

DPM NEWS

(585) 463-2900 | 44 Celebration Drive, Suite 2100 | dpm@urmc.rochester.edu

EKG Case

Dr. Maia Dorsett, provides a challenging 12-lead EKG for your consideration on *page 6* with discussion later on *page 15*. See if you can come to the correct diagnosis!

Sodium Bicarb in Cardiac Arrest

On *Page 11*, Dr. Terry Makhoul provides current research on the effect of sodium bicarbonate on cardiac arrest outcomes.

The Power of Mentorship

Dr. Christopher Galton continues his "Power of..." series with a breakdown of the importance of some great mentors on *page 13*.

From the Editor

On behalf of Melinda Johnston and the MLREMS PIER Committee, please read the note below and consider submitting a worthy colleague for one of the listed awards.

Eric Rathfelder
Editor-In-Chief

It's that time of year again and we are accepting applications for the Monroe-Livingston Regional EMS Awards! Have you worked with an outstanding provider and would like to see them recognized? Please submit an application! The awards packet with award criteria information is available on our website: www.mlrems.org/mlrems/public-information-education-and-recruitment-pier/.

The members of the Monroe-Livingston Regional EMS Council will determine the local award recipients, whose names will be forwarded to the Awards Committee of the NYS EMS Council for consideration as a statewide award recipient from the Monroe-Livingston Regional EMS Council.

- BLS Provider of the Year
- ALS Provider of the Year
- Harriet C. Weber EMS Leadership
- EMS Educator of Excellence
- EMS Communication Specialist of the Year
- Registered Nurse of Excellence
- Physician of Excellence
- EMS Agency of the Year
- Excellence in EMS Quality and Safety
- Youth Provider of the Year
- Richard "Dick" Tripp Community Service Award

Would you like to submit an application but would like some help in organizing your thoughts on paper? Contact the PIER Committee and we are happy to help! (piercommittee@mlrems.org). **The deadline for submission is February 1.**

Landing Zone Safety

John Concesion FP-C, Flight Paramedic/Director of Safety, Mercy Flight Central

Helicopter air ambulances can be used to rapidly transport seriously ill or injured patients to distant trauma centers, PCI centers, or other specialty care facilities. A successful air medical transport handoff requires ground EMS personnel knowledgeable in landing zone operations and patient loading safety. Let's look at each phase of a successful air medical transport hand-off, and review important safety practices.



When the decision to utilize a helicopter air ambulance is made, landing zone (LZ) preparations should begin immediately. LZ command must locate a suitable area to serve as a landing zone. This area is close to the active incident scene, (but not too close), on a flat, stable surface free of debris, and away from hazards to aviation such as trees, buildings, towers, utility poles, and wires. The landing zone itself should be 100 x 100 feet, at least 75 feet from hazards or obstructions. Check to see if the ground is firm and level. A soft field can cause the aircraft to shift on landing, making it unstable and requiring the pilot to take off in search of an alternate site. An unlevel surface may bring the tail rotor closer to the ground, endangering the aircraft, crew and ground personnel.

Mark the LZ with 4 orange cones. At night, use illuminated cones, or commercial battery powered landing zone markers if you have them. If you don't have illuminated markers, that's fine, the search light on the aircraft will illuminate the LZ clearly on approach. Vehicle headlights directed at the landing zone can impair a pilot's night vision sensitivity, so generally, they are not recommended. Red flashing lights on apparatus near the landing zone can help the pilot and crew locate the LZ from a distance, but it's very helpful to shut them down, (unless required for scene safety), as the aircraft approaches. Most pilots will be flying with the aid of night vision goggles and excess light makes landing more difficult.

When the aircraft is about 5 minutes out, the flight crew will contact LZ command. They will ask for a description of the LZ, (hard surfaced, grass, etc.), and the location of any trees, poles, wires or buildings nearby. They will also ask about the direction of the surface winds. Try to be as specific as possible when you reply. Detailed LZ information is greatly appreciated. If difficulties communicating with the inbound aircraft occur, ask dispatch to verify the contact frequency with the helicopter's comm center, or suggest an alternate frequency – the flight crew will be doing the same thing.

When the aircraft arrives overhead, the pilot may complete an "orbit" of the scene to get a good look. Stow loose items so they don't become airborne as the aircraft approaches. Ensure that rescuers and bystanders are clear of the landing zone. The pilot will abort an approach if personnel appear too close to the touchdown point. The pilot will select a spot in the LZ and may hover briefly before touchdown, rotating the aircraft so that rescuers do not approach from the rear. The touchdown may not be in the center of the LZ. Ensure all personnel remain clear of the aircraft after touchdown. In many cases the pilot will keep the aircraft running, so extreme caution must be observed by all crewmembers. The air medical providers, (AMPs), will bring the cot and their medical equipment away from the aircraft. They may ask for a guard to be posted to ensure no bystanders or rescuers approach the aircraft from behind. If so, the AMPs will provide specific instructions.

