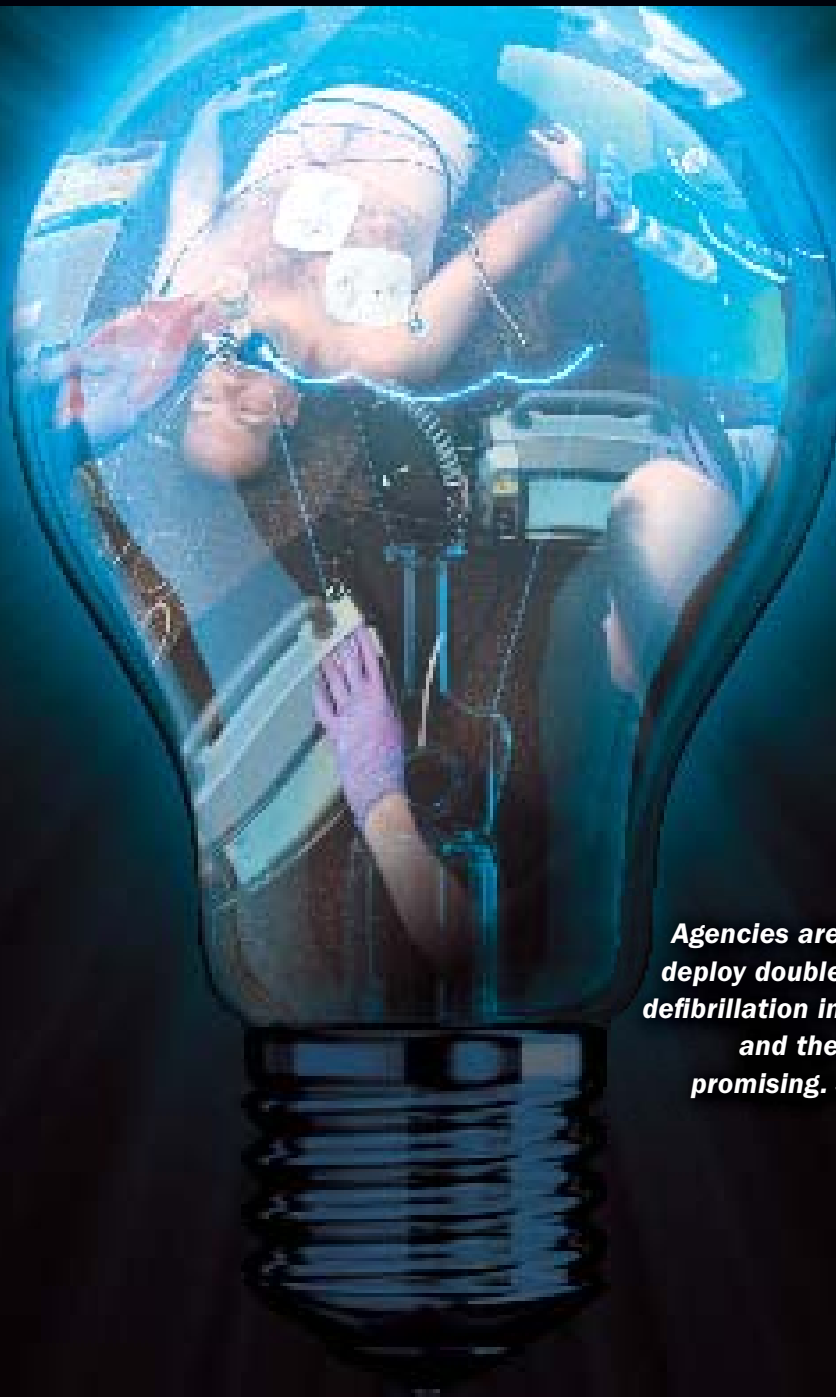


# EMS<sup>2011</sup> Innovations

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*Agencies are starting to  
deploy double sequential  
defibrillation in the field—  
and the results are  
promising. See page 6.*

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# Picking Up Speed

## The pace of change in EMS seems to be accelerating like never before

First they stand. Then they walk. Then they run. In 2011, EMS is really picking up speed.

It feels like a time of profound and rapid advances, doesn't it? From improved cardiac resuscitation to potential opportunities under health-care reform to field EMS legislation in Congress to the whole range of new and beneficial interventions making their way into the field, the rate of progress seems to be accelerating.

This special section takes a look out the window at where we are today. Drawn from content delivered at the annual EMS State of the Sciences (Gathering of Eagles) and NAEMSP conferences, it reports on important advances, clinical and operational, that are helping EMS systems deliver better care and operate more efficiently. Top docs help us add some perspective to what it means to you.

Have a look at what's new and exciting. Today, it's more important than ever to keep up to speed.

**Cover photo: Wake County (NC) EMS formally implemented its double sequential external defibrillation protocol in April 2010. Photo by Mike Legeros.**

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# Behind the

## Q&A with Paul Pepe from the Gathering of Eagles

Following a 13-year tradition, nearly 1,000 EMS educators, medical directors, chiefs and paramedics from across the country converged on Dallas at the end of February for a weekend of lively discussions and the occasional debate about the state of EMS and critical issues facing prehospital care. EMS World recently spoke with legendary emergency physician Paul Pepe, MD, MPH, FCCM, FACEP, who is largely responsible for organizing the annual event known formally as the EMS State of the Sciences Conference, or more familiarly as A Gathering of Eagles.

### What makes this event so unique and popular?

Part of what makes it fun is that we actually don't know what's on the program until everyone gets here. It's not advertised—it's strictly word of mouth—but it's become the place to be. We start off with a history of Eagles, since about a third of the audience is new each year, and then Corey Slovis, MD, from Nashville opens with a funny video and presentation of what he calls "The Pentagon Papers: The Five Most Important Publications of the Past Year." That sets the tone for the rest of the meeting.

### What were some of the highlights this year?

We started off with results of the North American multicenter ITD trial on resuscitation outcomes presented by Tom Aufderheide, who was the principal investigator. That was followed by a paper on the ResQPOD compression/decompression pump trial from R.J. Frascione from St. Paul. Following that, Kathleen Schrank from Miami looked at the new ACLS guidelines and which of them she would and would not follow. Craig Manifold looked at early intraosseous administration of epinephrine and noted that in San Antonio they've seen improved outcomes by getting the IO in right away and not waiting to start an IV.

Juliette Saussy reported on an interesting

development in New Orleans where they're using two defibrillators simultaneously on patients they can't get out of VF after the first shock or two. Paul Hinchey of Austin then picked up on something I've been doing for years called the "pit crew approach" to cardiac arrest where everyone on scene knows exactly what his or her job is when they get to the patient—just like a pit crew.

Some other issues touched on included end-tidal CO<sub>2</sub> as a gold standard for airway management and how it is useful in sepsis; comparison of military and 9-1-1 use of tourniquets for trauma; and the pros and cons of collar use and how putting on a collar incorrectly or unnecessarily can actually make a neck injury worse. ACEP President Sandra Schneider predicted that paramedics will be used more frequently for home visits and checks.

