Singapore's Out-of-Hospital Cardiac Arrest Data Report (2011-2021)

UNIT FOR PRE-HOSPITAL EMERGENCY CARE
UPEC
SINGAPORE

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Executive Summary

In this sixth report of yearly out-of-hospital cardiac arrest (OHCA) data we present 11 years' worth of OHCA case burden, response rates, and outcomes. Several goals in the prehospital environment have been achieved and we have made remarkable progress over the last decade. Nevertheless, we anticipate many challenges ahead of us that need to be overcome such as increasing Automated External Defibrillators (AED) utilisation beyond 20%. In this edition of the report, we have included AED-data maps to provide a bit more resolution on location of our AED use cases, and districts in which successful resuscitations occurred. Seeing this mapped data and knowing what Singaporeans are capable of, I challenge us all to work with community partners to enhance our preparedness and set the stage for greater use of AEDs which are an essential response to OHCA. Anyone can learn to use an AED, and our partners at SCDF have embarked on an ambitious task over the years to install these devices nearby where you live.

The 2021 data reflects what responding to OHCA cases was like during the COVID-19 pandemic in Singapore. I am inspired by the fact that our response numbers during that period did not fall drastically. During this period, we were anticipating the negative effect of the pandemic on our community's response to OHCA. However, we have seen an encouraging resilience and a bounce back. Highlights for this reporting period include:

- In 2021, the number of out-of-hospital cardiac arrests (OHCA) increased from 3432 in 2020 to **3637**. This increase is due to the growing proportion of the elderly population in Singapore. Age is a major risk factor for cardiac arrest.

- The bystander cardiopulmonary resuscitation (CPR) rates increased from 56.2**%** in 2020 to **59.4%** in 2021.

- AEDs applied/used rates rose slightly from 8.5% in 2020 to **9.5%** in 2021. We suspect that this slight tick upwards could be the beginning of an anticipated bouncing back from measures taken during the COVID-19 response (including momentary pausing of the community alert app) which brought down the AED use rate. As before, the Bystander AED

use rate is a critical indicator to watch because early use of AEDs can more than double the survival rate.[1]

- In 2021, the Return of Spontaneous Circulation (ROSC) at scene/*en route* rate decreased to **8.5%** from 9.8% in 2020 marking 3 years of decreasing rates. ROSC is another important indicator to monitor because it is an initial, but unstable, state of recovery.

- The overall number of people who survived-to-discharge in 2021 was **140** compared to 149 in 2020. Also, the overall OHCA survival-to-discharge rate decreased to **3.8%** in 2021 from 4.3% in 2020.

- Utstein survival fell to **19.9%** in 2021, down from 22.2% in 2020. The Utstein survival rate is an internationally accepted benchmark measure. We use it to monitor how well we are doing with our overall efforts to improve the entire chain-of-survival.

- Of those patients who survived an OHCA in 2021, **79.3%** did so with good-to-moderate neurological function compared to 73.8% in 2020. Survival-to-discharge with good-to-moderate neurological functioning is the gold standard for OHCA survival. While our survival rates are dipping, those who are surviving, survive well.

Training the public in CPR and AED use remains a priority to move the important progress indicators in the right direction. The public should remain aware that **79.5%** of cardiac arrests occurred in the home. Generally, these cases are often witnessed by a family member in the same household who will have the earliest opportunity to respond. With AEDs increasingly available in HDB blocks and elsewhere nationwide, it remains important that we are prepared with knowledge and the skills to retrieve and use one immediately.

We encourage that every able person registers with the myResponder phone app so that each of us are prepared to help in the earliest stage of an OHCA and use an AED. This calendar year of 2024 and for 2025 we will implement a pilot study to test an advanced CPRcard™ system to help community responders during an emergency. This pilot study will equip myResponders / community first responders (CFR) with a device and training to work with SCDF dispatcher centre in a much more meaningful way and enhance the teamwork between them before ambulance arrival. I invite you to participate when you receive an invitation. The critical element is to become a registered myResponder app user (CFR).

[1] 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.

While we have made progress, in some critical areas we have lost some ground. These are lost opportunities to save lives and should strengthen our resolve to do more. Resuscitation and survival are dependent on many factors but the most critical is that we have a positive attitude towards making a difference. We remain steadfast in our mission and expect to see our OHCA performance indicators bounce back and trend back upward with new initiatives to come. Let us collectively continue to focus on increasing the quality of early CPR, increasing AED use, high-performance EMS resuscitation and excellent post-resuscitation care to improve survival with good neurological outcomes.

Sincerely,

Prof. Marcus E.H. Ong

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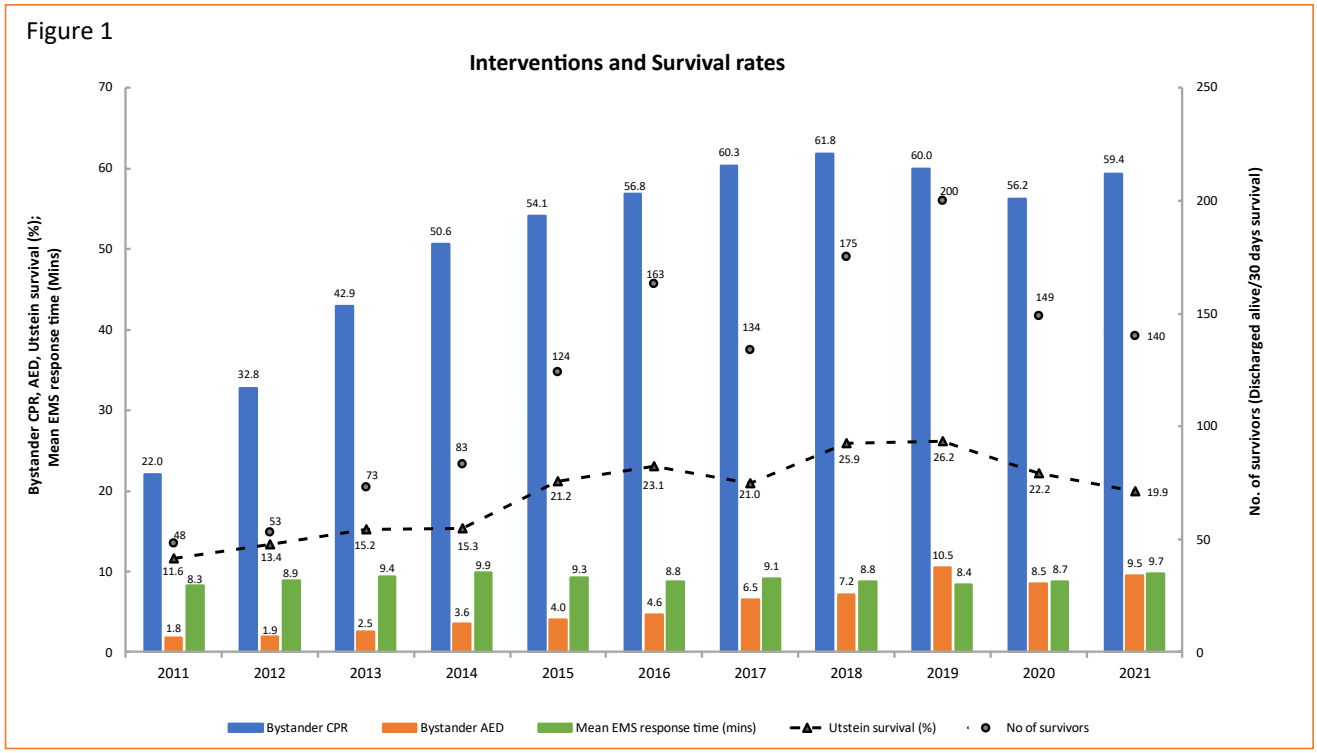
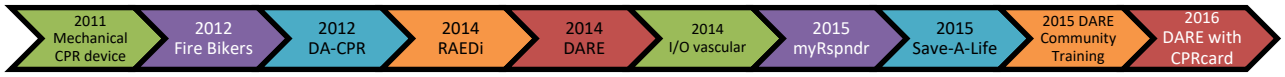
"…we anticipate many challenges ahead of us that need to be overcome such as increasing Automated External Defibrillators (AED) utilisation beyond 20%."

—Prof Marcus Ong

The Big Picture – Fruits of sustained, collective efforts.

