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EMS MAGAZINE

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EMS Innovations 2010

Cutting-edge clinical advances drawn from
the Gathering of Eagles conference

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Better Buildings

Across EMS, we're laying stronger foundations for care

When it comes to patient care, you were there first. That is to say, for many people entering the U.S. healthcare system, you are the first caregivers to get your hands on them. Call-takers and dispatchers may hear their initial complaints and provide basic instructions, but you're the first to physically examine, to see and touch and measure their problems, and then to differentiate possible causes and deliver interventions to help.

That's a unique responsibility. What you decide and do fundamentally shapes what happens on the rest of your patients' healthcare journeys. You construct the foundation for their further care. Great buildings can only rise on strong foundations.

This package of stories—drawn from this year's EMS State of the Sciences Conference (also known as the Gathering of Eagles), the prestigious yearly conclave at which EMS medical directors from the nation's largest cities meet to talk about cutting-edge issues and their latest interventions and innovations—examines ways in which EMS can provide better foundations and contribute to stronger structures. From intellectually uninhibiting our providers to acknowledging the latest research to occasionally arm-twisting recalcitrant EDs, there are a lot of ways we can help ensure that our care is good, and good things happen to our patients after they leave us.

Obviously, our dispensations aren't definitive, and we're limited by protocols and practice scopes. Sometimes we'll just be wrong. But consider the following pieces in the context of the whole care system, and how starting patient care on the right foot can improve the rest of the trip.

For information on the 2011 EMS State of the Sciences Conference, visit <http://gatheringofeagles.us/>.

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Cover photo: A training exercise in British Columbia. Treatment guidelines there are intended to help providers deliver more individualized care. Photo courtesy BCAS.

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PHILIPS
sense and simplicity

VERATHON

The Spitting Image of a Heart Attack

By David A. Wampler, PhD, LP, Geoffrey Smith, BS, NREMT-P, Jeremy McElroy, EMT-P, Spencer W. Redding, DDS, MEd, & Craig Manifold, DO

How saliva testing could help EMS speed the diagnostic process

When treating a cardiac emergency, have you ever considered the value of your patient's spit?

While this may seem odd, research indicates many heart attack biomarkers found in blood can also be detected in patients' saliva. Identifying these biomarkers in saliva may help rapidly identify non-ST segment elevation myocardial infarctions (NSTEMIs). By collecting saliva—much easier to obtain than blood—from suspect patients in the field, prehospital caregivers may be able to further speed the early identification of AMIs and contribute to better outcomes. Personnel with minimal training can easily perform the required point-of-care saliva test in a prehospital setting.

John McDevitt, PhD, a chemist at Rice University, developed the groundbreaking "lab on a chip" technology that makes this possible, and it is currently manufactured commercially by LabNow, Inc., a biotechnology firm in Austin, TX. The chip's analyzer has a footprint about the size of a shoebox, and is light enough for wall mounting. The analysis card uses a 1-cm square stainless steel chip with dozens of wells containing tiny detection beads. If the applied sample contains the characteristic proteins of the disease of interest—in this case the proteins indicative of AMI, although the technology is applicable to many disease processes—the detection beads emit a fluorescent color. The analyzer will then "read" the chip and indicate the probability the patient is experiencing an AMI. The first product using this technology is currently being deployed in Africa, targeting HIV immune function.

University of Kentucky researchers

have identified higher concentrations of 32 salivary proteins in victims suffering heart attacks. Of these 32 proteins, four (myeloperoxidase, C-reactive protein, matrix metalloproteinase 9, interleukin 1B) were identified as a salivary protein "fingerprint." When combined with EKG results, this biomarker fingerprint was found to be comparable to standard blood serum using current testing methods.

IN THE FIELD

Researchers at the University of Texas Health Science Center at San Antonio seek to answer the question of how feasibly this test can be performed in the busy EMS environment.

Field testing is ongoing by paramedics with the San Antonio Fire Department. Twenty-six paramedics voluntarily participated in three hours of training to prepare for the trial. This instruction covered institutional review board compliance, participant recruitment and consent, study protocol and collection techniques. This phase of field testing involves recruiting patients experiencing symptoms suspicious of AMI and acute coronary syndrome.

With these patients, medics use swabs to collect small saliva samples, about 0.1 ml. Each saliva sample is applied to the credit card-size lab-on-a-chip card and inserted into the analyzer. In less than 15 minutes, the instrument indicates the probability of AMI. If the EMS crew obtains the sample early in the patient encounter, they should have results by arrival at the emergency department.



Photos courtesy LabNow

To date, researchers in the San Antonio EMS study have analyzed the saliva of 42 patients, about a third of their recruiting goal. The study will continue for another year. Preliminary results are promising and indicate the technology is a strong candidate for a larger multisite study in the pre-hospital setting.

The noninvasive nature of the test ideally suits it to be performed by either advanced or basic EMTs with or without access to 12-lead interpretation and/or telemetry. This diagnostic tool may also be valuable to rule in patients who have NSTEMIs.

This program has been enthusiastically supported by the San Antonio Fire Department and its Office of the Medical Director. This research is supported by the National Institute of Dental and Craniofacial Research at the National Institutes of Health. ▀

David A. Wampler, PhD, LP, is a paramedic researcher and civilian training officer in the San Antonio Fire Department's Office of the Medical Director.

