








EMS 10

INNOVATORS IN EMS

2013

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Innovation & Progress

EMS 10 honorees paving the path for the future of EMS

By A.J. Heightman, MPA, EMT-P

This is the sixth year of the EMS 10 Innovators in EMS program, jointly sponsored by Physio-Control and *JEMS*. The program has a simple mission but a powerful objective: Identify some of the best innovators in the EMS industry and alert the EMS community to their achievements to help providers and patients in the future.

The EMS 10 Innovators selection committee judged this year's nominees on their hard work, dedication and selfless efforts in 2013 and selected the individuals or pairs they felt exhibited the innovations that can have the greatest impact on the future of EMS.

We profile each honoree in this special digital supplement to *JEMS* to not only inform and educate you on their innovative work in EMS, but also to encourage you to ride on the wave of their innovations, use them to better develop your EMS system, and inspire you and your colleagues to think outside the box, take some calculated risks and innovate in an area of EMS that you feel could make a difference for patients, EMS systems or your prehospital colleagues.

From left to right: Dr. John Riccio, Shaughn Maxwell, Dr. Paul Pepe, Dr. Kevin Seaman, Jim Parrish

(front row) Philip Callahan, Farooq Muhammad, Victor Convertino, Scott Matin, Peter Dworsky, David Edgar

(not pictured)
Dr. Ahamed Idris, Rick Lewis

Philip Callahan, PhD, NREMT-P … Recognized for developing a resiliency-based behavioral health initiative for first responders to help address, and alleviate, the problem of PTSD among the EMS community.

Victor Convertino, PhD … Recognized for publishing research on the compensatory reserve index and intrathoracic pressure regulation therapy that provides tools to rapidly determine the status of a patient.

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Rick Lewis, EMT-P and John Riccio, MD … Recognized for developing the Advance Resource Medic (ARM) vehicle and deployment system, allowing for a changed dispatch and triage process.

Shaughn Maxwell, EMT-P … Recognized for developing "EMS checklists" to ensure evidence-based critical interventions occur when specific clinical conditions are encountered.

Farooq Muhammad, EMT-P … Recognized for writing, producing and starring in innovative social media videos designed to educate the public about EMS and instill pride in EMS providers.

Jim Parrish, MBA, FACHE, FACMPE … Recognized for facilitating a movement at Humboldt General Hospital toward prehospital care, a training program and a police-paramedic program.

Kevin Seaman, MD, FACEP … Recognized for establishing a division of the Seattle Resuscitation Academy in Howard County, Md., contributing to prehospital emergency care beyond the borders of the county.

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First Response Resiliency

Philip Callahan developed and introduced a resiliency-based behavioral health initiative that helps first responders dealing with post-traumatic stress disorder.

In July 2012, an armed man entered a Century 16 multiplex theater in Aurora, Colo., killing 12 people and injuring more than 50 others. Mass-casualty events like the massacre at Sandy Hook Elementary School and the bombing at the finish line of the Boston Marathon followed. For some of the first responders of these types of situations, the events themselves were just the beginning of a nightmare that can linger for weeks, months or even years.

Philip Callahan

First responders have reported haunting symptoms that include feelings of hopelessness, sleeplessness, anxiety and despair that can grow into full-blown post-traumatic stress disorder (PTSD). PTSD is now recognized as a growing problem for first responders and EMS personnel, particularly those who are called to mass-casualty events. Philip Callahan, PhD, NREMT-P, paramedic and professor emeritus at the University of Arizona, recognized the problems of PTSD among the EMS community and developed a resiliency-based behavioral health initiative to help address, and alleviate, this growing problem.

Veteran Support

"Since I come from a fire and EMS background, I wanted to work with this endeavor, knowing that a lot of the characteristics that combat veterans were dealing with were similar to what fire, police and EMS deal with," Callahan says.

We developed a resiliency-based program because resiliency turns out, in this instance, to be one of the best measures of student success.

While designed to address the lingering effects of trauma, the program Callahan developed was initially born out of a desire to help returning combat veterans graduate from college. He found that vets were graduating at a rate 15% lower than the rate of civilian students. So Callahan partnered with Michael Marks, a clinical psychologist at the Southern Arizona Veterans Administration, to develop a curriculum to aid veterans in being more successful in school.

"We found that veterans were coming back with a high degree of PTSD, hyper-vigilance and a number of other issues. Their attention wasn't good, and they weren't staying in school," Callahan says. "We developed a resiliency-based program because resiliency turns out, in this instance, to be one of the best measures of student success."

Resiliency Program

What began as a program to help student veterans find educational success eventually grew into First Response Resiliency, a one-day course that pinpoints the importance of taking care of mind and body.

Agencies grapple with time and cost constraints, so the initial challenge was to compress a semester-long resiliency course into an effective one-day workshop. Building upon an individual's existing resiliency skills and linking them to evidence-based practices helped achieve the program's goals.

Individuals then form problem-based learning teams to apply each skill to a scenario that is likely something they will see in their own world of fire, police or EMS. The process begins with the simpler behavioral skills of goal setting, diet and exercise, sleep and relaxation, and then progresses to more complex cognitive skills of putting things into perspective, recognizing self-defeating thoughts, dealing with wins and losses, practicing empathy for critical thinking, and the ABCs of managing behaviors. "These earlier skills, as well as working in learning teams, aids in developing the social skills of reaching out to others and establishing a social support network," Callahan says.

Issues of anger, sadness, depression, guilt and fear are addressed, and students are also taught how to strengthen skills in empathy, listening and communication. "We teach a lot of things that your mother told you to do, and how to do them properly," Callahan says. "We take a skill and help them internalize and build on it for success. Then we break out into smaller groups and apply the skill to a case study. They get a chance to internalize and apply the skills in case studies before they leave the classroom."

Before and after every class, students are given a general resiliency test of 23

questions to measure group characteristics. Sometimes, Callahan says, the improvement in the scores is so great as to give the students a real sense of empowerment.

Preempting PTSD

The course is designed to be preemptive in nature, thereby minimizing the likelihood of students ever developing PTSD. "Some years ago, a researcher worked with West Point cadets and found that when they went into combat with this resiliency training they were far less likely to contract PTSD," Callahan says. "More interesting was the trickledown effect. The people who worked with the cadets were also less likely to contract PSTD."

Callahan saw the same results with combat veterans. "One of the major preemptive skills for resiliency is social support. The program was making such a huge difference in the veterans' lives that they were going home and teaching these skills to their families," he says. "Our approach now, when possible, is to bring in the significant other if they are interested in going through the training."

Given the research basis of the program, Callahan has worked closely with the Mesa (Ariz.) Fire Department, the University of Arizona Police Department, and the Colorado Department of Public Health and Environment Office of Emergency Preparedness and Response for about two years to better develop the program.

Callahan took the program to the police department in Aurora to help first responders deal with the movie theater shooting. He will begin using the program to work with recruits and experienced first responders in Arizona and Colorado this winter and spring.

"We want to work with recruits before they actually begin their careers so that the skills become part of their lifestyle as they go through the academy," Callahan says. "Then they can bring those skills forward in their careers."

"The issue with these kinds of events is that they do impact you, and they become problematic when the thoughts and feelings don't go away after three to six months," he says. "We like go in three to six months after an event to address these issues, and [in the case of Aurora] we were able to effect statistically significant changes."

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Teaching Skills

One thing Callahan wants to emphasize is the lack of judgment directed toward students who enter the program. "We don't pathologize the issue of mental health; we don't treat this as a disorder," he says. "We teach people skills that are evidence- and research-based that make a difference. There is no stigma associated with the approach."

Once the program has concluded, Callahan encourages participants to meet up with each other to form support groups to work on additional skills. Six to eight weeks after the training, Callahan retests individuals to ensure gains are sustained and gathers feedback to strengthen the program. Teaching these skills to participants is important, but equally important is that they maintain and sustain what they have learned throughout their careers and lives.

During traumatic events such as mass shootings, the focus initially centers on dealing with the situation and quickly treating the wounded; the well-being of first responders isn't always first and foremost in people's minds. But in the aftermath of those events, the effects can leave deep-seated mental and emotional trauma that persists weeks or months afterward. In many cases, initial counseling for the event is wholly inadequate. First responders need more support.

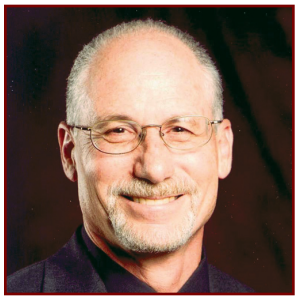
Seeing the impact that First Response Resiliency can have on its participants is not only personally and professionally gratifying to Callahan, but also professionally satisfying, particularly when he is told the course was a life-changing event for a participant.

"That's why I do it," he says, "because it makes such a huge difference."

The CRI & ITD Complement

Victor Convertino's research on the compensatory reserve index (CRI) and intrathoracic pressure regulation (IPR) therapy provides tools to more rapidly determine the status of a patient.

Many times our greatest successes rise out of our greatest failures. And perhaps no one knows that better than Victor Convertino, PhD, senior research physiologist and manager for the Tactical Combat Casualty Care Research Program Area for the U.S. Army Institute of Surgical Research at Fort Sam Houston, Texas. Dr. Convertino completed the coursework for his Ph.D. at the University of California (UC), Davis, but failed at his first attempt to pass his oral exams. "I wasn't ready with the innovative thinking process," he says.



Victor Convertino

Fortunately Dr. Ray Burger, Convertino's committee chair, stepped in with support. "We met at 7 p.m. every Monday and Wednesday for six months," Convertino says. "He challenged me with questions that got me to think differently. That led to where I am today."

Where he is today has resulted in his being named the 2013 Outstanding Distinguished Graduate Award recipient for UC Davis, as well as being recognized by *JEMS* for his landmark research on the compensatory reserve index (CRI) and intrathoracic pressure regulation (IPR) therapy.