The AMPs will meet rescuers and go with them to the patient. Once both AMPs are at the patient side, proceed with a verbal report. Please include information about the incident, the physical exam findings, vital signs, and treatments that have been performed. The AMPs will work quickly to receive this data and prepare for departure. After report has been given and a rapid assessment has been completed, the patient will be moved to the air-medical cot, wrapped in the life-blanket, and secured.

One AMP will take equipment back to the aircraft and the other will work with responders to bring the patient to the aircraft. Prior to approaching the aircraft, the AMP will brief ground personnel, including requesting baseball caps be removed (which can fly into the engines/rotor system) and helmets be worn. Four personnel will be assigned to the four corners of the stretcher. A fifth may be assigned if the patient is being ventilated. The AMP will lead the cot towards the aircraft, feet first. We always approach the aircraft from the 9 or 3 o'clock position. The main rotor height is greatest at 9 and 3, giving the greatest safety margin. A running aircraft assaults your senses. The lights, sound, smell of jet fuel, and heat from the spinning turbine engines can make even the simplest task a challenge. If you're not sure of what to do, please ask! After approaching from the side of the aircraft and getting a hand signal from the pilot, the patient will be moved to the rear of the aircraft for loading. As the stretcher approaches the open clamshell doors, the AMP will assume a position between you and the tail rotor. Never move between the AMP and the tail of the aircraft. Two wheels of the stretcher are positioned on the floor of the aircraft, and before the stretcher is loaded, the ground personnel will be signaled to depart. Depart via the exact same route taken to approach the helicopter. Once ground personnel have departed the landing zone, the AMP will secure the doors, perform a safety walk-around, and board the aircraft. Please shut off any flood lights directed toward the LZ prior to liftoff.

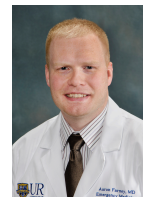


Conducting a safe air medical operation requires care and attention by all providers on the ground and in the air. When all members understand the procedure and work together, a safe transition from ground to air medical care is assured.

Emergency Medicine Residents in the Field (Part II of II)

Aaron Farney MD

Have you seen a UR emergency medicine resident in the field lately and wondered what they are doing? Or wondered what *can* they do? Or thought to yourself, “what’s the difference between a medical student and a resident?” Medical training can be confusing. In this two part series, I will clarify some of these questions. In Part I (see Spring 2017 newsletter), we reviewed medical training, from medical school through residency. In Part II, we will discuss EM residents and EMS.



Part I Reviewed

Part I of this series discussed the difference between medical students and residents. The key difference is that residency comes after medical school – residents are doctors. Residency is specialty focused, meaning it is specific training aimed toward competency in a particular specialty of medicine. One example is emergency medicine, which most commonly entails a three-year long training program (although some are four years). There are currently 42 (14/year) emergency medicine (EM) residents in training at the University of Rochester. While EM residents spend a majority of their training in the emergency department, they also rotate through labor & delivery, anesthesia, cardiology, ICU/critical care, toxicology, trauma, and, of course, EMS. After successful completion of EM residency, the graduates go on to serve as EM attendings locally and throughout the country.

Why are emergency medicine residents riding along with EMS?

A basic understanding of EMS is essential to the practice of emergency medicine. Most emergency medicine residents have no prior EMS experience. They have never been in the back of an ambulance. They have never tried to gain vascular access in an unstable trauma patient while extrication is occurring. While the ED can be pretty hectic, fortunately our residents are not required to intubate someone on the kitchen floor, or try to run a cardiac arrest in a cramped back bedroom. There are no long spiral staircases in the ED that our incapacitated patients need to be moved down. Moreover, physicians in training have support staff, such as experienced nurses, respiratory therapists, techs, and attendings readily available.

Our hope is that after a handful of ride-alongs, residents will come away with a new appreciation of exactly how challenging it can be to deliver good out-of-hospital care. An appreciation of the constraints and care limitations of the prehospital environment should translate into better recognition of quality prehospital care and good long-term working relationships with EMS throughout the physician's career. Many of these physicians will go on to serve as EMS liaisons for their hospitals, or even serve as EMS medical directors. The EMS rotation is a necessary foundation to be effective in those roles.

When do they rotate?

