

Prehospital Emergency Care Research

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Why Do Research?

To improve patient care:

Saving lives by knowledge creation,
improving systems

Data drives policy



Why Do Research?

AT 22, S'PORE WOMAN SUFFERS CARDIAC ARREST AT HOME
HER HEART STOPPED

31
TIMES

And she survives Page 2



PHOTO: MICHAEL YONG/STRIKE PHOTOGRAPHY

She had cardiac arrest when she was **22** years old



PICTURES: LIMKE WANG/STRIKE PHOTOGRAPHY

Her heart stopped 31 times even though she had no pre-existing health condition

REPORT: BENSON ANG
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AT 22, she suffered a cardiac arrest. And after the woman was sent to hospital, her heart stopped another 30 times. Thankfully, she survived.

Book editor Samantha Yong, now 23, suffered the cardiac arrest at home in the Toek Bangah area in January last year.

The Singaporean was getting ready for work that day when she suddenly fainted.

She told The New Paper yesterday: "I didn't really feel or remember anything about the incident."

A few days before the episode, Ms Yong had had heart palpitations. But she didn't pay attention to it.

"I didn't have any pre-existing health condition. So it really took me by surprise," she said.

When she fell in the bedroom, she knocked over a fan, and this woke up her then boyfriend, identified

only as Michael. The American, a computer programmer, now 25, saw Ms Yong lying unconscious on the floor. She looked pale and her lips were blue. But she had a pulse.

So Michael immediately called for an ambulance and conducted cardiopulmonary resuscitation (CPR) on her.

He had learnt this in high school, but had not performed it on anyone in about 10 years.

Said Ms Yong: "He was really scared and panicky. He had to talk himself through the steps to calm himself down."

'He really saved my life there'

"He really saved my life there. Without him, I won't be here."

When the paramedics arrived, they gave her an electric shock, which restored her heartbeat to normal.

Ms Yong was sent to the accident and emergency department at Singapore General Hospital.

But there, her heart stopped another 30 times. Each time, the doctors revived her.

And finally, her condition stabilised. She was admitted to the cardiac care unit at the National Heart Centre, where she had an operation to

"My colleagues were the ones who arranged for an instructor to come in. I'm so touched by what they did."

— Ms Samantha Yong

have an automated implantable cardioverter defibrillator inserted into her chest.

This battery-powered device can monitor a patient's heart rhythm constantly.

When this rhythm is abnormal, the device administers electric shocks to correct the abnormalities.

Ms Yong was discharged 10 days after being admitted. She returned to work in March last year.

She said: "I still don't really know the cause of the arrest. My doctors think it might be a genetic condition but I can't be sure."

"They are still researching and monitoring me."

World's first trial to boost heart attack survival rates

The Singapore General Hospital (SGH) will conduct the world's first trial to determine when is the best time to deliver electrical shocks to patients who suffer heart attacks.

SGH doctors will investigate if delivering this shock at a specific time during cardiopulmonary resuscitation (CPR) can improve the patients' chance of survival.

Cardiac arrest patients who are taken to its emergency department with severely abnormal heart rhythm are eligible for the study. They may be enrolled into it from next month.

Currently, patients who have cardiac arrests are given CPR and shocks to their hearts immediately.

The CPR is paused when the shock is delivered. But with the advent of automated CPR machines, pauses can be avoided and the shock can now be synchronised with CPR.

SGH's doctors hope this arrangement can increase shock success, as shown in animal studies.

The study aims to enrol 142 patients, to be randomly divided into two groups.

In each group, the automated CPR machine and defibrillator will be programmed to give a shock at a different time during the chest compression.

In one group, patients will be given the shock during a point when pressure is taken off the chest. In another,

patients will be shocked at the pre-compression phase, which is the current standard of care.

The pre-compression phase is the period between each complete chest compression.

The study is led by Associate Professor Marcus Ong, a senior consultant at SGH's department of emergency medicine. He said: "We want to increase patients' chances of survival. This study has the potential to significantly impact current practice of resuscitation."

Heart attacks are totally unpredictable and can strike anyone anywhere and at any time.

Cardiac arrests

According to a Straits Times report, more than 1,000 cardiac arrests happen in Singapore every year.

SGH alone sees 150 to 200 such patients each year. In Singapore, only 2 per cent of those patients survive. In the US, Europe and Japan, this figure is 20 per cent.

In general, conducting CPR immediately on a patient doubles his or her chance of survival.

SGH is organising a community forum this Saturday to inform the public about the study and teach them what to do if they encounter someone suffering a heart attack.

The free event, Surviving a Cardiac Arrest: What You Need to Know, will be held in the SGH at Block 6, Level 9, from 2pm to 4pm.

The forum will be conducted in English.



Nevertheless, the people around Ms Yong had taken precautions just in case the incident happens again.

Michael, now her husband, has installed several corner protectors around the house so she won't hurt herself if she falls again.

Her publishing company, World Scientific, also installed an automated external defibrillator (AED) in the office.

An AED is an external device which can help restore a normal heartbeat by delivering electric shocks.

Course in CPR

Ms Yong's colleagues had also volunteered to take a course in CPR and first aid.

About 20 of her colleagues took the course last July, which was conducted over a few weeks.

Said Ms Yong: "I'm very lucky to have such supportive family members and friends. My colleagues were the ones who arranged for an instructor to come in."

"I'm so touched by what they did."

A cardiologist, Dr Soon Chao Yang, told The New

Paper that it is very rare for a 22-year-old woman to suffer a heart attack.

There is less than a 1 per cent chance of someone like Ms Yong having such an attack, said the medical director of Nobel Heart Centre, which is under the Healthway Medical Group.

"Patients her age usually have other health problems - like diabetes or an auto-immune disease - that prompt heart problems to develop at such a young age."

"Sometimes, heart attacks can be due to just stress," added Dr Soon.

He said that during a heart attack, it is not uncommon for a person's heart to repeatedly go into an abnormal rhythm.

He said: "During the episode, the heart is injured, unstable. It is not 'happy'. So it can stop again and again, even up to 20 times."

"It's like a storm that keeps coming. Thankfully, this happened in the hospital, where the doctors can revive the heart pretty quickly."

"If she was out of the hospital, she would probably have died."

It's all about the patient!



**IMPROVEMENTS
IN SURVIVAL FOR
OUT-OF-HOSPITAL
CARDIAC ARREST
IN SINGAPORE
OVER 10 YEARS**

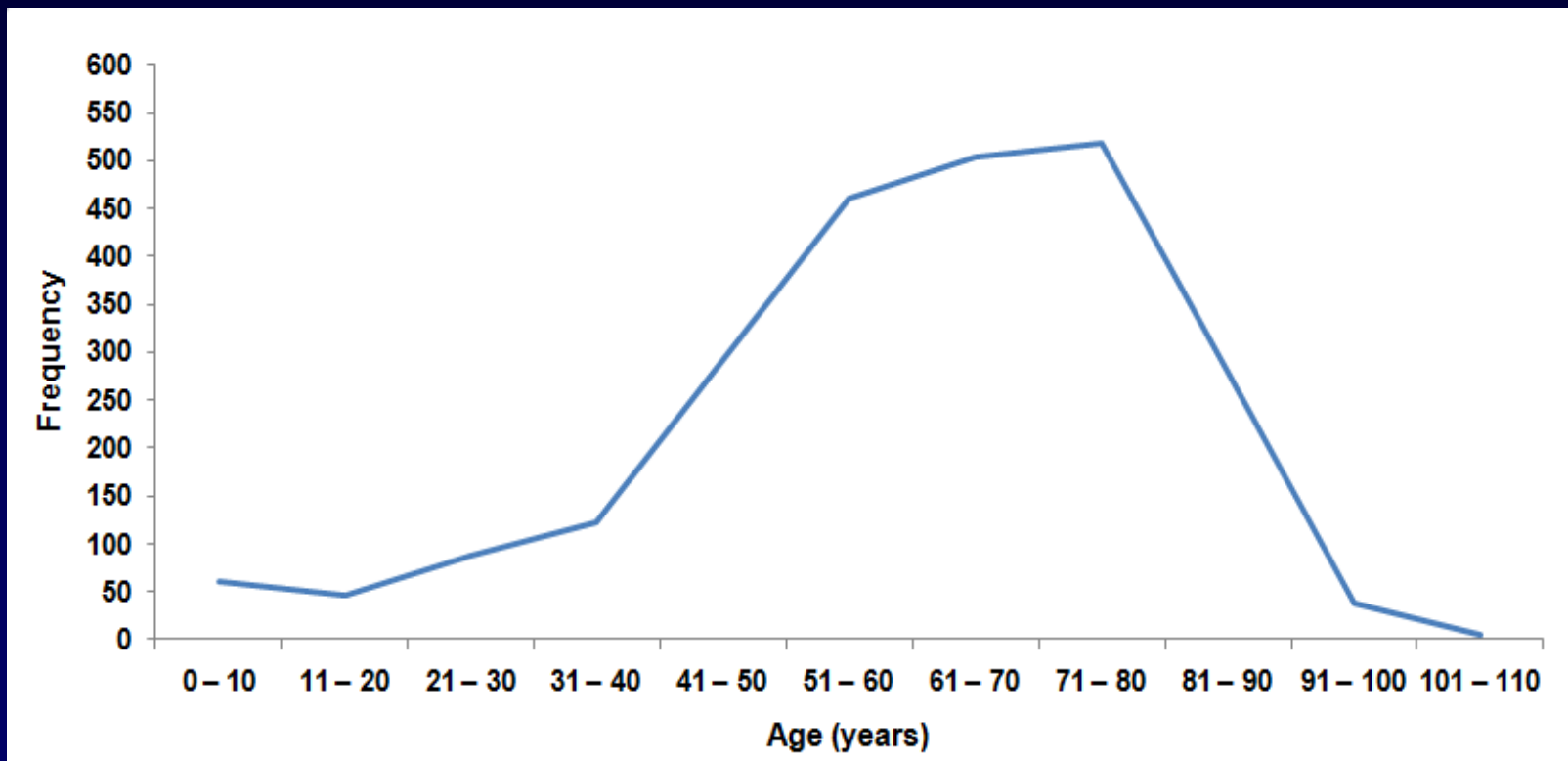
**It's about understanding and
improving the system!**

