



SINGAPORE OUT-OF-HOSPITAL CARDIAC ARREST DATA REPORT (2011-2016)

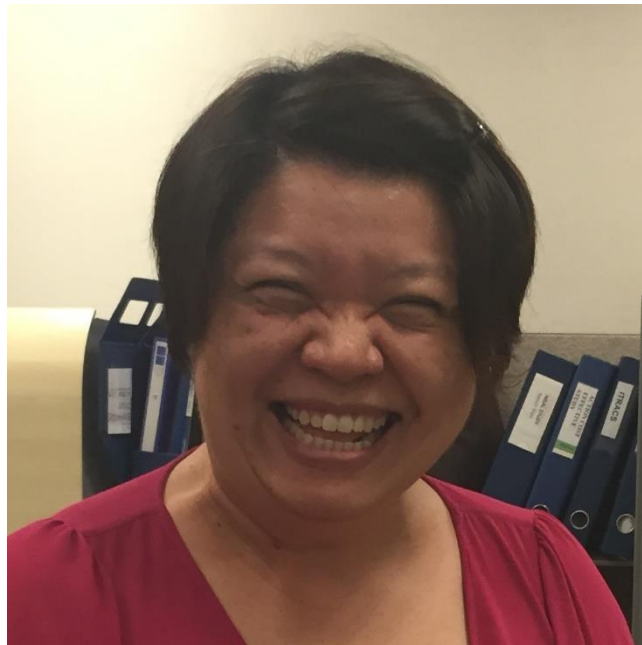


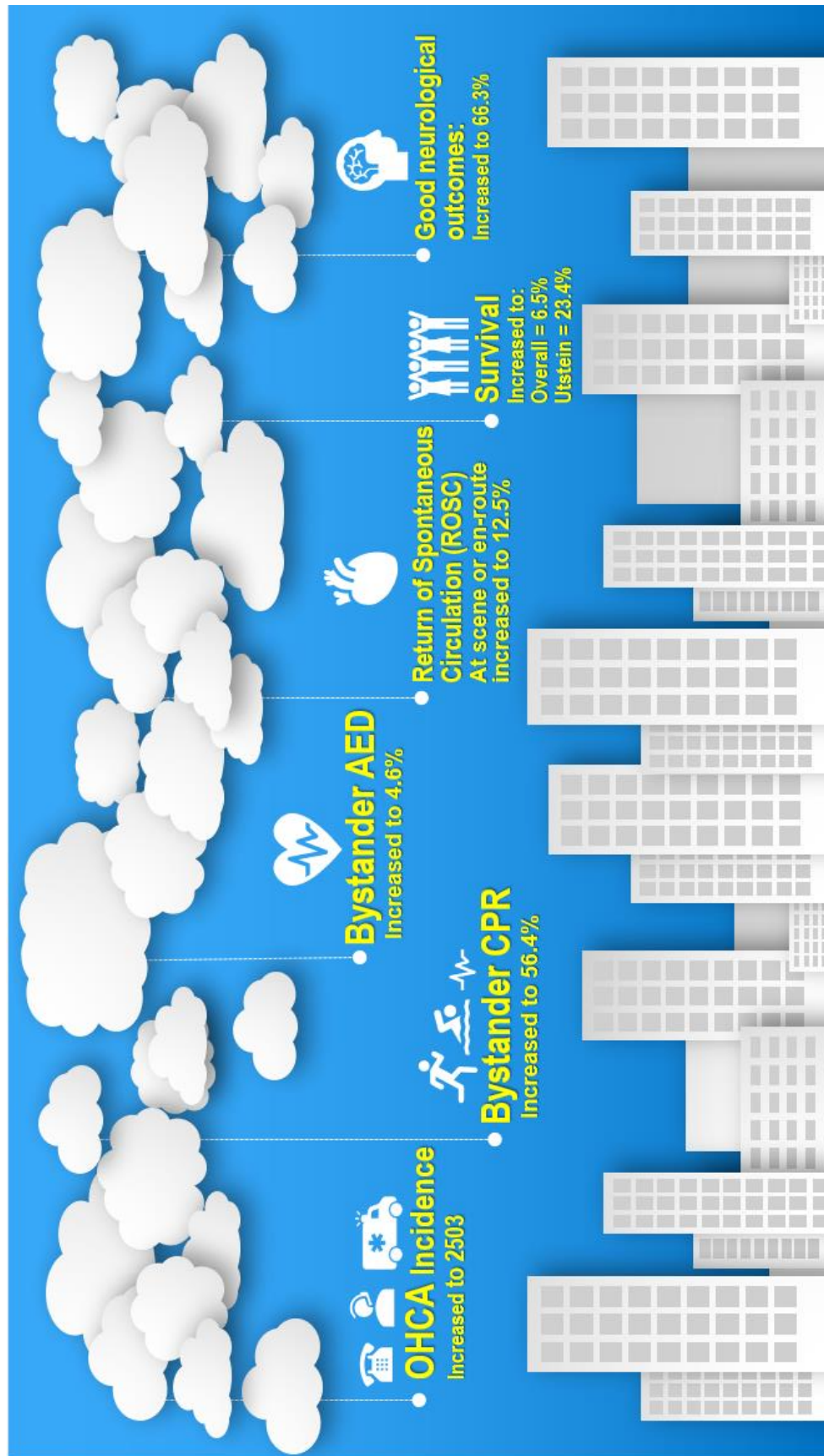
Dedicated to the loving memory of our beloved colleague

Ms Susan Yap



**Gone too soon, but she left a legacy of
professional excellence and lives saved.**





Out-of-hospital Cardiac Arrest: 2016 data



2,503

Out-of-hospital cardiac arrest cases in 2016

What you should know...