Geoffrey Smith, BS, NREMT-P, is a civilian training officer for the San Antonio Fire Department. He was involved in the initial development of the salivary diagnostic study.

Jeremy McElroy, EMT-P, is a paramedic with the San Antonio Fire Department.

Spencer W. Redding, DDS, MEd, is professor and chair of the Department of Comprehensive Dentistry at the University of Texas Health Science Center at San Antonio. His research is focused on salivary diagnosis of systemic disease.

Craig Manifold, DO, is medical director for the San Antonio Fire Department and San Antonio AirLIFE, as well as commander of the 149th Medical Group, Texas Air National Guard.

By John Erich,
Associate Editor

Collar Me Bad

Study prompts worries that cervical devices may harm some patients

There's little in EMS more automatic than applying cervical collars to patients with possible neck injuries. That doing this might in some cases harm them is a horrifying prospect. But that's an implication raised by research published earlier this year by the *Journal of Trauma*.

A team led by Baylor University orthopedist Peleg Ben-Galim, MD, found that using extrication collars in the presence of severe dissociative neck injuries can result in abnormal separation within the upper cervical spine. On cadaver models with recreated c-spine injuries, collars produced a separation of 7.3 +/- 4.0 mm between C1 and C2.

"Cervical extrication collars are put on about 15 million times a year... to protect the cervical spine in case of a bad injury," co-investigator John

Hipp, PhD, director of Baylor's Spine Research Lab, said in announcing the findings. "It is known that after a person has a bad injury, you can create a secondary injury very easily. We have

lature, then captured images by x-ray, fluoroscopy and/or CT scan before and after application of a rigid collar and some typical patient maneuvers. Distraction was clearly visible—the

"The cervical collar, in the case of a really bad injury, not only doesn't protect the spine, but can actually make things a lot worse."

discovered that the cervical collar, in the case of a really bad injury, not only doesn't protect the spine, but can actually make things a lot worse."

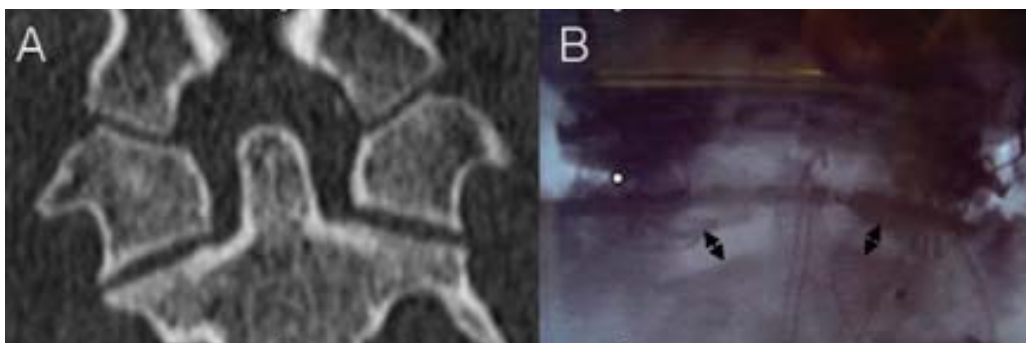
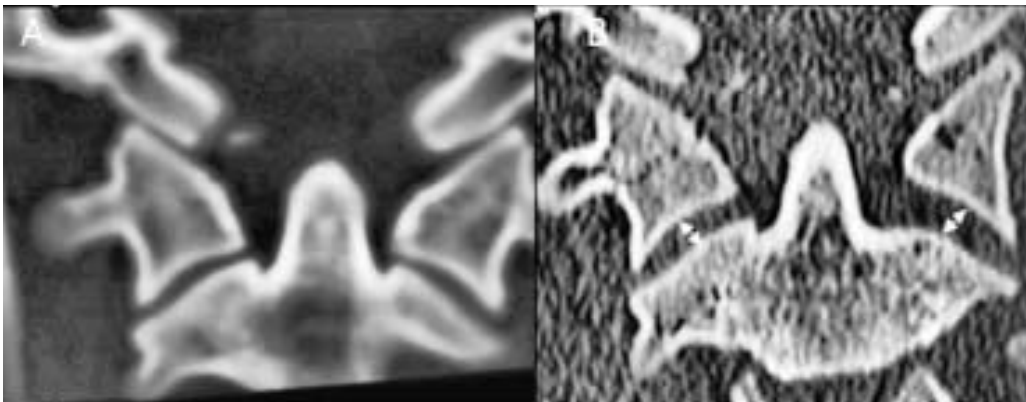
The cadaver recreations were based on real cases. Researchers cut the bodies' neck ligaments and membranes but left supporting muscu-

collar consistently pushed the head up and away from the shoulders. In a living patient with unstable cervical anatomy, this could contribute to secondary injury—or worse.

What this means for EMS, though, probably isn't all that much yet. It's certainly not enough to send systems out changing standards of care. C-collars remain appropriate and safe for most of the patients on whom they're used. But there are definitely some things we should take from these findings.

