

How data and technology can help improve cardiac arrest outcomes

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Director, Unit for Prehospital Emergency Care



Partners in Academic Medicine



PATIENTS. AT THE HEART OF ALL WE DO.

Members of the SingHealth Group



Conflict of interest

- Dr Ong has patents relating to cardiac arrest prediction licensed to Zoll Medical Corp.
- He is Scientific Advisor to Global Healthcare SG, a start up providing cooling solutions and TIIM Healthcare SG, a start up providing Artificial Intelligence solutions for risk stratification



IT Takes a system to save a life!

995

Heartware

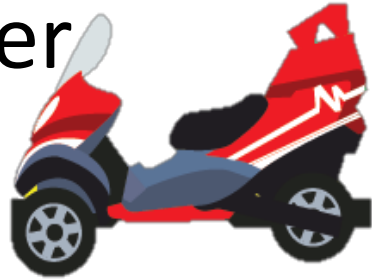
- Active Citizens



Software

- myResponder

8 mins



Hardware

- AEDs

11 mins



Technology brings people together

- MyResponder - Off duty nurse educator
- Responded to a case of an 'unconscious person'
- Performed CPR for 10 minutes and mouth to mouth
- The victim is now back at work 6 weeks after his cardiac arrest



the new paper
ONLINE

NEWS SPORTS M-ENTERTAINMENT E-PAPER

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LIFELINE: Madam Michelle Lim meeting Mr Ken Gong for the first time yesterday since his cardiac arrest last month.
TNP PHOTO: PHYLLICIA WANG

WOMAN HELPS SAVE MAN USING NEW SCDF PHONE APP

PHONE APP HELPS WOMAN SAVE CARDIAC ARREST VICTIM

f t e p g+ 428

Feb 19, 2016 6:00am

BY NABILAH AWANG

A woman who teaches cardiopulmonary resuscitation (CPR) helped save the life of a cardiac arrest victim after being alerted to him by a phone app.

96% FAILED this test
Can you answer it?
How many matchstick are there?

3
5

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Singapore EMS

- Area 719 km²
- Urban / Suburban
- Population 5.47 mil
- Multi-racial/cultural/religion
- Currently **60** Emergency Ambulances
- **178,154** calls in 2016
- Total about **300** Active Paramedics

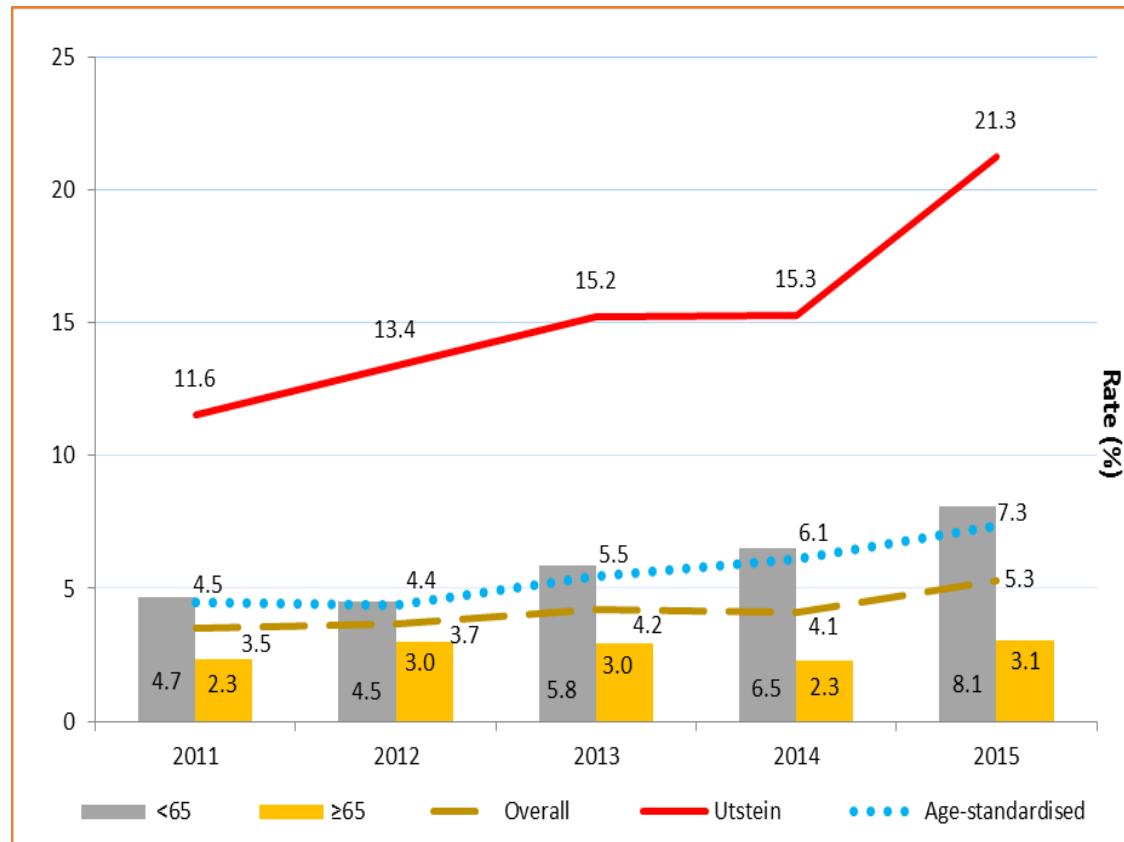


National Cardiac Arrest Registry:

- *Cardiac Arrest and Resuscitation Epidemiology (CARE I): Epidemiology of OHCA in Singapore -1 Oct 2001 to 30 Apr 2002*
- *CARE II: Prospective clinical trial of adrenaline in OHCA -1 Oct 2002 to 14 Oct 2004*
- *CARE III: Geospatial analysis of ambulance demand - 1 January 2006 to 31 May 2006*
- *CARE IV: Smart Ambulance Deployment*
- *Pan Asian Resuscitation Outcomes Study (PAROS) >200,000 cases recruited*

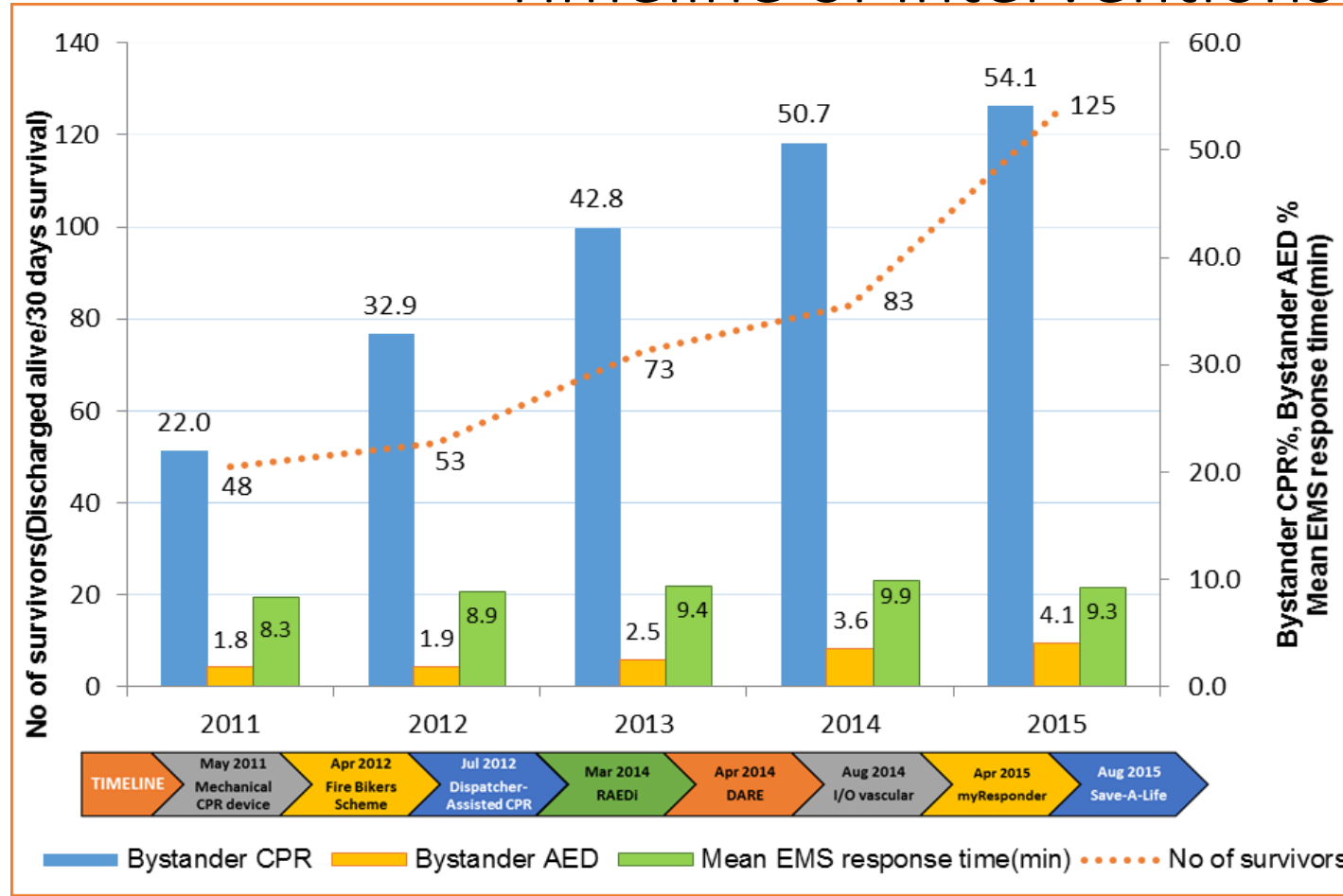


Survival Rates: Overall, Utstein, <65 and >65



- **Witnessed cardiac arrest survival rates** have **doubled** from 11.6 to 21.3%
- **Overall survival rates** have gone up from 3.5 to 5.3%
- Younger patients (<65) are 2.6 times more likely to survive than older patients (>65)

Timeline of Interventions



- Total survivors increased from 48 to 125.
- Bystander CPR rates increase from 22% to 54%
- AED use 1.8% to 4.1%
- EMS response time gradually increasing 8.3mins→9.3mins

Modifiable Factors Associated With Survival After Out-of-Hospital Cardiac Arrest in the Pan-Asian Resuscitation Outcomes Study



Hideharu Tanaka, MD; Marcus E. H. Ong, MBBS*; Fahad J. Siddiqui, MBBS; Matthew H. M. Ma, MD; Hiroshi Kaneko, MBA; Kyung Won Lee, MD; Kentaro Kajino, MD; Chih-Hao Lin, MD; Han Nee Gan, MBBS; Pairoj Khruengkarnchana, MD; Omer Alsakaf, PhD; Nik H. Rahman, MBCHB; Nausheen E. Doctor, MBBS; Pryseley Assam, PhD; Sang Do Shin, MD; for the PAROS Clinical Research Network[†]

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Study objective: The study aims to identify modifiable factors associated with improved out-of-hospital cardiac arrest survival among communities in the Pan-Asian Resuscitation Outcomes Study (PAROS) Clinical Research Network: Japan, Singapore, South Korea, Malaysia, Taiwan, Thailand, and the United Arab Emirates (Dubai).

