



Impact of myResponder Mobile Application on Out-of-Hospital Cardiac Arrest Survival in Singapore

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Introduction

Out-of-hospital cardiac arrest (OHCA) is a recognized global burden. Crucial to its management is the 'Chain of Survival', which comprises of early recognition, early cardio-pulmonary resuscitation (CPR), early defibrillation, basic and advanced emergency medical services (EMS), and advanced life support and post-cardiac arrest care.

Modern digital tools and crowd-sourcing technologies may improve community-based response to OHCA. However, what is not known is the extent to which these supportive technologies enhance OHCA survival outcomes.

In this study, we sought to determine the impact of the myResponder mobile application (app) on local community-based response and OHCA survival outcomes.

Methods

The myResponder app is a locally developed app by the Singapore Civil Defence Force (SCDF) that uses crowd-sourcing technology to link registered volunteers with nearby OHCA cases. Figure 1 illustrates the workflow of the myResponder app.

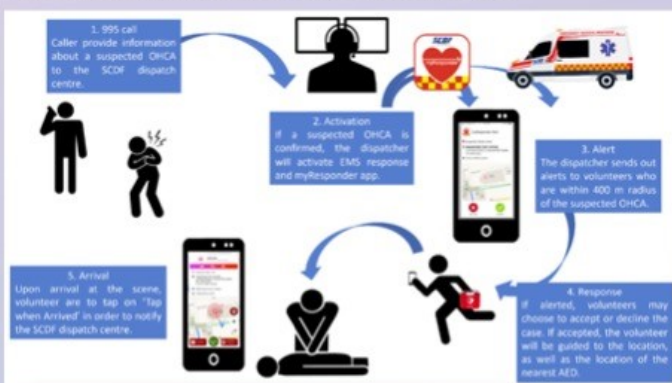


Figure 1: The myResponder app workflow

- Study design: Retrospective cohort study of all 2016-2018 OHCA cases in Singapore
- Study outcomes: Bystander CPR, bystander AED, pre-hospital ROSC, survival-to-discharge
- Statistical analysis: uni- and multivariate analyses; statistical significance set at $p < 0.05$

Results

| Patient Characteristics | Overall (N = 6217) | myResponder Activation | | p-value |
|------------------------------|--------------------|------------------------|----------------|---------|
| | | No (N = 3549) | Yes (N = 2668) | |
| Gender, n (%) | | | | |
| Male | 3890 (62.7) | 2259 (63.7) | 1640 (61.5) | 0.883 |
| Female | 2316 (37.3) | 1289 (36.3) | 1028 (38.5) | |
| Age, mean (SD) | 67.75 (16.56) | 67.17 (16.49) | 68.62 (16.61) | 0.002 |
| Race, n (%) | | | | |
| Chinese | 4286 (68.9) | 2423 (68.5) | 1863 (69.1) | |
| Malay | 875 (15.7) | 526 (15.0) | 413 (15.5) | 0.892 |
| Indian | 703 (11.3) | 409 (11.5) | 294 (11.0) | |
| Other | 273 (4.4) | 155 (4.4) | 118 (4.4) | |
| Known medical history, n (%) | | | | |
| No | 1071 (17.2) | 728 (20.5) | 343 (12.8) | <0.001 |
| Yes | 5146 (82.8) | 2821 (79.5) | 2325 (87.1) | |
| First arrest rhythm, n (%) | | | | |
| Non-shockable rhythm | 6233 (84.2) | 2998 (84.4) | 2237 (83.8) | 0.594 |
| Shockable rhythm | 884 (15.8) | 550 (15.6) | 431 (16.2) | |

| OHCA Event Characteristics | Overall (N = 6217) | myResponder Activation | | p-value |
|-----------------------------------|--------------------|------------------------|----------------|---------|
| | | No (N = 3549) | Yes (N = 2668) | |
| Location, n (%) | | | | |
| Private | 4828 (77.7) | 2587 (72.9) | 2241 (84.0) | <0.001 |
| Public | 1389 (22.3) | 962 (27.1) | 427 (16.0) | |
| Witnessed collapse, n (%) | | | | |
| No | 2729 (43.9) | 1346 (37.9) | 1382 (51.5) | <0.001 |
| Yes | 3488 (56.1) | 2203 (62.1) | 1285 (48.2) | |
| Time of arrest, n (%) | | | | |
| Early morning | 1140 (18.3) | 657 (18.8) | 483 (18.1) | |
| Morning | 1730 (27.8) | 876 (24.8) | 754 (28.3) | 0.787 |
| Afternoon | 1714 (27.6) | 993 (28.0) | 722 (27.1) | |
| Night | 1633 (26.3) | 924 (26.0) | 709 (26.6) | |
| Response time interval, mean (SD) | 11.20 (5.24) | 11.34 (4.85) | 11.64 (4.99) | 0.355 |
| Distance, mean (SD) | 23.48 (18.86) | 22.54 (19.82) | 24.81 (11.15) | 0.057 |

Results - cont.

Table 2: Univariate and multivariate analyses of outcomes of interest

| | | myResponder Activation | | Univariate analysis p-value | Multivariate analysis p-value |
|-------------------------------|--|------------------------|----------------|-----------------------------|-------------------------------|
| | | No (N = 3549) | Yes (N = 2668) | | |
| Bystander CPR provided, n (%) | No | 1422 (40.1) | 397 (14.9) | <0.001 | <0.001 |
| | Yes | 2127 (59.9) | 2271 (85.1) | | |
| Bystander AED provided, n (%) | No | 3321 (93.6) | 2508 (94.0) | 0.525 | 0.003 |
| | Yes | 228 (6.4) | 160 (6.0) | | |
| Pre-hospital ROSC, n (%) | No | 3129 (88.2) | 2365 (88.6) | 0.588 | 0.912 |
| | Yes | 420 (11.8) | 303 (11.4) | | |
| Patient Outcome, n (%) | Died in hospital | 3373 (95.0) | 2544 (95.4) | 0.612 | 0.999 |
| | Discharged alive/Remains alive in hospital at 30th day post-arrest | 176 (5.0) | 124 (4.6) | | |

- Activation of the myResponder app was significantly associated with an increase in bystander CPR and bystander AED
- However, we were unable to show a significant association between myResponder activation and OHCA survival

Discussion

Our study was able to show that myResponder activation was effective in improving bystander interventions. However, this has not yet translated to better OHCA survival outcomes.

Possible reasons why:

- Low penetration rate ∴ low proportion of active responders
- Quality of CPR by myResponders not known

Limitations of the study

- Retrospective cohort study using a database that is dependent on self-reporting by app users → possible under-reporting of arrivals (Step 5 in Figure 1)
- Did not account for cases in which there is provision of bystander CPR via DA-CPR
- Other unmeasured confounders (e.g., improvements in OHCA treatment, use of high-performance CPR by SCDF, etc)

Future Direction(s)

- Assess the time-dependent impact of the myResponder app
- Identify challenges for the application of the myResponder app

Summary

- The myResponder app effective in increasing bystander interventions
- The myResponder app shows some promise in improving OHCA survival
- Increasing awareness of the app and improving the quality of CPR by myResponders is needed to see improvement in OHCA survival.