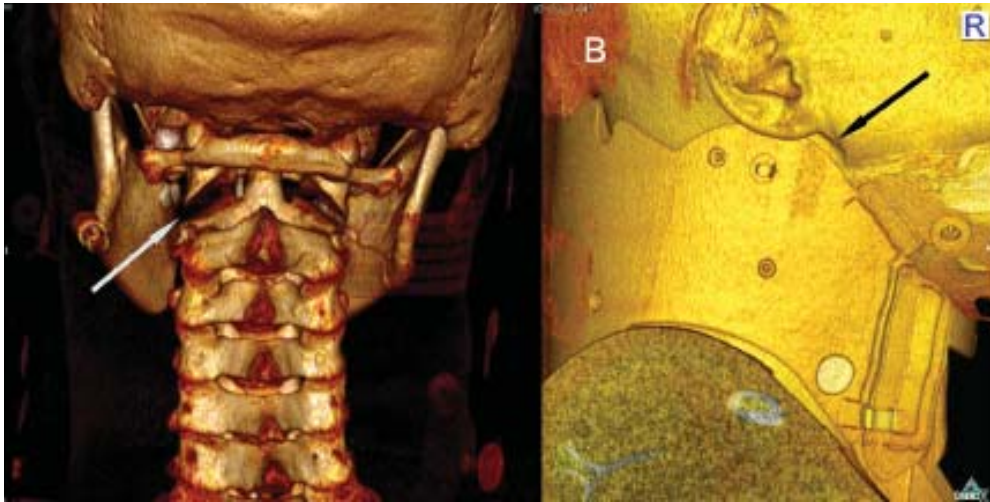
"It's a call to bring everyone back to the basics," says Houston Fire Department Medical Director David Perse, MD, EMT-P, FACEP, who spoke on the data at the Gathering of Eagles conference. "When people have cervical spinal injuries, the neck by definition is unstable, so as you care for that patient, you need to make sure you move that neck as little as possible. With internal decapitation injuries, contrary to what some may believe, not all patients die before EMS arrives on scene, and a few actually survive to the hospital. That makes it important that we either identify them in the field, or at least care for them properly."

It's worth noting that the types of injuries examined here would typically be fatal in the field. However, fluoroscopy has documented the same effect on a living patient with a high cervical injury,



These distractions were documented in patients with severe dissociative neck injuries who received cervical immobilization in the field and survived to the hospital.

Photos courtesy Baylor College of Medicine



Even correctly fitting collars can allow a slight side-to-side wobble, investigators found.

and dissociation need not be complete for additional spinal cord trauma to occur.

So EMS needs to be vigilant about the neck. The difficulty is that severe neck injuries are often accompanied by substantial other trauma. Victims will likely have other injuries that demand providers' attention. And, more difficult still, if our current methods of c-spine immobilization are suboptimal, then what? What should we use instead?

For now, if you're a concerned chief or medical director, it's a call to emphasize technique. The purpose of collars is to minimize movement of the head and neck. Hard collars may not do that much better than soft collars and head blocks—as the Baylor team showed, even a correctly sized collar can allow a slight lateral wobble when a board tilts. Providers must also guard against any tendency, when holding stabilization on the head, to unconsciously provide gentle traction.

"We need to be smarter than the problem," says Persse. "Our guys need to be aware, when they come across somebody who's in a rapid-deceleration injury or fall or whatever, of paying attention to the neck. You want to try to have and keep the head in a neutral position. Depending on circumstances, there may be half a dozen different ways to do that, but the goal is a neutral position, and not to be distracting."

To drive the point home in Houston, personnel were shown the fluoroscopic

images of the vertebral separation. "With the experience of just watching that," says Persse, "silence would fall across the room."

Additional research published by the *Journal of Trauma* also found higher mortality in victims of penetrating trauma who were spine-immobilized. Those authors, from Johns Hopkins, advised against the routine use of spinal immobilization for those patients.

With dissociative neck injuries, most

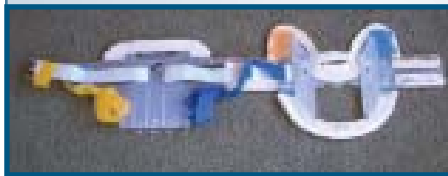
mechanisms will be blunt, and the Baylor team wasn't able, in reviewing trauma center records, to find any patients who'd survived them. They did, however, find a handful who experienced otherwise-unexplained hypotension and died.

"That was unnerving," says Persse. "Now they're wondering if those folks could all have been in neurogenic shock when everybody was looking for sources of hypovolemic shock, which they could never find." ▀

Splinting Cervical Injuries in Position

You want your patient's head in a neutral position, but patients with potential cervical injuries aren't always found that way. Being "smarter than the problem" could mean splinting them in the position found, rather than moving an unstable neck.