Methods: This was a prospective, international, multicenter cohort study of out-of-hospital cardiac arrest in the Asia-Pacific. Arrests caused by trauma, patients who were not transported by emergency medical services (EMS), and pediatric out-of-hospital cardiac arrest cases (<18 years) were excluded from the analysis. Modifiable out-of-hospital factors (bystander cardiopulmonary resuscitation [CPR] and defibrillation, out-of-hospital defibrillation, advanced airway, and drug administration) were compared for all out-of-hospital cardiac arrest patients presenting to EMS and participating hospitals. The primary outcome measure was survival to hospital discharge or 30 days of hospitalization (if not discharged). We used multilevel mixed-effects logistic regression models to identify factors independently associated with out-of-hospital cardiac arrest survival, accounting for clustering within each community.

Results: Of 66,780 out-of-hospital cardiac arrest cases reported between January 2009 and December 2012, we included 56,765 in the analysis. In the adjusted model, modifiable factors associated with improved out-of-hospital cardiac arrest outcomes included bystander CPR (odds ratio [OR] 1.43; 95% confidence interval [CI] 1.31 to 1.55), response time less than or equal to 8 minutes (OR 1.52; 95% CI 1.35 to 1.71), and out-of-hospital defibrillation (OR 2.31; 95% CI 1.96 to 2.72). Out-of-hospital advanced airway (OR 0.73; 95% CI 0.67 to 0.80) was negatively associated with out-of-hospital cardiac arrest survival.

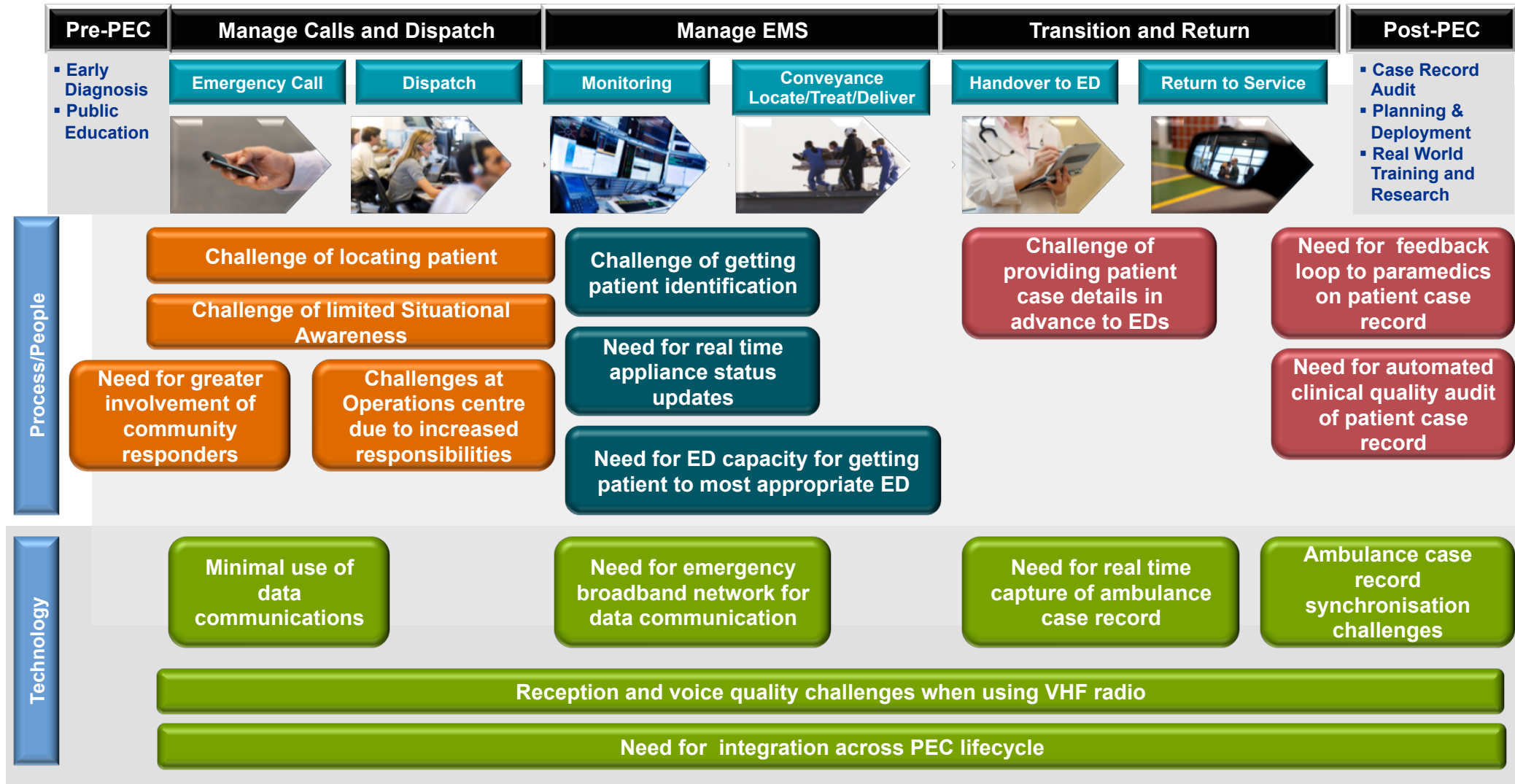
Conclusion: In the PAROS cohort, bystander CPR, out-of-hospital defibrillation, and response time less than or equal to 8 minutes were positively associated with increased out-of-hospital cardiac arrest survival, whereas out-of-hospital advanced airway was associated with decreased out-of-hospital cardiac arrest survival. Developing EMS systems should focus on basic life support interventions in out-of-hospital cardiac arrest resuscitation. [Ann Emerg Med. 2018;71:608-617.]

Please see page 609 for the Editor's Capsule Summary of this article.

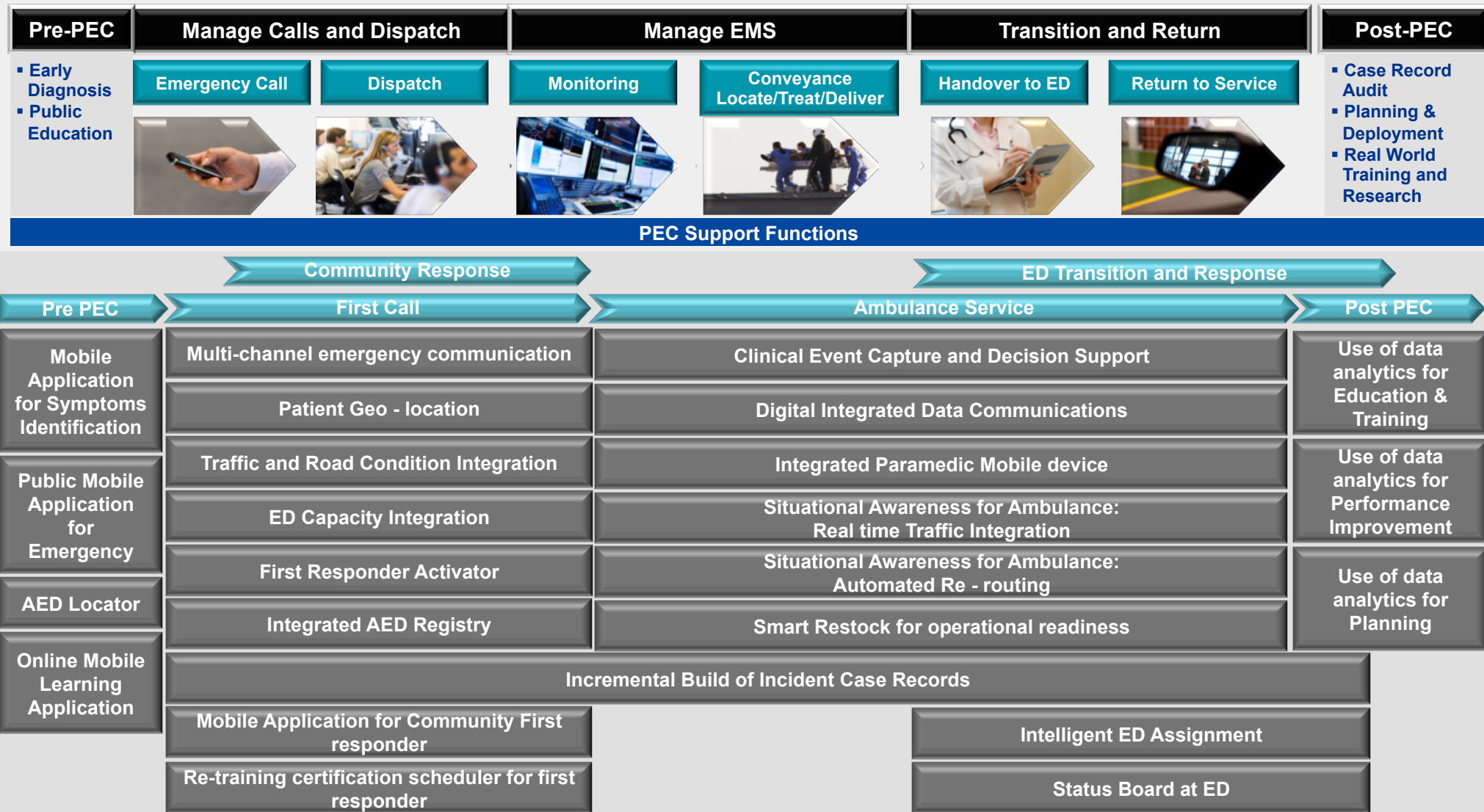
Readers: click on the link to go directly to a survey in which you can provide [feedback](#) to *Annals* on this particular article.