Bystander CPR



CPR requires only your hands and the will. Call 995 and dispatcher will coach you.

Bystander AED



Early use of an AED could increase survival by 3 times

DA-CPR involved (SCDF cases only)



SCDF Dispatchers help callers with CPR over the phone. Call 995 in an emergency.

Home/residence



OHCA occurs mostly in residential areas and in homes

Utstein survival



Utstein cases are those where resuscitation was possible.

Survival



Of all 2503 cases, percent that survived to 30 days or hospital discharge.



Executive Summary

One year has passed since our first report¹. In this second report, we added 2016 data along with new measures we will be monitoring. Also, instead of layered graphs, we have simplified them. Therefore, the number of graphs and pages have increased. Highlights for this reporting are:

- In 2016, the number of out-of-hospital cardiac arrests (OHCA) increased to **2503**, up from 2374 in 2015. This increase is possibly due to the growing proportion of the elderly population in Singapore. Age is one risk factor for cardiac arrest.
- The bystander CPR rate increased to **56.4%** in 2016, up from 54.1% in 2015.
- Bystander use of an Automated External Defibrillators (AED) in 2016 increased slightly to **4.6%**, from 4.1%. As of March 2019, 4,842 AEDs have been installed through SCDF's Save-a-life initiative. SCDF is on track to finish installing 5,000 AEDs to provide coverage for 10,000 HDB blocks. Bystander AED use is a critical indicator to watch because early application of AEDs can more than double the survival rate.²
- In 2016, the Return of Spontaneous Circulation (ROSC) at scene/en-route rate increased to **12.5%**, up from 8.8% in 2015. ROSC is another important process indicator we monitor. It is a sign that prehospital resuscitative efforts are trending in the right direction. However, ROSC may not necessarily translate into survival unless it is followed up by well-coordinated emergency department and ICU care.
- The overall OHCA survival-to-discharge rate increased to **6.5%**, compared to 5.3% in 2015.
- The **Utstein** survival rate is a sub-group of the survival measure. It allows the comparison of non-trauma cardiac arrest survival by using a standardised subset of cases which were witnessed to have collapsed from a medical cause with an initial shockable rhythm. Such cases

¹ White AE, Wah W, Ong MEH. 2011-2015 Singapore Out-of-Hospital Cardiac Arrest Registry Report. September 2017. Republic of Singapore. Unit for Prehospital Emergency Care. 2017.


² Holmberg MJ, Vognsen M, Andersen MS, Donnino MW, Andersen LW. Bystander automated external defibrillator use and clinical outcomes after out-of-hospital cardiac arrest: A systematic review and meta-analysis. Resuscitation. 2017 Nov 1;120:77-87.

have a clearly defined onset of disease and the quality of EMS systems directly influences the outcomes of such patients. We use it to monitor how well our overall efforts are to improve the entire chain-of-survival. Reported Utstein survival rates will be a higher percentage than the reported overall survival rates.

- Utstein survival was **23.4%** in 2016, up from 21.3% in 2015.
- Of those patients who survived OHCA in 2016, **66.3%** did so with good-to-moderate neurological outcomes. This is up from 62.1% in 2015. Survival-to-discharge with good-to-moderate neurological functioning is the gold standard measure of survival.

On many of the key indicators, we are making steady progress. This progress must be sustained in the face of an increasing number of OHCA cases in residential areas of Singapore.

Sincerely,



Prof. Marcus E.H. Ong



Alexander E. White, JD, MPH; Pek Pin Pin, MPH; Nur Shahidah Binte Ahmad, Dr. Ng Yih Yng, Prof Marcus Ong Eng Hock, MBBS, FRCS (A&E), MPH, and
Ms. Susan Yap

ACKNOWLEDGEMENTS

OHCA data collection was supported by National Medical Research Council Singapore Clinician Scientist Award grants.