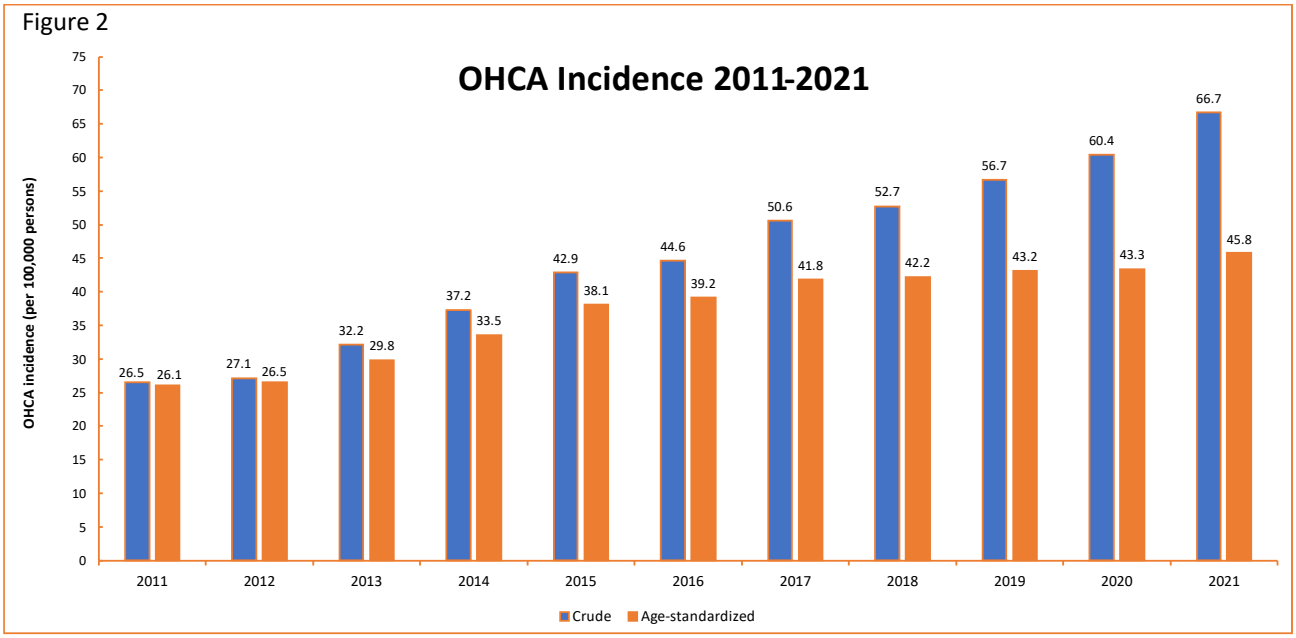
Figure 1





Incidence of OHCA

Figure 2



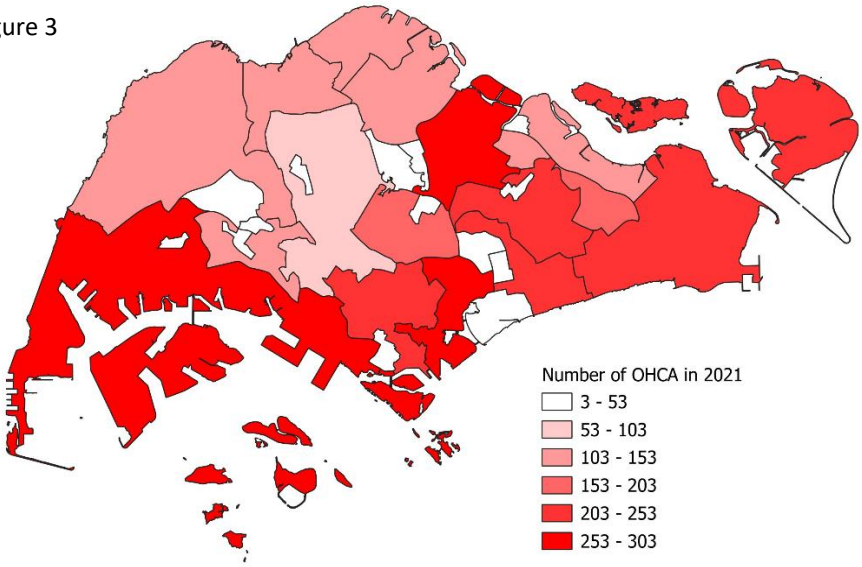
- Crude incidence increased to **66.7 per 100,000** persons in 2021 from 60.4 per 100,000 persons in 2020.

- The age-standardised incidence[2], which allows for comparisons with other locales, increased slightly to **45.8 per 100,000** in 2021 compared to 43.3 per 100,000 in 2020.

[2] Age-standardized incidence figures were derived by applying the category-specific incidence of each population to the Segi World Standard population. World Health Organization 2001. Age Standardization of Rates. https://www.who.int/healthinfo/paper31.pdf Last accessed on September 15, 2021. (Attempted again on January 3, 2024. Link no longer active.)

2021 Incidence by Electoral District[3]

Figure 3



District	Incidence *
ANG MO KIO	282
WEST COAST	276
JALAN BESAR	256
TANJONG PAGAR	236
ALJUNIED	235
EAST COAST	214
MARINE PARADE	208
TAMPINES	166
BISHAN-TOA PAYOH	165
NEE SOON	148
CHUA CHU KANG	142
PASIR RIS-PUNGGOL	142
SEMBAWANG	133
MARSILING-YEW TEE	132
JURONG	130
SENGKANG	106
HOLLAND-BUKIT TIMAH	93
MACPHERSON	48
BUKIT PANJANG	47
BUKIT BATOK	43
MOUNTBATTEN	43
HONG KAH NORTH	37
YUHUA	36
HOUGANG	30
KEBUN BARU	29
RADIN MAS	24
YIO CHU KANG	24
MARYMOUNT	23
POTONG PASIR	22
PIONEER	21
PUNGGOL WEST	3

- We include this map to show the 2021 geographic distribution of OHCA case locations[4] across the nation.

- The greatest number of cases occurred in central, east, and west regions. Northern Singapore had relatively fewer cases.

- Ang Mo Kio had the highest number of cases at **282** followed by West Coast at **276** cases, and Jalan Besar at **256**.

- Punggol West had the lowest number of OHCA cases at **3**.

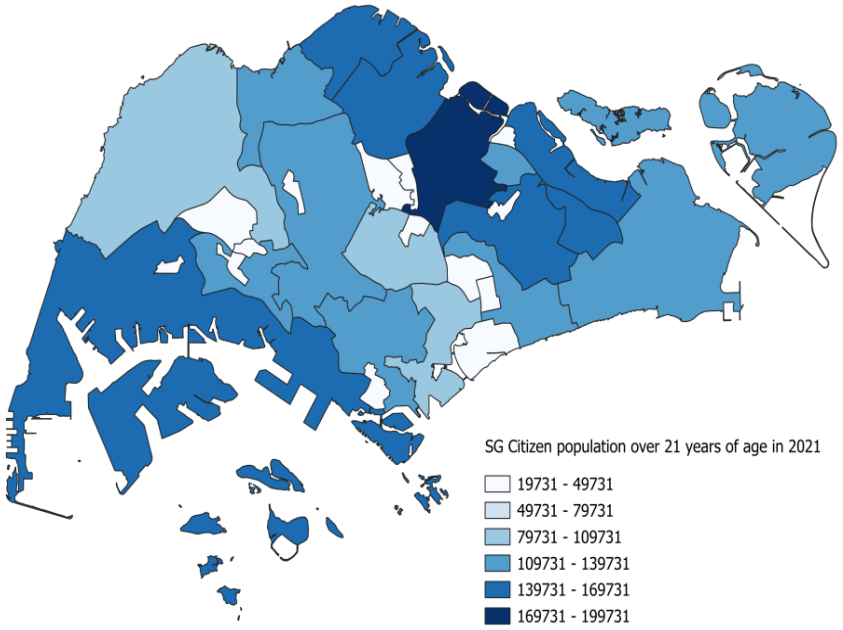
- Some cases did not have a post code associated. Thus, they are not included in this map/count.

(*See Table of nursing home case counts in **ANNEX.** It is provided for additional context for this (Figure 3) map. Annex table shows the contribution of nursing cases to location counts*).

[3] 141 OHCA cases were not reported in the map because of missing postal codes.
[4] Postal codes are of the locations where victims were found/treated. This may not reflect where the victim resided.