EM residents spend two dedicated weeks in their second year of training (R2 year) on EMS. The rotation intentionally occurs midway through training. The residents have at least a year of experience under their belt, but are not yet ready to be attendings.

How is the rotation structured?

There are three components to the EMS rotation: knowledge acquisition, quality improvement (QI), and experiential.

Residents are required to complete reading and didactic training that reviews the history of EMS, relevant EMS legislation, EMS training and education, service delivery models, and EMS scope of practice. They are also required to complete the introductory ICS courses (ICS 100 and 700).

In addition, residents are required to complete a QI project addressing a specific question. Residents develop a clinical question, review a number of prehospital charts, abstract data to answer the question, and ultimately provide recommendations on areas of improvement at the system level based on their findings.

The most recognizable component of the EMS rotation is the experiential, or ride-along component. Residents are required to ride along with no less than six agencies during their two-week rotation. To

offer maximal exposure to the breadth of service delivery models, the agencies they ride along with are intentionally varied. Residents ride along with first-response fire departments, suburban, and rural transporting services, and optionally, helicopter EMS. They are also stationed at mass gathering events and work with covering EMS agencies to render care. Examples include the Rochester Marathon, Amerks games, the Hemlock Fair, and the New York State Festival of Balloons.

What can residents do in the field?

While the primary goal on ride-alongs is exposure to the prehospital environment, residents do have relevant knowledge and skills and are thus encouraged to be hands on with patient care. They are asked to assist with vital signs, splinting, EKG's, vascular access, medication administration, etc. They may perform invasive procedures, including CPR, cardioversion, IO placement, and intubation. These are all procedures that the residents have likely done many times prior to their EMS rotation – just not outside the hospital!

Are residents riding along able to provide medical control?

All of the emergency medicine residents that ride along in the field have taken a medical control course and are authorized to provide routine online medical control, with two exceptions. Per institutional and regional policy, **residents cannot authorize RSI or termination of resuscitation**. A provider seeking these orders must contact online medical control and ask to speak with an attending (unless standing order is met).

So, who is in charge of patient care?

You, as the EMS provider, are responsible for your patient. You should engage your ride-along to assist with care as described above, but ultimately it is your patient, and care should not be merely turned over to the resident. This is made clear to the residents prior to their ride-alongs. If a question as to how to proceed arises, do not hesitate to contact online medical control in real time. Myself and the other DPM physicians are available if further clarification is needed.

What about liability?

Because the ride-alongs are part of a resident's official duties, care rendered by residents during ride-alongs is covered under the residency program. Any agency participating in ride-alongs has a written agreement with URMC reflecting this.

Pharmacists, PA's, and NP's:

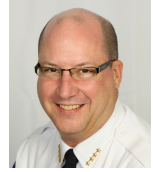
URMC is fortunate to have not only a strong emergency medicine residency for physicians, but also great training programs for pharmacists, physician assistants (PA's), and nurse practitioners (NP's) who wish to practice in the emergency medicine environment. Occasionally, there will be a pharmacist resident, or an APP fellow riding along with EMS. Pharmacists and APP's are not physicians, therefore may not provide any medical control. Nonetheless, they may assist with patient care within their scope of practice.

Not "students."

I will close this series with one last comment – residents are not "students." Calling a resident a student in front of a patient is equivalent to calling an EMT an "ambulance driver" – a bit insulting! Residents are physicians-in-training. A resident will introduce him or herself to patients as "doctor," and this is both appropriate and accurate. Yes, they are still learning – but aren't we all!?

EMS 3.0 vs. EMS Agenda 2050

Reg Allen BS, NREMT-P



These two initiatives co-exist in that EMS 3.0 is intended to provide a guide for the near term to survive as an EMS agency. Whereas the EMS Agenda 2050 is where we as EMS professionals would like to take EMS over the next 30 years. “EMS Agenda 2050 is a collaborative and inclusive two-year project to create a bold plan for the next several decades. EMS community members, stakeholder organizations and the public are all encouraged to get involved in writing a new Agenda for the Future that will set forth a vision for the next thirty years of EMS system advancement.”

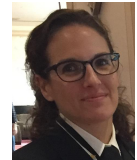
This project is not being done in a vacuum, everyone can get involved. There have already been two public meetings held in 2017 and two more are scheduled, one on January 17 and again on March 1, 2018. There will also be webinars that you can attend to learn more and add your input. There is also a [website](#) where you can review the [Straw Man Document](#) and share YOUR ideas!!

By April of 2018, the committee expects to have a draft agenda, with a comment period commencing in May of next year. The final EMS Agenda 2050 document is slated for August 2018 with a National implementation forum slated for September. Don't sit on the sidelines, take an interest and get involved.