### Explain the lightning rounds.

That's when all the Eagles come up on stage and people in the audience ask questions that require rapid-fire answers. Then we do reverse lightning rounds where members of the audience come up and answer questions about the problems they're facing in their own EMS systems.

**The 2011 Gathering of Eagles conference allows attendees to learn from EMS medical directors from across the country and around the world.**

### How does the future look for Eagles?

We had to turn away a lot of vendors and attendees for this meeting because we sold out so rapidly. It's clear we'll have to expand somehow so more people will be able to attend. But there are two things you can count on: It still won't be advertised, and you won't know what's on the agenda until you show up. Even as we grow, there's still a certain intimacy to the meeting. At most conferences, faculty come in, give their talk, and they're out of there. With Eagles, they all stay through the entire meeting and attendees get to interface with them, including during lunch breaks.

For information on the 2012 EMS State of the Sciences Conference, visit <http://gatheringofeagles.us/>.



# Scenes

## Q&A with Kevin Mackey from the NAEMSP Annual Conference

The goal of the National Association of EMS Physicians is to provide leadership and promote excellence in out-of-hospital emergency medical services. To that end, one of the most important things NAEMSP does is its annual conference each January, which brings top-notch, cutting-edge education from physicians and other experts to attendees who can then take it home to their systems. Assembling that content falls to the NAEMSP's Program Committee, which for the last two years has been chaired by Kevin Mackey, MD, FACEP, EMS medical director for the Sacramento Metropolitan Fire District and five surrounding counties in California. Mackey explained to EMS World how the committee goes about putting together each year's show.

### Do you solicit particular content, or do people come to you with proposals?

We solicit them. Occasionally we'll have folks come to us, but it's pretty unusual they offer something we think would be a good fit for us. People who come to you to present ideas that way are usually trying to sell something.

### How do you go about selecting topics and matching them to speakers?

When I was program chair, we solicited the membership to find out what areas interested them. We broke it down into key topic areas, then asked, within those areas,

what people wanted to see. The members sparked ideas that way, and we'd take those and attract speakers.

A lot of ideas are generated from within the program committee as well. We all follow the literature. *Prehospital Emergency Care* is our peer-review journal, and you can go back through a year's worth of *PEC* and kind of see what the general themes were and what people were talking about. Then also we collaborate—we have discussions and partnerships with people who have been to other EMS conferences and events and heard interesting topics and suggested speakers to us.

And then there is the news. What's new and current? We're already talking about getting

someone to come talk about the response to the Japanese tsunami.

### What goes into a good presentation?

Three things: first, it's on topic—that's most important; second, it's short and to the point—that's absolutely vital; and third, it has to have a solid take-home value. There have to be one or two things in the presentation that people can take back to their EMS systems and say, "You know what? Here is something that worked in this other place, and it's something that can work in our system, and this is how we can make it work."

### What is the role of groups like NAEMSP in bringing new ideas to the EMS masses?

We have a very tight niche: prehospital emergency care administration and leadership. Our role is to have an understanding of what's out there, and know how to take what's out there and implement it into the street in a sensible way that's safe and patient-centered. That's not an easy thing—it's not something someone can just walk in off the street and do. That's why EMS became a subspecialty.

For information on the 2012 NAEMSP Annual Conference, visit [www.naemsp.org](http://www.naemsp.org).





# Hold the Coroner

Could double sequential defib stop refractory v-fib?



Attendees at the Gathering of Eagles heard about several instances where ROSC was obtained after using double sequential defibrillation.

**Y**our patient's in v-fib, and nothing's bringing him out. You've tried everything in the arsenal—continuous compressions, repeated shocks, all the drugs; nothing breaks it. Twenty minutes pass, then 25. The tube's fine, the EtCO<sub>2</sub> normal, the patient takes an occasional spontaneous breath, but the heart fibs on.

What do you do now? Is it time to call it a day?

Not so fast. A few U.S. systems are now permitting a novel last-gasp effort to save patients like this: double sequential defibrillation, using two AEDs to deliver a final big blast of energy before writing a victim off.

It doesn't always work. We don't know a lot about why it works when it does. There aren't many numbers to look at. But in a presentation at February's EMS State of the Sciences Conference in Dallas, former New Orleans EMS Director Juliette Saussy, MD,

told of achieving several instances of return of spontaneous circulation with the measure, and even of a neurologically intact survivor to hospital discharge.

Big Easy medics employed the double defib 16 times in a year, Saussy said. Four recipients achieved ROSC sustained to the hospital. One, a 64-year-old female, ultimately went home neurologically intact.

The protocol actually originated with Wake County EMS in North Carolina where medical control docs kept getting calls from frustrated medics who had gone through their protocols for VF/PVT, then persistent VF/PVT, and couldn't get their patients out of it.

"Under the old CPR," says Brent Myers, MD, MPH, medical director of Wake County's Department of EMS, "our hunch is that the perfusion was so poor, with all the breaks everybody was taking, that these patients wouldn't stay in fib—they would deteriorate into asystole. Now, with the continuous

compressions and everything else, they weren't doing that, and we didn't really have a whole lot to offer our crews. We'd go through the ACLS algorithm and look at all the correctable causes, but just not be able to get these people out of fib."

System leaders turned to local cardiologists for ideas. "The first words out of every one of their mouths," says Myers, "were, 'Have you tried the second defibrillator yet?'"

Turns out there are some references to this in the cardiology literature. Much of it deals with refractory atrial fibrillation, though some looks at ventricular arrhythmias too. Back in 1994, a team led by New York cardiologist David Hoch looked at sequential shocks from two defibrillators after unsuccessful single shocks for refractory VF during routine electrophysiologic studies. Refractory v-fib,

Photo by Mike Legeros

Hoch's team noted, can occur in up to 0.1% of EP studies, but animal studies have shown that rapid sequential shocks may reduce its threshold. Among almost 3,000 consecutive patients, only five needed the double shocks, but all five were resuscitated successfully. "This technique of rapid double sequential external shocks may have general applicability," Hoch's team concluded, "providing a simple and potentially lifesaving approach to refractory ventricular fibrillation."<sup>1</sup>

The shocks in Hoch's study were delivered 0.5–4.5 seconds apart. Wake's protocol directs the dual defibrillation occur "as synchronously as possible," recognizing, Myers says, the limitations of a single rescuer in the field trying to activate both defibrillators simultaneously.

A 2005 Mexican study of 21 patients with paroxysmal or persistent atrial fibrillation saw 19 achieve sinus rhythm with double sequential shocks; its authors termed the intervention "safe and highly efficacious."<sup>2</sup> In a 2004 Turkish study of 15 patients with refractory a-fib and heart disease, 13

achieved sinus after simultaneous shocks totaling 720 joules. Eleven of those maintained it six months later.<sup>3</sup> Overall, Myers says, there's not a huge volume of literature, but what there is clearly suggests the double-shock gambit is safe.

## WHY IT WORKS

Why might it work? Some hypotheses:

- It's a vector issue, where using four pads instead of two creates a broader energy vector.