Citizen Population 21 years of age and older

Figure 4



District	Population
ANG MO KIO	185,261
PASIR RIS-PUNGGOL	166,556
TAMPINES	151,589
ALJUNIED	150,821
SEMBAWANG	147,786
NEE SOON	146,902
WEST COAST	146,089
MARINE PARADE	139,622
TANJONG PAGAR	134,494
JURONG	131,058
EAST COAST	121,644
SENGKANG	120,100
MARSILING-YEW TEE	117,077
HOLLAND-BUKIT TIMAH	114,973
JALAN BESAR	107,720
CHUA CHU KANG	106,632
BISHAN-TOA PAYOH	101,220
BUKIT PANJANG	35,437
BUKIT BATOK	29,948
MACPHERSON	28,513
HONG KAH NORTH	28,046
PUNGGOL WEST	26,587
HOUGANG	26,432
YIO CHU KANG	25,962
RADIN MAS	24,931
PIONEER	24,653
MOUNTBATTEN	24,246
MARYMOUNT	23,431
KEBUN BARU	22,623
YUHUA	21,351
POTONG PASIR	19,731

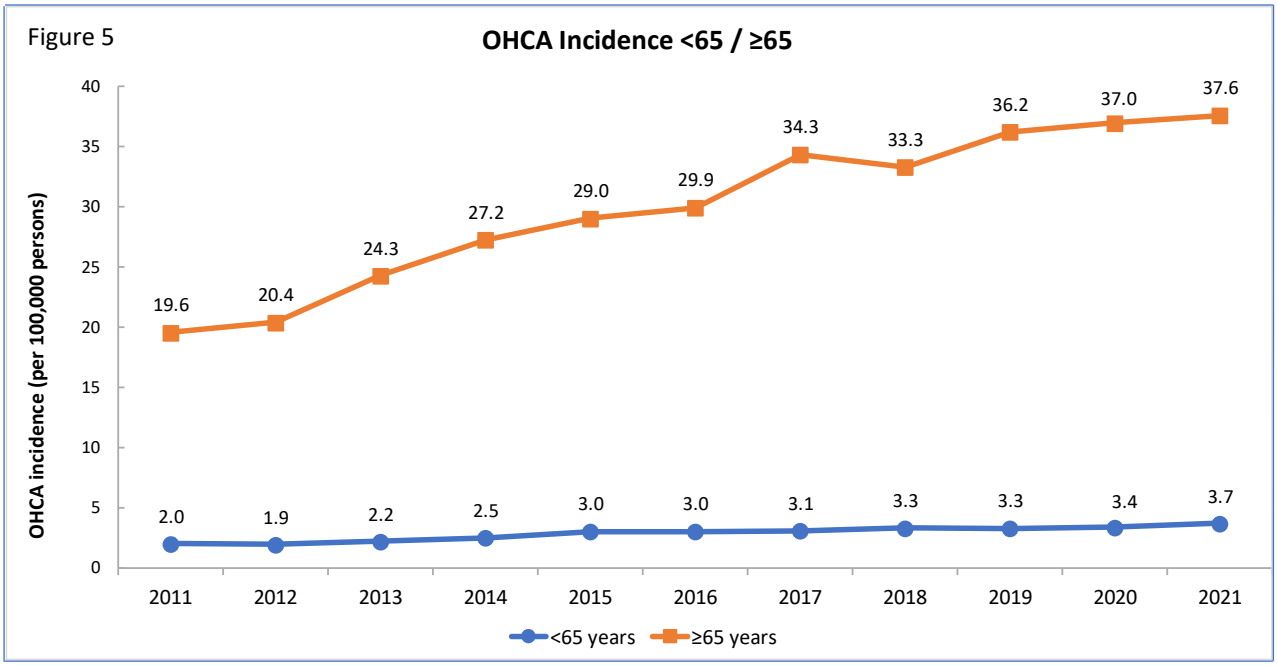
- We do not observe a direct correlation between districts with the highest population of residents aged ≥21 and highest amounts of OHCA cases. However, we are not able to stratify age groups such that we could isolate and look at districts' population of those aged ≥65. We hope to get this level of data in the future.

- Out of 3,637 cases, **47** OHCA cases occurred among those under 21 years of age (about 1.3% of total OHCA cases).

- In 2021, the average age of an OHCA victim was **70** years old and the median age was **73**.

- The number of cases among non-residents/foreigners was negligible.

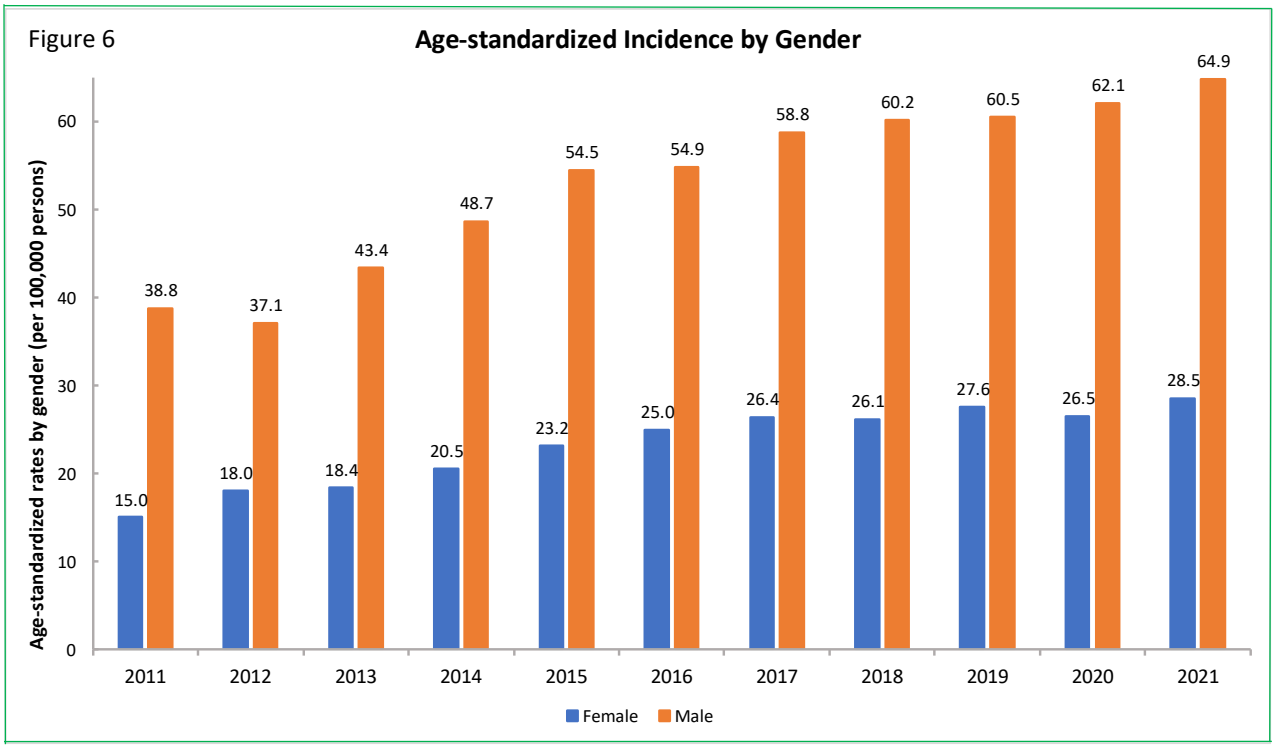
Figure 5



- The incidence among those aged 64 or younger remained steady at **3.7 per 100,000** persons in 2021, compared with 3.4 per 100,000 persons in 2020.

- Similarly, for those aged 65 years and older the incidence increased slightly to **37.6 per 100,000** persons in 2021 compared to 37.0 per 100,000 persons in 2020.

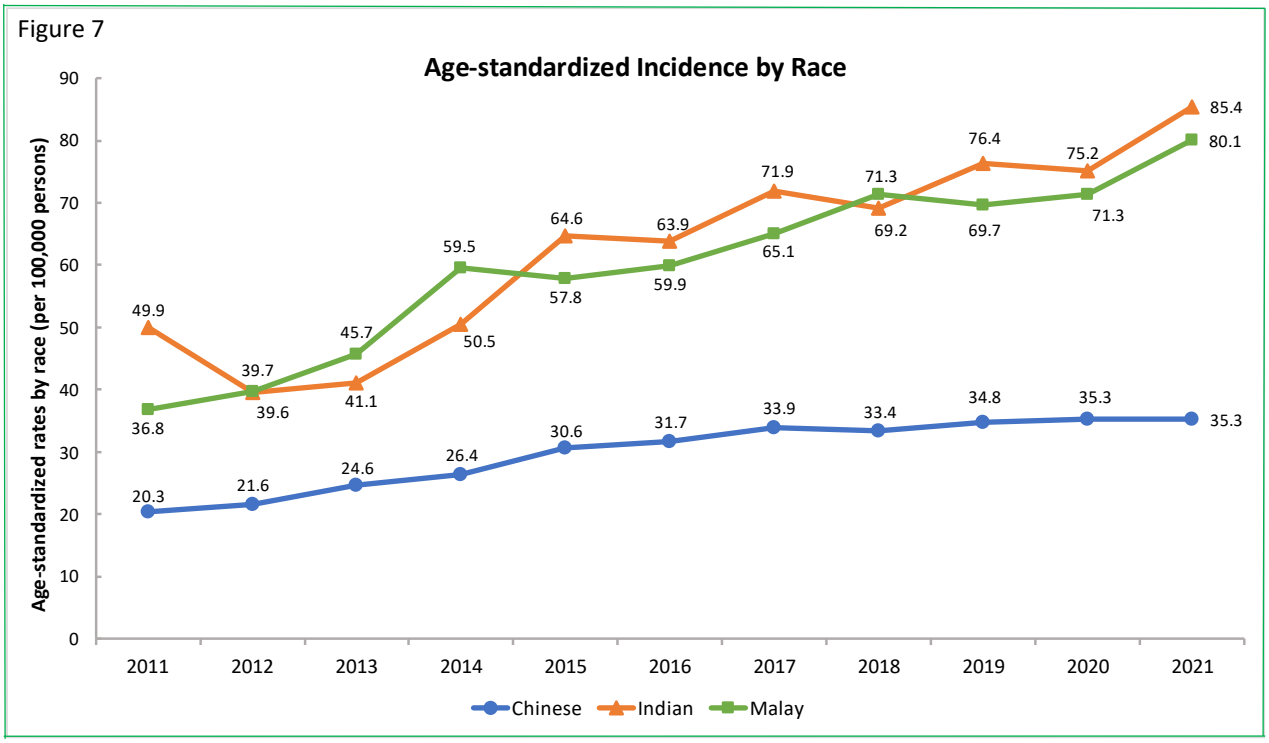
Figure 6



- Age-standardized incidence among females increased to **28.5 per 100,000** persons in 2021, up from 26.5 per 100,000 persons in 2020.