A [podcast](#) for this article is available at www.annemergmed.com.

Pre-hospital Emergency Care National IT Blueprint



PEC Potential Solution Capabilities



Dispatcher-Assisted First Responder Programme (DARE)



HOME B8

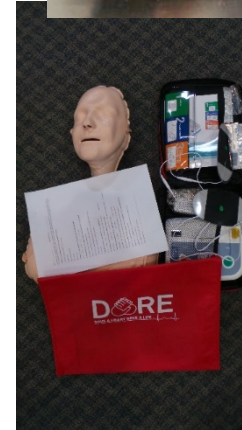
ST PHOTO: DESMOND FOO

LEARN CPR? THEY'RE ALL EARS

You are never too young to learn how to save lives.

Pupils at St Anthony's Primary School proved just that yesterday when they learnt how to administer

cardiopulmonary resuscitation (CPR) and use an automated external defibrillator. About 2,300 students have attended this life-saving programme so far.



STAY ON
THE LINE



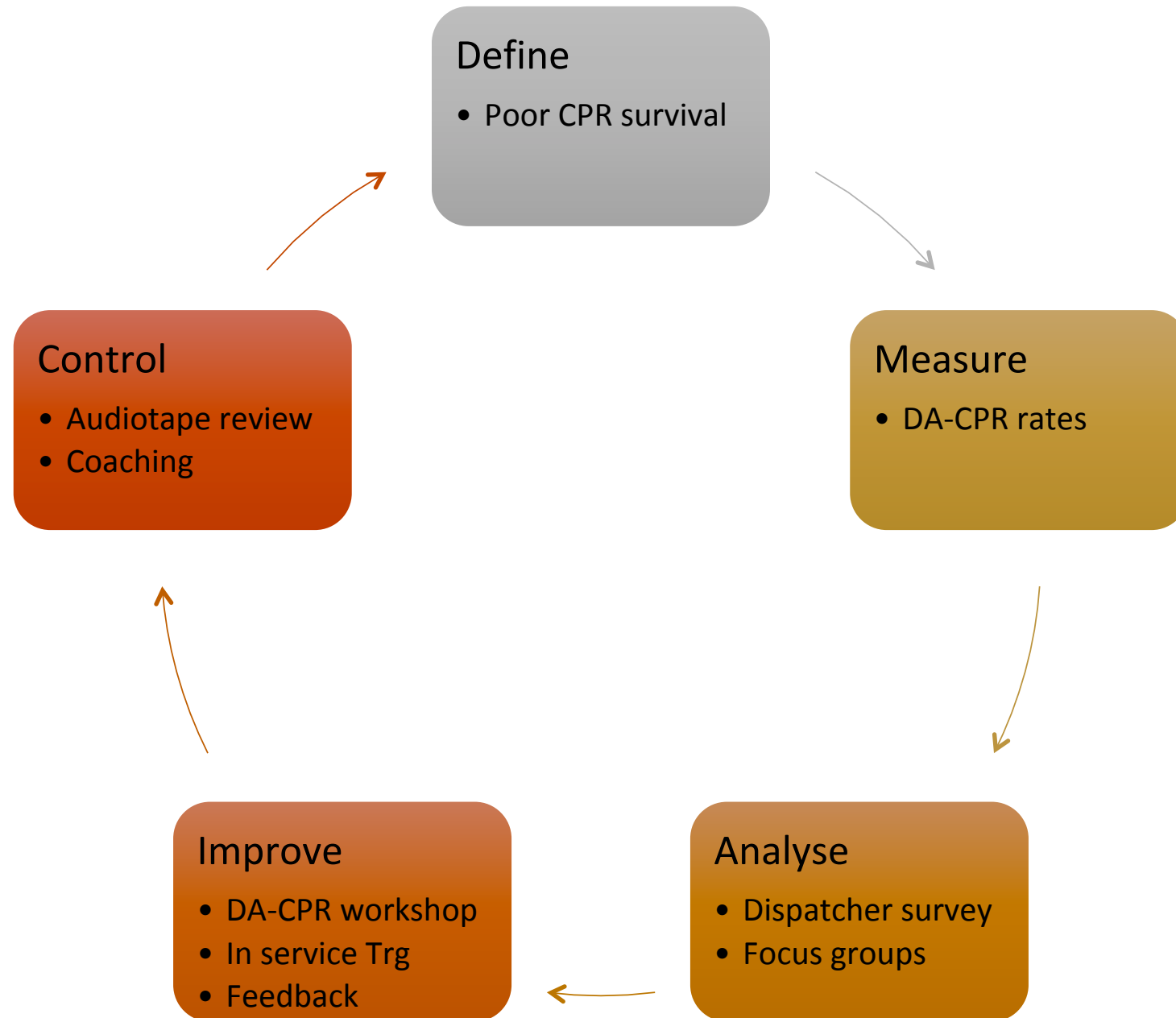
PUSH HARD
AND FAST



AED



Data Driven Improvement Cycle



Dispatcher ID/Name: _____ Time of call: _____
 Case/Incident #: _____ Incident Address: _____

Transfer Call? Yes ☐ No ☐ If yes, time elapsed before dispatcher first addressed caller? _____

CPR instructions started? Yes ☐ No ☐ Delayed ☐

VICTIM

Age: _____

Victim status change?

Conscious?	Yes	No	Unk

Yes	No	Unk

Were agonals heard?
Time elapsed:

Descriptor:	
Gasping	
Gurgling	
Moaning	
Groaning	
Snoring	
Snorting	
Labored	
Noisy	
Heavy	
Others	

Breathing normally?	Yes	No	Time

TIME MEASURES

QI Recognizes Need for CPR	Dispatch Recognizes Need for CPR	Dispatcher Began Instructions	Time of First Compression	Time of First Rescue Breaths

If Secondary Breathing Assessment performed:

Time Assessment Began	Time Assessment Ended

RESCUE

CPR Already in Progress When Call was Received?	CPR started independently during call?	Was the caller the rescuer?	Rescuer knows bystander CPR?	If yes, rescuer was:
Yes No Unk	Yes No Unk	Yes No Unk	Yes No Unk	Professional Lay



Clinical paper

A before–after interventional trial of dispatcher-assisted cardio-pulmonary resuscitation for out-of-hospital cardiac arrests in Singapore[☆]



Sumitro Harjanto^a, May Xue Bi Na^b, Ying Hao^c, Yih Yng Ng^d, Nausheen Doctor^e,
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ABSTRACT

Aim: To evaluate the effects of a comprehensive dispatcher-assisted CPR (DACPR) training program on bystander CPR (BCPR) rate and the outcomes of out-of-hospital cardiac arrest (OHCA) in Singapore.

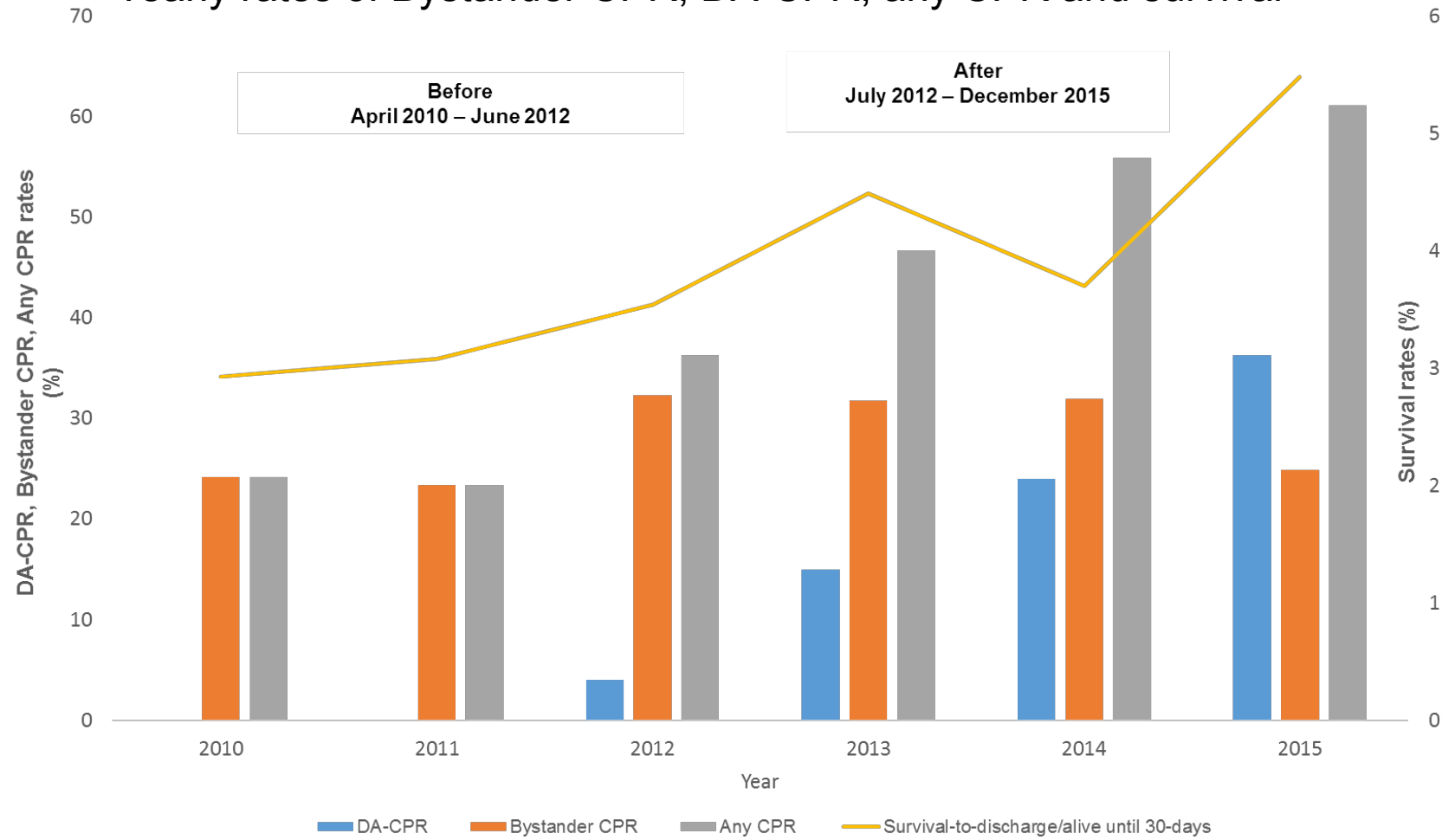
Methods: This is an initial program evaluation of a national DACPR intervention. A before–after analysis was conducted using OHCA cases retrieved from a local registry and DACPR information derived from audio recordings and ambulance notes. The primary outcomes were survival to admission, survival at 30 days post-arrest and good functional recovery.

