

The University
of Hong Kong
Cardiopulmonary
Resuscitation Knowledge
Study Group

Knowledge of cardiopulmonary resuscitation among the public in Hong Kong: telephone questionnaire survey

香港市民對心肺復甦的認識：電話問卷調查

Objectives. To evaluate the knowledge of basic life-support and training experience in cardiopulmonary resuscitation among the public in Hong Kong and to identify areas for improvement in public education.

Design. Telephone interview using a structured multiple-choice questionnaire.

Setting. Random cross-section of the Hong Kong public, from mid-March to May 2002.

Participants. Men and women aged 16 years and older selected using random telephone dialling.

Main outcome measure. Overall score in the cardiopulmonary resuscitation knowledge questionnaire.

Results. Of the 357 participants, approximately 12% had received cardiopulmonary resuscitation training. Cardiopulmonary resuscitation knowledge in Hong Kong was poor, even among the previously trained and especially with regard to circulatory maintenance. The most common reason for not taking cardiopulmonary resuscitation training was lack of time.

Conclusion. The degree of citizen preparedness in initiating cardiopulmonary resuscitation is very poor in Hong Kong. Intensified educational efforts and exploration of new approaches to improve this first stage in the chain of survival are warranted.

目的：評估香港市民對基本生命支持的知識，以及接受心肺復甦訓練的經驗，並且找出在公眾教育方面可加以改善的地方。

設計：依據包含多項選擇題的問卷進行的電話訪問。

安排：2002年3月中至5月期間，香港市民的隨機抽樣調查。

參與者：以隨機撥號方法接觸的16歲或以上的男性及女性。

主要結果測量：有關心肺復甦的問卷的總得分。

結果：在357名參與者當中，有接近12%曾接受心肺復甦訓練。香港市民，即使是曾經接受心肺復甦訓練者，對於心肺復甦的知識甚少；其中對於維持血液循環的知識尤其缺乏。未有接受心肺復甦訓練的最普遍原因是沒有時間。

結論：香港市民對進行心肺復甦的準備意識非常低，證明有需要大力加強公眾教育，並要發掘新方法以改善生存鏈的首個階段。

Key words:

Cardiopulmonary resuscitation;
Heart arrest;
Hong Kong;
Knowledge;
Questionnaires

關鍵詞：

心肺復甦；
心動停止；
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Introduction

According to the Department of Health of the Hong Kong Special Administrative Region Government, coronary heart disease is the second most common disease-specific cause of death (15.6% of all deaths in 1999).¹ Despite efforts to reduce the mortality from this disease, the mortality rate is still rising.¹⁻³ One of the most catastrophic outcomes of coronary heart disease and the most frequent cause of death is sudden cardiac arrest. If cardiac arrest occurs in an out-of-hospital setting, the chance of survival is very slim.⁴⁻⁸ However, if early cardiopulmonary resuscitation (CPR) is initiated by nearby individuals, the survival rate of out-of-hospital cardiac arrests (OHCA) can be improved substantially.⁹⁻¹⁷ Unfortunately, the rate of bystander CPR (also known as basic life-support) in our locality is only 15.6% and the rate of survival until hospital discharge is 1.25%.⁸ Although the cause of failure of resuscitation is multifactorial, bystander knowledge of

CPR may be a major determinant. To improve the survival rate of OHCA, a higher rate of bystander participation in basic life-support is needed. Participation, however, depends on the knowledge of CPR among the general public.

In the West, CPR knowledge among the general public is, on the whole, poor.^{18,19} Until now, no surveys on this subject have been conducted in Hong Kong. Thus, this study assessed the overall CPR knowledge of the general population in Hong Kong and the proportion of the local population trained in CPR. We also aimed at identifying the demographic characteristics of those who prove to be particularly weak in this area of knowledge to help in the design of future CPR training programmes. Targeting the general public in this way is as efficacious as implementing community-wide programmes.²⁰⁻²⁵ Furthermore, we attempted to define the various factors that determine whether or not a person participates in CPR training.

Methods

This cross-sectional descriptive study was conducted in a standardised interview format via telephone using a structured and fixed-alternative (multiple-choice) questionnaire. The protocol was approved by the University of Hong Kong Faculty of Medicine Ethics Committee. All participants were assured of full confidentiality and gave verbal informed consent.