- Age-standardized incidence among males increased to **64.9 per 100,000** persons in 2021 compared to 62.1 per 100,000 persons in 2020.

Figure 7



Incidence among:

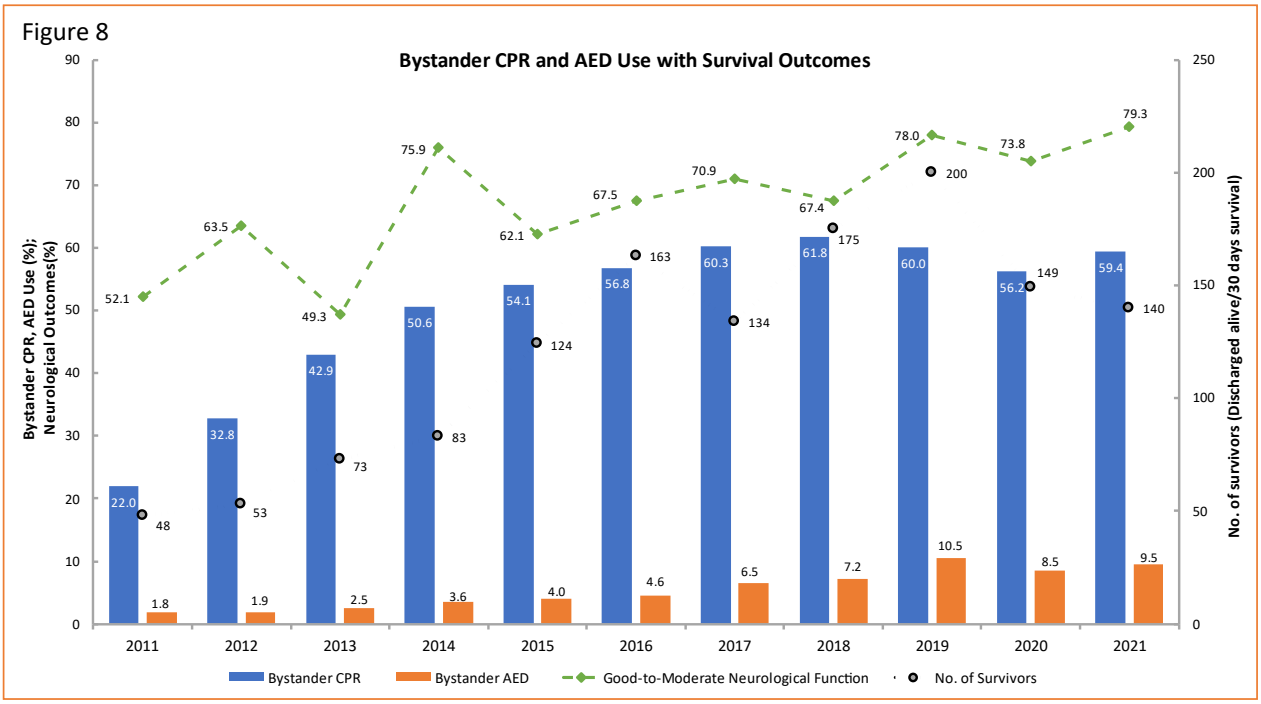
- Chinese remained steady at **35.3 per 100,000** persons in 2021, compared to 35.3 per 100,000 persons in 2020.

- Indians jumped to **85.4 per 100,000** persons in 2021, up from 75.2 per 100,000 persons in 2020.

- Malays similarly jumped to **80.1 per 100,000** persons in 2021, up from 71.3 per 100,000 persons in 2020.

Bystander CPR and AED use

Figure 8



- Bystander CPR increased to **59.4%** in 2021 from 56.2% in 2020.

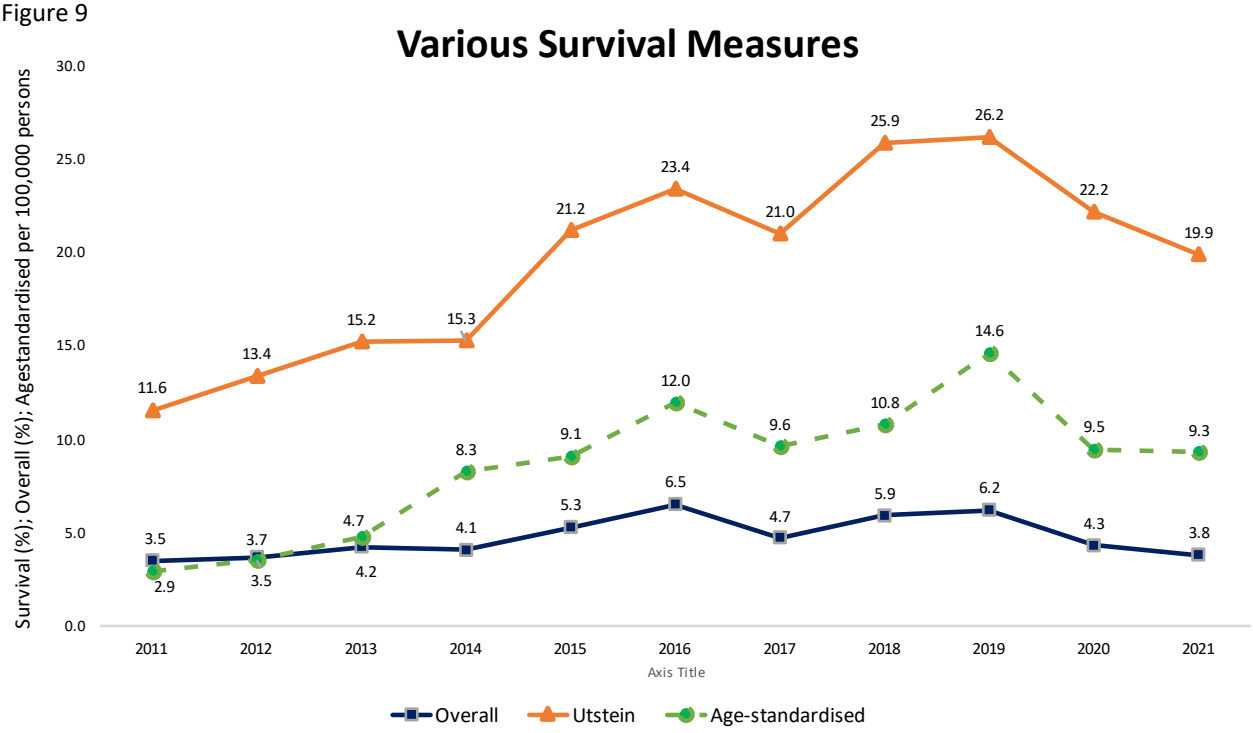
- Automated External Defibrillators (AED) applied/use rate increased slightly to **9.5%** in 2021, up from 8.5% in 2020.

- The number of survivors dropped to **140** in 2021 from 149 in 2020.

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

Utstein rates *are a reporting of OHCA cases that were witnessed, had a shockable heart rhythm, and were caused by some heart problem, i.e., not trauma. These are the cases where resuscitation efforts (CPR+AED) have the highest success rates, i.e., "potentially survivable". As a subset of the overall OHCA cases, reported Utstein survival rates are larger percentages than overall survival rates.*

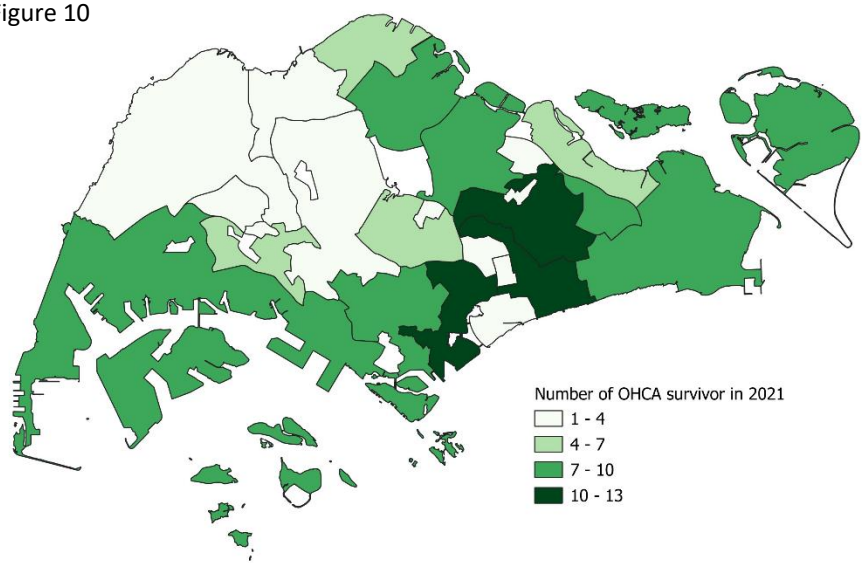
Figure 9



- Overall OHCA survival rate dropped to **3.8%** in 2021 from 4.3% in 2020.
- Utstein survival rate dropped to **19.9%** in 2021 compared to 22.2% in 2020.
- Age-standardized survival rate remained steady at **9.3%** in 2021 compared to 9.5% in 2020.