- It's a duration issue, related to what is basically a single prolonged shock delivered by consecutive defibrillations. In that case, consecutive may be better than simultaneous.

- It's an energy issue, relating to the sheer number of joules delivered. In that case, simultaneous may be better than consecutive.

"Which of the three it is, we don't know," says Myers. "To me, the most likely is the broadened vector. In talking with crews and being on some of these scenes, the body

habitus of the person in fib does not seem to be predictive. Some of these people have a body mass index of 30, some have a body mass index of 18—they're all over the board. So it doesn't strike me as purely an impedance thing or purely an energy thing, because the body habitus of the patients who have this problem just doesn't seem to support that. But that's very anecdotal, and I don't have any definitive evidence one way or the other."

Wake formally implemented its double sequential external defibrillation protocol in April 2010, and was waiting for a year's worth of data before assessing potential benefit. They've regained some perfusing rhythms, Myers says, but not tracked patients to hospital disposition yet. They should know more soon. In the meantime, although emphasizing the intervention's safety, Myers cautions systems about rushing ahead with it.

"I think the way to look at this is, we have this new clinical problem of persistent v-fib," he says. "With the old resuscitation techniques, people didn't make it this far in the prehospital setting, so we never had to deal with it. Now we have this new clinical entity, and we're trying to bring the best evidence we can to give people some recommendations. I can't say this is the best way. What I can say is that it's not doing any harm. We use it at a point in the resuscitation where we're running out of options. It may be a viable alternative, but a medical director has to take into account the entirety of their situation and see if it's something that makes sense in their community."

If, as Saussy noted, the alternative is calling the coroner, that's something a medical director might at least want to think about. ▀

## When to Double Down? MedStar Tries It Earlier

Double sequential defibrillation for refractory v-fib is also practiced in Ft. Worth where it's used a bit earlier in the resuscitation process.

The Emergency Physicians Advisory Board (EPAB), which provides medical oversight for the city's MedStar system, has allowed it for a few months now. MedStar's advanced-practice paramedics respond to most cardiac arrest calls, and if they get there and a patient has already been defibrillated but is still fibbing, they can call medical control and get permission to use the second defibrillator.

"If we've already defibrillated them and they're refractory, we'll go right to the increase in dose," says EPAB Medical Director Jeff Beeson, DO. "We already use the highest energy setting available on our monitors, so we can't go any higher on those. And we know the electrical phase of the arrest is time-sensitive. Other systems have picked a certain number of times to defibrillate first [five in Wake's case], but there's really no science behind that. My point is, if it didn't work once, why would you think it's going to work if you do it again?"

MedStar hasn't amassed big numbers yet, but every patient except one on whom the double defib has been used has converted out of a shockable rhythm. Around half have regained pulses. At least one survived to hospital discharge, neurologically intact, after 25 minutes of CPR and multiple shocks.

Like Myers, Beeson suspects the intervention's success is a function of the doubled defibrillation plane.

"If you have a sternal-apex approach to defibrillation, it's top to bottom and makes sense," he says. "But in most body habituses, if you draw a line between those pads, the heart's not within those lines. Not the entire heart. Part of it is. So when you do the anterior to posterior and sternal to apex, I just think you're getting a more complete defibrillation. The ultimate goal of defibrillation is attempting to get all the myocardial tissues to depolarize and reset, and I think this gives you a better chance of catching the vast majority of them."

## References

1. Hoch DH, et al. Double sequential external shocks for refractory ventricular fibrillation. *J Am Coll Cardiol* 23(5): 1,141–5, Apr 1994.
2. Velázquez Rodríguez E, et al. Double sequential electrical transthoracic shocks for refractory atrial fibrillation. *Arch Cardiol Mex* 75 Suppl 3: S3–69–80, Jul–Sep 2005.
3. Kabukcu M, et al. Simultaneous double external DC shock technique for refractory atrial fibrillation in concomitant heart disease. *Jpn Heart J* 45(6): 929–36, Nov 2004.



# The Day the D50 Dried Up

**What one agency did when faced with a drug supply issue could be applied as a best practice nationwide**

**I**n EMS, adversity is what we do. We're used to being dealt bad hands and spinning the proverbial stuff into Shinola. In that sense, it's not a surprise that an enterprising system could turn a sudden shortage of a needed drug into a positive for its patients and itself.

In this case the drug was 50% dextrose solution for injection, which, as many services experienced, was in short supply following a spike in demand last year.

The system was Oklahoma's Emergency Medical Services Authority (EMSA), which serves around 1.25 million residents in Oklahoma City, Tulsa and surrounding areas. How EMSA handled its D50 drying up can be a lesson for systems facing shortages anywhere.

"Personally," says EMSA Medical Director Jeffrey Goodloe, MD, NREMT-P, "I think the drug shortage last year was one of the best things that ever happened to our system in terms of operational and financial efficiency."

## HAVING VS. USING

When the dextrose started to dwindle, EMSA leaders had to assess some things:

- What crews actually used;
- What units normally carried;
- What was kept in reserve.

What units carried was 10 or more amps per ambulance, three per paramedic engine. What they used, well, that turned out to be a bit of a surprise.

The belief was that crews were regularly seeing some diabetics who had chronic problems managing their blood sugar, and that some particularly bad-off patients

required more than one amp of D50 on a single run. Neither turned out to be the case, Goodloe told attendees at the EMS State of the Sciences Conference in February. A review of run data showed that over six months, there had been but a single "power user," who had required seven amps in that half-year, and not a single patient who had required more than one amp on a call.

"This really showed the power of data driving decisions, and not best guesses or hunches," says Goodloe. "We'd assumed we were using dextrose 50% for individual patients multiple times every few months, or had folks with episodes of such profound hypoglycemia that they required two-plus administrations in one patient encounter. What we found was, we don't have any power users in our system. The typical patient in a six-month time frame whom we were managing for diabetic complications, we only saw once in that six-month time frame."

Knowing that, EMSA could adjust what it carried on units with confidence crews wouldn't be caught short. Leaders cut ambulance stocks from 10 amps to 4, freeing up hundreds of amps to add back to an inventory that had shrunk to less than a week's worth. "The supply room," says Goodloe, "went from not having enough to us having to find extra boxes to put it all in." They also placed an order for the drug whenever they could get it.

And then EMSA turned the process to its other drugs. It will ultimately repeat it for every one its units carry. That's a long process and not yet complete, but eventually, all unit stocking and reserve inventory will be tied to demonstrated use.



So far leaders have found some drugs, particularly those used a lot, were carried in appropriate quantities. But others, less frequently used, are proving to be overstocked.

"In most situations, we're finding we can actually cut the amount of pharmaceuticals needed to resupply," says Goodloe. "On top of that, we can cut back on some of what's being carried, but not administered as much as we thought it was."

It's a lot of data to analyze. EMSA gives pharmaceuticals on almost 30% of its runs, or around 45,000–50,000 calls a year. But major metropolitan systems replicating this procedure, Goodloe suggested at Eagles, could save up to a quarter million dollars. That's a lot of money that could be reinvested in patient care, people and other priorities.

