Knowledge and Attitudes Towards Cardiac Arrest, Cardiopulmonary Resuscitation and Dispatcher-Assisted Cardiopulmonary Resuscitation

CHP Group 5
Introduction
Methodology
Results
Discussion
Limitations
Conclusion
Out of Hospital Cardiac Arrest Survival Rate

1, 2, 3

2%

Cardiac Arrest

Cardiac arrest: abrupt malfunctioning of the heart’s electrical system (loss of the heart’s ability to function properly) → arrhythmia (ventricular fibrillation commonest) → death

Can be reversed by performing CPR and using a defibrillator to shock the heart to restore a normal heart rhythm

Not the same as a ‘heart attack’

Generally public knowledge poor 4,5

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Agonal Breathing

May occur during cardiac arrest to improve victim’s ventilation, oxygenation & circulation → SURVIVAL (reduces cerebral hypoxia)

Presents as a range of breathing patterns → gasping, difficult, occasional & slow breathing\(^6,7\)

Untrained bystanders may mistake this as ‘normal breathing’ → failure to initiate CPR → cerebral anoxia → irreversible damage to vital organs → death

Globally identified as major barrier to effective bystander recognition of OHCA → dispatcher-failure to initiate CPR\(^7,10\)

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The Chain of Survival

Early Recognition
- Recognition
- Ambulance Activation

Early CPR
- CPR
- DACPR

Early Defibrillation

Early Advanced Care
The Chain of Survival

Mean ambulance arrival time: 8 mins\textsuperscript{11}

Prompt institution of bystander CPR (BCPR) is critical – 2-3x chance of survival \textsuperscript{12}

Local BCPR rates are only 20\% \textsuperscript{15}


Dispatcher-Assisted CPR (DACPR)

- Cost-effective
- Increases BCPR rates by 10-20% 16,17
- Dispatcher guides caller with step-by-step instructions on how to perform CPR

Early CPR

References:
DACPR Protocol

Is the victim conscious? + Is the victim breathing normally? = DACPR

(No) + (No) = DACPR
Problem

Public is unable to identify normal breathing\textsuperscript{4,5}

50% cannot identify agonal breathing\textsuperscript{18}

Unable to recognize cardiac arrest in time

Adverse outcomes

Early Recognition
Study Objectives

- Identification of cardiac arrest
- Barriers towards Early Recognition
- Barriers towards Early Ambulance Activation
- Barriers towards CPR
- Barriers towards DACPR
- Improve DACPR Protocol
Study Objectives

Primary Aim
Investigate participant’s ability to identify cardiac arrest through its symptoms and signs

Secondary Aims
- Investigate barriers towards early recognition
- Investigate barriers towards early Ambulance activation
- Investigate barriers towards CPR
- Investigate barriers towards DACPR
- Propose improvements to current DACPR protocol
Introduction
Methodology
Results
Discussion
Limitations
Conclusion
Study Design

Part 1
Cross-Sectional Study

- Do you know what CPR is?
  - Yes
  - No

- Are you trained in CPR?
  - Yes
  - No

- Have you ever performed CPR in an emergency?
  - Yes
  - No

The following 6 questions are about CPR technique. CPR should be started:

- Choose one of the following answers:
  - As soon as possible
  - After calling emergency hotline
  - After ambulance has arrived

Part 2:
Randomized Controlled Trial (RCT)
Study Population

Jurong
East

Geographical Variation

High OHCA
High BCPR

Bedok
Selection Criteria

Part 1
- Singaporeans or PRs
- Aged 21 and above
- English, Chinese, Malay or Tamil-speaking
- Able to give informed consent

Part 2
- Only English-speaking
Conduct of Survey

× 3
Conduct of Survey

Oral consent

Participant Information Sheet

________________________

________________________

________________________
Data Collection

Security measures taken to secure data
- SQL escape
- Asymmetrical data encryption
- Data access controls

Interviewer training to minimise interviewer bias
Part 1: Questionnaire Design

Self-administered questionnaire with interviewer assistance

32 Questions

4 sections:
1) Sociodemographic characteristics
2) Knowledge and Attitudes towards cardiac arrest
3) Knowledge and Attitudes towards CPR
4) Knowledge and Attitudes towards DA-CPR

Questions developed based on literature review & consultation with Emergency Medicine professionals
Part 2: Videos

- Participants to be assessed on their ability to recognize cardiac arrest
- Videos were used as a surrogate measure
- Video-filming process was conducted over a period of 5 months
- Filmed a total of 16 videos depicting both normal and abnormal breathing patterns
Part 2: Videos

- Agonal
- Apnoea
- Tachypnoea
- Snoring
- Asleep
- Chewing
Part 2: Videos
Part 2: Videos
Part 2: Videos
Part 2: Videos Validation

- Surveyed 100 doctors from major restructured hospitals
- Convenience sampling
- Question asked after watching each video
  1. Is he conscious
  2. Is he breathing normally
Part 2: Validation Results