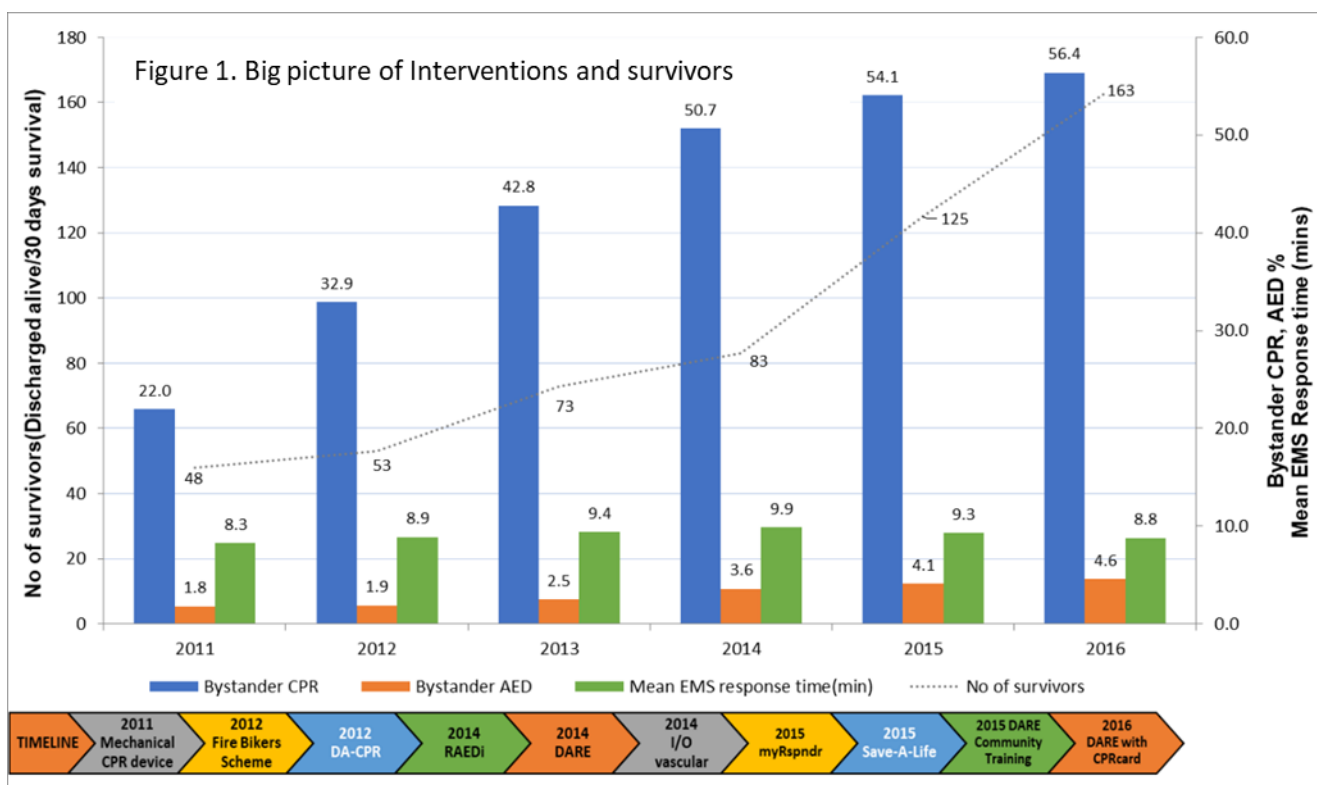
The authors would like to thank the following for data contribution:

Singapore Civil Defence Force	LTC (Dr) Shalini Arulanandam MAJ Joey Tay Ai Meng WO2 Doris Low Lian Tien WO2 Mohamed Zohri Bin Anwar WO2 Siti Zarinah Binte Sarip SSN Winston Teo Kok Liang SSN Geraldine Goh Shu Yi Ms Marie Ng
National University Hospital	Dr Benjamin Leong Sieu-Hon
Changi General Hospital	Dr Gan Han Nee Dr Tiah Ling
Tan Tock Seng Hospital	Dr Michael Chia Yih Chong
Singapore General Hospital	Prof Marcus Ong Eng Hock Dr Nausheen Edwin Doctor
Khoo Teck Puat Hospital	Dr Desmond Mao Renhao Dr Goh E Shaun
Ng Teng Fong General Hospital	Dr Cheah Si Oon Adj Asst Prof Rabind Antony Charles
KK Women and Children Hospital	A/Prof (Adj) Tham Lai Peng

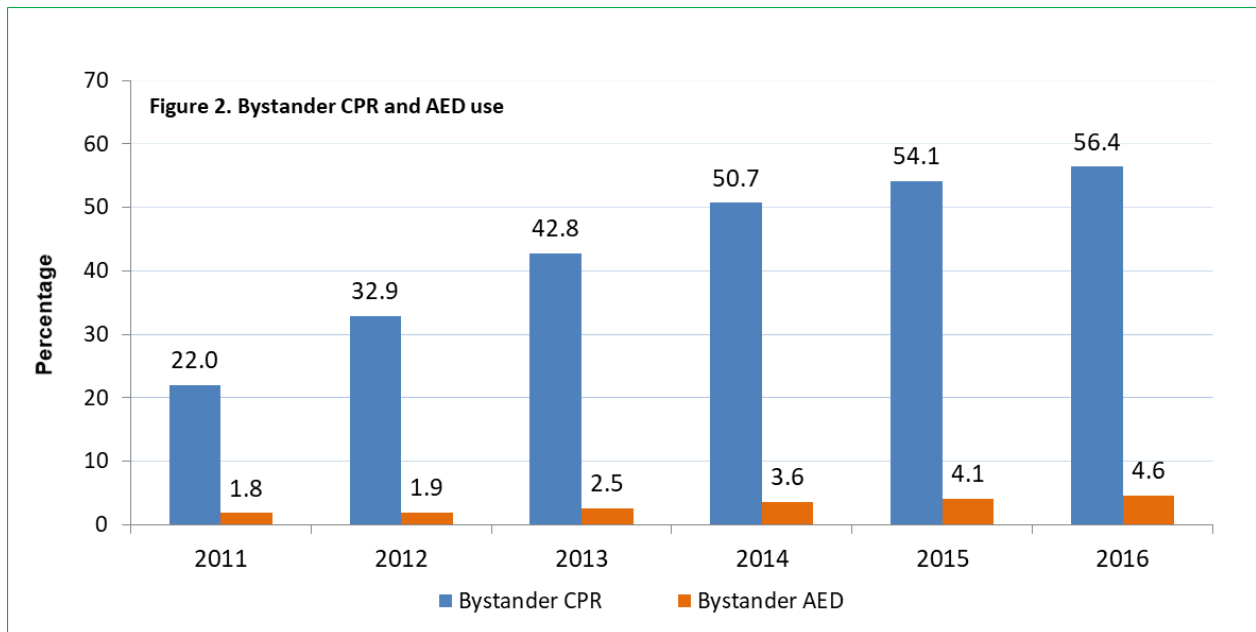
Suggested citation: White AE, Pek PP, Nur Shahidah, Ng YY, Ong MEH, Yap S. *Singapore Out-of-Hospital Cardiac Arrest Registry Report 2011-2016*. May 2019. Republic of Singapore. Unit for Prehospital Emergency Care. 2019.