Results: Data was collected before the intervention (April 2010 to December 2011), during the run-in period (January 2012 to June 2012) and after the intervention (July 2012 to February 2013). A total of 2968 cases were included in the study with a mean age of 65.6. Overall survival rate was 3.9% (116) with good functional recovery in 2.2% (66) of the patients. BCPR rate increased from 22.4% to 42.1% ($p < 0.001$) with

Telephone CPR Program



Yearly rates of Bystander CPR, DA-CPR, any CPR and survival



The SCDF myResponder App



myResponder

SCDF
The Life Saving Force

myResponder App

Available on the
App Store

ANDROID APP ON
Google play



1

Dial 995 and send
your geo-location
at the same time

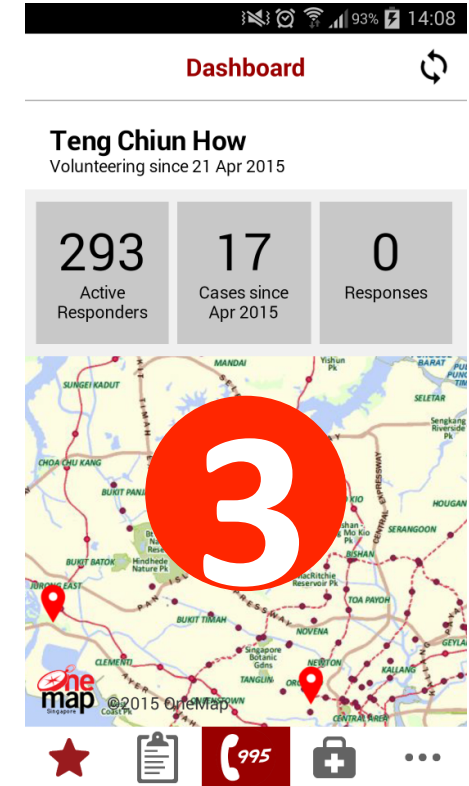
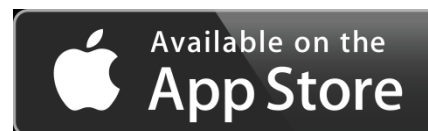


AED Locations



2

Know where
the nearest
AED is located



Dashboard



Teng Chiun How

Volunteering since 21 Apr 2015

293

Active
Responders

17

Cases since
Apr 2015

0

Responses

3



Sign up as a
volunteer
responder

MyResponder

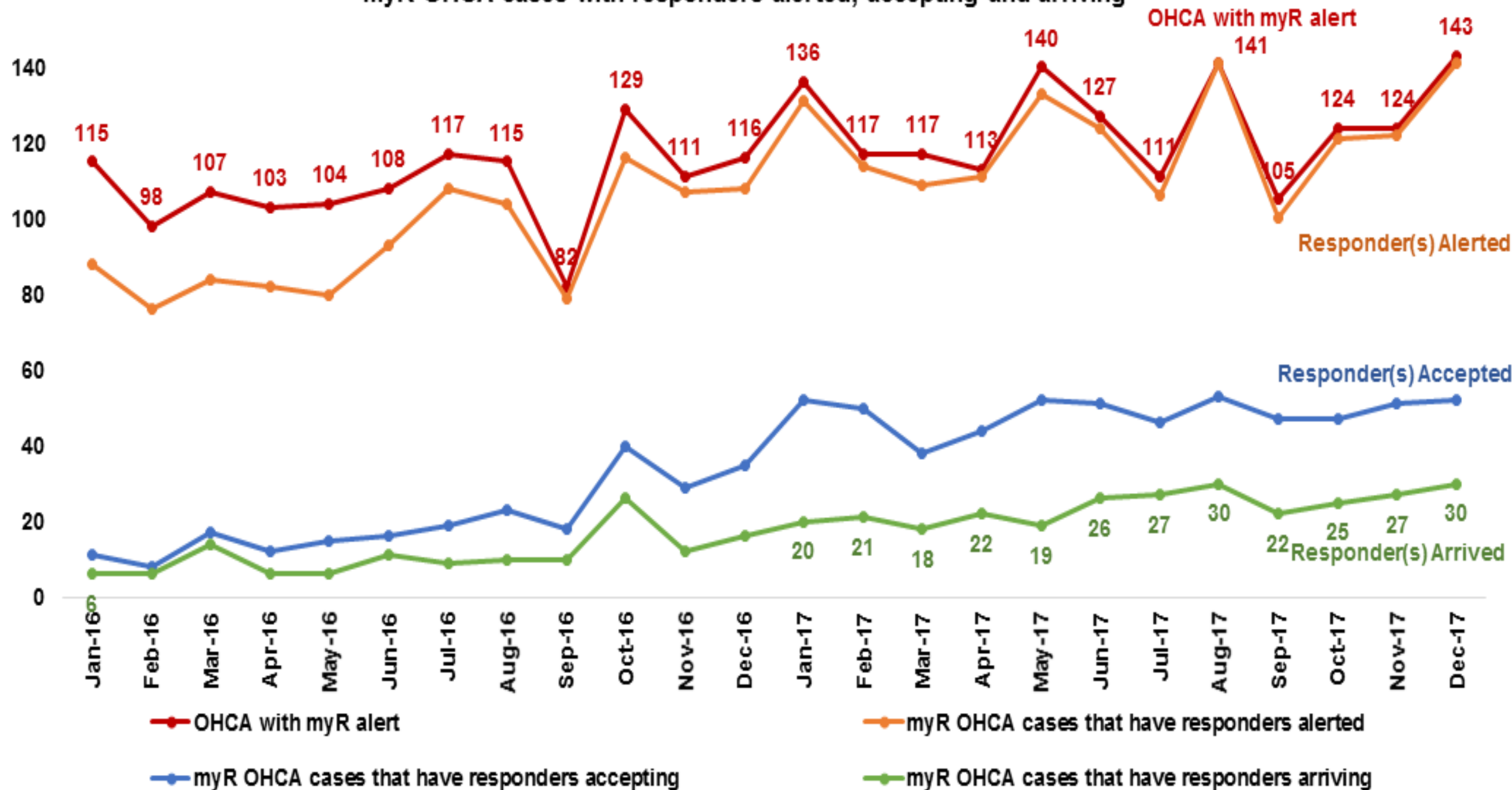


Leverage on existing I.T.

- 9-9-5 Dispatch System
- National authentication system: **SingPass**
- OneMap for detailed map layers
- Govt Cloud Services



myR OHCA cases with responders alerted, accepting and arriving



AED Installation by SCDF

- Nationwide public AED program
- Focus on residential apartments





R-AEDI

The Registry for Automated
External Defibrillator Integration



Find, Verify and Map

The Rise of the Super-Responders 超人

从手机应用知道有人病发 学生英雄2年 急救5陌生人

杨永明 报道
jmyong@sph.com.sg
赖南达 摄影

手机应用“myResponder”显示有人心脏病病发，两名工艺学院生分工合作，一人做心肺复苏，一人去取心脏除颤器，火速救人。

高中，18岁救人学生英雄过去两年，通过“myResponder”帮过至少五个人。

两名学生英雄分别是18岁的李伟强和19岁的林天成。他们目前还在新加坡工艺教育西学院（ITE College West）就读。

李伟强昨日上午，在下午5时左右接到“myResponder”手机应用的通报，说附近有人疑似心脏病发。地点在德惠巷第112座顶层单位，刚好就在他学校的对面。

李伟强马上响应，在赶往救人途中，他找来了同校同学林天成，然后两人一起赶到该单位，发现一名向阿伯在协助不幸人。李伟强立即为他做心肺复苏（CPR），并让林天成到附近电梯口找自动心脏除颤器（AED）。

李伟强向记者描述过程时说：“阿伯一动也不动地躺在床上，而且已经没有脉搏，我只能马上做CPR，同时找AED。幸好民防部队人员很快就赶到。”

遇到紧急情况，他为何能处变不惊？

救人见血又破财 学生英雄不后悔

取AED时划伤手指，学生英雄虽然得到赔偿90元医药费，见血又破财，却义无反顾。

林天成向记者坦言，自己并非myResponder的一员。

“我那时刚考过驾照，伟强突然忙来找我帮忙，叫我去拿AED。我听说人命关天，就跟着他去。”

拿到AED，两人打破玻璃取出钥匙，林天成在过程中割伤了食指。

“帮伯口鼻流血，而一直流血，但为了救人我顾不了那么多。后来，我赶回去上课，只好到最近的诊所包扎。”

李伟强花了90元，他见血又破财，但都不后悔。

“若能救人一命，90元不算什么，而且帮人的感觉很好，我也打算下载myResponder，多帮助别人。”

▲林天成在打破玻璃取钥匙的过程中，手指被割伤。

▲李伟强在急救过程中，为15岁的心脏病患者做心肺复苏。

▲李伟强在急救过程中，为15岁的心脏病患者做心肺复苏。

myResponder应用 没受过急救训练 也可注册提供协助

民防部队于2015年4月17日推出myResponder应用，软件不仅能推出最近用户的自动心脏除颤器（AED）设备的地点，若用户附近有心脏病发作者，也能通过软件获得通知。

当局接获疑似心脏骤停个案的通报后，会立刻用应用通知在事发地点400公尺范围内的用户。只有已注册为“社区急救员”的700多名用户才会接到通知。

即使没有接受过急救训练的公众，还是可以注册为急救员。填报通知时，他们可帮忙把最近的自动心脏除颤器带到现场，或在民防救援人员的指导下为患者进行急救，或协助指引救护车到事发地点。

为公
来
两台

周海丽 报道
haili@sph.com.sg
为报章22岁
新人林天成，通过本报的提示，通过报纸刊登资料，八天内可最早前报道，在本地留过少受家人上流或作天。两名林天成（17岁）承认罪行，该男



Saving almost 20 lives in the past 4 years!!!



