FINANCIAL REPORT

The ZOLL Foundation financial status at March 31, 2018 was as follows: The Foundation had assets of approximately $13 million. Additional contributions from ZOLL Medical, Asahi Kasei, and other potential donors are expected to be added to the Foundation's assets through 2020, allowing for expansion of grants as the Foundation's assets increase.

The Foundation has provided $718,748 in funding support to investigators since it began supporting research in resuscitation and acute critical care on a global basis. Average grants range from $10,000–$50,000 depending on scale and duration of the research.

WHAT AND HOW

During the reporting period the Foundation implemented a new on-line program for applicants to use to apply for support, receive confirmation of submissions, complete application requirements, and upload professional information and the supporting information useful in describing anticipated research. The Foundation also established a twice a year application deadline and approval/review schedule to give applicants a better tool for planning submissions, understanding prospective approval dates, and planning their work if approved. The online system also supports convenient Board review of applications and supporting materials.

Applications for support can be made through the Foundation website, www.zollfoundation.org, which publicizes the Foundation's purposes and grants. The application process is designed to be fairly simple. There are two deadlines each year, March 31 and September 30, with awards being made around May 31 and November 30, respectively. The Board meets two times a year to review grant applications and conduct Foundation business. Grantees agree to certain stipulations about the administration of the grant, provide yearly reports about the use of the grant funds, and a final report related to their work when completed. Grants are typically made to the institution the grantee is affiliated with, in accordance with rules governing 501(c)(3) organizations, and earmarked for their work.

WHO IS BEHIND THE FOUNDATION

BOARD OF DIRECTORS

The Board is very privileged to have **Dr. Norman Paradis** as a member lending scientific expertise to the Board's review of applications. He is a visiting Professor of Medicine, Geisel School of Medicine Dartmouth College, and Clinical Associate Professor of Emergency Medicine, Keck School of Medicine at the University of Southern California. He is also an Attending Physician at Dartmouth Hitchcock Hospital in Lebanon, New Hampshire, and LAC-USC Medical Center, Los Angeles, California. Board Certified in Emergency Medicine, Dr. Paradis is a highly respected resuscitation scientist and physician.

Ms. Coreen M. Packer, Trustee of the Packer Family Trust, also serves on the Board as an outside director.

Mr. Ward Hamilton, retired from ZOLL Medical after 25 years, was named President of the Foundation in January 2018.

Mr. Richard Packer, former Foundation President, replaced Hamilton as Clerk; he is Chairman of ZOLL Medical and Primary Executive Officer of Asahi Kasei HealthCare.

Mr. John Bergeron, semi-retired from ZOLL, continues as Treasurer.

No directors receive any compensation and all serve voluntarily.

ADMINISTRATION

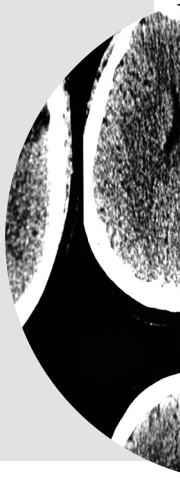
Ms. Susan Schumacher, a Senior Director in Marketing at ZOLL, is Administrator.

The Foundation's Counsel **Alyssa C. Fitzgerald, Esq.** of Goodwin Proctor LLP, Boston, Massachusetts.

THANK YOU

The Foundation acknowledges and thanks the many researchers who have submitted applications and helped to establish this foundation's activities. We regret we are not able fund all applicants.

The Foundation also acknowledges and thanks the organizations and individuals who have and continue to contribute to the Foundation. These contributions have ensured sufficient resources to pursue the goals we established in the formation of the organization.

