The Revolution in EMS Care

Thanks to new technology, new life-saving techniques and new missions, ambulance crews are far from the ‘horizontal taxicabs’ they once were

By LAURA LANDRO

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There’s a revolution taking place in emergency medical services, and for many, it could be life changing. From the increasingly sophisticated equipment they carry and the new lifesaving techniques they use, to the changing roles they play in some communities—providing preventive care and monitoring patients at home—ambulance crews today are hardly recognizable from their origins as “horizontal taxicabs.”

Here’s a look at some of the most important changes happening in EMS care around the country—including a few plans in the testing phase still, and the challenges EMS professionals face to bring those to reality.

In case of emergency ...

EMS crews today are better equipped than ever for the worst kinds of emergencies, from cardiac arrests and gunshot victims to car crashes and other life-threatening injuries. These days, more ground and air ambulances include X-ray and ultrasound devices, machines that perform automatic chest compressions for CPR, communications systems that forward electrocardiograms to the emergency room, and equipment for lab tests that can identify dangerous conditions such as a developing septic infection.
Much of the best equipment—including a helicopter equipped as a mobile emergency room or intensive-care unit—can be found at the Mayo Clinic, in Rochester, Minn. Regarded as a leader in sophisticated onboard equipment and communications, Mayo often consults with other medical transport systems to share best patient care strategies, and works with U.S. military physicians to share expertise on how treatment of battlefield wounds might apply to civilian medicine.

Mayo provides increasingly advanced pre-hospital treatment, says Scott Zietlow, a trauma surgeon and medical director of the Mayo One trauma helicopter program. External defibrillators and pacemakers are standard, as are portable analyzers for lab tests and noninvasive devices to determine if a blood transfusion or antibiotics are needed. Because Mayo has its own blood banks, its air ambulances are able to provide a growing array of blood products that most others don’t carry.

In addition to featuring state-of-the-art equipment, Mayo’s emergency medical service has helped test a number of EMS innovations, including capnography, a monitoring device that helps in the placement of breathing tubes and measures the concentration of carbon dioxide in exhaled air. This can guide the effectiveness of CPR chest compressions and gauge the likelihood that a patient can be revived. Mayo Clinic can also transport patients on a machine that does the work of a heart and lungs.

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**Alternative Routes**

Giving emergency responders the flexibility to manage less-urgent 911 calls without taking patients to hospital emergency departments could generate substantial savings for Medicare, according to estimates from a Rand Corp. study.

<table>
<thead>
<tr>
<th>15.6%</th>
<th>$1 billion</th>
<th>$560 million</th>
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<tbody>
<tr>
<td>Portion of all Medicare-covered ambulance rides for patients whose conditions are not urgent or could be treated by primary-care providers</td>
<td>What Medicare spends annually on EMS and emergency-department costs for 911 patients who potentially could be treated outside of the hospital</td>
<td>Annual savings if some lower-level 911 cases were managed in less-expensive settings</td>
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Source: Health Affairs, 2013

The Wall Street Journal.

Mayo’s work with the military has led its EMS crews to adopt quick-clotting bandages and tourniquets for blunt trauma and penetrating wounds. A study of 125 patients that Dr. Zietlow co-wrote, published last year in the Journal of Special Operations Medicine, concluded that civilian use of tourniquets and hemostatic gauze is highly effective at stopping bleeding.

Mayo EMS crews also plan to adopt a practice the military uses as an alternative to intravenous lines, particularly when a limb has been lost: sternal intraosseous infusion, in which fluids and medications are administered into the bone marrow directly through the sternum.
Coming soon: preventive-care teams  
In what could amount to a sea change for many EMS workers, health-care policy makers are looking at having so-called community paramedicine teams provide preventive care—and even make regularly scheduled house calls.

In a concept some are calling “EMS 3.0,” ambulance crews with advanced medical training in more communities already are treating patients in their homes, including frail or elderly patients, helping to manage chronic conditions like diabetes, and are checking on recently discharged hospital patients to ensure they are following their care instructions.