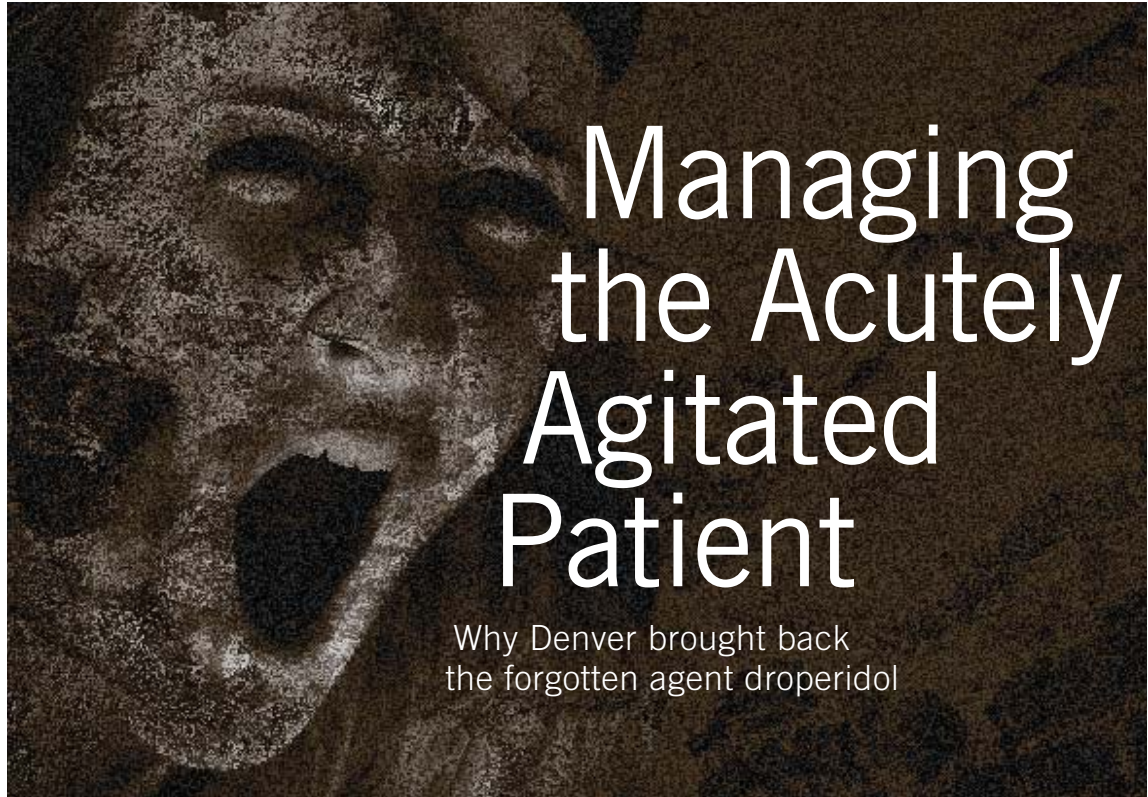
"Say a patient fell out of a tree and landed on his shoulders and neck, and he's complaining his neck hurts really, really bad," says Houston Fire Department Medical Director David Persse, MD, EMT-P, FACEP. "His head's turned to the left. He can feel and wiggle his fingers and toes. You probably need to move him with minimal movement to his neck, but you're not going to get him into a standard collar with his head turned. You have to kind of splint them as they lie."



That may take you back to the days of improvising with sweatshirts and sandbags. Another option could be products like EmeGear's XCollar and NexSplint, which can be applied to patients in their position of injury, allowing use on those who are asymmetrical. While they may not reduce potential distraction in severe neck injuries, they do seem to reduce movement: A study by the University of Pittsburgh's Emergency Responder Human Performance Laboratory found the XCollar more protective against movement in all directions—flexion/extension, left and right flexion and left and right rotation—on both seated and boarded patients than other collars tested.

The NexSplint was named a Top Innovation at EMS EXPO in 2008. For more, visit www.XCollar.com.

By Christopher B. Colwell, MD, FACEP



Managing the Acutely Agitated Patient

Why Denver brought back the forgotten agent droperidol

Management of acutely agitated patients can present a challenge both in the field and in the emergency department. There are a variety of techniques that can be used to manage agitated behavior in the prehospital setting, including verbal management techniques and physical restraints. This discussion will focus on chemical restraint of the acutely agitated patient.

In September 2009, the American College of Emergency Physicians' Task Force on Excited Delirium published a white paper that concluded that some episodes of excited delirium "may be amenable to early therapeutic intervention in some cases in the pre-mortem state," and that "physical restraints should be rapidly supplemented with chemical restraints" in agitated patients who require restraint.¹ Options for chemical sedation in the prehospital setting include benzodiazepines, antipsychotics (also called neuroleptics), antihistamines and, rarely, dissociative agents such as ketamine. A survey of 34 larger metropolitan city EMS agencies at the annual Gathering of Eagles conference revealed that 33 of these agencies use some method

of chemical restraint. Of those, 26 use midazolam (Versed), nine use diazepam (Valium), four use lorazepam (Ativan), eight use haloperidol (Haldol), two use droperidol (Inapsine), and one uses ketamine. (Some agencies have more than one agent available for chemical sedation.)

The care of agitated patients in the field is challenging on many levels and chemical restraint is sometimes necessary.

While benzodiazepines are excellent agents in many settings, particularly to treat patients with acute agitation related to cocaine or methamphetamine ingestion, they may not be ideal in all situations. Antipsychotics are also effective in managing agitated behavior and may result in fewer episodes of oversedation.² In particular, antipsychotics may be a better choice when

dealing with agitated behavior related to alcohol use or psychiatric conditions. There are both typical antipsychotics such as haloperidol and droperidol and newer, atypical antipsychotics such as ziprasidone (Geodon) and olanzapine (Zyprexa).

