116	75.57±13.53	yes	28	88.11±12.02
Bachelor degree	19	88.26±19.81	service personnel	83	71.61±14.58	no	568	78.13±14.67
F value		11.716	Self-employed	78	78.24±12.87	t value		4.237
P-value		0.000**	Technical staff	71	79.85±13.07	P-value		0.000**
Marital status			other	62	78.68±13.52	Health status		
Single	99	82.06±15.96	F value		5.336	Very bad	16	89.88±11.09
Married	486	77.97±14.16	P-value		0.000**	Bad	6	74.33±12.26
Divorced	11	75.55±22.07	Job experience (Years)			General	75	
F value		3.462	1-4.9	360	78.24±14.40	Better	214	76.20±15.02
P-value		0.032*	5-10	134	79.57±15.43	Very well	285	80.67±13.80
Religious belief			≥10	102	78.61±14.86	F value		6.37

yes	24	80.71±16.64	F value		0.396	P-value		0.000**
no	572	78.51±14.62	P-value		0.673	History of heart disease with Family members		
t value		0.636	Work place			no	558	78.38±14.83
P-value		0.531	Security guards of residential complex	99	72.33±12.93	yes	38	81.81±12.19
Monthly household income (RMB [a])			Security guards of Hospital	176	84.00±13.46	t value		1.417
≤4999	270	75.73±14.30	Security guards of Airport	66	83.97±10.50	P-value		0.157
5000~9999	316	81.23±14.07	Security guards of supermarket	92	78.48±15.45			
≥10000	10	73.10±26.66	Security guards of commercial building	163	15.29±1.20			
F value		11.266	F value		17.623			
P-value		0.000**	P-value		0.000**			

note：* P ﹤ 0. 05；**P ﹤ 0. 01）

Multiple linear regression analysis of the influencing factors of the KAP Security guards' KAP of CPR were divided into dependent variables, and all

statistically significant variables in the single-factor analysis results were used as independent variables to perform multiple linear regression analysis. The variables and assignments were shown in Table 4. Multiple linear regression analysis showed that, the workplace, previous occupations, previous exposure, training and performance of CPR, age, and educational background were the main factors affecting the KAP of CPR of the security guards (all of the P values <0.05). These main factors were introduced into the regression equation, the 7 influencing factors can explain 35.0% of the variation in the total score of KAP for security guards. The results were given in Table5.The regression model was tested by F and was statistically significant (F=23.854, P=0.000), and the regression equation was established. The regression equation $Y=74.828-1.155X_5-0.431X_7+7.95X_9+7.091X_{12}+2.95X_{11}-2.155X_1+1.461X_2$.

Table 4 Assignment of the independent variable index introduced into the regression equation

code	independent variable	Assignment methods
X_1	Age Range	20-39=1、40-49=2、50-59=3、60-70=4
X_2	Educational background	Elementary school and below=1、Junior high school=2、High school=3、Community college=4、Bachelor degree and above=5
X_3	Marital status	Single=1、Married=2、Divorced=3
X_4	Monthly household income(RMB)	≤4999=1、5000-9999=2、≥10000=3
X_5	Work place	security guards of residential complex=1、security guards of hospital=2、security guards of airport=3、security guards of supermarkets=4、security guards of commercial buildings=5
X_6	Professional qualifications	Junior Security Guard、1、Intermediate Security Guard、2、Senior Security Guard、3、Security Officer、4、Senior Security Officer、5
X_7	Previous occupations	doctor=1、security guard=2、soldier/army=3、firemen=4、driver=5、fitness coach=6、armed police=7、farmer=8、service personnel=9、self-employed=10、technical staff=11、other=12
X_8	Health status	Very bad=1、bad=2、General=3、well=4、very well=5
X_9	Heard of CPR	yes=1、no=0
X_{10}	Rescue experience of CPR	yes=1、no=0
X_{11}	Performance of CPR	yes=1、no=0
X_{12}	Training of CPR	yes=1、no=0

Table 5 The results of multiple linear regression analysis of the factors affecting the total scores of CPR for security guards

independent variable	partial regression coefficient	Std Error	standardized regression coefficient	t value	P-value
Constant (quantity)	74.828	4.817	-	15.533	0.000**
Work place	-1.155	0.349	-0.121	-3.315	0.001**
Previous occupations	-0.431	0.142	-0.105	-3.037	0.002**
Training of CPR	7.091	1.267	0.239	5.597	0.000**
Performance of CPR	2.95	1.342	0.092	2.198	0.028*
Heard of CPR	7.95	1.281	0.226	6.207	0.000**
Rescue experience of CPR	2.456	2.321	0.037	1.058	0.291
Age Range	-2.155	0.668	-0.134	-3.226	0.001**
Educational Background	1.461	0.652	0.087	2.24	0.025*
Marital status	-0.646	1.373	-0.018	-0.47	0.638
Monthly household income(RMB)	0.664	1.103	0.024	0.601	0.548
Professional Qualifications	-1.366	0.979	-0.052	-1.395	0.164
Health status	0.388	0.555	0.024	0.699	0.485