I encourage every provider to visit the [EMS Agenda 2050 website](#). Learn about the initiative and share your ideas. Take an interest in your profession and where it's heading.

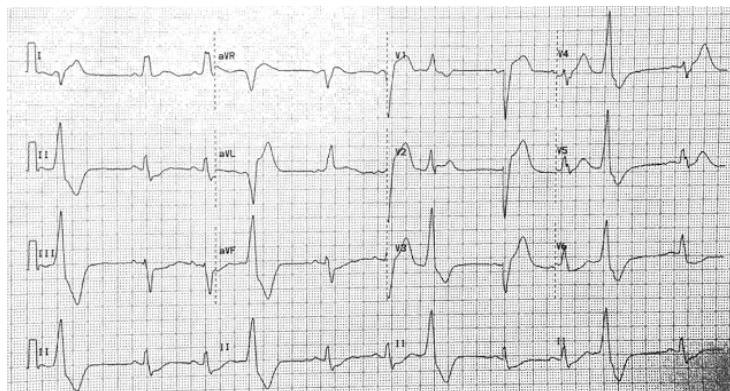
EKG Challenge - Case

Maia Dorsett MD, PhD



On a Sunday afternoon, an elderly gentleman with a history of hypertension calls 911 because of chest pain that began one hour ago. He is diaphoretic and appears very uncomfortable.

Initial vital signs include a heart rate of 50, blood pressure of 100/60 and an oxygen saturation of 96% on room air. An ECG is obtained.

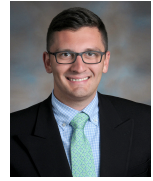


What do you think is going on? What critical actions would you take?

Please go to page 15 to read the case conclusion.

Empowering Patient Centered Care: Shared Decision-Making in EMS

Eric M. Thomas MS, PA-C, EMT-B



The art of providing patient centered care in the multifactorial environments in which we practice Emergency Medicine is a continuous challenge undoubtedly faced by prehospital care providers. The dynamic nature of complex scenes, patients, patient families, and clinical scenarios with which we are presented never cease to provide a shortage of demands and challenges. Though we are poised to provide care in circumstances others would consider hectic; our organized prehospital chaos, in many cases is what inspired our love and passion for EMS.

Providing care under such circumstances is a welcomed challenge for so many; however, the comfort level we have in these chaotic environments result in a lost focus on always providing patient centered care. The art of helping and empowering patients to make clinical decisions is a challenging one. In healthcare, we work in a unique environment in which patients are (usually) not readily equipped with the knowledge necessary to make informed decisions regarding their respective plan of care.

Shared decision-making is a vital component of patient centered healthcare which aims to educate patients and empower them to participate in decisions regarding their plan of care. When patients become engaged in this process they are, in many cases, grateful at the opportunity to learn about their health, collaborate with the prehospital provider, obtain the information and tools necessary to make a decision, and recognize that a decision needs to be made. Providers are also likely to benefit from this style dialogue as patients become better prepared to discuss their care options, the patient gains a better understanding of what is going to be done, and a trusting relationship between the provider and patient is strengthened. The goal of shared decision-making is for the patient and the provider to come to a shared agreement about the ultimate plan of care.

So, you might ask, what is shared decision-making, and, how does it integrate into my prehospital practice? I will provide a very brief realistic clinical scenario below and subsequent discussion with, and, without the use of shared decision-making:

Case #1:

You are presented with a 72-year-old female who is experiencing objective findings of tachypnea, tachycardia, hypotension and fever secondary to pneumonia diagnosed radiographically at Urgent Care. Given the clear infectious source, you suspect sepsis and wish to start a large bore IV for intravenous fluid administration. The patient is refusing the IV.

No shared decision making:

EMS Provider: "Ma'am I would like to start an IV to give you some IV fluids."

Patient: "No, you're not going to stick me in this moving truck! And, why am I going to the hospital? I went to Urgent Care so I didn't have to go to the hospital!"

With shared decision making:

EMS Provider: “Ma’am I would like to do a few things to help you feel better before we get to the hospital, can we discuss them before I start, and, you’ll be welcome to decide if we should proceed?”

Patient: “Yes, and can you tell me why we are going to the hospital because I went to urgent care so I wouldn’t have to.”

EMS Provider: “Yes, you were diagnosed with a lung infection called pneumonia at Urgent Care, and, we are concerned that the infection may have spread to your blood. We are taking you to the hospital so you can get IV antibiotics which is the best treatment for the infection. Typically for patients in your scenario, we start an IV line and give IV fluids. This is likely to help you feel somewhat improved and is also the evidence based treatment for your current condition. If we don’t do the IV now, we could get behind on getting fluids started which I’m afraid might worsen your condition. The IV line also provides the team with a site to administer emergency medications while on the way to the hospital should the need arise, although we don’t anticipate that. Does that sound like a reasonable plan?”