First introduced in the United States in 1970, droperidol is a butyrophenone and a potent antagonist of dopamine subtype 2 receptors in the limbic system. It is a potent antipsychotic used both for chemical restraint and as an antiemetic. Droperidol has been shown to be an effective sedative agent with few treatment failures and no respiratory depression.^{3,4} It has also been shown to be safe in a variety of clinical settings, including emergency management of acute agitation.⁵⁻⁷ In a randomized controlled trial, droperidol was found to result in more rapid control of agitated patients than haloperidol, with no increase in undesirable effects.⁸ In another trial comparing droperidol to midazolam, no difference was found in the onset of adequate sedation, but patients receiving midazolam showed an increased need for active airway management.⁹

So why is droperidol not more widely used in EMS? In December 2001, the FDA issued a “black box” warning for the drug based on reports of QT prolongation and/or torsade de pointes in patients receiving it. This warning came after more than 30 years of clinical use, making it the longest latency period from initial FDA approval to black box warning to date. The warning was also issued despite the fact that no clinical trial or systematic review had reported any adverse cardiac events. It resulted in a dramatic decrease in the use of droperidol across the country despite a number of published articles questioning the warning’s validity.¹⁰⁻¹³ Among the conclusions of these articles was that “the evidence is not convincing for a causal relationship between therapeutic droperidol administration and life-threatening cardiac events,” and that “the black box warning appears to have originated from post-marketing surveillance data rather than data reported in peer-reviewed medical literature.” Hennepin County, MN, published a review in 2005 concluding that since the removal of droperidol from its system as a treatment option for out-of-hospital agitated patients, it had seen an increased frequency of continuous pulse oximetry monitoring,

intubation, ED critical care management and ICU admission.¹⁴

In September 2007, the FDA issued a similar warning for haloperidol, stating that torsade de pointes and QT prolongation had been observed in patients receiving it. In response to this warning, in January 2009 Denver went back to using droperidol rather than haloperidol. Since then, we have had the same experience as the authors of those many published reports: We’ve found droperidol both safe and effective. Authors from Camden, NJ, published similar experiences with safety and effectiveness earlier this year.⁷

The care of agitated patients in the field is challenging on many levels, and chemical restraint is sometimes necessary to safely manage them. While benzodiazepines are great in many cases, they are not the ideal agent for all situations. Antipsychotics such as droperidol should be an option in some cases, such as for patients experiencing agitation related to alcohol use or an acute psychiatric condition. There is growing experience with newer, atypical antipsychotics, and these may be an option to consider in the future. ■

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Other Highlights From the Gathering of Eagles

Other highlights from this year’s Gathering of Eagles conference, held Feb. 26–27 in Dallas:

• Stop the bleeding

Miami Fire-Rescue Medical Director Kathleen Schrank, MD, discussed the benefits of tourniquets for massive hemorrhage. The potential for patients to bleed out is underestimated, she warned, and tourniquets are safe on warm extremities for up to two hours. Tips: Use a wide band, 2 inches above the injury, and be sure it’s sufficiently tight. Hold direct pressure for at least 10 minutes. There is no evidence of benefit from elevating a bleeding extremity.

• Athlete helmet removal

For athletes with potential c-spine injuries incurred during games, helmets are often left in place by EMS, unless an airway issue requires their removal. In Oklahoma City and Tulsa, they’re routinely removed. Jeff Goodloe, MD, associate medical director for those cities’ Emergency Medical Services Authority, related how EMSA providers are taught to stabilize the helmet and head as a single

unit, with the fingers on the mandible; how they stabilize anteriorly and posteriorly, then apply lateral pressure to remove the helmet; and how they then resume stabilization of the exposed head. EMSA providers get plenty of hands-on training in this procedure.

• Operating in disaster zones

John Griswell, MD, medical director for Ft. Worth’s MedStar, responded to the Haitian earthquake with Team Rubicon, a group of emergency responders and other volunteers dedicated to bridging the gap between disasters and definitive aid with small, nimble, fast-deploying assistance teams that get on the ground quickly in affected areas. His lessons: Don’t make yourself a burden—respond with recognized teams in established frameworks; when repacking drugs, know your lot numbers and expiration dates; know your limitations, but be flexible: paramedics and nurses were used virtually interchangeably in Haiti; and know whom you’re helping: In Haiti, donations of rice intended to help actually undermined local farmers’ income from their crops.

By John Erich,
Associate Editor

Beyond the Box

Moving from protocols to treatment guidelines in British Columbia



Photo courtesy BCAS

Under the British Columbia Ambulance Service's anaphylaxis protocol, you couldn't give epinephrine right away—a patient's blood pressure first had to drop below a defined threshold. There were legitimate reasons for that, but for providers treating anaphylactic patients who had not yet deteriorated to that point, it created some uncomfortable moments.

"Knowing sometimes that a patient was having anaphylaxis and getting worse," says Karen Wanger, MD, BCAS'

regional medical director for Vancouver and the lower BC mainland, "paramedics either had to break protocol and give epi earlier, if they thought that was the right thing to do, or they had to wait until the patient's blood pressure fell below 90. When you think about that, that's not the best way to treat anaphylaxis."

It was, however, the kind of situation that got BCAS leaders to start thinking about their protocols, and how to give their providers more flexibility to do

what's best for individual patients. The result of that process was a move from protocols to less-proscriptive treatment guidelines that allow BC medics to use greater clinical judgment in delivering care.