Compensatory Reserve Index

The CRI uses an algorithm that takes patient information obtained from a non-invasive pulse oximeter and then gauges whether those who appear to be hemodynamically stable might decompensate. In simplest terms, the CRI is the technological equivalent of the canary in the coalmine.

"We have standard vital sign monitors that measure things that don't give good information on all patients," Convertino says. "The best example is blood pressure, which is compensated for by our many physiological mechanisms. It can be very stable [even while the] patient is losing their ability to continue to compensate. When the patient gets to the bottom of their compensation, their blood pressure falls off a cliff, and now they are in shock because we were watching their blood pressure rather than a measure of their reserve to compensate."

Convertino's research centers on strategies to more effectively and rapidly signal when a patient falls into danger of crashing. To date, he and his team have studied more than 250 men and women between the ages of 18 and 55. From his research, Convertino has discovered that it's the arterial waveform that should be most measured because, "Those features represent the integration of all compensatory mechanisms. If you can track the feature changes in the total arterial waveform, you know everything that's going on in the compensation of the heart and vessels," he says. "All the information you need to know is in that."

Research Collaboration

Using his research, Convertino collaborated with a robotics-engineering group at the University of Colorado. The group has extensive expertise in waveform feature extraction and analysis, and they built a smart field monitor that compares all the changes that are going on in the arterial waveform and delivers the information in real time.

"It's eloquently simple," Convertino says. "Up until five or 10 years ago, we didn't have the technology to noninvasively measure and analyze arterial waveforms, so we had to stick catheters in arteries. Now we've come up with an index that can give new information on an individual who is bleeding, and may be heading toward shock, and we can get that information well in advance of the vital signs."

Convertino and his colleagues are currently conducting the first clinical trial with the intent to show that the CRI tracks stroke volumes similar to a predicate device that is already FDA approved. He hopes this strategy will demonstrate to the FDA that the research and methodology for measuring the arterial waveform is sound, and that FDA approval will be granted within one year.

But Convertino has already received positive indications for his methodologies from the Department of Combat Doctrine Development at Fort Sam Houston. This division sets doctrines for what combat medics need on the field. "They have basically said that the CRI meets a requirement," Convertino says. "This is huge because it gives us support from a programmatic advantage to continue advanced development of this within the Army for its needs on the battlefield."

Recently, the surgeon general of the Army, Lieutenant General (LTG) Patricia Horoho, made a visit to Convertino and his team. They placed the monitor on her finger to demonstrate how the CRI worked. "LTG Horoho is the first nurse in the position of surgeon general for

the Army, and she said physicians and nurses need an earlier predicator of when an individual is crashing," Convertino says. "She said it was a game changer.'"

Impedance Threshold Device

In addition to his research on the CRI, Convertino is also being recognized for his work on the application of non-invasive IPR therapy using an impedance threshold device (ITD). The ITD can increase blood pressure in people who are breathing spontaneously, which can give physicians more time to treat hypotensive trauma patients in prehospital environments. "The beauty of IPR therapy is that it takes physiology that is already present," says Convertino. "What the IPR does is provide resistance during a patient's inspiration, so that you have greater negative pressure in the thorax. That sucks more blood to the heart and brain. It's so elegantly simple that I'm almost embarrassed that I didn't think of it first."

As part of his research, Convertino and his colleagues also published the results of a clinical evaluation demonstrating the ResQGARD ITD's efficacy in treating 200 patients in the EMS setting. "There is one for use in CPR called the ResQPOD, and there is one called the ResQVENT for individuals who are intubated on ventilators," Convertino says. "If a patient has had a bad injury where they've lost a lot of blood, this helps improve the blood flow to the heart and brain, and keeps them from going into shock."

The study assessed the change in vital signs following paramedic administration of the ITD, as well as patient tolerance of the device. The conclusion of the evaluation proved the efficacy of a non-invasive tool for BLS personnel.

Simplifying Treatment

The CRI and IPR create a formidable team in helping to save lives because of both their efficacy and ease of use. Rather than carrying heavy equipment and fluids into the field, civilian paramedics and combat medics alike can use the CRI and ITD complement to determine the status of a patient. "You can imagine having an algorithm that tells them that the individual is moving toward shock," Convertino says. "All they have to do is watch a gas gauge and see if it goes from green to yellow to red."

The CRI and IPR create a formidable team in helping to save lives because of both their efficacy and ease of use. Rather than carrying heavy equipment and fluids into the field, paramedics can use the complement to determine the status of the patient.

He adds, "Rather than the challenge of carrying IVs and fluids onto the battlefield, medics can have something in their kits as simple and small as the ResQGARD. They can ask the injured person to breathe on it, which will increase blood flow back to the heart."

Lest anyone think that Convertino's work resides in the lofty world of research and theory, an email he received from an emergency medicine physician in the ED of a combat support hospital in Baghdad tells a different story. Two severely wounded soldiers were brought in, one with a gunshot wound to the head and the other with a gunshot wound to the pelvis. The soldier with the head wound died. The soldier with the pelvic wound registered blood pressure at 36/16, with hemoglobin down to six or eight.

"As a last-ditch effort to save his life, the physician used an ITD device," Convertino says. "It brought the blood pressure up enough to get him stabilized and to the OR. They saved his life."

True Purpose

Upon arrival to work every morning, Convertino notes the brass signs on the building that adorn both entrances to the U.S. Army Institute of Surgical Research: For Combat Wounded … "When I walk in the door each day and see that sign, I realize the opportunities and the responsibility that I have to conduct research that is directly supporting the combat medics in saving lives on the battlefield," he says.

Convertino's office sits across the parking lot from the Center for the Intrepid, a state-of-the-art rehabilitation center for combat amputees, which also drives the point home for him. "I am doing something I love and have the freedom to do," he says. "That freedom is the freedom of every American. We have that because we have these brave men and women who are willing to make the ultimate sacrifice so that we can keep that. I think about that every day."

Lights & Sirens

Peter Dworsky and Scott Matin developed *Driving Responsibly: The Truth about Sirens*, an educational video outlining the misconceptions and dangers of emergency siren and light use.

The first thing that might catch you by surprise when you watch *Driving Responsibly: The Truth about Sirens* (www.monoc.org/sirenPSA2.cfm) isn't the quality of the video, the camera angles or editing (professional though they are). No, the first thing that might surprise you is the following statistics: 1) EMS responds to 30 million calls annually, (2) research shows that the use of lights and sirens has little impact on patient outcome, (3) there are 10 serious EMS injuries every day and 10,000 ambulance crashes a year, and (4) EMS providers are killed annually at twice the national average of non-EMTs.

Peter Dworsky (left)
Scott Matin (right)

"We started looking at injury and fatality rates when it comes to ambulances, and they were pretty staggering," says Scott Matin, MBA, NREMT-P, vice president, clinical education and business services for Monmouth Ocean Hospital Service Corporation (MONOC) Mobile Health Services in Neptune, N.J. "And [the reported incidents are] probably only a fraction of what's really out there." So Matin, along with Peter Dworsky, MPH, CBRM, NREMT-P, corporate director of support services for MONOC, decided to examine ways to improve safety for EMS providers.

Gathering Evidence

Given the lack of a central clearinghouse for monitoring and data collection for EMS-related vehicle accidents, Matin thinks the estimates may be low. "It's not like the commercial trucking industry, which is monitored closely," he says.

Regardless of whether the estimates are low, the central fact remains that too many EMS providers are injured or killed in high-speed emergency calls. So MONOC decided to take a look at one piece of the puzzle: the role that the use of lights and sirens play in the accidents.

The decision to look more closely at the statistics, and what's behind them, is entirely appropriate. MONOC is the largest non-profit provider of EMS and ambulance services in New Jersey, and part of its mission is to develop and implement best practices that can affect change, not only at MONOC but also throughout the national ambulance industry.

Matin and Dworsky took on the challenge of investigating the ramifications of siren use during EMS calls. "We monitored collisions around the country, and we looked at our own practices and saw that things needed to change," Dworsky says. "We looked at research that shows that EMS providers are being severely injured or killed during collisions, and most of the collisions appear to be preventable."

Questioning Lights & Sirens

The gathering of evidence around clinical practices and collision rates convinced them of the need to develop an educational piece around the issue. "We wanted to do something to change driver behavior and get people to slow down and not use lights and sirens when not necessary," says Dworsky.

What the two came up with is an innovative video that has created industry buzz—and controversy—for EMS. Asking EMS agencies across the country and around the world to limit their use of lights and sirens, except in the case of transporting only the most critical of patients, is nothing short of a paradigm shift, but that is what Dworsky and Matin are doing. They recognize that they're attempting to change a deeply ingrained culture for providers who were raised on lights and sirens.

"There is research out there that shows you only save a couple of minutes at most if you use lights and sirens," says Matin. "We know from practicing prehospital medicine that those few minutes you save with lights and sirens will make little difference to most people." But the risk to EMS personnel of being injured or killed in a siren-driven ambulance run to a scene or hospital is present on every call.

Still, Matin and Dworsky understood that trying to undo decades of thinking by sending the message to limit sirens to only the most critically ill patients wouldn't be easy. They realized that to be truly effective, they would need the message to be visual. A short video, they correctly guessed, would have the most impact.

Culture of Safety

So Matin and Dworsky developed a six-minute video and then added a two-minute experiment at the end to illustrate their point. To see the outcome of the experiment, you will have to watch the video. "We thought that using a video would attract attention," Matin says. "We also thought the experiment would make people think twice."

