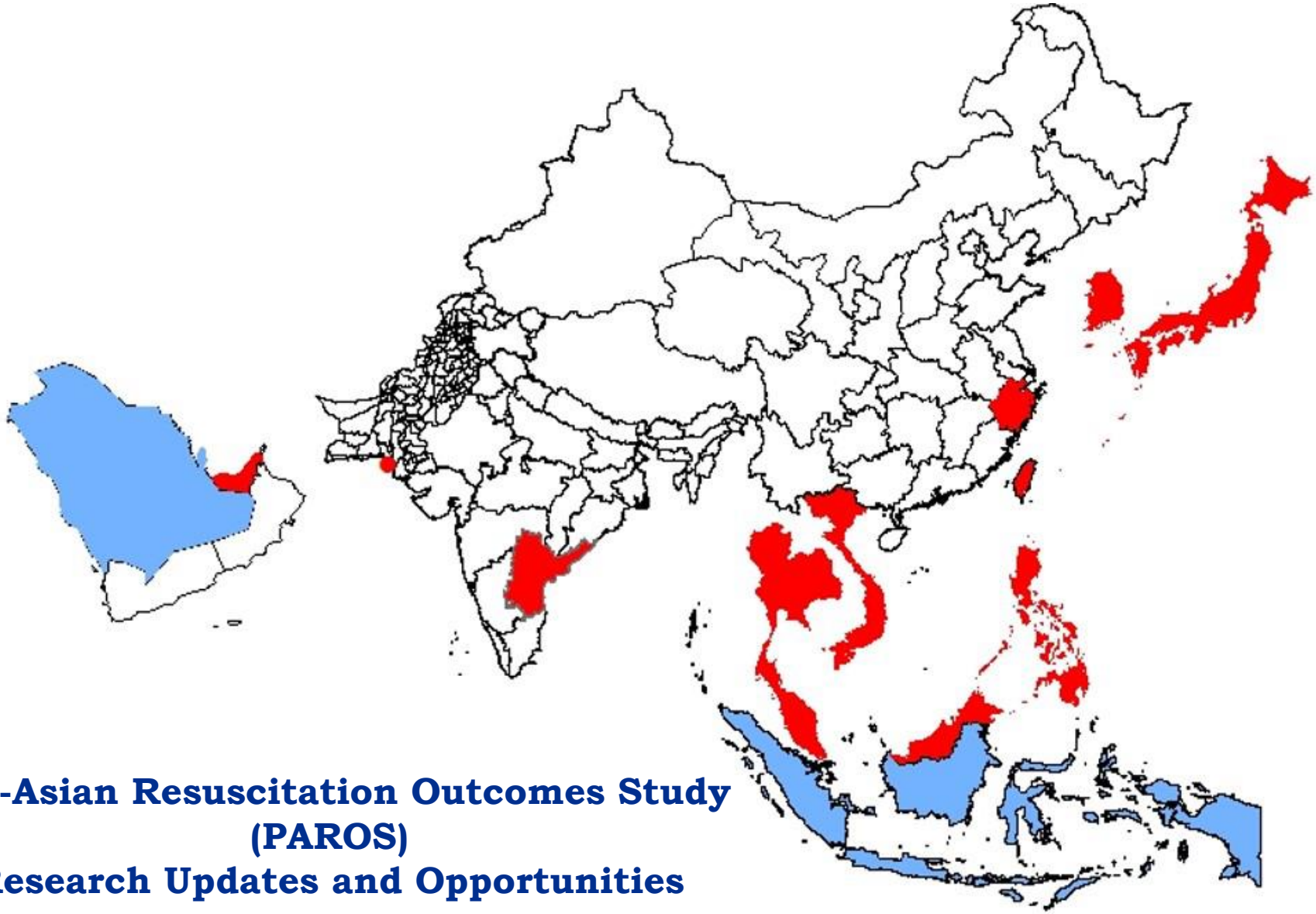

Pan-Asian Resuscitation Outcomes Study (PAROS)
Research Updates and Opportunities

Dr. NG Wei Ming
Consultant
Unit of Pre-Hospital Emergency Care (UPEC)

Recent Publications

Resuscitation. 2018 Nov;132:85-89. doi: 10.1016/j.resuscitation.2018.08.022. Epub 2018 Aug 29.

Global resuscitation alliance utstein recommendations for developing emergency care systems to improve cardiac arrest survival.

Nadarajan GD[1], Tiah L[2], Ho AFW[2], Azazh A[2], Castren MK[2], Chong SL[2], El Sayed MJ[2], Hara T[2], Leong BS[2], Lippert FK[2], Ma MHM[2], Ng YY[2], Ohn HM[2], Overton J[2], Pek PP[2], Perret S[2], Wallis LA[2], Wong KD[2], Ong MEH[2].