“This progress must be sustained in the face of an increasing number of OHCA cases in residential areas”

The Big Picture – fruit of sustained, collective efforts

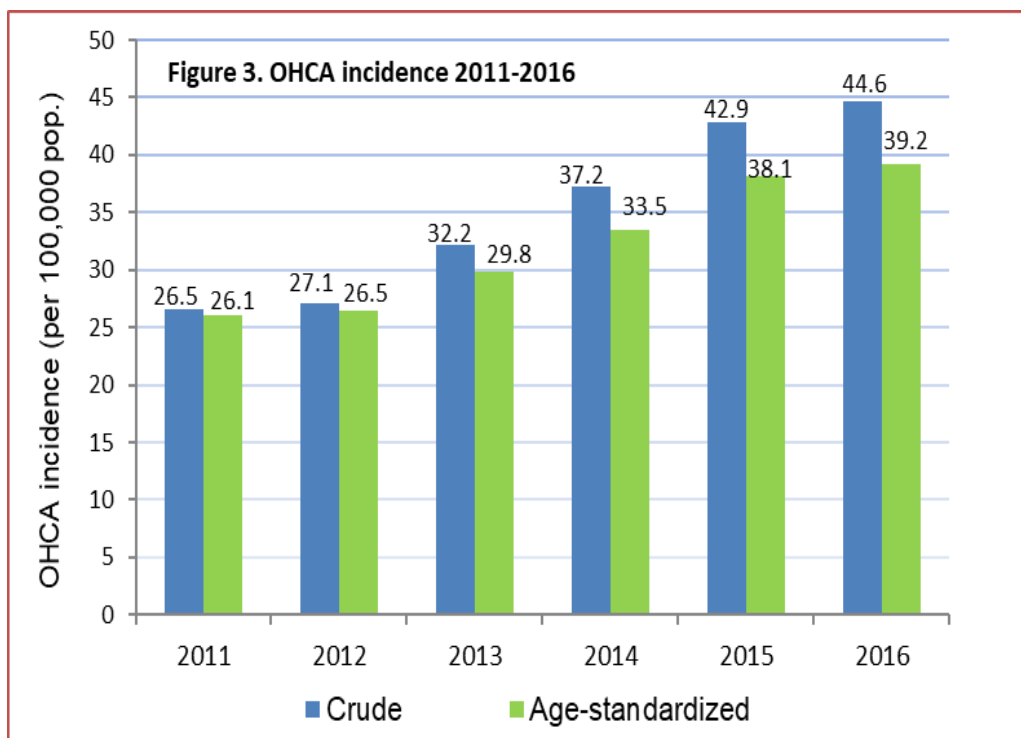


Bystander CPR and AED use



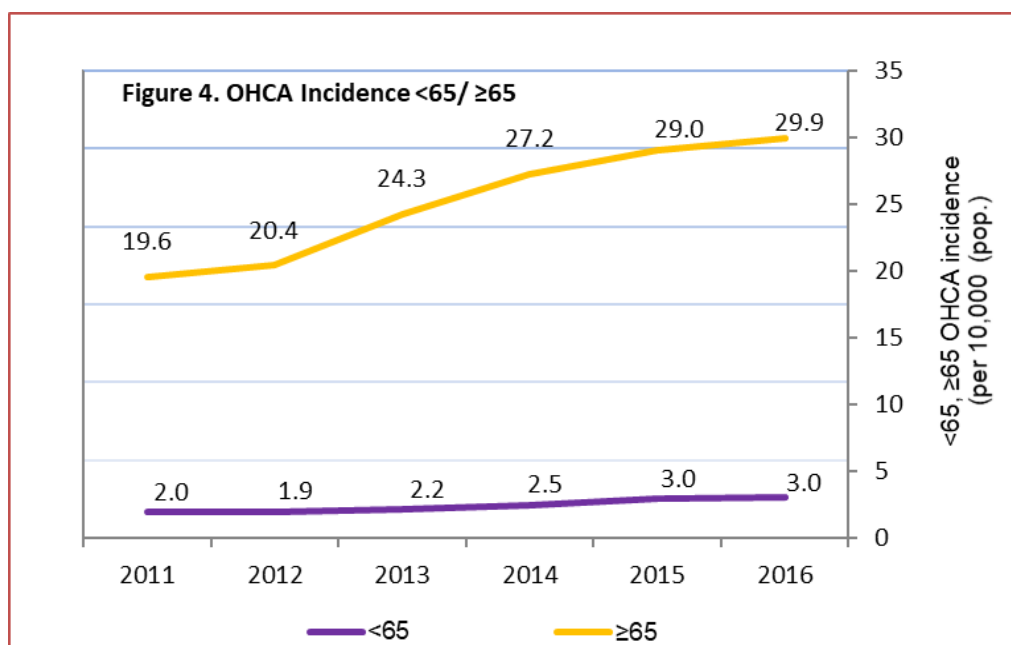
- Bystander CPR rate increased to **56.4%** in 2016, up from 54.1% in 2015.
- Automated External Defibrillators (AED) use (applied) in 2016 increased slightly to **4.6%**, from 4.1%.
- Expect to see a meaningful increase as subsequent years will include uses of AEDs newly installed in residential areas through SCDF's Save-a-life programme, which was launched in 2015.
- Collective efforts have resulted in **163 survivors** in 2016 up from 125 in 2015.