Dworsky says they developed the video as another tool to get EMS providers to adopt a culture of safety. "We've been addressing seatbelt

Matin and Dworsky understood that trying to undo decades of thinking by sending the message to limit sirens to only the most critically ill patients wouldn't be easy. They realized that to be truly effective, they would need the message to be visual. A short video, they correcly guessed, would have the most impact.

issues, airbags, supplemental restraints, mounting systems and driving patterns for years. The video is just another method for changing driver behavior and addressing vehicle safety," he says. "We are moving toward evidence-based medicine in EMS, so here is evidence-based research on how to change driver behavior—and why to change it."

The ultimate message of their video is: Simply going faster is not the solution. "Just because you get to the hospital faster, it doesn't mean the patient is going to get seen any sooner," Dworsky says. "You don't make up time by driving faster. You make up time by getting out of the door sooner."

Dworsky adds, "We do ask our staff to use lights and sirens when appropriate, and to notify the hospital that they're coming in with a critical patient."

Changing Requirements

As part of their mission of cultural change, Matin and Dworsky are working with contract managers in towns and cities in New Jersey to change the performance requirement wording in contracts between EMS and hospitals. Rather than a contract stating that EMS will respond to 90% of calls within eight minutes, they want contracts to read that EMS will respond in eight minutes or less to priority calls. "Otherwise, you are forcing us into a situation where we are required to speed and exhibit reckless behavior to maintain a performance requirement in a contract that has a negative outcome for the patients," Dworsky says.

Certainly most EMS agencies are driven by performance requirements, but Matin argues that many of those numbers are arbitrary. "There's nothing to support those numbers," he says. "A lot of people still use them because there isn't anything out there that says otherwise. Things have changed dramatically in practicing prehospital medicine."

Matin points out that today's modern ambulances can provide just as much medicine in the field as many EDs. And he argues that the urgency of using red lights and sirens while driving many non-critical patients isn't necessary.

Dworsky adds: "Some people think that when they put their uniform on, they have to put on their cape and get there really fast. Getting halfway there fast and then getting into an accident doesn't help anybody," he says. "If we do that, we are violating our Hippocratic oath of 'First do no harm.'"

Final Experiment

Of everything shown in the video, the two are most pleased with the setup and execution of the experiment at the end. "We worked hard to make sure that the experiment would be legitimate and accurate," Matin says.

When finished, Dworsky and Matin made a big push to advertise the video to the worldwide EMS community. They wanted the information freely available, so they put the video into the public domain. They posted the video on the MONOC website (monoc.org), numerous EMS message boards, social media sites and distributed it to listservs. They even emailed the link of the video to 10,000 people.

Driving Responsibility: The Truth about Sirens has now been downloaded and viewed by people and associations throughout the U.S., Canada, Europe, the Middle East and Australia. "It doesn't matter where you're at," Matin says. "EMS agencies worldwide experience the same problems."

In the end, Dworsky and Matin simply want others to spend a few minutes watching the video and thinking about its message. "We can do great things with ambulances by bringing people to the hospital, or going to the scene, but at the same time terrible things can happen," Matin says. "If there's anything that we can possibly do to minimize that, I think it's our responsibility as professionals and career EMS providers to do it."

Developing the Matrix

David Edgar created a crew fatigue policy to objectively monitor crew activity and fatigue throughout their shift.

It's no secret that EMS agencies are stretched thin when it comes to resources and staff. To alleviate some of the burden, many are entering into partnerships with other government agencies, hospitals and tertiary care centers. These public-private partnerships have proven to be valuable to both parties, especially as the demand for quality healthcare continues to rise. One such partnership is the Iowa EMS Alliance, a unique affiliation between the city of West Des Moines and UnityPoint Health Des Moines, which includes a children's hospital, a Level 1 trauma center and a suburban and community hospital.

David Edgar

With the partnership, West Des Moines EMS quickly found they were conducting transports all day and night, and often over long distances. "Some of these transports were going to Minneapolis, Iowa City and the Mayo Clinic in Rochester, all of which are two to three hours away," says David Edgar, MHA, assistant chief of EMS for the city of West Des Moines. "Having many transports during the day and then having to transport to Mayo in the middle of the night posed a real issue for us."

Examining Transport

Iowa's shortage of beds for mental health patients added to the challenge, particularly when West Des Moines EMS had to make two or three transports in the middle of the night. The transports had to be made because ED rooms needed to be cleared and hospitals didn't want to lose a mental health bed at the receiving hospital.

At the heart of Edgar's innovative matrix is the constant goal of safety, for both providers and for patients.

So Edgar, along with lead paramedic Jana Trede, began to scrutinize the transport situation and its impact on personnel. They looked for inefficiencies in transport but also searched for how to meaningfully address the problems of crew fatigue for EMS personnel who make long-haul transports, especially throughout the night.

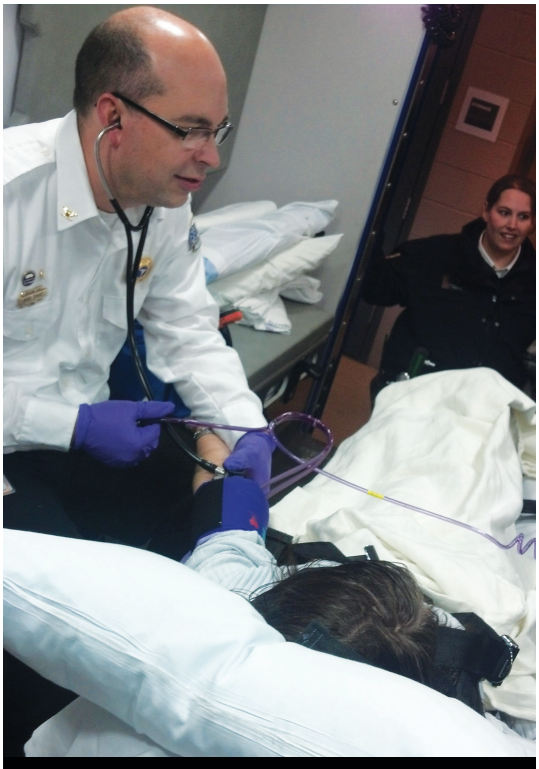
With the support of the hospitals in the Alliance, parameters were set around scheduling and personnel availability. "The policy states that we will go a certain amount of miles between 10 p.m. and 4 a.m.," Edgar says. "We restrict the hours of 4 a.m. to 7 a.m. to calls within our metropolitan area." Non-emergency transports that have to go farther are held until fresh crews arrive at 7 a.m. Many parts of Iowa are rural, and a two-person transport that runs into problems with a mental health patient in the middle of the night can find itself without quickly accessible law enforcement in certain locations. So the reconfigured scheduling solution helped with medic safety as well as fatigue.

Many might think that the creation of this kind of alliance, along with the recalibration of schedules, is enough. For Edgar, these changes were just the beginning. During this time, he had been reading articles on aviation, specifically noting how the industry has adopted a "matrix" to monitor fatigue levels in aircraft personnel. Edgar wondered if the same concept could be carried over to EMS ground transport. He attended a conference where he ran into the safety director from LifeFlight Eagle in Kansas City, Mo., Jana Trede. Edgar and Trede discussed the idea of a fatigue matrix, and then Trede made a trip to Kansas City to attend a LifeFlight safety session.

Fatigue Matrix

Edgar learned that Gold Cross, an ALS ground ambulance run by the Mayo Clinic, had created a matrix for every transport. "Jana and I sat with the information, took examples and made tweaks, and created a matrix point system for our metropolitan ground transports," he says. He then expanded the matrix to include ground transport personnel and the crews working only on 9-1-1 ambulances.

To be effective, Edgar made simplicity the centerpiece of the matrix policy. Shifts are tracked in half-hour increments, starting at 7 a.m., for a 16-hour period. "Anyone working a 24-hour shift, including our city medics, has to fill out this matrix," Edgar says. "It's turned into our shift supervisor at 7:00 each night. The matrix looks for windshield time, so from the time a medic initiates a call until the time they get back, they fill in boxes in half-hour increments until 11:00 that night."



"We felt there were times our staff was completing long-distance transports that they probably shouldn't have. With this new policy, it doesn't give them a choice."

The matrix also tracks whether crews were able to get sufficient and timely nutrition or whether a student was present for a ride-along. It even tracks adverse weather conditions. "Forty-mile-an-hour winds can be stressful during a two-hour transport, especially if they have had to fight the ambulance in the wind for the entire transport," Edgar says.

Individual documentation is tracked closely, with various calls earning points for medics. EMS personnel are awarded points for attending meetings, as well as for hours spent working in the hospital in the pediatric and acute care units. At 7 p.m., the points are added up. Numbers fall into a spectrum of three categories: green, yellow or red.

"If you are in the one- to 15-point zone, you are in the green and nothing further happens," says Edgar. "If you are in the 16- to 20-point range, that's yellow. That means we are going to extend the point matrix to 11 p.m."

Someone accumulating more than 20 points during a shift moves to the red zone. Any medic crossing into the red doesn't have a choice on eligibility for long-distance transfers—the answer is no. "It's automatic," Edgar says. "We are trying to identify when it's probably not safe to be doing a long-distance transfer." If a medic falls into the red, it doesn't mean they are too fatigued to drive or handle patient care, it just means they shouldn't be completing multi-hour transports. The medic is traded out with a crewmember on a 9-1-1 only ambulance, as long as the trading medic has an acceptable fatigue matrix.

Timeout

For several years, the city of West Des Moines EMS has had a timeout policy in place where medics could self-select out if they were too fatigued to complete a patient transport. Before the inception of the matrix the policy was used very little, if at all. Edgar believes medics were reluctant to show weakness and, therefore, hesitant to implement the policy on themselves. "We felt there were times our staff was completing long-distance transports that they probably shouldn't have," he says. "With this new policy, it doesn't give them a choice. In the last month and a half, we've switched out five people, and that's five times more than we've done over the last year."