## THE LEMONADE-MAKING MACHINE

One caution for systems moving ahead with this kind of review and recalibration: Be careful how it might come off to local lawmakers or media. "You have to be careful, when you talk about this way of saving money, that you don't erroneously broadcast that your system has been frivolous with its spending," says Goodloe. "We look at it as being smarter—we're looking at things in a different way. But you have to be careful as





you move forward that your past practice isn't held against you."

In fact, many systems only now have the readily available kinds of data to facilitate

sionally support the clinicians giving that care. And it takes real, hard dollars to do that," says Goodloe. "This is a way to help generate some of those dollars to drive that

**"The drug shortage was one of the best things that ever happened to our system."**

this kind of appraisal. EMSA's results are another good argument for getting it. No operational decision should be based on a hunch.

As you crunch the numbers and make any adjustments, it's important to keep field troops in the loop as well. They have to know leaders aren't just squeezing the drugs for profit, but are making data-driven decisions that will make their operation leaner, but not endanger patients or make care harder.

"The goal is to ultimately deliver the best clinical performance possible, and to profes-

clinical ability through equipment, through training, and through recruitment and retention of qualified professionals. But you have to do it in a stepwise approach.

"We just simply took a shortage of one medication and said, 'You know, this is not a lemon coming our way. This is the proverbial opportunity to make lemonade.' So we basically designed a lemonade-making machine to look at all the pharmaceuticals and better appraise what we use, carry and supply. And when we do that, that's a pretty big cost savings to a large system." ■

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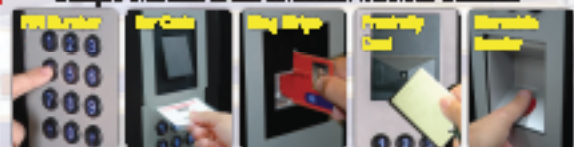
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## Focus on the Literature

At each year's EMS State of the Sciences Conference, Nashville EMS medical director Corey Slovis, MD, presents his five most important EMS studies of the preceding year. Here are his top choices for 2010.

### ACLS

The evidence showing compression-only CPR works as well as the traditional version continues to mount, but there have been other important recent changes to CPR and emergency cardiovascular care. Major points of the 2010 international consensus treatment recommendations concern intubation, capnography, atropine, adenosine and therapeutic hypothermia. Some pearls:

- There's no evidence to support endotracheal tubes as better than supraglottic airways. Consider Kings, LMAs and Combitubes, especially without frequent retraining.

### Bougie Use

With a simulated difficult airway, Pennsylvania researchers found, bougie-assisted intubation is more successful than traditional ETI without increasing intubation time. In this study, 35 paramedics, flight nurses and emergency physicians randomly intubated a manikin both ways; using the bougie resulted in 94% success, ETI 77%. Half of subjects said using the bougie was easier, while just 9% preferred the ET tube.

Messa MJ, Kupas DF, Dunham DL. Comparison of bougie-assisted intubation with traditional endotracheal intubation in a simulated difficult airway. *Prehosp Emerg Care* 15(1): 30–3, Jan 2011.

### Oxygen and COPD

Researchers in Tasmania compared standard high-flow oxygen to titrated oxygen for prehospital patients with acute exacerbation of chronic obstructive pulmonary disease. They found the risk of death was significantly lower in the titrated oxygen group for patients with COPD and overall. Overall mortality was 9% in the high-flow group vs. 4% in the titrated group; mortality in the COPD subgroup was 9% vs. 2% respectively. Titrated oxygen treatment reduced mortality compared with high-flow oxygen by 58% for all patients and by 78% for patients with COPD. Titrated COPD patients were also less likely to have respiratory acidosis or hypercapnia.

Austin MA, Wills KE, Blizzard L, Walters EH, Wood-Baker R. Effect of high flow oxygen on mortality in chronic obstructive pulmonary disease patients in prehospital setting: randomized controlled trial. *BMJ* 341: c5462, 2010.

### Easier Intubation

What else can we do to make difficult airways easier? Recent literature has addressed ways to better intubate obese patients (two people/two hands, videoscope, early bougie/supraglottic, CPAP, ketamine); the two-handed jaw-thrust vs. one-handed "EC-clamp" technique for mask ventilation of unconscious and apneic patients

(the former is superior); and a new position for intubation: the Alexandrou Angle, which elevates the supine patient's head 20°–30° in relation to the body and legs. Students in New York who tried different positions on manikins preferred this position to flat or Trendelenburg for visualizing the vocal cords.

Dargin J, Medzon R. Emergency department management of the airway in obese adults. *Ann Emerg Med* 56(2): 95–104, Aug 2010.

Joffe AM, Hetzel S, Liew EC. A two-handed jaw-thrust technique is superior to the one-handed "EC-clamp" technique for mask ventilation in the apneic unconscious person. *Anesthesiology* 113(4): 873–9, Oct 2010.

Alexandrou NA, Yeh B, Barbara P, Leber M, Marshall LW Jr. An innovative approach to orotracheal intubations: The Alexandrou angle of intubation position. *J Emerg Med* 40(1): 7–13, Jan 2011.

### Nasal Oxygen for Obese Patients

Michigan researchers sought to evaluate the influence of nasal oxygen on the duration of arterial oxygen saturation of 95% or more during simulated difficult laryngoscopies on obese patients. Half of their 30 patients got additional nasal O<sub>2</sub> during periods of apnea while anesthetized, and they measured duration of SpO<sub>2</sub> greater than or equal to 95% up to a maximum of 6 minutes, as well as lowest SpO<sub>2</sub> values and time to regain 100% SpO<sub>2</sub>.

Their results: Giving the nasal O<sub>2</sub> was associated with significant prolongation of SpO<sub>2</sub> time of 95% or more; a significant increase in patients with apnea but SpO<sub>2</sub> greater than or equal to 95% at 6 minutes; and significantly higher minimum SpO<sub>2</sub>. Resaturation times were no different. The nasal O<sub>2</sub>, they concluded, is associated with significant increases in frequency and duration of SpO<sub>2</sub> greater than or equal to 95%, and higher minimum SpO<sub>2</sub> during prolonged laryngoscopy in obese patients.

Ramachandran SK, Cosnowski A, Shanks A, Turner CR. Apneic oxygenation during prolonged laryngoscopy in obese patients: A randomized, controlled trial of nasal oxygen administration. *J Clin Anesth* 22(3): 164–8, May 2010.



**Major points of the 2010 international consensus treatment recommendations concern intubation, capnography, atropine, adenosine and therapeutic hypothermia.**

- Waveform capnography is recommended for ETT placement confirmation; colorimetric is acceptable.
- Atropine is no longer recommended for PEA or asystole.
- Adenosine may be useful for paroxysmal supraventricular tachycardia and can be used in regular monomorphic wide-complex tachycardias.

Morrison LJ, Deakin CD, et al. 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circ* 122(suppl 2): s345–421, 2010.

