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On the Cover
Kern County, CA, fire crews and paramedics work together to move a patient to a helicopter landing zone during pre-fire season training. Photo by Barry D. Smith.

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QUALITY CORNER: CHECKING OUT
Except for the actual patient care we render, there is probably nothing so important as checking your ambulance to ensure you are ready for what may come your way. Read more at EMSWorld.com/1205956.

MOULAGE OF THE MONTH
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Bobbie Merica continues her guide to simulating injuries and illnesses through effective use of moulage.
This month: Pediatric stroke. See EMSWorld.com/12050955

EMSWorld® VIDEO OF THE WEEK
EMS World is pleased to announce it has partnered with ReelDx, a pioneer of real-patient video in medical education, to publish real-patient video case studies designed to educate EMS providers.
The case studies offer short videos of real encounters in the field and in emergency rooms, substantial case data and imagery, and behind-the-scenes insights on the encounter.
Go to EMSWorld.com/video.

EMSWorld® PODCASTS
THE WORLD OF EMS: SAVING PROVIDERS
World of EMS host Chris Cebollero talks to Chris Colwell, MD, medical director for Denver Paramedics and the Denver Fire Department, as well as director of emergency medicine at the Denver Health Medical Center, about the recent suicide of Denver Health paramedic Debbie Crawford, who had worked as a paramedic since the 1980s. They discuss how we can better recognize signs of stress and depression among our colleagues and provide resources for those who need help.
See EMSWorld.com/12047526.

WORD ON THE STREET: TALKING SMACC
In this month’s Word on the Street podcast, EMS World editorial advisory board member Rob Lawrence talks with Ashley Voss Liebig, who serves on the U.S.-based organizing committee of SMACC US (Social Media and Critical Care conference) heading to Chicago in June, and to a previous SMACC attendee, Queensland Ambulance Service officer Mick Lazell. Find out how social media and the #FOAMed movement is transforming how we learn about critical care.
See EMSWorld.com/12053225.

WEBCASTS
Visit EMSWorld.com/webcasts to access our archives:
THE FUTURE OF CRITICAL CARE TRANSPORT: HOW DO WE GET THERE?
Critical care transport has been around for decades, but continues to be a rapidly evolving area in EMS. In this webinar, we will look at the past and growth of the critical care transport industry and critical care paramedicine.
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When the City of New Orleans faced the daunting task of selecting a new ambulance manufacturer, they were looking for a company that would stand the test of time.
New Orleans EMS Chief Carl Flores says, “We chose Braun Industries because they have 40 years of proven commitment to the EMS industry and their customers. We talked with some of the largest departments in the country and they all had exceptional reviews about working with Braun Industries. In the end, Braun was able to deliver on all of our requests - when no other manufacturer could. They went above and beyond in proving to us they were in it for the long haul.”
The department’s highly customized Liberty models include a Whelen LED light package, Whelen Dominator 8 LED light in grille, SK4 ultraviolet air purification system, custom personnel storage locker for crew gear built-in to console, built-in GPS feature, rear module camera & backup camera, DriveCam event recorder, all aluminum interior, Meganite cabinets, custom equipment mounts, and custom designed aluminum console to store mobile data terminal, siren, radios, wireless keyboard, & flashlights.

To learn why Chief Flores and departments across the country prefer Braun ambulances, visit our website at www.BraunAmbulances.com or call us toll free at 877-422-8315.
Talking SMACC

Social Media and Critical Care conference educates through technology

Traditionally education has been delivered in a classroom setting by teacher and textbook. But what if you could listen to a global subject matter expert streaming a master class directly into your headphones, or you could establish a study buddy 10 time zones away? How about posing a clinical problem or question and getting answers and best practices from clinicians from around the world?

This is the concept behind the Free Open-Access Medication movement, better known as #FOAMed. Conceived in a pub in Dublin, Ireland (where else?), the idea quickly gained traction among physicians, residents and students, who started to share problems, questions, solutions and suggestions using the #FOAMed hashtag for easy searching on social media. The movement is made up of blog posts, podcasts and videos, with Facebook groups and Twitter feeds spreading the message.

The viral success of FOAM led to the first SMACC (Social Media and Critical Care) conference held in Australia, which attracted 600 participants in 2013 and doubled to 1,200 in 2014. And now, by popular demand, SMACC is coming to Chicago in June 2015 (see www.smacc.net.au). In keeping with its cloud-based origins, SMACC is not a traditional conference. The sharp, smart delivery follows a “Mad TED” style of presentation to enthuse attendees in house and online.

In this month’s Word on the Street podcast, EMS World contributor Rob Lawrence talks with Ashley Voss Liebig, who serves on the U.S.-based organizing committee of SMACC US, to find out how #FOAMed is transforming how we learn about critical care. See EMS World Expo, September 15–19 in Las Vegas, NV. Registration is now open at EMSWorldExpo.com.
Integrated Patient Transport System for Missouri Agency

MIKE MCCART, DEPUTY CHIEF OF THE Pulaski County Ambulance District in mid-Missouri, wanted to get out of the box, literally, to provide emergency medical services for his community.

In late February, the district took delivery of a custom-made 2014 Mercedes Sprinter ambulance built by Osage and using a new component set from Ferno. “The innova-
tive design has the safety of medics’ and patients’ in mind. It is more compact than the typical box-style ambulance and supply cabinets have been replaced with soft-sided bags. The supply bags, monitors, oxygen and IV equipment hang along the side with quick-release mounts on a track system.”

“Pulaski County is about to try an ambulance that the provider who is seated behind the patient’s head when airway management is required. For More Information Circle 14 on Reader Service Card

“Physio-Control solutions can help you improve STEMI outcomes. Ensure speedy, reliable 12-lead data transmission with Physio-Control.”

How do you improve STEMI outcomes?

Bottom line: Physio-Control solutions can help you reduce D2B and E2B times.

Pulaski County requested a forward-facing seat instead of the typical side bench seating for more safety and better access to the patient and medical supplies. The ambulance is also equipped with Ferno’s Acetech system to monitor vehicle location and support safe driving behaviors. The ambulance is also equipped with Ferno’s Acetech system to monitor vehicle location and support safe driving behaviors. The ambulance is also equipped with Ferno’s Acetech system to monitor vehicle location and support safe driving behaviors. The ambulance is also equipped with Ferno’s Acetech system to monitor vehicle location and support safe driving behaviors.

We’ve known it for years: Better, faster communication saves lives. In the past, that was hard to act on in the field, due to slow technology and urgent demands on attention. Physio-Control takes the pressure off of EMS teams and makes it easy to deliver high-quality patient data to hospital caregivers long before arrival.

MONOC and Physio-Control

The LIFENET® System helped MONOC paramedics send ECGs from the field to the hospital more easily and with fewer steps. That meant multiple transmissions over the course of travel—and better, faster pre-arrival information. That led to better overall care for all of MONOC’s STEMI patients.

We don’t know how you could argue the benefits. This system improves patient outcomes by cutting E2B and D2B times.”

---Scott Matin, MONOC Vice President of Clinical, Education, and Quality Improvement

Learn more!

Download the case study at www.physio-control.com/MONOC/
Bariatric Patient Care
When an obese patient is transported, what can be done with his scooter?

THE LATE-AFTERNOON TRAINING session is interrupted by the dispatch tones, and Attack One is requested to respond for a “person unresponsive.” The crew notes an extra piece of equipment—a ladder truck—is also asked to respond on this incident. No further information is available.

The scene is at the edge of a downtown park, where a group of bystanders surrounds a patient. The Attack One crew parts the crowd and finds a middle-aged man who is strapped into a large-person conveyance scooter, slumped over the steering mechanism. He is breathing but pale and withdraws only to painful stimuli.

A helpful bystander reports they noticed the man coming out of the park on his scooter when he gradually slowed and came to a stop on the sidewalk. He lowered his head onto the steering handle, and bystanders found him to be unresponsive, not just sleeping. No one is familiar with the man.

The Attack One crew takes control of the man’s head. His skin is pale and cool, he is breathing, and his pulse is palpable at his neck. He is very large, weighing perhaps 500 lbs. They find a wallet with his identification but no indication of medical problems or alerts. He lives in an apartment near the park. His cell phone is available, and one of the younger crew members opens it and identifies an emergency contact in the directory, but unfortunately that person is not available when called.

The Attack One crew parts the crowd and sees the man. He is very large, weighing perhaps 500 lbs. They find a wallet with his identification but no indication of medical problems or alerts. He lives in an apartment near the park. His cell phone is available, and one of the younger crew members opens it and identifies an emergency contact in the directory, but unfortunately that person is not available when called.

The crew members work quickly with the patient. They attempt to move him. "Dispatch, we need an ambulance with a large-stretch capacity stretcher sent to our scene," the paramedic requests. She appreciates the 9-1-1 center has dispatched the additional truck company to the call, but they will need the larger stretcher to move the patient.

The paramedic moves through a structured physical examination to look for the source of the man’s altered level of consciousness. She finds no signs of trauma; no smell of intoxicating beverages; no track marks; no unusual breath smell; and no diaphoresis. His pupils are dilated, and his pulse rate is rapid. No medical alert indicators are present. No insulin pump is found. A blood sugar is obtained as the crew rapidly starts an intravenous line—it’s about 150.

The paramedic ponders a minute. This patient is elderly, with some difficulty breathing when lying flat. A helpful bystander reports they noticed the man coming out of the park on his scooter when he gradually slowed and came to a stop on the sidewalk. He lowered his head onto the steering handle, and bystanders found him to be unresponsive, not just sleeping. No one is familiar with the man.

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anaphylaxis as the only reasonable causes. With his rapid heart rate, anaphylaxis seems most likely.

The paramedic decides to treat this as anaphylaxis, so the intravenous line is opened and a bolus of one liter started, and an epinephrine injection of 0.5 ml of 1:1000 concentration is drawn up. That medicine will have to be administered intramuscularly to begin, since the patient’s skin is not perfusing well and a dose placed subcutaneously won’t likely be picked up and delivered to the vascular system. The paramedic tells the EMTs she will give the patient 4–5 minutes to respond to the intramuscular dose; then they will have an intravenous dose ready for administration. That gives the crew enough time to do the initial treatment and then have enough responders and the stretcher available to do a safe removal off the scooter.

The IM epinephrine dose is administered into the upper arm with a long needle, then the arm rubbed to improve delivery of the medicine. The patient’s condition doesn’t change. Oxygen is being administered, and the fluid infusion is going smoothly.

When the ambulance with the large-capacity stretcher arrives, the responders bring the large textile movement tarp over, gently roll the patient onto it, then slide him onto the stretcher. All hands are used to effect a safe transfer.

A timely phone call then arrives on the patient’s cell phone. It’s the emergency contact returning the message left on her phone; she reports she’s the man’s sister. She lives in the city but will not be able to join her brother for a couple of hours. Importantly, she reports the man has no medical problems other than his extreme obesity. She is not aware of him being ill recently or having any allergies.

The crew gives her the information about the hospital to which they’ll be transporting. She advises that the siblings’ parents are out of town, and they have a special van the man has to be moved in with his high-capacity scooter. They left the area a couple days ago, and the patient was aware he would not have access to a van for about a week. The sister will find a way to contact them and have them call the hospital.

The patient and stretcher are moved into the ambulance using ramps and a winch. As the Attack One paramedic jumps in the ambulance, she notices the large scooter inside.

Learning Point
Anaphylaxis is a life-threatening condition that is sometimes difficult to identify. Epinephrine is the lifesaving treatment. Very large patients require special preparation for their treatment, transportation and management of the devices used in their daily activities.

Approximately 620,000 children per year ride in ambulances while improperly restrained.

The Quantum ACR-4 provides for the safe and effective transport of infants and children in an ambulance.