Seventeen-year-old Muhammad Luqman Abdul Rahman responds to emergencies because he knows he would want others to do the same for him, should he need help. PHOTO: AZIZ HUSSIN FOR THE STRAITS TIMES

He has saved nearly 20 lives since age 13

By Linette Lai

The first time Muhammad Luqman Abdul Rahman saved a life, he was just 13 years old.

He had received his first aid certificate less than a month before, and was on the way home from school.

Then, the Singapore Civil Defence Force's MyResponder app alerted him that someone nearby needed help.

A factory worker at an industrial estate in Bedok had suffered a heart attack and collapsed. Luqman performed cardiopulmonary resuscitation (CPR) on the man until the ambulance arrived.

Luqman, who is now 17 and a Temasek Junior College second-year student, remembers feeling panicky at the scene in 2013.

"It didn't occur to me that doing CPR on someone would be very, very different from practising it," he recalled. "It actually felt a little daunting."

The man survived, and Luqman has since gone on to save nearly 20 lives through the MyResponder app.

Whenever someone suffers a heart attack and calls for an ambulance, app users within 400m are simultaneously alerted.

For Luqman, these emergency calls have come when he was asleep at home or even on the way to school. It was that first incident at the factory, however, that has left the deepest impression.

"He wasn't a local – he was a foreign worker who was working very hard to make ends meet back home," he said.

"It was also very relatable because he wasn't that old – he was in his 20s at the time."

At first, Luqman's parents were opposed to him responding to emergencies in this way. They were afraid that he would be blamed should something go wrong.

But he won them over by asking them to come with him the next time the alert sounded.

"I took them to one of my cases... and that was when they understood," he said.

"I feel that a life is at stake, and since I am in a position to assist, I should render my assistance first."

It is about more than saving lives though. Once, he arrived at the scene of an incident to find someone else already performing CPR.

"I saw that there were many people crowding around the patient... and I thought maybe I could help by getting people to move out of the house, so that the paramedics can enter," said the teenager.

He responds to these cases because he knows he would want others to do the same for him.

"Every second matters when we are in need," he said. "And of course, if we are in that situation ourselves, we would want others who are around to help us."

"I feel that a life is at stake, and since I am in a position to assist, I should render my assistance first. Every second matters when we are in need. And of course, if we are in that situation ourselves, we would want others who are around to help us."

MUHAMMAD LUQMAN ABDUL RAHMAN, 17, a Temasek Junior College student, who has saved nearly 20 lives through the MyResponder app.

linettel@sph.com.sg

我报 MyPaper

mypaper.sg MCI(P) 146/10/2014 星期五 2015年7月24日

» 国人对新加坡社会看法改善

咨询公司对新加坡公民和永久居民展开调查,让他们选最能形容新加坡社会的词汇。结果显示,与3年前相比,国人眼中的新加坡社会较正面,是享有“教育机会”、“和平”及“安全”的国家。本地新闻B2

» 希腊第2轮纾困投票通过

希腊国会从前晚就新纾困方案的第2轮投票进行辩论,一直讨论到昨天凌晨,终于以大比数顺利通过。当国会就纾困方案进行辩论时,约9000民众在国会外聚集,反对进一步财政紧缩。世界新闻B4

» 金秀贤同父异母妹妹沾光被批

韩国歌手金珠娜发行为韩剧献唱的插曲,自曝是“金秀贤同父异母妹妹”搏版面,间接曝光金秀贤歌手老爸金忠勋23年前疑“偷吃”往事,被网友狠批。娱乐B12



协助更多心脏病发者 救命App使用率待提高

苏文琪

通知公众就近协助疑似心脏病发者的手机应用软件,已推出超过3个月,用户使用率仍有待提高,以帮助更多患者,增加对方的存活机会。

民防部队于今年4月17日推出的“myResponder”应用软件,至今的下载量约2500次。该软件可指出设有自动心脏除颤器(AED)最靠近的地点,也可用于通知用户附近有心脏病发者。

当局接获疑似心脏骤停个案的通报后,会立刻用软件通知在事发地点400公尺内的用户。只有已注册为“社区急救员”的700多名用户才会接到通知。

过去3个月,民防部队共发出约1000则急救通知,当中六成确为心脏骤停个案。不

过,仅不到5%的通知获公众回应。45起获回应个案中,有15起确为心脏骤停个案。

民防部队总医务官黄毅堂医生上校说,即使没有接受过急救训练,公众还是可以注册为急救员。接获通知时,他们可帮忙取来最靠近的自动心脏除颤器,或在民防接线员的指导下为患者进行心外按摩,或协助指引救护人员到事发地点。

他说:“心脏骤停的情况下,每一秒都非常重要,有人及时介入帮忙,将增加患者的存活机会。”

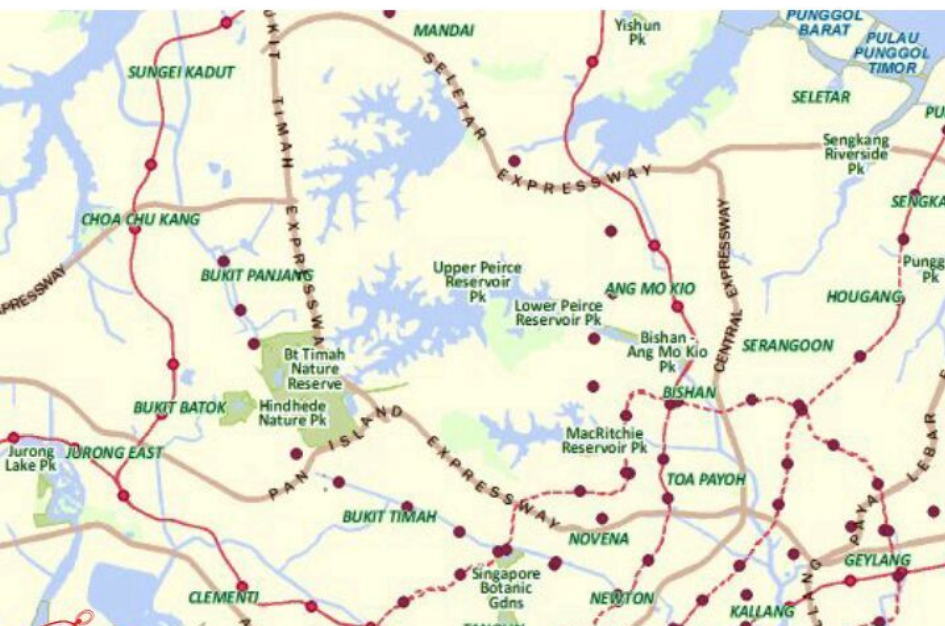
另外,软件现虽以处理心脏骤停个案为主,用户仍可借由软件通知民防部队其他紧急事故,当局会通过定位技术得知通报者的位置。

目前获回应个案中,未有心脏骤停者成功存活,但获援助的其他患者都从中受益。



邻里主动应急计划志愿者彭秀翠(左)和拉詹在接获“myResponder”应用软件的通知后,能赶在救护车之前到场,及时为患者提供援助。(周柏荣摄)

! You are in **DRIVING** mode



Automated External Defibrillators installed on 100 SMRT taxis

The initiative is part of a three-year pilot programme called SMRT-Temasek Cares AED on Wheels, which aims to increase the availability of AEDs within the community.

POSTED: 27 Nov 2015 21:43 UPDATED: 27 Nov 2015 23:59

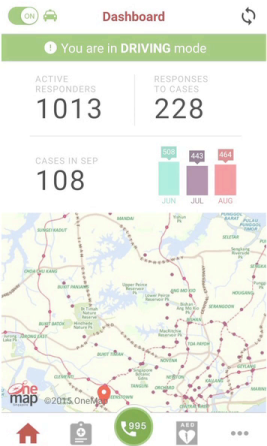
VIDEOS PHOTOS



SMRT taxi driver Simon Ngiam Shu Leng with the AED which will be installed in his taxi. (Photo: SMRT)

AED on Wheels Program

AED On Wheels



Quality of CPR - CPRCard

TODAY • MONDAY 12 JUNE 2017

2 hot news

Cardiac arrest cases are on the rise. If the chest compressions they are giving are deep, just enough

NEO CHIA CHIN
Check out the new device

SINGAPORE A new device, the size of a credit card and a depth gauge, is the latest tool that could improve the effectiveness of CPR in saving the lives of cardiac arrest victims.

Following early trials and wider acceptance, the CPRCard, designed and built by the Singapore Red Cross, is a pocket-sized, portable, and easy-to-use device that can be used by anyone, even people who have never received training.

The battery-operated device is placed on the victim's chest before CPR is performed. It allows users to see if the chest compressions they are giving are deep and fast enough to keep the victim's blood flowing.

About 1,000 CPRCard devices have been given out since last year to those who have completed the Red Cross' standard First Responder training programme.

The Health Ministry's Director for Health Policy, Emergency Care, and Patient Safety, Dr. Tan Joo Koh, said the device is a "game-changer" for CPR training.

A 10,000-participant community trial that is under evaluation is the first step in the device's journey. The trial will involve members of the public learning the device's use and how to use it in a simulated situation.

Under the two-year study, researchers will also be looking at how the device is used in the field, and how it is used in the hospital setting, said Associate Professor Tan Joo Koh.

The CPRCard is a collaboration with the Singapore Red Cross, and the Singapore Red Cross' training programme.

Cardiac arrest is a common cause of death in Singapore, and the Red Cross' training programme is the first step in the device's journey.

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New device could help save more cardiac arrest victims



Health Minister and Member of Parliament (Chia Chai Kang GRC) Gan Kim Yong (right) and Singapore Red Cross' training programme director (left) demonstrate the CPRCard device.