The problem with protocols is that they force behavior. As well, patients have to be forced into protocols that may or may not fit all aspects of their presentations. That can lead to the practice of "cookbook" medicine—providers dutifully following prescribed care recipes and reluctant to deviate from them, no matter the individual peculiarities of a given patient. Under guidelines, conversely, providers are liberated to think and act more freely based on their training, experience and best professional discernment.

"The long-range goal is to improve the critical thinking skills of our paramedics," says Wanger. "That's a move toward providing the care patients need in the moment, rather than a strict set of lockstep guidelines that don't always speak to the variable types of problems patients have."

Critical thinking is an attribute that must be developed if prehospital caregivers are to evolve from mere technicians to true clinicians. Developing it requires some supporting elements. In British Columbia that began with education. An initial course introduced the new treatment guidelines; a second will delve more deeply into them. Newcomers are primed during orientation. Field personnel also get face time with service physicians to discuss the guidelines in practice. Wanger conducts monthly "interesting case" rounds where she visits stations to discuss unusual calls and applicable guidelines, then field questions. The goal is to catch near-misses and highlight good catches.

Recognizing that some EMS providers

will simply operate better with protocols, BCAS has retained some flexibility for them. All or some of the protocols can still be used by those not yet comfortable with the guidelines. The idea is to provide an entire “toolbox” from which providers can select what’s appropriate and comfortable.

“There are people who think in a more concrete fashion, and just aren’t comfortable with that kind of open, varied critical thinking,” says Wanger. “We hope to move them to the guidelines as time goes on. But our protocols are perfectly safe—it’s not like they’re giving lesser care. Frankly, at 3 or 4 o’clock in the morning, most people do well remembering something that’s a bit more lockstep.”

The guidelines were also crafted in a ground-up way that helped optimize field folks’ buy-in. The process began with a survey of providers’ attitudes about their care delivery. Many expressed desires to operate with a bit more freedom, outside tightly defined protocol boxes. The anaphylaxis protocol was one example.

With key issues identified, topics were divided among BCAS’ regional medical directors and passed on to physician-led teams of medics charged with researching relevant literature. Their findings and subsequent recommendations came back to the regional medical directors. Some identified areas weren’t amenable to change due to things like scope of practice laws. Others were new. Everything had to be sorted, prioritized and formalized—an enormous undertaking.

“It took our protocols, really, and broadened them into what we thought was reasonable,” says Wanger. “We couldn’t take everything that was suggested, but our field docs did a little synthesizing, and we developed, in some cases, reasonable compromises.”

In their final incarnations, the treatment guidelines have three parts: a single-page overview of the problem and its guiding medical principles; a list of potential interventions at each provider level; and a level-specific list of interventions for each provider.

It’s hard to apply metrics to a change like this—there are no easy values to gauge its effectiveness. Using guidelines won’t make a difference in scene times, and privacy laws make it hard to connect them to patient outcomes. What’s more obvious is paramedic satisfaction, and the degree to which collaborating in the process has enhanced the symbiosis between BCAS’ clinical leadership and crews in the field.

“We know we have paramedic satisfaction—they talk to us,” says Wanger. “We believe there’s going to be an improvement in patient care. With the critical thinking and a background that covers more pathophysiology, they’ll be able to better speak to different things. They’ll better understand how their interventions work and what red flags to watch for. We expect that will lead to better treatment and a better look at patients globally.” ■

Sample BCAS Guideline: Hypo/Hyperglycemia

Patients with a history of type 1 and type 2 diabetes are at risk of developing hypo or hyperglycemia.

In the case of hypoglycemia, their history frequently reveals an imbalance of insulin or oral hypoglycemics by:

- An overdose of insulin or hypoglycemics;
- Insulin administration was not followed;
- Missing a meal;
- A recent change in diabetic medication;
- Overexertion without matching food intake.

In the case of hyperglycemia, history may reveal:

- Recent infection or illness;
- Gradual onset of symptoms of dehydration, lethargy, confusion;
- Excessive urine output;
- Insulin-dependent diabetics often smell ketotic (like ketones);
- Non-insulin-dependent diabetics can have high blood sugars, dehydration but no ketosis.

Guiding Principles

Measuring capillary blood glucose will guide treatment.

Symptomatic hypoglycemia does not occur unless glucose is less than 4 mmol.

Hyperglycemic symptoms are rare if glucose is less than 18 mmol, but many patients tolerate much higher levels without any symptoms.

In hypoglycemic patients who can still comply with directions, administering oral glucose may be enough to increase their level of consciousness and avoid unnecessary IV initiation.

All patients receiving IV dextrose require 50 mg of thiamine IV unless contraindicated.

Although many hypoglycemic diabetics decline transport following successful treatment, care must be taken to ensure a reasonable underlying cause of the event has been identified—i.e., the event is clearly attributable to a late or missed meal in the face of a normal dose of insulin, or the patient’s physical activity has been higher than usual in the period prior to the incident. These patients should never be left in the absence of another responsible adult.

Type 2 diabetics on oral hypoglycemic agents who require treatment in the field should be transported to hospital, as this is an extraordinary event and very likely to recur.