Author information

Abstract

INTRODUCTION: The Global Resuscitation Alliance (GRA) was established in 2015 to improve survival for Out- of-Hospital Cardiac Arrest (OHCA) using the best practices developed by the Seattle Resuscitation Academy. However, these 10 programs were recommended in the context of developed Emergency Care Systems (ECS). Implementing these programs can be challenging for ECS at earlier stages of development. We aimed to explore barriers faced by developing ECS and to establish pre-requisites needed. We also developed a framework by which developing ECS may use to build their emergency response capability.

METHOD: A consensus meeting was held in Singapore on 1st-2nd August 2017. The 74 participants were key stakeholders from 26 countries, including Emergency Medical Services (EMS) directors, physicians and academics, and two Physicians who sit on the World Health Organisation (WHO) panel for development of Emergency Care Systems. Five discussion groups examined the chain of survival: community, dispatch, ambulance and hospital; a separate group considered perinatal resuscitation. Discussion points were voted upon to reach a consensus.

RESULTS: The answers and discussion points from each groupwere classified into a table adapted from WHO's framework of development for Emergency Services. After which, it was used to construct the modified survival framework with the chain of survival as the backbone. Eleven key statements were then derived to describe the pre-requisites for achieving the GRA 10 programs. The participants eventually voted on the importance and feasibility of these 11 statements as well as the GRA 10 programs using a matrix that is used by organisations to prioritise their action steps.

CONCLUSION: In this paper, we propose a modified framework of survival for developing ECS systems. There are barriers for developing ECS systems to improve OHCA survival rates. These barriers may be overcome by systematic prioritisation and cost-effective innovative solutions.

Resuscitation. 2018 Dec;133:71-74. doi: 10.1016/j.resuscitation.2018.09.027. Epub 2018 Oct 4.

Global resuscitation alliance consensus recommendations for developing emergency care systems: Reducing perinatal mortality.

Chong SL[1], Laerdal T[2], Cordero J[3], Khursheed M[4], Haedar A[5], Cai W[6], Nadarajan GD[7], Ho AFW[7], Pek PP[7], Chan SKT[8], Ong MEH[9].

Author information

Abstract

Perinatal and neonatal deaths account for an increasing proportion of deaths under 5 years old. We present essential elements to reduce perinatal mortality, barriers to establishing these elements, and the role of developing emergency care systems. Essential elements for prompt perinatal and postnatal care are categorised based on care-seeking behaviours, access to a primary care facility and for the severely ill, access to advanced neonatal care. The role of emergency care systems is key to overcoming obstacles currently faced in countries with high perinatal and neonatal mortality rates.

Int J Cardiol. 2018 Nov 15;271:352-358. doi: 10.1016/j.ijcard.2018.04.070.

Health impacts of the Southeast Asian haze problem - A time-stratified case crossover study of the relationship between ambient air pollution and sudden cardiac deaths in Singapore.

Ho AFW[1], Wah W[2], Earnest A[3], Ng YY[4], Xie Z[5], Shahidah N[6], Yap S[7], Pek PP[8], Liu N[9], Lam SSW[10], Ong MEH[11]; Singapore PAROS Investigator.

Author information

Abstract

OBJECTIVES: To investigate the association between air pollution and out-of-hospital cardiac arrest (OHCA) incidence in Singapore.

DESIGN: A time-stratified case-crossover design study.

SETTING: OHCA incidences of all etiology in Singapore.

PARTICIPANTS: 8589 OHCA incidences reported to Pan-Asian Resuscitation Outcomes Study (PAROS) registry in Singapore between 2010 and 2015.

MAIN OUTCOME MEASURES: A conditional Poisson regression model was applied to daily OHCA incidence that included potential confounders such as daily temperature, rainfall, wind speed, Pollutant Standards Index (PSI) and age. All models were adjusted for over-dispersion, autocorrelation and population at risk. We assessed the relationship with OHCA incidence and PSI in the entire cohort and in predetermined subgroups of demographic and clinical characteristics.

RESULTS: 334 out of 8589 (3.89%) cases survived. Moderate (Risk ratio/RR = 1.1, 95% CI = 1.07-1.15) and unhealthy (RR =1.37, 95% CI = 1.2-1.56) levels of PSI showed significant association with increased OHCA occurrence. Sub-group analysis based on individual demographic and clinical features showed generally significant association between OHCA incidence and moderate/unhealthy PSI, excep age < 65, Malay and other ethnicity, traumatic arrests and history of heart disease and diabetes. The association was most pronounced among cases age > 65, male, Indian and non-traumatic. Each increment of 30 unit in PSI on the same day and previous 1-5 days was significantly associated with 5.8-8.1% increased risk of OHCA (p < 0.001).

