Ten-year stepwise improving of the favorable neurological outcomes of OHCA patients in Japan

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Background

One-month survival rate of the witnessed cardiogenic cardiac arrest has been improved from 3.3% in 2005 to 16.6% in 2016 in Japan. The question remain unclear that what kind of factor attribute neurological outcome.

Aim

This study is aimed to analyze how do we improve number of favorable neurological outcomes of out-of-hospital cardiac arrest (OHCA) in Japan.

Material and Methods

Material : A retrospective cohort study using from 2005 to 2016 with population-based OHCA registry data. Eligible 169328 adults (15-85 years old) patients with bystander-witnessed cardiogenic cardiac arrests patients were extracted.

Mesurement: PAD, DA-CPR and Bystander CPR rate prior to EMS arrival were compared from 2005 to 2016. Also, yearly trend and effectiveness of these treatment were compered. The primary endpoint was one-month survival with a favorable neurological outcome after OHCA, defined as the Glasgow-Pittsburgh Cerebral Performance Category scale 1 or 2 (CPC1-2).

Statistical analysys : Multivariable logistic regression analysis (JMP ver 11)were applied .

Result

PAD rate was 0.2% in 2005, 2.4% in 2010, and 3.2% in 2015. DA-CPR rate was 19.7% in 2005, 29.3% in 2010 and 37.0% in 2015 and Bystander CPR rate was 36.9% in 2005, 46.0% in 2010 and 51.5 % in 2015.