* ONLY 17, BUT JC STUDENT HAS SAVED MANY LIVES

A 17-year-old student has saved many lives with his CPR skills.

The student, who is a member of the Singapore Red Cross, has been trained in CPR and has saved many lives.

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these compressions too quickly, at a rate of up to 100 compressions per minute, and at a depth of 20 to 25 cm.

"The device is a credit card size, and it's easy to use," said Dr. Tan Joo Koh. "It's a game-changer for CPR training."

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THE STRAITS TIMES

SCDF turns to artificial intelligence to help emergency call dispatchers



🕒 PUBLISHED JUL 9, 2018, 8:10 PM SGT | UPDATED JUL 9, 2018, 11:00 PM



Isabelle Liew (mailto:bxliw@sph.com.sg)

SINGAPORE -With Singapore's emergency dispatch phone operators receiving almost 200,000 calls for assistance a year, every minute is vital.

Video Call 119



Speech Recognition and Artificial Intelligence





SCDF
The Life Saving Force



MINISTRY OF HEALTH
SINGAPORE



OPERATIONAL MEDICAL NETWORKS INFORMATICS INTEGRATOR (OMNII) Briefing to SingHealth/EHA Clusters

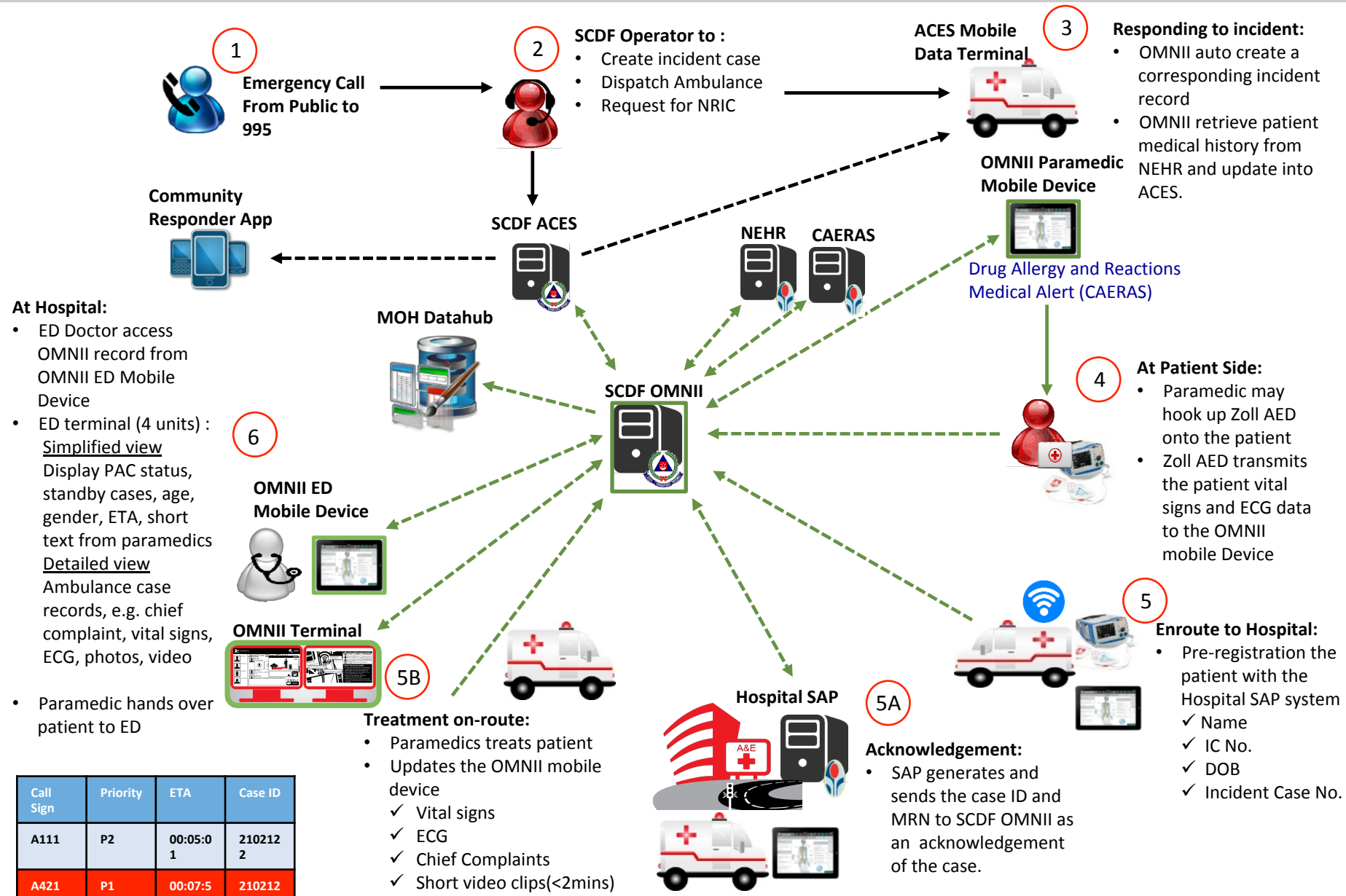
8 Sep 2017

What is OMNII?

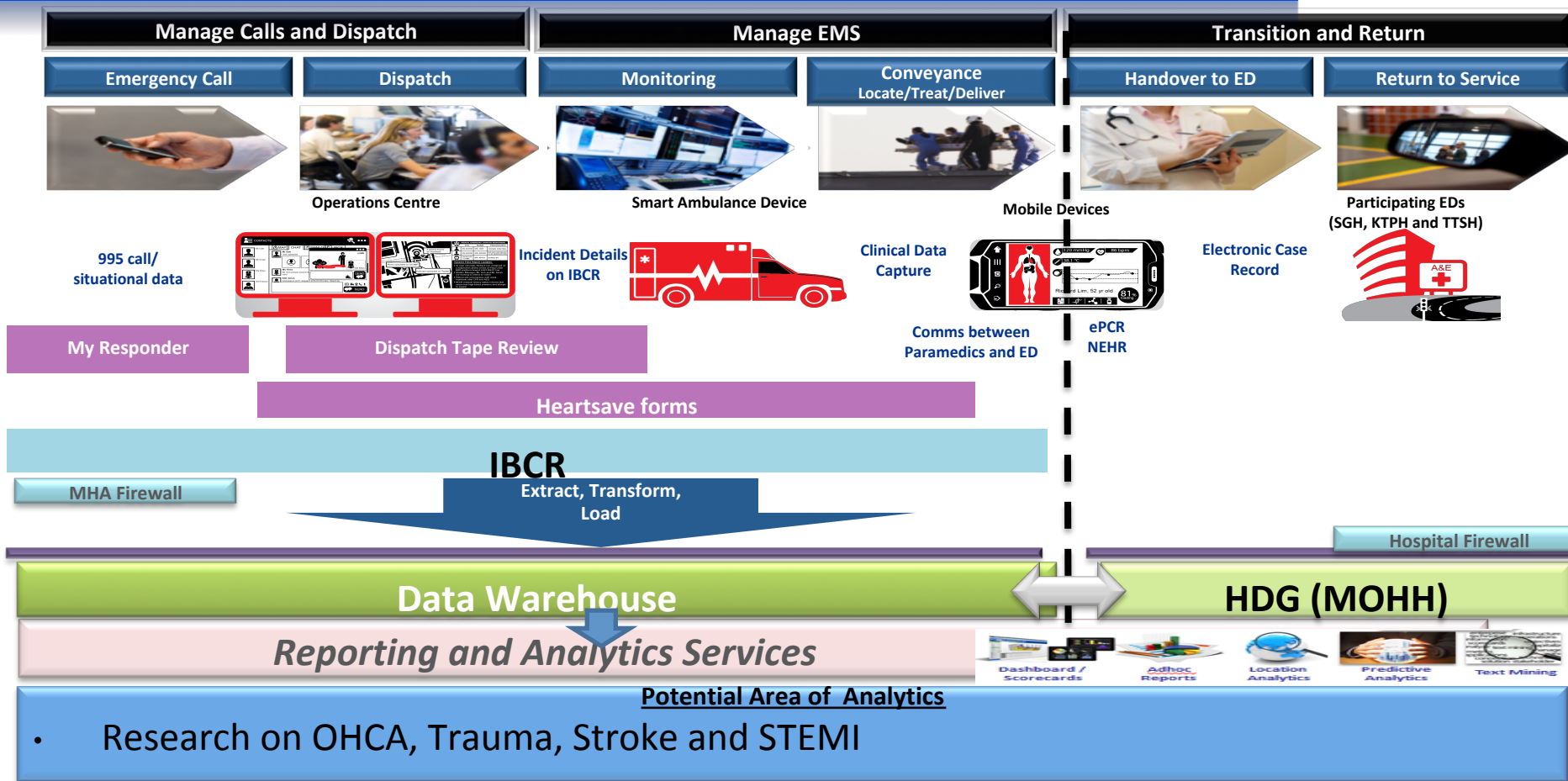


- **One Patient, One Record** -Seamless patient data sharing
- **Patient Focused** – Make better real-time decisions
- **High Quality Data** – Increase automated & more accurate data collection. Spend less time manually documenting/correcting data.
- **Real-time Coordinated Care** between *community*, *EMS* and *hospital*
- **Operational Integration** of SCDF and MOH Ops Ctr, EMS & Hospitals
- **Measure and Improve** – Endlessly repeated in a virtuous cycle.

