

## The Latest in Resuscitation Science Research Highlights from the American Heart Association's 2017 Resuscitation Science Symposium

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The American Heart Association (AHA)'s Resuscitation Science Symposium (ReSS), held November 10 to 12, 2017, during the AHA Scientific Sessions, offered attendees access to reports of cutting-edge research, networking events, late-breaking science, and much more. This year, 50 oral abstracts and >250 poster abstracts were presented.

### Young Investigator Dinner

The first event of ReSS was the Young Investigator's Dinner. During the dinner, a panel of senior researchers took to the stage to discuss funding opportunities in cardiac arrest and resuscitation research. Although funding for sudden cardiac arrest research has decreased during the past decade, the speakers encouraged the young investigators in the room to remain optimistic and provided examples of funding mechanisms and sources for funding of early-career researchers.

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Panelists discussed the importance of finding mentors and reaching out to others to develop working relationships. The panel concluded by reiterating the critical attribute needed for success as a young investigator: persistence!

Young investigators with top-scoring ReSS abstracts were honored. The 33 awardees' winning abstracts ranged from basic-science research to clinical and epidemiologic studies (Appendix 1).

### Women in Resuscitation and the AHA/Japanese Circulation Society Concurrent Sessions

The Women in Resuscitation networking session focused on the topic of Mentorship and Sponsorship. The session began with an outstanding panel of speakers who discussed the importance of identifying mentors who talk *with* you and sponsors who talk *about* you to others, emphasizing that young investigators need both. However, panel members observed that women are often overmentored and under-sponsored, which resonated with the participants. Although mentors and sponsors may need to be different people, it is possible for truly good mentors to be both. Panelists encouraged young investigators to be prepared to "under" commit and "over" deliver when sponsors provide opportunities early in the investigator's career, to establish credibility and build skills and expertise. Questions and comments from participants generated discussion about the mutual relationship between mentors and mentees. Finally, the panel members encouraged the mentees to have confidence in their own abilities!

The joint session of the American Heart Association/Japanese Circulation Society focused on the many shared interests between these 2 organizations and recognized the immense contributions that the Japanese scientists bring to ReSS and published resuscitation science year after year. This year's joint session focused on bystander cardiopulmonary resuscitation (CPR) and public access defibrillation, 2 pillars in any effort to improve clinical outcomes after out-of-hospital

cardiac arrest (OHCA). Presenters from Japan shared data from the all-Japan registry and from programs of primary and secondary school CPR training. US researchers discussed community engagement to increase bystander CPR and the critical importance of dispatcher-guided CPR. This session highlighted the importance of the basic links in the AHA's Chain of Survival from cardiac arrest: early access to the emergency medical services (EMS) dispatcher, early bystander CPR, and public access CPR and automated external defibrillator programs to promote early defibrillation. Exciting implementation research is underway in both countries!

## Awards Ceremonies

During this year's ReSS, 2 resuscitation clinicians and researchers were honored with Lifetime Achievement Awards.

Dr Vinay Nadkarni, recipient of the AHA Lifetime Achievement Award for Cardiac Resuscitation Research, is a professor and endowed chair at the Children's Hospital of Philadelphia, Departments of Anesthesia, Critical Care, and Pediatrics, University of Pennsylvania Perelman School of Medicine, and is the founder and director of the Children's Hospital of Philadelphia Center for Simulation, Advanced Education and Innovation. Nadkarni served as cochair of the International Liaison Committee on Resuscitation (2007–2016) and was chairman of the AHA Emergency Cardiovascular Care Committee (2006–2010). He was a founding member of the AHA's National Registry of CPR (now Get With the Guidelines-Resuscitation), with current enrollment of >350 hospitals nationwide, and of the Agency for Healthcare Research and Quality-funded National Emergency Airway Registry for Children, with 30 participating hospitals in the United States. Nadkarni was a member of the Board of Directors and is now President of the Citizen's CPR Foundation, and he served on the Board of Directors of the World Federation of Pediatric Intensive and Critical Care Societies. Nadkarni has authored >400 peer-reviewed articles. Nadkarni described the journey of his parents as immigrants to the US, and likened the challenge of research to climbing Mount Everest, noting that goals are needed but flexibility is required to meet challenges along the way. Nadkarni encouraged the participants to strive for excellence and not be afraid to fail, because failure can provide some of the greatest learning opportunities.