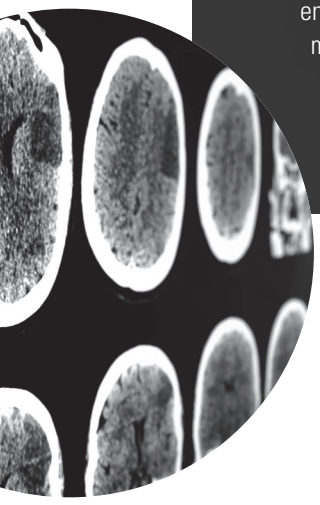


ZOLL FOUNDATION
ACTIVITIES REPORT

APRIL 2016 – MARCH 2018

> “In addition to successfully completing and publishing our project, the data supported by this grant were foundational preliminary data for a subsequently funded 5-year K23 career development award that builds our work here.”

Jonathan Elmer, M.D., Assistant Professor, Departments of Emergency Medicine, Critical Care Medicine and Neurology, University of Pittsburgh. 2014 ZOLL Foundation grant recipient for research entitled, “Swine model of multimodal neurological monitoring and goal-directed treatment after cardiac arrest.”



The ZOLL Foundation was established in 2013 by ZOLL Medical Corporation, an Asahi Kasei Group Company, as a Massachusetts non-profit charitable organization to promote research in resuscitation and acute critical care.

The Foundation qualifies as tax-exempt under the United States Internal Revenue Code Section 501(c)(3). Contributions to the Foundation are tax-deductible under Section 170 of the Code. The Foundation is also registered as a non-profit charity with the Office of the Attorney General for the Commonwealth of Massachusetts. As a non-profit organization, the Foundation can accept tax-deductible contributions from individuals. As a private foundation, it can make grants to other organizations classified as 501(c)(3) public charities or private foundations; foreign organizations whose activities are in furtherance of the foundation's charitable purposes; and individuals who meet grant eligibility criteria.

The Foundation's purposes have been supported by substantial donations from ZOLL Medical Corporation, Asahi Kasei, The Packer Family Trust, donations from ZOLL executives and employees, and ongoing contributions from members of the ZOLL and Asahi Kasei Group companies.

The Foundation exists as an independent entity from ZOLL Medical Corporation, with a separate Board of Directors, including two outside directors who are not ZOLL employees, and two directors who are ZOLL retirees.

It is the Foundation's primary purpose to provide grants targeted at new research, new researchers, and new ideas in education and public awareness related to improving resuscitation practices, preventing patient deterioration with associated cardiac arrest and morbidity, and enhancing the care of acute patients to reduce mortality and morbidity. By Board determination, grants provided focus on getting new ideas started, providing "seed money" to help stimulate interest in the field, and attracting young investigators to the public health problems of sudden death, acute critical care, and improving post-resuscitation care.

The Board is oriented to providing support to applicants through smaller grants, in contrast to a single or a few large grants for major studies. It is the Board's objective that support of early ideas and new professionals interested in resuscitation will both motivate recipients to focus their careers on improving resuscitation and critical care, and also allow them to attract additional support and funding for additional studies, if promising, based on the early work funded by the ZOLL Foundation.

The activities of the Foundation are governed by by-laws on file with the Secretary of State for the Commonwealth of Massachusetts. The Foundation has a policy to not provide grants that include amounts for institutional overhead. The Foundation adheres to policies covering conflict of interest, grant-making procedures, and records retention. Grants to organizations outside of the United States are subject to checks related to foreign entities necessary to maintain the Foundation's 501(c)(3) status as a charitable organization. The Foundation's fiscal year ends on March 31 of each year.

The Board has also adopted a policy to not support research directly related to ZOLL Medical products or Asahi Kasei medical products to avoid potential conflict-of-interest issues related to the Foundation's charitable status. The incidental use of ZOLL products in research funded by the Foundation will be reviewed by the Board, and will be allowed if such use is in its entirety incidental to the purpose for which the research is being performed.

To keep all contributors and interested parties informed about the Foundation's activities and help applicants with information related to approved projects, the Foundation is committed to publishing reports on an annual or other appropriate periodic basis reviewing the support it has provided in accordance with the purposes for which it was established.

The ZOLL Foundation's first report was provided in an Annual Report that covered activities through March 31, 2016, 30 months after the foundation was deemed a tax-exempt, non-profit organization on September 10, 2013. This report covers the period from April 2016 until March 2018.