• Allows for the safe, effective, restraint of all children from 4-99 pounds
• Open channel design allows complete patient access
• Tightens into the mattress of the stretcher not into the child.
• Compact packaging, taking up less room in the back of an ambulance.
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er is the only object being left behind. She asks the captain from the ladder crew if he can find a way to get the scooter to the hospital.

“Sure,” he replies, “although I have no idea how to get that done. It won’t fit on our apparatus. I’ll try to get the police or the metro bus service to move it there.” But he is fairly sure those will not really be good options.

The paramedic starts giving an audible signal. “Sir, you are with metro EMS,” the paramedic tells him. “You were found unconscious on your scooter, and it appears you are having an allergic reaction to something. How are you feeling?”

“I feel completely washed out. It’s hard to breathe. I’m lying on my back. Can you lift my head?”

The head of the stretcher is raised slowly, and the patient reports he feels much better as it is. His skin begins to pink up, and his radial pulse and the oximeter on his finger are both resounding.

The paramedic administers a dose of diphenhydramine, a dose of methylprednisolone and a dose of ondansetron for nausea. By the time the ambulance arrives at the hospital, the patient is sitting up and comfortable receiving oxygen by cannula. His blood pressure is palpable at about 80 mmHg. Most important, the patient is now beginning to speak.

“I felt like I got stung by something as I was going through the park. It was on my back, so I couldn’t tell what happened. Can you look to see? I have never had a problem like this before. And I’m starting to feel sick to my stomach.” He advises he has no chest pain.

The paramedic can’t find anything examining the patient’s upper back but can’t do a complete exam at this time due to the patient’s size. “We will look again when we get to the hospital,” she tells him. “Before we get there, I’m going to give you some other medicines we use for allergic reactions. I will also give you some medicine for your nausea.”

The paramedic administers a dose of epinephrine by taking a vial of epinephrine off, his oxygen mask off, his oxygen saturation is above 90%. The blood pressure is palpable at about 80 mmHg. Most important, the patient is now beginning to speak.

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The paramedic administers a dose of diphenhydramine, a dose of methylprednisolone and a dose of ondansetron for nausea. By the time the ambulance arrives at the hospital, the patient is sitting up and comfortable receiving oxygen by cannula. His blood pressure is palpable at 130 mmHg.

“Great for you, sir—you seem to be getting better,” the medic tells him. “The emergency department staff will be glad you’re able to talk with them as we go in. Our report from the scene indicated you were unconscious.”

The gentleman is turned over to ED staff in much better shape than when found. As he is he tells the Attack One crew, “Thank you for making me feel better. Where is my scooter?”

Emergency Department Management

The patient is loaded onto an oversize ED cot, and during the transfer he is completely disrobed. On his lower back is an area that is raised and inflamed, consistent with a bee sting. The emergency physician congratulates the EMS team on an outstanding pickup based on clinical findings, without a history or physical evidence of a sting.

Case Discussion

The “unconscious unknown” patient is a significant challenge for EMS providers. Lack of known medical history makes it even more challenging. Difficulty in being
able to obtain vital signs makes things harder still.

The most common treatable causes of altered level of consciousness for emergency providers relate to a blood sugar that is low or an intoxicating-substance level that is high. Both have characteristic findings on physical evaluation. A glucometer offers a dramatic improvement in the ability to find abnormal blood sugars, both high and low. A normal sugar allows the EMT the assurance to look for other causes.

There are four substances that offer “wake up” opportunities for EMS. These are glucose, naloxone, oxygen and epinephrine. The first three are very safe. The fourth can have significant complications. Epinephrine is lifesaving when given for allergic reactions. A recent estimate is that 1.6% of persons in this country have had severe allergic reactions, with the most frequent triggers being medications, insect stings and foods. Foods are becoming more prevalent as a cause. Epinephrine has been used for years in emergency care. Recent years have seen the drug placed in the hands of the public in automated injectors. But the availability of these auto-injector devices has been challenged, and the price of the devices has risen dramatically. Some EMS services have developed much less expensive approaches to epinephrine availability for EMTs and EMT-Intermediates.1

EMS providers must be able to provide care for very large patients and the devices that are used to maintain their health and prevent injuries. Very large patients have the right to emergency care, and providers have the responsibility to deliver care without risking injury.

It is beneficial to have resources in the region to move very large patients and their devices. Some of these patients use scooters or large wheelchairs for conveyance. These are expensive and cannot be left on the street or in other public places if the patient is transported away. Movement of those devices cannot be done in an ambulance or a standard supervisor vehicle, fire engine or ladder truck.

Thus agencies may have the opportunity to work with a local ambulette service, metropolitan transit service or other public agency to move these devices. There are a variety of events that may require such a resource to be readily available. It is cost- and time-efficient to have those special resources available through mutual aid or other shared resource agreements.  

REFERENCE
Delivering ALS Care on the Fire Line

How Kern County, CA, developed an ALS fire line paramedic program

By Barry D. Smith

Kern County is the third-largest county in California. Its 8,000 square miles include the southern end of the Sierra Nevada Mountains, as well as parts of other mountain ranges. Steep, rugged terrain that rises over 8,700 feet is covered with forest and thick brush. It doesn’t take much imagination to know that fighting a wildland fire under these conditions is hazardous. The terrain calls for hard physical labor, with falling trees and rocks, smoke, snakes and insects presenting opportunities for injury.

“The Kern County Fire Department (KCFD) has two type-2 hand crews and one type-1 hotshot crew for fighting wildland fires,” explains Guy Lawrence, EMS coordinator for the department. “On many wildland fires, the hand crews are working in wilderness areas miles from road access. In the past, the hand crews only had an EMT with a first-aid kit. ALS care could be hours away. With our fire line paramedic program, ALS care can now be on scene in minutes.”

About five years ago, there was a request from the federal government for ALS care on the fire line. This request was made after an incident at a remote fire where a firefighter was hit with a snag and bled to death. Due to the heavy smoke, responders were unable to get a helicopter in immediately. It took more than three hours to get ALS care to the patient. KCFD’s hand crews are very active during the fire season, both in the county and traveling all over the west for large fires managed by federal agencies, so the department decided to set up its own fire line paramedic program to provide ALS care to its hand crews.

“We have about 50 paramedics in our department and one ALS fire station in a remote area of Kern County,” says Lawrence. “A private ALS ambulance service has a contract to provide paramedic service and transport for the rest of the county. We have a dozen paramedics who develop and teach our EMT, continuing education and refresher training for our 550 firefighters. We have 8–10 paramedics involved with the fire line medic program and another three fire line medics are assigned to our helicopter program.”

“We had to get approval to develop the fire line medic program through our local EMS agency, which is the Kern County EMS Office. We had to write a fire line medic protocol and submit it for approval by the county EMS office. We also had to get approval from the Kern County EMS Commission. Then it had to go to the county board of supervisors through the EMS Advisory Board. It was quite a lengthy process and took about a year to get everyone’s approval.”

Protocols & Equipment

The treatment protocols the fire line medics use are the same as those for all paramedics in Kern County. One of the major differences is the paramedics are covered when they go out of Kern County. This means they can go to any federal incident in the country and use their paramedic protocols. The fire line medic protocol also outlines training requirements, experience requirements to become a fire line medic, charting requirements when out of county, and the equipment and medications that must be carried on the fire line.

All the equipment is carried in two packs that are locked in a large toolbox with wheels. The toolbox also carries restock supplies. To function at the ALS level requires a team of two people, a fire line EMT and a fire line paramedic, which is the requirement from the EMS agency. One pack has BLS gear and the other ALS. They are required to carry all the same medications as any ALS unit in Kern County; they just don’t carry as much. The only things not done are 12-lead ECGs and cardiac pacing. They carry an AED plus a small cardiac monitor, the Philips IntelliVue MP2. This protocol was developed by the Kern County Fire Department helicopters play an important role in the fireline medic program.

How Kern County, CA, developed an ALS fire line paramedic program

By Barry D. Smith

Photos by Barry D. Smith
weighs about three pounds and has automatic blood pressure and SpO₂ capabilities. “The fire line medics have to be comfortable working in remote areas, so we don’t take new paramedics into the program,” says Lawrence. “They also have to qualify as federal wildland firefighters with a series of classes, as well as a helicopter crew member class and the fire line EMT class. As additional training, we are putting our fire line medics through the Advanced Wilderness Life Support class, a three-day course on wilderness medicine that reviews the types of injuries and illnesses a fire line medic might see. “The fire line medics are not tied to our hand crews when they go out of the county. The medics are assigned to an incident and work for the medical unit leader within the ICS system. They may be assigned to a specific hand crew, but are usually assigned to an area and cover all the firefighters in that area. As an example, we had a team of an EMT and paramedic at a remote camp on one fire for two weeks. When the firefighters at the camp went out to the line, the medical team went with them.”

Air Support
With large fires lasting many days or weeks, there is a designated rescue helicopter assigned each day. The goal is to have it equipped...
WITH LARGE FIRES LASTING MANY DAYS OR WEEKS, THERE IS A DESIGNATED RESCUE HELICOPTER ASSIGNED EACH DAY.

“...Our helicopter unit did 13 rescues while on out-of-county fires in 2014,” says Lawrence. “Three or four were very significant rescues. During the 2014 season, they were on standbys for over 100 days. One in a remote area of northern California involved a firefighter who was struck by a falling tree. He sustained several fractures with internal bleeding. This occurred at about 2 a.m. Our helicopter flew in using night vision goggles and used the rescue hoist to extricate him. He was then flown to the trauma center in Redding, CA. We had one of our fire line medics on scene caring for him and then the paramedic on the helicopter continued care en route to the hospital. The surgeon who worked on the patient said if it had taken any longer to get him out, he probably would have died.

On a fire near Yosemite National Park, another tree fell and hit a firefighter who sustained several cervical fractures. Again, it was at night in remote, steep terrain. Ground evacuation would have taken many hours. A KCFD helicopter was on standby for that fire and had the patient at a trauma center within an hour of injury. Outside of Southern California, where many fire department helicopters are ALS, there are not many fire ALS helicopters with our capabilities. So we find our helicopter being requested for federal fires to act as the medical/rescue aerial resource. The best advice I can give for other departments that want to set up a similar program is don’t reinvent the wheel. Call someone who has already done it and get their input. I get calls on a regular basis from other departments asking us about our program. Start early because it takes time to work through all the regulatory agencies.

“The program has been phenomenal and we have had some very good patient outcomes, especially with the rapid transport capabilities with the helicopter component.”

CALL FOR ENTRIES!

The nomination period is now open for the National EMS Awards of Excellence, established by EMS World and the National Association of Emergency Medical Technicians (NAEMT) to recognize outstanding achievement in the EMS profession.

Go to EMSWorld.com/national-ems-awards to nominate your agency or a colleague in the following categories:

- **Paramedic of the Year**
- **EMT of the Year**
- **Learning Educator of the Year**
- **Military Medic of the Year**
- **Paid EMS Service of the Year**
- **Volunteer EMS Service of the Year**
- **EMT Demonstrates Excellence in Military Medicine**
- **Recognition of Contributions to EMS**

**Award Recipients Receive:**
- $1,000;
- Three EMS World Expo core program registrations;
- $1,200 for travel and lodging at EMS World Expo/NAEMT Annual Meeting in Las Vegas, NV, Sept. 15–19

**Nomination Deadline:** June 15, 2015
Partnerships with MIH-CP programs can help avoid needless hospital visits

By Meredith Anastasio, J. Daniel Bruce & John Mezo

The rapidly changing dynamic of America’s healthcare system has created new expectations for many providers. The drive to achieve the Institute for Healthcare Improvement’s Triple Aim—improved care experience for the patient, improved population health and reduced costs—has fostered the creation of many innovative partnerships designed to enhance healthcare across the continuum. This column focuses on the synergistic relationships and integrations developing between EMS-based mobile integrated healthcare (MIH) and the home healthcare industry.