<table>
<thead>
<tr>
<th>% Correct</th>
<th>Agonal Conscious</th>
<th>Agonal Breathing</th>
<th>Apnoea Conscious</th>
<th>Apnoea Breathing</th>
<th>Agonal Conscious</th>
<th>Agonal Breathing</th>
<th>Apnoea Conscious</th>
<th>Apnoea Breathing</th>
</tr>
</thead>
<tbody>
<tr>
<td>95%</td>
<td>95%</td>
<td>98%</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
<td>94%</td>
<td>97%</td>
<td>95%</td>
</tr>
</tbody>
</table>
Part 2: Validation Results

% Correct

- Tachypnea Conscious: 85%
- Tachypnea Breathing: 78%
- Chewing Conscious: 99%
- Chewing Breathing: 96%
- Asleep Conscious: 84%
- Asleep Breathing: 94%
- Snoring Conscious: 85%
- Snoring Breathing: 90%
# Part 2: Intervention Study

<table>
<thead>
<tr>
<th>Start</th>
<th>Baseline (4 videos)</th>
<th>Randomization</th>
<th>Control (4 videos)</th>
<th>Intervention (4 videos)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Control arm
- **Baseline (4 videos)**
  1. Is the victim conscious?
  2. Is the victim breathing normally?

- **Study**
  1. Is the victim conscious?
  2. Is the victim breathing normally?

## Intervention arm
- **Baseline (4 videos)**
  1. Is the victim conscious?
  2. Is the victim breathing normally?

- **Study**
  1. Is the victim conscious?
  2. Is the victim gasping, breathing with difficulty, occasionally or slowly?
### Part 2: Videos

<table>
<thead>
<tr>
<th>Label</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow</td>
<td>2</td>
<td>3.23</td>
</tr>
<tr>
<td>Gasping</td>
<td>15</td>
<td>24.2</td>
</tr>
<tr>
<td>Moaning</td>
<td>4</td>
<td>6.45</td>
</tr>
<tr>
<td>Difficult/Ineffective/Laboured</td>
<td>10</td>
<td>16.1</td>
</tr>
<tr>
<td>Gurgling</td>
<td>7</td>
<td>11.3</td>
</tr>
<tr>
<td>Occasional/Irregular</td>
<td>7</td>
<td>11.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Label</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy/Hard</td>
<td>4</td>
<td>6.45</td>
</tr>
<tr>
<td>Deep</td>
<td>1</td>
<td>1.61</td>
</tr>
<tr>
<td>Slow</td>
<td>1</td>
<td>1.61</td>
</tr>
<tr>
<td>Poor/Weak</td>
<td>5</td>
<td>8.06</td>
</tr>
<tr>
<td>Wheezing</td>
<td>4</td>
<td>6.45</td>
</tr>
<tr>
<td>Snoring</td>
<td>2</td>
<td>3.22</td>
</tr>
</tbody>
</table>
Sample Size Calculations

Part 1
To achieve 5% precision (95% CI) when estimating the proportion of subjects capable of identifying cardiac arrest, the required sample size is

\[ N = 384 \text{ Participants} \]

(When the true proportion is 50%)

Part 2
50% can identify conscious + breathing. To detect improvement in the identification rate by 10% (i.e. 60% identification rate), the required sample size is

\[ N = 774 \text{ Participants} \]

(80% statistical power, 5% significance level)
Data Analysis

• $\chi^2$ tests were used to compare relationships between variables
• Odds ratios with 95% confidence intervals were used to estimate associations
• $p<0.05$ were statistically significant
Introduction
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Study Flowchart (Part 1)

Units Selected (n = 3364)
1717 B, 1647 JE

Units Surveyed (n = 2604)
1325 B, 1279 JE

Units Responded (n = 917)
462 B, 455 JE

Included (n = 902)
450 B, 452 JE

Excluded < 21yo (n = 15)
Study Population

- Age
- Sex
- Race
  - Marital status
  - Employment status
  - Healthcare worker
  - Education
  - Housing type
  - Household size
  - Household income
  - Heart disease
  - Prior CPR training and performance
## Study Population