GRANT OUTCOMES*

Those awarded grants are required to submit an annual progress report. Seed grants can often be the catalyst for significant new work and the results yielded can be the stimulus for additional research and funding. The Foundation's grants are intended for newer investigators around the globe who have the potential to make a big impact on their field of research, especially resuscitation and acute critical care. In addition, we are mindful of the exposure of the research through scientific assemblies and publications, which have the means to stimulate further interest in research in the field and drive applications from others interested in support from the ZOLL Foundation. Applications for funding support have grown as the Foundation's activities have become more prominent. We believe this will stimulate more applications, making for a more highly competitive process. Additionally, the amount of funding available is also increasing, as more donations increase the Foundation's resources.

We are pleased to add two excerpts from final reports provided by two of our earlier grantees. Their results are indicative of how meaningful a modest grant from the ZOLL Foundation can be in advancing research and the careers of new researchers in resuscitation and acute critical care.

Aaron Donahue, M.D., one of first to be awarded a Foundation grant in 2014, is Associate Professor of Critical Care Medicine and Pediatrics, Perelman School of Medicine at the University of Pennsylvania, in addition to being an Attending Physician in the Division of Critical Care Medicine and Emergency Medicine at Children's Hospital of Philadelphia (CHOP). His research, conducted with Benjamin Kerrey, MD, and Karen O'Connell, M.D., is entitled, "Videography in Pediatric Emergency Research: Establishing a Multicenter Collaborative and Resuscitation Registry." In the period covering the grant funding – 2015 to 2017 – the project achieved all goals established in the original proposal. These milestones were: 1) Creating a data registry to be populated from video review of pediatric resuscitation events in three tertiary pediatric emergency departments; 2) Completing feasibility and reliability testing using simulated resuscitations under video recorded conditions, and 3) Going live with actual patient cases late in 2016 after IRB approvals from two of three centers, with the third pending.

Dr. Donahue's and colleagues' preliminary research results were presented at a number of respected meetings, including the Eastern Society for Pediatric Research in Philadelphia, the International Pediatric Simulation Symposium and Workshop in Glasgow, the annual meeting of the Pediatric Academic Societies in Baltimore, and the American Heart Association Resuscitation Science Symposium in New Orleans. Additionally, a peer-reviewed manuscript was accepted for publication in *Pediatric Emergency Care*, with a second manuscript in preparation. And finally, a favorable score was received on an application for NIH funding through NICHD.

Timothy C. Y. Chan, PhD, was awarded a grant in 2015 for his research on "Optimizing public access defibrillation deployment incorporating hours of operation." At the University of Toronto, he is Canada Research Chair in Novel Optimization and Analytics in Health; Associate Professor, Mechanical and Industrial Engineering; and Director, Centre for Healthcare Engineering. With the support of the ZOLL Foundation funding, a novel spatiotemporal model to optimize the deployment of AEDs in both space and time was designed. AED locations were determined by considering estimates of both geographical and time-of-day risk for out-of-hospital cardiac arrest (OHCA). Data collected on hours of operation of public buildings and businesses in Toronto enabled a second study to characterize the spatiotemporal risk of OHCA in different location types in Toronto. Being able to rank businesses and other location types according to a novel risk measure will serve as a guide for public-private partnership in public access defibrillator deployment.

The initial project resulted in two high-impact papers that describe the findings of the two studies. A paper on the spatiotemporal optimization study was published in the *Journal of the American College of Cardiology* in 2016 (Sun et al., 2016). A subsequent paper classifying spatiotemporal risk of different location types was accepted in *Circulation* for publication in Spring 2017 (Sun et al., 2017). The 2016 publication attracted substantial attention by other media, including *Cardiovascular Business*, *Reuters*, *Global News*, *The Globe and Mail*, *Huffington Post*, *Science Daily*, and *US News & World Report* Online. The rising profile of Dr. Chan importantly attracted other research groups and knowledge users as ongoing research and implementation partners, including the Copenhagen project and the University of Toronto.