Dr Hasan Alam was awarded the AHA Lifetime Achievement Award for Trauma Resuscitation Science. Alam is the Norman Thompson Professor of Surgery and Section Head of the Section of General Surgery at the University of Michigan Hospital. He was the founding medical director of the Multi-Disciplinary Intensive Care Unit at the Massachusetts General Hospital. His research focuses on hemorrhagic shock, traumatic brain injuries, resuscitation techniques, novel cell

preservation strategies, modulation of response to lethal insults, therapeutic hypothermia, hemorrhage control, and development of new treatments for sepsis. Alam has authored >200 peer-reviewed articles. During his acceptance speech, he discussed the importance of assembling the right team, focusing on making changes at the right time, and noted that although sometimes urgent need quickly propels research forward, other times research advances through a lifetime of small steps that get you where you need to be.

The Ian G. Jacobs Award for International Group Collaboration to Advance Resuscitation Science was awarded to the European Registry of Cardiac Arrest (<https://www.erc.edu/projects/eureka-one>). This incredible consortium of >25 countries has collaborated to assemble data from >50 000 OHCA events and has published >40 resuscitation articles.

## Best Oral Abstracts

The winners of the Best Oral Abstracts (Appendix 2) represented a mix of qualitative, quantitative, observational, and basic science research, and all were the products of young investigators! These included an abstract that related differences in team composition to variation in the outcomes for in-hospital cardiac arrest in US hospitals, one that proposed an explanation for why reducing endoplasmic reticulum stress reduces cardiomyocyte apoptosis and trauma-induced secondary cardiac injury, one that explored sex and race differences in the presence of do not resuscitate orders among patients who developed return of spontaneous circulation after cardiac arrest, and one that reported an increase in return of spontaneous circulation and 1-year survival associated with prehospital physician-delivered advanced life support, compared with survival when only prehospital basic life support care is provided.

## Plenary Sessions

The first plenary session of ReSS 2017, titled "Outcomes of Patients Living With Implantable Cardioverter Defibrillators," was delivered by a panel that included researchers, a survivor, the survivor's wife, rehabilitation specialists, and physicians. This panel provided a multifaceted perspective of what it is like to survive cardiac arrest and live with an implantable cardioverter defibrillator. Panelists highlighted the wide range in patient abilities and disabilities at any of the cerebral performance category scores. The disabilities may be invisible to the medical community, but they have real impact on the daily lives of survivors and their families. Panelists discussed an approach to postarrest rehabilitation research to better target methods to reduce the disabilities that challenge survivors and their families, including evaluation of the benefit of exercise for patients who survive cardiac arrest. Each of the speakers in this

session brought a unique perspective and highlighted the kind of patient-centered resuscitation research still needed.

An entire plenary session was devoted to methods of improving bystander CPR by integrating several innovative strategies, including dispatcher-guided CPR. In Singapore, survival after OHCA increased after taxi drivers were equipped and trained in CPR and the use of automated external defibrillators. In the United Kingdom, gains in OHCA survival attributed to dispatcher-guided CPR were sustainable only when coupled with a robust quality assurance program. The quality assurance program included listening to recordings of actual emergency calls to ensure that dispatchers were able to rapidly identify cardiac arrest and quickly guide the caller to initiate chest compressions. In Norway, community CPR education contains information so that, even before an event, bystanders learn what to expect when they call EMS, as well as how to perform CPR. In the final segment of this session, participants learned that most emergency dispatch centers do not provide dispatcher-guided CPR and of those that do, a minority perform any quality assurance monitoring. Presenters cited the AHA Scientific Statement on dispatcher prearrival CPR instructions and the many free resources that are publicly available to assist municipalities to operationalize their dispatcher-guided CPR programs.<sup>1</sup>

The plenary session, “Prognostication After Resuscitation,” included presentations from 4 leaders in the fields of cardiac arrest, trauma, and neurocritical care discussing the evidence available to support neuroprognostication after a wide range of brain insults. The presenters noted the challenges in accurate neuroprognostication and how the evolution of resuscitation techniques and postcardiac arrest care has led to new information and new uncertainty about patient neurologic outcomes.