One of the main goals of EMS-based MIH is to navigate patients through the healthcare system, not replace healthcare system resources already available in the community. Home health and hospice agencies are valuable links in the chain of healthcare—and, for qualifying patients, a logical care delivery model that can be enhanced through partnership with the local EMS agency.

The following are some examples of how home health and hospice agencies have integrated with their local EMS provider to create significant benefits for both the agencies and their patients.

Increased Referrals

Home health providers are increasingly being challenged by hospitals and insurers to reduce preventable emergency department visits and hospital admissions. Patients receiving home health services tend to have multiple chronic diseases with polypharmacy and are at significant risk for ED visits and hospital admissions. Under the transitioning healthcare system, hospitals are held financially accountable for certain unplanned readmissions. And, if the hospital is part of a risk-sharing financial arrangement such as an ACO, they are financially at risk for the admission. Consequently, they desire to refer eligible patients to home health agencies that can ensure the patient safely transitions to the home environment without returning to the hospital unnecessarily. A home care agency that can appropriately prevent unnecessary ED visits and admissions gains an advantage over other agencies in today’s new healthcare environment.

MedPAC (the Medicare Payment Advisory Commission) is recommending to CMS that home health agencies also receive penalties for patients who return to the hospital. The policy recommendation outlines a savings to the Medicare program. The estimate for this savings, if approved in 2015, is between $50 million and $250 million. MedPAC suggests with the growth in healthcare utilization and the growing population that penalties to home health agencies for readmissions could save as much as $1 billion dollars by 2020.¹ The financial penalties to hospitals from one of their primary referral sources as well as proposed changes related to hospital readmissions pave the way for partnerships in communities across the United States.

While home care agencies instruct patients to call them for any changes in their condition and routinely staff registered nurses 24/7, 365 days a year, often patients and families call 9-1-1 out of panic as opposed to true medical emergencies. With a rapid response time, the EMS provider can be on site within minutes. Patients receiving a Klarus patient who is in their first-year of enrollment receive an advantage over other agencies in today’s new healthcare environment.

MedStar enrolls Klarus patients who are in their first-responder service area into their database, which allows the call center to

The HALO Vent creates an occlusive, yet vented seal for open or sucking chest wounds, stab wounds or other trauma which could lead to tension pneumothorax. It aggressively adheres and conforms to a patient’s body and allows for the release of gases and fluids. The HALO Vent was developed to withstand wet/extreme environments and is used by EMS, military and law enforcement services.

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Klarus Home Care & EMS Partnership—Actual Patient Experience

- 67-year-old male, DOR of cardiomyopathy, chronic heart failure, pleural effusion, diabetes type II.
- Exacerbation of CHF 2x in last 60 days, TX by RN using Klarus CHF protocols: 40 mg IV Lasix.
- Patient calls 9-1-1 due to exacerbation, does not call Klarus. This starts a domino effect. The EMTs and paramedics assess the patient and find them in clinical distress. The family is scared and cannot locate the DNR. EMS does what it’s trained to do: Start treatment and take the patient to the ED. Once in the ED, the hospital initiates care and the family may identify that a patient who calls 9-1-1 is on home health services with Klarus. In addition to sending an ambulance, MedStar also dispatches a specially trained mobile healthcare paramedic (MHP) to the scene. The on-scene MHP then works directly on the phone with the Klarus Home Care RN to do real-time care coordination for minor medical issues. Perhaps the patient can be episodically managed at the scene with a follow-up visit by the nurse, thereby preventing an avoidable ED visit or hospital admission.

Hospitals are looking for home health providers who are utilizing innovative approaches and whose data can demonstrate a reduction in avoidable hospitalizations. Partnerships between EMS providers and home health companies can pave the way to providing a more value-based service that drives down overutilization, resulting in lower costs. Klarus Home Care absorbs the costs in their partnership with the first responders to accomplish the goal of reducing hospitalizations from 9-1-1 calls. In some cases, when EMS is going through the intake process, the mobile healthcare paramedic trained in patient navigation and program eligibility may identify that the patient qualifies for home health. In this case the MHP can suggest to the patient’s physician that a referral to a home health provider may be appropriate.

Gained Operational Efficiency

Home care agencies not partnered with EMS are often unaware when their patients call 9-1-1 and are taken to the emergency room. The opportunity for the patient to be treated in the home, the least restrictive environment, is lost. This has a direct impact on the home care agencies’ performance and the overall cost to the healthcare system. Additionally, many times the home health agency doesn’t become aware the patient is in the hospital until the nurse goes to the house for a regularly scheduled visit. This creates lost productivity for the home health agency.

Further, it may at times be logistically difficult for a home care agency to make it to a patient’s house at 2 a.m. or on weekends for an unscheduled visit. Nurses available to make these visits in the middle of the night may also be concerned about safety in certain parts of the community. Working with EMS gives the home care agency additional support for their current services. Consider the accompanying real scenarios of patients enrolled in the MedStar MIH programs with Klarus Home Care and VITAS Healthcare. Both of these examples demonstrate the value to the patient, the home health agency, the hospital and the overall cost to the healthcare system. Integrated mobile healthcare in the Fort Worth market changes the EMS incentive.

EMS-MIH and Hospice Care

The goal of the hospice agency is to help the patient at home transition to their afterlife with comfort and compassion. The family is instructed in the proper way to access the hospice nurse if the patient begins to struggle at home. Unfortunately, in the panic of seeing their loved one struggle, many families call 9-1-1. This starts a domino effect. The EMTs and paramedics assess the patient and find them in clinical distress. The family is scared and cannot locate the DNR. EMS does what it’s trained to do: Start treatment and take the patient to the ED. Once in the ED, the hospice agency is notified and makes a follow-up visit by the nurse to provide comfort care, if the patient is on hospice. The goal of the hospice agency is to help the patient make the transition to their afterlife with comfort and compassion. The family is instructed in the proper way to access the hospice nurse if the patient begins to struggle at home. Unfortunately, in the panic of seeing their loved one struggle, many families call 9-1-1. This starts a domino effect. The EMTs and paramedics assess the patient and find them in clinical distress. The family is scared and cannot locate the DNR. EMS does what it’s trained to do: Start treatment and take the patient to the ED. Once in the ED, the hospice agency is notified and makes a follow-up visit by the nurse to provide comfort care, if the patient is on hospice.

EMS incentive.

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- ...and many more.

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VITAS Hospice & EMS Partnership—Actual Patient Experience

- Priority 1 9-1-1 call from caller identified as VITAS hospice client in 9-1-1 CAD.
- Specially trained MHP added to response.
- MHP arrives on scene to find patient home alone.
- Patient relates she became anxious and short of breath and is unable to move from chair to turn on her oxygen.
- Client appears to be weak with limited mobility due to advanced Parkinson’s.
- Paperwork for VITAS is laid out on table with signed DNR.
- She has around-the-clock care with providers obtained by her family, but they leave Saturday mornings and are not generally back until the afternoon.
- Patient relates her caregiver is off today and she is supposed to have a substitute arrive at 11 a.m., but they are late.

EMS Care Coordination with VITAS

- On-scene MHP speaks with VITAS triage nurse and discusses the situation.
- MHP releases ambulance and FD unit, waits for caregiver to arrive and explains the situation.
- Also speaks with VITAS triage nurse.
- Patient left in care of caregiver.
- VITAS does a home visit later in the day.

OUTCOME:

- Patient stabilized and made more comfortable.
- Wishes of patient and family met.
- Transport to ED, admission and potential voluntary disenrollment avoided.
- Care coordinated with VITAS.

 decide this is all too overwhelming and voluntarily disenroll the patient from hospice. This is not in the best interests of the patient or the hospice agency. The patient’s wishes are not fulfilled; the hospice agency now has ambulance and ED bills to pay and loses the per-diem fees normally available had the patient stayed on service.

In Fort Worth we see a different outcome from the same scenario thanks to an innovative partnership with VITAS Healthcare. When the family calls 9-1-1, the computer-aided dispatch system notifies the 9-1-1 call-taker that this patient is enrolled in the VITAS partnership. This causes an alternative domino effect: A hospice-trained MHP joins the ambulance response team, and the patient’s hospice nurse is notified of the response. When the MHP arrives on the scene, they assess the patient and determine if the clinical issue is part of the hospice plan of care. If so, they then access the patient’s comfort pack, alleviating the patient’s suffering; remind the family of the goal of hospice care and the wishes of the patient; and inform them the hospice nurse is on their way. They offer to wait with the family until the hospice nurse arrives and release the ambulance back into service. No transport, no disenrollment and the patient’s wishes are achieved.

In the event the patient’s condition on scene is such that management at home is not practical, care coordination occurs between the MHP on scene and the VITAS nurse to have the patient transferred from home to an inpatient hospice unit.

Under this program, in place since 2013, 168 patients identified by VITAS as being at high risk for voluntary disenrollment have been enrolled by VITAS. These patients generated 49 EMS calls, but only 29 were transported. Twelve were transferred to an inpatient hospice unit; 17 were transported to the ED at the insistence of the family and subsequently voluntarily disenrolled from hospice (10%). The rest died peacefully at home in the presence of the hospice nurse and/or the MedStar MHP.

Another benefit for VITAS from this program has been increased referrals. The MedStar MHPs have been trained in the IHI Conversation Project and can work with patients enrolled in their other MIH programs (such as the service’s high-utilizer or CHF readmission-prevention program) who may be appropriate for enrollment in palliative care. Often, as the relationship between the patient, patient’s family and MHP evolves, the MHP can successfully introduce the conversation the patient or family was not ready to have while in the hospital.

These are just a few examples of how EMS-MIH and home health can work collaboratively. It is not a competitive relationship, but a cooperative one designed to meet the needs of the patient.

REFERENCE

Heart failure (HF) is a common medical problem in the United States. It’s experienced by approximately 5.1 million persons, with more than 650,000 new cases diagnosed annually. The incidence of HF increases with age, and for Americans over 40 the lifetime risk of developing HF is 20%. It occurs most frequently among black men and least frequently in white women.

HF is the primary diagnosis in more than a million annual U.S. hospital admissions. Patients admitted for HF are at risk for rehospitalization, with a one-month all-cause readmission rate of about 24% and a six-month rate greater than 50%.

There were 60,341 deaths from heart failure in U.S. in 2012, the last year for which data is available. Considering that in 2012 cardiovascular disease (the leading cause of death in the U.S. that year) killed 782,985 persons, we can determine that 7.7% of all cardiovascular deaths in 2012 were from HF. While survival rates for persons with HF have improved, the absolute mortality rates for HF are approximately 50% within five years of diagnosis.

This month’s EMS World CE article uses three case scenarios to explore the evaluation and prehospital treatment of the patient with HF. These cases explore the clinical context of all the elements of the history and clinical exam to form a “big picture” understanding of the event, and also discuss the appropriate management of the patient with chronic and acute HF in the prehospital setting.

Pathophysiology
Heart failure is the inability of the heart to produce adequate cardiac output to meet the perfusion and oxygenation requirements of the body’s tissues. It is...
DECREASED CARDIAC OUTPUT

There are two mechanisms by which HF can occur:
• Systolic dysfunction, the result of impaired cardiac contractile function; or
• Diastolic dysfunction, the result of abnormal cardiac relaxation, stiffness or filling.