CARE Study

- ↓ *Largest and most comprehensive OHCA study to date*
- ↓ *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: Ongoing*
- ↓ *Pan Asian Resuscitation Outcomes Study (PAROS)*

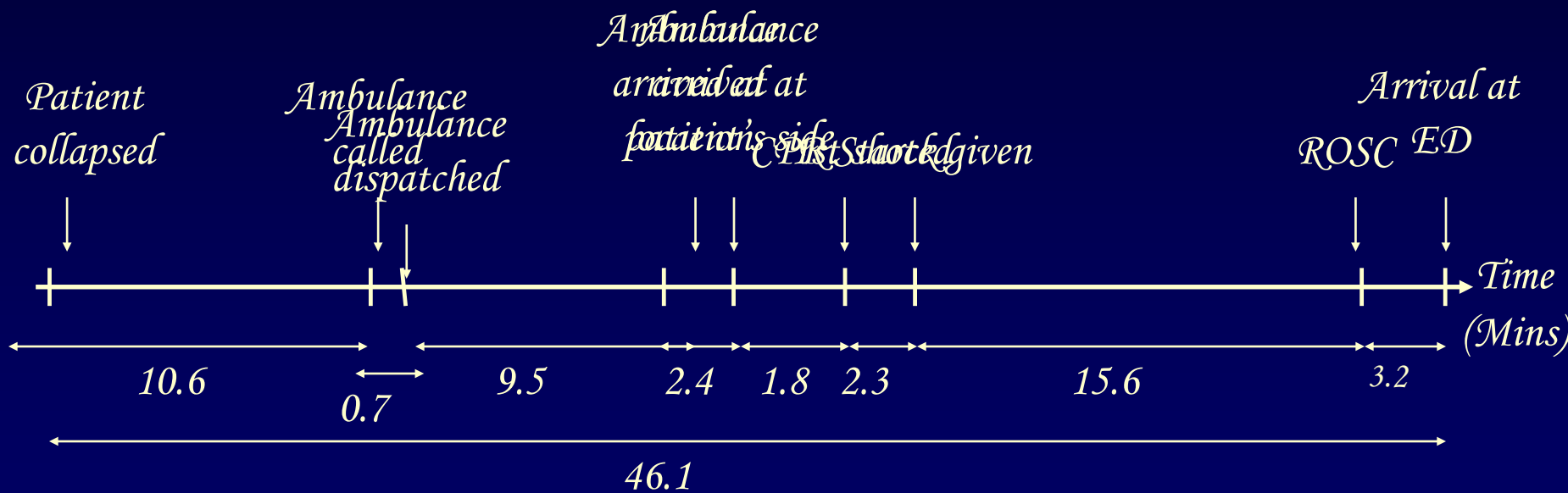


>2000 Out-of-Hospital Cardiac Arrest/year
>65% of OHCA Deaths were in Independent,
Economically Active Patients Age <70



Early Access

CARE Study: EMS Response Time



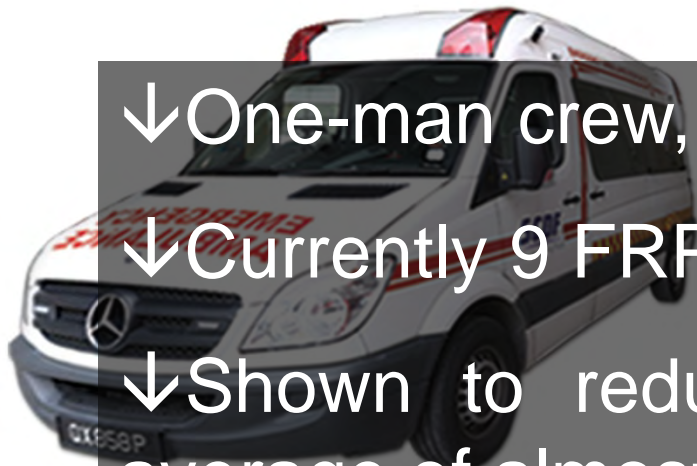
Fast Response Paramedic (FRP)

↓ One-man crew, equipped with AED

↓ Currently 9 FRPs in service

↓ Shown to reduce response times by an average of almost 5 minutes

↓ Adding more Firebiker units



Singapore: preparedness in a tightly packed community

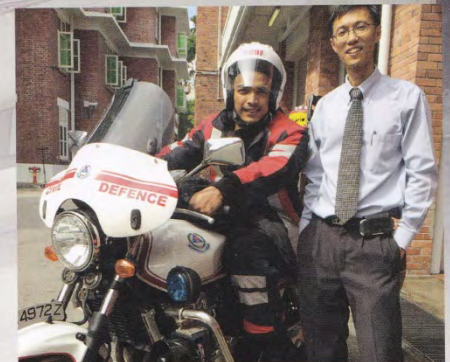
...ing and developing a strong Chain of Survival in
...demands innovative use of existing resources. For
...d to be 12 square metres, it is
...an ambulance will arrive after 10 minutes – too
...responders have failed to act – and need 46 minutes to
...carry the patient to the hospital. Moreover, lifts in its high-rise
...owners typically have no place for a stretcher or a gurney.

...measures that are lifting this bustling city to be among
...survival include the multi-disciplinary resuscitation
...associated with a faster response – that
...a trained and confident bystander in every house-
...well-equipped paramedics using motorcycles to move
...through traffic, and special smart phone emergency apps
...community responders to rush in with the
...PRCard for lay people is being
...Singapore. Key leaders have realized that precisely the
...of the population provides great opportunities. Because
...often live together, most cases will entail the
...really close.