“We are a natural provider of care outside of hospitals and other institutions,” says Kevin McGinnis, program manager, community paramedicine, mobile integrated health care and rural emergency care for the National Association of State EMS Officials. “The majority of calls that go through 911 are nonemergencies, and we can use EMS resources to address otherwise unaddressed health needs in communities,” Mr. McGinnis says.

Among the nonemergency calls that paramedics often respond to: shortness of breath, weakness and fatigue from dehydration, cuts and abrasions, abdominal pain, low-grade fevers, cold-like symptoms, urinary problems and minor falls in the home.

Dovetailing with efforts to align EMS workers more closely with core health-care delivery, EMS organizations in a draft report released last month called for “an EMS system that maximizes value to the community by providing new and essential services.” Extending EMS responsibilities to helping people navigate the health-care system, coordinating care and better educating patients, the report said, can “ultimately lower cost and improve the quality of patient care.”

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House Calls

Emergency responders in Mesa, Ariz., are treating some patients with less-urgent problems at home. Here is how they handle 911 calls:

<table>
<thead>
<tr>
<th>IF THE MEDICAL EMERGENCY/PROBLEM...</th>
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<tbody>
<tr>
<td><strong>is life threatening...</strong></td>
</tr>
<tr>
<td>✦ A four-person advanced life-support crew is dispatched</td>
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<tr>
<td>✦ Patient is transported to hospital</td>
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<tr>
<td><strong>isn’t life threatening...</strong></td>
</tr>
<tr>
<td>✦ A nurse performs triage over the phone</td>
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<tr>
<td>✦ Caller either receives advice on how to self treat, and/or a two-person team comprised of a firefighter-paramedic and a nurse practitioner (or physician assistant) is sent to provide care</td>
</tr>
<tr>
<td><strong>involves behavioral health....</strong></td>
</tr>
<tr>
<td>✦ If the patient's life isn't in danger, a firefighter-paramedic and behavioral health professional are dispatched to the scene</td>
</tr>
<tr>
<td>✦ If the situation is life-threatening, the full four-person crew is deployed</td>
</tr>
</tbody>
</table>

Source: Mesa Fire and Medical Department

The report cited big hurdles, including a highly fragmented national EMS system and payment policies which generally reimburse EMS providers only when they transport patients to a hospital. That could change as private insurance companies and the federal Medicare and Medicaid programs continue in their transition from a fee-for service model to one linked to the quality of care provided and measurable patient outcomes.
According to a 2013 study in the journal Health Affairs, if Medicare would reimburse EMS for services other than transporting patients to an ER, it would improve the continuity of care and save the federal government as much as $560 million a year. If private insurance companies followed suit, the study added, overall savings could be twice as large. The Centers for Medicare and Medicaid Services is now funding several programs testing new models that would reimburse for such alternative models.

Many EMS services are financially strapped due to the hospital-transport-only reimbursement policy, says Kevin Munjal, director of prehospital care at the Mount Sinai Health System in New York. In smaller communities and rural areas, the model is too low-volume to support paid staff, so EMS is provided by volunteers. That, in turn, puts their ability to respond in a true emergency at risk.

By creating a system that reimburses EMS professionals to do things like treat patients at home, move them to other health-care providers and check on them after they leave the hospital, “we could unleash innovative new models of care that meet unmet needs, while making emergency response more reliable,” says Dr. Munjal, who is leading a nationwide EMS innovation project. Otherwise, he warns, “many would argue that EMS’s ability to be there in emergencies is under threat.”

**Treating more patients at home**

Meanwhile, several pilot programs are working on ambulance services whose job is to not take people to the hospital. Mount Sinai and a local ambulance company have established a community paramedicine program in which specially trained paramedics respond to calls from patients enrolled in the program or in Mount Sinai’s visiting doctors program. The paramedics visit and examine the patients in their homes, and consult with doctors at the hospital via telemedicine, or two-way video, on what to do next. Out of 36 patients who called the service over a six-month period, only five were transported to the hospital, for an estimated savings of about $1,400 per encounter, Dr. Munjal says. The pilot program was started with a grant from the Centers for Medicare and Medicaid Services and is supported by private foundations.