# Different Destinations

**London's Clinical Assessment Units help steer patients right**

**A**rising tide lifts all boats, as they say, and so it is with increasing demand for EMS. The climbing call numbers faced by many systems include both direly ill and injured citizens in true extremis, but also numbers of less-sick and not-so-terribly-hurt callers whose needs can be appropriately met through other avenues.

“but also because there's a strong feeling that some patients who currently go to emergency departments could be managed quite properly by referral to a primary care physician or general practitioner, or perhaps by going to a minor-injuries unit or urgent care center. Many times patients can be seen

sioned a “New Front End Model” built on using rapid-response vehicles to answer

**“Many times patients can be seen there more quickly than they would be in an emergency department.”**

Recognizing and redirecting the latter helps you better serve the former, and those twin benefits underlie the Clinical Assessment Units (CAU) conceived by the London Ambulance Service in England.

LAS knows a bit about demand: It gets around 4,000 calls a day, nearly a quarter of them for immediate life threats. Cumulatively it tallies more than a million incidents a year across a service population that can swell as high as 9.5 million.

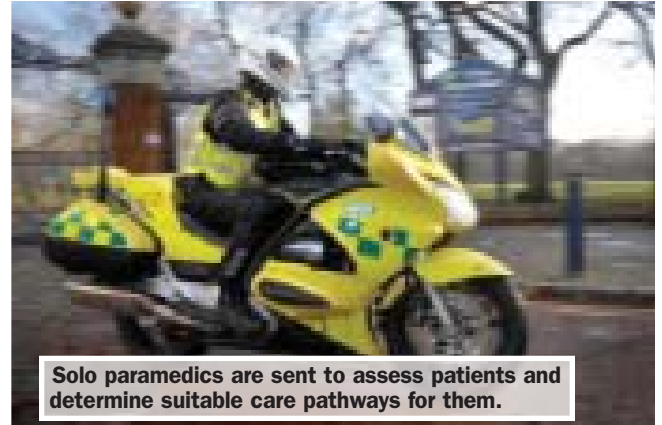
Many of those callers, service leaders believe, can have their needs safely met through the CAUs: solo paramedics in nontransport vehicles sent to calls to assess patients and determine suitable care pathways for them.

If, upon assessment, their patients are found to need ambulances, the CAU medics can call them. Alternatively, they can treat and release those patients, if they deem it sufficient, or direct them to primary care, walk-in clinics or other facilities that can meet their needs without transport to an emergency department.

“It's partly about managing rising demand,” says LAS Medical Director Fiona Moore, MD,

there more quickly than they would be in an emergency department.”

The idea arose in part from the work of the U.K. Department of Health, whose 2005 publication *Taking Healthcare to the Patient: Transforming NHS Ambulance Services* promoted empowering providers in their care delivery and working with other healthcare organizations to share the burden of urgent care; and an English healthcare/emergency services consultant, ORH Ltd., which envi-



**Solo paramedics are sent to assess patients and determine suitable care pathways for them.**

low-priority calls and thus reduce ambulance demand and hospital transports.

Putting those ideas into practice required some groundwork. LAS leaders first had to collaborate with potential local destination facilities that had differing hours, capabilities and levels of medical expertise, so as to know which were feasible for which patients. Jointly they developed a list of minor injuries and illnesses that could safely be directed to these destinations. “Basically it's minor

## FIGURE 1

### Call Categorization

**RED 1:** Actual death imminent (e.g., unconscious not breathing)

**RED 2:** Possible death imminent (e.g., unconsciousness/not alert with other signs like mechanism of injury)

**RED 3:** Risk of imminent death (breathing and conscious but at high risk)

**AMBER 1:** Definitely serious (not immediately life threatening but require urgent on-scene assessment, treatment and conveyance)

**AMBER 2:** Possibly serious (not immediately life threatening and no specific gain from immediate treatment on scene or in A&E)

**GREEN 1:** Requiring assessment and/or transport (not life threatening or serious, but needs assistance)

**GREEN 2:** Suitable for telephone triage and/or advice (probably no need for transport—telephone consultation can be used to determine need)



conditions like coughs, colds and minor rashes,” says Moore, “and then minor injuries that won’t need an x-ray and generally won’t need suturing.”

Paramedics manning the CAUs also needed expanded training. This included enhanced patient assessment: taking more detailed histories on presenting complaints, drugs and medical backgrounds; and performing more detailed physical evaluations, with good, supportive documentation.

The CAUs were first trialed last year in Barnehurst, southeast of London. In 24 hours, they resulted in a 36% reduction in ED transports. The program was expanded to Greenwich before being temporarily stalled, but is hoped to resume in Bromley later this year.

### APPROPRIATE PATHWAYS

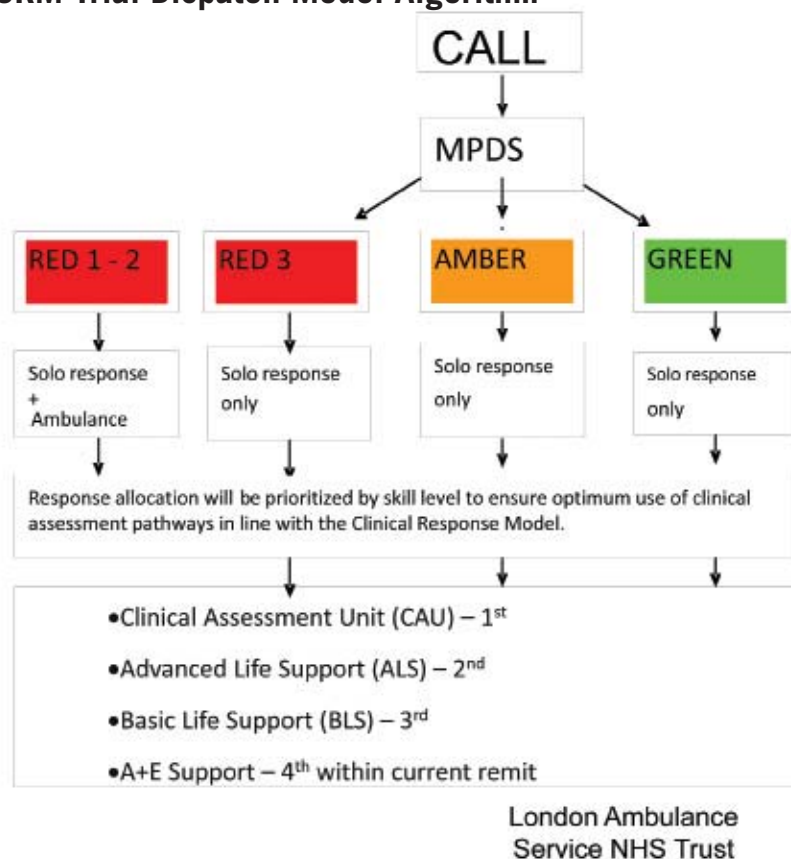
Beyond the extra training and collaboration with local healthcare facilities, there are a few other important considerations to the CAU program.