note：R^2=0.365、adjustment R^2=0.350、F=23.854 、P=0.000、*p＜0.05、**p＜0.01

Discussion

The current status of CPR KAP of security guards

From our study results, we found that the security guards surveyed have a low level of CPR knowledge, and their grasp of CPR knowledge is not ideal. Compared with many domestic studies [24,25,26], For example, Mei [24], Li [25] and Tao [26] have consistent results on the domestic public and primary caregivers of coronary heart disease. The above-mentioned data may be due to the publicity of cardiopulmonary resuscitation and insufficient attention and limited channels for security guards to learn first aid knowledge, except for the lack of attention to CPR and incomplete knowledge of domestic security personnel. The training penetration rate of cardiopulmonary resuscitation is also an important indicator to measure the comprehensive strength of a country [27]. Although the Chinese government and health departments have begun to pay attention to and promote the training and popularization of emergency care knowledge and skills, and have achieved gratifying results in the training of professional skills, the training and popularization of non-professionals urgently need to be strengthened.

According to the data presented in this study, the average CPR attitude score of the security guards surveyed was 31.99±3.94, and their attitude towards CPR implementation was relatively active. Compared with the study by Chen et al. [28], the results were inconsistent, which may be related to the willingness of different occupations to implement first aid. In an emergency, security guards are more willing to implement CPR than the general public. On the other hand, the average score of CPR behavior of the security guards under investigation is 20.89±4.54, and the behavior of implementing CPR is relatively weak. Compared with Li[25] and other studies, the results are consistent. The results of another multi-center study show the average CPR implementation rate of witnesses outside hospitals in large and medium-sized cities in China is only 4.5% [19], which also validates this view. The reason for the above data may be that only a small part of the security guards participating in the investigation have participated in rescue experience, and the chance of doing CPR for real people is relatively small. The government should actively advocate the concept of "Healthy China, First Aid First", and advocate the social morality of "Take action when it's time to take action". Encourage citizens to take the initiative to rescue in emergencies, so as to increase the rate of witnesses' CPR implementation and rescue success rate.

Analysis of influencing factors of CPR for security guards

workplace

According to the data presented in this study, the different workplaces of security guards under investigation are the influencing factors of KAP. Among them, the score of KAP with security guards in hospitals is the highest, followed by airports, hypermarkets and communities, and the scored of KAP with security guards in commercial buildings is the lowest. The reason for the above data may be: security personnel's awareness of first aid in different places and their attitude towards CPR is different from behavior enthusiasm: hospitals, as an important venue for protecting human health, are responsible for the health and safety of human life. At the same time, this study also shows that although first aid is a key responsibility of the government's livelihood, security guards in different workplaces have different levels of awareness of first aid knowledge. Some scholars conducted an epidemiological survey on the location of CA and confirmed that CA mostly occurred in public places outside the hospitals. The high-incidence locations are mainly public sports venues, transportation hubs (such as airports, train stations and subway stations), large shopping centers, communities, etc. [19]. Therefore, it is necessary to strengthen the training of first aid knowledge and skills of security guards in these places, and make full use of existing resources to build a "government-led, vertical and horizontal linkage of various departments (industry), medical personnel as the main trainer, and security guards for everyone to participate." The first aid training system enables training to be carried out regularly and stably, in order to improve the CPR knowledge and skills of security guards in public places.

Past occupations

According to the data presented in this study, the past occupations of the security guards under investigation have an impact on knowledge, trust, and behavior. security guards who have been engaged in fitness coaching, military service, and military work in the past have the highest scores for knowledge, belief and behavior, followed by firefighters, armed police, etc. The reasons for the above data may be related to the particularity of these jobs. Personnel engaged in these occupations must master a certain amount of first aid knowledge, and be able to put the lives of others in the first place when facing the dangers of others' lives, which reflects the good professional qualities of people who have engaged in the above occupations in the past. At the same time, among the personnel surveyed based on this research, the proportion of security guards with senior professional titles (security guard and senior security officer) is only 1.4%, while junior security guards account for the vast majority (89.7%). Therefore, according to the data presented in this research, the title level is not an influencing factor for the surveyed personnel knowledge, belief and behavior.