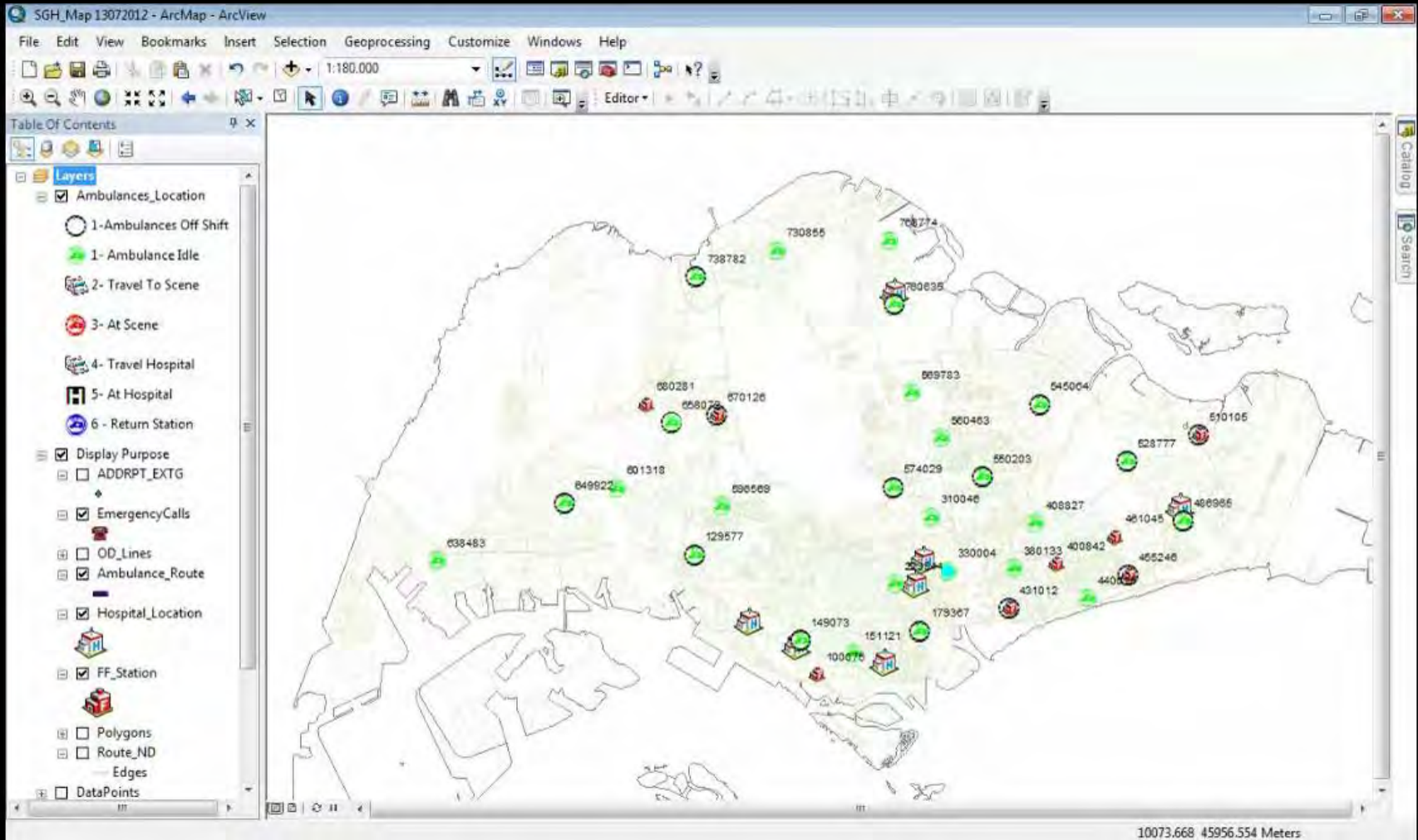
...the inspiration came from Seattle. Marcus Ong Eng
...PAROS – Pan Asian Resuscitation Outcomes
...is a driving force in Asian lifesaving.
...advocates more and better bystander CPR, while
...build up one of the world's largest cardiac arrest registers
...more than 30,000 cases a year. This enables the
...and deficiencies of each
...ing and Quality
...processes to improve outcome.

...network is growing quickly, and by hundreds of million
...South Korea, Thailand, the Philippines, and Japan are
...of the PAROS network, and plans are being prepared
...China, Indonesia, Pakistan, and Qatar in adopting
...dispatcher-assisted CPR intervention package.

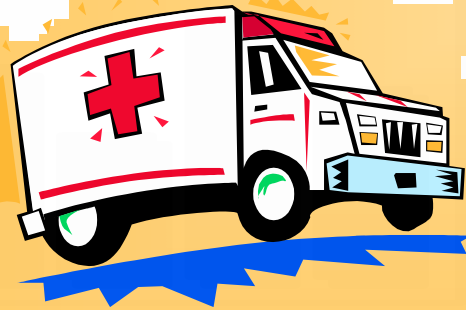
...The key to success is determined and enthusiastic local leader-
...," says Marcus Ong. The initiative must come from each
...when a community realizes that it has a problem and
...collaboration to solve it. Moreover, fast-progressing
...and Seoul are cultures where people have a strong
...improve and are ready to contribute to the community.



Marcus Ong with motorbike ambulance paramedic.



Survival Outcomes with the Introduction of Intravenous Adrenaline in the Management of Out-of-Hospital Cardiac Arrest (CARE II Study)



Dr Marcus Ong Eng Hock

MBBS, FRCS (A&E) Ed, MPH (VCU), FAMS

Consultant, Director of Research and Senior Medical Scientist

Dept of Emergency Medicine, Singapore General Hospital

Improved OHCA survival over 10 years

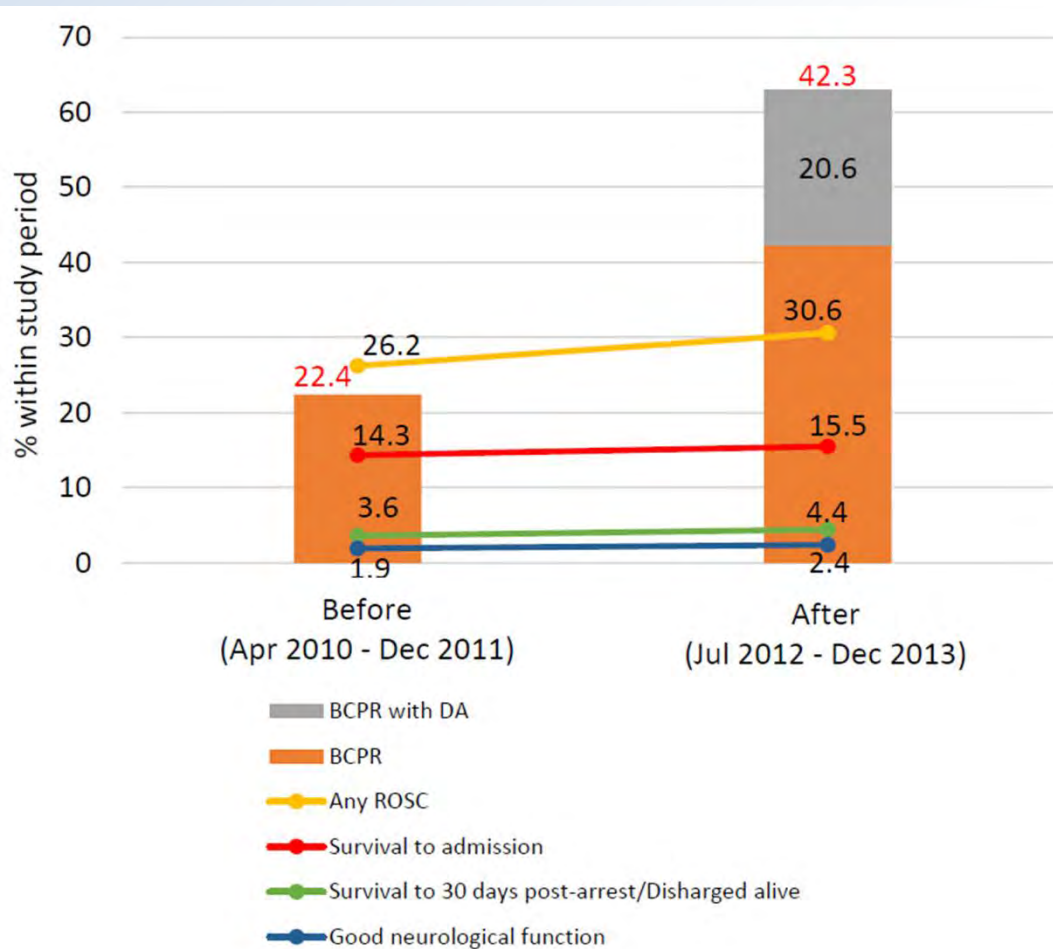
	2001-2004 n=2428	2010-2012 n=3026	Adjusted OR* (95% CI)
<i>Survival - All Arrests</i>			
Discharged alive or Alive at 30 days	38 (1.6%)	97 (3.3%)	2.2 (1.5 - 3.3)
Good neurological function	28 (1.2%)	53 (1.8%)	1.7 (1.1 - 2.8)
<i>Survival - Utstein Style</i>			
Discharged alive or Remain alive at 30 days	7/280 (2.5%)	35/317 (11.0%)	9.6 (2.2 – 41.9)
Good neurological function	6/280 (2.1%)	22/317 (7.0%)	6.0 (1.3 – 27.0)

*adjusted for age, gender, and history of heart disease

It's about innovation and progress !

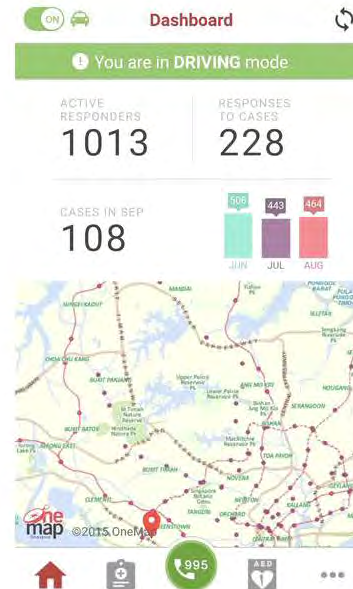


Implementation of DA-CPR



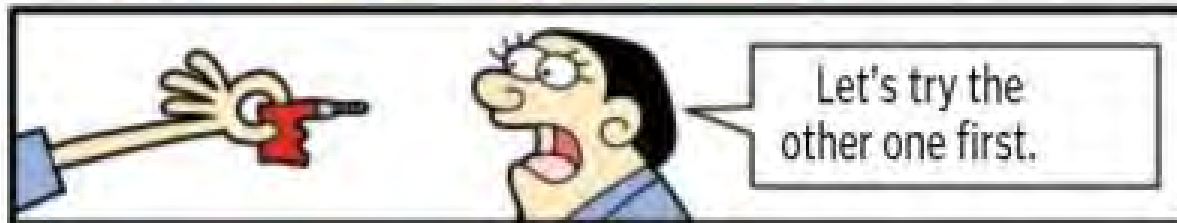
AED on Wheels Program

AED On Wheels



PUNCH LINES

New way to get adrenaline to the heart of cardiac arrest victims — by drilling below the knee



Therapeutic Hypothermia Treatment



Cooling the body can 'cut risk of fatality' after cardiac arrest

By POON CHIAN HUI

CARDIAC arrest sufferers can be kept alive using a new technique that cools their bodies to below the normal temperature and then slowly reheats them.