Patient: “Are there any risks to starting the IV line?”

EMS Provider: “Yes, there are risks to any procedure and in the case of an IV there is a small risk for infection at the site or subsequent blood infection. Given that we presume your blood may be infected already secondary to the pneumonia, in your case, the benefit of the IV line and fluids is likely to exceed the low infection risk. I would advocate the same care for a member of my family.”

Patient: “Okay, that sounds reasonable.”

The above clinical scenario provides a brief yet realistic example of how you can skillfully integrate shared decision-making into your practice as an EMS provider to help patients make sound clinical decisions. Participating in this style dialogue allows for the patient to feel engaged and educated regarding their care plan, and, providers will benefit from the practice of high quality and patient centered, evidence based medicine. The risks, and, benefits of the decision are also shifted, in part, to the patient rather than resting solely on the care provider.

Although only one example was provided in this article, I can personally think of several added benefits to regularly integrating this style into your prehospital practice (difficult sign-offs, medication administrations, interventions, etc.). I challenge all of you to try out this skill next time you’re on the road. Like anything else we do, practice makes perfect, and I personally struggle with mastering this skill. Please remember that patient centered care is highly valued by all whom we serve, and, we frankly owe this to our patient customers. I have left tips below to aid in the shared decision-making process, and I welcome discussion or questions at any time to: eric.thomas@urmc.rochester.edu

Wishing you a warm and safe holiday season!

Shared Decision Making Tips:

1. Invite the patient to participate:
 - a. Alerts the patient that they're a stakeholder in the decision-making process
2. Present options:
 - a. The patient wants to know what is available, and, what is not available to them
3. Provide information on benefits and risks:
 - a. Educate patients on evidence based medicine and ensure they understand
4. Assist patients on evaluation options considering their goals and concerns:
 - a. Ask the patient what is important to them, what they might be concerned about, and what the barriers are to the decision at hand
5. Facilitate deliberation and decision making:
 - a. Inquire what else the patient might want to know to aid in making an informed decision
6. Assist patients through the decision:
 - a. Explain the next steps, ensure understanding, and discuss challenges with following through on any decision

Education Outside the Box - National Fire Academy

Brian Bartolick EMT-P, FP-C



For our third article regarding non-traditional EMS training, I want to tell you all about some excellent low cost training opportunities at The National Fire Academy and the New York State Preparedness Training Center.

The National Fire Academy (NFA) is a physical training academy on a picturesque campus in Emmitsburg, Maryland administered by FEMA through the U.S. Fire Administration. Although the word 'fire' appears in a lot of the names and publications, there are many applicable classes specifically for EMS providers and managers. Local public safety leaders have described the NFA by saying, "The quality of the instructors and fellow students is second to none, and you will learn as much from your classmates as you will learn in the classroom."

The NFA provides many on-campus courses where FEMA provides or reimburses the cost of travel, lodging, the course and attendance fees. Students are required to purchase meals at the on-campus cafeteria, and pay \$1 a week for attendance at any student association events. Frankly, a lot of learning can happen at the Command Post pub in the center of the facility, after hours, with your peers and students from all over the nation. Wednesday is karaoke night! Any level of provider with 10 years or so of experience is cheating themselves, and the taxpayers, if they have not attended a course at the NFA.

I personally have taken two fire based courses at the NFA, and one at the Emergency Management Institute which is co-located on the campus. This spring, I hope to attend the NFA a third time and be accepted to a course entitled EMS-Quality Management. Based upon past experience, I know this will be a challenging week full of ideas and information sharing, plus friendships and networking contacts lasting for years after class. This facility is by far the premier Fire and EMS educational institution in our country. It should be noted that most courses are not quite tactical hands-on treatment courses like we

may be used to attending. These courses are for entry level supervision right up to upper level EMS agency management. The website below will lead you to the course listing for EMS, but I invite you to rummage around the catalog to see what is available.

<https://apps.usfa.fema.gov/nfacourses/catalog/>

There is an application process for the NFA and a FEMA student ID number is required, but that is clearly explained on the website. The application period closes soon for the current crop of courses, but a new application period for courses in the fall is right around the corner. Being only about a five-hour drive away, it is a wonderful asset to have so close. As students travel in from all over the county, most by plane, a car will make you very popular and could pay dividends with an evening trip to Camden Yards in Baltimore, or more importantly, The Gettysburg National Military Park right up the highway. Camp David is a stone's throw away, but I wouldn't recommend at all trying to take a drive to find it.