Questionnaire development

The nine questions in the questionnaire were derived from the most recent guidelines on adult basic life-support that were produced by the International Liaison Committee on Resuscitation and adopted by the American Heart Association (Table 1).^{26,27} The St John's Ambulance, the Red Cross, and the Auxiliary Medical Service—the three largest CPR training organisations in Hong Kong—were also consulted for advice.

Pilot interviews among 50 members of the public aged 16 years and older were performed to test the wording of the questions and to identify common response categories. Pilot questionnaires were also sent to three local CPR experts to assess questionnaire validity using Likert

scaling. After the pilot stage, the questionnaire, interview instructions, and data collection procedure were modified and standardised.

Using a test-retest procedure, we assessed questionnaire reliability. In this exercise, 10% of the previously surveyed respondents were randomly selected for re-interview 1 week later. The mean level of answer agreement was 92% between the two sets of results (range, 80%-100%; standard deviation [SD], 7%).

Sampling

The study population consisted of randomly selected Hong Kong permanent residents aged 16 years and older. The age of 16 years is the current minimum age requirement for participation in the local CPR training programme. From mid-March to May 2002, 790 phone calls were made, and 357 individuals were interviewed (response rate, 45%). Multistage sampling was adopted for this survey. In the first stage, a computer-generated list of random household telephone numbers was dialled. In the second stage, a member from each household was selected using the Kish grid tool. According to a random number record sheet, the interviewer requested to interview the person in the household with the randomly assigned seniority in age. If the person was unavailable, the interviewer surveyed the next eldest member of the household.

Telephone interviews

Nine medical undergraduates familiar with CPR conducted the telephone interviews, which lasted 5 minutes on average. After an interviewer obtained verbal consent from a respondent, demographic details including sex, age, level of education, and details of prior CPR training were recorded. The nine questions on CPR knowledge and the choice of answers were then read out and repeated if necessary. Answers were marked on the structured questionnaire. For each question, respondents were asked to choose one correct answer from three alternatives plus a "don't know" option. A correct answer scored 1, and if the respondent answered wrongly or did not know the answer, marks were not deducted. The scores were summed to yield a total knowledge score (range, 0-9). Random guessing would have resulted in a mean score of 3.

Table 1. Questions asked in telephone survey and features that they were designed to test

| Question | Feature that question was designed to test |
|---|--|
| (1) How do you determine that this person is unresponsive and needs help? (2) What will you do first to help the person? | Recognition of an emergency situation |
| (3) To secure the airway in an unresponsive victim, which of the following steps would you do first? (4) How do you open the person's airway? | Securing the airway in an unresponsive victim |
| (5) Which of the following is not the correct way to determine the person is breathing? (6) What should you do if the victim is not breathing? | Provision of ventilation to an unresponsive victim who is breathing |
| (7) Where is the best location to check for the pulse? (8) What should you do if you cannot detect the pulse? (9) What is the best site for chest compressions? | Maintenance of circulation in an unresponsive victim who is not breathing and has no pulse |

Table 2. Demographic characteristics of the study sample and the Hong Kong population in 2001

| Characteristic | Sample, n=357 (%) | Hong Kong population in 2001 (%) | Observed difference Z (95% confidence interval) x 10 ⁻² |
|--------------------|-------------------|----------------------------------|--|
| Sex | | | |
| Male | 145 (41) | 3 285 344 (49) | 8.36 (3.26 to 13.50)* |
| Female | 212 (59) | 3 423 045 (51) | -10.40 (-15.50 to -5.32)* |
| Age (years) | | | |
| 16-25 | 96 (27) | 1 073 342 (16) | -10.50 (-15.10 to -5.85)* |
| 26-35 | 82 (23) | 1 341 677 (20) | -3.17 (-7.53 to 1.19) |
| 36-45 | 74 (21) | 1 610 013 (24) | 3.29 (-0.94 to 7.52) |
| 46-55 | 39 (11) | 1 140 426 (17) | 5.95 (2.68 to 9.22)* |
| 56-65 | 33 (9) | 603 755 (9) | -0.28 (-3.28 to 2.73) |
| ≥66 | 33 (9) | 872 090 (13) | 4.66 (1.74 to 7.58)* |
| Education | | | |
| ≤Primary | 64 (18) | 1 618 212 (29) | 11.30 (7.30 to 15.20)* |
| Form 1 to Form 3 | 54 (15) | 1 060 489 (19) | 3.53 (-0.21 to 7.28) |
| Form 4 to Form 5 | 118 (33) | 1 473 681 (26) | -7.01 (-21.20 to 11.90) |
| Matriculation | 39 (11) | 528 090 (9) | -1.21 (-4.41 to 1.99) |
| ≥University | 82 (23) | 918 500 (16) | -6.56 (-10.90 to 2.20) |