OMNII Workflow



Healthcare Big Data and Advanced Analytics

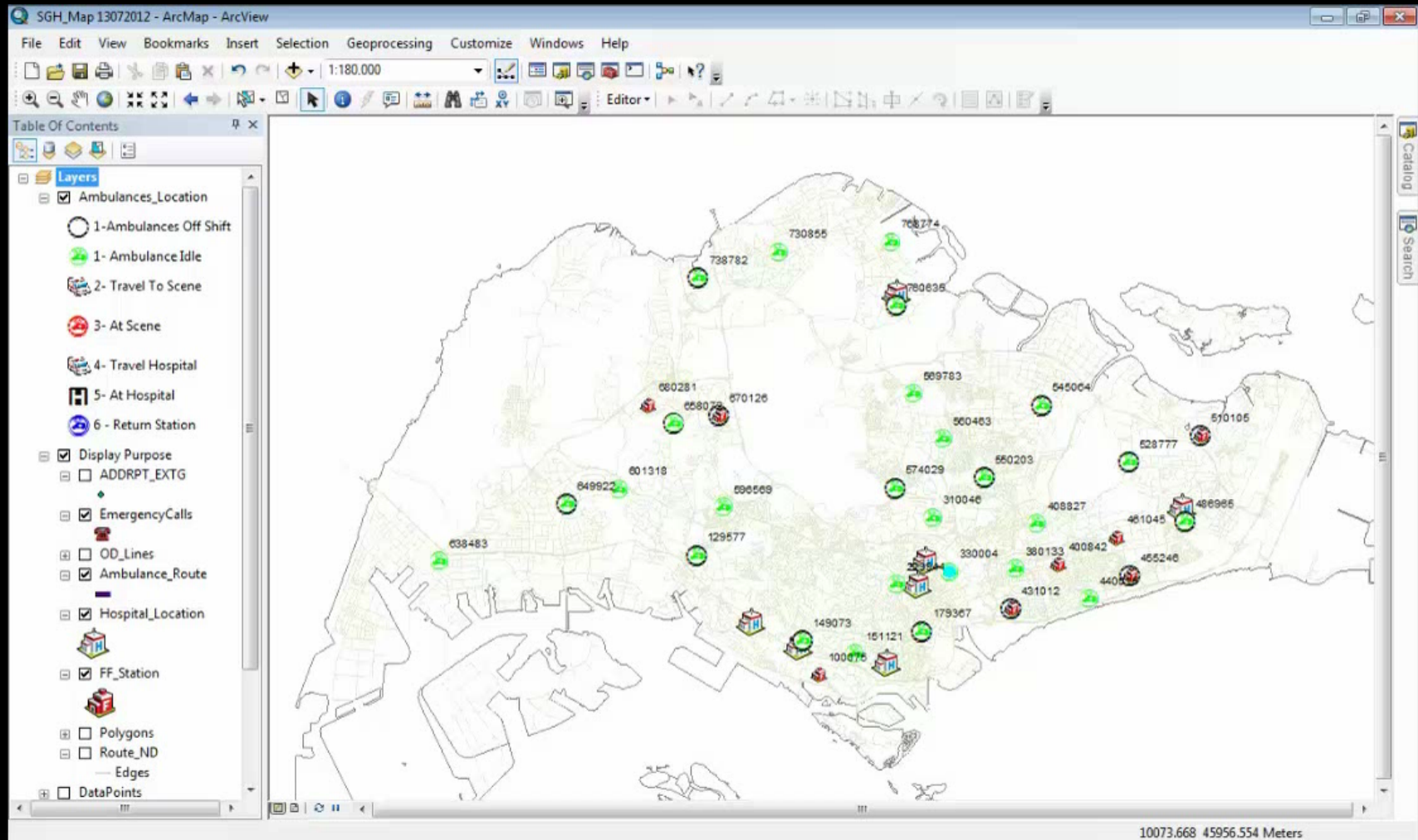


Reducing Ambulance Response Times Using Geospatial–Time Analysis of Ambulance Deployment

Marcus Eng Hock Ong, MBBS (S'pore), MPH, Tut Fu Chiam, MBBS (S'pore), MMed,
Faith Suan Peng Ng, MApp Stat, Papia Sultana, PhD, Swee Han Lim, MBBS (S'pore),
FRCS Ed (A&E), Benjamin Sieu-Hon Leong, MBBS (S'pore), MRCS Ed (A&E), Victor
Yeok Kein Ong, MBBS (S'pore), FRCS Ed (A&E), Elaine Ching Ching Tan, MBBS
(S'pore), MRCS Ed (A&E), Lai Peng Tham, MBBS (S'pore), MMed, Susan Yap, RN, and
V. Anantharaman, MBBS (S'pore), FRCS Ed (A&E), on behalf of
the Cardiac Arrest Resuscitation Epidemiology (CARE) Study Group:

ACADEMIC EMERGENCY MEDICINE 2010; 17:951–957 . 2010 by
the Society for Academic Emergency
Medicine





Use of an Automated, Load-Distributing Band Chest Compression Device for Out-of-Hospital Cardiac Arrest Resuscitation

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APPROXIMATELY 400 TO 460 000 individuals die every year from out-of-hospital cardiac arrest (OHCA),¹ representing approximately one third of all cardiovascular deaths² in the United States. Only 1% to 8% of individuals with OHCA survive to hospital discharge.³⁻⁶ Patients who have ventricular fibrillation for less than 3 to 4 minutes (the electrical phase of cardiac arrest)⁷ fare relatively well if rescuers arrive quickly and provide prompt defibrillation.⁸⁻¹¹

Context Only 1% to 8% of adults with out-of-hospital cardiac arrest survive to hospital discharge.

Objective To compare resuscitation outcomes before and after an urban emergency medical services (EMS) system switched from manual cardiopulmonary resuscitation (CPR) to load-distributing band (LDB) CPR.

Design, Setting, and Patients A phased, observational cohort evaluation with intention-to-treat analysis of 783 adults with out-of-hospital, nontraumatic cardiac arrest. A total of 499 patients were included in the manual CPR phase (January 1, 2001, to March 31, 2003) and 284 patients in the LDB-CPR phase (December 20, 2003, to March 31, 2005); of these patients, the LDB device was applied in 210 patients.

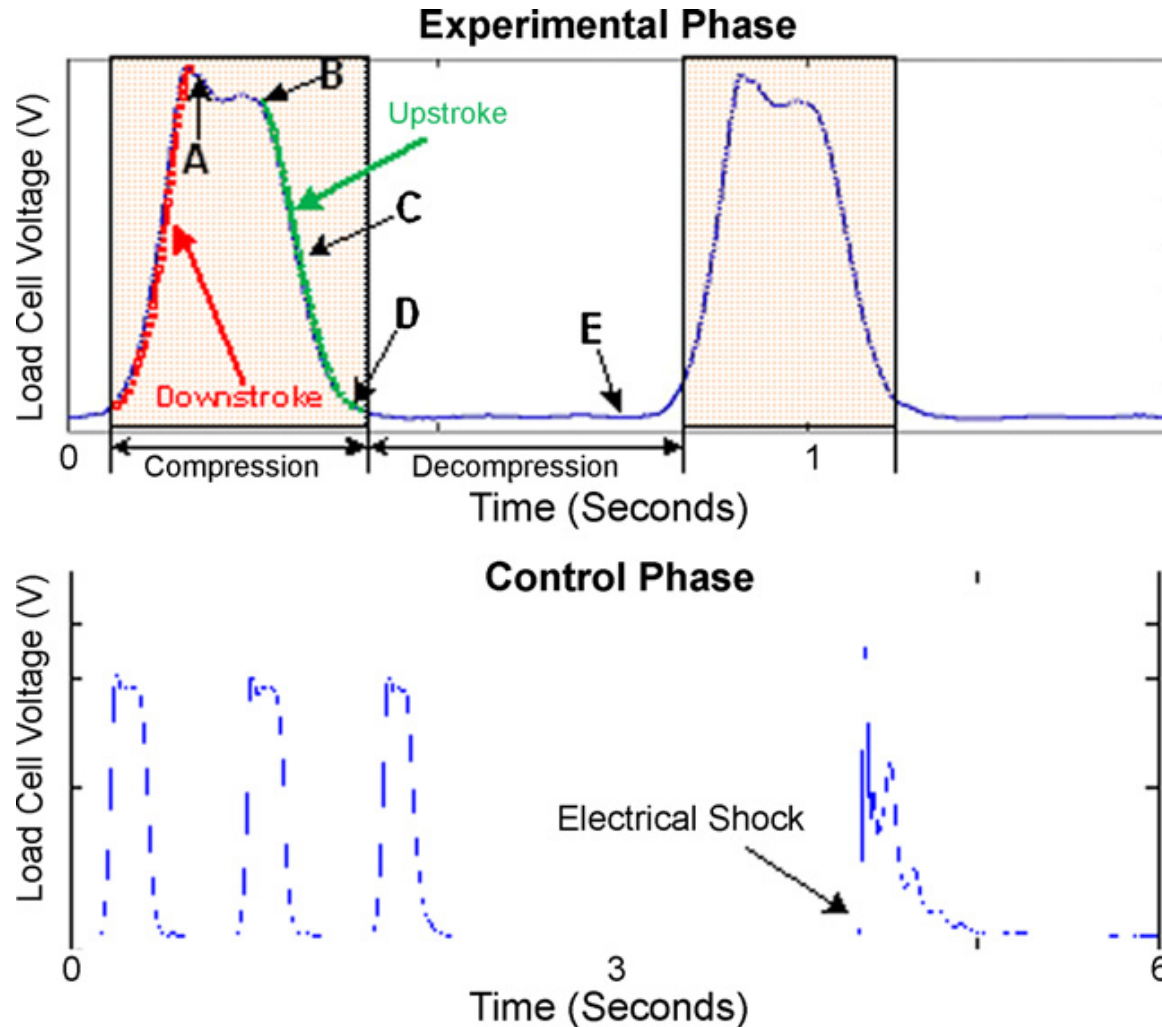
Intervention Urban EMS system change from manual CPR to LDB-CPR.

Main Outcome Measures Return of spontaneous circulation (ROSC), with secondary outcome measures of survival to hospital admission and hospital discharge, and neurological outcome at discharge.