Incidence rates of OHCA



- Crude incidence rate increased to **44.6 per 100,000 pop.** up from 42.9 in 2015.

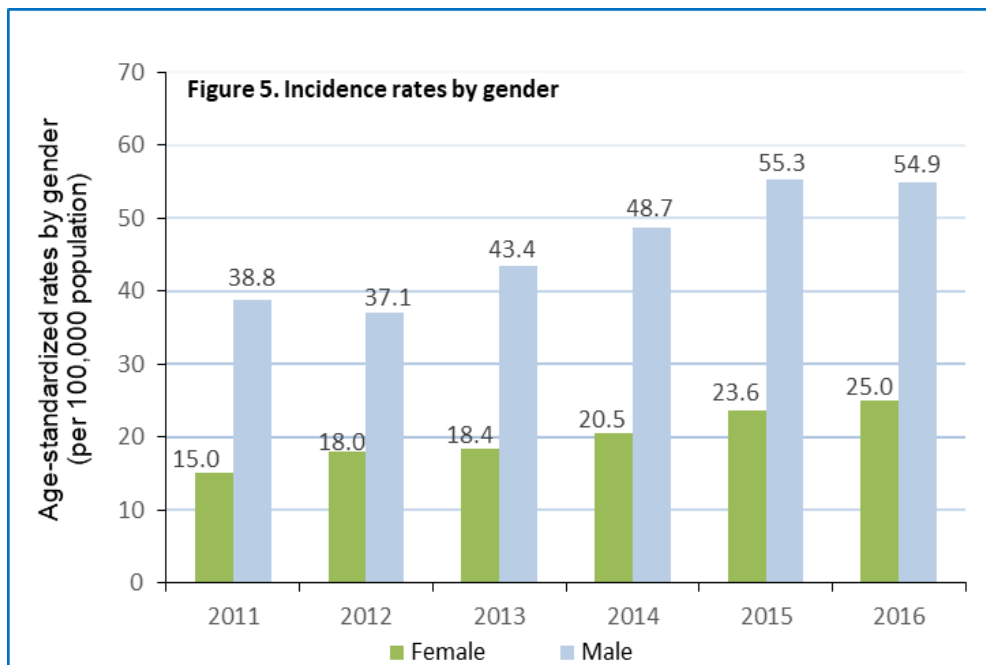
- The age-standardised rate, which allows for comparisons with other locales, increased to **39.2 per 100,000**, up from 38.1 per 100,000 in 2015.



- The incidence rate among those aged 64 years or younger remained level at **3.0 per 100,000**.

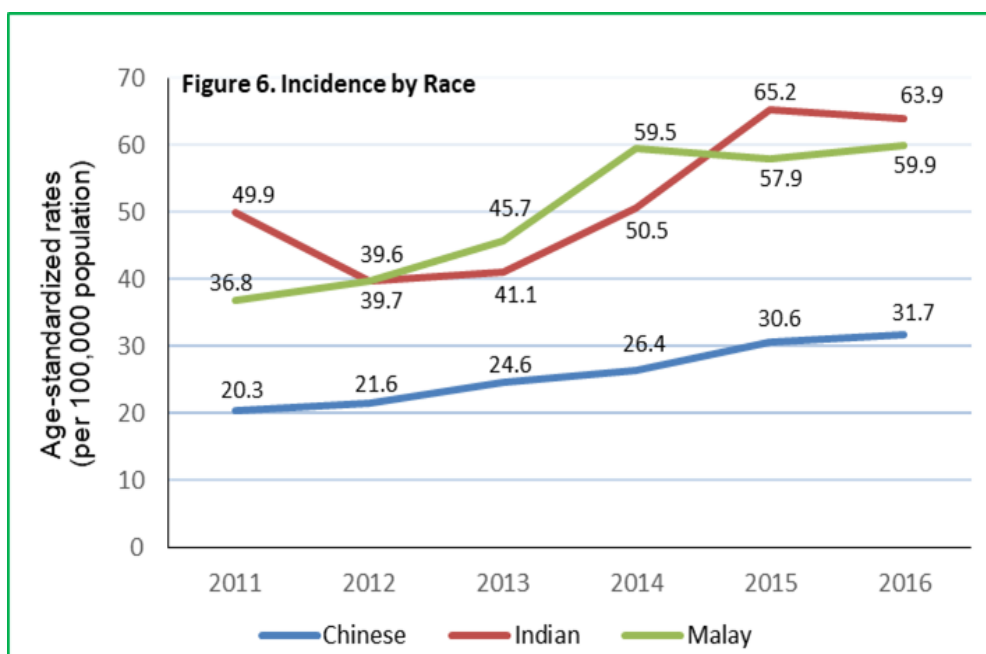
- For those aged 65 and older, the rate remained steady at **29.9 per 100,000** compared to 29 per 100,00 in 2015.

Incidence rates by gender and race



- Incidence rate among females increased to **25 per 100,000** in 2016, up from 23.6 per 100,000 in 2015.

- Incidence among males remained steady at **54.9 per 100,000**, slightly lower than 55.3 in 2015.