For prognostication after traumatic brain injury, no tools have excellent positive or negative predictive value (eg, 8% of patients with a postinjury Glasgow Coma Score of 3 have a good outcome), and there is no single optimal tool to predict neurologic outcome after traumatic brain injury. New tools are needed that control for or minimize potential effects of possible clinician biases (ie, withdrawal of care) and shared decision making.

Additional data presented showed that typical assessment and predictive tools for cardiac arrest are flawed and imprecise. Neuroimaging has improved in recent years, but it is not perfect. Computed tomography of the brain, specifically, is only useful when performed early (shortly after the event) and when it demonstrates cerebral edema. This early finding has high specificity for a poor outcome. Magnetic resonance imaging may be better, especially when used in days 2 to 5. Because these neuroassessment tools are imprecise, clinicians must be comfortable with uncertainty in their discussions with patients/families.

For prognostication after cardiac arrest, the presentation, “Appropriate Duration of Resuscitation Efforts,” focused on OHCA. In the past, termination of resuscitation was considered when there was no response to a 20-minute resuscitation attempt. This duration allows time for delivery of high-quality CPR, and, in the presence of a shockable rhythm, delivery of several shocks, plus epinephrine and an antiarrhythmic, or, for a nonshockable rhythm, delivery of  $\geq 2$  doses of epinephrine. Such older CPR duration thresholds became questionable when it became clear that CPR quality varied widely. New data were presented to suggest that for patients with shockable rhythms, attempted resuscitation may be indicated for a minimum of 40 minutes; for patients with nonshockable initial rhythms, attempted resuscitation for a minimum of 30 minutes may be appropriate.

Researchers from the University of Minnesota shared data linking their resuscitation protocol that includes institution of extracorporeal life support or extracorporeal membrane oxygenation as part of resuscitation with increased survival from cardiac arrest. Experts noted that OHCA from a shockable rhythm is usually the result of acute coronary syndrome, so “it’s all about flow.” Good survival is predicted by witnessed arrest, shorter EMS response interval, lower serum lactate, higher end-tidal carbon dioxide during resuscitation, and the presence of intermittent return of spontaneous circulation. To be successful, you “need a bailout strategy” that includes external CPR, a surgeon to take care of CPR-induced injuries, and neuroresuscitation. At this time, other than the link between early cerebral edema on cerebral tomography and early brain death, no neuroprognostic tools were sensitive and specific for poor outcome.

The plenary session on coagulopathy after trauma and cardiac arrest included a review of multiple areas of the coagulation cascade that are affected by traumatic and ischemic injury, as well as by fluid resuscitation for following injury. The speaker also summarized the effects of coagulopathy in the patient resuscitated from cardiac arrest.

The plenary session on pharmacologic resuscitation strategies included information about traditional resuscitation drugs and pharmacologic agents that affect novel targets. The first presentation of the session reviewed preclinical and clinical studies using epinephrine and antiarrhythmic medications, with an emphasis on the importance of the need to determine optimal timing of drug delivery. An in-depth review of the ALPS (Amiodarone, Lidocaine, Placebo Study) left participants with the overarching message of the importance of the right dose, through the right route, to the right patient, at the right time.<sup>2</sup> Attendees were also entertained with a summary of several clinical trials, documenting the limitations of retrospective reviews that often yield conflicting results. However, attendees were reminded that even from neutral or negative trials (so-called “failures”), many lessons are learned that

inform the next generation of research. The final presentation of the session provided a review of pharmacologic agents that affect novel targets of mitochondrial metabolism, a promising avenue of research. Agents being clinically evaluated include erythropoietin, sodium-hydrogen exchanger 1, NO, and nitrite.

