

RACING TO THE TOP IN CARDIAC CARE

Improving SCA outcomes through proven CPR fundamentals, robust analytics and the latest in biomedical technology

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As the leading cause of death in adults over age 40, sudden cardiac arrest (SCA) presents one of the most formidable challenges to EMS crews and hospitals. According to AHA, the average SCA survival rate is 10.6%, and survival with good neurologic function is 8.3%. Nearly one in three victims survives when the arrest is witnessed by a bystander.

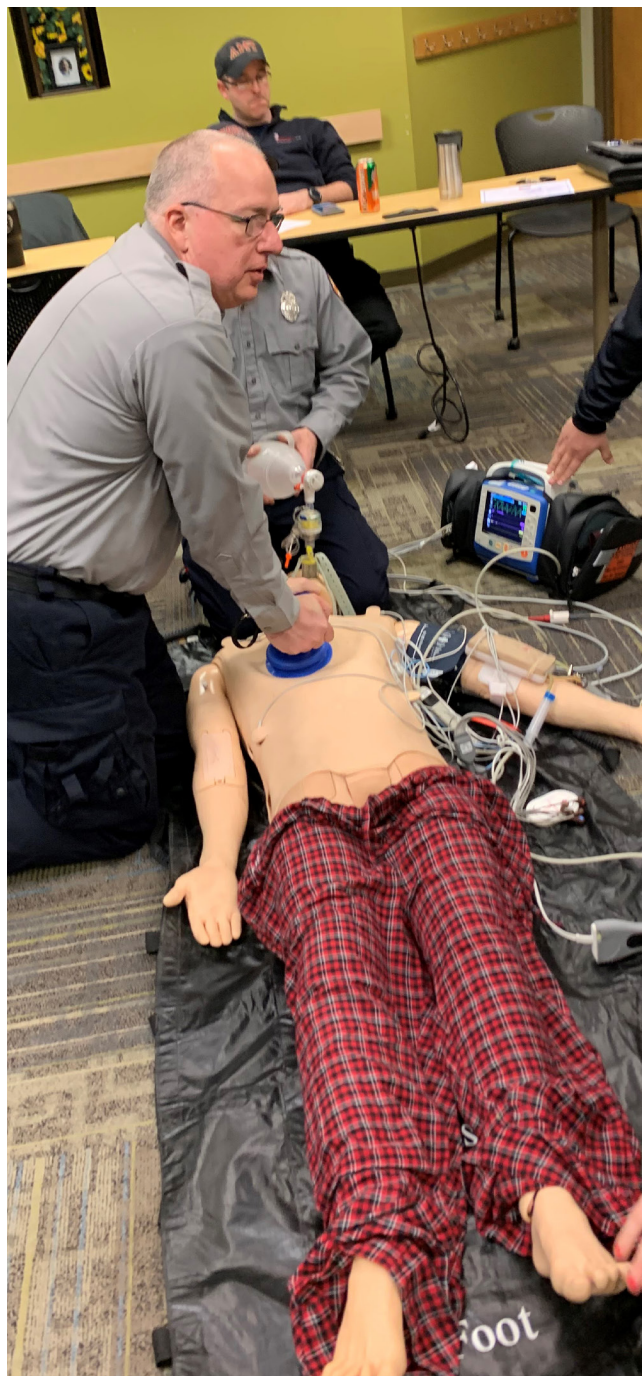
The most progressive EMS systems are those willing to take an unflinching look at areas where improvements can be made. When Advanced Medical Transport (AMT), located in central Illinois, examined cohort data and outcomes results related to out-of-hospital cardiac arrest (OHCA) in its service area, the reality was less than desirable. Initially, only limited data was available and quality improvement initiatives were strictly measuring return of spontaneous circulation (ROSC) outcomes. The tracking of end-outcomes regarding neurologically intact survival-to-discharge was seldom reported. Closer examination revealed high variability in resuscitative efforts with no focused leadership, resources, training, education, or data collection in regard to cardiac arrest patients.

“We knew that with a focused and systemic approach, we could increase survivability in our community. We decided that in order to improve true survivability, we would need to work hard and trust the process,” says Lauren Emanuelson, RN, BSN, CCEMT-P, PHRN, clinical coordinator of the AMT Race to the Top program. “You have to own your accountability and align what your crews are doing to current evidence. Be a data-driven practice. That starts with a top-to-bottom review. You don’t know what you are missing until you measure it.”