Beware the otherwise healthy patient with a history of recent illness who is unconscious, hyperglycemic and hypotensive. These patients may be as yet undiagnosed type 2 diabetics who have developed hyperglycemic nonketotic coma. These patients are at risk of dying and need careful management in the emergency department.

EMR/PCP Interventions

Correct hypoglycemia: Glucogel, 1 package applied to oral mucosa.

PCP only: Glucagon, 1 mg SC, if IV unattainable or for persistent hypoglycemia.

PCP IV only: Dextrose, 10–25 gms (100–250 cc) D10W IV; thiamine, 50 mg IV.

By John Erich,
Associate Editor

As Cool As Us

How EMS can help drive the care patients get in hospitals

No money. No clout. Fighting with the big dogs for every morsel we get and scrapping just to keep functioning day by day.

That's the reality for a lot of American EMS, and it's an identity many of us have internalized. But it's not wholly accurate. EMS does indeed often have leverage, and in some very important areas. As the first caregivers to our communities' sick and injured, we diagnose their problems, initiate their treatments and chart the preliminary courses of their care. Increasingly, as EMS grows in sophistication and capability, the methods and tools and interventions we employ in doing so directly determine what our hospitals do next, and how.

Take a classic example, therapeutic hypothermia for cardiac arrest patients. If we begin it in the field, we can't very well deliver resuscitated patients to facilities that can't continue cooling.



EtCO₂ monitoring helps prevent unrecognized esophageal intubations.

The Argument for Temps in the Field

The H1N1 outbreak of 2009 demonstrated the importance of EMS and hospitals working closely together. For healthcare providers in New Orleans, it also demonstrated the merit of EMS taking patients' temperatures.

"With H1N1, it made a huge difference," says New Orleans EMS Director Juliette Saussy, MD. "How do I tell whether you have an influenzalike illness if I can't even tell whether you have a fever? How do I alert that crew? How do I alert the hospital?"

In a pandemic situation, with urgent precautions to be taken, that's an imperative for the protection of caregivers. Care of the patient doesn't change, but staff need to protect themselves.

"If somebody is unconscious, and I come in and tell you they have a temperature of 106°F, doesn't that change your care?" asks Saussy. "Of course it does! To my mind, it has a clear benefit, it's cost-effective, and it gives you a tremendous amount of information."

An EMS system that cools in the field can therefore tell its potential destination hospitals that they won't be getting those oh-so-profitable cardiac cases until they can cool them too. That's a shot we can call—and some of us have.

"We basically said, 'We're doing this. Hospitals, let us know who's going to

continue this care,'" says New Orleans EMS Director Juliette Saussy, MD. "The hospitals all suddenly said, 'We can do this!' They really want those patients, and our decision really kind of drove intrahospital, intra-ED, intra-ICU cooling. The cardiologists were on board, the neurologists were on board,

and it really kind of brought the system together."

That's a happy bonus, but the main driver for any EMS intervention is of course what's best for patients. For resuscitated cardiac arrest patients, cooling is—so why not flex some muscle in doing what's right?

It needn't stop there. In New Orleans—a city's whose entire healthcare infrastructure was essentially gutted not so long ago—EMS has been able to help push numerous other interventions into hospitals: end-tidal CO₂ monitoring (patient benefit: no more unrecognized esophageal intubations). Adult intraosseous access (immediate access for ED staff; no unnecessary central lines). Fentanyl for pain relief instead of morphine (faster-acting, fewer reactions). Work is

ngoing in other areas, including resuscitation bundling. “Those numbers are looking great; hopefully at the end of it we can find the best combination,” says Saussy. “And hopefully, that will drive resuscitation centers.”



Photo courtesy New Orleans EMS

Ultimatums like New Orleans EMS’ cooling mandate represent a kind of hard power, but it’s worth noting that EMS can wield a softer power too, and impact patients’ welfare and hospitals’ care in more traditional ways that shouldn’t be forgotten. Those involve bringing safety messages to the community and being active in injury- and accident-prevention. Many EMS systems do this kind of thing already: CPR classes, car seat and bike helmet giveaways, towing crashed cars to schools for anti-drunk driving presentations and so forth.

Somewhere in between lie things like paramedic activation of cath labs for STEMI patients. In New Orleans, they can do it without sending EKGs ahead for confirmation—certainly a way of determining hospital care and simultaneously benefiting patients.

“The cardiologists are pretty happy with the way this has worked, including our lack of false positives,” says Saussy. “But I think once we have the technology, we’ll transmit [EKGs ahead]. I’m not necessarily sure we need to, but the benefit I see is in transmitting to a hospital where a patient’s been before, and they can pull up an old EKG and say, ‘Is this old or new? Tell me what’s going on with

this guy’s history.’ If you have some funky EKG, but it’s really your baseline, we need to know that.”

Life is always easier when EMS and its hospitals get along, and that’s particularly true when EMS is trying to influence hospitals’ behaviors. Turf, politics and resource limitations can derail the best of intentions. For advances to work, there has to be free communication, good personal relationships and lots of feedback both ways.

With the STEMI activations, for instance, New Orleans’ EMS teams get QA and after-action followup from hospital cardiologists. They discuss false positives, things that were missed, and provide general education on matters of the heart.