* P<0.05 (Student's *t* test)

Statistical analysis

The total Hong Kong population aged 16 years and older was 5.6 million, according to the census data.²⁸ The expected frequency of people who had received prior CPR training was assumed to be 10%. The sample size in this study (357) yielded a precision of 3.1% (using Epi-info Version 6; Centers for Disease Control and Prevention, Atlanta, US).

Pearson's Chi squared test was used to analyse the association between CPR knowledge and demographic variables. The Student's *t* test was used to compare the characteristics of the surveyed sample and the general population, and the total scores of participants with or without prior training in CPR. Statistical analysis was performed with the Statistical Package for the Social Sciences, Windows version 11.0 (SPSS Inc., Chicago, US). Results with a P value of less than 0.05 were considered significant.

Results

Among the 357 respondents, 41% were men and 67% had an education level of secondary school Form 4 or above (Table 2). Compared with the general public aged 16 and older, the sample had a lower proportion of men and a higher proportion of women. The sample also had a significantly higher proportion of 16- to 25-year-olds and significantly lower proportions of 46- to 55-year-olds and those aged 66 and older. In contrast, the distributions of respondents by educational level were similar to those of the general population, but the study group had a significantly lower proportion of people with an education up to primary level. The differences between the sample and the general population might be because of the time at which the telephone surveys were conducted—usually during the evenings after 6:00 pm. Only 12% had received CPR training, the majority having been trained by the St John's Ambulance (Table 3). In addition, more than half of the trained respondents had taken the course out of interest, nearly a third because of their occupation, and a tenth because it was an organisational requirement. Only a fifth

Table 3. Prior training among the surveyed sample

| Response | No. (%) |
|--|-----------|
| Any prior CPR* training? (n=357) | |
| Yes | 42 (12) |
| No | 315 (88) |
| Where did you receive your CPR training? (n=42) | |
| St John's Ambulance | 24 (57) |
| Red Cross | 2 (5) |
| Auxiliary Medical Service | 1 (2) |
| Others | 15 (36) |
| Reason for taking the CPR course (n=42) | |
| Interest | 24 (57) |
| Work nature | 13 (31) |
| Organisational | 4 (10) |
| Others | 1 (2) |
| When did you receive your last CPR training? (n=42) | |
| <1 year | 8 (19) |
| 1-2 years | 7 (17) |
| 3-5 years | 5 (12) |
| 6-10 years | 10 (24) |
| >10 years | 12 (29) |
| Have you ever performed CPR on a real person before? (n=42) | |
| Yes | 4 (10) |
| No | 38 (90.5) |

* CPR cardiopulmonary resuscitation

Table 4. Characteristics of sample with or without cardiopulmonary resuscitation training

| Characteristic | Yes, n=42 No. (%) | No, n=315 No. (%) |
|-------------------|-------------------|-------------------|
| Sex* | | |
| Male | 28 (67) | 117 (37) |
| Female | 14 (33) | 198 (63) |
| Education* | | |
| ≤Primary | 3 (7) | 60 (19) |
| Form 1 to Form 3 | 2 (5) | 53 (17) |
| Form 4 to Form 5 | 14 (33) | 105 (33) |
| Up to Form 7 | 1 (2) | 33 (11) |
| Matriculation | 1 (2) | 3 (1) |
| ≥University | 21 (50) | 61 (19) |

* P<0.001 (χ² test)

of trained respondents had undergone training in the past year; more than a quarter had received training more than a decade ago. A tenth of the trained respondents had actually administered CPR in a real-life situation.