The "therapeutic hypothermia" treatment more than triples their chances of surviving, according to preliminary results of a clinical trial in Singapore.

It also reduces the risk of brain damage – a common problem among those who live.

The technique – which is already used in countries such as Australia – spells new hope for the 1,500 people in Singapore who suffer a cardiac arrest outside hospital every year.

At the moment, their survival rate is a dismal 2.7 per cent.

First, the patient's body is rapidly cooled to between 32 deg C and

34 deg C. This is done either by wrapping large cooling-gel pads around the torso and legs or by pumping cool saline into a catheter that is inserted into the body.

The temperature is then maintained for 24 hours while the patient is put into a medically induced coma.

After that, the body is gradually warmed to the normal 36.5 deg C.

Bringing the temperature down helps to save barely alive cells, said Associate Professor Marcus Ong, who is the lead researcher in the trial at Singapore General Hospital (SGH).

This is because when oxygen is cut off during a cardiac arrest, "it starts a chain reaction that ultimately leads to cell death".

But when the cells are cooled, they do not need as much oxygen, which reduces the damage.

"If left alone, the area of dam-

age would increase and becomes permanent," added Prof Ong, a senior consultant in emergency medicine at the hospital.

Forty cardiac arrest patients aged 18 to 80 were involved in the clinical trial between 2008 and last year.

Most of the survivors given conventional intensive care ended up in a coma or vegetative state.

By contrast, more than half of the patients who received the hypothermia treatment woke up with minimal brain damage.

They include information technology manager Peng Hua, who collapsed suddenly at work last September.

Colleagues and paramedics managed to resuscitate him. And by the time the 39-year-old arrived at hospital, his heart had started beating again.

He was then cooled and slowly

*"Therapeutic hypothermia" lowers the body temperature and protects neurological function
----> survival increased from 16% (4 survivors) to 44% (11 survivors) .*

Pilot prospective study of therapeutic hypothermia for treatment of post-cardiac arrest patients. Ng M, Wong AS, Chew HC, Shahidah N, Pek PP, Poh J, Chin CT, Chua TS, Ong ME. Int J Cardiol. 2014 May 15;173(3):612-3

PEC Pilot Initiatives

Alignment with PEC Lifecycle

Manage Calls and Dispatch

Emergency Call

Dispatch



Manage EMS

Monitoring



Conveyance
Locate/Treat/Deliver



Transition and Return

Handover to ED



Return to Service



PEC Pilot Initiatives

Mobile App for Public/ Community Responder Pilot

Supplies Restock Pilot

Emergency Mobile Location Pilot

Single End-to-End Pilot

Ambulance Pilot

Paramedic Mobile Device Pilot

SCDF Operations Centre Pilot

Quality Assurance Pilot

IBCR (Incremental build of Case Record) Pilot

Purpose of the Pilot

- Assess the impact of proposed solution capabilities on PEC
- Demonstrate benefits of seamless data integration and situational awareness across PEC
- Test the speed and ease of implementation (time, resources, cost)
- Test robustness of the technologies and integration capabilities for seamless operations

It's about impacting policy!

Pre-hospital Emergency Care

5 Year Plan (2009 – 2014)

It's about impacting our communities!



Dispatcher-Assisted First Responder Programme
(DARE)