CONCLUSIONS: We found a transient effect of short-term air pollution on OHCA incidence after adjusting for meteorological indicators and individual characteristics. These finding have public health implications for prevention of OHCA and emergency health services during haz

Ann Emerg Med. 2018 May;71(5):608-617.e15. doi: 10.1016/j.annemergmed.2017.07.484. Epub 2017 Oct 3.

Modifiable Factors Associated With Survival After Out-of-Hospital Cardiac Arrest in the Pan-Asian Resuscitation Outcomes Study.

Tanaka H[1], Ong MEH[2], Siddiqui FJ[3], Ma MHM[4], Kaneko H[5], Lee KW[6], Kajino K[7], Lin CH[8], Gan HN[9], Khruekarnchana P[10], Alsakaf O[11], Rahman NH[12], Doctor NE[13], Assam P[3], Shin SD[6]; PAROS Clinical Research Network.

Collaborators (20)

Author information

Abstract

STUDY OBJECTIVE: The study aims to identify modifiable factors associated with improved out-of-hospital cardiac arrest survival among communities in the Pan-Asian Resuscitation Outcomes Study (PAROS) Clinical Research Network: Japan, Singapore, South Korea, Malaysia, Taiwan, Thailand, and the United Arab Emirates (Dubai).

METHODS: This was a prospective, international, multicenter cohort study of out-of-hospital cardiac arrest in the Asia-Pacific. Arrests caused by trauma, patients who were not transported by emergency medical services (EMS), and pediatric out-of-hospital cardiac arrest cases (<18 years) were excluded from the analysis. Modifiable out-of-hospital factors (bystander cardiopulmonary resuscitation [CPR] and defibrillation, out-of-hospital defibrillation, advanced airway, and drug administration) were compared for all out-of-hospital cardiac arrest patients presenting to EMS and participating hospitals. The primary outcome measure was survival to hospital discharge or 30 days of hospitalization (if not discharged). We used multilevel mixed-effects logistic regression models to identify factors independently associated with out-of-hospital cardiac arrest survival, accounting for clustering within each community.

RESULTS: Of 66,780 out-of-hospital cardiac arrest cases reported between January 2009 and December 2012, we included 56,765 in the analysis. In the adjusted model, modifiable factors associated with improved out-of-hospital cardiac arrest outcomes included bystander CPR (odds ratio [OR] 1.43; 95% confidence interval [CI] 1.31 to 1.55), response time less than or equal to 8 minutes (OR 1.52; 95% CI 1.35 to 1.71), and out-of-hospital defibrillation (OR 2.31; 95% CI 1.96 to 2.72). Out-of-hospital advanced airway (OR 0.73; 95% CI 0.67 to 0.80) was negatively associated with out-of-hospital cardiac arrest survival.

CONCLUSION: In the PAROS cohort, bystander CPR, out-of-hospital defibrillation, and response time less than or equal to 8 minutes were positively associated with increased out-of-hospital cardiac arrest survival, whereas out-of-hospital advanced airway was associated with decreased out-of-hospital cardiac arrest survival. Developing EMS systems should focus on basic life support interventions in out-of-hospital cardiac arrest resuscitation.

Resuscitation. 2018 Apr;125:111-117. doi: 10.1016/j.resuscitation.2018.01.040. Epub 2018 Feb 5.

Epidemiology and outcome of paediatric out-of-hospital cardiac arrests: A paediatric sub-study of the Pan-Asian resuscitation outcomes study (PAROS).

Tham LP[1], Wah W[2], Phillips R[3], Shahidah N[4], Ng YY[5], Shin SD[6], Nishiuchi T[7], Wong KD[8], Ko PC[9], Khunkaew N[10], Naroo GY[11], Ong MEH[12].

Author information

Abstract

BACKGROUND: The Pan Asian Resuscitation Outcomes Study (PAROS) is a retrospective study of out- of-hospital cardiac arrest(OHCA), collaborating with EMS agencies and academic centers in Japan, South Korea, Malaysia, Singapore, Taiwan, Thailand and UAE-Dubai. The objectives of this study is to describe the characteristics and outcomes, and to find factors associated with survival after paediatric OHCA.

METHODS: We studied all children less than 17 years of age with OHCA conveyed by EMS and non-EMS transports from January 2009 to December 2012. We did univariate and multivariate logistic regression analyses to assess the factors associated with survival-to-discharge outcomes.