“We work really hard on all those relationships,” says Saussy. “It’s really about getting to know the people—the CEOs and emergency department directors and nursing administrators—and really having one-on-one sorts of relationships. These people are in my cell phone. If I have a problem, I pick up the phone and call. We meet on a regular basis. So it’s just keeping the lines of communication open and building consensus. We all want the same thing, which is what’s best for our patients.”

Hypothermia for SCI

By John Erich,
Associate Editor

Animal data, human anecdotes suggest another benefit for cooling

You’ve probably not heard of Dan O’Reilly, but his story was remarkable. The 55-year-old Canadian was surfing on a 2004 Mexican vacation when a large wave overwhelmed and nearly drowned him. He was near-lifeless when dragged from the surf. He received quick medical help, but doctors couldn’t identify any trauma. They thought perhaps he’d suffered a heart attack or stroke in the water. In a coma, on life support, with virtually no brain function, O’Reilly was flown to the States.

There, in desperation, doctors in Houston tried hypothermia, figuring it was their best chance at preserving some brain function. They cooled O’Reilly for three days—and then he woke up, mind intact. That was surprising enough. Just as surprising was the MRI that showed O’Reilly hadn’t had a heart attack at all—rather, he’d suffered a severe spinal cord injury.

It had been, as one media account put it, “the best possible misdiagnosis.” In conjunction with the other interven-

tions O’Reilly received, the cooling therapy apparently helped protect both his brain and spinal cord.

“Cooling does a number of things,” explains George Ralls, MD, FACEP, medical director for the Orlando/Orange County EMS system in Florida. “First, it suppresses inflammation. With an injury, the injured tissue becomes inflamed, and that can lead to injury of adjacent tissue that’s initially intact. That can cause a loss of good nerve tissue that wasn’t directly damaged. Cooling also reduces production of

REUTERS/Gary Wiepert



Players were rattled by Everett's injury, but his recovery has been remarkable.

oxygen free radicals and metabolic demand in the spinal cord itself. So it's a number of different things, but the neuroprotective process is the same we use for closed head injuries or cardiac arrest."

A more familiar case may be Kevin Everett's. A tight end for the NFL's Buffalo Bills, Everett sustained a life-threatening C3-C4 dislocation during a game in 2007. Doctors expected permanent neurologic impairment. But Everett was treated aggressively, receiving prompt cooling, IV steroids and rapid surgical decompression. After an injury following which fewer than a quarter of patients ever walk again, Everett was on his feet within three months.

"With Everett, they did more than one thing that was outside the box," says Ralls. "It's difficult to tell which of those interventions had the most impact—maybe all three, maybe one of the three." But it's clear the outcome defied normal expectations.

Let's emphasize one thing: Hypothermia is not now the standard of care for spinal cord injury, and if you show up at a hospital with a cooled SCI patient, some doctors are likely to have

some very harsh words for you. But the evidence, it's intriguing.

First the animals: A 2009 *Critical Care Medicine* review of experimental and clinical data surrounding modest hypothermia for acute SCI in a variety of animals (cats, dogs, monkeys, rats and ferrets) found just one investigation of 17 that showed negative outcomes. In those cases, cooling spanned a wide range of times and temperatures. A study in the *Journal of Comparative Neurology* that year found cooling rats to 33°C for four hours beginning five minutes after moderate cervical displacement resulted in faster recovery of locomotor ability and improved forelimb strength.

"None of those rats had the same level of function as an uninjured rat, but they did better than the ones that weren't cooled," notes Ralls. "The evidence there leans toward preserving some degree of function, which is important for spinal cord-injured patients. For them, every level counts."

Still, rats aren't people, and the human data, while preliminarily encouraging, isn't yet as strong. In a 2009 article in the *Journal of Neurotrauma*, a team led by Dr. Allan Levi of the Miami

Project to Cure Paralysis reviewed the cases of 14 patients with acute, complete c-spine injuries who were cooled by IV catheter. That provided needed baseline data that's now informing broader examination.

There's nothing so far to suggest cooling of SCI patients needs to begin in the field. In Levi's paper, it began from 3-33 hours postinjury. The point there was not to establish ideal parameters, just to show the therapy doesn't seem associated with bad outcomes.

It's also worth noting that while things like cardiac arrest are distinct clinical entities, spinal cord injuries—in the real world, versus in the lab—typically come with significant additional trauma.

"For EMS, it's going to be an entity wrapped into a lot of other stuff," says Ralls. "It could be a multisystem trauma patient. It could be intra-abdominal bleeding. There could be other complicating issues."

With a benefit apparently emerging, though, it's worth digging deeper in search of optimum initiation, duration and temperature parameters, and what else should accompany hypothermia to maximize any benefit.

That work is continuing. It's still early. But it's not inconceivable that emergency caregivers could, one day, cool SCI patients just as many of us now cool cardiac arrest patients.

"It's an exciting thing on the horizon. We all want to do everything we can for our patients," says Ralls. "But it's important to remember we don't know for sure at this point how much hypothermia's going to help. And, probably more important, we don't know if in some cases it's going to hurt. The animal models, although encouraging, are not representative of our patients who sustain multisystem trauma. The reason we cool cardiac arrests is because we reacted to the results of a well-designed randomized controlled trial. We didn't just come up with it. So while it's exciting to see this on the horizon, people need to be patient and wait for the results of something that can really define this as either safe and appropriate or not." ■