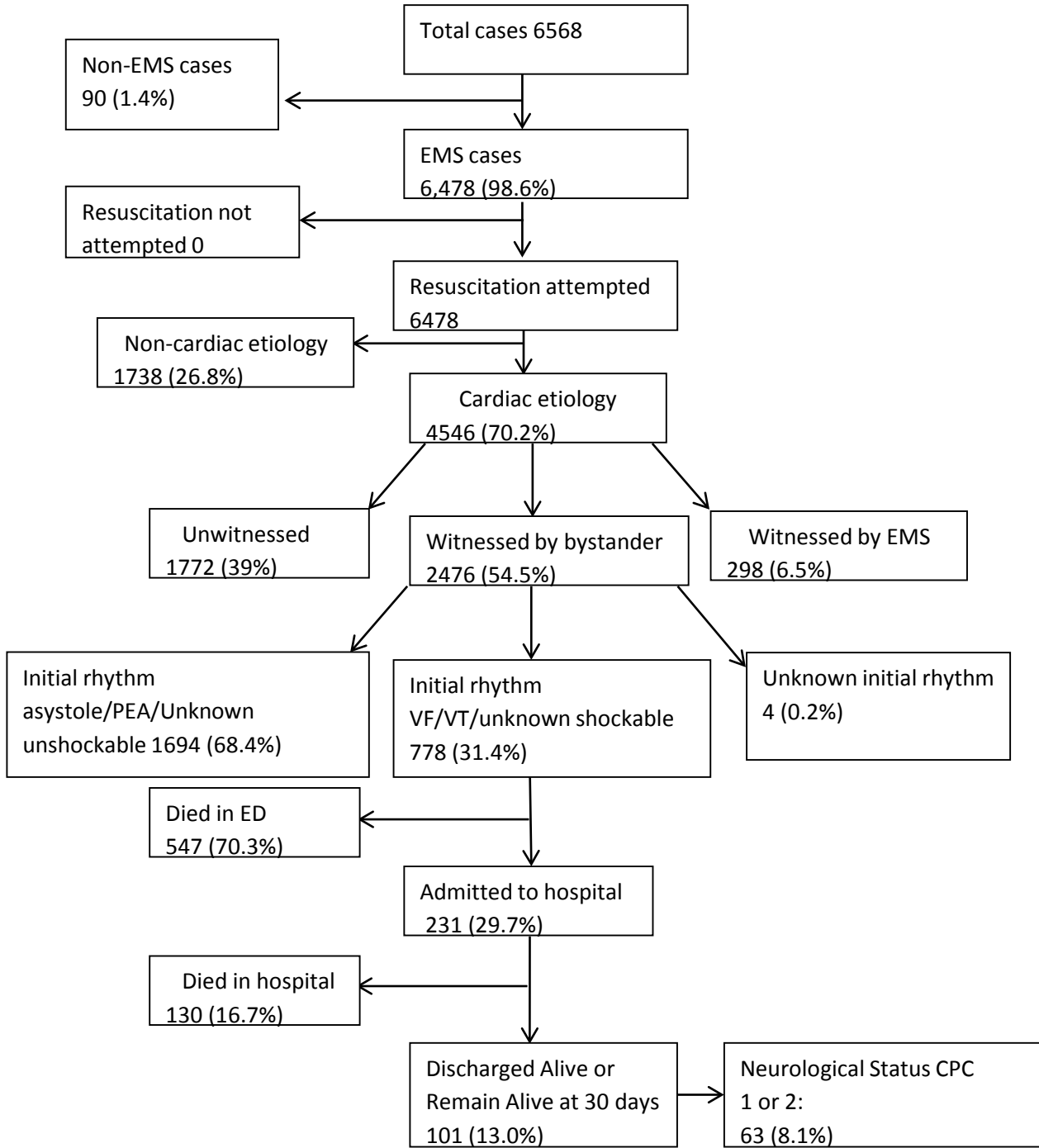


ASIA
TONIGHT

Announcement



Fig. 1: Utstein flow chart for 2011-2014

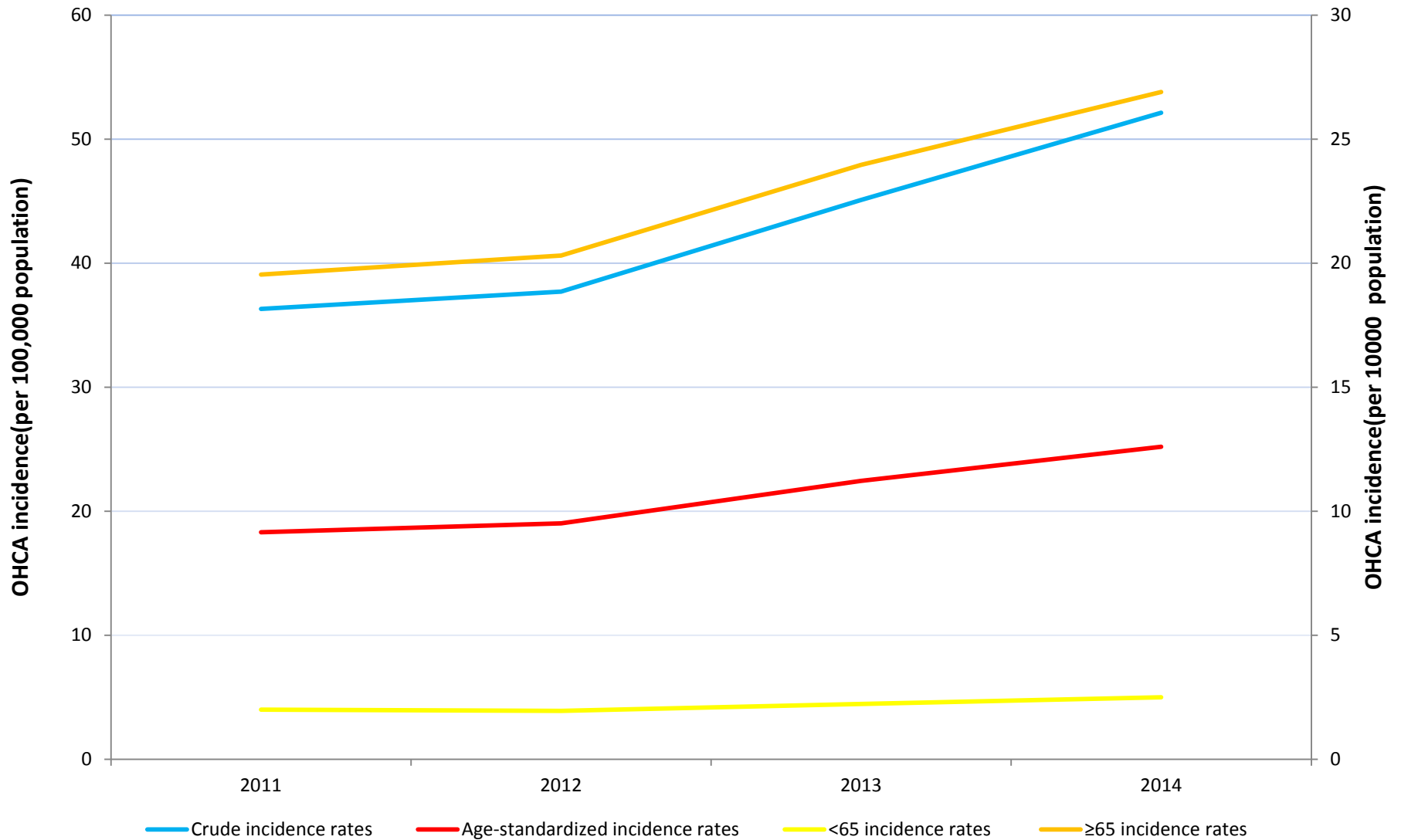


 **Table 1: Temporal trends in characteristics and outcomes of OHCA from 2011-2014**

	2011 (n=1376)	2012 (n=1440)	2013 (n=1734)	2014 (n=2018)	P for trend
Characteristics					
Age, year , median (IQR)	65(53.0-77.0)	66(54.0-78.0)	68(55.0-79.8)	68(55.0-80.0)	<0.001
Age <65years, n (%)	686 (49.9)	667 (46.3)	753 (43.4)	849 (42.1)	<0.001
Age >/=65years, n(%)	690 (50.1)	773 (53.7)	981 (56.6)	1169 (57.9)	
Gender- Male, n (%)	934 (67.9)	911 (63.3)	1129 (65.1)	1305 (64.7)	0.078
Race, Chinese, n (%)	892 (64.8)	984 (68.3)	1225 (70.6)	1340 (66.4)	0.001
Medical history- none, n (%)	167 (12.1)	182 (12.6)	199 (11.5)	255 (12.6)	0.759
Patient brought in by EMS, n (%)	1362 (99.0)	1421 (98.7)	1712 (98.8)	1983 (98.3)	0.333
Location of OHCA- residential, n (%)	982 (71.4)	982 (68.2)	1234 (71.5)	1466 (72.6)	0.041
OHCA witnessed, n (%)	886 (64.4)	836 (58.1)	1017 (58.6)	1230 (61.0)	0.002
Initial arrest rhythm- shockable, n (%)	251 (18.2)	279 (19.4)	302 (17.4)	341 (16.9)	0.295
EMS response time, min, median (IQR)					
(call- arrival at scene)	7.78(5.90-10.28)	8.42(6.42-10.94)	8.8(6.57-11.82)	9.5(7.52-12.07)	<0.001
Bystander CPR, n (%)	302 (21.9)	466 (32.4)	741 (42.7)	1016 (50.4)	<0.001
Bystander AED applied, n (%)	25 (1.8)	26 (1.8)	42 (2.4)	71 (3.5)	0.003
Mechanical CPR, n (%)	162 (11.8)	633 (44.0)	1249 (72.0)	1452 (72.0)	<0.001
Pre-hospital defibrillation, n (%)	324 (23.5)	367 (25.5)	422 (24.3)	556 (27.6)	0.025
Pre-hospital advanced airway, n (%)	1132 (82.3)	1201 (83.4)	1515 (87.4)	1741 (86.3)	<0.001
Pre-hospital drug administration, n (%)	634 (46.1)	696 (48.3)	871 (50.2)	1050 (52.1)	0.003
Cause of arrest- cardiac etiology, n (%)	1063 (77.3)	1002 (69.6)	1164 (67.1)	1372 (68.0)	<0.001
Emergency PCI performed, n (%)	35 (2.5)	41 (2.8)	68 (3.9)	96 (4.8)	0.009
Emergency CABG performed, n (%)	0 (0.0)	0 (0.0)	3 (0.2)	6 (0.3)	0.122
Hypothermia therapy initiated, n (%)	17 (1.2)	23 (1.6)	62 (3.6)	113 (5.6)	<0.001
ECMO therapy initiated, n (%)	1 (0.1)	0 (0.0)	3 (0.2)	11 (0.5)	0.013
Outcomes					
Survival , n (%) (discharge alive/ remain in hospital 30d post-arrest)	48 (3.5)	52 (3.6)	69 (4.0)	75 (3.7)	0.901
Utstein survival, n(%)	20(11.6)	22(12.8)	28(13.5)	31(13.8)	0.923
Post arrest CPC (1/2), n (%)	24 (1.7)	32 (2.2)	34 (2.0)	56 (2.8)	0.245
Post-arrest OPC (1/2), n (%)	24 (1.7)	31 (2.2)	31 (1.8)	55 (2.7)	0.26