The matrix does allow flexibility. For example, one medic found himself one point from red at 10 p.m. His supervisor talked to him and the decision was made to switch him out. "The medic in that discussion had somewhat of a choice too," Edgar says. "He would not have had that choice had he been in the red."

Report writing and other administrative tasks are not tracked and counted. However, 24-hour medics keep separate daily logs on themselves to cover gaps. "We want to make sure we aren't missing something that could add to daily fatigue," Edgar says.

At the heart of Edgar's innovative matrix is the constant goal of safety, for both providers and for patients. "My goal is to not get a call at 3 a.m. that an ambulance is on its top because someone fell asleep," he says. "We know we have situations that aren't ideal, but if there are tools that we can use to eliminate risks,then I wouldn't be doing my job if we weren't utilizing them."

Edgar adds, "I can take people who are unhappy with me because they have to switch stations halfway through their shift, because the alternative is my having to explain to somebody why his or her loved one was injured or killed in an ambulance accident. I look at this as a good mitigation policy."

Staying Safe

Edgar feels responsible for the safety of the department's 80 staff members, and he feels the matrix is one way to help protect EMS staff, patients and the public. "Our department is focused on employee safety," he says, particularly since volume in West Des Moines has grown over the last few years to more than 7,000 transports annually.

He acknowledges that change can be difficult but emphasizes that the EMS environment today, while rewarding, is complex and challenging. "We are asking them to do difficult jobs in difficult situations," Edgar says. "We need to focus on providing tools and administrative support that make their jobs as safe as possible. I'm confident that this matrix is the right thing to do."

Finding the Sweet Spot

Dr. Ahamed Idris found the chest compression rate "sweet spot" and how to measure what's happening during resuscitation.

Many combat veterans who went to Vietnam found pain and trauma. Dr. Ahamed Idris went to Vietnam and found something else—a career path.

"Before I went into the Army, I had absolutely no interest in medicine. I was going to be a physicist," says the professor of surgery and internal medicine and director of emergency research at the University of Texas Southwestern Medical Center. "But I ended up in the Army Medical Corps. Being a medic in Vietnam was one big emergency, and I discovered that I enjoyed taking care of emergencies."

Dr. Ahamed Idris

Idris knew that he was deeply interested in research, a passion that had been with him since adolescence, so that's where he focused his medical education.

Finding a Path

It was the late 1970s and the field of emergency medicine was just opening up. While working as an attending physician in the emergency department of The John H. Stroger, Jr. Hospital of Cook County (formerly Cook County Hospital) in Chicago, Idris helped the hospital develop the first emergency medicine residency program. "I didn't do an emergency medicine residency, but I helped develop one at Cook County Hospital," he says.

With his experiences in Vietnam and his subsequent medical education, a love of emergency medicine and research coalesced into a professional pathway that has had significant implications for both Idris and emergency medical research. His research findings have had a dramatic impact on the saving of tens of thousands of lives, specifically in the area of cardiac arrest survival. And on metronome sales as well, but we'll get to that.

The ROC

Recognized during 2013 as the most prolific principal investigator (PI) for the National Institutes of Health (NIH) Resuscitation Outcome Consortium (ROC), Idris has made some of his most compelling research advancements as a lead researcher for the ROC. Started by the NIH in 2004, ROC is a consortium of 10 regions throughout the United States and Canada. These regions include Seattle and King County, Wash.; Portland, Ore.; Dallas and Fort Worth, Texas; and San Diego. Other sites include Birmingham, Ala., Milwaukee and Pittsburgh. Ottawa, Toronto, and Vancouver, British Columbia make up the Canadian sites.

Twenty-two cities in Northern Texas, including Dallas and Fort Worth, participate in Idris' ROC site. "We were formed by the NIH to conduct prehospital research focused on cardiac arrest and severe traumatic injury," he says. "We're probably the largest consortium in the world conducting these prehospital studies. We have completed four clinical trials and are currently doing two more cardiac arrest trials. We also are about to start another clinical trial on traumatic injury."

Idris' Dallas-Fort Worth ROC site now maintains a cardiac arrest registry of more than 20,000 patients and is the highest enrolling U.S. site in the ROC, in terms of number of patients enrolled in cardiac arrest and trauma studies. The ROC as a whole has more than 150,000 patients, with a database that increases by 25,000 every year. "I believe it's one of the largest registries in the world," says Idris.

Chest Compression Rates

Such a distinction is important because, in this case, size really does matter. To do the kind of research that impacts lives across the world, statistical samplings must be great enough to encompass large groups of diverse people. Take, for example, research on chest compression rates. Because of his role on the National Emergency Cardiovascular Care Committee for the American Heart Association (AHA), Idris was given the assignment to review 2010 guidelines for chest compression rates. He conducted a comprehensive review of existing research and literature, and what he found surprised him. "Not one human study of chest compression rates and outcomes existed," Idris says, "in particular the outcomes for rescuer resuscitation and survival."

Because of the scant information available, chest compression rates for prehospital providers were set at 100 per minute. "The American Heart Association committee didn't place an upper limit on rate because there wasn't evidence to suggest that there should be an upper limit," says Idris. "There were a number of people who didn't agree with that, including myself, but we had no evidence to refute it."

Fortunately, Idris was in a position to do something about the lack of information because he was part of the ROC, which had a large amount of data that could speak to the guideline. Idris proposed a study on chest compression rates, with a return of spontaneous circulation and survival as an outcome. The proposal tested

hypotheses and proposed agreed upon analytical methods, all overseen by a statistician. "That's the advantage of dealing with a consortium like this," Idris says. "The studies are legitimate and have high quality. I did the study because it needed to be done; we needed to have some human evidence."

Chest Compression Study

The study looked at 3,000 patients, and when completed and analyzed, the results surprised Idris and others because they showed that the return of spontaneous circulation (ROSC) peaks at 100 to 120 compressions per minute. Idris calls this narrowly defined band the "sweet spot." Above 120 compressions, successful resuscitation starts to fall off, and at 150 compressions, success is less than half. "No one knew that," he says. "Half the people on the American Heart Association committee thought that faster was better because animal data showed that faster is better. In fact, the American Heart Association's mantra is "push hard and fast." The reason they have that mantra is because they thought people pressed too slowly."

Idris adds: "Before the study, we had no knowledge of chest compression rates. We didn't know that chest compression rates affected survival at all. So when I saw the curve I was pretty surprised."

According to Idris, the results of the study now open a new field of research. And he emphasizes that EMS providers need to pay attention to their rate of compression and keep from going too fast or too slow. "On my site in Dallas, the mean chest compression rate, measured for the first two years, was 135 per minute," Idris says. "And 150 to 180 was not uncommon. About a third of the chest compression rates, a third of the resuscitations, were over 120 per minute." The newly discovered data suggests a paradigm shift for emergency medicine.

Tracking Compressions

Idris investigated other ROC sites across North America and found that most were using chest compression rates above 120 per minute with one-third of patients. Now that the "sweet spot" has been established, Idris has become a big proponent of the metronome.

Recognized during 2013 as the most prolific principal investigator for the National Institute of Health Resuscitation Outcome Consortium (ROC), Idris has made some of his most compelling research advancements as the lead researcher for the ROC.

"We can solve this problem by putting a metronome onboard ambulances," he says. "Fortunately, many of the defibrillators and AEDs that are being used today have a metronome built into them." Idris has also partnered with a company to design a metronome that gives guidance regarding ventilation and chest compression, which he has placed on ambulances and fire trucks. "And I think more companies are building better metronomes in their equipment now," he says.

To be clear, the success of this study hinged on having viable and detailed raw data, which Idris was able to collect off of the electronic files of monitor defibrillators that are used on patients in the field during CPR. Those files were difficult to obtain, but Idris was persistent. "I had to really focus my efforts on developing a structure to collect the files off the defibrillators," he says. "Now we have the highest rate of collection in the ROC. We are collecting files on more than 95% of patients who receive CPR in the field."

What makes these electronic files so valuable is the detail—and the measurement—they track. The files record all chest compressions administered to a patient by a paramedic. Many of the monitors also show depth, interruptions and shock administration. "It's almost as good as being there—maybe better," Idris says. "You can't change anything without first measuring it. Now that we have the ability to measure what's going on during resuscitation, we have the opportunity to make discoveries."

Improving Lives

Idris says he sees the path he has traveled from Vietnam medic to full-blown medical researcher as a logical progression in his life. "The place I'm at today gives me the greatest opportunity that I could have in improving people's lives," he says. "I don't know how many people found a career as a result of their service in Vietnam, but I really owe my career to the Army. If I hadn't become a medic, I wouldn't have had any interest in medicine whatsoever."

And that would have been a loss to us all. That Idris pursued the path he did has been a tremendous benefit to so many.

Bringing Care to the Patient

Rick Lewis and Dr. John Riccio developed the Advance Resource Medic (ARM) vehicle and deployment system, allowing for a changed dispatch and triage process.

The Denver metro area isn't Gotham City. It doesn't have Batman or Robin or the Riddler, but it does have the Batmobile. A gadget-laden EMS Batmobile to be exact. And it would make even Batman envious.

Launched on Aug. 1, 2013, the Advance Resource Medic (ARM) car provides medical assistance on non-life threatening calls. It's staffed with an advanced practice paramedic and nurse practitioner.

Rick Lewis (left)
Dr. John Riccio (right)

The program comes from Dr. John Riccio, chief medical officer for True North Health Navigation and EMS medical director for Centura Health Prehospital Emergency Services, and Rick Lewis, EMT-P, EMS chief for South Metro Fire Rescue Authority, all located in Colorado. The initial idea came to Riccio as he was caring for his 91-year-old mother, who was grappling with medical problems. He was trying to keep his parents living together in their home and encountered many challenges. "I'm a medical professional, and I couldn't effectively navigate the system," he says.