Out-of-Hospital Cardiac Arrest Survivors (count)

Figure 10

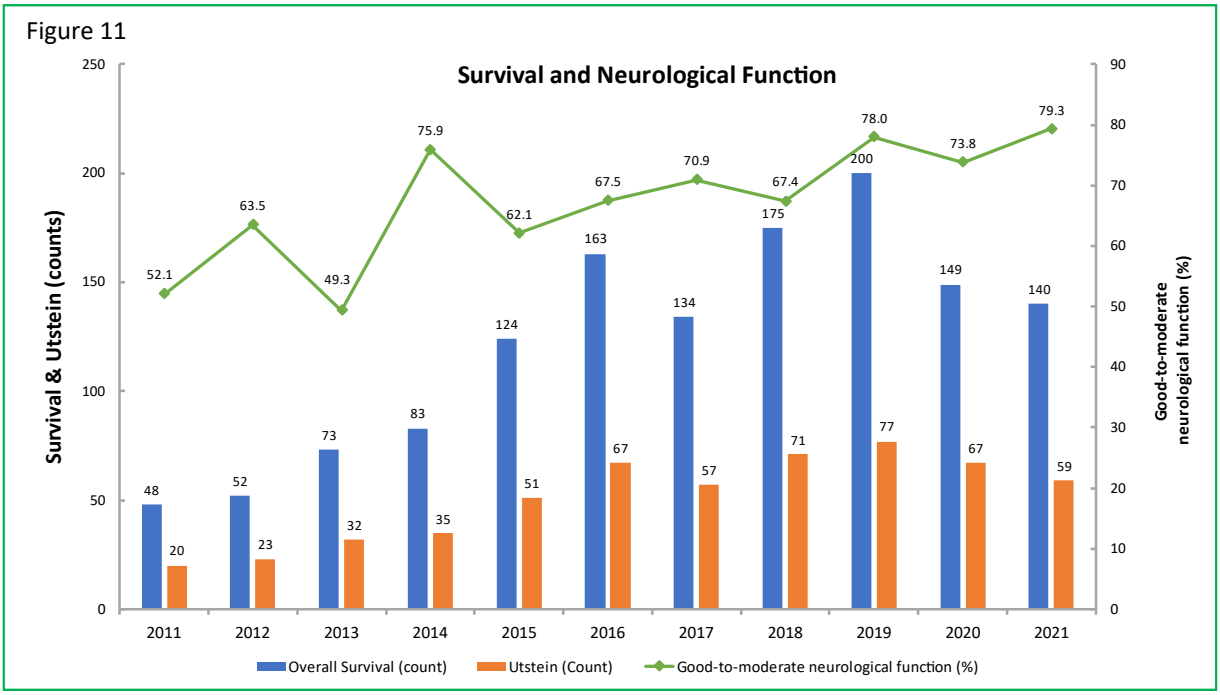


District	Survivors
JALAN BESAR	13
ALJUNIED	11
MARINE PARADE	11
EAST COAST	10
TANJONG PAGAR	10
ANG MO KIO	8
NEE SOON	8
TAMPINES	8
WEST COAST	8
PASIR RIS-PUNGGOL	7
SEMBAWANG	7
JURONG	6
BISHAN-TOA PAYOH	5
HOLLAND-BUKIT TIMAH	4
BUKIT BATOK	3
CHUA CHU KANG	2
MACPHERSON	2
MARSILING YEW TEE	2
MOUNTBATTEN	2
SENGKANG	2
HONG KAH NORTH	1
HOUGANG	1
MARYMOUNT	1
POTONG PASIR	1

- In 2021, Jalan Besar (with **13** survivors), Aljunied (with **11**), Marine Parade (with **11**) East Coast (with **10**) and Tanjong Pagar (with **10**) were the districts with the top 3 number of survivors.

- Hong Kah North (with **1** survivor), Hougang (with **1**), Marymount (with **1**), and Potong Pasir (with **1**) had the lowest number of survivors.

Figure 11



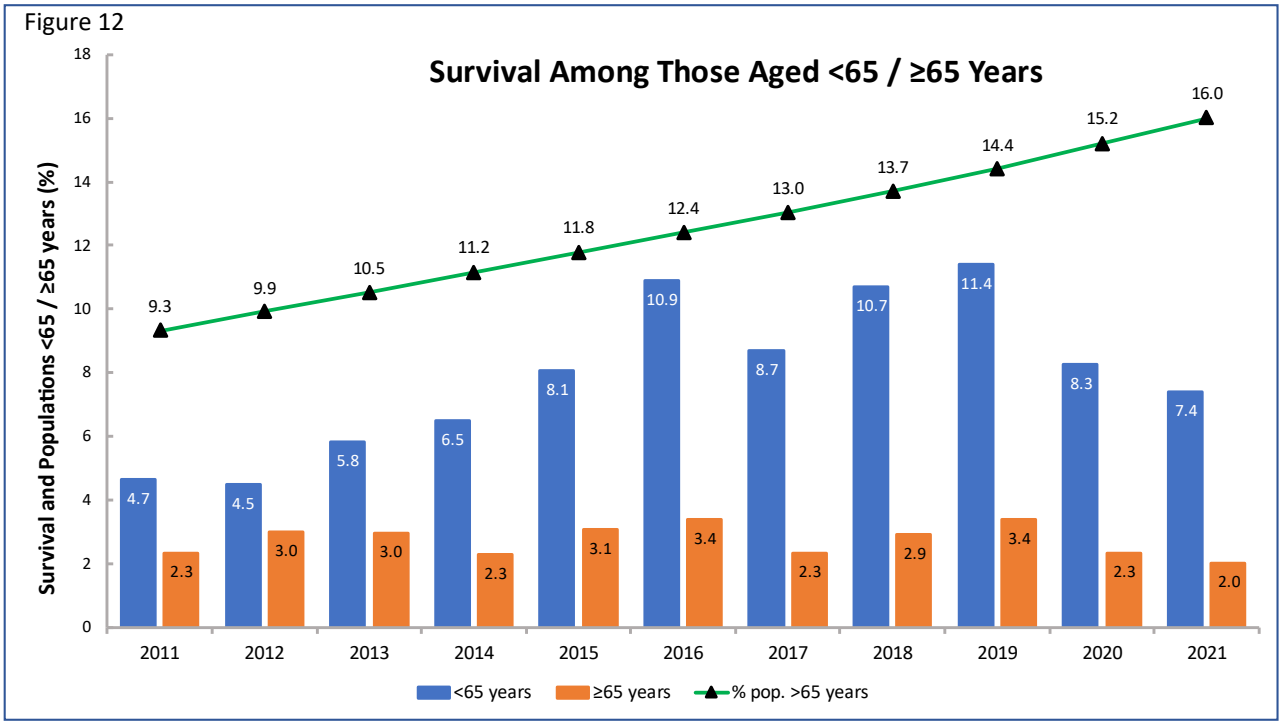
- Neurological function is measured by use of the Cerebral Performance Categories (CPC) scale. The score tells us about the survivor's neurological status and is an indication of how well survivors are recovering.

- Patients who survive OHCA are assigned a CPC score of 1 to 4 with CPC 1 being the best outcome.

- Good-to-moderate entails a CPC score of 1 or 2.

- The rate of survivors with good-to-moderate neurological function increased to **79.3%** in 2021, up from 73.8% in 2020.

Figure 12



- Survival among those younger than age 65 decreased to **7.4%** in 2021 from 8.3% in 2020.

- Among those aged 65 and older, the survival rate decreased slightly to **2.0%** in 2021, from 2.3% in 2020.

