Original Article

Effects of science popularization of first aid knowledge and skills using new media among community residents

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Abstract: Objective: The aim of this study was to investigate the effects of science popularization of first aid knowledge and skills using new media among community residents. Methods: A total of 120 residents were enrolled in six urban communities in Nanchang, Jiangxi Province, China, for first aid training. They were randomized into the control group and observation group. Both groups were given regular lectures about first aid knowledge, along with skills training and demonstrations. The observation group received extra training through an educational application, Red Cross First Aid Handbook, and professional answers to various questions about first aid through communication and interaction on instant messaging applications, such as like WeChat. They also received first aid knowledge and skills through other types of education, including exquisite illustrations, videos of news and current events, and science-popularization cartoons pushed through the public platform of new media. All residents received tests on first aid knowledge and skills before and after training. Results and scores were then analyzed. Results: In terms of first aid knowledge, scores of first aid concept, cardiopulmonary resuscitation, first witness, golden rescue time, common emergency concept, and first aid attitude among the residents of the two groups, after training, were significantly higher than those before training. Scores in the observation group were significantly higher than those in the control group, with statistically significant differences (all P<0.05). Regarding first aid skills, scores of first-arrival-performance, cardiopulmonary resuscitation, hemostasis, dressing & bandaging, fracture fixation, and handling among the residents of the two groups, after training, were raised, compared with those before training (all P<0.05). Scores in the observation group were significantly higher than those in the control group, with statistically significant differences (all P<0.05). Pearson’s correlation and linear regression analysis showed a statistically significant correlation between first aid knowledge and skills (P<0.05). Multiple logistic regression analysis of the training effects showed that age, educational level, interest, and health status were the main influencing factors of science popularization and its training effects. Conclusion: Science popularization with new media can improve resident first aid knowledge and skills, enhancing their ability to perform actual operations, such as cardiopulmonary resuscitation, hemostasis, fixation and handling, and providing better pre-hospital conditions following clinical treatment.

Keywords: Community residents, new media training, first aid knowledge, first aid skills

Introduction

With the increase in the number of people with chronic diseases and the frequent occurrence of traffic accidents and natural disasters, on-site first aid has shown increasing value in reducing mortality and improving prognosis [1-4]. Medical studies have indicated that the survival rate could reach 50% if first aid is given in a scientific way within 4 minutes of cardiac arrest, while the death rate could reach as high as 99% when the arrest lasts for more than 10 minutes. For this condition, a certain portion of patients will lose valuable rescue time simply by relying on on-site rescues from professional personnel. First aid training or its science popularization, as an important part of medical work, has become an emergency treatment, as well as a remedial measure, for pre-hospital first aid after the onset of adverse events [5, 6]. In Italy, about 77.00% of the residents have received first aid training. About 5.5 million residents of the US will receive training from the American Heart Association every year [7, 8]. However, the popularity rate of first aid knowledge in China is less than 1%, far below international
levels. Therefore, urgent improvement is needed regarding first aid knowledge and skills training. Moreover, many problems in first aid training are present in China, such as insufficient popularization of first aid knowledge, boring training content, poor mastery of cardiopulmonary resuscitation, less practice opportunities, and unskilled operation [9].

Therefore, the strengths of new media should be capitalized upon, aiming to spread first aid knowledge to residents and improve first aid literacy of the public. This may serve as an important auxiliary measure in dealing with first aid incidents. New media in network, as the product of modern society, is also one of the indispensable channels in the popularization of science. Science information that is collected, processed, and published using the media can maximize the scope of science popularization. The emergence of first aid related applications, such as the Red Cross First Aid Handbook, has greatly enhanced resident interest in first aid knowledge and skills in various forms, such as pictures, videos, and words. In addition, new media solves problems concerning training time, place, and funds, to some extent, with relatively simple, time-saving, and labor-saving operation, along with strong publicity and low investments. This study aimed to investigate the effects of science popularization of first aid knowledge and skills using new media among community residents.