Healthcare Delivery

Riccio knew other families were plagued by the same issues and were probably trapped in a cycle of 9-1-1 calls, hours-long hospital waits, then back home to then repeat the cycle. He knew there had to be a better solution for low-acuity calls than automatically transporting to the ED.

Rick Lewis was also considering better ways to make response to emergency calls more efficient. "When you call 9-1-1, you always get all the troops," he says. "You get a fire engine, paramedics—you get eight guys. And the call could be for a nosebleed. Meanwhile, if a guy a block away has a heart attack, paramedics may not be available. Then you have to call somebody further away."

So the two sat down and came up with an innovative answer that combines the fire department and EMS paramedics with a nurse practitioner in the ARM vehicle. "The idea is to bring advanced care to people on scene, so we don't always have to transport them," Riccio says. "That's how we came up with the idea of marrying what we do in the Emergency Department with what EMS does."

The ARM car is one piece of a larger whole in providing healthcare delivery; it's really more of a system. The initial triage for calls is done through MetCom, an advanced dispatch system. When a call comes into 9-1-1, the dispatcher asks a series of questions and then determines where the call fits on the acuity scale. "So the Alpha and Bravo are lower acuity calls and the ARM car is going to those," Riccio says. "That decision is being made by dispatch. We are going to lower acuity because that's who we're trying to take care of. We don't want to tie up our big guns with those calls."

While some growing pains are expected when adding priority medical dispatch into a system, according to Lewis the process has gone smoothly.

Into the Field

The ARM vehicle, which is a Clinical Laboratory Improvement Amendment (CLIA)-approved moderate complexity lab, is a state-of-the-art rolling medical laboratory. It offers the technology to perform chem panels, B-type natriuretic peptide (BNP), international normalized ratio (INR), prothrombin time (PT), partial thromboplastin time (PTT), strep, urine human chorionic gonadotropin (UHCG), mono testing and hemoglobin A1C. "And we can do a complete blood count (CBC), which differentiates us from the rest of the mobile laboratories because they can rarely do a complete blood count with differential," Lewis says.

The vehicle allows the paramedic and nurse practitioner to splint, suture, staple, pack nosebleeds and administer IV antibiotics. "The moderate complexity makes it more like a modern hospital laboratory," says Riccio. "We can do a lot of advanced EMS."

Simply put, the ARM car brings emergency medical technology and skills out into the field. "The CLIA lab is not something I've heard a lot of other people doing," Riccio adds. "As far as I know, we are the first ones to have the CLIA lab."

The ARM car program is aimed at the area's skilled-nursing and assisted-living centers, which are experiencing tremendous growth. "They open a bed a day in our district and have for the last three years," says Lewis. "Our district is 176 square miles, and when acuity goes up, with respiratory ailments, cold and flu, those calls just skyrocket."

Community Needs

So far the program has served more than 70 patients, and the number is growing. Lewis and Riccio have been meeting with the skilled-nursing and assisted-living centers in the area to spread the word about the program. "We're trying to get them to think of using us to help

Launched on Aug. 1, 2013, the Advance Resource Medic (ARM) car provides medical assistance on non-life threatening calls. It's staffed with an advance practice paramedic and nurse practicioner.

with these patients," Riccio says. Being transported can be stressful and confusing for elderly patients, and the centers have to deal with holding beds and giving away beds if patients don't return in a timely manner. "It's a nightmare," says Riccio, one that can be avoided many times by simply having the ARM car come to the patient.

"An important part of any of these integrated mobile healthcare programs is fitting the need to your community," Riccio adds. "We thought this was a big gap in our community in so many areas. We want to help people navigate the system, and there is the convenience of bringing care right there on scene."

One advantages of the ARM car is the nurse practitioner, who talks to the families and homecare nurses, arranges for follow-ups and coordinates numerous details for patients. "A lot of it is just putting together all the pieces of care and integrating it so that everybody is on the same page," Riccio says. In addition, the program integrates medical records, which go to primary care physicians and other healthcare providers. The ARM car also has the capability to display patients' hospital medical records via CORHIO, the state health information exchange (HIE).

Lewis relays a story of a woman from Michigan who visited Denver and developed tremendous back pain. "The nurse practitioner consulted a neurosurgeon who recommended she have an injection for her herniated disc," he says. "The nurse made lots of calls until she got the patient in to see an interventional radiologist in less than 24 hours, which is unheard of here."

Lewis also tells the story of a 22-year-old autistic man who sustained a laceration. "The last time they had to take him to the hospital, they had to tie him down and sedate him," Lewis says. The ARM car treated the 22-year-old in his home with no issues. "His mom is a registered nurse, and she was just floored," Lewis says. "For him, leaving the environment is way worse than any injury he could sustain."

Cutting Edge Medicine

The cost of the ARM program is born by South Metro Fire, including the purchase of the vehicle and the cost of buying and installing the lab equipment. But the savings have more than made up for those costs. According to Riccio, an ambulance transport averages $1,000 and care provided in the emergency department costs another $2,200. "If we take care of you [with the ARM car], the cost is closer to $500," he says. "We plotted that out, based on the volume we're seeing, and the citizens in the South Metro District will save almost $2 million this year."

Lewis, a 32-year veteran of EMS in Denver, acknowledges that the city practices cutting-edge medicine but can be hesitant to try new things. He also acknowledges that EMS and physicians tend to be risk averse—all of which contributes to the default decision of taking patients directly to the ED. "We are participating in this healthcare pile-up," Lewis says. "We are using the most expensive conveyance to go to the most expensive place to get treated for things that are low acuity."

Lewis credits his chief, Daniel Qualman, for having the vision to see what a program such as ARM can do for a community, even if it takes a while to gain traction. Riccio and Lewis also thank Dr. Jeff Beeson and MedStar Mobile Healthcare of Fort Worth, Texas, and Dr. Gary Smith of the Mesa Fire Department for their help and guidance in this endeavor. "They are all in," Lewis says. "When you have that kind of backup, it makes you kind of fearless. So we can have the temerity to watch it blossom."

Best Practices with Checklists

Shaughn Maxwell developed "EMS checklists" to ensure evidence-based critical interventions occur when specific clinical conditions are encountered.

It started with a book, which grew into a series of checklists that may now result in the transformation of the EMS industry.

Last year, Shaughn Maxwell, EMT-P, medical services officer and division head for EMS, Snohomish County (Wash.) Fire District 1, was working on a committee charged with developing a statewide system for cardiac and stroke care; this coordinated system would be one of the first in the nation. Specifically, the committee was trying to outline the key interventions that EMS providers should know and implement on every patient call. Given the more than 200 EMS protocols now in service, it was a tall order indeed.

Shaughn Maxwell

Consistent Care

"It was such a complex conversation that I asked myself how was I going to remember these things for every patient, let alone make sure that the 200 people I oversee remember them," says Maxwell. "But I feel that everyone should get the same, best care, so I wondered how we could provide consistent care for every patient."

Around the same time, Maxwell was reading *The Checklist Manifesto: How to Get Things Right* by Atul Gawande. The book details how the complexity of our lives can be better managed through the use of checklists—an idea that intrigued Maxwell.

Maxwell believes that good checklists require extensive knowledge, persistence and focus to develop.

"The book discusses how all high-consequence industries, like aviation, the nuclear industry and surgery, are using checklists to deliver consistent reliability," Maxwell says. "And I wondered, 'why aren't we doing this in EMS?' Fire departments use checklists; it's called an incident command checklist. We use checklists to make sure the medic and fire truck are ready in the morning. We are surrounded by checklists; they've been under our noses all along."

Coincidentally, Maxwell's medical director, Dr. Richard Campbell, was reading the same book. "We didn't know we were both reading the book," Maxwell says. From his reading, Maxwell discovered that Dr. Gawande was appointed by the World Health Organization (WHO) to find ways to make surgery safer around the world. To do so, the WHO adopted checklists. "They thought it would reduce complications by 15%," Maxwell says. "In fact, it reduced complications by one-third and cut death rates by half. They stumbled upon something great." The surgical checklists that the WHO designed have now been adopted in more than 20 countries as a standard for care.

Developing Checklists

Armed with this knowledge, Maxwell believed that the use of checklists could dramatically impact EMS care. He and Dr. Campbell decided to introduce the idea of developing checklists for high-acuity patients, not just for cardiac and stroke care but also for all critical conditions where EMS can make a difference.

To start the process, they used a consensus paper published in the *Journal of Prehospital Emergency Care* called "Evidence-Based Performance Measure for Emergency Medical Services Systems: A Model for Expanded EMS Benchmarking." Maxwell and Campbell also looked at additional research and settled on 10 areas where checklists might make a critical impact. "These areas are only 10% of the calls we go on, but we know we can make a big difference with our interventions," Maxwell says.

The number needed to treat (NNT) was a measurement tool from the research that really struck Maxwell. "It's a phenomenal way to illustrate for EMS providers which interventions make a difference and which don't," he says. As an illustration of how the NNT works, Maxwell uses an example of a heart drug that is given to five people. If one of their lives was saved then the drug would have an NNT of five. If it took 50 people to save a life, the drug would have an NNT of 50. "If you do a 12 lead, give an aspirin and get a patient to the cath lab in less than 90 minutes, you have an NNT with a ST elevation myocardial infarction (STEMI) of 15," Maxwell says. "But if you only give an aspirin, the NNT jumps up to 42."

So what does this have to do with checklists? By performing interventions

"When we use a checklist as a tool to help us be more successful, it's sometimes looked at as a weakness. But a checklist should be looked at as a strength. I think checklists are a secret weapon to make you better at anything."

"by the book," NNT can drop significantly for patients. Those interventions done correctly can make a big difference in the outcome for the patient, and checklists can help ensure that interventions are done correctly every time.