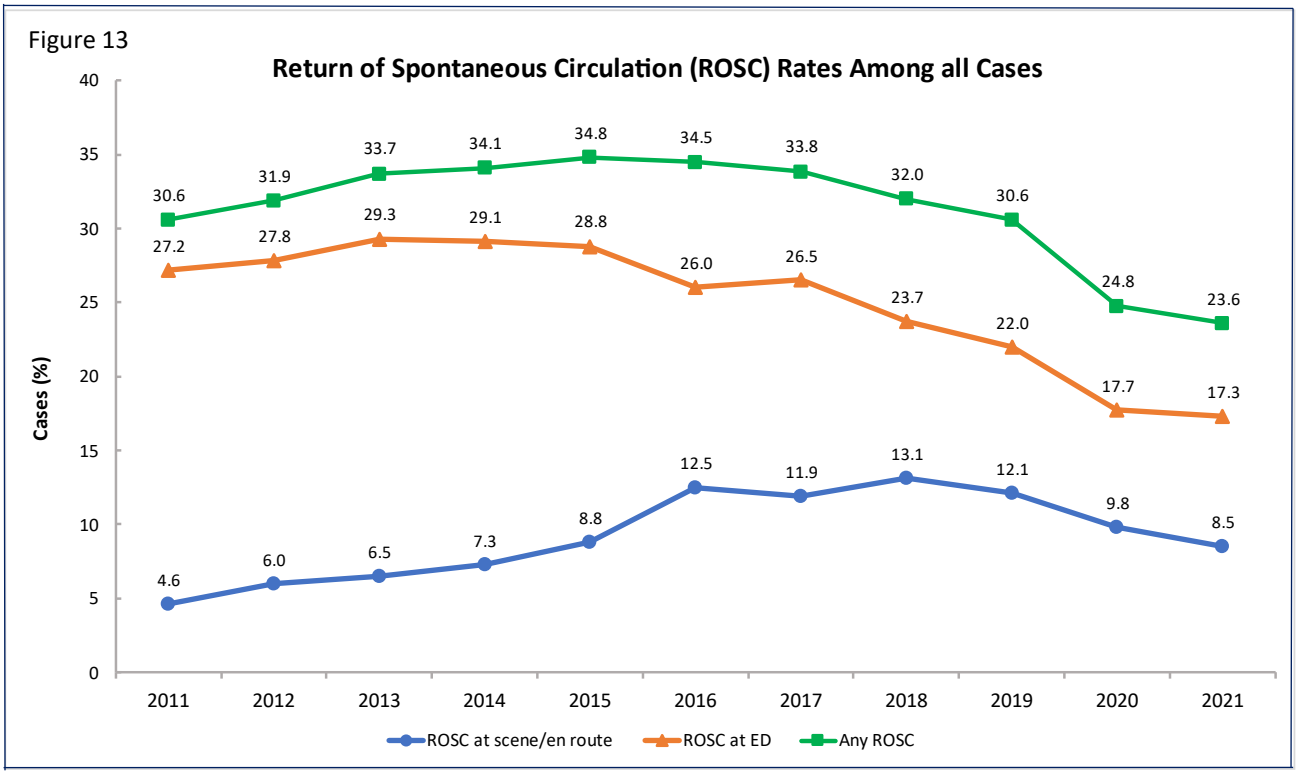
- For context, the proportion of Singaporean residents[5] aged 65 and above has steadily increased year over year, and in 2021 they made up **16.0%** of the population. In 2020, those aged 65 and above made up 15.2%.[6]

[5] Singapore residents comprise both citizens and permanent residents. From 2003 onwards, data excludes residents who are overseas for a continuous period of 12 months or longer as at the reference period.

[6] Population data set was accessed from the SingStat website of the Department of Statistics (DOS), a department of the Ministry of Trade and Industry in the Government of Singapore. Methodology and tools have been updated and the previous figures have changed. This document reflects updated data for 2011-2020 obtained from **https://tablebuilder.singstat.gov.sg/table/TS/M810011#!**. Last accessed on January 5, 2024.

Return of spontaneous circulation (ROSC)

Figure 13



- ROSC is an important indicator to monitor because it is an initial, but unstable, state of recovery.

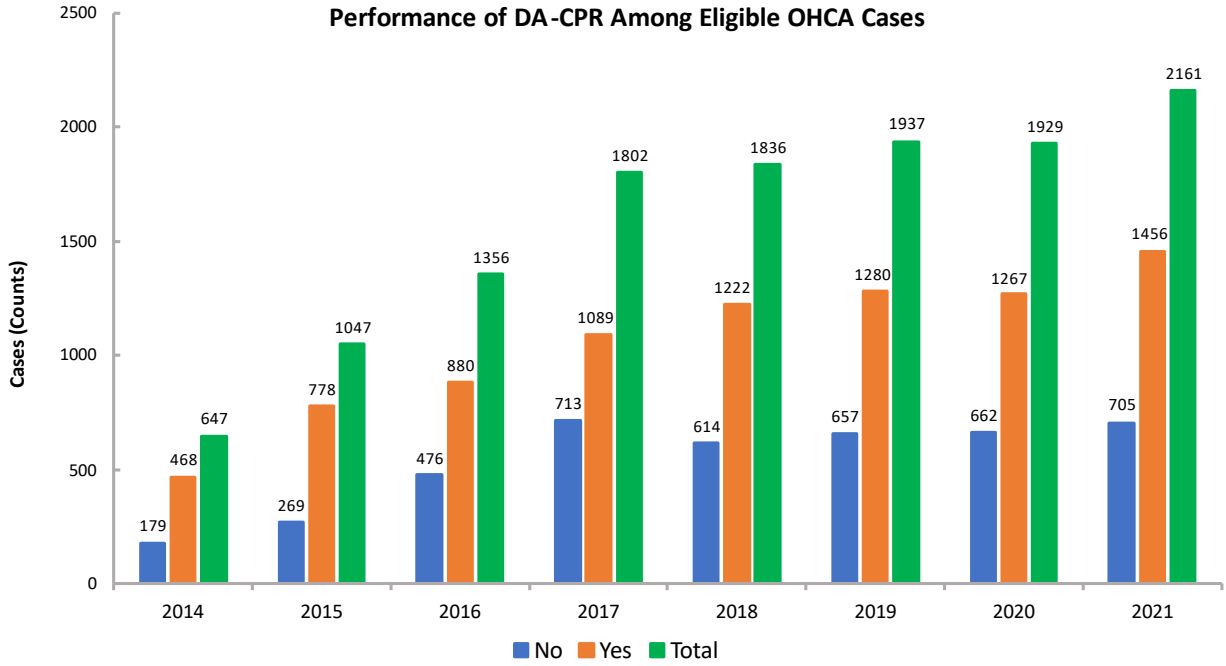
- In 2021, the Return of Spontaneous Circulation (ROSC) at scene/en route rate decreased to **8.5%**, down from 9.8% in 2020. This presents the third year of decreased rates. We want to see improvement in this category because it is one indicator of how prehospital efforts by the community are performing.

- In 2021, ROSC achieved in the emergency department remained steady at **17.3%** compared to 17.7% in 2020.

- The rate of ROSC achieved at any point dropped to **23.6%** in 2021 compared to 24.8% in 2020.

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

Figure 14



- This chart shows the number of DA-CPR included cases where: 1) no DA-CPR was performed, 2) where DA-CPR was performed, and 3) total eligible cases.

- *Excluded cases are SCDF-witnessed collapses and non-EMS cases.

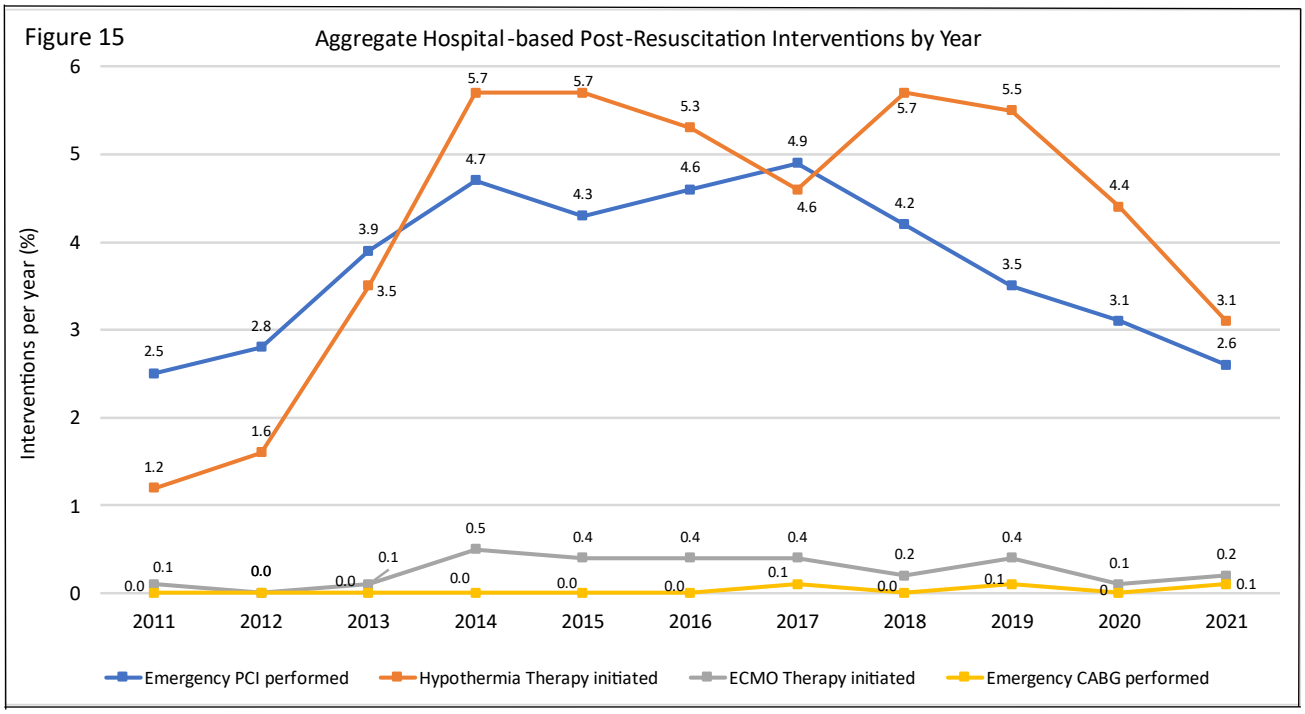
- In 2021, there was a slight improvement. **1456 (67.4%) out of 2161** eligible cases involved DA-CPR compared to 1267 (65.7%) out of 1929 eligible cases in 2020.