One is the overall mixture of vehicles on the road. LAS has historically used cars to help meet demand, backed up by ambulances, but ended up averaging around 1.6 resources sent to every call.

“Clearly that’s pretty wasteful,” Moore says, “but you do need to decide what your safe level of service is. Because what you don’t want is to use your cars to assess patients

FIGURE 2

### CRM Trial Dispatch Model Algorithm



but at high risk), amber and green level calls got just the solo response, with response allocation prioritized by skill level to optimize use of clinical assessment pathways.

Medics determining where patients need

tioners and paramedic consultants. This will have the dual benefit of bringing more clinical expertise to the field and expanding career opportunities for ambitious personnel.

Finally there’s an educational component. For the public, when people call 9-9-9 (the U.K. equivalent to 9-1-1), they expect an ambulance and transport, not a medic who steers them to urgent care. They need to know their needs are being met fully and safely. And for LAS medics, Moore wants to emphasize this isn’t just a way to leave more people at home.

“We have to get the message across that this is about referring patients to appropriate care pathways,” she says. “There may be more people you can leave at home, but you can only do that safely, and that means a lot of additional training, sometimes additional clinical support, and always being aware of the potential significance of the decision not to transport someone.”

**“In 24 hours, the Clinical Assessment Units resulted in a 36% reduction in ED transports.”**

who turn out to be quite unwell, and then there’ll be a long interval between first arrival on scene and the ambulance turning up.”

LAS used its CAUs on most calls, with specific exclusions. During the trial, red 1 (imminent death likely) and 2 (imminent death possible) category calls got CAUs plus ambulances; red 3 (breathing and conscious

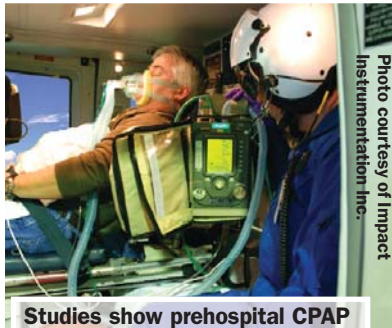
to go and with what urgency also need ample clinical support to back them up. LAS medics have 24/7 access to online medical control (doctors or senior paramedics), and the service is looking at enhancing the skills of its “team leaders” in the field (it has approximately 180 around London), and ultimately introducing advanced paramedic practi-

## Focus on Respiration

At this year's EMS State of the Sciences Conference, organizers grouped a handful of breathing-themed presentations under a theme of "evolving considerations in respiratory support." Its concepts included:

### Does CPAP help prevent drug-assisted intubation?

Prehospital CPAP seems to help prevent intubation. A small study in Nova Scotia a few years back linked CPAP for patients in severe respiratory failure to a 30% reduction in the number needing intubation. Using it in Houston reduced fire department intubations from 4.5 to 3.7 a day. In Portland, this prompted leaders to



Studies show prehospital CPAP helps prevent intubations.

wonder if CPAP could help limit drug-facilitated intubations. The Multnomah County system had been using it since 2008 on qualified respiratory-distress patients. They reviewed data for drug-facilitated intubations from 2006–10 and found, among those patients, post-CPAP decreases in patients presenting with respiratory distress secondary to congestive heart failure and/or COPD. The effect was greatest on those presenting with CHF.

### The impact of CPAP on physiologic improvement

With a presence in 38 states amassing three million patient contacts a year, AMR surely generates data. All those reports made it a fertile place to study the impact of CPAP on physiologic improvement. New Chief Medical Officer Ed Racht, MD, had nearly 61,000 records at his disposal for the task.

Just 2.2% of those patients received CPAP, but that's still 1,311 patients. And yes, they improved: More than 52% experienced improvements in their Rapid Acute Physiology Scores. RAPS is a scale that uses routinely available measures like pulse, BP, respiratory rate and GCS to gauge

patients' severity. It's pretty good at predicting mortality. Of patients who didn't get CPAP, 37% had increases. A fifth of CPAP patients actually had improvements of 3 or more on their RAPS (the scale runs from 0–16), vs. 12% of those without.

### Using EMT-Bs to treat asthma patients

EpiPens came to FDNY's BLS ambulances two years ago to better treat patients in anaphylactic shock. But what about asthma? Department leaders knew from a previous study that EMT-Bs could effectively give those patients albuterol, but epi comes with higher stakes.

It had proven pretty safe for ALS use: On 235 patients over 12 months, according to FDNY Medical Director John Freese, MD, it decreased heart rate and blood pressure, and allowed BVM ventilation to be discontinued on a third of the patients. A single death was reported. So starting April 1, 2010, a new protocol let FDNY Basics deliver a single 0.3 mg dose of epi post-albuterol to patients under 33 in severe respiratory distress or shock. The effort has been so successful, FDNY is now eyeing expanding use of its auto-injectors and dispatching BLS to all calls of asthma exacerbation.

## Focus on Capnography

At this year's EMS State of the Sciences Conference, organizers grouped a handful of capnography-themed presentations into a "mini-symposium" on end-tidal CO<sub>2</sub> monitoring. Its concepts included:

### EtCO<sub>2</sub> analysis as the "gold standard" for airway management

Oklahoma's Emergency Medical Services Authority (EMSA) really believes in capnography to verify tube placement: In 2009, it began suspending providers for not using it. Per a 2008 memo from the office of EMSA's medical director, "All tracheal intubations will have EtCO<sub>2</sub> confirmation within 60 seconds of ETT insertion and continuous monitoring of lung ventilation." A protocol for confirmation of tube placement followed in 2009, with 30 days off and remedial airway education for medics who failed to utilize timely continuous post-intubation waveform

capnography. In the state's largest cities, Oklahoma City and Tulsa, the mandate covered more than 1,200 intubations in 2010.

### Using EtCO<sub>2</sub> analysis in sepsis syndromes

Sepsis is the 10th-leading cause of American deaths, and severe sepsis can have a mortality rate of 30%–40%. Early goal-directed therapy begun in the ED and aimed at quickly reversing global tissue hypoxia is the best current strategy against such mortality.

That hypoxia begins early in the sepsis process and may precede changes in vital signs. A key finding is elevated serum lactate levels: As oxygen demand exceeds supply and tissue becomes hypoxic, these levels will rise, eventually resulting in lactic acidosis. EGDT is triggered with a lactate level greater than 4 mmol/L in conjunction with systolic BP less than 90 and

two or more criteria for Systemic Inflammatory Response Syndrome (temperature less than 36°C or greater than 38°C; heart rate greater than 90 bpm; respiratory rate greater than 20 or PCO<sub>2</sub> less than 32 mmHg; white blood cell count less than 4,000 or greater than 12,000). It cuts mortality by roughly a third.

Beginning this trajectory is an important opportunity for EMS, argued Orange County (FL) EMS medical director George Ralls, MD. Ralls cited an Orlando-based study that found a "significant association" between EtCO<sub>2</sub> levels and in-hospital mortality in ED patients with suspected sepsis, and that EtCO<sub>2</sub> levels correlated inversely with lactate levels in these patients. "With future studies," authors concluded, "[EtCO<sub>2</sub> monitoring] may be used as a potential risk and non-invasive stratification tool for predicting sepsis severity in this patient population."