Headquartered in Peoria, Illinois, Advanced Medical Transport covers communities across northern Illinois and eastern Iowa and responds to 60,000 calls for service per year. While the agency prided itself on staying current with evidence-based practice surrounding OHCA, few comprehensive metrics were available prior to 2014 to back that up.

“Our focus on cardiac arrest was an important part of our comprehensive key performance indicators, but it was very similar to most all ALS systems,” says Andrew Rand, CEO of AMT. “For much of my career, evidence-based medicine in the EMS space was not a reality; so that framework had to change.”

Consequently, AMT leadership, in close collaboration with Roland Tenley, the Battalion Chief of Emergency Medical Services for the City of Peoria Fire Department, made an organizational decision to begin with a fresh team of eyes on everything supported by the data being accumulated in the National CARES database. A new initiative was born from the ground up, and was supported from the top down—the mantra being things that get measured, get better.





THE 8 OBJECTIVES OF RACE TO THE TOP

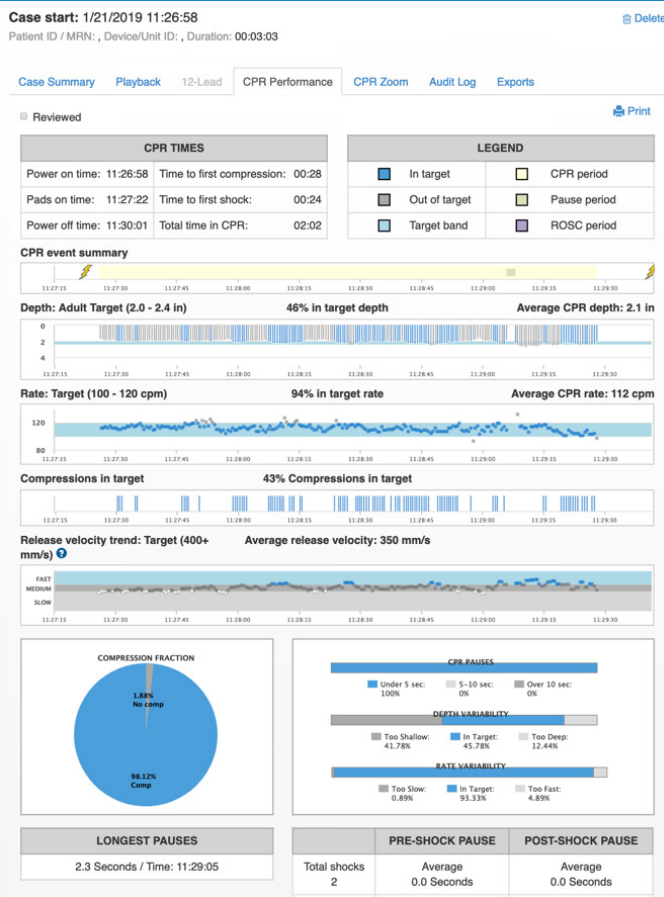
- Immediate recognition of sudden cardiac arrest
- 9-1-1 activation, "First-Care" hands-only CPR, GPS to the rescue
- Access to and utilization of AEDs
- Pit crew resuscitation by EMS providers
- Deployment of advanced practice paramedics
- Advanced biomedical tools
- Immediate provider feedback
- Community and caregiver recognition

What is Race to the Top?

Originally developed at AMT in 2014 with the assistance of physician experts, medical centers and biomedical manufacturers, Race to the Top is an all-encompassing quality improvement program targeting continuous improvement in cardiac arrest outcomes. The program focuses on the development of resuscitative education identified through a case-by-case review process. Next, a robust training program with other local first responder entities utilized simplified practice, evidence-based medicine and data-driven modifications to clinical protocols as needed.