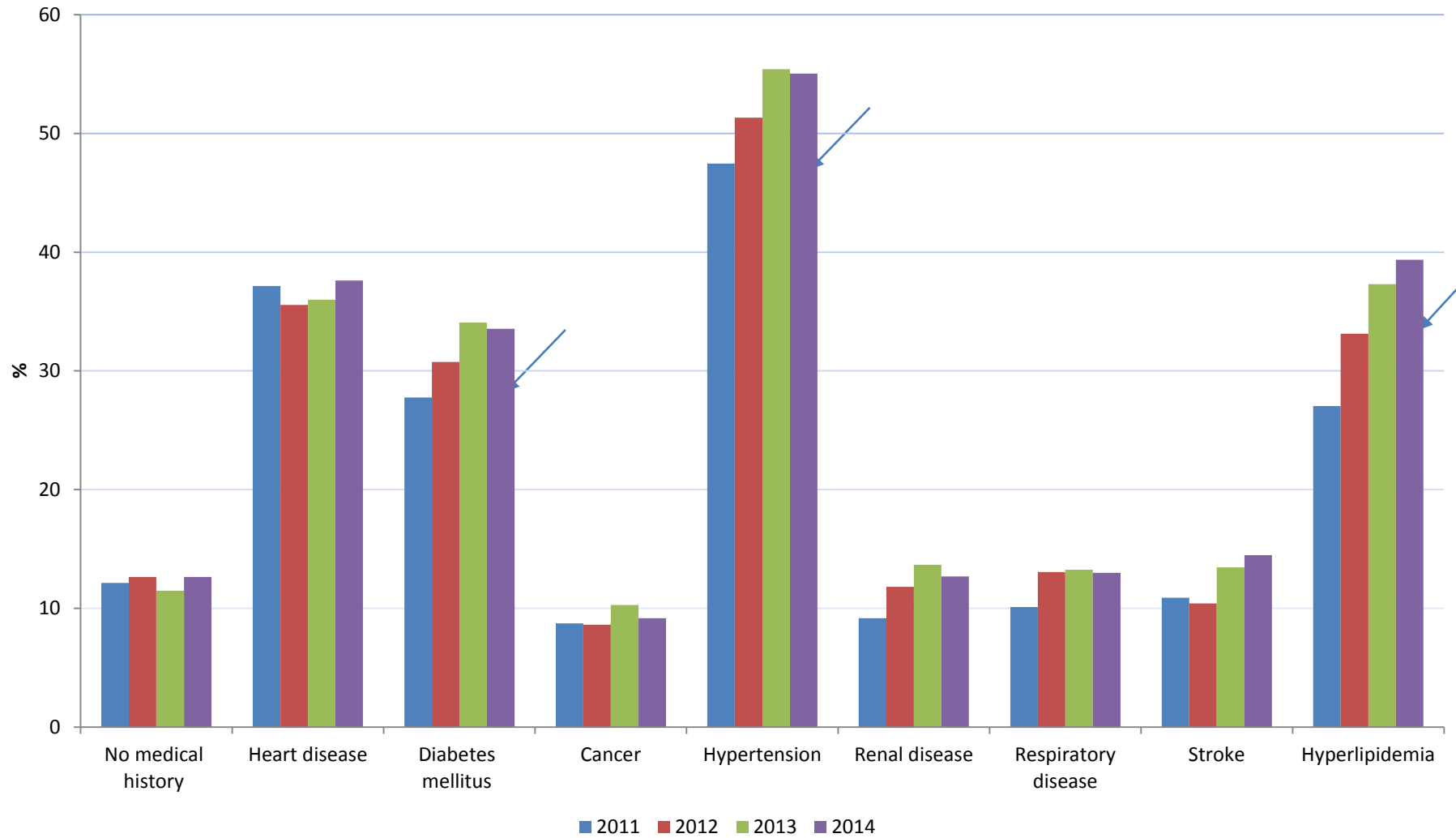


OHCA incidence ,2011-2014



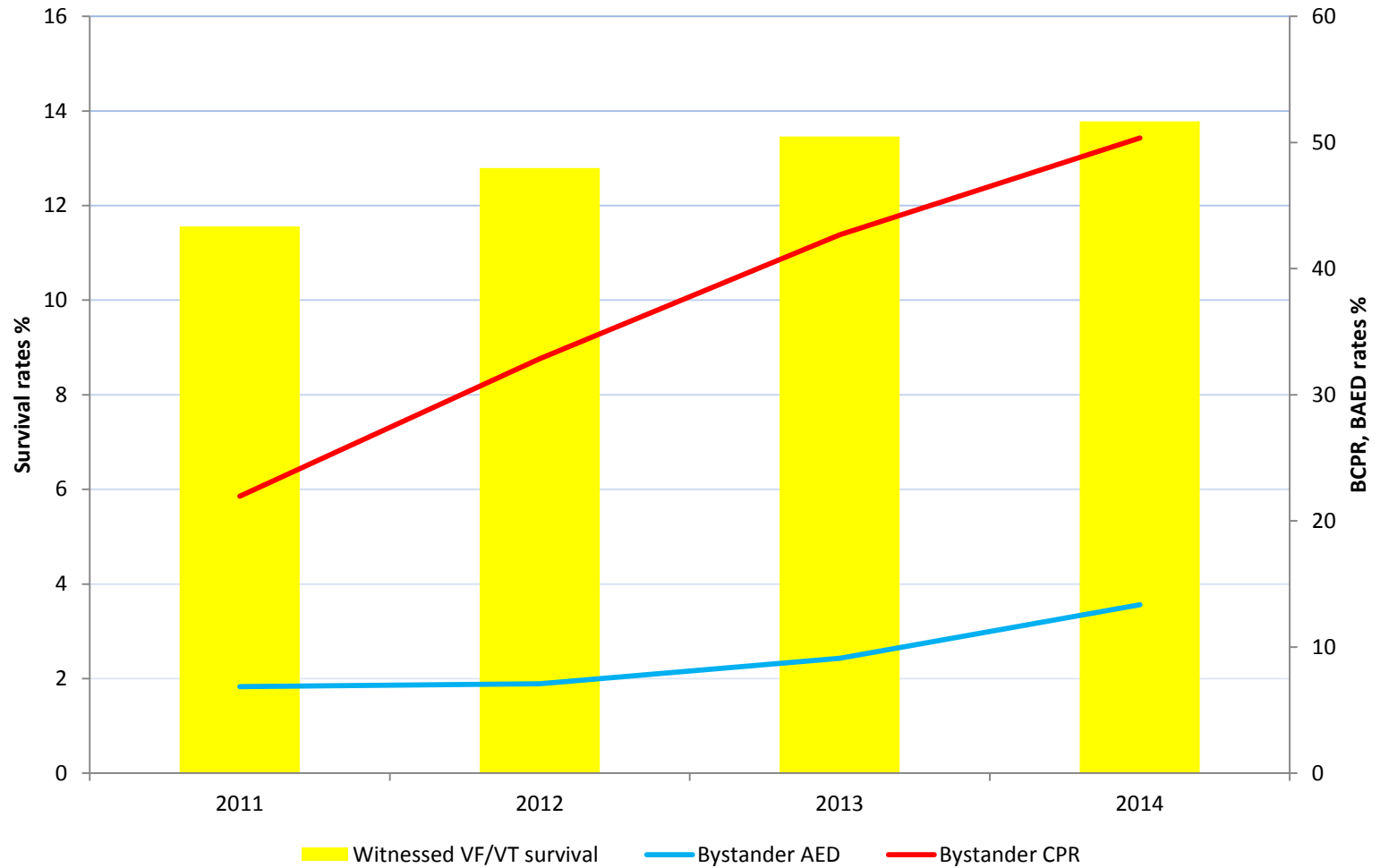


Prevalence of medical history among OHCA by year,2011-2014



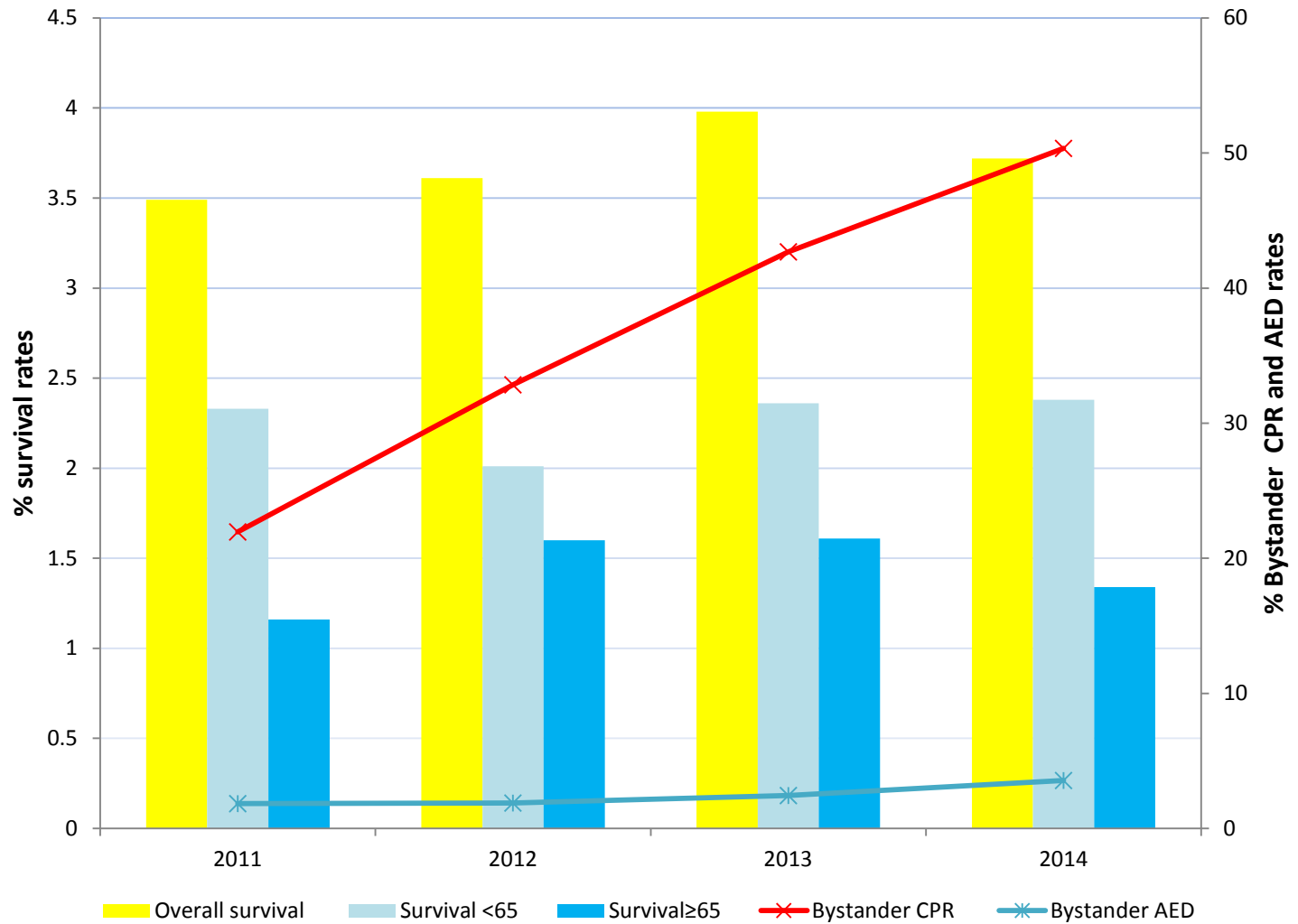


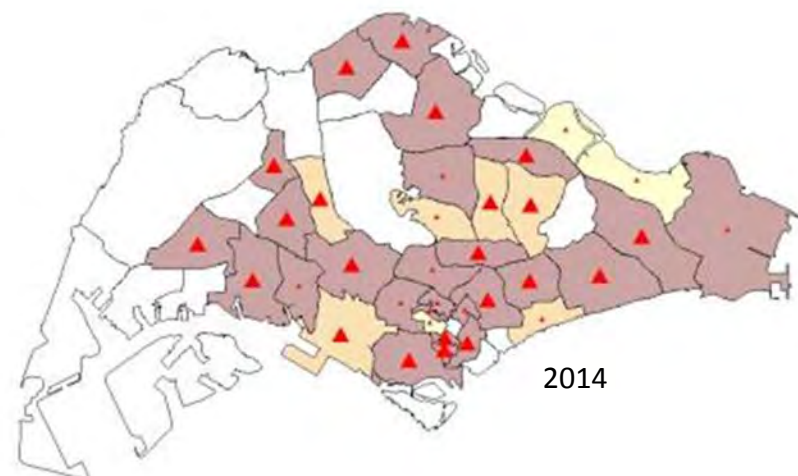
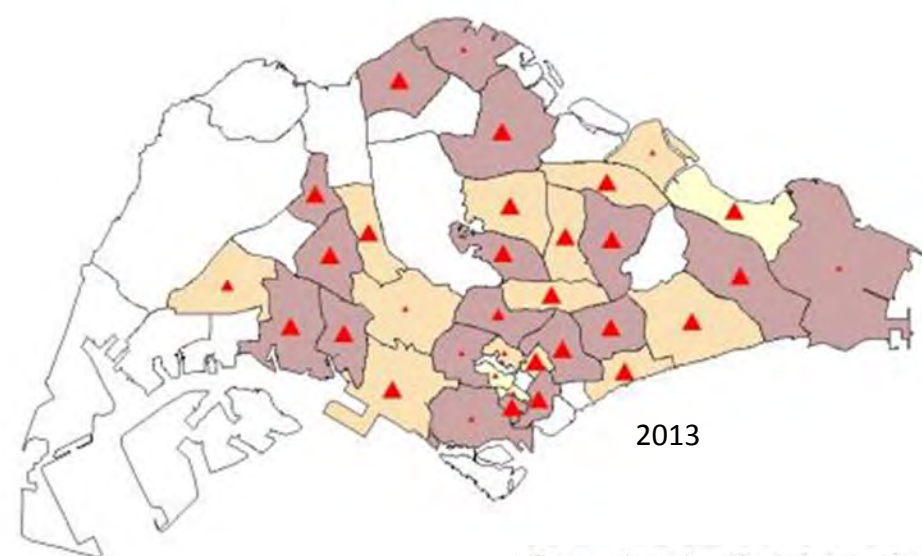