Participation in CPR training

According to the data presented in this research, whether you have heard of CPR and whether you have participated in CPR training has an impact on the knowledge, belief, and behavior of security personnel. It is consistent with the research results of Tao [26] and Liu [29]. This may be related to the fact that they have known and understood part of CPR related knowledge through various channels, and realized that having CPR knowledge and skills can play a vital role in saving the lives of patients at critical times. At the same time, it further suggests that strengthening training is the focus of popularizing CPR. Research by Yan et al. [30] shows that the public's first aid knowledge has been improved and enhanced through training such as PPT courseware, video demonstration, and scenario simulation. However, this survey found that 57.7% of security guards have never received training. In China, there is a lack of an assessment system on knowledge of CPR for securit guards ,and there is no unified pre-job training textbooks and training teacher standards in China, and there is still no domestic policy on first aid training and assessment for security guards.Without relevant laws requiring professional training, security guards have very limited knowledge of CPR ,and result in low rate of rescue success. However, the law in the United States stipulates that some people with special occupations, such as police and firefighters,and security guards must receive CPR training [31].Meanwhile , the United States is one of the most developed countries in the security service industry today,and Security guards in USA must receive at least 8 hours of professional CPR training before and after starting work, and after receiving 16 hours of on-the-job training, 8 hours of CPR training are required after working each year[32]. The state and government departments in China should attach great importance to it, formulate corresponding policies and systems, increase publicity, encourage and require all types of security guards to participate in first aid training and assessment, and at the same time strengthen ideological and moral education and increase their attention to first aid. And it can add a strong sense of responsibility and responsibility to the security guards when they are encountering emergencies, and overcome obstacles to the implementation of CPR, and better implement on-site first aid in China.

CPR operation mastery

According to the data presented in this research, the CPR operation mastery has an impact on the knowledge, belief and behavior of security personnel. It is consistent with the research results of Wang[33]. The reasons for the above data suggest that operations and drills are an important way to simulate emergency response and improve emergency management and handling capabilities. In addition, the presence or absence of CPR rescue experience is not an influencing factor that affects the investigators' knowledge, belief, and behavior. This is compared with Huang [34] research, and the results are inconsistent. This may be due to the low proportion of security guards who participated in the CPR rescue in this investigation. Only 4.7% of the security guards participated in the rescue, which affected the results of this investigation.

Age

According to the data presented in this study, age is the main factor affecting knowledge, belief and behavior. At the same time, the results of single factor analysis showed that the security guards of the 20-39 and 40-49-year-old groups had a highest level of knowledge, belief and behavior, followed by the 50-59 years old, and the 60-70 years old group had the lowest score. This result is consistent with Tao [26] . This may be the same as that of the security guards under the age of 50 who are in the middle and adolescent period. Social communication is relatively active, and they are more receptive to new things. At the same time, they are better at using new media such as the Internet and mobile terminals to obtain the latest knowledge and have fairly good information acquisition skills so its knowledge and attitude score is higher. However, older security guards gradually degrade their ability to accept and use new things, and their memory gradually declines. Their willingness to learn actively is lower than that of young people, so the total score of knowledge, belief and behavior is lower. With the acceleration of population aging, potential rescuers are often in the elderly group. The 14th National Five-Year Plan has clearly emphasized and pointed out the important role of the elderly in society. Therefore, it should be used as appropriate among the elderly security personnel. Carry out training to enable capable elderly security guards to play an active role when they become "first witnesses."

Education Background

According to the data of this study, education background is the main influencing factor of KAP. In this group, the security guards CPR junior high school, primary school and below are lower than other security personnel, which is consistent with the study [35] The reason of the above data may be due to the fact that the higher the education level, the higher the knowledge mastery, the higher the amount of information acquisition, and the higher the level of understanding of emergency knowledge. All factors should be taken into account in the CPR training of security personnel, especially the training methods of low-educated security personnel, and the training of security guards with lower education level should be strengthened.

Limitations of the study

There is a limitation in this study. The result in this study cannot be all generalized to all security guides, as the security guides in this study were from one city. More research needs to be done, specifically recruiting more security guides from more workplace in different cities in

China to confirm the findings of this study.

Conclusion

In summary, the KAP of CPR among the security guards in Shanghai needs further improvement. It is recommended that professional departments as a unit to explore targeted and feasible training programs to security guards. The Government, in conjunction with the Red Cross Societies and hospitals, is advised to conduct emergency training and assessment of security guides, to increase the dissemination of relevant CPR knowledge, to develop relevant training programme through the media and modern information technology, and to expand the scope and depth of emergency training. Meanwhile, the state and the municipal government should actively publicize the [36] of the "good people Law ", encourage and protect rescuers, which can greatly encourage the will of the people to rescue, and actively rescue in a state of emergency. In order to improve witness CPR implementation rate and rescue success rate.

The training and intervention program should combine their cultural background, work experience and other influencing factors to improve the level of CPR and first aid ability of security guards.

Abbreviations

CPR:cardiopulmonary resuscitation;KAP:knowledge, attitude and practice

SCD:Sudden Cardiac Death;OHCA:Out-of-hospital cardiac arrest.

Declarations

Acknowledgments

Authors` contributions

MZY, YQP and WW contributed to the conception and design of the study. FF, ZY were responsible for the collection of data. MK was responsible for the analysis of clinical data and preliminary statistical analysis. MZY and YQP have drafted the manuscript .The author(s) read and approved the final manuscript.

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Availability of data and materials

The data sets used and analyzed during the current study are available from the first author on reasonable request.

Ethics approval and consent to participate

The study was approved by the Institutional Review Board of Shanghai General Hospital (process number 2018ylk41).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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