Race to the Top consists of eight specific, interdependent, measurable objectives:

- **Immediate recognition of sudden cardiac arrest.** Community outreach and education are central to raise the awareness of immediate CPR and 9-1-1 activation in the critical seconds after a cardiac event.
- **9-1-1 activation, "First-Care" hands-only CPR, and GPS to the rescue.** Hands-only CPR and application of an AED by bystanders can improve survival chances before responders can arrive. AMT also deployed technology allowing smartphones to receive instant notification of an SCA event in their area as well as identifying the location of the nearest AED.
- **Early defibrillation with AEDs.** AMT has donated over 750 AEDs for public access and trained 35,000 citizen CPR partners in the communities it serves.
- **Pit crew resuscitation by EMS providers.** Coordinated by experts in emergency medicine, Race to the Top's pit crew model assigns specific tasks to each responder in a specific order, resulting in a precisely choreographed resuscitation based on evidence-based protocols.
- **Deployment of advanced practice paramedics.** AMT has specially trained paramedics to assist in the training and coordination of pit crew efforts and to offer leadership during the organized resuscitation effort. The goal is to dispatch





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—Lauren Emanuelson, RN, BSN, CCEMT-P, PHRN,
Race to the Top Coordinator

specially trained paramedics to every cardiac arrest scene in the near future.

► **Advanced biomedical tools.** Active compression-decompression CPR (ACD-CPR) via use of the ResQ CPR System is a key component of the protocol, allowing responders to provide high-quality chest compressions with active chest wall recoil while on scene. Mechanical CPR is used for transporting a small, very specific percentage of actively resuscitated patients. In addition, providers utilize ZOLL X Series monitors to visualize real-time CPR biofeedback during the resuscitation attempt.

► **Immediate provider feedback.** Post-call event review includes analysis of recorded metrics such as chest wall recoil, compression rate and depth, compression initiation, pause times, compression fraction, defibrillation times with energy selection, and changes in the underlying cardiac rhythm. The providers' electronic patient care report is overlaid with the streaming data to discern the timing of events.

► **Community and caregiver recognition.** AMT's Community Resuscitation Award recognizes members of the public who take the initiative in saving a cardiac arrest victim. Dispatchers and first responders are also recognized.

Every cardiac arrest call that AMT responds to undergoes a data-driven review during which Emanuelson and her team analyze the ePCR against metrics captured through ZOLL technology, including its X Series monitors and ResQPOD and ResQPUMP devices. A report of the strengths and weaknesses of the process serves to identify recurring themes and target an educational plan based on actual events.

"Seeing the outcomes data helps providers understand the



ACCOLADES

► Race to the Top coordinator Lauren Emanuelson was the recipient of the 2019 ZOLL EMS Pulse Award. To coincide with National EMS Week, ZOLL created the EMS Pulse Awards to recognize professionals who are the pulse of their EMS organization, working behind the scenes and empowering their service to provide better care and ultimately enable their teams to save more lives within their communities.

► The Race to the Top program received an AMBY award in 2016 for Best Clinical Outcomes. In 2019, the program has been awarded a Community Impact Award in relation to joint resuscitation academy training and resuscitation supply donations to local first responder entities.

Recommendations: **ALL GOALS**

Timed Metrics:	Goal:	Actual Time:	Goal Met	CPR Performance
Monitor Applied:	T - 1 minute	1:44	Yes	Target Depth: 92%
ResQPod Applied:	T - 1 minute	1:00	Yes	Average Depth: 2.3"
BVM Use:	T - 1 minute	2:14	Yes	Target Rate: 79%
Igel Inserted	T - 1 minute	1:00	Yes	Average Rate: 109 cpm
Capnography	T - 1 minute	1:44	Yes	Compressions in target: 78%
Defib (V-fib/V-tach):	T - 2 minutes	Not indicated	N/A	Recoil: 384 mm/s
Mechanical Application:	T-2 min (standard) T-10 min (ResQ CPR)	4:00, 8 second deployment	Delayed	Fraction: 93.46%
IV/IO Access:	T - 5 minutes	4:00	Yes	CPR protocol followed: Automated
First Dose of Epi:	T - 6 minutes	5:00	Yes	All meds per protocol: Yes
Amiodarone Given?	After 2 nd defib	Not indicated	N/A	Additional meds given: None