Checklist Enhancement

To date, Maxwell and the committee have created 12 checklists. They covered the 10 areas they set out to complete and have expanded into two emerging areas: syncope and sepsis.

Maxwell believes that good checklists require extensive knowledge, persistence and focus to develop. "When I read the book that said checklists can go through 50 revisions, I thought, 'yes, I'm sure they go through a lot of revisions,'" he says. "I now feel the full weight of that statement. We did more than 25 revisions on our first checklist." To get it right, the committee debated flow, process, accuracy and the priorities of what to do when. "We have Immediate Actions, which they use in the aviation industry, and then we have Items to Consider," he says. "Where does something fall? Is it an Immediate Action or a Consideration? They are incredibly complex [questions] for such a simple tool."

Once a draft of a checklist was presented, the committee gave feedback, sometimes for hours. "I had a group of our smartest paramedics and doctors in a room, and we developed headaches trying to analyze the absolute best wording and best order of the checklist," Maxwell says. "We'd revise them and then look them over again."

Maxwell was so intrigued with the idea and success he was having developing EMS checklists that he emailed the man who inspired him, author Atul Gawande. "He was so kind and humble," Maxwell says. "He has sent people my way, and they have assisted me in checklist design."

Maxwell talked to Gawande about the resistance that some in EMS have to checklists because they feel the lists take too much time. Gawande told Maxwell about a recent study that looked at using checklists during simulated emergencies in the operating room. One team used a checklist and the other did not. The results showed that the team that used a checklist had a 75% reduction in missteps and errors. "It made me feel validated," Maxwell says. "It also made me realize checklists need to become an EMS best practice."

Avoid Missing a Step

Many years ago, a head-on car accident in the middle of the night claimed the lives of 11 people in Eastern Washington. Maxwell remembers saying a prayer, asking for help to do everything he could to give the victims the best possible chance. "I think we did everything right that night, but we'll never know," he says. "If you do a checklist, you will know you did everything right because nothing will be missed."

Years later, he was called to a commercial construction site where a propane tank had exploded. The call encompassed a construction fire, a brushfire, and a mass casualty incident (MCI), all in one. Maxwell was handed the MCI checklist when he arrived on scene. "Everything went right that day," he says. "But I have the double validation that we used the checklist. And because I went down the checklist, I know that we did everything right."

With the use of checklists clearly so effective, one would think that EMS would quickly adopt the practice. But the industry has been slow to get on board. Maxwell attributes this to the culture and the pride of paramedics. "We are taught in paramedic school to be independent and autonomous and that you need to remember everything. That includes drug dosages and all the protocols. If someone asks you a question and you don't have the answer top of mind, then you aren't really considered a good paramedic," he says. "But the world is becoming so complex that you can't remember everything. As long as there are humans, there is going to be imperfection and fallibility. Once we can accept that we are fallible, I think we can be better than we are today."

Maxwell says he hopes that every prehospital provider decides to break through barriers and try to help people to the best of their ability. And he sees checklists as a cornerstone of that commitment. "When we use a checklist as a tool to help us be more successful, it's sometimes looked at as a weakness," he says. "But a checklist should be looked at as a strength. I think checklists are a secret weapon to make you better at anything."

A Musical Education

Farooq Muhammad wrote, produced and starred in innovative social media videos designed to educate the public about EMS and instill pride in EMS providers.

Like most paramedics, Lt. Farooq Muhammad, EMT-P, of the FDNY, likes to make sure all his equipment is in good working order before using it. Cardiac monitor? Check. Blood pressure cuff? Check. Pen and paper for rap lyrics? Check. Video camera and film editing equipment? Check.

Farooq Muhammad

Rap lyrics, video camera and film editing equipment? The singing paramedic needs all of this equipment to be in good working order so that he can create informative rap videos that depict life in EMS. "I want to show the public what we do because they have misconceptions about EMS," Muhammad says. "For instance, people call us ambulance drivers and I want to emphasize that we are not just ambulance drivers. I want them to know we have medical training. I want to show people the equipment we use, and I want to motivate my coworkers."

Finding a Voice

While Muhammad admits he liked all kinds of music growing up in Brooklyn, rap was new and he found it interesting. So he started writing rap songs as a way to share his thoughts with his friends. "My friends told me I was good enough to do something professionally, but I said, 'no, it was just a hobby,'" he says. "I never took it seriously. It was just something I played around with."

Muhammad wants the public to understand what paramedics and EMTs do and how they do it each and every day to positively impact lives and communities.

But unlike many children who outgrow their creative pursuits, Muhammad continued to write rap lyrics well into adulthood. To date, the medical rapper has created six very popular rap videos that can all be found on YouTube. His first such video, *Call 9-1-1*, came about almost by accident. "One day, I was sitting in the ambulance with my partner, and I shared something I wrote with him," Muhammad says. "It had nothing to do with EMS. It was just something about life." His partner told Muhammad the lyrics were good, really good, and suddenly a light bulb switched on.

"I said to him, 'you know what would be really cool? If I wrote a song about what we do in EMS.' His response was that I should do just that."

Muhammad took the advice to heart and wrote a rap song about emergency medicine. Then he took it to work to show his coworkers. They were all enthusiastic about the lyrics and, given that ringing endorsement, he decided to make a full-length video.

Making a Video

Muhammad contacted the FDNY press office to ask their permission to create and post the rap video online. He sent emails but didn't receive an immediate response. "I'm sure they were wondering, what is this rap stuff?" Muhammad says. Curious about the inquiry, the FDNY did contact Muhammad and invited him to explain his project. After hearing his explanation, they gave him the green light and asked to see the video before posting.

Muhammad recruited coworkers and a fellow paramedic who had expertise in filming and editing. He reached out to a music studio that agreed to record him. When he showed the finished product to the FDNY, not only did they like it, but Commissioner Nicholas Scoppetta loved it.

In life, timing is everything. *Call 9-1-1* was completed in 2009, just before National EMS Week. "The chief of EMS loved it and wanted to release it during EMS Week," Muhammad says. "We didn't plan to release it then; it just worked out that way." *Call 9-1-1* has now been viewed more than 278,000 times.

Muhammad has followed that success with other videos including *EMS Anthem*, *Blue Star EMS* and *Never Give Up*. The videos have been viewed a combined one million times. Commissioner Salvatore Cassano was equally as delighted with the positive message and approved the next four videos.

Global Recognition

Because of the popularity of the videos, Muhammad's celebrity now extends beyond YouTube. He has approximately 3,000 Facebook friends, has been a guest on *The Today Show* and been honored by President George Bush at the White House. "That was a once-in-a-lifetime experience," Muhammad says. "Who gets

to sit next to the president having dinner, and then see him give a speech and mention you by name? It's something I will never forget."

He also has followers reaching out from all over the world. "People who are visiting the United States ask to meet me," Muhammad says. "No matter where in the world they are, when it comes to EMS they have the same issues. It's a small world and a small family of people when it comes to EMS, and these videos have proved that to me."

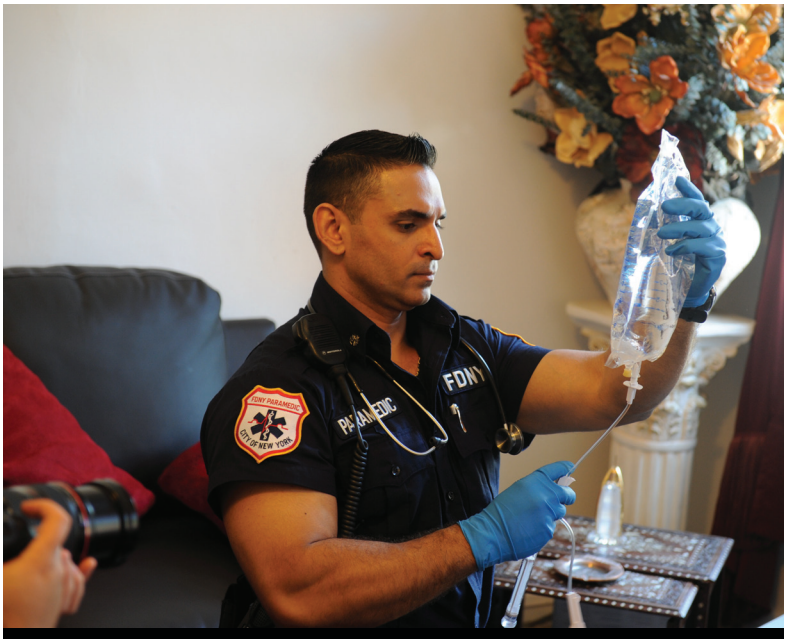
Muhammad also finds recognition in Brooklyn where he works. "I'll be somewhere doing my job and someone will walk up to me and say, 'Aren't you that rapping paramedic?'" he says. "One time I was buying a pizza and two guys walked up. One was wearing an EMT uniform from a private company and he said to his friend, 'look, there's that guy.' And they gave me a wave."

Acknowledging EMS Providers

While Muhammad appreciates the outpouring of support for him and his rap videos, celebrity is not his goal. The real message he hopes to convey in his unorthodox approach is that EMS providers work very hard to provide the very best in patient care. He wants the public to understand what paramedics and EMTs do and how they do it each and every day to positively impact lives and communities.

In the video *Never Give Up*, Muhammad vowed to drive home a special message. "I don't ever want to give up, and I try to impart that in the video," he says. "I want to show people that we don't give up. We keep going and we stay strong."

Muhammad also wants the videos to showcase the love and respect he has for his fellow workers and the EMS profession overall. "I always felt I could do different creative things, and rapping was one of those," he says. "I found an outlet to use that creativity and a way to express myself in these videos that shows my love and appreciation for the job we do."



"No matter where in the world they are, when it comes to EMS they have the same issues. It's a small world and small family of people when it comes to EMS, and these videos have proved that to me."