Materials and methods

Subjects

A total of 120 residents in Nanchang, Jiangxi Province, China, that had not participated in any educational trainings about first aid knowledge and skills were recruited and selected for this study. Residents with odd and even numbers in the order of enrollment were included into the control group and observation group, respectively. All recruited residents met the inclusion and exclusion criteria. Inclusion criteria were: Subjects aged 30.0 to 60.0 years old; Subjects with normal cognitive ability to complete the training and examination independently; Subjects that did not participate in any other types of educational training within five years; Subjects that were not medical service personnel of any communities; Subjects that were able to attend the training on time and complete the corresponding assessment; Subjects providing informed consent. Exclusion criteria: Subjects that were unable to participate in the training and assessment on a regular basis; Subjects with a mental disorder or unconsciousness; Subjects that suffered from serious diseases with a predicted survival time of 3 years or less; Subjects that showed poor adherence, with a total time of participating in training courses of less than 6 hours.

Methods

The control group was trained directly through on-site lectures and operation demonstrations of skills, followed by question-and-answer sessions [10]. The observation group received the same on-site lectures but with scenario-based simulation exercises. These were followed by role-playing exercises, involving roles of the injured and the first responder guided by professionals, along with question-and-answer sessions. In addition, residents in the observation group were advised to download the application of the Red Cross First Aid Handbook and follow the relevant microblogs and Wechat public platforms, receiving exquisite illustrations, videos of news and current events, and science-popularization cartoons about first aid knowledge and skills. Wechat group was established to facilitate communication at any time between the residents and professionals [11, 12]. Training content included three aspects, first aid knowledge, common first aid skills, and treatment of common diseases and emergencies. Training time for the residents in both groups was 12 hours, divided into 6 classes. During the training period, this study investigated the ways of acquiring first aid knowledge and skills among residents before training.

 Observation indexes

Measures and relevant tests for assessment were designed according to the 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care [13] and the First Aid Manual for Resident Community, released by local authorities based on relevant domestic and foreign documents and tests. Assessment for first aid knowledge, in this study, was designed according to first aid knowledge questionnaires of the emergency center. It consisted of six items, including first aid concept, cardiopulmonary resuscitation, first witness, golden rescue time, common emergency concept, and first aid attitude [14-17]. Each item was composed of five questions in the form of single
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<table>
<thead>
<tr>
<th>Table 1. Comparison of general information between the two groups</th>
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<tbody>
<tr>
<td>Control group (n=60)</td>
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<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Gender (male/female)</td>
</tr>
<tr>
<td>Age (year)</td>
</tr>
<tr>
<td>Training time (hour)</td>
</tr>
<tr>
<td>Chronic disease (yes/no)</td>
</tr>
<tr>
<td>Han residents (yes/no)</td>
</tr>
<tr>
<td>Residence (local/migrant)</td>
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</tbody>
</table>

choice, true-or-false, or fill-in-the-blank questions, with 1 point for right answers and 0 points for wrong answers for each question. Regarding first aid skills, the single-rescuer cardiopulmonary resuscitation assessment form released by the Red Cross and first aid assessment forms, including first-arrival performance, hemostasis, dressing & bandaging, fracture fixation, and handling established by the local First Aid Center, were used for assessment among residents. Six items were established with a maximum score of 5 points each.

Statistical analysis

Data was analyzed using SPSS software version 21.0. Measurement data are expressed as mean ± standard deviation (X ± sd). Measurement data with normal distribution between the two groups or between pre- and post-training within one group were compared using independent t-test and paired t-test, respectively. Enumeration data are expressed as number of cases (n) using the χ² test and Fisher’s exact probability test. Variables affecting training effects were analyzed using multiple logistic regression analysis. Scores of the observation group, after training, were taken as dependent variables (score over 50 was assigned to 1 and a score of 50 or less was assigned to 0). Age (≤40 years: 1; >40 years: 0), gender (female: 1; male: 0), education level (high school and above: 1; below high school: 0), interest (interest: 1; disinterest: 0), occupation (occupation: 1; no occupation: 0), and health status (good 1; bad: 0) were taken as independent variables. For all analyses, P<0.05 indicates statistical significance.