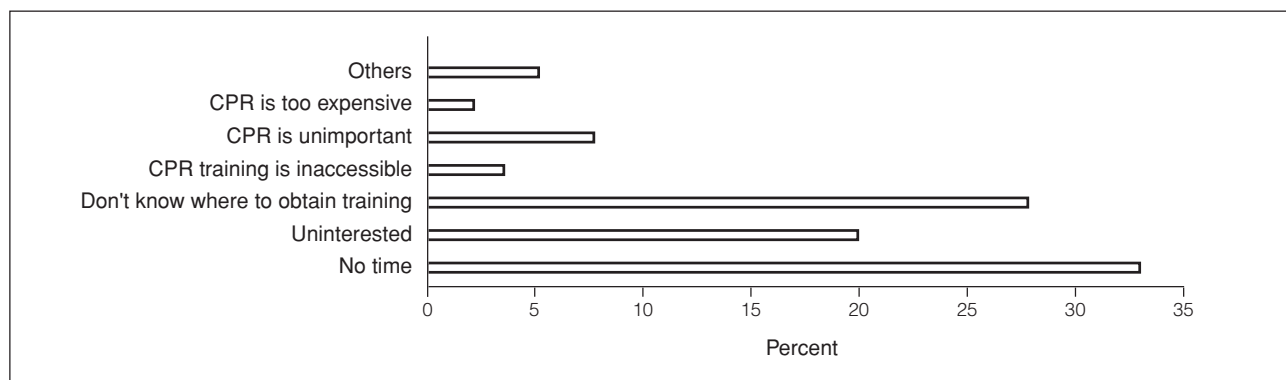


Fig. Reasons for not taking cardiopulmonary resuscitation (CPR) training (n=315)

Men were more likely than women to have undergone CPR training (Table 4). The level of education was correlated with prior CPR training; half of those who had training were university graduates. The most common reason for not having received CPR training was that respondents had “no time” (104/315, 33%) [Fig].

More than four in 10 respondents recognised an emergency situation: 44% of the 357 respondents knew how to determine whether a person is unresponsive and needs help, and 77% knew that they should call for help. However, smaller proportions of people knew about securing the airway of an unresponsive person: 25% answered correctly that doing so is the top priority, and 32% that the correct method of providing an open airway is to lift the head and tilt the chin. On the subject of respiration, 30% identified that looking for abdominal movement is not a correct way of checking that a person is breathing, and 31% knew that they should begin rescue breathing with two slow breaths if a person is not breathing. A quarter to almost a half of interviewees showed knowledge of maintenance of circulation in an unresponsive person who is not breathing and has no pulse: 45% answered correctly that the carotid area is the best location to check for a pulse; 6% that they would initiate external chest compressions if there is no pulse; and 26% that chest compressions requires that the hands be placed over the middle of the sternum.

Although the sex of the participant and the score were not associated (P=0.24), the younger and older respondents had significantly different score patterns, with younger

respondents consistently scoring higher than older peers (P=0.006). Respondents also had significantly different score patterns depending on their educational attainment (P<0.001); those with more education seemed to score higher than those with less education (Table 5). Compared with participants without prior training in CPR, those with prior training performed better: the total scores (mean ± standard error) were 5.24 ± 0.32 versus 3.22 ± 0.09 (P<0.001). The score also tended to decrease with the time elapsed since training, especially in the first 3 years and after more than a decade: the mean score was 6.13 (SD, 0.81) after up to 1 year; 5.00 (0.85) after 1 to 3 years; 5.20 (0.38) after 3 to 5 years; 5.30 (0.68) after 5 to 10 years; and 4.75 (0.65) after more than 10 years. Only one of the 42 trained persons correctly answered all the questions.

Discussion

The proportion of interviewees who had received CPR training was only 12%. The American Heart Association suggested that at least 20% of adults need to be trained in CPR before morbidity and mortality from out-of-hospital arrest can be reduced substantially.²⁷ Hong Kong lags behind Minneapolis and Seattle in the US, as well as Poland, in the general public’s level of knowledge of CPR.^{18,20,22} Hence, more extensive community-based CPR training is needed in Hong Kong.