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>Bedok</th>
<th>Jurong East</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Participants</strong></td>
<td>902</td>
<td>450 (49.9%)</td>
<td>452 (50.1%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>46.5 (SD 17.2)</td>
<td>48.6 (SD 17.8)</td>
<td>44.4 (SD 16.2)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>388 (43.0%)</td>
<td>196 (43.6%)</td>
<td>192 (42.5%)</td>
</tr>
<tr>
<td>Female</td>
<td>514 (57.0%)</td>
<td>254 (56.4%)</td>
<td>260 (57.5%)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>607 (67.3%)</td>
<td>301 (66.9%)</td>
<td>206 (67.7%)</td>
</tr>
<tr>
<td>Malay</td>
<td>132 (14.6%)</td>
<td>80 (17.8%)</td>
<td>52 (11.5%)</td>
</tr>
<tr>
<td>Indian</td>
<td>118 (13.1%)</td>
<td>47 (10.4%)</td>
<td>71 (15.7%)</td>
</tr>
<tr>
<td>Others</td>
<td>45 (5.0%)</td>
<td>22 (4.9%)</td>
<td>23 (5.1%)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>250 (27.7%)</td>
<td>110 (24.4%)</td>
<td>140 (31.0%)</td>
</tr>
<tr>
<td>Married</td>
<td>600 (66.5%)</td>
<td>312 (69.3%)</td>
<td>288 (63.7%)</td>
</tr>
<tr>
<td>Others</td>
<td>52 (5.8%)</td>
<td>28 (6.2%)</td>
<td>24 (5.3%)</td>
</tr>
</tbody>
</table>
### Study Population

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>Bedok</th>
<th>Jurong East</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>438 (48.6%)</td>
<td>196 (43.6%)</td>
<td>242 (53.5%)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>311 (34.5%)</td>
<td>158 (35.1%)</td>
<td>153 (33.8%)</td>
</tr>
<tr>
<td>Retired</td>
<td>153 (17.0%)</td>
<td>96 (21.3%)</td>
<td>57 (12.6%)</td>
</tr>
<tr>
<td><strong>Healthcare worker</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 (3.9%)</td>
<td>20 (4.4%)</td>
<td>15 (3.3%)</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary and below</td>
<td>459 (50.9%)</td>
<td>283 (62.9%)</td>
<td>176 (38.9%)</td>
</tr>
<tr>
<td>Post-secondary</td>
<td>443 (49.1%)</td>
<td>167 (37.1%)</td>
<td>276 (61.1%)</td>
</tr>
<tr>
<td><strong>Housing type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 – 3 rooms</td>
<td>399 (44.2%)</td>
<td>251 (55.8%)</td>
<td>148 (32.7%)</td>
</tr>
<tr>
<td>4 rooms and above</td>
<td>503 (55.8%)</td>
<td>199 (44.2%)</td>
<td>304 (67.3%)</td>
</tr>
<tr>
<td><strong>Household size</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 – 4 people</td>
<td>658 (72.9%)</td>
<td>339 (75.3%)</td>
<td>319 (70.6%)</td>
</tr>
<tr>
<td>5 people and above</td>
<td>244 (27.1%)</td>
<td>111 (24.7%)</td>
<td>133 (29.4%)</td>
</tr>
<tr>
<td><strong>Household income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$4000</td>
<td>233 (25.8%)</td>
<td>80 (17.8%)</td>
<td>153 (33.8%)</td>
</tr>
<tr>
<td>≥$4000</td>
<td>242 (26.8%)</td>
<td>111 (24.7%)</td>
<td>131 (29.0%)</td>
</tr>
<tr>
<td>Did not reveal</td>
<td>427 (47.3%)</td>
<td>259 (57.6%)</td>
<td>168 (37.2%)</td>
</tr>
</tbody>
</table>
# Study Population

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>Bedok</th>
<th>Jurong East</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart disease</td>
<td>76 (8.4%)</td>
<td>45 (10.0%)</td>
<td>31 (6.9%)</td>
</tr>
<tr>
<td></td>
<td>296 (32.8%)</td>
<td>138 (30.7%)</td>
<td>158 (35.0%)</td>
</tr>
<tr>
<td>Family/friends</td>
<td>225 (25.1%)</td>
<td>114 (25.5%)</td>
<td>111 (24.7%)</td>
</tr>
<tr>
<td>Previously performed CPR in an emergency</td>
<td>36 (4.0%)</td>
<td>23 (5.1%)</td>
<td>13 (2.9%)</td>
</tr>
</tbody>
</table>
Early Recognition
• Recognition
• Ambulance Activation

Early CPR
• CPR
• DACPR

Early Defibrillation

Early Advanced Care
Cardiac Arrest
Symptoms
How do you identify cardiac arrest? (Choose 2)