Results

General information

There were no significant differences in gender, age, training time, chronic disease, proportion of Han residents, and numbers of residents between the two groups (all P>0.05). See Table 1.

First aid knowledge

Before training, there were no differences between the two groups in first aid concept, cardiopulmonary resuscitation, first witness, golden rescue time, common emergency concept, and first aid attitude (all P>0.05). After training, scores of the above measures among residents of the two groups saw significant increases. Scores in the observation group were significantly higher than those in the control group, with statistically significant differences (all P<0.05). See Figure 1.

First aid skills

Before training, there were no differences between the two groups in first-arrival performance, cardiopulmonary resuscitation, hemostasis, dressing & bandaging, fracture fixation, and handling (all P>0.05). After training, scores of the above measures of the two groups were raised (all P<0.05). Scores in the observation group were significantly higher than those in the control group, with statistically significant differences (all P<0.05).

Factors affecting first aid knowledge and skills

There were no gender differences among residents trained using new media. There were no differences regarding average scores among the ones with jobs or otherwise. However, the average scores of the residents receiving training through new media, aged 40 years old or below, were significantly higher than those of residents aged over 40 years old. Moreover, average scores of residents that finished senior high school or higher levels, those in healthy condition, and those with interest in the training, were higher than those of residents that
Figure 1. Comparison of assessment scores on first aid knowledge ($\bar{X} \pm sd$). ***indicates $P<0.001$. A: Scores of knowledge about first aid concept in two groups; B: Scores of knowledge about cardiopulmonary resuscitation in two groups; C: Scores of knowledge about first witness in two groups; D: Scores of knowledge about golden rescue time in two groups; E: Scores of knowledge about common emergency concept in two groups; F: Scores of knowledge about first aid attitude in two groups. Higher scores indicate better training effects.
Figure 2. Comparison of assessment scores on first aid skills (\( \bar{x} \pm sd \)). *** indicates P<0.001. A: Scores of skills about first-arrival performance in two groups; B: Scores of skills about cardiopulmonary resuscitation in two groups; C: Scores of skills about hemostasis in two groups; D: Scores of skills about dressing & bandaging in two groups; E: Scores of skills about fracture fixation in two groups; F: Scores of skills about handling in two groups.
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just received education below the level of senior high school, those in a relatively unhealthy condition, and those that had no interest in the training, respectively. Differences were statistically significant (all \( P<0.05 \)). See Figure 3.

**Correlation between first aid knowledge and skills**

Pearson’s correlation and linear regression analysis showed a significant positive correlation between first aid knowledge and skills, with a correlation coefficient of 0.650. Differences were statistically significant (\( P<0.05 \)). See Figure 4A.

**Ways of acquiring first aid knowledge before training**

A survey of the approaches of receiving first aid knowledge among included residents showed that the main sources of first aid knowledge for residents, before training, were television (n=...
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Table 2. Logistic regression analysis of factors influencing training effects