**Systolic Heart Failure**

In systolic heart failure (SHF), the heart has impaired contractile function, resulting in a decreased stroke volume (SV) and cardiac output (CO) and subsequent low blood pressure. Patients with SHF also have a decreased ejection fraction (EF). The EF is the percentage of blood pumped out of the ventricle with each heartbeat. A healthy adult would be expected to have an ejection fraction between 50%–75%. A patient with an EF less than or equal to 40% is said to have HF.1

A number of factors can lead to impaired myocardial contractile function. Acute myocardial infarction (AMI) can acutely lead to impaired contractility, as infarcted myocardium is significantly weaker than healthy myocardium. After an AMI the scarred, remodeled ventricular myocardium will have less contractile force than healthy myocardium. Dilated cardiomyopathy can result from many etiologies, including chronic hypertension. Chronic increased blood pressure stretches and dilates the ventricular tissue, making it weaker. Valvular disease and ineffective heart valves can allow the retrograde movement of blood during systole, resulting in decreased SV. In addition, faulty heart valves (such as the aortic and pulmonary semilunar valves) can impede the forward movement of blood, resulting in decreased SV as well as increased intraventricular pressures, which can cause further problems such as cardiomyopathies.2

**Diastolic Heart Failure**

In diastolic heart failure (DHF), the ventricular wall cannot adequately relax, allowing a complex clinical syndrome that can arise from any structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or eject blood, resulting in decreased cardiac output.3 There are two mechanisms by which DHF can occur:
• Diastolic dysfunction, the result of impaired diastolic filling; or
• Diastolic stenosis, the result of a cardiac valve (such as the mitral or aortic) impeding blood flow.

**Diastolic dysfunction**

Diastolic dysfunction, the result of abnormal diastolic filling, occurs as a result of a stiffening of the ventricular wall that prevents the normal ventricular relaxation that occurs during diastole. Numerous etiologies can lead to ventricular wall stiffening. Chronic hypertension as the ventricle is chronically pushing against an elevated systemic blood pressure and increased afterload. In amyloidosis, protein is deposited in the ventricular wall, causing it to stiffen. Patients with DHF do not suffer a marked decrease in their EF.7

**Diastolic stenosis**

Stenosis, the result of a cardiac valve (such as the mitral or aortic) impeding blood flow, is the leaking of fluid from the capillaries into the surrounding tissues, resulting in fluid buildup (edema). Left untreated, this will lead to pulmonary edema and congestive heart failure. Rales, or crackles, are the hallmark finding associated with LSHF. The pulmonary edema present in LSHF occurs for the same physiologic reasons as the ascites and peripheral edema of RSHF. Left unchecked, left heart failure will lead to right heart failure, as pressure backs up through the pulmonary vasculature and into the right ventricle.

**Diastolic Heart Failure**

**Left-Sided Heart Failure**

Left-sided heart failure (LSHF) occurs when the left ventricle cannot maintain adequate CO and effectively move fluid throughout the body. This can occur as a result of SHF or DHF mechanisms. As a result, blood and pressure back up into the vena cava. Increased pressures in the superior vena cava carry over to the jugular veins, leading to jugular venous distension (JVD). Increased pressures traveling down the inferior vena cava lead to clinical exam findings such as hepatomegaly, ascites and peripheral (pedal) edema.

**Right-Sided Heart Failure**

Right-sided heart failure (RSHF) occurs when the right ventricle can no longer maintain adequate CO and effectively move blood forward. This can occur as a result of SHF or DHF mechanisms. As a result, blood and pressure back up into the vena cava. Increased pressures in the superior vena cava carry over to the jugular veins, leading to jugular venous distension (JVD). Increased pressures traveling down the inferior vena cava lead to clinical exam findings such as hepatomegaly, ascites and peripheral (pedal) edema.

**Diastolic Heart Failure**

**Left-Sided Heart Failure**

It’s 1152 hours. You and your partner are dispatched to a residential address in a retirement community for a patient complaining of weakness. A 66-year-old obese male presents conscious and alert to person, place, time and event; sitting upright on his couch, he complains of dyspnea, dizziness and weakness with exertion. He says he first noticed these symptoms about two weeks ago and decided to come in to see his primary care physician. He is otherwise healthy with no past medical history of note. His medications include lisinopril, quinapril and aspirin for hypertension. He has a normal BMI of 28. His physical exam shows jugular venous distension (JVD) and rales. He is being treated with diuretics and a referral is made to see a cardiologist. Case #1

**Left-Sided Heart Failure**

**Right-Sided Heart Failure**

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### TABLE 1: RISK FACTORS FOR HEART FAILURE

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>Increased blood pressure</td>
</tr>
<tr>
<td>Metabolic syndrome</td>
<td>Obesity, diabetes, metabolic disorders</td>
</tr>
<tr>
<td>Cigarette smoking</td>
<td>Smoking</td>
</tr>
<tr>
<td>Valvular heart disease</td>
<td>Structural or functional cardiac disorder</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>Impaired contractile function</td>
</tr>
<tr>
<td>Coronary artery disease/atherosclerosis</td>
<td>Impaired contractile function</td>
</tr>
<tr>
<td>Obesity</td>
<td>Impaired contractile function</td>
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weeks ago and that “it seems to be getting slowly worse every day.” Today the patient experienced “the worst weakness I’ve felt yet—I almost passed out” while walking home from a market around the corner. He says his symptoms are “not the same as my COPD when it gets bad,” so he doesn’t think it’s that.

While at rest on his couch, he denies any chest pain, pressure or discomfort. He also denies any difficulty breathing, weakness, dizziness, abdominal or back pain, head ache, nausea or vomiting. “It all goes away as long as I’m resting,” he says. His wife, present on the scene, adds that the patient has been tired, which is not normal for him, and has been complaining of abdominal pain over the same period as his symptoms. Hearing this, the patient adds, “Oh, yeah, my pain over the same period as his symptoms.

There are three manifestations of volume overload in patients with HF: peripheral edema and elevated venous pressures in patients with RHF, and pulmonary congestion in patients with LHF. The patient in Case #1 exhibits these first two manifestations. His JVD and enlarged heart failure. It is most likely the result of his COPD and hypertension, and he is a 102-pack-year smoker. His medications include a Combivent (albuterol/ipratropium) MDI and lisinopril. He has no known drug allergies. Your clinical exam reveals jugular venous distension, bilateral lower 2± extremity edema from the knees to feet, sacral edema and skin that is warm, pale and dry. Auscultation of his lungs reveals slight expiratory wheezing in all fields, with good air movement. You note his abdomen is distended and his liver is palpable and large, and he reports pain with palpation. When you press on his liver, his JVD becomes more pronounced. His vital signs are: HR, 72/min. and regular; BP, 152/90 mmHg; RR, 22/min. with good tidal volume; SpO2, 90% on room air; sidestream EtCO2, 34 mmHg with a very slight “shark fin” waveform morphology. A 12-lead ECG reveals a sinus rhythm with dominant R-waves in V1 and V2, prominent S-waves in V5 and V6, and increased amplitude of the P-wave in lead II.

What is your best guess as to the etiology of the patient’s dyspnea, weakness and dizziness with exertion? What history and clinical exam findings help you narrow your differential diagnosis? How would you treat this patient?

Discussion

This patient shows the history and clinical exam findings characteristic of right-sided heart failure. It is most likely the result of his COPD, a condition termed cor pulmonale.

COPD results in pulmonary hypertension, which causes a resistance to blood flow through the pulmonary capillaries. Pressure then backs up into the right ventricle, resulting in either ventricular hypertrophy or dilation. As the right ventricle becomes affected, pressure further backs up into and dilates the right atrium and eventually backs up into the venous system as well.

There are three manifestations of volume overload in patients with HF: peripheral edema and elevated venous pressures in patients with RHF, and pulmonary congestion in patients with LHF. The patient in Case #1 exhibits these first two manifestations. His JVD and enlarged liver are the result of the elevated venous pressures present when the weakened right ventricle cannot move blood forward. He also exhibits a hepatojugular reflux, visible as a pulsatile wave in the jugular vein when the liver, engorged with blood and pressure, is palpated firmly. In addition, the patient described some upper right quadrant abdominal pain, common with hepatomegaly in RHF. The patient also exhibits peripheral edema. We would not expect to find sacral edema in this patient, as he is normally ambulatory and sacral edema is more common in patients who are bedridden.

The patient’s dyspnea, dizziness and weakness with exertion are characteristic of chronic and worsening RHF. This occurs as a direct result of the inability of the diseased right ventricle to increase cardiac output during periods of high demand. Everyday activities such as walking and working become difficult. There are many risk factors for heart failure present in this patient’s medical and social history. He has been a heavy lifetime smoker and has COPD, putting him at risk for cor pulmonale. In addition, he is obese and has a history of hypertension.

The 12-lead ECG of a patient with cor pulmonale may exhibit findings suggestive of the disease. These include right bundle branch block, right axis deviation and signs of both right ventricular hypertrophy (RVH) and right atrial enlargement. ECG findings characteristic of RVH include a right axis deviation of 90-plus degrees, dominant R-wave in V1 and V2 (more than 7 mm tall), and prominent S-waves in V5 and V6 (more than 7 mm tall). Evidence of right atrial enlargement includes a greater than 2.5 mm increase in the amplitude of the P-wave in leads II, III and aVF. Other characteristic findings associated with cor pulmonale include wandering atrial pacemaker and multifocal atrial tachycardia.

The prehospital treatment of the patient with right heart failure and cor pulmonale centers on a number of goals:

• Ensuring airway patency;
• Ensuring adequate oxygenation and ventilation;
• Ensuring effective fluid management in light of altered circulation; and
• Treating both Precordial Thud and Mid-Shift Fractures.

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Assessing for STEMI and monitoring the cardiac rhythm;
Gaining intravenous access;
Reducing the pulmonary artery pressure (reducing right ventricular afterload);
Improving right ventricular contractility;
Assessment of the airway, supplemental oxygen administration and assisted ventilation via bag-valve mask or CPAP should be routine in all patients with HF when indicated. The 2010 Heart Failure Society of America guidelines state that routine administration of supplemental oxygen in the absence of hypoxia is not recommended. Supplemental oxygen administration is recommended if hypoxia is present. Administration of supplemental oxygen will result in a reduction in pulmonary artery pressure, as the correction of hypoxia will reverse any hypoxic vasoconstriction that has occurred.

Routine administration of supplemental oxygen in the absence of hypoxia is not recommended. For patients experiencing hypotension with RHF and cor pulmonale, right ventricular contractility can be increased with the administration of an inotropic agent such as dopamine or dobutamine. Dopamine, at intermediate doses (3–10 mcg/kg/min.), is a beta-1 adrenergic receptor agonist and promotes noradrenaline release. This results in increased cardiac contractility and chronotropy, increased CO and mild increases in systemic vascular resistance (SVR). At higher infusion rates (10–20 mcg/kg/min.), potent vasoconstriction occurs secondary to alpha-1 adrenergic receptor agonism. Dobutamine is a beta-1 and –2 adrenergic receptor agonist with very mild effects, offering the desired increases in inotropy (alpha and beta effects) without the undesirable increases in SVR (alpha effects). Doses up to 15 mcg/kg/min. increase cardiac contractility without greatly affecting SVR. The patient in Case #1 does not require aggressive prehospital management. Arguably, with a history of COPD and SpO₂ of 90% on room air, he should not be administered supplemental oxygen because of the dangers involved with giving that to chronic CO₂ retainers. Likewise, with a blood pressure of 152/90, he does not require blood pressure support with an inotropic agent. This patient should be placed on the cardiac monitor and have a 12-lead ECG performed. Intravenous access should be obtained and no fluid administration provided. In addition, a breathing treatment with nebulized bronchodilators and/or anticholinergic can be considered, as he has a history of COPD, slight wheezing in all lung fields and presents with a slight "shark fin" waveform on capnography. He should be placed in a position of comfort and monitored en route to an emergency department for evaluation.

Case #2
It’s 0530 hours. You and your partner are dispatched to a residential address for a patient with difficulty breathing. A 56-year-old female presents conscious, alert and oriented to person, place, time and event. She sits upright in a chair in obvious respiratory distress and says, “My breathing is really bad.” You note from the door that she is tripoding, using accessory muscles to breathe and has pale skin.