I, as well as many other local public safety leaders are strong and vocal advocates for attendance at the NFA. To that end, I will happily assist anyone with the application process, or evening finding out more information.

A second facility right here in New York is the New York State Preparedness Training Center (SPTC) operated by the NYS Division of Homeland Security and Emergency Services (DHSES) at the former Oneida County Airport, just off the Thruway at exit 32.

Full disclosure here, I have not personally attended a class at the SPTC, but many of my colleagues have attended classes such as *Emergency Vehicle Defensive Driving Course; Rescue Task Force & Advance Active Shooter Scenario course (A2S2)*. The reason I wanted to write about this course and facility is that so many EMTs and Paramedics have come back and have raved about the training program. Although the year is nearly done, next year's classes should soon be published at the below link.

<http://www.dhSES.ny.gov/training/calendar/?agency=SPTC>

There are a number of other outlets for training across the state found here: <http://www.dhSES.ny.gov/training/calendar/index.cfm>

The active shooter classes and rescue task force at SPTC have been enjoyed by many local EMTs, and I'm sure they would be happy to talk about it. I know from reports and pictures that this is true-to-life active shooter and MCI type training. A local EMS chief has taken a number of the defensive driving classes, and reports that they are driving instruction like nothing else he has attended. Classroom based instruction is followed by time on the SPTC's Emergency Vehicle Operations Track (EVOT), allowing students to practice what they have learned. The only downside is that student's must bring their own agency's vehicles to drive on the track.

For multi-day training programs, students living over 50 miles from the facility are eligible for lodging paid for by DHSES. Again, an application process for the classes is required, and needs to be followed, especially if you plan on taking advantage of the lodging.

There are many great academies and training centers across the nation that provide outstanding learning opportunities, including TEEX at Texas A & M, EMRTC at New Mexico Tech and the CTOS center in Nevada. The two that I mentioned and strongly advocate for above are in support of the finest training available, easy to access and profoundly impactful to our profession. Please take a minute to check out the links and try and attend a class.

Prehospital Use of Sodium Bicarbonate in Out of Hospital Cardiac Arrest: A Worthwhile Intervention?

Terry Makhoul Pharm-D

Sodium bicarbonate (NaHCO_3) administration in the pre-hospital setting for out of hospital cardiac arrest (OHCA) is a controversial and debated topic^{1,4}. The use of NaHCO_3 during cardiac arrest dates back to the late 1970s when it was recommended in early Emergency Cardiac Care guidelines.⁵ Guidelines have evolved and the 2010 Advanced Cardiac Life Support (ACLS) guidelines for adults published by the American Heart Association (AHA) state that “routine use of sodium bicarbonate is not recommended for patients in cardiac arrest” (class III recommendation, based on level of evidence B).⁶ The use of NaHCO_3 is certainly appropriate during cardiac arrest secondary to tricyclic antidepressant overdose, as it negates sodium blockade and QRS widening caused by tricyclic antidepressants and also causes serum alkalization to aid excretion of the drug.⁷

Sodium bicarbonate acts as a buffer solution. It mixes with acid in blood and forms carbonic acid (H_2CO_3), which is converted to carbon dioxide (CO_2) and water (H_2O). When ventilation is adequate, CO_2 is expelled by the lungs, therefore reducing the acid burden in blood.⁸ The acidosis that forms during cardiac arrest is secondary to hypoxia, poor tissue perfusion, and increased lactate production. This acidosis is thought to contribute to decreased myocardial contractility, impaired responsiveness to catecholamines, and potentially multi-organ system failure.² Sodium bicarbonate appears to be an attractive pre-hospital intervention in cardiac arrest cases given prolonged unresponsive times often encountered in OHCA. As a result, studies have explored prehospital administration of NaHCO_3 and its effect on patient outcomes (Table 1). Largely, outcomes are not improved with NaHCO_3 and the available literature does not encourage use of pre-hospital NaHCO_3 .

Table 1: Literature Review

Study	Design	Intervention	Outcome
Vukmir et al. <i>Am J Emerg Med.</i> 2006	Randomized, double-blind controlled trial	NaHCO_3 1 mEq/kg vs. placebo	Survival: 7.4% vs. 6.7%, $p = 0.88^*$ Survival in arrest >15 mins: 32.8% vs. 15.4%, $p = 0.007$
Kawano et al. <i>Resuscitation.</i> 2017	Retrospective cohort study	NaHCO_3 vs. no NaHCO_3	Favorable Neurological Outcome: 1.2% vs. 10.6% Survival at Hospital Discharge: 2.2% vs. 3.5%

* Editorial reviews have questioned the statistical tests that were performed by this study group, and overall their conclusions remain disputed. Authors of the editorial argue that the conclusions of this study were that NaHCO_3 compared to placebo was not associated with improvement in survival regardless of duration of cardiac arrest.