In a similar pilot program in Mesa, Ariz., dispatchers in the Mesa Fire and Medical Department talk to patients who call the 911 center. For many whose problems are not deemed an emergency, nurses offer medical advice, or send a community-medicine unit to the caller’s home. The units include firefighter paramedics, nurse practitioners or physician assistants, or behavioral-health counselors from local fire departments and health-care providers and a hospital. A test of 983 patient encounters from August 2012 to February 2013 showed a cost savings of over $1 million, according to Mesa Deputy Chief Steven Ward. In 2014, the Mesa program also received a grant from the Centers for Medicare and Medicaid Services.

Caring for patients at home has advantages for everyone—when it’s possible. Tony Lo Giudice, the Mesa department’s community-care grant administrator, says that out of 55,000 calls a year, about 40% are low-acuity, “and it can be can be very expensive to place everyone in an ambulance and take them to the ER.” The community-care units also visit some hospital patients after discharge that are at higher risk of being readmitted, to offer preventive-care measures and make sure the patients are following discharge instructions. Paramedics are then able to identify those that might need follow-up services such as a social worker or physician referral, says Mr. Lo Giudice.

Susie Jackson, who lived in Gilbert, Ariz., says the community unit was a big help when her mother, Nancy Long, 80, cut her arm badly. Ms. Jackson called 911 and jumped in her car to get to her mother, expecting to spend the day in the ER with her. Instead, a physician assistant with the community-care unit stitched up the wound in her mother’s home. “It put my mother at so much ease that she didn’t have to leave home to be taken care of,” says Ms. Jackson.
A national emergency network
New information systems under development could make it far easier to share information in an emergency. First responders currently rely on thousands of separate and incompatible networks during emergencies, and often can’t easily communicate and work together. A 2012 federal law created the First Responder Network Authority, known as FirstNet, an independent authority that is developing a high-speed, nationwide, wireless broadband network dedicated to public safety. EMS teams would be able to transmit live video and images from car crash scenes, for example, even in rural areas with limited coverage.

In another national effort, known as Next Generation 911, states are upgrading antiquated 911 systems, which can only receive phone calls, allowing callers to send video and pictures to dispatchers. A growing number of states have recently added 911 text messaging.

With such advances and mobile apps designed for EMS services, first responders could use smartphones to share information that is now often lost or incomplete when they hand over patients at the ER, says Benjamin Schooley, an assistant professor of integrated information systems at the University of South Carolina. His design of a mobile system that allows paramedics to transmit video, pictures and other information to hospitals from car crashes has been tested in Idaho and Montana.

So far, Dr. Schooley says, EMS has only started to scratch the surface of what it can do with patient data in real time.

When less care is more
Counterintuitively, perhaps, researchers are finding that some patients may benefit from less intervention by paramedics. Studies have shown that in cases of penetrating trauma, such as gunshot or stab wounds in the torso, chest, abdomen or upper arms of legs, so-called advanced life support methods including providing IV fluids and inserting breathing tubes don’t improve survival rates.

Ambulance crews around the country are using new techniques and testing new missions.
PHOTO: ISTOCKPHOTO/GETTY IMAGES
Temple University Hospital in Philadelphia is embarking on a five-year study that will randomly group patients who are shot or stabbed. One group will receive advanced life support. The other group will be brought immediately to the hospital with only basic life-support therapy such as an oxygen mask if needed. The hospital has been meeting with city residents to explain the study and provide wristbands for those who want to opt out.

Zoe Maher, a trauma surgeon and researcher for the study, says that while the procedures can help in rural areas where trips to the hospital are long, in a city they might not help—and could hurt patients who are shot or stabbed and bleeding to death. For example, administering IV fluids can dilute the blood’s clotting ability, and putting a tube down the victim’s throat can increase pressure in the chest cavity and decrease the amount of blood coming back to the heart. “Sometimes we think of innovation as adding more treatment, but innovation here means doing less,” says Amy Goldberg, chair of Temple’s department of surgery. “We need to embrace this just as we would a new device or a new technology.”

Ms. Landro, a Wall Street Journal assistant managing editor, writes the Informed Patient column. Email: laura.landro@wsj.com.