Longest pauses:	8.4 seconds	Initial Capnography:	31 mmHg
	7.1 seconds	Capnography at ROSC:	26 mmHg
	7.0 seconds	Capno at first defib	N/A
Pauses < 5 seconds:	20%	Capno at end of care:	24 mmHg
Pauses 5-10 seconds:	80%	Average ventilation/min:	9 bpm
Pauses >10 seconds:	0%	Highest ventilation/min	17 bpm

Race to the Top ResQCPR Protocol

T=0	1. Compressions are 8:1 – started immediately with ResQPump ACD-CPR Device at a rate of 80 bpm with changing rescuer every 2 minutes.
T= 1 min	2. Monitor applied within 1 minute of patient contact at the first pulse check. Upon AMT arrival, Zoll monitor will be applied right away with accelerometer being left off and pads applied in the anterior/posterior position.
T= 1 min	3. Airway system completed—Igel supraglottic airway inserted with ResQPOD and inline capnography attached to the BVM. a. Be cognizant to hit the CO2 button on the Zoll monitor to activate end tidal capnography. b. The Igel will not be used in any pediatric patient smaller than 50 kg c. Provide asynchronous ventilations once every six seconds.
T= 2 min	4. Defibrillation at 2 minutes of patient contact if pulseless vfib/vtach a. Defibrillation immediately if witnessed arrest per 9-1-1 response team member b. Defibrillation after 2 minutes of CPR if unwitnessed arrest
T= 5 min	5. IV access within 5 minutes of patient contact, if unable to establish an IV, IO placement to the humeral head
T= 6 min	6. Medications per the ACLS algorithm within 6 minutes of patient contact a. Epinephrine 1 mg of 1:10,000 every 3-5 minutes b. Amiodarone 300 mg if vfib/vtach pulseless arrest after 2nd defibrillation attempt. Second dose of Amiodarone is 150 mg for recurrent vfib and after 3rd defibrillation attempt. c. Consideration of Narcan should be given if suspected opioid overdose. d. Sodium Bicarbonate should be given if known renal failure, suspected ASA overdose, and tricyclic antidepressant overdose.
T=10 min	7. Lucas device should be applied and in less than 10 seconds with accelerometer pad directly under the Lucas arm/suction cup. The Lucas device will also be applied earlier if the following occurs: a. If ROSC is obtained and patient is stabilized, prepare for transport and apply Lucas device without activation. If patient is being transported and CPR is still being done, immediate placement of Lucas device should be done.

‘why’ of what they’re doing,” says Greg Chance, Vice President of Strategy for Advanced Medical Transport. “It’s a powerful visual tool to make adjustments and justify our reasoning.” The outcomes data collected drives the development of enhanced protocols that best physiologically benefit the patient.

Culture Change

A common obstacle in any large-scale culture change is overcoming entrenched attitudes, and AMT’s Race to the Top initiative was no different. “Our crews were not accustomed to staying on scene,” says Emanuelson. “It was a change in mindset from ‘get them to the hospital’ to emphasizing the importance of perfusion on scene. That was starting point number one.” New protocols focused on unlearning advanced care and returning to the basics of resuscitative medicine—high-quality and continuous chest compressions with minimal interruption.

Changing the mindset was a massive undertaking. Joint training initiatives with the local paid fire department served as a launching point for the revamped and simulation-based training. Active compression-decompression CPR (ACD-CPR) using the ResQCPR System was a new technology in the community. The deployment strategy was to start with a transparent training model with the local fire department.

Within the first year of the deployment of the ResQCPR System, all AMT personnel had completed mandatory resuscitation academy training. Utilizing the fire department with a joint training initiative helped provide real-life scenarios. With all hands on deck, AMT personnel and local first responders were equipped with a streamlined (simplified) training model and high-quality equipment. The joint training and investment in the most effective technology, along with the continuous quality improvement review process to recognize deficiencies

At the end of the day, this story is so simple to tell. And the truth is in the results.

—Andrew Rand, CEO, Advanced Medical Transport

and identify areas of improvement, led to survivability surpassing national trends.

Establishing a team of “champions” with specialized training and education on current evidence helped field crews adapt to the new approach. Resuscitation Academy training was made mandatory for all responder levels in 2018.