We performed a retrospective review of 25 pre-hospital cardiac arrest cases. There were a total of nine cases where NaHCO₃ was administered (Figure 1). More than half of these administrations (56%) were a 50 mEq IV bolus. This dose choice may be driven by current NYS EMS protocols which read that paramedics may administer NaHCO₃ 50 mEq for suspected hyperkalemia or acidosis during a cardiac arrest presenting with any initial rhythm. Although NaHCO₃ was once thought to be a preferred treatment in hyperkalemia, it does not provide substantial lowering of serum potassium in the acute setting and is unlikely to be beneficial.⁹

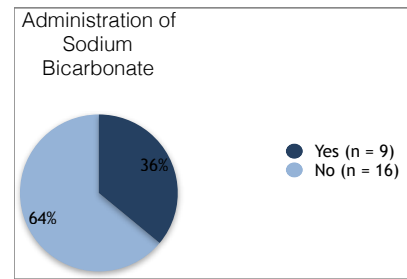


Figure 1

Among the 9 patients that received NaHCO₃ during OHCA, three (33%) received the appropriate weight

Sodium Bicarbonate Dose	Number of Subjects n = 9
< 1 mEq/kg	5 (56%)
1 mEq/kg	3 (33%)
> 1 mEq/kg	1 (11%)

Table 2: Dose of Sodium Bicarbonate

based dose of 1 mEq/kg (Table 2).⁶ This practice by some pre-hospital providers may stem from older versions of the NYS EMS protocols or the dose recommendation by the AHA (1 mEq/kg).⁶ In our review of cases, most commonly (56%), the NaHCO₃ dose was sub-therapeutic (<1 mEq/kg). In one case, the total dose of NaHCO₃ administered during resuscitation was 2.9 mEq/kg (100 mEq in a 35 kg patient). Also, rationale for use of NaHCO₃ administration may be charted in the medical record. In five cases the rationale was provided as “Per protocol” (2), “Lactic Acidosis” (2) and “Dialysis patient” (1) under

the NaHCO₃ treatment summary. Overall, it does not appear that the dose or rationale for use of NaHCO₃ is uniform among providers.

Eight of nine (89%) cardiac arrest cases had an initial rhythm of asystole or PEA, which is an interesting finding. It raises the question of whether pre-hospital providers are more inclined to use NaHCO₃ in a non-shockable rhythm since it is an additional intervention to offer patients. Additionally, pre-hospital providers may consider asystole to be the result of prolonged hypoperfusion and are inclined to administer NaHCO₃ since those patients may have presumed acidosis at that point in the resuscitation. On average, NaHCO₃ was administered 12±8 minutes after IV access was obtained. Administration of NaHCO₃ did not influence rates of ROSC achieved prior to ED arrival. Outcomes comparing NaHCO₃ administration with no NaHCO₃ administration are listed below in Table 3.

	NaHCO ₃ n = 9	No NaHCO ₃ n = 16	p-value, Fisher’s Exact Test
Return of Spontaneous Circulation	1/9 (11%)	5/16 (31%)	0.4
Field Terminations	2/9 (22%)	4/16 (25%)	1.0

Table 3: Patient Outcomes

Empiric administration of NaHCO₃ is not without risk. It may compromise cerebral perfusion pressure by reducing systemic vascular resistance, may lead to alkalosis which impairs oxygenation of the tissues, may increase plasma osmolarity, and may exacerbate intracellular acidosis via the production of CO₂.^{2,3}

Additionally, the AHA states that "high quality chest compressions" and early defibrillation in an attempt to achieve rapid ROSC are the "mainstays of restoring acid-base balance during cardiac arrest".⁶ Sodium bicarbonate is also associated with a substantial cost and may be difficult to obtain. The average wholesale price for each 50 mEq/50 mL syringe is ~\$10.¹⁰ Moreover, NaHCO₃ has been on national shortage and both the American Society of Health-System Pharmacists and The Society of Critical Care Medicine make recommendations to conserve its use.¹¹ Given the current pre-hospital evidence, risks with NaHCO₃ use, national shortage and cost associated with NaHCO₃, and our review of 25 OHCA cases, NaHCO₃ administered empirically in the pre-hospital setting for OHCA is unlikely to improve patient outcomes. Pre-hospital use should only be considered in cases of TCA overdose. It is more resourceful and evidence-based to utilize NaHCO₃ in the setting of cardiac arrest upon confirmation of significant acidosis at ED arrival.