Her difficulty breathing started at around 1700 yesterday afternoon, and she also reports that she experienced “some pressure in the middle of my chest.” Last night she was unable to sleep lying flat and had to use pillows to prop herself up so I didn’t feel like I was suffocating.” Eventually she gave up trying to sleep and moved to her living room chair. Her breathing got worse throughout the night and she was unable to get up to use the bathroom this morning, so she called 9-1-1. She tells you, “I can’t breathe when I try to get up and walk, and I feel like I am going to pass out.”

The patient denies any chest pain, dizziness, weakness, nausea or vomiting. Her medical history includes hypertension and a myocardial infarction three years ago with stent placement in her left coronary artery. Her medications include ASA, nitroglycerin and monitored en route to an emergency department for evaluation.

Recall from Case #1 the three manifestations of volume overload in patients with HF: peripheral edema and elevated venous pressure, dyspnea and exertional intolerance.

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pressures in patients with RHF, and pulmonary congestion in patients with LHF. This patient exhibits the pulmonary edema characteristic of LHF. This edema, or congestion, is what gives rise to the term congestive heart failure (CHF). CHF can result from LHF (pulmonary congestion) as well as RHF (hepatic congestion). Her left ventricle, already weakened from a previous MI and now weakened with an evolving AMI, cannot adequately pump blood forward in the cardiovascular system, resulting in a backup of blood and pressure throughout the left atrium and into the pulmonary circulation. Increased pulmonary capillary pressures force fluid out of the vasculature and into the interstitial spaces and alveoli of the lungs, resulting in pulmonary edema. This patient exhibits many of the classic signs and symptoms of CHF, including orthopnea (difficulty breathing while lying supine), paroxysmal nocturnal dyspnea (difficulty breathing at night) and sitting in an upright position. Sitting upright allows gravity to pool and consolidate the edema at the bases of the lungs, allowing for optimal ventilation (considering the circumstances) ventilation of the alveoli and gas exchange. This patient also presented with JVD on clinical exam, but no peribronchial or sacral edema. JVD is not an uncommon assessment finding in patients with LHF and pulmonary edema, as the increased pulmonary capillary pressure leads to increased pressure on the right side of the heart as well. JVD occurs rapidly in patients with increased right-sided atrial and ventricular pressures. Pedal and sacral edema take longer to develop. Note that she takes Bumex, a diuretic, and enalapril, an ACE inhibitor, both commonly prescribed to help treatment hypertension and heart failure. The 12-lead ECG acquired in this case helps with understanding the mechanism of this patient’s CHF; acute myocardial infarction. The prehospital treatment of this patient with left heart failure centers on a number of goals:

• Ensuring airway patency;
• Ensuring adequate oxygenation and ventilation;
• Sitting the patient upright;
• Assessing for STEMI and monitoring the cardiac rhythm;
• Gaining intravenous access;
• Diuretic therapy;
• Vasodilator therapy;
The patient in is obvious moderate-to-severe respiratory distress but still ventilating adequately, making her a perfect candidate for CPAP. Ideally, CPAP could be administered with tittered oxygen at an FiO2 sufficient to correct hypoxia but not overoxygenate. CPAP decreases the need for intubation and improves respiratory parameters such as heart rate, dyspnea, hypercapnia and acidosis in patients with CHF. The increased airway pressure created by CPAP actually pushes fluid from the alveolar and interstitial spaces back into the pulmonary vasculature, correcting pulmonary overdistention and improving ventilation. Patients in respiratory failure, as evidenced by inadequate respiratory rate or tidal volume, and patients in severe respiratory distress with cardiogenic signs and symptoms should be intubated and ventilated with a BVM or placed on mechanical ventilation if available. Positive end-expiratory pressure (PEEP) and high flow oxygen should be administered to all intubated patients.13 Patients with heart failure and fluid volume overload will benefit from the administration of a vasodilator such as nitroglycerin. Nitroglycerin added to diuretic therapy may lead to even more rapid improvement of pulmonary edema.14 IV nitrites such as nitroglycerin or nitroglycerin are preferred in the hospital environment but not typically available to prehospital care providers. Sublingual nitroglycerin, while not as fast-acting or easy to titrate as IV is, is an effective means of achieving vasodilation. Vasodilation is a benefit to the patient in fluid volume overload, as it increases venous capacitance, reducing preload and decreasing net workload of the heart as well as allowing for a fluid shift from the alveoli and interstitial lung space into the vasculature, especially when combined with CPAP. While there are no national guidelines for the SL administration of nitroglycerin in patients with CHF, we can consider the dosing guidelines for IV nitroglycerin and adapt them to the prehospital environment and SL administration. IV nitroglycerin is often administered at an initial dose of 5–10 mcg/min. and increased in increments of 5–10 mcg/min. every 3–5 minutes as required and should be tolerated, with a maximum dose of about 200 mcg/min. A typical 400 mcg (0.4 mg) dose of SL nitroglycerin used in the prehospital environment, administered every five minutes, would equal out to 80 mcg/min, well below the maximum dose considered for IV nitroglycerin. In addition, the bioavailability of SL nitroglycerin will be decreased secondary to first-pass metabolism. Patients with systolic blood pressures greater than 150 can be administered 800 mcg of nitroglycerin (2 x 0.4 mcg doses) every five minutes. Regardless of the dose administered, the patient’s blood pressure after each administration, as hypotension is a possible and undesirable side effect. In addition, question male patients about the use of erectile dysfunction medications within the previous 24 hours, as concomitant use of these medications can negate the effect of SL nitroglycerin use can result in profound hypotension. Patients in LVHF are usually volume-overloaded and require reduction of that intravascular volume to reduce pulmonary edema. Current guidelines recommend that patients with acute decompensated heart failure with evidence of volume overload, regardless of etiology, be treated with intravenous diuretics as part of their initial management, level of evidence Class B (nitrates in this scenario are evidence Class A).15 Exclusion from this treatment are patients with hypotension or cardiogenic shock. Loop diuretics are the most common medi- cations administered in heart failure, and common starting doses include:16

• Furosemide, 40 mg IV
• Torsemide, 10–20 mg IV
The use of diuretics in the treatment of heart failure is an ongoing debate in the academic literature, with many EMS medi- cal directors opting to remove the practice altogether. Furosemide was frequently administered to patients in whom its use was considered inappropriate. In addition, it was “not uncommonly” administered to patients in clinical situations in which it was consid- ered potentially harmful.17 As always, follow your local protocols.

• Specific treatment for the patient in Case #2 would include oxygen administration and airway support with CPAP, as she is in moderate to severe distress and has no con- trols for the use of CPAP. Obtain IV access and administer 0.4 mg of nitro- glycerin every 3–5 minutes while main- taining a blood pressure of at least 90–100 mmHg systolic. Nitroglycerin administration will not only help treat the patient’s pulmonary edema but will also treat the active STEMI that caused it. As such, give the patient nitroglycerin and transport her to a STEMI center. An IV diuretic such as furosemide can also be administered to correct the fluid volume overload.

Case #3
You’re dispatched to a residential address for an unconscious person. Upon arrival you find a 72-year-old male slumped in a chair, unresponsive and in respiratory failure. The patient’s wife says he got up out of bed last night at about 2300 “because he was not feeling well and his breathing was bother- ing him.” She awoke this morning about 10 minutes ago, found him as described and promptly called 9-1-1. She says he complained only of difficulty breathing. He has a history of two-myocardial infarctions with three stent placements, CHF, atrial fibrillation, hypertension and type 2 diabetes. His medications include ASA, nitroglycerin as needed, Lisinopril, dobutamine, Coumadin and insulin. He has no known drug allergies.

His clinical exam reveals peripheral and sacral edema, JVD, areas in all lung fields with little air movement bilaterally and cold, diaphoretic, cyanotic skin. His vital signs are: HR, 96/min. and irregular; BP, 70/palp.; respirations 20/min, shallow; SpO2, 68% on room air. A 12-lead ECG reveals atrial fibrillation with a left bundle branch block and con- cordant ST-segment depression in lead V3.

Discussion
The patient in Case #3 is presenting in decompensated cardiogenic shock with pulmonary edema and requires immedi- ate intervention. The prehospital treatment of the patient with cardiogenic shock and pulmonary edema centers on the follow- ing goals:

• Ensuring airway patency;
• Ensuring adequate oxygenation and ventilation;
• Assessing for STEMI and monitoring the cardiac rhythm;
• Gaining intravenous access, administering fluid volume;
• Correcting hypotension with inotropic or vasopressor medications.

He is clearly in respiratory failure, and that and his unconsciousness are contraindications for the use of CPAP. This patient requires immediate BLS airway maneuvers, the insertion of a BLS airway adjunct and BVM ventilation with 100% oxygen at 15 lpm in preparation for endotracheal intubation. The positive pressure generated via BVM ventilation, with a PEEP valve attached, has the same effect as CPAP with regard to driving fluid from the alveoli and interstitial lung space back into the pulmonary vasculature.

The administration of nitroglycerin is not an option in this patient because of his profound hypotension. This patient is having a pump problem and so should be administered IV fluid and an inotropic or vasopressor agent used to increase the blood pressure and improve end-organ perfusion and mental status.

Dobutamine is frequently used to treat severe and refractory HF and cardiogenic shock, though it’s not always available in the prehospital environment. Norepinephrine (Levophed) is a potent vasoressor with some inotropic properties and if available can be considered in patients with severe cardiogenic shock.

Dopamine, arguably the most common inotropic or vasopressor utilized in the prehospital environment, can also be used. Dopamine, however, is not necessarily “better” than dobutamine or norepinephrine. While the efficacy of dopamine over norepinephrine is unclear, some evidence suggests that outcomes may be better with norepinephrine. Regardless of the vasopressor or inotropic agent used, titrate it to achieve a blood pressure that both ensures end-organ perfusion and creates a blood pressure reserve. The emphasis in patients in cardiogenic shock, from the EMS perspective, is ensuring adequate ventilation and oxygenation, administering vasopressors to ensure end-organ perfusion, and rapid transport to a hospital for more definitive care.

Conclusion

Patients in heart failure can present on a wide clinical and hemodynamic spectrum from seemingly minor complaints and stable vital signs to decompenated cardiogenic shock. Recognition of the signs and symptoms that accompany right- versus left-sided HF can aid in the understanding of the underlying problem and treatment required. Regardless of the mechanism of HF, the treatment goals are similar for all patients:

• Ensuring airway patency;
• Ensuring adequate oxygenation and ventilation;
• Assessing for STEMI and monitoring the cardiac rhythm;
• Gaining intravenous access;
• Correcting hypotension with inotropic or vasopressor medications.

REFERENCES

Ambulances are synonymous with EMS, but what happens when patients are located someplace an ambulance can’t go—a heavily wooded hiking trail, a crowded urban area in the midst of a major outdoor sporting event, a community devastated by a natural disaster? Those are times when alternative vehicles like ATVs and UTVs become vital pieces of equipment, more than justifying their expense. And while they may be small, ATVs used in EMS are still outfitted with much of the same equipment as a standard ambulance, meaning quality patient care doesn’t need to be sacrificed for the sake of mobility.

**Real-World Applications**

After the events of September 11, 2001, many EMS agencies began building on the observed successes of the use of ATVs and UTVs by FDNY EMS during its response to the World Trade Center attacks, says Henry Cortacans, MAS, CEM, NREMT-P, state planner for the New Jersey EMS Task Force.
Rosco's Dual-Vision XC 2+1 has the capacity to identify unsafe driver behavior through its ability to continuously record video and provide instant driver feedback. The Dual-Vision XC 2+1 AER is the most efficient windshield based three (3) camera capable continuous and event recording device. It has 160+ hours of continuous recording capability and the ability to precisely identify and save three types of events (G-force, Speed, Panic Button). With no monthly fees, free firmware with software upgrades, and powerful DV-Pro® fleet management database software, Dual-Vision XC 2+1 is revolutionizing driver behavior through its ability to continuously record video and provide instant driver feedback.