2/2: 5.6%

- Painful chest: 54%
- Nausea, vomiting: 14%
- Feel pulse: 28%
- Tap: 40%
- Chest rise: 16%
- Don't know: 31%
<table>
<thead>
<tr>
<th>Category</th>
<th>2 Correct Symptoms/Signs of Cardiac Arrest OR (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.017 (1.001-1.034)</td>
</tr>
<tr>
<td>Sex</td>
<td>Male Reference</td>
</tr>
<tr>
<td></td>
<td>Female 0.742 (0.419-1.313)</td>
</tr>
<tr>
<td>Race</td>
<td>Male Reference</td>
</tr>
<tr>
<td></td>
<td>Chinese Reference 0.480 (0.168-1.370)</td>
</tr>
<tr>
<td></td>
<td>Malay 0.480 (0.168-1.370)</td>
</tr>
<tr>
<td></td>
<td>Indian 0.822 (0.339-1.995)</td>
</tr>
<tr>
<td>Estate</td>
<td>Male Reference</td>
</tr>
<tr>
<td></td>
<td>Bedok Reference 0.263 (0.133-0.520)</td>
</tr>
<tr>
<td></td>
<td>Jurong 0.263 (0.133-0.520)</td>
</tr>
<tr>
<td>Education</td>
<td>Male Reference</td>
</tr>
<tr>
<td></td>
<td>Secondary Reference 0.468 (0.255-0.861)</td>
</tr>
<tr>
<td></td>
<td>Post-secondary 0.468 (0.255-0.861)</td>
</tr>
<tr>
<td>Prior CPR training</td>
<td>Male Reference</td>
</tr>
<tr>
<td></td>
<td>No Reference 1.560 (0.851-2.859)</td>
</tr>
<tr>
<td></td>
<td>Yes 1.560 (0.851-2.859)</td>
</tr>
<tr>
<td>Heart disease</td>
<td>Male Reference</td>
</tr>
<tr>
<td></td>
<td>No Reference 1.411 (0.793-2.510)</td>
</tr>
<tr>
<td></td>
<td>Yes 1.411 (0.793-2.510)</td>
</tr>
</tbody>
</table>
Section Summary

Cardiac arrest ≠ AMI

5.6% of participants knew cardiac arrest symptoms
  ◦ Elderly more aware
  ◦ Jurong, higher education less aware
What do you know about cardiac arrest?

- Cardiac arrest is the same as heart attack (No): 75%
- Cardiac arrest is more common in Males than Females (True): 49%
- Cardiac arrest occurs in teenagers (True): 63%
- Cardiac arrest occurs in people without previous heart problems (Yes): 66%
- A person in cardiac arrest may not have chest pain (Yes): 51%
- Cardiac arrest cases usually occur: (At home): 10%
Cardiac arrest is the same as heart attack OR (CI) | Cardiac arrest cases usually occur at home OR (CI)
---|---
Age | 0.99 (0.986-1.004) | 1.017 (1.004 – 1.029)
Sex | Male | Reference | Reference
   | Female | 0.775 (0.571-1.050) | 1.307 (0.841-2.031)
Race | Chinese | Reference | Reference
   | Malay | 0.868 (0.558-1.350) | 1.343 (0.756-2.386)
   | Indian | 0.800 (0.499-1.281) | 1.223 (0.659-2.269)
Estate | Bedok | Reference | Reference
   | Jurong | 0.861 (0.636-1.166) | 1.263 (0.822-1.940)
Education | Secondary | Reference | Reference
   | Post-secondary | 1.024 (0.756-1.386) | 0.781 (0.508-1.202)
Prior CPR training | No | Reference | Reference
   | Yes | 1.389 (0.991, 1.945) | 0.672 (0.393, 1.150)
Section Summary

Cardiac arrest ≠ AMI

Cardiac arrest cases occur at home
  ◦ Elderly more aware that cardiac arrest occurs at home
Ambulance Activation
What is the number to call for an ambulance?

995
64% 995
18% Don’t know
11% 999
2% 911
1% 991
4% Others

911

999

1777

???

991
<table>
<thead>
<tr>
<th>Category</th>
<th>OR (CI) Correct Ambulance Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.978 (0.970-0.986)</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td>0.741 (0.561-0.977)</td>
</tr>
<tr>
<td>Race</td>
<td>Chinese</td>
</tr>
<tr>
<td></td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Malay</td>
</tr>
<tr>
<td></td>
<td>0.774 (0.524-1.144)</td>
</tr>
<tr>
<td></td>
<td>Indian</td>
</tr>
<tr>
<td></td>
<td>0.665 (0.444-0.996)</td>
</tr>
<tr>
<td>Estate</td>
<td>Bedok</td>
</tr>
<tr>
<td></td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Jurong</td>
</tr>
<tr>
<td></td>
<td>1.398 (1.064-1.837)</td>
</tr>
<tr>
<td>Education</td>
<td>Secondary</td>
</tr>
<tr>
<td></td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Post-secondary</td>
</tr>
<tr>
<td></td>
<td>1.659 (1.260-2.184)</td>
</tr>
<tr>
<td>Prior CPR training</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2.551 (1.795-3.626)</td>
</tr>
<tr>
<td>Heart disease</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>0.981 (0.740-1.302)</td>
</tr>
</tbody>
</table>
36.5% don't know number for ambulance
- Elderly, female, Indians less likely to know
- Jurong, more educated, prior CPR-trained more likely
Cardiopulmonary Resuscitation
What do you know about CPR?