# A Stepping Stone to Standardization

**What does medical subspecialty status mean for EMS?**

**T**he declaration last year of EMS as an officially recognized medical subspecialty—so decreed by the American Board of Emergency Medicine (ABEM), one of 24 medical specialty boards under the American Board of Medical Specialties (ABMS)—was met with hosannas across the prehospital community. But for the programs actually training the medical directors of tomorrow, now comes the hard part.

Among the ramifications of the long-sought decision, EMS fellowship programs could face hurdles to meet new requirements for

accreditation by the Accreditation Council for Graduate Medical Education (ACGME).

## BACKGROUND

ABMS' member boards represent 145 recognized medical specialties and subspecialties. Under ABEM, EMS joins medical toxicology, pediatric emergency medicine, sports medicine, undersea/hyperbaric medicine, and hospice/palliative medicine.

"Subspecialty certification is one of the stepping stones

## FIGURE 1

### Curriculum Format

Intentionally mirrors the four volumes of the NAEMSP text *Emergency Medical Services: Clinical Practice and System Oversight*.

- Clinical Aspects of Prehospital Medicine
  - Time/Life Critical Events
  - Injury
  - Medical Emergencies
  - Special Clinical Considerations
- Medical Oversight of EMS
  - Medical Oversight
  - EMS Systems
  - EMS Personnel
  - System Management
- Quality Management and Research
  - Quality Management
  - Research
- Special Operations
  - Mass Casualty Management
  - Chemical/Biological/Nuclear/Explosive (CBRNE)
  - Mass Gathering
  - Disaster Management
  - EMS Special Operations

**"Leaders of the EMS subspecialty effort have been working out exactly what those fellows will learn."**

toward standardizing EMS care in the United States," says Jane Brice, MD, MPH, an associate professor of emergency medicine and director of the EMS fellowship program at the University of North Carolina, who led the team writing the new fellowship curriculum.

"When you standardize the training and knowledge base EMS medical directors bring to their systems, you create a foundation on which to build. Going forward, EMS medical directors who are board certified in EMS will have had the same training, based on a standardized curriculum, and will have all passed the same test, which guarantees a foundation of knowledge. That will lead to more cohesiveness and interoperability

between systems."

ABEM will develop and administer the certification exam for graduates of accredited fellowship programs, which is expected to be ready in 2013. In the meantime, leaders of the EMS subspecialty effort have been working out exactly what those fellows will learn.

EMS already had a fellowship curriculum and supporting core content, but that was developed in 1994 and thus outdated. Both components needed revamping to be more clinical and current.

A team led by Johns Hopkins' Michael Millin, MD, rewrote the core content, and once ABEM signed off on that, Brice's group





set the curriculum. The format they utilized mirrored the four volumes of the NAEMSP's *Emergency Medical Services: Clinical Practice and System Oversight* text: clinical aspects of prehospital medicine; medical oversight of EMS; quality management and research; and special operations (see Figure 1).

In delivering that curriculum, accredited fellowship programs will have to meet requirements of the ACGME. And while those are still officially under development, an early draft version provides an idea of what they might entail.

They describe desired fellowship outcomes and set minimum requirements for fellows, program directors and faculty. Notably, they require of fellowship institutions instruction in a broad range of areas pertinent to EMS—not only expected fields like resuscitation, critical care, trauma and infectious disease, but also areas like air medical services, psychiatry and ophthalmology, which some fellowship programs may not currently cover.

"Our fellowship programs are currently homegrown, so they build on the strength of their institution," says Brice. "For instance, your institution may not have an aeromedical program, so you're not able to provide your fellow with training in aeromedical systems.

"In setting out what an EMS fellow needs to know," Brice continues, "the EMS fellowship curriculum will require that fellowships

FIGURE 2

## Sample Curriculum Element

### 1.1 Time/Life Critical Events

#### Goals and Objectives:

At the completion of fellowship training, the EMS physician will be competent to:

1. Recognize patients in the prehospital environment with time/life critical events
2. Perform procedures necessary for patient stabilization and treatment in the prehospital environment
3. Assess and manage the airway in the prehospital environment
4. Assess and manage breathing through physical examination, measurement of oxygen saturation and end-tidal CO<sub>2</sub> monitoring
5. Assess and manage circulation and delivery of medication
6. Assess and manage the differential diagnosis to find and treat reversible causes of time/life critical events

#### Evaluation and Assessment Methods:

1. Direct observation of patient assessment and treatment skills in the prehospital setting by program director or faculty supervisor
2. Structured patient simulations
3. 360° feedback from faculty, allied health personnel, patient
4. Retrospective chart review

not necessarily develop those expertises or specialties, but at least create agreements with other institutions that can provide fellows with that information, so that every fellow graduating from a fellowship program has the same foundation of knowledge."

There's no guidebook for this, and fellowship programs are going to encounter a variety of challenges in making their changes. One resource that might assist is the newly formed Council of EMS Fellowship Directors created at this year's NAEMSP annual meeting and chaired by David Cone, MD, director of the EMS fellowship program at Yale. It will facilitate sharing valuable ideas and best practices as they're identified.

"I think each fellowship is going to have its unique difficulties in meeting the requirements," says Brice. "I don't think anybody's going to skate through without challenges. Working together, we hope to make this as painless as possible. But there's going to be pain." ▀

## Our Time Finally Comes: What Tipped the Scale?

The quest for EMS subspecialty certification began in the 1990s but failed when ABEM decided the field was too administrative and lacked a unique body of knowledge and strong scientific underpinnings.

By 2010, those views had changed. What changed them?

"I think part of it was just the maturation of EMS," says ABEM President Mark Steele, MD. "Over the years, the interest in EMS has grown to where there's now really a significant critical mass of physicians practicing in the field. NAEMSP has over 800 physician members, and there are currently something like 62 EMS fellowships. Those are obviously not ACGME-accredited, but it's assumed many will be applying.

"Also there's the research base within EMS," Steele continues. "Over the years, there have been thousands of articles published. And I think over time the extension of practice into the field has become more significant.

"Part of the challenge with any new subspecialty is that you have to convince ABMS that the field of practice is distinct and unique. In the early days, to differentiate standard emergency medicine care in a hospital from that in the field, from a clinical perspective, was probably more difficult. I think today it's much clearer and the extension of clinical practice into the field is very well delineated."



By Kathleen S. Schrank, MD, FACEP, FACP

# Cardiac Arrest Management

## Adapting AHA Guidelines 2010 to your EMS protocols

**S**ince the American Heart Association's first set of CPR and Emergency Cardiac Care guidelines were published in 1974,<sup>1</sup>

we have all come to eagerly await the updates published every 5–6 years.

The new AHA Guidelines 2010<sup>2</sup> are now being avidly digested, dissected and debated, and EMS agencies across the country are reviewing and revising their cardiac arrest treatment protocols. As we do this, it's crucial to remember that these are guidelines, not mandates, and we must critically evaluate what specific protocols are optimal for our patients and our personnel.