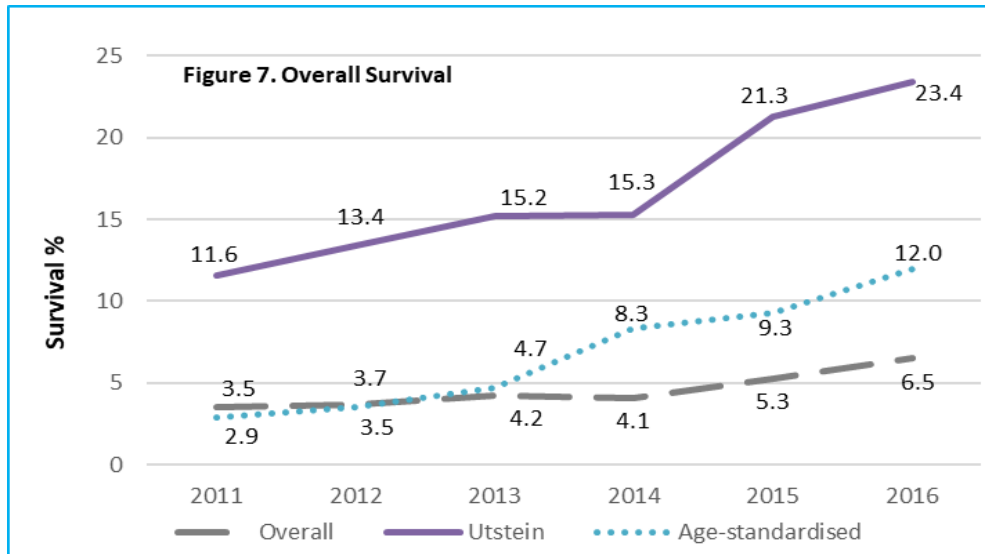
- Chinese increased slightly to **31.7 per 100,000** from 30.6 in 2015.

- Indians dropped to **63.9 per 100,000** from 65.2 in 2015.

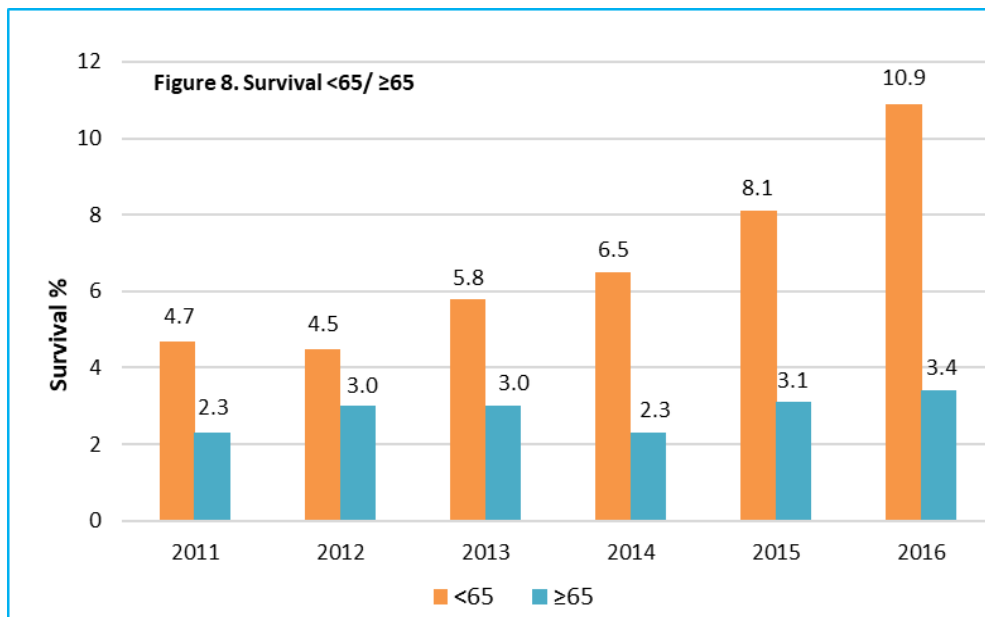
- Malays increased to **59.9 per 100,000** up from 57.9 in 2015.

Survival rates: Overall, Utstein, age-standardised, and those aged </≥65 years

Utstein rates are derived from a reporting template for OHCA cases that were witnessed, had a shockable heart rhythm, and were caused by a heart problem; not trauma. These are the cases where resuscitation efforts (CPR+AED) have the highest success rates. As a sub-group of the overall OHCA cases, Utstein survival rates are larger than overall survival rates.