The level of CPR knowledge in our population is unsatisfactory, especially for those who have not received any prior training; these respondents had mean knowledge

Table 5. Knowledge scores of respondents, according to age-group and educational level

| Age and education | Knowledge scores | | |
|----------------------|----------------------|-----------------------|----------------------|
| | 0-1, n=43 No. (%) | 2-4, n=194 No. (%) | 5-9, n=78 No. (%) |
| <i>Age (years)*</i> | | | |
| 16-35 | 22 (51) | 137 (71) | 60 (77) |
| ≥36 | 21 (49) | 57 (29) | 18 (23) |
| <i>Education†</i> | | | |
| ≤Primary | 20 (47) | 33 (17) | 7 (9) |
| Secondary (Form 1-5) | 19 (44) | 97 (50) | 42 (54) |
| ≥Matriculation | 4 (9) | 64 (33) | 29 (37) |

* P=0.006 (χ² test)

† P<0.001 (χ² test)

score of only 3.22 on a scale of 0 to 9. However, the public could have deduced through common sense on some parts of the chain of survival involving CPR, such as the recognition of unresponsiveness and the need to alert emergency medical services. The weakest overall performance was about maintaining circulation. One third of the untrained respondents incorrectly said that the radial pulse was the best location to check for a pulse, reflecting a common misconception.

Individuals with previous training in CPR displayed superior knowledge; however, their knowledge level was still far from satisfactory. Their mean score was only 5.24, and only one trained person correctly answered all the questions. Although one cannot equate knowledge with clinical skills, most of these previously trained people would be incompetent in performing CPR in real situations, because failure of any one step would result in failure of the resuscitation attempt. Furthermore, knowledge declines gradually following CPR training. While the St John's Ambulance recommends a refresher course every 3 years, the exact time and frequency at which these courses should be taken is still under debate, and attendance is purely voluntary. Our findings underscore the importance of regularly updating knowledge by attending refresher courses and identifying ways of increasing CPR knowledge levels.

As expected, we found that younger people and those with a higher educational level scored higher than others. Although the young and educated may know more than others about CPR, it is also important for a wide range of people in the community to acquire necessary skills so that CPR can be started immediately in an emergency.

However, two common reasons for not taking part in CPR training were that the public "don't know where to obtain CPR training" and "CPR training is inaccessible". These findings suggest the need for increased promotion by CPR training organisations. Sizeable proportions of people cited occupational or organisational requirement as the reason for learning CPR. This result suggests that other respondents, and the public in general, lack motivation and incentive to learn CPR techniques.²⁹

Our results suggest that the volume and quality of CPR training should be enhanced in Hong Kong. Firstly, efforts should be made to publicise CPR training and to educate the public about its importance. Training should be made accessible to the general population, at low cost and with flexible times. It may even be incorporated into the secondary school curriculum in order to reach all social classes.³⁰ In addition, the family members of patients with cardiac disease and other conditions predisposing to cardiac arrest may be targeted.

Secondly, the teaching of CPR training courses needs to be improved to help the public learn and retain CPR skills.

Incorporation of visual aids and audio-signalling performance aids have shown to enhance CPR skill acquisition.³¹⁻³⁴ Other studies have suggested reducing the number of steps required in the resuscitation process and focusing on the most important step—re-establishing and maintaining the circulation.^{26,35,36} After the initial training course, video-aided CPR training courses may provide a cost-effective option for refresher courses. The instructors themselves should also be well trained and undergo regular retraining to ensure their ability to teach CPR.³⁷⁻³⁹

Although our study showed that the level of knowledge of CPR dropped sharply after the initial CPR course, future studies should target those who had prior training, to further evaluate the cause of the drop in knowledge.⁴⁰ Target groups who may have a higher need to perform CPR, such as those who have a family member with cardiac disease, should also be specifically evaluated to assess their knowledge of CPR. Furthermore, studies should also be done to assess the skills and attitudes, rather than just the level of knowledge, of those with prior CPR training to assess more accurately their ability to effectively perform CPR in real life.

Conclusions

General knowledge regarding CPR in Hong Kong is poor, even among the previously trained. There is a clear need for a review of basic life-support education, with concerted efforts to investigate new approaches to bystander resuscitation and to develop a certification-recertification system. Only 12% of the Hong Kong population has received CPR training, a major reason being a lack of spare time. Hence, there is an urgent need to raise public awareness of the importance of basic life-support, to evaluate the existing programmes, and to provide more extensive community-based training programmes.

Appendix

The University of Hong Kong Cardiopulmonary Resuscitation Knowledge Study Group comprises BMY Cheung, C Ho, KO Kou, EEYL Kuong, KW Lai, PL Leow, PK Tam, KS Tse, YL Tung, and PYM Woo.

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