### THE DEVELOPMENT PROCESS

It is also important to recognize how the AHA's guidelines are developed. Most EMS personnel see only the material presented in BLS and ACLS courses, not the actual guidelines publication, worksheets, evidence rankings or journal articles. When EMS

organizations, not just the AHA. All available research articles are critiqued and ranked. Worksheets are posted for open comment as the new guidelines are debated. Eventually, an evidence-based consensus recommendation is published as "The Guidelines," where specific interventions are categorized as Class I (should be done), IIa (reasonable to do), IIb (may be considered) or Class III (not helpful and may be harmful). Some are "Class Indeterminate," where not enough research is available to recommend for or against that treatment.

Many answers are not clear-cut, so there are differences in guidelines published by the three main groups (AHA, International Liaison Committee on Resuscitation and European Resuscitation Council). Both medical and educational goals are considered. Overly complex guidelines are therefore avoided, while content and testing have been simplified to accommodate a broad base of learners. For example, we are taught to perform CPR in 2-minute cycles; therefore, the post-shock waiting time prior to a pulse check was set at 2 minutes in 2005 for ease of learning. Eventually, one ACLS course curriculum is created from the AHA Guidelines as a basic, evidence-based approach to cardiac arrest care for all healthcare providers.

Guidelines 2010 provide outstanding emphasis on several high-priority items for EMS to incorporate, such as:

- Simplification of public training and 9-1-1 instructions to focus on chest compressions only
- C-A-B approach, including "Push Hard, Push Fast" high-quality compressions with minimal interruptions
- Team approach to BLS and ACLS



- Waveform capnography peri-resuscitation
- Induced hypothermia after Return of Spontaneous Circulation (ROSC).

However, there are several potential stumbling blocks when translating the guidelines to EMS use. The AHA and authors of each set of guidelines are well aware of this, saying "It is important to note that these guidelines will not apply to all rescuers and all victims in all situations. The leader of a resuscitation attempt may need to adapt application of the guidelines to unique circumstances."<sup>3</sup> They made a point of changing the title from "Standards" in 1974 to "Standards and Guidelines" and then to "Guidelines" as of 1992.<sup>4</sup>

### PROTOCOLS SHOULD REFLECT PRACTICE

New research may suggest a better approach long before the next guidelines are published; EMS can change faster. The "one-size-fits-all" ACLS course is not optimal. EM, ICU and EMS practitioners handle cardiac catastrophes daily and have considerably more education and experience than other ACLS learners, who might see one cardiac arrest every five years but are nonetheless

**"It's crucial to remember that these are guidelines, not mandates."**

protocols do not match AHA course content completely, the result is often confusion and frustration. However, EMS medical directors must consider many factors as they adapt the guidelines to EMS use.

Development of each set of guidelines includes a staggering amount of work by hundreds of resuscitation experts from many

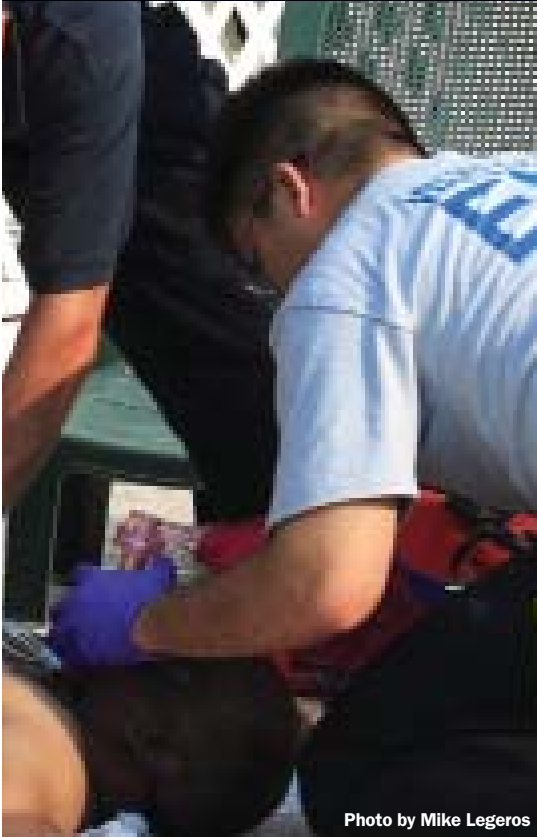


Photo by Mike Legeros

trials are therefore extremely difficult and expensive to do (and may never be done!). But there are likely to be subgroups where specific treatments may work. For example, asystole is occasionally the first arrest rhythm, not merely the end result of untreated VF in unwitnessed arrests. Similarly, refractory VF in a 40-year-old with a true sudden cardiac death event merits the addition of a second anti-arrhythmic drug (and perhaps 720 joules) if initial ACLS treatment fails, but the guidelines will not address this because good quality human studies have never been done.

There are many examples of treatments that looked fantastic in animal studies, only to be dropped from ACLS use after studies in humans failed to show improvement in long-term outcome. However, if a drug

required to complete ACLS courses. We can and should be expected to know more and do more. Treatments that are labeled as “not for routine use in cardiac arrest” in Guidelines 2010 may benefit specific situations, while some options listed in the guidelines may not be included in the ACLS course, so our EMS protocols may include them.

While it is obviously great to treat according to best medical evidence, there are large gaps in resuscitation science where optimal treatment is unclear or simply has never been studied rigorously in humans. Survival from arrests in non-shockable rhythms is extremely poor, and optimal human research

## “There are large gaps in resuscitation science where optimal treatment is unclear.”

significantly improved initial ROSC but not long-term outcome, does that really mean it should be discarded? Was the problem due to the drug, to other issues (e.g., inadvertent hyperventilation or gaps in compressions during human trials), or to post-resuscitation care (especially lack of induced hypothermia)?

For all of these reasons, it is appropriate

### Resources

USA Guidelines 2010: [www.guidelines.ecc.org](http://www.guidelines.ecc.org)  
European Guidelines 2010: [www.erc.edu](http://www.erc.edu)  
International Guidelines 2010: [www.ilcor.org](http://www.ilcor.org)

for EMS medical directors to consider a “best practice” approach to BLS and ACLS protocols for our EMS systems, based on available evidence, our experience and practicality. The evidence-based recommendations from the AHA Guidelines are a tremendous foundation that we must build upon, with variations that are appropriate for the skills of our EMS personnel and for our patients. Our primary goal must stay focused on what is best for our patients.

At the Gathering of Eagles conference, speakers presented an array of options for EMS to consider, and we learned that none of us chose to fully conform to the AHA Guidelines. Where we differ, we have studied and debated and picked the best choices—

the ones we would want done if our loved ones were the cardiac arrest victims. We are passionate about our choices, and each of us considers every EMS run as “my patient.” We expect a lot from our EMS personnel and from ourselves, and we all keep learning from each other. ▮

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At the Gathering of Eagles conference, speakers presented an array of options for EMS to consider, and we learned that none of us chose to fully conform to the AHA Guidelines.





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