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>Wald</th>
<th>OR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>2.128</td>
<td>1.066</td>
<td>3.989</td>
<td>8.399</td>
<td>1.010-67.803</td>
<td>0.046</td>
</tr>
<tr>
<td>Gender</td>
<td>1.437</td>
<td>0.920</td>
<td>2.442</td>
<td>4.209</td>
<td>0.694-25.529</td>
<td>0.118</td>
</tr>
<tr>
<td>Educational level</td>
<td>3.417</td>
<td>1.464</td>
<td>5.445</td>
<td>30.489</td>
<td>1.728-537.915</td>
<td>0.020</td>
</tr>
<tr>
<td>Interest</td>
<td>4.052</td>
<td>1.454</td>
<td>7.766</td>
<td>57.539</td>
<td>3.328-994.911</td>
<td>0.005</td>
</tr>
<tr>
<td>Health status</td>
<td>2.084</td>
<td>0.937</td>
<td>4.944</td>
<td>8.033</td>
<td>1.280-50.404</td>
<td>0.026</td>
</tr>
<tr>
<td>Occupation</td>
<td>0.195</td>
<td>0.744</td>
<td>0.063</td>
<td>1.215</td>
<td>0.266-5.543</td>
<td>0.802</td>
</tr>
<tr>
<td>Constant</td>
<td>-7.312</td>
<td>2.466</td>
<td>8.791</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: B, regression coefficient; SE, standard error; Wald, Wald test; OR, odds ratio; CI, confidence interval.

36; 30.00%), the internet (n=21; 17.50%), first aid related books (n=18; 15.00%), newspapers (n=14; 11.67%), lectures (n=11; 9.17%), and radios (n=9; 7.50%). See Figure 4B.

Multiple logistic regression analysis of influence factors

Influence factors and the variables influencing training effects were analyzed using multiple logistic regression analysis. Scores of the observation group, after training, were taken as dependent variables. Age, gender, education level, interest, occupation, and health status were taken as independent variables. Analysis of training effects showed that age, educational level, interest, and health status entered the regression model and presented as the main influencing factors of the training effects. Interest was the leading factor, followed by educational level. There were no gender differences among residents trained through new media. Gender and occupation showed no correlation with training effects. See Table 2.

Discussion

Science popularization is a method of spreading scientific knowledge to the general public in a common and easy way through various media. It will be gradually improved with the development of science and technology, as well as the progression of society. It is also an inevitable social phenomenon considering these improvements [18]. With the aggravation of population aging and the increase of factors leading to social instability in China, the probability of adverse events is on the rise. Thus, more first aid responders are needed. Once respiration and heartbeats stop for eight seconds, cerebral anoxia will occur. This is followed by comas after a half minute. After one minute, brain cells begin to die, with an end to all brain cells after six minutes. Irreversible death of the cells presents after ten minutes. Therefore, approaches to improve public first aid skills have become a problem that must be solved in society [19]. In China, the traditional mode for science popularization has posed difficulties in meeting the needs of the public, with a big gap between the training needs and the number of people in need of training. Hence, innovation and diversity in modes for science popularization should be given importance, along with an increase in the intensity of first aid training and gradual improvement in first aid knowledge and skills among residents. Therefore, raising public awareness of pre-hospital cardiopulmonary resuscitation and treatment for physical trauma will save more lives [20].

At present, in most cities of China, patients or their families, or first witnesses, often just call the emergency telephone number for help when discovering an emergency without any pre-hospital first aid. The emergency center will arrange an emergency ambulance to the scene and transfer the patient to the relevant hospital for treatment, with an average time of 15 minutes [21]. However, if someone with first aid knowledge and skills at the scene performs first aid at the earliest possible time or someone carries out initial treatment for the patient under the guidance of professional medical personnel through the telephone, rescue times will be effectively shortened. More than a quarter of patients with myocardial infarction in China have met their death because they did not receive pre-hospital treatment or effective treatment at the earliest possible time. The survival rate of cardiac arrest patients with ventricular fibrillation will decrease by 7% to 10% for every minute of cardiopulmonary resuscitation delay. One study demonstrated that more
than one hundred people survive every day in Europe and the United States where cardiopulmonary resuscitation has been popularized [22]. However, China has not yet established a perfect first aid training system for science popularization. Moreover, training knowledge and skills are monotonously delivered through videos in boring modes, like indoctrination and cramming, which are inefficient, time- and labor-consuming, and boring to the receivers. Times and places suitable for all residents receiving the training are hard to schedule due to various types of work and life plans. Therefore, innovative and efficient mode for science popularization has become the focus of research among relevant scholars [23, 24].