Those words have more impact when you realize that Muhammad nearly lost his life on Sept. 11, 2001, at the World Trade Center. It's not something he likes to talk about. He found himself triaging the injured beside one of the towers before it fell.

Musical Instruction

Still, memories like these and the countless other calls he's run give him the creative ideas that infuse his rap lyrics. With pen and paper, he brainstorms themes about his personal and professional experiences. "They stir thoughts in my head," he says. "I replay calls I've had and try to tell a story. I try to be detailed, especially for EMS providers, in telling them not to cut corners and to be thorough, like wearing gloves and not getting stuck by needles."

Muhammad also details EMS equipment and its use because he wants the public to better understand the role a paramedic or EMT plays in the medical field. "I try to let the public know that we intubate, defibrillate, read electrocardiograms (ECGs), and give medication," he says. "A lot of the public talks to me and they tell me, 'I didn't know you guys did all that.'"

It's clear from Muhammad's videos and lyrics that he has real pride in EMS. He acknowledges its difficulties and stresses, but emphasizes the necessity for providers to stay sound in mind and body. He hopes his videos help his fellow providers remember that.

Ultimately, while Muhammad hopes that the messages in the videos resonate with all viewers, he specifically targets his fellow EMS providers, firefighters and police officers with the goal to help them understand that what they do matters—to their patients and their community. "I'm proud of what we do. We make an impact and a difference in people's lives," Muhammad says. "We've got to respect each other, respect ourselves. That's the only way we're going to grow, and it's the only way we're going to get respect from other agencies. That's what I try to share."

Indeed, that's a rap.

Equipment & System Upgrade

Jim Parrish facilitated a movement at Humboldt General Hospital toward prehospital care, a training program and a police-paramedic program.

Humboldt General Hospital prides itself on providing its 8,000 local and 17,000 county residents with the best possible care. It seems like an achievable goal but, in fact, it's an aspiration that has been hard fought and hard won.

Jim Parrish

The journey the Winnemucca, Nevada-based hospital has taken from its modest 1897 roots of just six rooms to a present structure that includes a new 35,860-square-foot expansion, complete with a $10 million computer system integrating all hospital technologies under one network, has been more than a century in the making. But, arguably, it's the vision of Humboldt's CEO, Jim Parrish, MBA, FACHE, FACMPE, that has been the driving force in making profound changes to the hospital by bringing it and its EMS and medical staff into the 21st century.

System Upgrade

Parrish arrived at the hospital in 2004 to find Humboldt's EMS department made up largely of volunteer EMTs. He also found the hospital staff working with insufficient and antiquated equipment and, on top of that, there was a shortage of critical personnel. All of these issues posed particular challenges because the hospital's EMS department was responding to more than 1,200 calls a year. "I knew we needed to upgrade our equipment and ambulance service right away," Parrish says.

And upgrade he did. The hospital now has a primary and secondary rescue truck, the oldest having been around for just four years. Recently the hospital purchased a combination ambulance and rescue truck—a $400,000 investment. Parrish then began upgrading the hospital's equipment and technology to state-of-the-art systems and devices.

Trickiest of all, Parrish moved the hospital away from a volunteer-based system to hiring full-time paid EMS personnel. "People take a lot of pride in volunteering, but in order to improve our patient outcomes and response times we had to go with a paid service," he says. EMS is now staffed 24 hours a day. Volunteer EMS is still part of the hospital's personnel structure, but they serve on a casual call basis. "They come in and backfill," Parrish says. "So we are still able to respond within five minutes, if we get stacked up with four calls." And a paramedic now rides on every rig.

Parrish also addressed the need for paramedic training. Prior to his arrival, paramedics had to go elsewhere to receive the medical training needed to be part of the hospital's EMS team, so Parrish arranged for people who had been trained at other facilities to work with Humboldt. In the simplest terms, he hired them to be a part of the hospital. He also drew up an agreement to partner with a local college to teach accredited courses to Humboldt's paramedics. "We just graduated almost a dozen individuals," Parrish says. "Nine of them have taken and passed the exam."

Not only have these changes significantly impacted the Winnemucca community, but Parrish also has helped save the county millions of dollars. Before he arrived, patients were routinely flown more than 170 miles away to Reno's tertiary care facilities. "A flight service crew flew them, which cost $30,000 a flight," Parrish says. Now patients are transported by ambulance at a cost of $8,000 per transport. "On average, we save our community about $4 million a year," he says.

Developing Partnerships

All of this effort has not only changed the perception of Humboldt General Hospital, but of paramedics as well. "Our paramedics are viewed as heroes because they are the ones who show up at four in the morning," Parrish says. "They are all well received."

> **"Our paramedics are viewed as heroes because they are the ones who show up at four in the morning."**

Parrish has also partnered with the local police department and created the first-ever police-paramedic program. It all started when one of the hospital's paramedics left to work for the Winnemucca Police Department, and Parrish saw an opportunity. "We talked to him and said it would be cool if he could play a dual role of police officer and paramedic," says Parrish. He agreed with that idea, and so did the chief of police. "We bought the jump bag for his car, which is marked as a paramedic car. He is the first call, so we are able to get someone on scene within two or three minutes," he says. "Sometimes he can go on a call and clear it, so we don't have to roll out an

Parrish acknowledges that keeping people out of his hospital will have an impact on revenue, but he thinks medicine will evolve in the future to the point that people can receive alternative care without putting hospitals like his out of business.

ambulance with two paramedics. He's already saved two lives."

Parrish is so pleased with the outcome that another officer, this time with the Winnemucca Sheriff's Office, will be taking on the same role. "He has just completed his classes, but he hasn't taken his test yet," Parrish says. "Once he takes his test and passes, he will be a paramedic on the sheriff's side."

None of this would have been possible, says Parrish, without the full support and enthusiasm of the chief of police and the sheriff's office. "Both the sheriff and the chief of police are very forward-thinking and concerned about community safety," says Parrish. "They see this as a huge step forward in keeping the community safe, and they've embraced it." They've also, no doubt, embraced the cost savings. The response vehicles for the two law enforcement paramedics have cost between $2,000 and $5,000—a tab the hospital has picked up. "It's nice for them because the police force has a limited budget," Parrish says.

Community Health

Parrish continued to seek additional opportunities to impact the community, and he spearheaded a community paramedicine program. Rather than just sending paramedics on emergency calls, Parrish and the hospital are trying to improve the health of the community by having paramedics make welfare checks on residents.

"This is a physician-supervised program for people with chronic diseases, such as chronic obstructive pulmonary disease (COPD), congestive heart failure or diabetes," says Parrish. "A paramedic might visit once or twice a week. They make sure a patient is taking their insulin or following their diet plan. More than just dictating to people, they are trying to connect with these folks and teach them how to take care of themselves."

To illustrate how effective the program has been, Parrish recalls a COPD patient who ran up a hospital bill of $212,000 over a two-year period. Last year, that same patient was enrolled in the paramedicine program. She was hospitalized only once and had a bill of only $12,000. "It's early yet," Parrish says, "but we've had tremendous success. We think if we can teach these people, monitor them, and be friends with them, we can raise their health status so they are not dependent on the emergency room and the hospital."

Ease of Care

Every year, Nevada plays host to thousands of people in an annual gathering in the Black Rock desert known as Burning Man, and Humboldt General Hospital is the medical provider for the event. In 2010, approximately 80 people in need of medical attention had to be taken by ambulance to Reno, which was costly and time consuming. In 2013, Parrish changed that through an initiative that had the hospital provide "self-contained" medical care. Humboldt's EMS provided medication on the premise, as well as onsite labs, ultrasound and teleradiology that could be read on a real-time basis. Last year, Humboldt transported just 28 people to Reno from the Burning Man event, out of a population in excess of 68,000.

The initiative was so successful that Humboldt purchased a portable X-ray machine to provide the same service to the Winnemucca community. "If somebody is homebound, we can take that unit to the house and do the X-ray without them having to come in," Parrish says. "It saves the community time, effort and money, as well as giving people access to medical care."

For Parrish, all of these innovations are simply a way to provide better healthcare to his community. He acknowledges that keeping people out of his hospital will have an impact on revenue, but he thinks medicine will evolve in the future to the point that people can receive alternative care without putting hospitals like his out of business. "It's getting back to common sense," he says. "We've lost common sense in this country when it comes to healthcare. We've got to get back to people understanding how to take care of themselves and not going to the ER with colds and sniffles."

If Jim Parrish can be part of the dialogue, and part of the solution, you can bet that the changes will be far reaching for everyone involved.

Improving Survival Rates

Dr. Kevin Seaman established a division of the Seattle Resuscitation Academy in Howard County (Md.), contributing to prehospital emergency care well beyond the borders of the county.

If you log on to the Howard County (Md.) Department of Fire and Rescue Services' (HCDFRS) website, you'll find the agency's core values, which say, in part, that the service will "create and maintain an environment of individual safety, well-being and trust." These are values that the nearly 900 career and volunteer providers of Howard County take seriously and try to maintain every day of the year.

Dr. Kevin Seaman

To this end, the service wanted to improve cardiac arrest survival rates in their county. So in 2010 the HCDFRS sent three people to the Resuscitation Academy in Seattle, overseen by Dr. Mickey Eisenberg, to learn why Seattle has such a renowned reputation for high cardiac arrest survival rates. Dr. Kevin Seaman, FACEP, medical director for HCDFRS, was one of the attendees, and the ensuing partnership with Seattle and Dr. Eisenberg would prove to be pivotal for both Seaman and Howard County.