* Please note that information shared is what was provided in a grantee's annual or final report. It represents only the latest information provided to the Foundation, but may not be the most final information available.

> "Thanks to the ZOLL Foundation, we can for the first time ever, look at the issue of cardiac arrests from a regional perspective in the Middle East."
>
> Allan Batt, M.D., Associate Professor, Fanshawe College. A 2018 ZOLL Foundation grant recipient proposing to conduct a scoping review of existing studies on OHCA in the Arabian Gulf to guide development of manuscripts or policies, as well as strengthen and aid future research on this issue in the region.

SUMMARY OF GRANTS

Since its inception through June 2019, the Foundation has awarded **over $1,000,000** in grants to **37 recipients.**

2019

GRANT TITLE	INSTITUTION	COUNTRY	LEAD RESEARCHER	TOTAL ($)
Investigate the effects of WIN55, 212-2 on CB2 receptors following cardiopulmonary resuscitation.	Virginia Commonwealth University	United States	Jennifer Bradley, MS, CRA	**$295,019**
Compare personalized selection of an optimal MAP to each patient versus standard hemodynamic management with all having same BP goal	University of Pittsburgh School of Medicine	United States	Patrick Coppler, PA-C	
Aim to improve initial & long-term survival & diminish neurological damage after global ischemia & reperfusion by administration of Hemarina-M101 after CA	Inselspital Bern University Hospital	Switzerland	Michael Glas, Dr. Medicine	
Hypothesize that CPR augmented by balloon aortic occlusion benefits from adaptive balloon-wealing protocol tailored to maintain a blood pressure	Travis Air Force Base, Clinical Investigation Facility	United States	Guillaume Hoareau, DVM, PhD	
Will test the prognostic potential of LPC using an established rate model of cardiac arrest and human patients	Feinstein Institute for Medical Reaserch	United States	Junhwan Kim, PhD	
Effect of MAP on cerebral perfusion & metabolism after CA in porcine	Oslo University Hospital	Norway	Christina Skare, MD	
Improving simulation-based medical education in pediatric resuscitation: Real-time feedback and visual attention	Medical University of Vienna	United States	Michael Wagner, MD	
Test the feasibility and yield of nanopore sequencing, as compared to culture, for assessment of body fluid speciments from post Cardiac Arrest patients	Univerisity of Pittsburgh	United States	Alexandra Weissman, MD	
Mechanisms ot pharmacological hypothermia induced by cannabinoid receptor agonist WIN55, 212-2 on outcomes of CPR	Soochow University Second Affiliated Hospital (Research at Virginia Commonwealth University)	China (United States)	Yan Xiao, MD	