- CPR should be started (ASAP): 61%
- No. of chest compressions per minute (100): 9%
- Depth of compression (5cm): 9%
- Site of compression: 43%
- Need for Mouth-to-Mouth ventilation (No): 13%
<table>
<thead>
<tr>
<th>Category</th>
<th>No. of chest compressions OR (CI)</th>
<th>Depth of compression OR (CI)</th>
<th>Need for mouth-to-mouth ventilation OR (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Male</td>
<td>Reference</td>
<td></td>
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</tr>
<tr>
<td>Female</td>
<td>Reference</td>
<td></td>
<td>Reference</td>
</tr>
<tr>
<td>Race</td>
<td>Chinese</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Malay</td>
<td>1.128 (0.596-2.133)</td>
<td>0.820 (0.419-1.605)</td>
<td>0.636 (0.336-1.203)</td>
</tr>
<tr>
<td>Indian</td>
<td>1.043 (0.528-2.061)</td>
<td>0.732 (0.353-1.519)</td>
<td>1.126 (0.648-1.956)</td>
</tr>
<tr>
<td>Race</td>
<td>Chinese</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Malay</td>
<td>1.128 (0.596-2.133)</td>
<td>0.820 (0.419-1.605)</td>
<td>0.636 (0.336-1.203)</td>
</tr>
<tr>
<td>Indian</td>
<td>1.043 (0.528-2.061)</td>
<td>0.732 (0.353-1.519)</td>
<td>1.126 (0.648-1.956)</td>
</tr>
<tr>
<td>Estate</td>
<td>Bedok</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Jurong</td>
<td>1.417 (0.892-2.249)</td>
<td>0.649 (0.411-1.025)</td>
<td>1.745 (1.169-2.604)</td>
</tr>
<tr>
<td>Education</td>
<td>Secondary</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Post-secondary</td>
<td>1.998 (1.243-3.212)</td>
<td>2.703 (1.660-4.402)</td>
<td>2.511 (1.658-3.803)</td>
</tr>
<tr>
<td>Prior CPR training</td>
<td>No</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Yes</td>
<td>5.160 (3.215, 8.283)</td>
<td>5.576 (3.490, 8.909)</td>
<td>2.079 (1.382, 3.129)</td>
</tr>
</tbody>
</table>
What prevents you from performing CPR?

- Not confident: 73%
- Not sure: 73%
- Injury: 71%
- Mouth to Mouth Ventilation: 39%
- Mouth to Mouth - Infectious Diseases: 38%
- Legal: 38%
- Male chest: 20%
- Female chest: 41%
<table>
<thead>
<tr>
<th>Category</th>
<th>Not confident OR (CI)</th>
<th>Not sure OR (CI)</th>
<th>Fear of causing Injury OR (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.011 (1.002-1.020)</td>
<td>1.013 (1.003-1.022)</td>
<td>1.013 (1.003-1.022)</td>
</tr>
<tr>
<td>Sex</td>
<td>Male Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Female</td>
<td>2.151 (1.584-2.920)</td>
<td>2.330 (1.714-3.167)</td>
<td>2.330 (1.714-3.167)</td>
</tr>
<tr>
<td>Race</td>
<td>Chinese Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Malay</td>
<td>0.776 (0.501-1.202)</td>
<td>0.874 (0.563-1.354)</td>
<td>1.198 (0.754-1.903)</td>
</tr>
<tr>
<td>Indian</td>
<td>0.681 (0.441-1.052)</td>
<td>0.936 (0.595-1.470)</td>
<td>0.668 (0.439-1.019)</td>
</tr>
<tr>
<td>Estate</td>
<td>Bedok Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Jurong</td>
<td>1.159 (0.857-1.567)</td>
<td>1.159 (0.857-1.567)</td>
<td>1.548 (1.149-2.086)</td>
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<td>Education</td>
<td>Secondary Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Post-secondary</td>
<td>0.776 (0.574-1.050)</td>
<td>0.740 (0.547-1.002)</td>
<td>0.992 (0.738-1.333)</td>
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<td>Prior CPR training</td>
<td>No Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Yes</td>
<td>0.276 (0.199-0.384)</td>
<td>0.168 (0.120, 0.235)</td>
<td>0.576 (0.417, 0.797)</td>
</tr>
<tr>
<td>Heart disease</td>
<td>No Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Yes</td>
<td>1.069 (0.780-1.464)</td>
<td>1.034 (0.755-1.417)</td>
<td>0.931 (0.685-1.265)</td>
</tr>
<tr>
<td>Category</td>
<td>Exposure of Female Chest OR (CI)</td>
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<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>1.002 (0.994-1.010)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Male Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.751 (0.570-0.988)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>Chinese Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Malay</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.976 (0.652-1.461)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indian</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.086 (0.720-1.638)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estate</td>
<td>Bedok Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jurong</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.244 (0.946-1.635)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Secondary Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.800 (0.609-1.052)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior CPR training</td>
<td>No Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.851 (0.623, 1.164)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Testing for confounding