RESULTS: A total of 974 children with OHCA were included. Bystander cardiopulmonary resuscitation rates ranged from 53.5% (Korea), 35.6% (Singapore) to 11.8% (UAE). Overall, 8.6% (range 0%-9.7%) of the children survived to discharge from hospital. Adolescents (13-17 years) had the highest survival rate of 13.8%. 3.7% of the children survived with good neurological outcomes of CPC 1 or 2. The independent pre-hospital factors associated with survival to discharge were witnessed arrest and initial shockable rhythm. In the sub-group analysis, pre-hospital advanced airway [odds ratio (OR) = 3.35, 95% confidence interval (CI) = 1.23-9.13] was positively associated with survival-to-discharge outcomes in children less than 13 years-old. Among adolescents, bystander CPR (OR = 2.74, 95%CI = 1.03-7.3) and initial shockable rhythm (OR = 20.51, 95%CI = 2.15-195.7) were positive factors.

CONCLUSION: The wide variation in the survival outcomes amongst the seven countries in our study may be due to the differences in the delivery of pre-hospital interventions and bystander CPR rates.

PAROS PHASE 3-

Ambulance-based interventions in Singapore

AMBULANCE INTERVENTIONS- IMPEDANCE THRESHOLD DEVICE

- The ITD has been shown to improve hemodynamics during CPR, including systolic and diastolic blood pressure, and ETCO2.
- The ITD has shown the most promise to improve survival when combined with active compression–decompression (ACD) CPR.
- One study found a 53% relative increase in survival to hospital discharge with good neurological function compared with standard CPR.
- Survival to 1 year was also higher in the ITD group than the standard CPR group (50% increase). Results from other trials have been mixed, especially with standard CPR, with a large RCT showing no difference in survival.

AMBULANCE INTERVENTIONS- HIGH PERFORMANCE TEAM CPR

- High Performance Team CPR includes a training system emphasizing minimal breaks in chest compressions, full chest recoil, adequate compression depth and adequate compression rate.

- The training system includes using CPR feedback training as well as protocols emphasizing teamwork and minimal interruptions to CPR.

AMBULANCE INTERVENTIONS- MANUAL DEFIBRILLATION BY INTERMEDIATE LIFE-SUPPORT PROVIDERS

- The use of AEDs requires time without chest compressions during rhythm analysis and charging.

- In ALS EMS systems, paramedics use defibrillators in manual mode to shorten peri-shock pauses during resuscitation

AMBULANCE INTERVENTIONS- IV AMIODARONE

- Two RCT demonstrated improved survival to hospital admission with amiodarone (compared to lidocaine) for patients in refractory VT/VF in the out-of-hospital setting.

- Another RCT demonstrated improved termination of VT and improved 24 hour survival with amiodarone (compared to lidocaine) for patients in VT, in the in-hospital setting.

- One study found that amiodarone prevented recurrent hypotensive VT in 40% of individuals who had failed procainamide, lidocaine and bretylium.

- In in-hospital VT/VF arrests two studies and demonstrated no difference in survival between patients given amiodarone or lidocaine.

METHODS

- The national ambulance service will be implementing these initiatives progressively in their 4 divisions over a period of 4 years
- Multiple interim analyses will be conducted in a “step-wedge” manner for comparisons of OHCA survival outcomes

Potential studies for collaboration

Study Title	Study Synopsis	Lead investigator
Advanced airway management on survival after OHCA	The effects of prehospital advanced airway on outcomes of OHCA patients are controversial. This study aims to evaluate the interaction effects of advanced airway management on survival after OHCA	Dr Ki Ok Ahn (Korea)
Non-Cardiac etiology OHCA	To describe the epidemiology and determine the predictors for survival outcomes according to cause (trauma vs asphyxia) of non-cardiac etiology OHCA	Open
Adherence of Therapeutic Hypothermia in Emergency Medicine Practice	To investigate the adherence of therapeutic hypothermia in emergency medicine practice among countries and the contributing factors for the differences between systems.	Open
In OHCAs, does shortening the response time affect survival?	Comparison of EMS response time with OHCA survival across regions to determine a threshold for “the best response time”.	Dr Chiang Wen-Chu (Taiwan)