“You need champions to teach this at a simple hands-on level,” stresses Emanuelson, who began with AMT in 2010 as a pre-hospital registered nurse and critical care paramedic before taking over as Race to the Top Coordinator in 2018. “We are always expanding and growing.” She adds that while Race to the Top has been a success at their service, protocols must be modified to be practical for your own service area and infrastructure, whether urban or rural, large or small, volunteer or paid.

Measuring Outcomes

With limited data prior to 2015, AMT’s focus at the outset of the Race to the Top initiative was to guide coordinated training efforts, eliminate process variability, and measure outcomes against leading resuscitation programs in the nation. With a



15.6% total discharge rate of all OHCA, and a 53.8% Utstein survival to discharge in 2015, AMT was squarely heading in the right direction.

AMT then determined that it needed to increase additional community engagement and awareness to further improve survival rates. With more than 35,000 citizen responders trained in hands-only CPR, the rate of bystander CPR in the Peoria area increased from 13 to 33 percent, while the survival-to-discharge rate for SCA victims nearly doubled in just 18 months. As new technology emerged, the focus was shifted to the providers, and innovative technology was added to Race to the Top.

The launch of the ResQCPR System exemplifies a process change with a structured deployment strategy. Launched on June 4, 2018, the initial deployment was targeted with a joint partnership with the City of Peoria Fire Department. The purpose of a structured, data-driven deployment is to best measure effectiveness on an isolated and measurable variable prior to systemwide implementation.

Investing in joint training between AMT personnel and first responder agencies has been a qualified success, says Rand. With the program goal directed at neurological discharge scores of CPC 1,2, and not merely return of spontaneous circulation, the agency is beginning to experience a new benchmark for future efforts. At present, 89.5% of all patients who survived to discharge were neurologically intact (17 out of 19 urban).

"We own every patient we touch," Rand says. Post-event review and weekly trend tracking via data collected by built-in



technology (and AMT's super measurement-IT department) in the ZOLL devices allows AMT to monitor progress and identify further areas of improvement.

"This is an investment we've made in the QI process," adds Chance. "We are moving the needle."

Because of the successful deployment strategy of co-training with local paid fire departments, the Race to the Top team recently completed co-training with the volunteer fire departments within its service area. The ResQCPR System has shown its efficacy and is now being donated to local volunteer departments. AMT will continue to track the data to implement subtle changes, but the expectation is to replicate the success shown with the initial deployment in 2018.



BY THE NUMBERS:

► In 2018, Advanced Medical Transport Invested nearly \$40,000 to train and equip their partner first responder agencies with the ZOLL ResQPOD and ResQPUMP devices. They had a 100% success rate on obtaining a return of spontaneous circulation in witnessed vfib/vtach arrest patients when the ResQCPR System was used after bystander CPR efforts were initiated.

► AMT's Survival Report In 2018:
30 total lives saved

Accountability

Marshaling a word-class emergency cardiac care and response system begins with a willingness to drive change and the courage to realize where improvements are necessary. AMT provides its outcomes to the CARES Registry, a voluntary national database that collects performance measures and outcomes related to out-of-hospital cardiac arrest.

Relationships with physician experts in resuscitation, emergency medicine, and interventional cardiology drive AMT to continually revise and improve their program.

"The bottom line is that you have to track and trend data to know where any deficiencies lie," Emanuelson says. "Create an open environment where people are talking about cardiac arrest care and get employees engaged. Break down each process and make sure it makes sense. Use the data. Once you make a change, train on that change. Then move on to the next area for improvement. Celebrate the small victories and keep working to move the needle toward better care."

The data has to be the starting point and the ending point, she continues. The data and the quality improvement process findings have to drive the education and protocol adjustments. Outcomes create provider buy-in. No piece of data is too small to be noticed. Nuanced deficiencies are small challenges that have an enormous impact on the patient. Most importantly, the process has to be important to the entire organization, from front-line providers to the administrative team.

"At the end of the day, this story is so simple to tell," Rand concludes. "And the truth is in the discharge results. What we've seen puts our program alongside other communities dedicated to improving their outcomes, and we are delighted to share what we have learned."

For more information visit

www.zoll.com/medical-products/impedance-threshold-device

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—Greg Chance, VP of Strategy, Advanced Medical Transport



Advanced Medical Transport Peoria Bystander Witnessed Field ROSC