The association between female sex and CPR barriers, may be spurious
Males are taught CPR in National Service
CPR training increases confidence

<table>
<thead>
<tr>
<th>Category</th>
<th>Not confident OR (CI)</th>
<th>Not sure OR (CI)</th>
<th>Injury OR (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td><strong>2.151 (1.584-2.920)</strong></td>
<td><strong>2.330 (1.714-3.167)</strong></td>
</tr>
</tbody>
</table>
Recap on confounding

E → D

A
Testing for confounding

Sex \[\rightarrow\] CPR Confidence

CPR training

<table>
<thead>
<tr>
<th>Male</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>2.151 (1.584-2.920)</td>
</tr>
</tbody>
</table>

p=0.000

CPR Confidence vs CPR training

p=0.000
Stratification analysis

<table>
<thead>
<tr>
<th>Lack of confidence</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>394</td>
<td>100</td>
<td>494</td>
</tr>
<tr>
<td>Male</td>
<td>240</td>
<td>131</td>
<td>371</td>
</tr>
<tr>
<td>Total</td>
<td>634</td>
<td>231</td>
<td>865</td>
</tr>
</tbody>
</table>

OR = \[rac{(394)(131)}{(240)(100)}\] = 2.151
CI: 1.584-2.920

Regardless of CPR training, an association between female sex and barriers remains

Not CPR-trained

CPR trained

<table>
<thead>
<tr>
<th>Lack of confidence</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>335</td>
<td>67</td>
<td>402</td>
</tr>
<tr>
<td>Male</td>
<td>182</td>
<td>60</td>
<td>242</td>
</tr>
<tr>
<td>Total</td>
<td>517</td>
<td>127</td>
<td>644</td>
</tr>
</tbody>
</table>

OR = \[rac{(335)(60)}{(182)(67)}\] = 1.648
CI: 1.113-2.440

<table>
<thead>
<tr>
<th>Lack of confidence</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>59</td>
<td>33</td>
<td>92</td>
</tr>
<tr>
<td>Male</td>
<td>58</td>
<td>71</td>
<td>129</td>
</tr>
<tr>
<td>Total</td>
<td>117</td>
<td>104</td>
<td>221</td>
</tr>
</tbody>
</table>

OR = \[rac{(59)(71)}{(33)(58)}\] = 2.189
CI: 1.263-3.791
Section Summary

No. of chest compressions, depth of compression, and optional requirement for mouth-to-mouth ventilation not known
- Elderly, female less knowledge
- Jurong, higher education, prior CPR training more knowledge

Top 3 barriers to CPR: not confident, not sure, fear of causing injury
- Elderly, female more barriers
- More well-educated, prior CPR training less barriers

Males unwilling to expose female victim’s chest
Dispatcher-Assisted CPR
I will perform DACPR even if I have not learnt it before

70% Yes
20% No
10% Don’t know
<table>
<thead>
<tr>
<th>Category</th>
<th>Will perform DACPR OR (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.985 (0.977-0.993)</td>
</tr>
<tr>
<td>Sex</td>
<td>Male Reference</td>
</tr>
<tr>
<td>Female</td>
<td>0.579 (0.430-0.779)</td>
</tr>
<tr>
<td>Race</td>
<td>Chinese Reference</td>
</tr>
<tr>
<td>Malay</td>
<td>0.791 (0.531-1.179)</td>
</tr>
<tr>
<td>Indian</td>
<td>1.688 (1.050-2.712)</td>
</tr>
<tr>
<td>Estate</td>
<td>Bedok Reference</td>
</tr>
<tr>
<td>Jurong</td>
<td>1.354 (1.016-1.805)</td>
</tr>
<tr>
<td>Education</td>
<td>Secondary Reference</td>
</tr>
<tr>
<td>Post-secondary</td>
<td>2.437 (1.809-3.284)</td>
</tr>
<tr>
<td>Prior CPR training</td>
<td>No Reference</td>
</tr>
<tr>
<td>Yes</td>
<td>2.266 (1.562-3.287)</td>
</tr>
<tr>
<td>Heart disease</td>
<td>No Reference</td>
</tr>
<tr>
<td>Yes</td>
<td>0.998 (0.741-1.343)</td>
</tr>
</tbody>
</table>
Do you think DACPR delays the ambulance?
<table>
<thead>
<tr>
<th>Category</th>
<th>DACPR Delays Ambulance Arrival OR (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.987 (0.979-0.995)</td>
</tr>
<tr>
<td>Sex</td>
<td>Male Reference</td>
</tr>
<tr>
<td>Female</td>
<td>0.646 (0.486-0.858)</td>
</tr>
<tr>
<td>Race</td>
<td>Chinese Reference</td>
</tr>
<tr>
<td>Malay</td>
<td>0.759 (0.514-1.122)</td>
</tr>
<tr>
<td>Indian</td>
<td>1.000 (0.659-1.517)</td>
</tr>
<tr>
<td>Estate</td>
<td>Bedok Reference</td>
</tr>
<tr>
<td>Jurong</td>
<td>1.517 (1.149-2.003)</td>
</tr>
<tr>
<td>Education</td>
<td>Secondary Reference</td>
</tr>
<tr>
<td>Post-secondary</td>
<td>2.099 (1.581-2.786)</td>
</tr>
<tr>
<td>Prior CPR training</td>
<td>No Reference</td>
</tr>
<tr>
<td>Yes</td>
<td>1.382 (0.996, 1.918)</td>
</tr>
<tr>
<td>Heart disease</td>
<td>No Reference</td>
</tr>
<tr>
<td>Yes</td>
<td>0.959 (0.720, 1.277)</td>
</tr>
</tbody>
</table>
With DACPR, do these factors prevent you from doing CPR?