Results Patients in the manual CPR and LDB-CPR phases were comparable except for a faster response time interval (mean difference, 26 seconds) and more EMS-witnessed arrests (18.7% vs 12.6%) with LDB. Rates for ROSC and survival were increased with LDB-CPR compared with manual CPR (for ROSC, 34.5%; 95% confidence interval [CI], 29.2%-40.3% vs 20.2%; 95% CI, 16.9%-24.0%; adjusted odds ratio [OR], 1.94; 95% CI, 1.38-2.72; for survival to hospital admission, 20.9%; 95% CI, 16.6%-26.1% vs 11.1%; 95% CI, 8.6%-14.2%; adjusted OR, 1.88; 95% CI, 1.23-2.86; and for survival to hospital discharge, 9.7%; 95% CI, 6.7%-13.8% vs 2.9%; 95% CI, 1.7%-4.8%; adjusted OR, 2.27; 95% CI, 1.11-4.77). In secondary analysis of the 210 patients in whom the LDB device was applied, 38 patients (18.1%) survived to hospital admission (95% CI, 13.4%-23.9%) and 12 patients (5.7%) survived to hospital discharge (95% CI, 3.0%-9.3%). Among patients in the manual CPR and LDB-CPR groups who survived to hospital discharge, there was no significant difference between groups in Cerebral Performance Category ($P=.36$) or Overall Performance Category ($P=.40$). The number needed to treat for the adjusted outcome survival to discharge was 15 (95% CI, 9-33).

Conclusion Compared with resuscitation using manual CPR, a resuscitation strat-

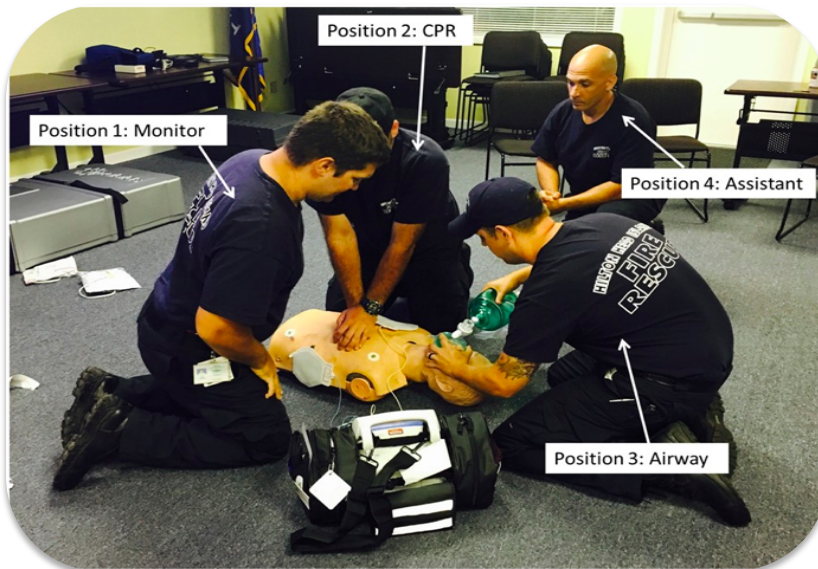
Synchronized Defibrillation During Compression Upstroke.



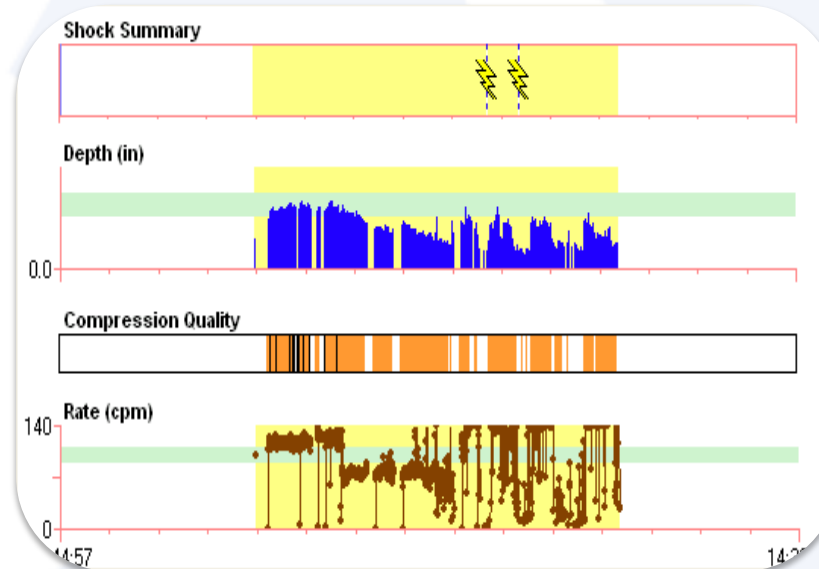
High Performance CPR



Measurement of Professional Resuscitation



HP-CPR



Measurement



Measurement of Resuscitation Performance



Public Access
Defibrillation



Defibrillator
Code Review



Audio
Recording



Body Worn
Cameras



CarbonCool System:

Global Healthcare SG

<https://www.globalhealthcare.sg/>

CarbonCool™ Full Body Suit

Model No.: FB-FPS10-001

(1 piece – Free Size)

Material used are not sterilized:

Neoprene, TPU & Velcro

Weight: approx. 890 grams



Cooling curves

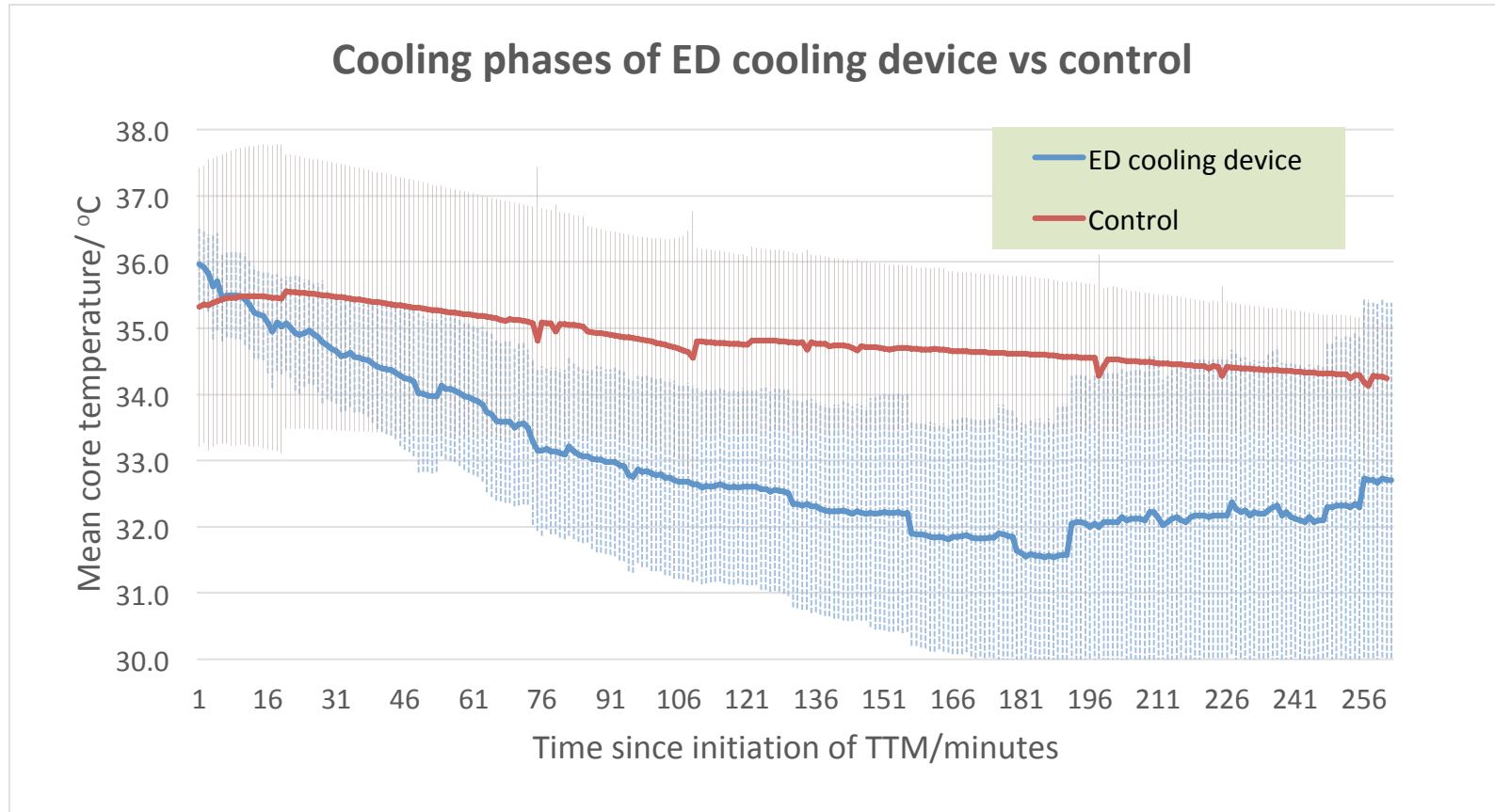


Figure 2: Aggregate cooling curves for ED cooling device (n = 21) and control (n = 44) core temperatures. Note the rate of cooling of with the use of the ED cooling device ($\sim 2.1^{\circ}\text{C}/\text{hour}$) compared to that of the control ($\sim 0.5^{\circ}\text{C}/\text{hour}$).

Virtual Singapore Emergency Response

Research Associate

(JOB-2018-0097221)

- Modelling & simulation
- Data analytics & optimisation techniques
- Min. MSc in Computer Science
- Min. 1 year experience

Research Associate

(JOB-2018-0097860)

- Modelling & simulation
- Understanding of Complexity Science
- MSc in Applied Mathematics
- Min. 1 year experience

Senior Research Fellow

(JOB-2018-0097871)

- Agent-based crowd modelling & simulation
- 3D modelling & visualisation
- Data analysis & optimisation.
- PhD in Computer Science
- Min. 2 years experience

Senior Research Fellow

(JOB-2018-0097876)

- Ethnographic & human factors design
- 3D modelling & visualisation
- Data analysis & quantitative research methods
- PhD in Psychology/Sociology
- Min. 2 years experience

Project Officer

(JOB-2018-0102225)

- Software Engineer position
- 3D modelling & visualisation
- Programming - C++, Java, Python
- BSc in Computer Science
- Min. 2 years experience

Project Officer

(JOB-2018-0102230)

- Software Engineer position
- 3D modelling & visualisation
- Programming - C++, Java, Python
- MSc in Computer Science
- Min. 2 years experience

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A collaborative project between Nanyang Technological University, SingHealth, Singapore Civil Defence Force, & GovTech, the Virtual Singapore platform is a 3D virtual replica of Singapore's built infrastructure, used to simulate, model, & enhance medical emergency response systems. A Smart Nation initiative, it is set to transform emergency care.

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