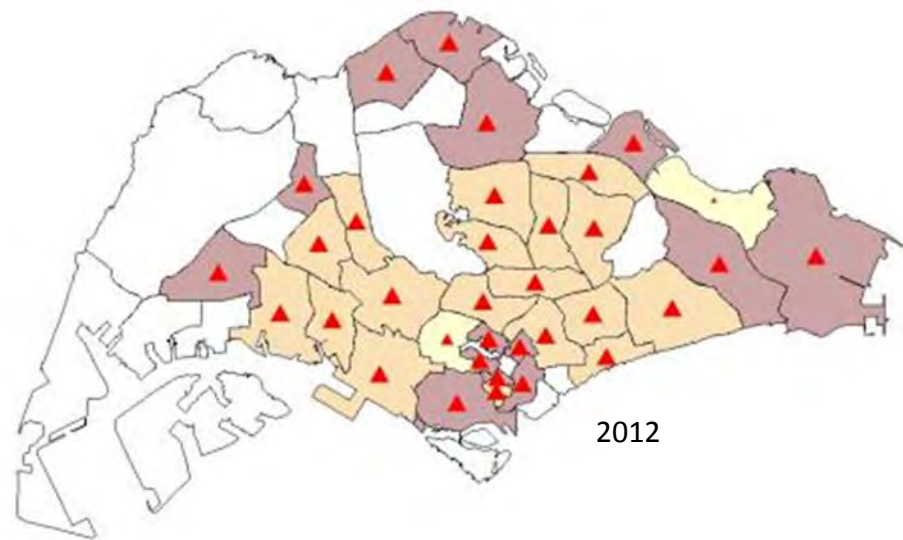
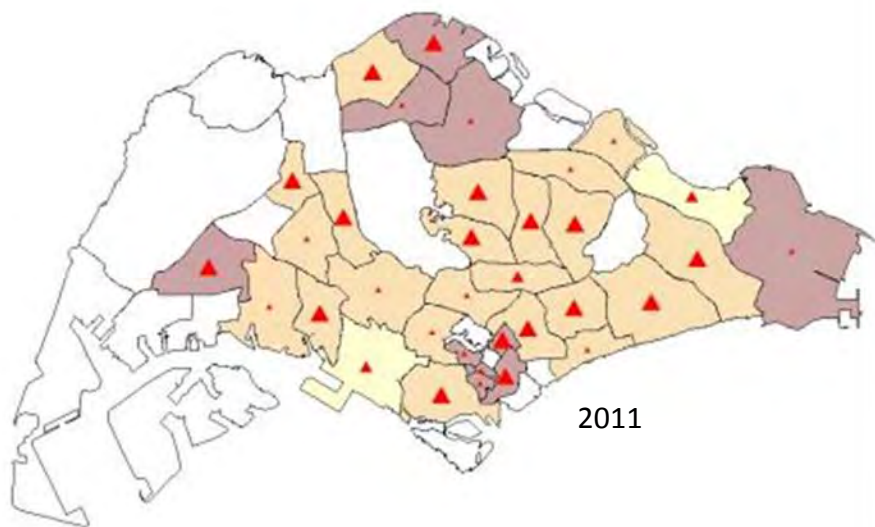
OHCA interventions and witnessed VF/VT survival



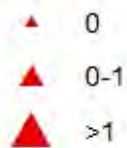


OHCA interventions and survival rates, 2011-2014





Age-standardized survival rates



Age-standardized OHCA incidence rates



It's about impacting the world!