- Not confident: 70% of Participants
- Not sure: 65% of Participants
- Injury: 80% of Participants
- Mouth to Mouth Ventilation: 40% of Participants
- Mouth to Mouth - Infectious Diseases: 35% of Participants
- Legal: 30% of Participants
- Male chest: 15% of Participants
- Female chest: 25% of Participants
Improving the DACPR Protocol
Intervention Study

Start → Baseline (4 Videos) → Intervention (4 Videos) → Control (4 Videos)

### Control
- Baseline
  1. Is the victim conscious?
  2. Is the victim breathing normally?
- Study
  1. Is the victim conscious?
  2. Is the victim breathing normally?

### Intervention
- Baseline
  1. Is the victim conscious?
  2. Is the victim breathing normally?
- Study
  1. Is the victim conscious?
  2. Is the victim gasping, breathing with difficulty, occasionally or slowly?
Total Survey Respondents (n = 902)
450 B, 452 JE

Total Participants (n = 417)
227 B, 190 JE

Control (n = 210)
227 B, 190 JE

Intervention (n = 207)
113 B, 95 JE
## Baseline Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>Control</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Participants</td>
<td>418</td>
<td>214 (51.2%)</td>
<td>204 (48.8%)</td>
</tr>
<tr>
<td>Age (SD)</td>
<td>40.7 (15.5)</td>
<td>40.6 (16.1)</td>
<td>40.8 (14.9)</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>194 (46.4%)</td>
<td>109 (50.9%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>224 (53.6%)</td>
<td>105 (49.1%)</td>
</tr>
<tr>
<td>Race</td>
<td>Chinese</td>
<td>257 (61.5%)</td>
<td>135 (63.1%)</td>
</tr>
<tr>
<td></td>
<td>Malay</td>
<td>63 (15.1%)</td>
<td>30 (14.0%)</td>
</tr>
<tr>
<td></td>
<td>Indian</td>
<td>66 (15.8%)</td>
<td>31 (14.5%)</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>32 (7.7%)</td>
<td>18 (8.4%)</td>
</tr>
<tr>
<td>Education</td>
<td>Pre-Secondary</td>
<td>165 (39.5%)</td>
<td>87 (40.7%)</td>
</tr>
<tr>
<td></td>
<td>Post-Secondary</td>
<td>253 (60.5%)</td>
<td>127 (59.3%)</td>
</tr>
</tbody>
</table>
Baseline Assessment

Control
- 36% 23% 3% 37%

Intervention
- 42% 28% 5% 25%

p = 0.013
Assessment after Intervention

Control
- 45%: 1 Video Correct
- 32%: 2 Videos Correct
- 5%: 3 Videos Correct
- 17%: 4 Videos Correct

Intervention
- 39%: 1 Video Correct
- 18%: 2 Videos Correct
- 42%: 3 Videos Correct

p = <0.001
Recognition of Consciousness

Control

- 33% 1 Video Correct
- 47% 2 Videos Correct
- 15% 3 Videos Correct
- 3% 4 Videos Correct

Intervention

- 34% 1 Video Correct
- 35% 2 Videos Correct
- 14% 3 Videos Correct
- 16% 4 Videos Correct

p = 0.001
Recognition of Breathing

Control

- 31% 1 Video Correct
- 52% 2 Videos Correct
- 10% 3 Videos Correct
- 6% 4 Videos Correct

Intervention

- 31% 1 Video Correct
- 34% 2 Videos Correct
- 22% 3 Videos Correct
- 10% 4 Videos Correct

\( p = 0.319 \)
Recognition of Agonal Respiration

- Is he conscious? (No)  
  - Control: 54%  
  - Intervention: 47%

- Is he breathing normally? (No)  
  - Control: 48%  
  - Intervention: 63%

**P-values:**
- Is he conscious?  
  - Control: p = 0.14
- Is he breathing normally?  
  - Control: p < 0.001
Summary – Intervention Study

Intervention not effective

Keywords may help for agonal breathing
Survey
5.6% knew symptoms of cardiac arrest
  ◦ 1.2% of respondents listed all 3 signs (unconsciousness, absence of breathing, and absence of circulation) and 10.6% listed 2 signs¹

Barriers to Early Recognition

25% knew that CA ≠ AMI
- 51% of respondents were aware that a heart attack differs from a cardiac arrest¹
- 18% thought that a cardiac arrest involves a person becoming unwell, exhibiting certain signs and symptoms, but remaining conscious.¹

10% knew that cardiac arrest cases occur at home
- 59.8% of cases locally occur at home²
- No comparative study

Barriers to Ambulance Activation

63.5% knew number for ambulance
  ◦ 2 previous local studies: 52.2%¹, 73.5%².