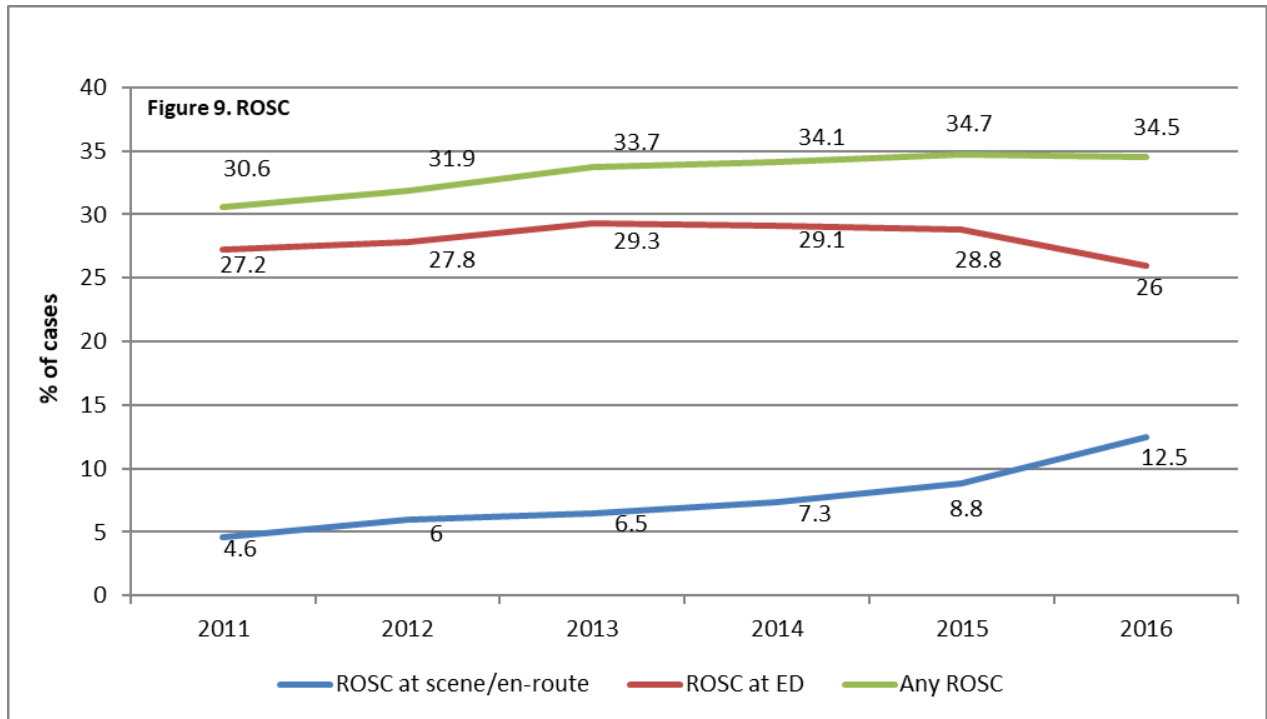


- Overall survival increased to **6.5%** in 2016, up from 5.3% in 2015.
- Utstein survival increased to **23.4%** from 21.3% in 2015.



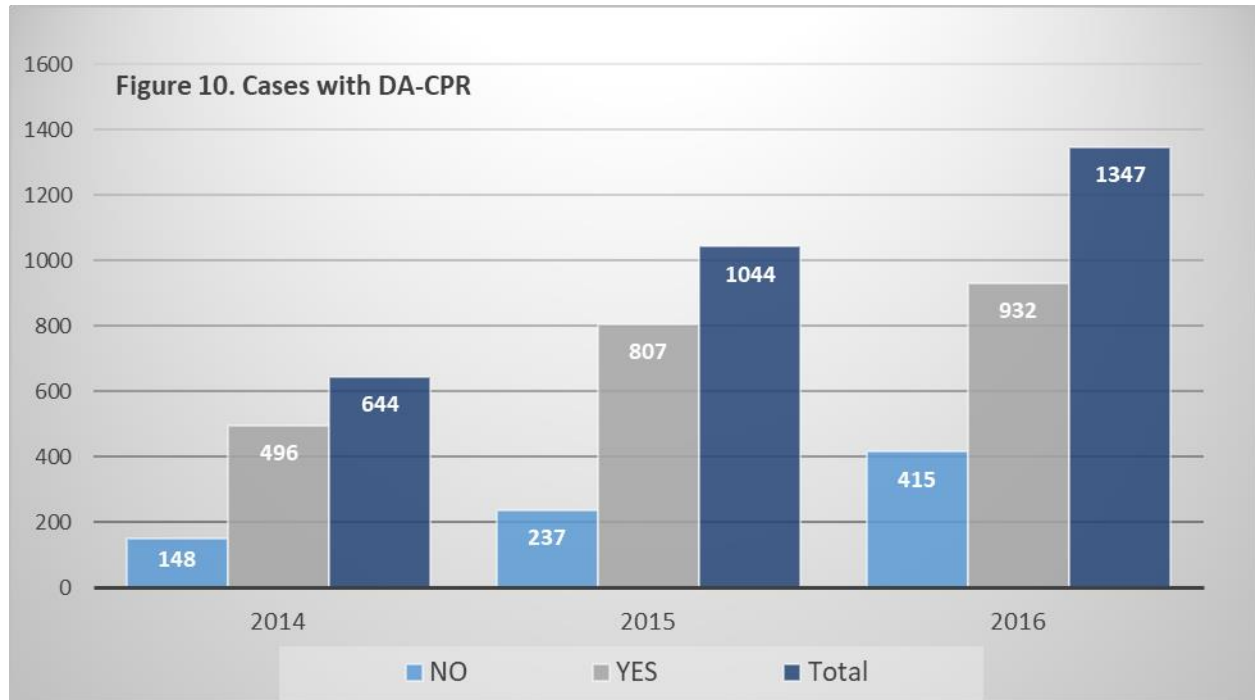
- Survival among those younger than 65 increased to **10.9%** in 2016, from 8.1% in 2015.
- Among those aged 65 or older, rates remained steady at **3.4%** in 2016, compared to 3.1% in 2015.

Return of spontaneous circulation (ROSC)



- ROSC achieved at scene or en route to hospital increased to **12.5%** from 8.8% in 2015.
- ROSC achieved in the emergency department dipped to **26.0%**, from 28.8%.
- The rate of ROSC achieved at any point was steady at **34.5%**, compared to 34.7% in 2015.

Cases involving Dispatcher-assisted CPR (*Eligible cases only)



* Excluded cases are mostly SCDF-witnessed collapses; also excluded non-EMS cases (patient came in by other means of transport, e.g., private ambulance, private transport, public transport).