- DA-CPR would not have been done if callers could not move the patient; refused to start CPR; or if SCDF arrived before dispatcher instructions began. Other reasons include caller declined instructions (e.g., already knew how to do CPR/AED); left or hung-up phone before dispatcher instructions were given; no one answered upon call back; caller too distraught; change in patient status; caller not with patient; patient cold and hard.[7]

[7] 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.

Post-resuscitation interventions for OHCA

<u>Post-resuscitation interventions</u> *are an important link in the chain of survival. We are including these measures in our reporting for the first time. Our hope is to provide information on all links so that each one can be strengthened. The intervention included here are: Coronary artery bypass grafting (CABG), Extracorporeal membrane oxygenation (ECMO), Percutaneous coronary intervention (PCI), and Targeted temperature management (TTM).*



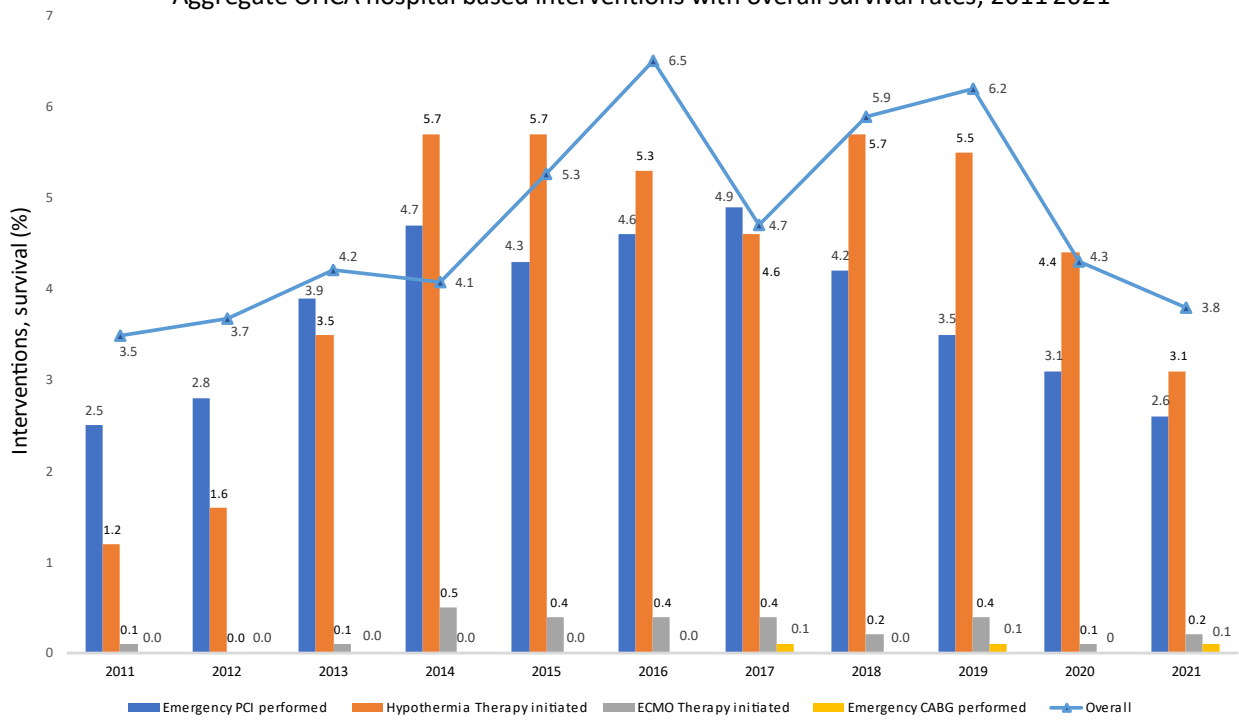
- The graph shows the aggregated rates for each of four post-OHCA hospital interventions from 2011-2021.

- Only public hospitals are included.

- Of the four hospital interventions charted, **hypothermia therapy** and **emergency PCI** are the most used treatments.

- Rates of all interventions have continued to dip.

Figure 16 Aggregate OHCA hospital-based interventions with overall survival rates, 2011-2021



- This graph shows an overlay of the overall rate of survival atop the four aggregated hospital interventions.

- Several parameters are overlaid here for convenience, however no conclusions regarding temporality, causal associations or clinical significance should be drawn.

- Such conclusions should be drawn after a proper and thorough analysis of case data.