Cardiac Arrest Program

"My task was to review our cardiac arrest rates, collect data and begin to furnish feedback to providers," Seaman says. In fact, what Seaman and his team did was take what they learned in Seattle back to Maryland and begin to craft and champion a "boots on the ground," firefighter-led comprehensive cardiac arrest campaign that has had significant impact on EMS providers and community residents, within the county and beyond. The critical elements were training providers in high-performance CPR, equipping police with automated external defibrillators (AEDs), measuring performance and giving feedback to providers.

To initiate such an expansive program, Howard County, which serves a population of 350,000 people over an area of 262 square miles, reviewed their performance around cardiac arrest survival and knew they could improve. Paramedics and firefighters worked through many challenges and collected data in the Utstein template, the standard for cardiac arrest reporting. The program required developing treatment protocols, creating community CPR training, revising instructions and education for dispatchers, and fostering a culture of code resource management. Seaman's leadership, coupled with field provider dedication, has resulted in the increase of survival to hospital discharge from 19 to 47%, one of the best rates in the country.

Seaman, with the Maryland Institute for Emergency Medical Services Systems (MIEMSS) in partnership with the Seattle Resuscitation Academy, developed the Maryland Resuscitation Academy (http://ramaryland.org). "The idea is to spread information and education on how to improve cardiac arrest survival in your community," Seaman says. Dr. Robert Bass, executive director for the MIEMSS, recently asked Seaman to lead the state's steering committee on cardiac arrest survival.

Community Education

To date, Howard County has trained more than 200 people in the Mid-Atlantic and East Coast regions in high-performance CPR, including EMTs and paramedics, medical directors, fire chiefs, EMS chiefs and emergency medical dispatchers.

"The real value is in educating our students and community leaders. We have trained 13,000 residents in CPR and AED, including 9,000 students. We need our residents to recognize the signs of cardiac arrest."

"The real value is in educating our students and community leaders," says Seaman. "We have trained 13,000 residents in CPR and AED, including 9,000 students. We need our residents to recognize the signs of cardiac arrest, understand how critical time is, begin bystander CPR and don't stop until we get there. We are also working with dispatchers to develop a curriculum to recognize the signs of cardiac arrest and aggressively coach bystanders or callers in hands-only CPR."

Under Seaman's leadership, and with the hard work of every member of HCDFRS, the organization is now recognized as a Mid-Atlantic and East Coast site for high-performance CPR. Both suburban and rural agencies in these areas have come to Howard County to receive education and training on how to implement their own high-performance CPR programs.

Improving Intubation

Dr. Kenneth Rothfield, chairman of anesthesiology at nearby St. Agnes Hospital, perceiving an opportunity to improve field intubation success, contacted Seaman and the two agreed to work together. Dr. Rothfield had earlier instituted a program at the hospital in which ED and intensive care physicians, anesthesiologists and respiratory therapists were trained in intubation using the GlideScope video laryngoscope. Rothfield wanted Howard County EMS to consider using the GlideScope, which is easy to learn and use, and doesn't interfere with compressions during intubation.

Howard County developed a protocol and research study to implement and track the efficacy of using this video laryngoscopy, the first jurisdiction in the state of Maryland to develop such a study and protocol. The study trained and followed 120 paramedics who used GlideScope on manikins, out in the field and in the hospital operating room. At the conclusion of the study, Seaman learned that the rates for intubation success jumped from 64 to 87% using GlideScope. "We concluded that by using video laryngoscopy, not only can you achieve better success but you also can intubate without compromising the quality of CPR, which we know is one factor that really influences cardiac arrest survival," he says.

A critical discovery was that the learning curve to master video laryngoscopy was significantly shorter than conventional techniques. "A paramedic student needs 15–20 direct laryngoscopy intubations to reach a success level of 80-90%," Seaman says. "With the GlideScope, following didactic and manikin education, they only need one or two intubations in the OR to get to the 80–90% success rate."

Seaman initiated the GlideScope program through this partnership and the devices were put on all ambulances in Howard County. This effort resulted in the increase of intubation success mentioned previously. However, a major challenge was cost. Video laryngoscopy can cost from a few hundred dollars to approximately $10,000 each. Some feel the cost is just too much for an agency to bear. For those who feel the units are too expensive, Seaman has a thought-provoking inquiry. "I understand budget constraints and know some feel they cannot afford it. But given the improved outcomes, I would ask: "How can you afford not to do it? Do you know your intubation success rate?'" He asks agencies to keep in mind that with developments in technology, there are a variety of video laryngoscopes available at various price points.

Increasing Awareness

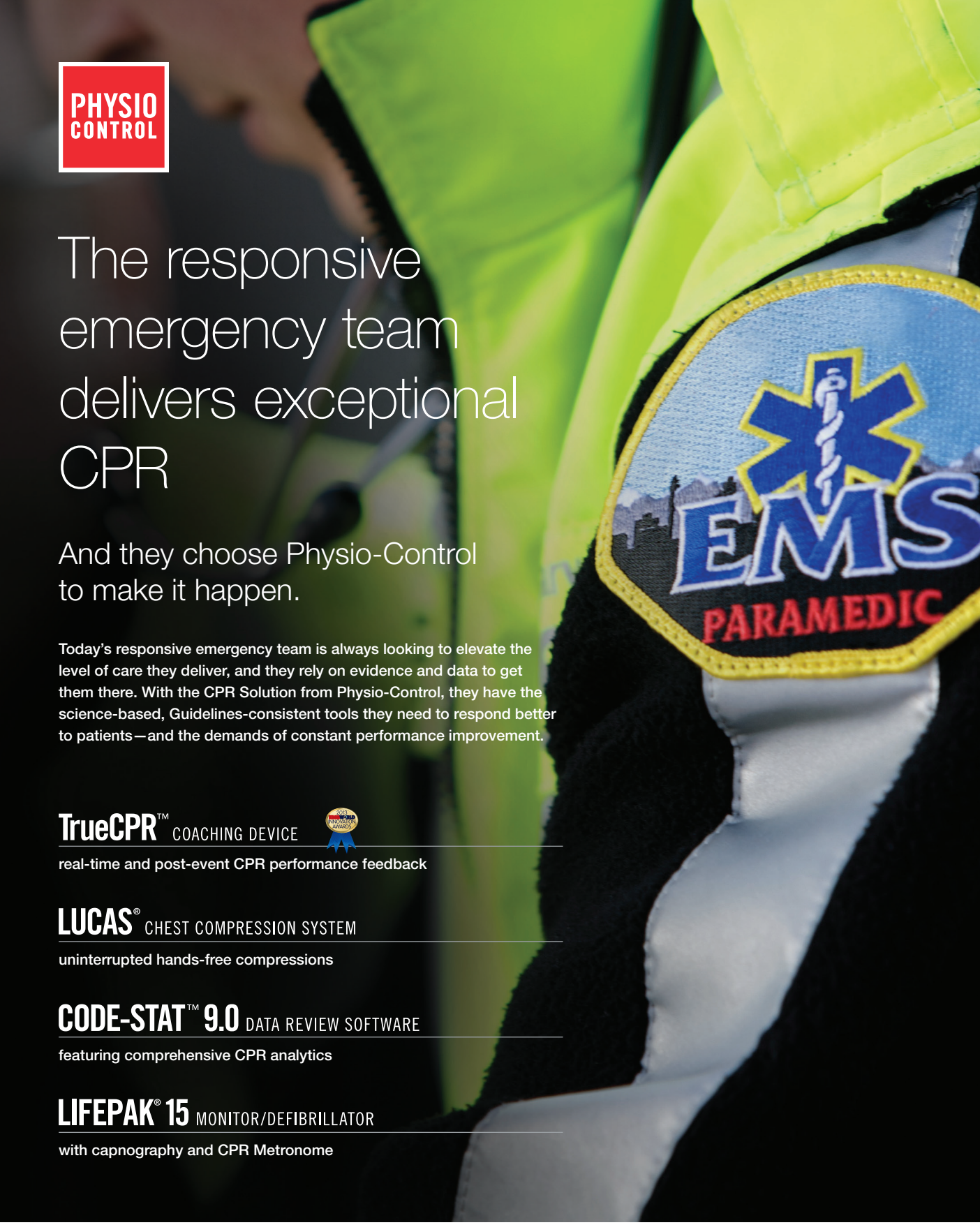
While many in the EMS community are focused on cardiac survival as a part of their job, prehospital care—and cardiovascular disease in particular—is personal to Kevin Seaman. His mother died of the disease and he wants to find better ways of not only treating cardiovascular problems, but also preventing them altogether.

In terms of the educational effort Howard County has made, Seaman hopes the awareness around cardiac arrest survival will become a priority in the community—particularly the message that cardiac arrest is survivable and preventable. "Cardiovascular disease is the number one killer in Howard County. It's the number one killer in Maryland. It's the number one killer in the United States. It really should be a public health crisis," Seaman says. "There are things we can do to improve survival from cardiac arrest, and it's not just treating it after it happens. The big message for me is prevention. I really want every one of those patients to survive with good quality of life, able to implement medical treatment and lifestyle strategies to prevent further episodes of cardiovascular disease." These messages can reach community residents without cardiovascular disease, helping them prevent the disease from ever occurring.

Seaman emphasizes that Howard County's success is due to the many paramedics and EMT/firefighters who work hard every day to make a real difference in people's lives. He is particularly focused on illustrating how proper training and concentrated data tracking can result in improved medical delivery and health outcomes for residents of his community.

"I'm a big believer in team play, and this has been a real team effort where the sum is greater than the parts," Seaman says. "We've had so many members of our department willing to pull together toward the same goal of measuring for better performance in improving cardiac arrest survival. I think that improvement energizes our providers to make a difference, and I want to help make them feel good about what they do."

Perhaps the best example of the real impact of what Seaman and his fellow group of EMS providers have done in Howard County can be seen when those they have helped save come back to say thank you. "Some of the reunions between our survivors and providers have made it all worthwhile," Seaman says.



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