## General Oral Presentations

An inspiring session on education innovations in resuscitation science began with an overview of free open access medical education. Tough questions were asked, including, “How do we synthesize the ‘fire hose’ of information and use it in a meaningful way?” This question led directly to the next question, “How do we establish a degree of rigor when synthesizing daily information sources?” and, “What is the corollary to Grading of Recommendations Assessment, Development, and Evaluation for open access medical education information?” These questions will all require further investigation.

A second session about innovations in education began with a visually stimulating presentation that demonstrated the possibilities for augmented reality in medical education. Some of the potential education applications include teaching and learning enhancement (eg, projected holographic images) and skills training (eg, models for central line insertion or CPR training). This provided a natural segue way into a presentation about the goal of simulation to provide a psychological space, surrounded by content experts, in which to rehearse. The final presentation of this session focused on the use of the interactive video game, “Lifesaver” (<https://www.erc.edu/projects/eureka-one>), designed to teach bystander CPR through seamless transitions from scene to scene with branching decision points for the user. The trailer for this “video” game was shown; the striking feature was that if the user made an error, the cardiac arrest victim died.

## Dickinson W. Richards Memorial Lecture

Dr Laurie Morrison delivered an inspirational Dickinson W. Richards Memorial Lecture titled, “Advancing Resuscitation Science: A Combination of Courage, Compassion, Collaboration, Carpe Diem, and a Little Grace.” She began by noting, “to rise from failure in science takes courage, tenacity, and compassion,” traits she demonstrated by relating the agonizing process of multiple grant revisions and years of failure. She then extolled the virtues of cauliflower, noting that some species of cauliflower grow in a fractal pattern. Specifically, the Romanesco cauliflower grows in a Fibonacci spiral that preserves a mathematical relationship to its central source, no matter how large it grows. In this metaphor for community and scientific collaboration, when a single floret dies, the plant becomes mathematically unstable and dies. Morrison

emphasized the importance of grace, humility, and compassion in scientific collaboration. In her words, “The Dickinson memorial lecture celebrates the individual, but also celebrates the community of science. Dickinson won the Nobel Prize, but he did so with 2 friends.”

Two more oral presentations followed the Dickinson W. Richards Memorial Lecture. The first was a retrospective epidemiologic analysis of cardiac arrest survival in the Resuscitation Outcomes Consortium (<https://roc.uwctc.org>) from 2011 to 2015. This included data from 86 000 OHCA events treated by 106 different EMS agencies from 10 enrolling sites. Researchers noted that although cardiac arrest care has evolved in nearly every link in the chain of survival, the incremental increases in survival are flattening out, so it takes a much more integrated effort to produce substantive increases in survival.

The last session of the day looked at race/ethnicity and socioeconomic factors associated with bystander CPR in pediatric OHCA, using the Cardiac Arrest Registry to Enhance Survival data set (<https://mycares.net>). This voluntary registry involves >1400 EMS agencies and 1800 hospitals, including 66 communities in 23 states with a catchment area of 106 million people (one third of the US population). This registry documents the disparities in bystander CPR that continue to exist across communities and that translate into disparities in clinical outcomes. This presentation prompted a provocative question from the audience, “At what point do we have a responsibility to the public to disclose these data on disparities in health delivery and outcomes?”

The National Institutes of Health Funding Report session addressed changes to the K-award training program ([https://grants.nih.gov/grants/funding/ac\\_search\\_results.htm?text\\_curr=k12&Search\\_Type=Activity](https://grants.nih.gov/grants/funding/ac_search_results.htm?text_curr=k12&Search_Type=Activity)) and provided an overview of the Strategies to Innovate Emergency Care (<https://sirenetwork.ucsf.edu>) network and the Emergency Medicine K12 program. To review these changes, check the National Institutes of Health website and talk with your program officer.

At the heavily attended EMS session, topics related to mechanical and manual CPR were presented. First, an overview of trials of both manual and mechanical CPR was summarized, comparing the Autopulse and Lucas devices with manual CPR; both devices conferred similar survival outcomes to manual CPR. Two presentations were then delivered in a balanced format, one providing support for the use of mechanical CPR and one providing support for the use of manual CPR for OHCA. The presenters concluded that clinicians should consider the pros and cons of each of these modes of CPR delivery.