Kasulis, EMT-P, EMS manager/battalion chief for New Hanover Regional Medical Center, notes his agency has been using them for 15 years. “We use them at mass gatherings—predominantly downtown events when roads are blocked off, high school football games, Civil War reenactments, etc. Really, anywhere where crowd size and geographic terrain may make for limited access. The deposited in many portions of New Jersey. “These assets assisted with transferring patients from disabled ambulances, actually responding on some 9-1-1 calls.” Cortacans explains, “and there was an instance where one was deployed to a highway to help rescue individuals from stranded vehicles in the roadway.”

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ALTERNATIVE VEHICLES

A New Hanover Regional Medical Center EMS ATV.

Once the New Jersey EMS Task Force was formalized in 2004—through the Homeland Security grant program—it began building its capacity. To date, says Cortacans, the New Jersey EMS Task Force has more than 30 such assets in a fleet of more than 100 pieces of apparatus.

“These assets are utilized for many types of special events,” Cortacans says, including concerts, marathons, community festivals, military air shows and more. “Because they can quickly maneuver through large crowds and tight spaces, it makes them ideal for these types of events.”

Specifically, the New Jersey EMS Task Force has utilized its ATVs during the New Jersey Marathon, Ironman Triathlon, Joint Base Air Show and Super Bowl XLVIII.

ATVs are used for much the same purpose in Wilmington, NC, where Aaron Gators can transport patients safely and efficiently out of a crowded to a designated triage/transport site.”

“We use these for responses as well,” states Cortacans. “During Tropical Storm Irene a ‘strike team’ of these assets was deployed to Paterson, NJ, to assist with the evacuation of a large apartment complex where flood waters were encroaching. During Superstorm Sandy, these assets were deployed all over New Jersey to assist with search and rescue/recovery. Roads were difficult to navigate due to debris from downed trees, power lines and structure damage, and along the coast where up to 10 feet of sand was deposited on roadways—the ATVs navigated through those challenges.”

Cortacans notes the agency’s ATVs were also used successfully during the “record setting” blizzard of December 26–27, 2010, during which 2–3 feet of snow was
New Jersey has ATVs from a number of different manufacturers, notes Cortacans, but “our most popular model is the ASAP Support Apparatus (ASAP). We purchase three base models—the MS 100, MS 250 and MS 500—that range from a basic entry-level product up to a fully loaded high-end version. Each model comes with an extensive list of options that gives the customer the flexibility to build the MedStat unit that best fits their needs.

off-road rescue and large-event patient transport, the MEDLITE is universal in nature and can be mounted on most of the large UTV side-by-side chassis on the market today. Kimtek MEDLITE Transports can carry an EMS long board, stretcher, Stokes basket or full-size wheeled ambulance cot. The MEDLITE is also perfect for your search and rescue operations. ASAP’s MedStat is an off-road ambulance that features a fully enclosed, all-aluminum patient compartment that secures a full-size cot and seating for up to two attendants and a driver. The MedStat unit has three base models—the MS 100, MS 250 and MS 500—that range from a basic entry-level product up to a fully loaded high-end version. Each model comes with an extensive list of options that gives the customer the flexibility to build the MedStat unit that best fits their needs.

The rapid evolution into community paramedicine and mobile integrated healthcare has been one of the most discussed issues in the EMS arena. Attend this exclusive event and hear from your peers as they share real-life examples of successful programs in action. Agenda includes individual and panel discussions covering:

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- How to Build Winning Relationships

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A Vehicle to Fit Every Need
Just as there are different ambulance body types and interior designs to fit the specific needs of EMS agencies and their patient populations, EMS ATVs and UTVs come in all shapes and sizes, and from a wide array of manufacturers.

Two of those manufacturers, Alternative Support Apparatus (ASAP) and Kimtek, offer different takes to suit very specific needs. Kimtek’s MEDLITE Transport ski units are made for budget-minded departments. These capable, no-nonsense rugged ski units are built to last. Designated for off-road rescue and large-event patient transport, the MEDLITE is universal in nature and can be mounted on most of the large UTV side-by-side chassis on the market today. Kimtek MEDLITE Transports can carry an EMS long board, stretcher, Stokes basket or full-size wheeled ambulance cot. The MEDLITE is also perfect for your search and rescue operations.

ASAP’s MedStat is an off-road ambulance that features a fully enclosed, all-aluminum patient compartment that secures a full-size cot and seating for up to two attendants and a driver. The MedStat unit has three base models—the MS 100, MS 250 and MS 500—that range from a basic entry-level product up to a fully loaded high-end version. Each model comes with an extensive list of options that gives the customer the flexibility to build the MedStat unit that best fits their needs.

The New Jersey EMS Task Force treats its ATVs and UTVs like mini ambulances. “They have almost everything you’d find in a regular ambulance, except in less quantity and smaller-sized items,” he explains. “The ASAPs come with a stretcher. There’s room for an attendant in the back and it’s fully enclosed so we can mitigate against the effects of weather. Generally, these are staffed by EMTs; however, we have had instances of paramedics staffing the asset(s) during extreme circumstances and with approval from the New Jersey Department of Health.”

Cortacans adds the vehicles are extremely beneficial for agencies. “They offer us flexibility in offering enhanced EMS coverage for special events, and give us a capability to respond to disasters by allowing us to get there. We even had a cardiac arrest resuscitation in one of them during a densely populated street festival early on when we only had a couple of the vehicles.”
Addressing Ambulance Standards

New ambulance design & safety standards will be in place by 2016—the question is, what will they look like?

By Jason Busch, Associate Editor

T he safety and design standards for ambulances in the U.S. will soon be changing, but while the new requirements are supposed to be in place by 2016, the industry has yet to reach consensus on just what those standards will look like. This poses an interesting problem for ambulance manufacturers, which will need to abide by the new standards, and the office of EMS in each individual state, which will need to adopt one of two competing sets of requirements.

Since 1974, the KKK-A-1822 (A-F) purchasing specification—or “Triple K”—has served as the guideline by which federal agencies and grant recipients purchase ambulances. However, while a majority of states use the Triple K specs, ambulance manufacturers and their customers have raised concerns in recent years about the need for safety requirements that just aren’t addressed in the guidelines. As a result, the Triple K standards are set to sunset at the end of this year and the EMS industry will need to adopt new guidelines beginning in 2016.

What’s slowing that process down, however, are competing sets of standards on the table. Both the Commission on Accreditation of Ambulance Services (CAAS) and the National Fire Protection Association (NFPA) have proposed new ambulance guidelines, and each set of standards differs.

The NFPA’s standard, NFPA 1917, is based on the organization’s standards for fire apparatus. According to the NFPA, it was developed with consideration of the Federal Specification KKK-A-1822 and NFPA 1901: Standard for Automotive Fire Apparatus. NFPA 1917 defines the minimum requirements for the design, performance and testing of new automotive ambulances intended for use under emergency conditions to provide medical treatment and transportation of sick or injured people to appropriate medical facilities. NFPA states the standard presents general requirements for ambulance design and performance, along with standalone chapters for ambulance components, including chassis, patient compartment, low-voltage electrical systems and warning devices, and line voltage electrical systems. NFPA 1917 also specifies provision for test methods.

Published in 2012, NFPA 1917 immediately met with resistance from the EMS industry, which noted a number of requirements viewed as overly restrictive, including limits on design and speed.

When industry experts gathered in Nashville for EMS World Expo 2014 (see EMSWorld.com/12030641), among the topics of discussion was building ambulances to meet new crash safety requirements from the Society of Automotive Engineers (SAE). Those requirements, released in July 2014, are aimed at creating safer patient compartments and work environments for EMS personnel.

According to Jim Green, project officer, Division of Safety Research, National Institute for Occupational Safety and Health (NIOSH), the overarching goals of the effort to revise the ambulance crash safety standards were to:

• Ensure all proposed patient compartment occupants with the same level of crash protection as passenger vehicles.
• Work with end users to ensure designs meet needs.
• Develop system-specific standards for publication to be referenced nationally or internationally in the near term.
• Incorporate changes into one or more bumper-to-bumper ambulance national standards in the long term.
• Most important, ensure all proposed standards are based on actual test data.

Among the new requirements is the J3027 recommended practice that outlines testing procedures for evaluating the integrity of ground ambulance patient litters, litter-retention systems and patient restraints in front and side impact collisions. Its purpose, the SAE says, is to provide litter manufacturers, ambulance builders and users with testing procedures and acceptance criteria to ensure the patient litter, its retention system and the patient restraint utilize dynamic performance test methodologies similar to those applied to other vehicle seating and occupant restraint systems. It includes descriptions of the test setup, instrumentation, photographic/video coverage, test fixtures and performance metrics.

Released at the same time as J3027, J3043 explains dynamic and static testing procedures for evaluating the integrity of equipment-mount devices or systems in a frontal or side crash. It is intended to provide equipment manufacturers, ambulance builders and users with testing procedures and acceptance criteria to ensure mounting mechanisms meet the same performance criteria as passenger vehicle seating and occupant restraint systems. Its purpose is to ensure ambulance occupant seating and restraint systems meet similar performance criteria as FMVSS 208 requires for seat-belted passengers in light vehicles.

Additional work on these standards remains underway, Green said. This includes:

• SAE J3057: Patient compartment structural integrity standard, which will dynamically and statically test the modular body to improve a builder’s ability to design and test for roll impact loading. Likely to be published in summer 2015;
• SAE J3057: Patient compartment structural integrity standard, which will ensure cabinets retain equipment using established crash pulses. Likely to be published in summer 2015;
• Interior surface delethalization involves making impact surfaces less likely to injure the worker or patient, and EMS Worker Anthropometry Study, which will assess body sizes and shapes (620 human subjects planned—480 completed so far).

Continued on page 54

Society of Automotive Engineers Releases Crash Safety Standards

When industry experts gathered in Nashville for EMS World Expo 2014 (see EMSWorld.com/12030641), among the topics of discussion was building ambulances to meet new crash safety requirements from the Society of Automotive Engineers (SAE). Those requirements, released in July 2014, are aimed at creating safer patient compartments and work environments for EMS personnel. According to Jim Green, project officer, Division of Safety Research, National Institute for Occupational Safety and Health (NIOSH), the overarching goals of the effort to revise the ambulance crash safety standards were to:

• Provide patient compartment occupants with the same level of crash protection as passenger vehicles;
• Work with end users to ensure designs meet needs;
• Develop system-specific standards for publication to be referenced nationally or internationally in the near term;
• Incorporate changes into one or more bumper-to-bumper ambulance national standards in the long term;
• Most important, ensure all proposed standards are based on actual test data.

Among the new requirements is the J3027 recommended practice that describes testing procedures for evaluating the integrity of ground ambulance patient litters, litter-retention systems and patient restraints in front and side impact collisions. Its purpose, the SAE says, is to provide litter manufacturers, ambulance builders and users with testing procedures and acceptance criteria to ensure the patient litter, its retention system and the patient restraint utilize dynamic performance test methodologies similar to those applied to other vehicle seating and occupant restraint systems. It includes descriptions of the test setup, instrumentation, photographic/video coverage, test fixtures and performance metrics.

Released at the same time as J3027, J3043 explains dynamic and static testing procedures for evaluating the integrity of equipment-mount devices or systems in a frontal or side crash. It is intended to provide equipment manufacturers, ambulance builders and users with testing procedures and acceptance criteria to ensure mounting mechanisms meet the same performance criteria across the industry. It allows manufacturers to conduct either dynamic testing or static testing.