ANNEX

Table 1: OHCA Results, 2011-2021

	2011 n=1377	2012 n=1440	2013 n=1736	2014 n=2037	2015 n=2372	2016 n=2503	2017 n=2841	2018 n=2972	2019 n=3233	2020 n=3432	2021 n=3637
Age, Mean (Median)	63.5 (65.0)	64.1 (66.0)	65.9 (65.9)	65.9 (68.0)	65.5 (67.0)	66.0 (69.0)	67.8 (70.0)	68.0 (70.0)	69.1 (71.0)	69.9 (72.0)	70.0 (73.0)
Gender (%)											
Female	442 (32.1)	528 (36.7)	605 (34.9)	721 (35.4)	826 (34.8)	912 (36.4)	1063 (37.4)	1075 (36.2)	1209 (37.4)	1244 (36.2)	1363 (37.5)
Male	935 (67.9)	912 (63.3)	1131 (65.2)	1316 (64.6)	1546 (65.2)	1591 (63.6)	1778 (62.6)	1897 (63.8)	2024 (62.6)	2188 (63.8)	2274 (62.5)
Location Type (%)											
Home residence	985 (71.6)	990 (68.8)	1246 (71.8)	1481 (72.7)	1658 (69.9)	1837 (73.4)	2117 (74.5)	2164 (72.8)	2390 (73.9)	2570 (74.9)	2890 (79.5)
Healthcare facilities	100 (7.3)	102 (7.1)	107 (6.2)	139 (6.8)	157 (6.6)	164 (6.6)	213 (7.5)	227 (7.6)	260 (8.0)	318 (9.3)	246 (6.8)
Public setting	260 (18.9)	308 (21.4)	320 (18.4)	387 (19.0)	458 (19.3)	446 (17.8)	451 (15.9)	501 (16.9)	514 (15.9)	484 (14.1)	501 (13.8)
Bystander Intervention (%)											
Bystander CPR	302 (22.0)	472 (32.8)	744 (42.9)	1031 (50.6)	1284 (54.1)	1422 (56.8)	1714 (60.3)	1836 (61.8)	1937 (60.0)	1929 (56.2)	2161 (59.4)
Bystander CPR - Witnessed arrest	214 (27.6)	304 (42.5)	423 (48.0)	615 (56.8)	779 (61.3)	808 (63.8)	1165 (72.1)	882 (69.9)	849 (67.1)	831 (64.2)	959 (66.1)
Bystander CPR - Not witnessed	88 (18.0)	168 (27.9)	321 (44.8)	416 (52.0)	505 (57.1)	614 (62.3)	549 (56.8)	954 (68.1)	1088 (65.1)	1098 (60.4)	1200 (63.1)
* DA-CPR performed	-	54 (18.6)	252 (34.0)	468 (72.3)	778 (74.3)	880 (64.9)	1089 (60.4)	1222 (66.6)	1280 (66.1)	1267 (65.7)	1456 (67.4)
DA-CPR performed - Witnessed arrest	-	29 (4.1)	129 (16.4)	244 (22.6)	421 (33.1)	450 (35.5)	698 (43.2)	532 (42.2)	505 (39.9)	500 (38.6)	582 (40.0)
DA-CPR performed - Not witnessed	-	25 (4.1)	123 (17.2)	224 (28.0)	357 (40.3)	430 (43.7)	391 (40.4)	690 (49.3)	775 (46.4)	767 (42.2)	874 (45.9)
Bystander AED	25 (1.8)	27 (1.9)	43 (2.5)	73 (3.6)	96 (4.0)	116 (4.6)	185 (6.5)	214 (7.2)	340 (10.5)	291 (8.5)	347 (9.5)
Arrest Witnessed by (%)											
Bystander - Family	481 (34.9)	414 (28.8)	526 (30.3)	729 (35.8)	808 (34.1)	779 (31.1)	1063 (37.4)	714 (24.0)	700 (21.6)	783 (22.8)	938 (25.8)
Bystander - Healthcare professional	65 (4.7)	69 (4.8)	70 (4.0)	79 (3.9)	113 (4.8)	110 (4.4)	201 (7.1)	111 (3.7)	106 (3.3)	133 (3.9)	145 (4.0)
Bystander - Layperson	229 (16.6)	232 (16.1)	284 (16.4)	275 (13.5)	350 (14.8)	377 (15.1)	352 (12.4)	437 (14.7)	460 (14.2)	378 (11.0)	368 (10.1)
EMS/Private ambulance	112 (8.1)	122 (8.5)	139 (8.0)	154 (7.6)	216 (9.1)	252 (10.1)	258 (9.1)	309 (10.4)	296 (9.2)	319 (9.3)	284 (7.8)
Not witnessed	490 (35.6)	603 (41.9)	717 (41.3)	800 (39.3)	885 (37.3)	985 (39.4)	967 (34.0)	1401 (47.1)	1671 (51.7)	1819 (53.0)	1902 (52.3)
Initial Rhythm (%)											
Shockable rhythm	251 (18.4)	280 (19.7)	304 (17.8)	347 (17.4)	378 (15.9)	435 (17.7)	422 (14.8)	451 (15.2)	503 (15.6)	516 (15.0)	456 (12.5)
Non-shockable rhythm	1114 (80.9)	1144 (80.3)	1405 (82.2)	1651 (82.6)	1941 (81.8)	2021 (82.3)	2360 (83.0)	2481 (83.5)	2717 (84.0)	2908 (84.7)	3181 (87.5)
Outcomes (%)											
ROSC at scene	63 (4.6)	86 (6.0)	113 (6.5)	148 (7.3)	209 (8.8)	312 (12.5)	339 (11.9)	389 (13.1)	392 (12.1)	335 (9.8)	309 (8.5)
ROSC at ED	374 (27.2)	400 (27.8)	509 (29.3)	593 (29.1)	684 (28.8)	650 (26.0)	754 (26.5)	704 (23.7)	712 (22.0)	608 (17.7)	630 (17.3)
Emergency PCI performed	35 (2.5)	41 (2.8)	68 (3.9)	96 (4.7)	101 (4.3)	116 (4.6)	138 (4.9)	125 (4.2)	114 (3.5)	107 (3.1)	95 (2.6)
Hypothermia Therapy initiated	17 (1.2)	23 (1.6)	61 (3.5)	117 (5.7)	135 (5.7)	132 (5.3)	132 (4.6)	168 (5.7)	179 (5.5)	150 (4.4)	114 (3.1)
ECMO Therapy inititaed	1 (0.1)	0 (0.0)	1 (0.1)	11 (0.5)	9 (0.4)	9 (0.4)	11 (0.4)	7 (0.2)	12 (0.4)	4 (0.1)	7 (0.2)
Emergency CABG performed	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.0)	1 (0.0)	1 (0.0)	2 (0.1)	0 (0.0)	2 (0.1)	0 (0.0)	3 (0.1)
Survival to admission	251 (18.2)	249 (17.3)	303 (17.5)	358 (17.6)	453 (19.1)	497 (19.9)	542 (19.1)	550 (18.5)	567 (17.5)	446 (13.0)	448 (12.3)

	2011 n=1377	2012 n=1440	2013 n=1736	2014 n=2037	2015 n=2372	2016 n=2503	2017 n=2841	2018 n=2972	2019 n=3233	2020 n=3432	2021 n=3637
Survival to discharge	48 (3.5)	52 (3.7)	73 (4.2)	83 (4.1)	124 (5.2)	163 (6.5)	134 (4.7)	175 (5.9)	200 (6.2)	149 (4.3)	140 (3.8)
Good-to-moderate neurological function (Overall)	25 (1.8)	33 (2.3)	36 (2.1)	63 (3.1)	77 (3.2)	110 (4.4)	95 (3.3)	118 (4.0)	156 (4.8)	110 (3.2)	111 (3.0)
** Good-to-moderate neurological function (Survived-to-discharged)	25 (52.1)	33 (63.5)	36 (49.3)	63 (75.9)	77 (62.1)	110 (67.5)	95 (70.9)	118 (67.4)	156 (78.0)	110 (73.8)	111 (79.3)
Utstein survival	20 (11.6)	23 (13.4)	32 (15.2)	35 (15.3)	51 (21.2)	67 (23.1)	57 (21.0)	71 (25.9)	77 (26.2)	67 (22.2)	59 (19.9)
Missing hospital outcomes	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.1)	1 (0.03)	0 (0.0)	1 (0.03)	1 (0.03)
Unknown hospital outcomes	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.03)	0 (0.0)	0 (0.0)	0 (0.0)
Non-shockable rhythm bystander witnessed survival	7 (1.2) n = 585	9 (1.7) n = 523	15 (2.3) n = 651	12 (1.5) n = 819	31 (3.1) n = 994	30 (3.2) n = 942	31 (2.4) n = 1306	30 (3.1) n = 966	29 (3.0) n = 955	32 (3.3) n = 974	35 (3.0) n = 1151
Good-to-moderate neurological function (non-shockable rhythm, bystander witnessed overall)	1 (1.7)	6 (1.1)	3 (0.5)	9 (1.1)	16 (1.6)	15 (1.6)	19 (1.4)	16 (1.6)	15 (1.6)	15 (1.5)	23 (2.0)
Good-to-moderate neurological function (non-shockable rhythm bystander witnessed survival)	1 (14.3)	6 (66.7)	3 (20.0)	9 (75.0)	16 (51.6)	15 (50.0)	19 (61.3)	16 (53.3)	15 (51.7)	15 (46.9)	23 (65.7)
Non-cardiac origin bystander witnessed survival	6 (4.0) n = 148	6 (3.4) n = 176	9 (3.7) n = 242	8 (2.8) n = 287	19 (5.0) n = 378	28 (8.4) n = 331	18 (3.5) n = 508	28 (8.5) n = 329	21 (7.5) n = 279	21 (7.4) n = 284	26 (8.6) n=303
Good-to-moderate neurological function (non-cardiac origin, bystander witnessed overall)	2 (1.3)	4 (2.3)	1 (0.4)	5 (1.7)	12 (3.2)	16 (4.8)	10 (2.0)	15 (4.5)	13 (4.7)	9 (3.2)	14 (4.6)
Good-to-moderate neurological function (non-cardiac origin, bystander witnessed survival)	2 (33.3)	4 (66.7)	1 (1.1)	5 (62.5)	12 (63.1)	16 (57.1)	10 (55.5)	15 (53.6)	13 (61.9)	9 (42.9)	14 (53.8)
* Calculations based on valid cases.											
**Calculations based on available data.											

Table 2: Nursing Home Case Count by Electoral District (2021)[8]

No.	District	OHCA cases	Cases at a Nursing home	Percent
1	ANG MO KIO	282	28	10%
2	WEST COAST	276	9	3%
3	JALAN BESAR	256	4	2%
4	TANJONG PAGAR	236	10	4%
5	ALJUNIED	235	13	6%
6	EAST COAST	214	11	5%
7	MARINE PARADE	208	13	6%
8	TAMPINES	166	3	2%
9	BISHAN-TOA PAYOH	165	6	4%
10	NEE SOON	148	5	3%
11	CHUA CHU KANG	142	13	9%
12	PASIR RIS-PUNGGOL	142	3	2%
13	SEMBAWANG	133	7	5%
14	MARSILING-YEW TEE	132	4	3%
15	JURONG	130	4	3%
16	SENGKANG	106	1	1%
17	HOLLAND-BUKIT TIMAH	93	1	1%
18	MACPHERSON	48	2	4%
19	BUKIT PANJANG	47	-	0%
20	BUKIT BATOK	43	-	0%
21	MOUNTBATTEN	43	1	2%
22	HONG KAH NORTH	37	7	19%
23	YUHUA	36	1	3%
24	HOUGANG	30	-	0%
25	KEBUN BARU	29	1	3%
26	RADIN MAS	24	-	0%
27	YIO CHU KANG	24	3	13%
28	MARYMOUNT	23	-	0%
29	POTONG PASIR	22	-	0%
30	PIONEER	21	-	0%
31	PUNGGOL WEST	3	-	0%

[8] Included this data to provide some context to the case count by electoral district map above.

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