- The Singapore's DA-CPR protocol was implemented in 2012.
- The chart shows the number of included cases where no DA-CPR was performed, where DA-CPR was performed, and total eligible cases.
- In 2016, 932 (**69%**) cases out of 1347 involved DA-CPR.
- 2015 had a higher rate of 77% of eligible cases involving DA-CPR (807 of 1044 eligible cases) in part because there was a lower number of eligible cases.
- Singapore researchers investigated the reasons why DA-CPR had not been done.³ DA-CPR would not be done if callers could not move the patient;

³ Ho AF, Sim ZJ, Shahidah N, Hao Y, Ng YY, Leong BS, Zarinah S, Teo WK, Goh GS, Jaafar H, Ong ME. Barriers to dispatcher-assisted cardiopulmonary resuscitation in Singapore. *Resuscitation*. 2016 Aug 1;105:149-55.

refused to start CPR; or SCDF arrived before instructions began. Other reasons include caller declined instructions (because they already knew how to do CPR); left or hung up the phone before instructions could be given; no one answered upon call back; caller was too distraught; there was a change in patient status; caller was not with patient; or patient was cold and hard.

Singapore Check List

Ten steps for improving OHCA survival

	Steps	Yes	In-progress	No
1.	Establish a Cardiac Arrest Registry	✓		
2.	Implement Dispatcher-Assisted CPR	✓		
3.	Implement High Performance CPR	✓		
4.	Implement Rapid Dispatch	✓		
5.	Voice record all attempted resuscitations	✓		
6.	First responder defibrillation		✓	
7.	Public Access Defibrillation	✓		
8.	Funding and Support for Training and QI	✓		
9.	Hypothermia in all receiving hospitals		✓	
10.	Culture of excellence (e.g., CQI)		✓	

OHCA Characteristics and Outcomes

	2011 n=1376	2012 n=1440	2013 n=1736	2014 n=2037	2015 n=2374	2016 n=2503
Age, Mean (Median)	63.5 (65)	64.1 (66)	65.9 (65.9)	65.9 (68)	65.6 (67)	66.0 (69)
Gender (%)						
Female	442 (32.1)	528 (36.7)	605 (34.9)	721 (35.4)	826 (34.8)	912 (36.4)
Male	934 (67.9)	912 (63.3)	1131 (65.2)	1316 (64.6)	1548 (65.2)	1591 (63.6)
Location Type (%)						
Home Residence	985 (71.6)	988 (68.6)	1245 (71.7)	1481 (72.7)	1656 (69.8)	1837 (73.4)
Nursing Home	54 (3.9)	54 (3.8)	58 (3.3)	72 (3.5)	83 (3.5)	92 (3.7)
Public setting	337 (24.4)	398 (27.8)	433 (25)	484 (23.8)	635 (26.8)	574 (22.9)
Bystander Intervention (%)						
Bystander CPR	302 (22)	473 (32.9)	743 (42.8)	1032 (50.7)	1284 (54.1)	1411 (56.4)
Bystander AED	25 (1.8)	27 (1.9)	43 (2.5)	73 (3.6)	97 (4.1)	115 (4.6)
Arrest witnessed by (%)						
Bystander - Family	480 (34.9)	414 (28.8)	526 (30.3)	729 (35.8)	809 (34.1)	779 (31.1)
Bystander - Healthcare professional	65 (4.7)	69 (4.8)	70 (4)	79 (3.9)	113 (4.8)	110 (4.4)
Bystander - Lay Person	229 (16.6)	232 (16.1)	284 (16.4)	275 (13.5)	350 (14.7)	377 (15.1)
EMS/Private ambulance	112 (8.1)	122 (8.5)	139 (8)	154 (7.6)	217 (9.1)	252 (10.1)
Not witnessed	490 (35.6)	603 (41.9)	717 (41.3)	800 (39.3)	885 (37.3)	985 (39.4)
Initial rhythm (%)						
Shockable rhythm	251 (18.4)	280 (19.7)	304 (17.8)	347 (17.4)	378 (16.3)	435 (17.7)
Non-shockable rhythm	1113 (81.6)	1144 (80.3)	1405 (82.2)	1651 (82.6)	1943 (83.7)	2021 (82.3)
Outcomes (%)						
ROSC at scene	63 (4.6)	86 (6.0)	113 (6.5)	148 (7.3)	208 (8.8)	312 (12.5)
ROSC at ED	374 (27.2)	400 (27.8)	509 (29.3)	593 (29.1)	684 (28.8)	650 (26.0)
Survival to admission	251 (18.2)	249 (17.3)	303 (17.5)	358 (17.6)	453 (19.1)	497 (19.9)
Survival to discharge	48 (3.5)	53 (3.7)	73 (4.2)	83 (4.1)	125 (5.3)	163 (6.5)
Good-to-moderate neurological function(Overall)	25 (1.82)	33 (2.29)	36 (2.07)	63 (3.09)	77 (3.24)	108 (4.3)
Good-to-moderate neurological function(Survived-to-discharge)	25 (52.1)	33 (63.5)	36 (49.3)	63 (75.9)	77 (62.1) *	108 (66.3)
Utstein survival	20 (11.6)	23 (13.4)	32 (15.2)	35 (15.3)	51 (21.3)	68 (23.4)
Missing hospital outcomes	0 (0)	0 (0)	0 (0)	1 (0.1)	1 (0.04)	1 (0.04)

*Calculation based on the 124 for which we had complete data.



For more information or for data requests:

Email: alexander.elgin.white@upec.sg | Phone: 6576-2636

Research and Policy group. Unit for Pre-hospital Emergency Care

May 2019