A third recommendation, J3026, specifies testing procedures to evaluate the integrity of ground ambulance occupant seating and restraint systems for workers and civilians transported in the patient compartment during frontal and side collisions. This practice is based on specific dynamics of the ambulance patient compartment and doesn’t apply to other vehicle applications or seating positions. J3026 accommodates seating systems installed in multiple attitudes, including side-facing, rear-facing and forward-facing. Its purpose is to ensure ambulance occupant seating and restraint systems meet similar performance criteria as FMVSS 208 requires for seat-belted passengers in light vehicles.

Additional work on these standards remains underway, Green said. This includes:

• SAE J3057: Patient compartment structural integrity standard, which will dynamically and statically test the modular body to improve a builder’s ability to design and test for roll impact loading. Likely to be published in summer 2015;
• SAE J3057: Patient compartment structural integrity standard, which will ensure cabinets retain equipment using established crash pulses. Likely to be published in summer 2015;
• Interior surface delethalization involves making impact surfaces less likely to injure the worker or patient, and EMS Worker Anthropometry Study, which will assess body sizes and shapes (620 human subjects planned—480 completed so far).
### Table 1: Comparing the Triple K, CAAS and NFPA Ambulance Standards

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<tbody>
<tr>
<td><strong>Access handrails</strong></td>
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<tr>
<td>Grab handle on the inside of each door or adjacent body structure</td>
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<tr>
<td><strong>Access to patient</strong></td>
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<tr>
<td>Primary attendant seat positioned a minimum of 25° from head of cot</td>
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<td><strong>AMD testing to verify compliance</strong></td>
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<tr>
<td>AMD tests 1-26 are required</td>
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<tr>
<td><strong>Bulkhead/partition</strong></td>
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<td>Bulkhead with latchable door</td>
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<tr>
<td><strong>Cabinet storage load</strong></td>
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<td>Not specified pending SAE requirements</td>
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<td><strong>Chevrons</strong></td>
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<td>Optional</td>
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<td><strong>CO monitor</strong></td>
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<tr>
<td>Testing per AMD 007 required</td>
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<tr>
<td><strong>Engine hour meter</strong></td>
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<tr>
<td>Optional</td>
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<tr>
<td><strong>Equipment storage criteria</strong></td>
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<tr>
<td>Minimum 35 cubic feet of interior storage; all devices to be fastened to manufacturers’ requirements</td>
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<tr>
<td><strong>Floor loading height</strong></td>
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<td>Maximum is 34°</td>
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<tr>
<td><strong>Floor testing requirements</strong></td>
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<tr>
<td>AMD 20 floor deflection test required to prove floor load capacity</td>
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<tr>
<td><strong>Generator requirements</strong></td>
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<tr>
<td>Not specified</td>
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<tr>
<td><strong>Ground lighting under vehcile</strong></td>
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<tr>
<td>Step wells to be illuminated</td>
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<tr>
<td><strong>Litter fasteners and anchorages</strong></td>
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<tr>
<td>NIOSH/SAE J027 may be required in Change #7 effective July 2015</td>
<td>NIOSH/SAE J027 standard required</td>
<td>NIOSH/SAE J027 may be required in 2016 edition</td>
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<tr>
<td><strong>Main electrical printed circuit board</strong></td>
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<tr>
<td>Certified to “Class 3 life support” standard</td>
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<tr>
<td><strong>Mounting and retention of equipment</strong></td>
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<td>NIOSH/SAE J043 may be required in Change #7 effective July 2015</td>
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<td><strong>Occupant payload calculations</strong></td>
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<tr>
<td>Weight calculated at 175 lbs. per person</td>
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<td><strong>Patient compartment seating</strong></td>
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<tr>
<td>NIOSH/SAE J026 may be required in Change #7 effective July 2015</td>
<td>NIOSH/SAE J026 standard required</td>
<td>NIOSH/SAE J026 may be required in 2016 edition</td>
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<tr>
<td><strong>Payload requirement</strong></td>
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<tr>
<td>Type 11,500 lbs. before options; Type 1/III, 1,750 lbs. before options</td>
<td>All types 1,300 lbs. minimum payload after all options</td>
<td>Purchaser to set minimum payload</td>
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<tr>
<td><strong>Reflective striping</strong></td>
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<tr>
<td>6”-14” orange reflective stripe around body</td>
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<tr>
<td><strong>Required door openings</strong></td>
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<tr>
<td>Rear and side doors required; minimum dimensions provided</td>
<td>Rear and side doors required; minimum dimensions provided</td>
<td>Two means of escape required; minimum size 10” x 24”</td>
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<tr>
<td><strong>Seat belt warning</strong></td>
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<tr>
<td>“Fasten Seat Belt” label required</td>
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<tr>
<td><strong>Suspension clearance angles</strong></td>
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<tr>
<td>Approach: 20 degrees; breakover: 10 degrees; departure: 10 degrees</td>
<td>Approach: 20 degrees; breakover: 10 degrees; departure: 10 degrees</td>
<td>Approach: 10 degrees; breakover: 10 degrees; departure: 10 degrees</td>
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<tr>
<td><strong>Tire pressure monitor</strong></td>
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<td>Optional</td>
<td></td>
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<tr>
<td><strong>Vehicle type certification</strong></td>
<td></td>
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</tr>
<tr>
<td>Proof of compliance and complete certification testing by ISO-approved laboratory is required for each type</td>
<td>Proof of compliance and complete certification testing by ISO-approved laboratory is required for each type</td>
<td>Visual indicator or monitor required</td>
<td></td>
</tr>
<tr>
<td><strong>Warning indicators</strong></td>
<td></td>
<td></td>
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<tr>
<td>Door ajar light</td>
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<td></td>
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<tr>
<td><strong>Warning lights</strong></td>
<td></td>
<td></td>
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<tr>
<td>KKK or NFPA configuration acceptable</td>
<td></td>
<td></td>
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<tr>
<td>Pursuer to specify</td>
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<td></td>
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<tr>
<td><strong>Wire harness protective loom</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300° F maximum rated</td>
<td></td>
<td></td>
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<tr>
<td><strong>Wiring</strong></td>
<td></td>
<td></td>
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<tr>
<td>5XL, CXL copper wiring or better</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Interior or exterior grab handles on the cab and patient compartment at each step location</td>
<td>Seat-to-cot dimension provided to allow for multiple cot positions</td>
<td>Monitor required</td>
<td></td>
</tr>
<tr>
<td>Some AMD tests required</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bullhead with optional window</td>
<td></td>
<td></td>
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<tr>
<td>Each cabinet to be labeled with maximum load</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warning lights are required for service ambulance</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>194°F maximum rated</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>TXL, SXL or CXL acceptable–strands other than copper permitted</td>
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In response, CAAS, a not-for-profit ambulance accreditation organization, came out with its own set of standards, the CAAS Ground Vehicle Standard (GVS-2015). Developed by a coalition of industry groups from EMS and the fire service, the CAAS guidelines identify the minimum requirements for new EMS ground ambulances built on OEM chassis and prepared for use as an ambulance. This standard applies to new vehicles only and does not include:

- Military vehicles
- Combat support ambulances
- Wheelchair vans/transport vehicles
- Mass-casualty vehicles/ambulance buses
- Refurbished or remounted ambulances
- Fire apparatus

According to CAAS, the purpose of the CAAS GVS-2015 is to “best serve patients by providing ground ambulances that are safe, nationally recognized, properly constructed, easily maintained, and when professionally staffed and provisioned, will function reliably in prehospital or other mobile emergency medical services.”

Right now, there’s no easy resolution in sight. Both the NFPA and CAAS have planned revisions to their standards during 2015, and as of now neither plan seems to have gained a foothold across the entire EMS industry.

But if one plan does gain universal acceptance, it’s going to dramatically affect the way ambulances are designed for years to come. Right now ambulance manufacturers can design and build to any standard. But if there’s just one accepted standard going forward, it’s going to make it easier and more cost effective for manufacturers to build vehicles. And it very likely could mean new safety features on ambulances that better protect the lives of patients and providers.

**References**

- www.regulations.gov.

**Both the NFPA and CAAS Have Planned Revisions to Their Standards During 2015.**
Ambulance Manufacturer Directory

Leading ambulance manufacturers profile their latest vehicle designs and equipment

1. **Braun Industries**
   - Website: [www.BraunAmbulances.com](http://www.BraunAmbulances.com)
   - Ambulance Type: Type I, II, and III
   - Engine Type: Gas, diesel
   - Chassis Type: Ford, Chevy, Spartan, International, Freightliner, RAM, Sprinter

For over 40 years, Braun has been manufacturing custom, handcrafted emergency vehicles that are “Built for Life.” The 2015 lineup includes the Responder, Signature Series, Patriot, Super Chief, Chief XL, Liberty and Express. Each ambulance features the quality, safety and innovation Braun is known for, including their SolidBody Construction, EZ Glide Door and other Braun exclusives. This year the ambulance manufacturer will also be unveiling a new model!

Circle 42 on Reader Service Card

2. **Crestline Coach Ltd.**
   - Website: [www.crestlinecoach.com](http://www.crestlinecoach.com)
   - Ambulance Type: Type I and III
   - Engine Type: Gas, diesel
   - Chassis Type: Chevy, Ford

Since 1975 Crestline has paved the way with industry innovations, manufacturing the safest and most advanced ambulances and emergency vehicles on the road. Crestline works with you as a partner through consultation, design, upfitting and delivery. We’ve been meeting the needs of our customers in over 30 countries around the world, delivering world-class ambulances and specialty vehicles. Our formula for success, the Crestline Advantage, consists of three key values we excel at: safety, innovation and durability.

Circle 43 on Reader Service Card

3. **Demers**
   - Website: [www.demers-ambulances.com](http://www.demers-ambulances.com)
   - Ambulance Type: Type I, II, III and medium-duty
   - Engine Type: Diesel, gas
   - Chassis Type: Ford, Chevy, Dodge, Freightliner, International, Mercedes

Demers’ exclusive Mobility Track Seating keeps you safely strapped into a comfortable, ergonomic captain’s seat that swivels and moves front to back and laterally. Better access to critical equipment and controls means your patients receive better care. The curbside seatback also folds down, providing support for dual patient transport needs. Over 300 Demers vehicles across North America are presently equipped with this feature, helping paramedics save lives.

Circle 44 on Reader Service Card

4. **Medix Specialty Vehicles, Inc.**
   - Website: [www.medixambulance.com](http://www.medixambulance.com)
   - Ambulance Type: Type I, II, and III
   - Engine Type: Diesel, gas
   - Chassis Type: Ford, Chevy, Mercedes

Medix has been manufacturing quality, affordable ambulances since 2000. Our success centers around a robust structural design, excellent fit and finish, quality of design, and consistently repeatable and managed manufacturing processes, all with a focus on safety and dependability. Medix is the first ambulance manufacturer certified to build on the Mercedes-Benz chassis and the first to bring the new Ford Transit II to the market, and all Medix units are QVM and KKK-A-1822 tested and compliant.

Circle 45 on Reader Service Card

5. **Mercedes-Benz USA/Daimler Vans USA**
   - Website: [www.sprinterusa.com](http://www.sprinterusa.com)
   - Ambulance Type: Sprinter Cargo 2500 for Type II and Sprinter 3500 cab-chassis Type III upfits
   - Engine Type: 2.1 L Bluetec 4-Cyl. CDI diesel; 3.0 L Bluetec V6 CDI diesel
   - Chassis Type: Mercedes-Benz and Freightliner Sprinter cab chassis 6 Sprinter 2500 cargo van

The Sprinter cab chassis offers efficiency, functionality and durability in one complete package. The flat, unobstructed frame rails provide a variety of upfitting opportunities and other features, such as standard high-output alternator (6.220 amp, 4-cyl.); 200 amp and optional 250 amp); standard adaptive ESP, optional high roof with tall rear and sliding doors, optional auxiliary battery, and optional PSM with unique ambulance features like wig-wag, high idle, idle shut down and continuous running engine feature. Optional Ambulance Package available—please see your dealer for details and availability.