The adjusted odds ratio (AOR) of CPC1-2 after receiving PAD (reference: no PAD) was 1.48(CI: 1.28-1.95) in the 2005, 1.83(CI: 1.54-2.19) in the 2010 and 1.34(CI: 1.09-1.64) in the 2015. AOR of CPC 1-2 after DA-CPR (reference: no DA-CPR) reached 1.37(CI1.09-1.71) in the 2005 and 1.45(CI: 1.24-1.71) in the 2010, 1.62(CI: 1.39-1.87) in the 2015, respectively.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
N	13621	14337	14522	15012	15180	15768	16000	16043	16713	16440	15712
Age	68.2 (13.4)	68.4 (13.3)	68.5 (13.6)	69.1 (13.2)	69.2 (13.3)	69.6 (13.1)	69.5 (13.4)	69.9 (13.0)	70.0 (13.2)	70.1 (13.0)	70.0 (13.2)
Male	9426 (69.2)	10052 (70.1)	10155 (69.9)	10525 (70.1)	10704 (70.6)	10929 (69.3)	11210 (70.1)	11047 (68.9)	11555 (69.1)	11527 (70.1)	10962 (69.8)
DABCP											
1	2689 (19.7)	3281 (22.8)	3636 (26.4)	4211 (28.1)	4522 (29.8)	4621 (29.3)	4796 (30.0)	5107 (31.8)	5423 (32.5)	5692 (34.6)	5814 (37.1)
2	2344 (17.2)	2438 (17.0)	2570 (17.7)	2532 (16.9)	2743 (18.1)	2653 (16.8)	2494 (15.6)	2518 (15.7)	2465 (14.8)	2499 (15.2)	2284 (14.5)
0	8588 (63.1)	8638 (60.3)	8116 (55.9)	8269 (55.1)	7895 (52.1)	8484 (53.9)	8710 (54.4)	8418 (52.5)	8825 (52.8)	8249 (50.2)	7604 (48.4)
Family Bystander	9594 (70.4)	10001 (69.8)	9784 (67.4)	9997 (66.6)	10137 (66.9)	10606 (67.3)	10681 (66.8)	10435 (65.0)	11209 (67.1)	10765 (65.5)	10342 (65.8)
BCPR	5029 (36.9)	5690 (39.7)	6387 (44.0)	6725 (44.8)	7248 (47.8)	7250 (46.0)	7283 (45.5)	7603 (47.4)	7874 (47.1)	8175 (49.7)	8089 (51.5)
PAD	32 (0.2)	90 (0.6)	176 (1.2)	241 (1.6)	350 (2.3)	374 (2.4)	378 (2.4)	466 (2.9)	475 (2.8)	519 (3.2)	501 (3.2)
DA-CPR	4496 (33.0)	5293 (36.9)	5743 (39.6)	6192 (41.3)	6451 (42.6)	6787 (43.0)	7135 (44.6)	7355 (45.9)	7828 (46.8)	8124 (49.4)	8010 (51.0)
Shockable	3537 (26.0)	3980 (27.8)	3969 (27.3)	4173 (27.8)	4375 (28.9)	4351 (27.6)	4298 (26.9)	4255 (26.5)	4364 (26.1)	4223 (25.7)	4057 (25.8)
Shock	4262 (31.3)	4751 (33.1)	4705 (33.2)	4895 (32.7)	5074 (33.5)	5119 (32.5)	5112 (32.0)	5110 (31.9)	4988 (30.7)	5075 (30.8)	4878 (30.3)
No. of Shock											
1	1776 (13.0)	1983 (13.8)	1898 (13.1)	1985 (13.2)	1899 (12.5)	2017 (12.8)	2064 (12.9)	2007 (12.5)	2464 (14.7)	2286 (13.9)	2132 (13.6)
2-1	1582 (11.6)	1856 (13.0)	2039 (14.0)	2076 (13.8)	1988 (13.1)	2056 (13.0)	2043 (12.8)	2080 (13.0)	2385 (14.3)	2652 (12.5)	1959 (12.5)
4-	895 (6.6)	971 (6.8)	770 (5.3)	833 (5.6)	819 (5.4)	981 (6.2)	1006 (6.3)	1048 (6.5)	2521 (15.1)	3032 (18.4)	2436 (15.5)
Airway management											
LM	6397 (47.0)	6460 (45.1)	6881 (47.4)	7580 (50.5)	7707 (50.8)	8098 (51.4)	8359 (52.2)	8533 (53.2)	248 (3.1)	207 (2.6)	178 (2.4)
LT	2289 (16.8)	2024 (14.1)	1759 (12.1)	1159 (7.7)	756 (5.0)	729 (4.6)	702 (4.4)	612 (3.8)	630 (3.8)	560 (7.1)	387 (5.1)
Drug Administration	4477 (32.9)	4930 (34.4)	4733 (32.6)	5087 (33.9)	5505 (36.3)	5658 (35.9)	5758 (36.0)	5729 (35.7)	5906 (74.8)	5904 (75.1)	5793 (76.6)
119 to Contact	458 (3.4)	923 (6.4)	1149 (7.9)	1186 (7.9)	1192 (7.9)	1257 (8.0)	1181 (7.4)	1169 (7.3)	1107 (14.0)	1191 (15.2)	1206 (15.9)
Contact to Hosp.	45 (0.3)	531 (3.7)	1339 (9.2)	2077 (13.8)	2820 (18.6)	3422 (21.7)	4027 (25.2)	4332 (27.0)	4713 (28.2)	4970 (30.2)	4998 (31.8)
ROSC	21 (16-27)	22 (17-28)	22 (17-28)	22 (17-28)	22 (17-28)	23 (18-29)	23 (18-30)	23 (18-30)	24 (18-31)	24 (18-31)	23 (18-30)
CPC 1-2	1183	1447 (10.1)	1700 (11.7)	1861 (12.4)	2200 (14.5)	2291 (14.5)	2467 (15.4)	2564 (16.0)	2840 (17.0)	2821 (17.2)	2830 (18.0)
	578	684 (4.8)	934 (6.4)	968 (6.5)	1129 (7.5)	1154 (7.3)	1167 (7.3)	1182 (7.4)	1282 (7.7)	1253 (7.6)	1300 (8.3)

Yearly trend of all demographics

The improvement is primarily attributed to markedly increase of bystander CPR from 38.6% to 50.9% and AED utilization. Adjusted odds ratio of CPC1-2 by bystander defibrillation was 2.24 (CI: 1.93–2.61) compared with EMS defibrillation.,

Yearly trend of CPC1-2 and ROSC

Discussion

In Japan, PAD has been started since 2005. More than 750,000 AEDs installed and dissemination. During the last 10 years, dramatically increased survival rate with the PAD, However, considering the implementation rate, large contribution to improving survival were reflect by increased number of bystander CPR after DA-CPR.

Conclusion

Conclusion: Implementation of PAD , CPR education and DA-CPR were directly reflected to improve OHCA outcomes according to the 10 steps for Survivals by Global Resuscitation Alliance (GRA).

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