Potential studies for collaboration

Study Title	Study Synopsis	Lead investigator
Place-Provider Matrix and Time Interval to Initiation of CPR and Defibrillation After OHCA	To compare the time interval of first CPR and defibrillation after OHCA by place-provider matrix and to determine the effect of the matrix on survival outcomes.	Prof Sang Do Shin (Korea)
Predictive performance of Termination-Of-Resuscitation (TOR) rules	Comparison predictive performance of TOR rules between Asian and Western populations	Dr Huang Yu-Sheng (Taiwan)
Relationship between OHCA burden and cardiac arrest outcomes	To determine association between OHCA burden per ambulance and EMS characteristics on EMS performance and OHCA outcomes	Dr Kuo Chan-Wei (Taiwan)
Outcome Prediction for OHCA Patients Using Statistical Computation Approaches	To develop and validate a statistical scoring method to predict OHCA outcomes and to compare the method across different populations	Dr Liu Nan (Singapore)

Potential studies for collaboration

Study Title	Study Synopsis	Lead investigator
Factors Influencing Bystander Cardiopulmonary Resuscitation and the Related Outcomes across countries	To investigate factors (e.g. patient and event characteristics)related to the administration of bystander CPR before arrival of EMS across countries, examining the effect of bystander CPR on survival by adjusting for selection bias, and constructing a classification tree model related to bystander CPR and their effect on survival between groups	Dr Jonathan Lu (Taiwan)
Location Characteristics and the Outcome Impact on OHCA	Compare location characteristics, epidemiology and their impact on survival for OHCA patients across countries	Dr Patrick Ko (Taiwan)

Potential studies for collaboration

Study Title	Study Synopsis	Lead investigator
Barriers to dispatcher-assisted cardiopulmonary resuscitation (DA-CPR) across OHCA registries	Assess impact of DA-CPR on bystander CPR and OHCA survival rates across OHCA registries and determine common barriers (system-/cultural) to DA-CPR	Dr Marcus Ong (Singapore)
Resuscitation Academy (RA) 10-Step Implementations among countries in the OHCA registries	Survey on extent of implementation of RA 10-steps for OHCA survival improvement across OHCA registries and correlating them to survival outcomes	Dr Marcus Ong (Singapore)
Arrest to first compression time and survival outcome in witness OHCA.	To investigate arrest to first compression time on survival outcomes in OHCA victims who receive bystander CPR	Dr Yu Jin Lee (Korea)

Potential studies for collaboration

Study Title	Study Synopsis	Lead investigator
The Outcomes of Traumatic or Injured OHCA and Ventricular Fibrillation	To investigate impact of defibrillation on survival outcomes in patients with traumatic arrests presenting with VF	Dr Yen-Pin Chen (Taiwan)
Comparison of dispatcher-assisted cardiopulmonary resuscitation (DA-CPR) practices among OHCA registries	Survey of DA-CPR practices/interventions among OHCA registries – each emergency dispatch centre may have systemic and structural interventions which influence effective implementation of DA-CPR	Dr Ng Yih Yng (Singapore)
Percutaneous coronary intervention provision and outcomes among cardiogenic OHCA	To investigate PCI rates among OHCA registries and their impact on OHCA survival for adult patients with ROSC after cardiogenic OHCA	Dr Takashi Tagami (Japan)
Environmental exposure as a risk factor for OHCA	To determine the association between ambient air pollution and OHCA incidence across countries/regions in the OHCA registries	Dr Andrew Ho (Singapore)

Potential studies for collaboration

Study Title	Study Synopsis	Lead investigator
CPRCard study	Comparison of chest compression rate and depth in CPR performed with Laerdal CPRcards (real-time CPR quality feedback device) vs those without	A/Prof Marcus Ong/ Mr Alex White
Advanced airway RCT	Multi-national RCT comparing prehospital basic airway management vs. advanced airway management in OHCA patients	Prof Sang Do Shin
PAROS 3 – Manual Defib, HP CPR, ITD, Amiodarone	Stepped-wedge implementation of manual defibrillation, high-performance CPR, ITD, and amiodarone for comparison of ROSC and survival rates with concurrent controls	A/Prof Marcus Ong
MyResponder/ other lay responders dispatch smartphone app	investigate the impact of the app in increasing bystander CPR/AED rate, ROSC, VF, and survival rates	A/Prof Marcus Ong/ Dr Ng Yih Yng

Virtual Singapore (VS) Project

- Multi-disciplinary project in collaboration with Singapore General Hospital, Singapore Civil Defense Force, and Complexity Institute
- Uses agent-based modelling and simulation technologies to optimise preparation and operation of EMS
- Focuses on the following: EMS provision for incidences at crowded places, evacuation of ED, and placement of AED in public housing estates
- If you are interested in conducting post-doc research in this area, please contact A/Prof Marcus Ong, marcus.ong.e.h@singhealth.com.sg

WHAT QUESTION DO YOU HAVE?

THANK YOU ☺