Circle 46 on Reader Service Card

6. **Lenco Armored Vehicles**
   - Website: [www.lencoarmor.com](http://www.lencoarmor.com)
   - Engine Type: V-10 gas or V8 turbo diesel
   - Chassis Type: Ford F-550 Super Duty

The Lenco MedEvac was designed to meet the requirements of tactical EMS personnel. It can be used as an armored response and rescue SWAT truck for dangerous call-outs, and is equipped to provide tactical EMS with a safe and effective environment to deal with trauma cases. The MedEvac has two wall-mounted litters, two on-board jumbo-D oxygen tanks with a lighted work station, and ample interior compartments for medical supply and gear storage.

Circle 47 on Reader Service Card

**ADDITIONAL MANUFACTURERS**

- **American Emergency Vehicles**
  - www.aev.com
- **Braun Northwest, Inc.**
  - www.braunnorthwest.com
- **Excellance, Inc.**
  - www.excellance.com
- **Frazer, Ltd.**
  - www.frazerbilt.com
- **Horton Emergency Vehicles**
  - www.hortonaembulance.com
- **Leader Emergency Vehicles**
  - www.leaderambulance.com
- **Life Line Emergency Vehicles**
  - www.lifelineambulance.com
- **Marque Ambulance**
  - marqueambulance.com
- **McCoy Miller**
  - www.mccoymiller.com
- **Miller Coach**
  - millercoach.com
- **Osage**
  - www.osageind.com
- **PL Custom Emergency Vehicles**
  - www.plcustom.com
- **Road Rescue**
  - www.roadrescue.com
- **Sartin Services**
  - www.sartinservices.com
- **Taylor Made Ambulance**
  - www.taylormadambulance.com
- **Wheeled Coach Industries, Inc.**
  - www.wheeledcoach.com
Circle 51 on Reader Service Card

d. 160-plus hours of continuous recording. DVXV continuously monitors and captures driving behavior while simultaneously providing real-time driver feedback. If predetermined speed limit and or G-force settings are exceeded, drivers are notified with an audible chime. The chime or “alert” is a behavior modification tool for drivers, helping reinforce safe driving habits. DVXV continuous video helps fleets confirm safe practices are consistently maintained by drivers. Visit www.roscovision.com.

Circle 49 on Reader Service Card

- 12v rechargeable battery; wall charger is included.
- Single unit. Operates off of a supplied 12v rechargeable battery; wall charger is included. Heavy-duty wheels allow the unit to facilitate horizontal loading into a compartment. Heavy-duty wheels allow the unit to facilitate horizontal loading into a compartment.
- Zico’s Horizontal Oxygen Cylinder Lift transports, raises and lowers “J” cylinders so you don’t have to, keeping heavy cylinders secured through the entire exchange process. Rotates 90 degrees to facilitate horizontal loading into a compartment. Heavy-duty wheels allow the unit to facilitate horizontal loading into a compartment.

Circle 48 on Reader Service Card

- Why risk back strain or injured feet when exchanging medical oxygen cylinders? Ziamatic Horizontal Oxygen Cylinder Lift is designed to make exchange easy. Ziamatic Horizontal Oxygen Cylinder Lift exchanges medical oxygen cylinders efﬁciently and safely.

Circle 50 on Reader Service Card

- Hassle-free infant or Attendant Seat. This seamless attendant seat with three-point belting system features a hassle-free latching system for attaching an infant carrier to the popular EVS 1780 seat. This seat will transport either the attendant or unjured infants. The infant carrier attaches to the seat in the same manner as a car: Simply latch in, tighten and go! What are YOU doing to keep your passengers safe? Visit www.evsltd.com.

Circle 49 on Reader Service Card

- The ACR-4 (ambulance child restraint) is the latest version of the original ACR, however, ACR-4 now allows for the safe restraint of all children from 4-pounds–99 pounds during transport. The ACR-4 is an innovative, ﬂexible and fully adjustable harnessing system designed for the safe and effective transport of infants and children in an ambulance, and it is color-coded for easy selection. Universal cot straps (included) connect with the ACR harness, holding the patient in place to prevent potentially dangerous movement during transportation. Visit www.quantum-ems.com.

Circle 51 on Reader Service Card

- For therapeutic hypothermic induction.
- Engel EMS Refrigerator/Freezer ENGELE USA offers a compact, constant-temperature refrigerator/freezer, developed specifically for saline storage for therapeutic hypothermic induction. The ENGELE EMS model features our “F” series compressor, which is quieter and runs longer. It can store up to six saline IV solutions and a small drug bag. Featuring a temperature range of 5°F to 113°F, it automatically heats in winter, and cools in summer, to maintain the set temperature. Visit www.Engel-USA.com.

Circle 52 on Reader Service Card

- Power-LOAD Cot Fastener System from Stryker EMS improves operator and patient safety by supporting the cot and patient throughout the loading and unloading process. By reducing spinal loads on operators, cumulative trauma injuries can be reduced. Power-LOAD wirelessly communicates with Power-PRO cots for maximum convenience and efﬁciency. Visit ems.stryker.com.

Circle 59 on Reader Service Card


Circle 58 on Reader Service Card

- Pioneer Series with 10 different ﬂoor plans available, the Pioneer Series has proven to be very versatile for emergency and quick response units. Its user-friendly compartments provide readily accessible storage for all types of equipment, all stored at waist/cheek height. Visit www.swabwagon.com.

Circle 56 on Reader Service Card

- Power-LOAD Cot Fastener System improves operator and patient safety by supporting the cot and patient throughout the loading and unloading process. By reducing spinal loads on operators, cumulative trauma injuries can be reduced. Power-LOAD wirelessly communicates with Power-PRO cots for maximum convenience and efﬁciency. Visit ems.stryker.com.

Circle 59 on Reader Service Card

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Circle 55 on Reader Service Card

- Portable and adjustable, heavy-duty Mac’s Bariatric Ambulance Lift is making Ambulance Crews Safer with the Mac’s Bariatric Ambulance Lift. With a 1,320 pound weight capacity the lift is prepared for any job you can roll on it. The platform is universal and will accommodate whatever equipment you choose to use. Bumper Stop Technology makes the lift available to the ambulance crew at all times, and functions as a bumper and step. Don’t strain your back—go see Mac! Visit www.macsliftgate.com.

Circle 54 on Reader Service Card

- Quantum ACR-4 Ambulance Child Restraint System: The ACR-4 (ambulance child restraint) is the latest version of the original ACR, however, ACR-4 now allows for the safe restraint of all children from 4-pounds–99 pounds during transport. The ACR-4 is an innovative, flexible and fully adjustable harnessing system designed for the safe and effective transport of infants and children in an ambulance, and it is color-coded for easy selection. Universal cot straps (included) connect with the ACR harness, holding the patient in place to prevent potentially dangerous movement during transportation.

Circle 50 on Reader Service Card

- MEDLITE Transport Units, Kimtek’s MEDLITE Transport compact skid unit series is designed to be a cost-effective, ﬂexible solution for emergency response in environments not suitable for the traditional ambulance. These lightweight slip-in skid units expand the versatility of UTVs. The MEDLITE Transport is ideal for use by all public safety agencies and has applications on golf courses, sporting events, industrial plants and mines, and backcountry rescue. It is built for off-road, rough, all-terrain and wildland situations. It is a very effective way to put the EMT right next to the patient during transport. Visit www.kimtekresearch.com.

Circle 54 on Reader Service Card

- Hassle-free infant or Attendant Seat. This seamless attendant seat with three-point belting system features a hassle-free latching system for attaching an infant carrier to the popular EVS 1780 seat. This seat will transport either the attendant or unjured infants. The infant carrier attaches to the seat in the same manner as a car: Simply latch in, tighten and go! What are YOU doing to keep your passengers safe? Visit www.evsltd.com.

Circle 51 on Reader Service Card

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Request Free Information at www.emsworld.com/e-inquiry

EMS Week 2015
May 17–23

For More Information Circle 61 on Reader Service Card
FOR YEARS I’VE BEEN TRYING TO JUSTIFY MY appreciation of the Three Stooges—mostly to The Lovely Helen, who claims the Stooges are proof the alleged 5% difference between human and chimpanzee DNA is more like 4% in men. To my wife I say wake up and go to sleep.

“Getting” the Stooges is a Mars/Venus thing. On behalf of my fellow Martians who happen to be in the patient-processing business, I’ve figured out how to make Moe, Larry and Curly almost as relevant to EMS as Johnny and Roy. But first some background:

I’ve noticed discussions on EMS websites about the use of code words to request help in the field urgently and secretly. I can relate. I used to annoy my partners at Opryland with hypothetical scenarios about sedate guests suddenly going postal. What if a presenting lunatic insists I treat him for an allergic reaction to, say, gunpowder, then refuses the SWAT team AMA? Am I supposed to look for an opportunity to disarm him with my penlight? “Sir, I just need to check your pupils for a few minutes—slowly, very slowly, while you’re getting sleepy, so sleepy…” I don’t think so.

A better solution would be a stealthy signal, known only by my agency, its members, their spouses and Facebook friends, meaning help me right now or I will haunt you for the rest of your life. Just put it in the back of the employee handbook under a heading that only EMS people would look at—something like Photo of Human Eyeball Clawed by Rabid Chipmunk.

Look no further than the Three Stooges for a precedent. They had to deal with imminent badness in their 1950 short Studio Stoops.

Moe and Larry are in a room, hiding from gangsters. As Larry leaves he tells Moe, “When I come back, I’ll give you the password.”

“Brilliant. What’ll it be?” asks Moe.

“Open the door.”

That still cracks me up, but the idea of prearranged words or phrases in EMS to limit danger is worth considering. I don’t remember being in a situation where I needed that, but I came close, twice, when patients who told me they were ex-cons objected rather vigorously to being examined in a small room with a closed door. OK, so maybe I shouldn’t have referred to my LIFEPAK 10 as “Old Sparky,” but hey, live and learn.

If we’re going to do this, we need to decide on the type of signal we’ll use. Consider these possibilities:

• 10-codes—Almost every department has them or used to. The best thing about 10-codes is they’ll sound plausible to psychopaths. The problem is consistency; there is none among agencies. I’ve worked in systems where 10-1, 10-3, 10-13 and 10-24 each meant help in the name of all that is holy, but 10-13 also might be the code for ordering a pepperoni pizza in some places.

• Words—I’m thinking they should be part of routine transmissions—something like “Medic Rubin to Base, show me back in service PUH-LEECE.” Or “Hospital X, I’m inbound with a mordenske galning.” That’s Danish for homicidal maniac. Studies show very few sociopaths speak Danish.

• Phrases—One approach would be to involve a significant other, as in, “Hey, honey, just called to say how much I enjoyed watching Real Housewives with you.” Helen would know right away I was in trouble or suffering from a berry aneurysm. Either way she’d call 9-1-1.

An alternative would be to keep it strictly business: “Base, just wondering when that shipment of bretylium will be in.” Heh heh, got you there, Mr. Bad Guy…unless you happen to be one of my deranged ex-partners.

• Protocols—You could disguise your crisis code as a medical control option. Medical control would figure out something’s wrong if you asked for, say, a chamois infusion or a porridge challenge. I bet they’d send help after they yanked your card.

• Nonverbal signals—How about keying S.O.S. through our radios? Oh, so Morse code isn’t part of your curriculum? Fine, then just keep pressing PTT to the beat of “Stayin’ Alive.” Cell phones might work if we could operate them like spies do in the movies—by feel, from a pocket. The idea would be to discreetly send a canned text message, something like “I’m being kidnapped by a patient who’s fondling my stethoscope.” Not sure about that one; Helen might think it’s just another overly dramatic excuse for being late.

Nyuk, nyuk, nyuk.
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