SUMMARY OF GRANTS *(continued)*

2018

GRANT TITLE	INSTITUTION	COUNTRY	LEAD RESEARCHER	TOTAL ($)
Test hypothesis that rapidly induced therapeutic hypothermia in those with acute coronary occlusion extends the door to perfusion time from 120 to 240 minutes with no increase in myocardial infarct size.	University of Arizona	United States	Madhan Shanmugasundaram, MD	
Determining the impact of telemedicine on outcomes after pediatric out-of-hospital cardiac arrest	Avera McKenna Hospital	United States	Katie A. DeJong, DO	
Role of electrical impedance in pseudo pulseless electrical activity	Dartmouth Hitchcock Medical Center	United States	Harman S. Gill, MD	
The usage and effects of epinephrine in pseudo-PEA	University of Pennsylvania	United States	Felipe Teran-Merino, MD	
Impact of kynurenin pathway (KP) inhibition on survival and neurological outcome after cardiac arrest and CPR	Istituto di Ricerche Farmacologiche Mario Negri	Italy	Aurora Magliocca, MD	
Define subsets of pulseless electrical activity (PEA) following initial out-of-hospital cardiac rhythm analysis using machine learning	University of Pennsylvania	United States	Steven Balian, MD	
Advance healthcare provider resuscitation quality using an immersive augmented reality CPR training system	University of Pennsylvania	United States	Marion Leary, MD	
Mechanisms of coagulation following OHCA and how influenced by post arrest care including therapeutic hypothermia.	Yeouido St. Mary's Hospital, Seoul	Korea	Jung-hee Wee, MD	
Testing hypothesis that shock burden will intensify myocardial injury	Rosalind Franklin University of Medicine and Science	United States	Salvatore Aiello, MS	**$706,057**
Feasiblity of random allocation to active RIC vs. Sham RIC quickly upon ED arrival following resuscitation	University of Washington	United States	Emily Bartlett, MD	
Investigate the pharmacokinetics of ART-123 in healthy pigs to verify that the relatively prolonged circulation times seen in other species will be reproduced in swine.	University of Michigan	United States	Colin Greineder	
Determine potential neuroprotective effects of dexmedetomidine	Massachusetts General Hospital, Simches Research Center	United States	Michael Silverman, MD	
Rapid Cycle Deliberate Practice in First Five Minutes Training to Improve Team Dynamics and Resuscitation Skills	Northeast Ohio Medical University	United States	Wendy Van Ittersum, MD	
Determine whether systemic allogeneic CDC administration reduces myocardial and neurological injury in swine with post-cardiac arrest syndrome.	University of Buffalo	United States	Brian Weil, PhD	
Investigate whether the three second pause in compressions is long enough to provide two ventilations when using mechanical chest compressions during out-of-hospital cardiac arrest	Amsterdam University Medical Center	Netherlands	Hans van Schuppen, M.D.	
Establish the effectiveness of physiologically guided resuscitation by use of NIRS during CPR	Kyoto University Health Service	Japan	Takeyuki Kiguchi, M.D.	

SUMMARY OF GRANTS *(continued)*

	GRANT TITLE	INSTITUTION	COUNTRY	LEAD RESEARCHER	TOTAL ($)
2017	Investigation of organ dysfunction of diabetics following cardiac arrest	Aarhus University Hospital	Denmark	Lauge Vammen, MD	$193,525
	The study of adrenaline and its effects on cardiac arrest	St. Michael's University	Canada	Steve Lin, MD	
	Use eye-tracking technology to characterize how providers focus their visual attention during newborn resuscitation and assess the impact of a novel resuscitation monitor	University of Pennsylvania	United States	Elizabeth E. Foglia, MD	
	Study involving cardiogenic shock patients randomized to therapeutic hypothermia plus standard medical care or standard medical care alone	University of Chicago Medicine	United States	Jonathan Paul, MD	
	Test use of Coenzyme Q10 for neuroprotection in post-cardiac arrest patients to mitigate mitochondrial injury	Aarhus University Hospital	Denmark	Mathias Holmberg, MD	
	A scoping review of existing studies investigating OHCA in the Arab Gulf Region	Fanshawe College	Canada	Alan M. Batt, MICP	
2014 – 2016	Implementation of a multicenter registry for pediatric ED resuscitations using video recording	University of Pennsylvania	United States	Aaron Donoghue, MD	$130,681
	Development of multimodal monitoring and treatment protocols for high-risk post-arrest patients	University of Pittsburgh	United States	Jonathan Elmer, MD	
	Optimizing public access defibrillation deployment incorporating hours of operation	University of Toronto	Canada	Timothy Chan, PhD	
	Test hypothesis that therapeutic hypothermia will be anti-arrhythmic during resuscitation and improve ROSC after VF arrest	Case Western Reserve University	United States	Joseph Stephen Piktel, MD	
	To investigate temporal differences between asphyxial induced cardiac arrest (ACA) and ventricular fibrillation induced cardiac arrest (VFCA) and its impact on myocardial and neurological injury; to examine the temporal changes in brain and cardiac ATP levels, antioxidant reserve, and the generation of reactive oxygen species	Aarhus University Hospital	Denmark	Soren Rahbek, MD	
	Potassium cardioplegia with calcium reversal for ventricular fibrillation arrest: a blinded randomized controlled trial	University of Pittsburgh	United States	Keith Marrill, MD	