During the session on genetics of sudden cardiac death, one lecture provided an overview of a wide range of research, concluding the following: (1) genetic testing is additive to autopsy information, (2) genetics is diagnostic, (3) it is useful

for surviving family members, (4) it is important to consider the cost, and (5) further research is needed. In addition, attendees were reminded that for pediatric genetics, long corrected QT is an important risk factor for sudden infant death syndrome. The session concluded with lessons from the sepsis genome-wide association study: more research is needed, and there is opportunity for collaboration!

## Year in Review: Trauma and Cardiac Arrest

The trauma year in review examined major developments in trauma resuscitation published during the past year. Topics included the opioid crisis, the use of resuscitative endovascular balloon occlusion of the aorta, and the EPR (Emergency Preservation and Resuscitation) trial.

The cardiac arrest year in review lecture highlighted key studies in coronary artery disease, bystander CPR disparities by race and socioeconomic status, targeted temperature management, and tracheal intubation. A powerful takeaway statement from that review: hypothermia studies are “a hot mess.”

## Late-Breaking Science

The “Late-Breaking Resuscitation Science” session was composed of presentations by 4 researchers that included compelling data from research projects focusing on cardiac arrest.<sup>3</sup> Studies included the NORCAST (Norwegian Cardiorespiratory Arrest Study),<sup>4</sup> with the aim to prospectively assess multimodal neuroprognostication in patients surviving OHCA, and another study about the use of resuscitative endovascular balloon occlusion of the aorta in a porcine model of hemorrhagic cardiac arrest.<sup>5</sup>

One-year outcome data were presented from a pilot study, FROST-I (Finding the Optimal Cooling Temperature After Out-of-Hospital Cardiac Arrest Trial).<sup>6</sup> FROST-I compared 150 patients with witnessed ventricular fibrillation OHCA treated with targeted temperature management, maintained at 32°C, 33°C, or 34°C. There were no differences in outcomes across the 3 groups. Finally, data from the Resuscitation Outcomes Consortium ALPS examined the association between antiarrhythmic use and rearrest or quantitative ECG waveform characteristics.<sup>2,7</sup> The use of antiarrhythmics (amiodarone, lidocaine, or placebo) did not affect rearrest rates.

## Oral Abstracts

The trauma session featured cutting-edge data from multiple continents and began with data evaluating the effect of both hypotension and hypoxia on mortality in the Excellence in Prehospital Injury Care Traumatic Brain Injury cohort. Researchers also evaluated a prehospital traumatic bleeding severity score to predict the need for massive transfusion.

Vasopressor use in patients with trauma was presented from the Japan trauma registry. Although the data suggest that vasopressor use is associated with increased risk of death, the data set cannot account for vasopressor dose or the use of multiple vasopressors.

Finally, disseminated intravascular coagulation in traumatically injured patients was reviewed. Disseminated intravascular coagulation is associated with increased mortality in traumatically injured patients, and it frequently requires multiple laboratory tests to diagnose. The speaker evaluated 5 different clinical scores to predict the presence of disseminated intravascular coagulation. The retrospective observational study of 1266 patients admitted with severe trauma between 2012 and 2015 found the Japan Ministry of Health and Welfare score demonstrated the best area under the curve (0.751; 95% confidence interval, 0.726–0.775) for predicting 28-day mortality.

The Basic Science/Translational session was jam packed with outstanding preclinical (animal) research, with a goal of understanding and minimizing brain injury after cardiac arrest. Overall, this session highlighted important studies that are finding therapies to attenuate brain injury after cardiac arrest and ischemia/reperfusion. Strategies included the use of chemical therapies during arrest, positioning of patients, and the use of physical and pharmacologic therapies in the immediate post–return of spontaneous circulation period.

In the concurrent session on cardiac arrest epidemiology, disparities in cardiac arrest care were demonstrated, including disparity in the bystander CPR provided for female victims of OHCA compared with male victims and disparities in care for victims of OHCA that occur long after the patient survives the arrest event. For example, patients with higher household income derive more benefit from a postcardiac arrest trip to the catheterization laboratory than those in lower income brackets. The influence of air pollution on OHCA in Singapore was also presented, followed by a discussion of the variation in in-hospital cardiac arrest survival to hospital discharge among facilities in the Veterans Administration system.