ASIAN EMS
Asian EMS Council

PAROS EXCO MEETING

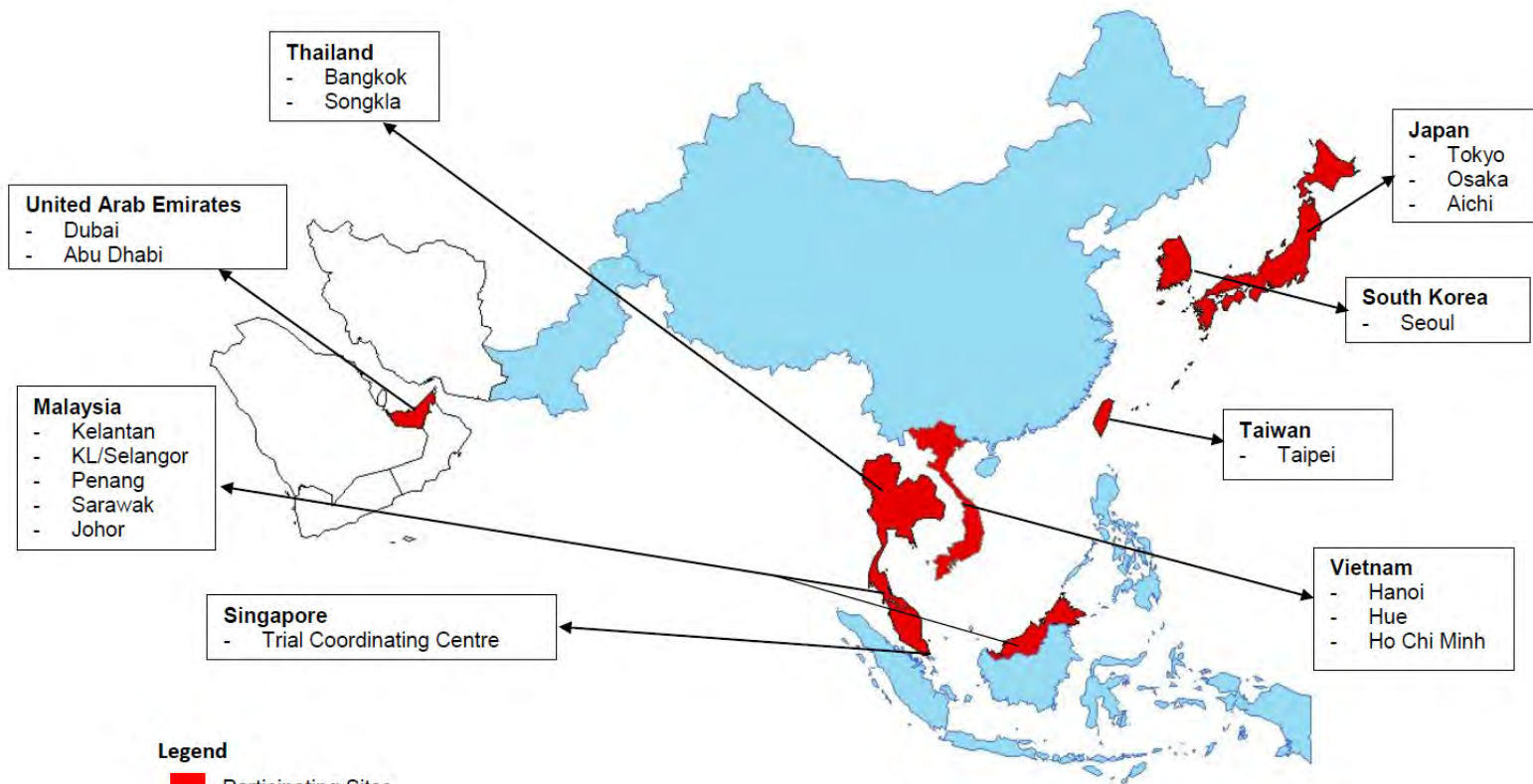
Apr 14th ~ Apr 15th, Songsil Hall

Pan Asian Resuscitation Outcomes Study

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Singapore*



Participating Countries



Legend

■ Participating Sites

Associate Countries:

China (Zhejiang)

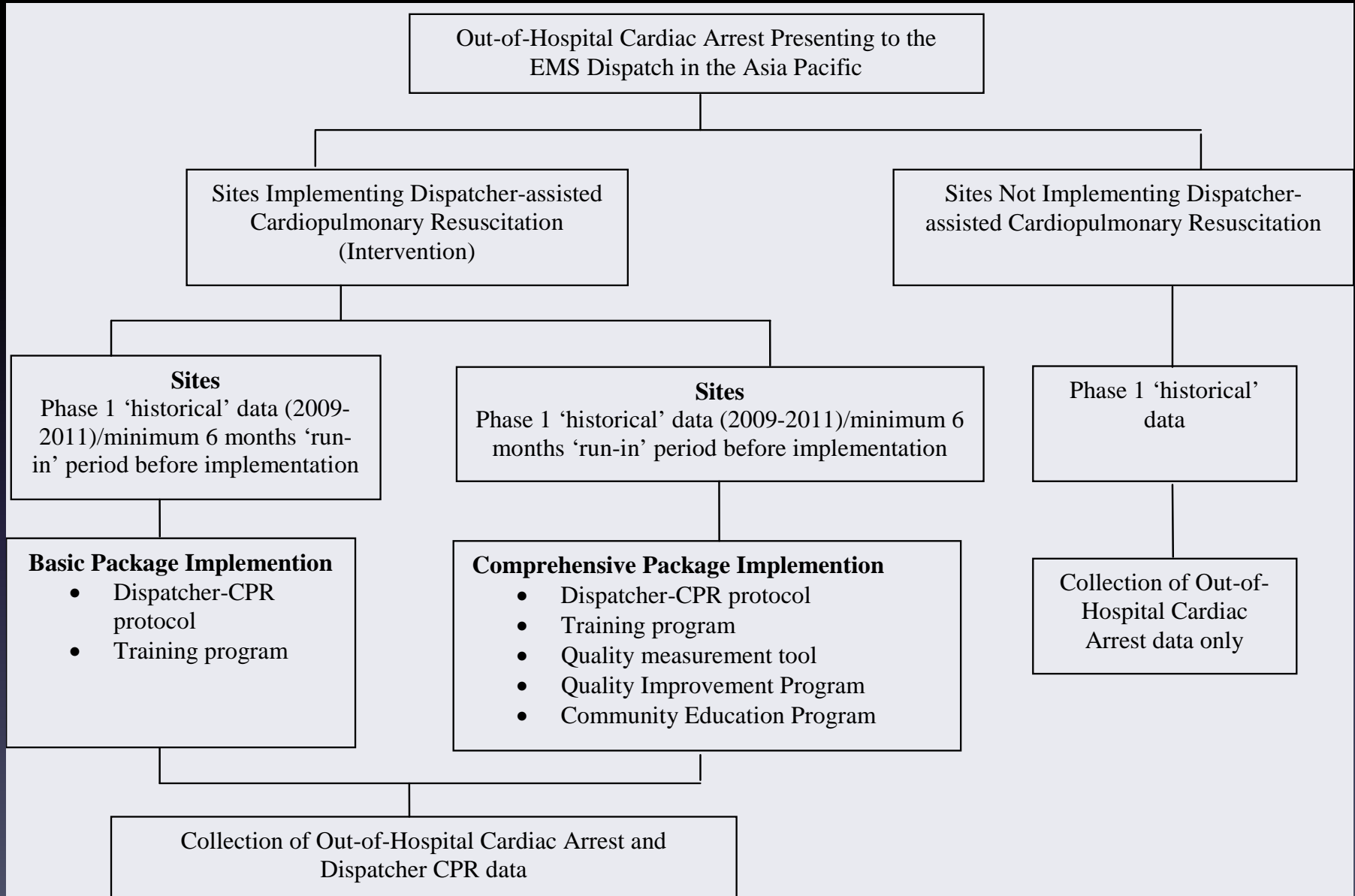
■ Philippines (Manila)

Indonesia (Malang)

Pakistan (Karachi)

New PAROS Applicants: India, Qatar

Pan-Asian Resuscitation Outcomes Study Phase 2



Results - Incidences and Outcomes of OHCA For EMS cases



	Japan (Tokyo, Aichi, Osaka)	Korea (Seoul)	Malaysia (Kuala Lumpur, Kota Bahru, Penang)	Singapore	Thailand (Bangkok, Songkla)	Taiwan (Taipei)	UAE (Dubai)	Overall
Total population coverage	29,582,011	10,249,679	2,760,439	5,076,700	2,576,384	2,650,968	2,003,170	55,899,351
Total number of all cases	51377	7990	389	3023	573	3023	405	66780
Total number of EMS cases	51377	7990	343	2958	299	3023	405	66395
Utstein (Witnessed, VF) (%)								
Total	2199	669	5	321	11	122	46	3373
Incidence rate per 100 000	7	7	0	6	0	5	2	6
EMS ROSC	772 (35.1)	154 (23.4)	0 (0)	36 (11.2)	1 (9.1)	38 (31.1)	6 (13.0)	1007 (29.8)
ED ROSC	Not Available	294 (56.2)	1 (25.0)	98 (30.4)	1 (9.1)	62 (50.8)	9 (19.6)	782/1809 (43.2)
Survived to admission	374/634 (59.0) ¹	290 (43.3)	0 (0)	84 (26.1)	1 (9.1)	23 (18.9)	10 (21.7)	959 (28.4)
Survived to discharged / Alive at 30 th day post arrest	686 (31.2)	206 (30.8)	NIL	37 (11.5)	NIL	23 (18.9)	7 (15.2)	635 (18.8)
Post Arrest CPC 1/2	463 (21.1)	122 (18.2)	NA	23 (7.1)	NA	20 (16.4)	7 (15.2)	636 (18.9)

¹ Data not available from Tokyo and Aichi

Multivariate Analysis of Factors Important for Survival (PAROS)

Variables	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Bystander CPR	1.9 (1.3 - 2.8)	1.1 (0.7 - 1.9)
Bystander AED	5.0 (2.1 - 11.9)	4.0 (1.3 - 11.7)
Response time 8 min or less	1.8 (1.3 - 2.6)	1.3 (0.8 - 2)
Ambulance defibrillation	5.9 (3.9 - 9.0)	1.2 (0.4 - 3.6)
Mechanical CPR by EMS	1.3 (0.7 - 2.5)	1.5 (0.7 - 3.2)
Pre-hospital Advanced Airway	1.0 (0.7 - 1.4)	0.2 (0.1 - 0.3)
Epinephrine	0.5 (0.3 - 0.8)	0.5 (0.3 - 0.9)
Hypothermia	19 (8.5 - 42.4)	27 (10.0 - 72.8)

AHA ReSS International Group Collaboration to Advance Resuscitation Science Award 2014



Collaborators from Malaysia, Taiwan, Korea, and Japan attending the award ceremony



#Kanglinch5

Saya tanya awak mahu makan kek?
我问你要不要吃蛋糕