Mohides et al. confirmed that training of first aid knowledge and skills through scenario simulations for community residents can improve their self-help and mutual aid abilities for accidental injuries, significantly improving their awareness about the importance of emergency response measures [21]. This study has found that, in terms of first aid knowledge, scores of first aid concept, cardiopulmonary resuscitation, first witness, golden rescue time, common emergency concept, and first aid attitude among the residents of the two groups, after training, were significantly higher than those before training. Scores in the observation group were significantly higher than those in the control group, with statistically significant differences. Regarding first aid skills, scores of first-arrival-performance, cardiopulmonary resuscitation, hemostasis, dressing & bandaging, fracture fixation, and handling among the residents of the two groups, after training, were raised, compared with those before training. Scores in the observation group were significantly higher than those in the control group, with statistically significant differences. In this study, residents in the observation group repeatedly learned first aid knowledge through applications in their spare time, enhancing the effects of skill training through animation simulation. Moreover, the residents directly communicated with experts on relevant confusing problems and real-timely receive relevant videos, pictures, and other information through instant messaging applications like WeChat, with further consolidation in theoretical knowledge and skills. Present results are consistent with the research conducted by Cong et al. They adopted the teaching mode of centralized face-to-face teaching plus network teaching based on the platform of Tencent QQ, effectively improving the current situation of lack of first aid knowledge and insufficient teaching resources among college students. They provided a new way of popularization for first aid knowledge among college students [25, 26]. Pearson’s correlation and linear regression analysis showed a significant correlation between first aid knowledge and skills, with statistically significant differences. Variables affecting training effects in this study were analyzed using multiple logistic regression analysis. Scores of the observation group, after training, were taken as dependent variables. Age, gender, education level, interest, occupation, and health status were taken as independent variables. Analysis of the training effects showed that age, educational level, interest, and health status entered the regression model and presented as the main influencing factors of the training effect. As a result, residents with older age, lower educational level, poor health, and poor economic conditions should be paid more attention. Residents in need of first aid training can ask for one-on-one help from volunteers of related institutions, such as the Red Cross. Residents with relatively younger ages, higher educational levels, strong interest, good health, and good economic conditions could receive a favorable training effect. They could be given more detailed training and even relevant training certificates to strengthen their confidence in applying first aid skills in real life.

However, the number of subjects involved in this research was small. There were certain limitations to the current study. Moreover, in the process of evaluation, professional expression in some questions and options may have confused the residents, with incomplete correct reflection of real thoughts of the respondents. In addition, the extent of life experience and reserved first aid knowledge varied among the residents participating in the training. This presented, to some degree, differences in the knowledge base of the training-receiver, affecting the evaluation of training effects. Moreover, China has not yet stipulated and published uniform teaching materials for first aid training, nor has there been a perfect and standard assessment strategy or method. This may have led to unsatisfactory assessments of training effects,
to a certain extent. Therefore, there should be cooperation with relevant state departments to scientifically arrange course contents and assessment methods, aiming to improve the effectiveness of first aid training among community residents. This study also found that the main sources of receiving first aid knowledge among residents, without participating in the training, were television, the internet, first aid related books, newspapers, lectures, and radio. In the next step, there should be an increased use of TV propaganda to improve the first aid knowledge base of residents without receiving relevant training. It is expected that relevant state departments will establish a unified training standard with standard training content. Therefore, improved overall levels of first aid knowledge and skills among community residents should be realized in the future.

In conclusion, science popularization with new media can improve resident first aid knowledge and skills and enhance their ability to perform actual operations, such as cardiopulmonary resuscitation, hemostasis, fixation, and handling. Therefore, this method is worthy of promotion and application.

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Disclosure of conflict of interest

None.

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