Knowledge on CPR

9% knew No. of chest compressions per minute
  ◦ 1.2% knew¹

9% knew correct depth of compressions
  ◦ 6.2% untrained in CPR did not make any errors in depth in practical simulation²

13% knew mouth-to-mouth ventilation was not compulsory
  ◦ No comparative study


Barriers to CPR

Top 3 barriers to CPR: not confident, not sure, fear of causing injury
  ◦ Identical to those identified by a previous local study¹

Males unwilling to expose female victim’s chest
  ◦ No comparative study

Barriers to DACPR

1/3 will not perform DACPR if not previously CPR-trained
  ◦ Dispatchers offered bystanders telephone instructions for cardiopulmonary resuscitation. 6% of bystanders were not willing to perform cardiopulmonary resuscitation.

1/4 think DACPR will delay ambulance arrival
  ◦ No comparative study

Perceived barriers towards CPR are reduced if participants know that there is dispatcher assistance available
  ◦ No comparative study

Sociodemographic characteristics

Less knowledge/poorer attitudes:
- Elderly
- Female
- Bedok estate

Better knowledge/attitudes:
- Education
- Prior CPR training
Intervention Study
Novel Videos
Implications of Findings

58.5% of local bystanders get both questions wrong

50-70% of our participants got both questions wrong

Identification of agonal breathing is a huge barrier to DACPR

Our study doesn’t change that.

Future research – Consider adding & separating keywords

---

1 Dr. Benjamin Leong, at Society for Emergency Medicine in Singapore Annual Scientific Meeting 2014, [http://www.youtube.com/watch?v=L6CT9UydwAA](http://www.youtube.com/watch?v=L6CT9UydwAA)

Why was the intervention unsuccessful?

**Participant Factors**
- Participant demographics equal at baseline

**Methodology Factors**
- Questions presented together
- Participants did not watch the videos long enough? (Mean 35s, SD 70.0)
- Study is underpowered?

**Intervention Factors**
- Intervention confused participants or not sufficiently strong
Strengths

Videos format
- Closer-to-life testing of participant's knowledge of Cardiac Arrest

Video Validation Study

Digital survey methods
- Ease of data collection
- Completeness of data
- Speed of administration
- Ease of randomisation
Limitations

Videos
Lack of interactivity
- Doctors often asked about the victim’s pulse

Questionnaire
- Loss in translation
- Recall bias
- Sample not representative of Singapore population

Intervention
- Difference between a controlled and a crisis situation
- Dispatchers ask 2 questions separately
Introduction
Methodology
Results
Discussion
Limitations
Conclusion
Conclusion

- Participants can't identify Cardiac Arrest Knowledge, attitude gaps.
- CPR Barriers Attitudes towards DACPR are positive Reduces barriers.
- Intervention not effective Potentially useful for Agonal breathing More research needed.
Recommendations

Many efforts undertaken by various organizations to improve CPR rates – gaps our project aims to fill?
Recommendations

Educate following misconceptions, possibly through CPR courses
- AMI ≠ cardiac arrest
- Cardiac arrest usually occur at home
- Mouth to mouth ventilation is not a must
- Educate concept of agonal breathing

Efforts should be directed at
- Older people
- Females
- Estates

Future research to improve DACPR
Recommendations

Don't lump the keywords together
Consider adding instead of replacing the keywords; good question to ask if the caller says "don’t know" to the second question
Videos can be used as teaching aids

Acknowledgements

We would like to thank

- Our supervisor, Dr Falk Mueller-Riemenschneider, for his guidance and dedication.
- Our advisor, Professor Rob Martinus Van Dam, for his guidance and dedication.
- Our advisor, Dr Choi Hyung Won, for his guidance and dedication.
- Prof Marcus Ong Eng Hock, for his expert opinion in the Emergency Medicine field with regards to questionnaire questions
- Dr Benjamin Leong, for his expert opinion in the Emergency Medicine field with regards to questionnaire questions and his participation in video-making
- The Singapore Civil Defence for taking time off their schedule to bring us around and show us examples of dispatcher-assisted telephone calls.
- The Saw Swee Hock School of Public Health, National University of Singapore, for kindly funding our project.
- The residents of Bedok and Jurong East for patiently completing our surveys.
The End.