A member of the Global Resuscitation Alliance

2022 CASE STUDY RESUSCITATION ACADEMY

Outcomes of out-of-hospital cardiac arrests after a decade of system-wide initiatives optimizing community chain of survival in Taipei City

SITUATION

Taipei City is a metropolis covered by a fire-based, two-tiered EMS system, with a population of 2.57 million in an area of 271.8 km2. At baseline in 2008-2009, the overall OHCA survival rate was 5.4% (survival to hospital discharge) and the survival rate of patients with initial shockable rhythm at that period was 19.9%. Although the infrastructure of EMS was well built (There are 41 basic life support (BLS) teams with early defibrillation capability and four advanced life support (ALS) teams.), initiatives focusing on improving the community chain of survival were warranted for the low survival rate of OHCA. Taipei City adopted serial initiatives aligned with GRA's ten steps during the following decade.

INTERVENTION(S)

After 2007, Taipei city EMS adopted multidirectional system-wide initiatives for the community chain of survival. The initiatives contained several steps: (1) Commencement of medical direction and public-access defibrillation project (2008–2009), (2) Digitised Utstein-based registry (2010–2011), (3) Public Involvement and Continuous QA process (2012–2013), (4) Proactive CPR promotion and PAD (2014–2015), and (5) Built culture of excellence and innovative technology implemented (2016–2017). The detailed implementation aligned with GRA 10 steps are listed below.

Table 1 – Implementation of two-yearly system-wide initiatives in the Taipei Fire Department from 2008 to 2017.

Year	Improvement Programs (Correlated GRA 10 steps)	System-wide Initiatives to Improve Community Chain of Survival
Pre-existing strategies Before 2007	Accountability (9)	The EMS Act in Taiwan (1995)
	Medical Oversight	Government certification of emergency medicine as a medical speciality (1998)
		Medical consulting committee in the Taipei Fire Department (2000)
		Official appointment of medical directors in the Taipei Fire Department (2006)
		Medical Director Regulation in Emergency Medical Act (2007)
	Cardiac Arrest Registry (1)	Paper-based Utstein-style Registry (2000)
	Rapid Dispatch (4)	Computer-assisted rapid dispatch system (2006)
	Accountability (9)	Dedicated ALS teams equipped with pre-hospital ALS care (2003)
		Government aims at improving quality of pre-hospital care in Taipei (2007)
2008–2009	Accountability (9)	Hospital accreditation and regionalization of time-sensitive acute illness and injury (2008)
	Measurement for professional resuscitation (5)	Thorough review of AED records and ambulance run sheets resuscitation (2008)
	Ongoing training and quality improvement of CPR (3)	
	AED programme for first responders (6)	Public implementation of AED (2009)

2010–2011	Cardiac Arrest Registry (1)	Inclusive, web-based Utstein-style registry (2010)
	Measurement for professional resuscitation (5)	Review of thorough on-scene voice record for CPR quality (2010)
		In-hospital extra-corporeal membrane oxygenation-integrated CPR (2011)
	AED programme for first responders (6)	Compression-only CPR for Bystanders (2011)
2012–2013	Accountability (9)	QA team in ambulance division (2012)
	Measurement for professional resuscitation (5)	Approved of SGA use for emergency medical technicians (2012)
		Review of in-ambulance CCTV for CPR quality (2013)
	AED programme for first responders (6)	The PAD Act and implementation (2013), Good Samaritan law
2014–2015	Telephone CPR (2)	Dispatch-assisted (telephone) CPR (2014)
	AED programme for first responders (6)	Easy-access and painless CPR training by the. Taipei Fire Department (2014)
		Police station equipped with AED (2015)
2016–2017	Culture of excellence (10)	Award to bystanders, EMT, dispatcher, and the QA team (2016)
	Mandatory training for CPR and AED (8)	Large-scale school-based training of CPR and AED (2016)
	Smart technology for CPR and AED (7)	Design of app for crowd-sourcing bystander CPR and AED (2017)

ALS, advance life support; AED, automated extracorporeal defibrillator; CPR, cardiopulmonary resuscitation; QA, quality assurance; CCTV, closed-circuit television; PAD, public access defibrillation; SGA, supraglottic airway.

ESTIMATE LIFESAVING IMPACT

To estimate the impact of our interventions, we reviewed the report from Korea team. With a national population of 50 million, Korea implemented GRA 10 steps across the ten years from 2006 to 2015. The OHCA survival to hospital discharge increased from 3.0% to 6.1%. And favourable neurological outcomes increased from 0.9% to 4.1% within the decade. Presumably, adapting GRA 10 steps altogether could save 137 extra lives per million population.

REPORT LIFESAVING IMPACT

Comparing the OHCA survival data between 2016–2017 and 2008–2009 periods, the percentage of survival to hospital discharge in Taipei increased two-fold in the past decade, along with a six-fold increase in favourable neurological outcomes. Similar trends were observed in the shockable and non-shockable groups. Our result highlighted the improved survival not only in shockable populations but also in non-shockable populations. The degree of improvement exceeded previous reports.

Outcomes, no. (%)						p-value for trend
Pre-hospital ROSC	239 (6.7%)	313 (9.1%)	250 (6.5%)	235 (6.2%)	241 (7.1%)	0.115
Sustained ROSC	933 (26.1%)	869 (25.1%)	911 (23.8%)	908 (23.8%)	872 (25.6%)	0.271
STHD	193 (5.4%)	253 (7.3%)	285 (7.5%)	328 (8.6%)	346 (10.1%)	<0.001*
CPC1&2	35 (1.0%)	100 (2.9%)	134 (3.5%)	190 (5.0%)	204 (6.0%)	<0.001*

Table 3 – Survival of non-shockable rhythm by initial ECG record. *p < 0.05 for trend.

Year	2008–2009	2010–2011	2012–2013	2014–2015	2016–2017	p-value
n (%)	3576	3456	3822	3811	3411	
Non-shockable rhythm	3320 (92.8%)	3123 (90.4%)	3408 (89.2%)	3365 (88.3%)	2985 (87.5%)	<0.001*
Asystole (n,%)	1847 (51.7%)	2006 (64.3%)	2286 (67.1%)	2135 (63.4%)	1783 (59.7%)	0.002*
STHD (n, %)	47 (2.5%)	63 (3.1%)	52 (2.3%)	47 (2.2%)	42 (2.4%)	0.222
CPC ≤ 2 (n, %)	4 (0.2%)	13 (0.7%)	11 (0.5%)	7 (0.3%)	13 (0.7%)	0.203
PEA (n, %)	498 (15.0%)	596 (19.1%)	721 (21.2%)	863 (25.6%)	836 (28.0%)	<0.001*
STHD (n, %)	46 (9.2%)	74 (12.4%)	70 (9.7%)	82 (9.5%)	92 (11.0%)	0.925
CPC ≤ 2 (n, %)	4 (0.8%)	18 (3.0%)	26 (3.6%)	40 (4.6%)	40 (4.8)%	<0.001*
Shockable rhythm	256 (7.2%)	333 (9.6%)	414 (10.8%)	446 (11.7%)	426 (12.5%)	<0.001*
STHD (n, %)	51 (19.9%)	73 (21.9%)	121 (29.2%)	141 (31.6%)	150 (35.2%)	<0.001*
CPC ≤ 2 (n, %)	15 (5.9%)	48 (14.4%)	72 (17.4%)	105 (23.5%)	106 (24.9%)	<0.001*

CPC, cerebral performance category; PEA, pulseless electrical activity; STHD, survival to hospital discharge.

For more information, please contact: mattma.tw@gmail.com