The concurrent clinical session included presentation of abstracts on OHCA refractory ventricular fibrillation, genetic risk, and coronary artery disease, as well as acute respiratory compromise. Researchers also presented the results of examining hypoxia and hyperoxia in resuscitated patients from the CRITICA (Comprehensive Registry of In-Hospital Care for OHCA Survival) study from Osaka, Japan.<sup>7,8</sup> In another abstract presentation, the Get With the Guidelines-Resuscitation ([http://www.heart.org/HEARTORG/Professional/GetWithTheGuidelines/GetWithTheGuidelines-Resuscitation/Get-With-The-Guidelines-Resuscitation\\_UCM\\_314496\\_SubHomePage.jsp](http://www.heart.org/HEARTORG/Professional/GetWithTheGuidelines/GetWithTheGuidelines-Resuscitation/Get-With-The-Guidelines-Resuscitation_UCM_314496_SubHomePage.jsp)) database was used to derive and validate a score to predict outcomes in pediatric patients resuscitated from cardiac arrest.

Finally, 2 presentations pushed the envelope in trauma and cardiac arrest research. One presented the effects of the use of an artificial substitute for red blood cells in a rat model of hemorrhagic shock, and the other presented the results of cerebral selective deep hypothermia for patients resuscitated from cardiac arrest and placed on extracorporeal membrane oxygenation.

### Conclusion

This year’s ReSS illustrated how we can learn from our prior experiences in resuscitation research, and it provided exciting new avenues to pursue future research. The common theme throughout ReSS was the notion that in research, what makes one successful is hard work, collaboration, teamwork, and persistence. This was demonstrated over and over again by all who presented!

### Appendix 1

#### ReSS 2017 Young Investigator Award Winners

Name	Abstract Title
Makoto Aoki	Increased Risk of Mortality With Vasopressor Use in Traumatic Hemorrhage Shock: A Nationwide Cohort Study in Japan
Mina Attin	Paced ECG Prior to In-Hospital Cardiac Arrest
Jason Bartos	Burden of Coronary Artery Disease in Patients With Out-of-Hospital Refractory Ventricular Fibrillation Cardiac Arrest
Justin Benoit	Timing of Advanced Airway Placement After Out-of-Hospital Cardiac Arrest: Earlier Is Better
Abhishek Bhardwaj	Targeted Temperature Management and Acute Kidney Injury in Cardiac Arrest
David Buckler	Association of Demographic and Geospatial Factors With the Provision of Bystander CPR Following Out-of-Hospital Cardiac Arrest
Apurba Chakrabarti	Hospital-Level Variation in Short-Term and Long-Term Survival After In-Hospital Cardiac Arrest in the Veterans Health Administration
Christopher Cheung	Clinical and Electrocardiographic Predictors of Occlusive and Obstructive Coronary Artery Disease Following Out-of-Hospital Cardiac Arrest
Andrea Cogliati	Annotating ECG Signals With Deep Neural Networks

Continued

#### Appendix 1. Continued

Name	Abstract Title
Patrick Coppler	Long-Term Outcomes Disparities in Survivors of Cardiac Arrest
Guillaume Debaty	Defining the End of the Circulatory Phase in Humans Undergoing Cardiopulmonary Resuscitation
Duc Do	Predicting the Risk of In-Hospital Cardiac Arrest in Real Time by Identification of Changes on Continuous Electrocardiographic Telemetry Monitoring Using Automated Algorithms
Asger Granfeldt	The Association Between the Severity of Chronic Obstructive Pulmonary Disease and Presenting Rhythm in Patients With Out-of-Hospital Cardiac Arrest
Brian Grunau	The Relationship Between Intra-Arrest Transport and Survival for Refractory Out-of-Hospital Cardiac Arrest
Kei Hayashida	Soluble Guanylate Cyclase- $\alpha$ 1 in Bone Marrow Derived Cells Is Required for Inhaled NO to Improve Outcomes After Cardiac Arrest and Cardiopulmonary Resuscitation in Mice
Mathias Holmberg	Derivation and Internal Validation of a Mortality Prediction Tool for Initial Survivors of Pediatric In-Hospital Cardiac Arrest
Rohan Khera	Hospital Variation in the Use of Targeted Temperature Management for Out-of-Hospital Cardiac Arrest
Takahiro Kinoshita	Novel Trauma Work Flow Using IVR-CT Installed in Trauma Resuscitation Room Improved Mortality in Patients With Severe Torso Injury
Dong Hun Lee	Prognostic Performance of 5 Disseminated Intravascular Coagulation Score Systems in Severe Trauma
Ronstan Lobo	Acute Coronary Occlusion Is Common in Patients Without STEMI Undergoing Early Coronary Angiography After Out-of-Hospital Cardiac Arrest
Tsung-Chien Lu	Development and Validation of a Triage Tool in Predicting Cardiac Arrest in the Emergency Department
Constantine Mavroudis	Inhaled NO Improves Cerebral Mitochondrial Function in a Blinded, Randomized Controlled Pediatric Swine Asphyxial Cardiac Arrest Trial
Takahiro Nakashima	The Potential of Public-Access Defibrillation by Citizen Before Emergency Medical Service Contact in Out-of-Hospital Cardiac Arrest Patients With Shockable Rhythm

Continued

Appendix 1. Continued

Name	Abstract Title
Mitsuaki Nishikimi	Risk Classification of Post-Cardiac Arrest Syndrome Based on the CAST: Is Targeted Temperature Management at 34°C Recommended in the Moderate-Risk Group?
Takayuki Ogura	Prehospital Traumatic Bleeding Severity Score: A Validation Study of On-Scene Prediction of the Need for Massive Transfusion
Masashi Okubo	Variation in Survival After Out-of-Hospital Cardiac Arrest Between Emergency Medical Services Agencies
Gwan Jin Park	Preventive Effects of Safety Car Seat on Clinical Outcomes to Children in Road Traffic Injury
Juan Russo	Optimal Mean Arterial Pressure in Comatose Survivors of Out-of-Hospital Cardiac Arrest: An Analysis of Area Below and Between Blood Pressure Thresholds
Jessica Salerno	Simulation of the Effects of Colocating Naloxone With Automated External Defibrillators
Huu Tam Truong	Combining Mechanical Chest Compressions With a Percutaneous Left Ventricular Assist Device Improves Favorable Neurological Function After Cardiac Arrest in a Large Animal Catheterization Laboratory
Chih-Hsien Wang	A Pilot Study of Cerebral Selective Deep Hypothermia in Extracorporeal Cardiopulmonary Resuscitation for Out-of-Hospital Cardiac Arrest Patients
Jiefeng Xu	The Effects of Rapid Esophageal Cooling on Cardiac Outcomes After Cardiopulmonary Resuscitation in a Porcine Model

CAST, Cardiac Arrhythmia Suppression Trial; CPR, cardiopulmonary resuscitation; IVR-CT, ; ReSS, Resuscitation Science Symposium; STEMI, ST-segment–elevation myocardial infarction.

Appendix 2

ReSS 2017 Best Abstract Award Winners

Name	Title	Category
Brahmajee K. Nallamothu	How Do Resuscitation Teams at Top-Performing Hospitals for In-Hospital Cardiac Arrest Differ? A Qualitative Study	Cardiac Resuscitation Science

Continued

Appendix 2. Continued

Name	Title	Category
Zi Ya	Endoplasmic Reticulum Stress Contributes to Cardiomyocyte Apoptosis in Trauma-Induced Secondary Cardiac Injury	Trauma Resuscitation Science
Sarah M. Perman	Do Race and Sex Differences Exist for Do Not Attempt Resuscitation Orders in Patients Successfully Resuscitated From In-Hospital Cardiac Arrest?	Trauma Resuscitation Science
Tatsuma Fukuda	Prehospital Advanced Life Support and Survival After Traumatic Out-of-Hospital Cardiac Arrest: A Cohort Study From the Japanese National Registry	Cardiac Resuscitation Science

ReSS, Resuscitation Science Symposium.

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