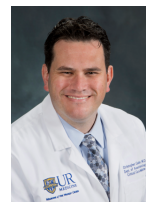
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The Power of Mentorship - Part 1

Christopher Galton MD, EMT-P

When we start our EMS careers, the path forward seems easy. You want to run every great call there is to run and you tell yourself that the path to becoming the best paramedic or EMT is through sticking tubes into people, covering up holes in the chest, and driving fast down the road. After a few years, most of us realize that longevity in this career comes from being satisfied with the less sexy calls. I was recently standing around with a group of EMS colleagues and we



were talking about how the people that stay in this career don't depend on the drama to keep them going. This discussion got me thinking about the value of mentorship and how three very important people in my career shaped the paramedic and physician that I am today. This multipart column will discuss the value of finding a mentor and how to go about it. I want to start by introducing you to three mentors of mine that really shaped my EMS career in the early days. These three people helped guide me toward a healthy EMS career and are a large part of why I continue to work in EMS even though the cost to my personal life is frequently high.

My first medical director was one of the early Denver General paramedics. After a long paramedic career, he went on to be a very successful emergency physician and eventually the EMS medical director of Colorado. Arthur Kanowitz was the physician that introduced me to the idea that EMS patients don't need to suffer. He believed that EMTs and paramedics had the ability to make positive impacts on the lives of every patient they interacted with. In the late 1990s, the mindset in EMS was that pain medications were potentially dangerous and should be used in only the worst cases. Dr. Kanowitz challenged that idea and pushed back against many powerful and prominent physician EMS leaders. He did research on the use of prehospital analgesics and demonstrated both safety and efficacy. He took that information to his colleagues and fought for what he believed in. His passion for looking past the "emergency" part of what we do and treating ailments without regard to circumstance, continues to change EMS minds across the country. Art is the reason that I am so passionate about treating pain and the reason that I will not stop preaching his vision until our collective performance is at a high level.

The first "ALS chief" I ever worked for was another early Denver General paramedic named Jeff Forster. Jeff was a legend in Denver as one of the best paramedics they ever turned out. He was the type of guy that people turned to when things were going bad, and he was the paramedic that every other paramedic wanted to be, including a baby paramedic named Galton. He was a legend for a variety of reasons, and he taught me an immense amount about not only EMS, but how to treat employees, how to lead by example, and the meaning of being a leader instead of a manager. One day, when the world was blowing up, he hopped on an ambulance and we went on a call together. After the call, he cleaned the back of my ambulance better than it has ever been cleaned before. I told him that I was happy to clean up after myself and asked him why he not only cleans the floors of my ambulance so diligently, but still rides at all hours of the day taking any call that came his way. He looked me square in the eyes and said one of the most impactful things I have ever heard. He said "never ask someone else to do something that you are not willing to do yourself." He led by example, and of all the great people I have met over the course of my professional life, he stands out as someone that worked hard every day to earn, and then maintain, the respect from those around him. It did not matter whether they were the chief medical director, entry level paramedic, or housekeeping staff cleaning up at the end of the day. He was always happy to help anyone do anything just to demonstrate that he valued them as much as we valued him. To this day, if he called me for help, I would claw my way through a brick wall to help him without even a thought.

Finally, I want to end with the person that had the most significant impact on the way I operate as a paramedic today. Thom Hillson (aka Thom Dick) is a columnist for multiple different EMS magazines and journals. He has written books about caring for patients and fellow EMS colleagues. To this day, I have never met another human being that cared more for every other living soul in this world. I started off my EMS career working the night shift for eight years, and I loved it. One of the drawbacks of the night shift is this creeping cynicism that becomes suffocating because of the typical clientele that make up your regular call volume working in an urban/suburban EMS system. I had the pleasure of working

with Thom for 4-5 years early in my career when I was an impressionable paramedic. I remember thinking he was a wise old sage that had been everywhere and seen everything. The two of us developed a wonderful relationship and he ended up writing me the best letter of recommendation for medical school that I have ever seen.

One day Thom pulled me aside and asked me to go grab lunch with him and he was the type of guy that you wanted to be around all the time, so I was thrilled. While we were out eating, he asked me if everything was all right. Initially I thought this was just banter, but he continued to say that he was worried about me. He had noticed a deterioration in my typically positive, upbeat attitude. I told him about being a little depressed lately because of some bad outcomes and how I was likely going through a period of burn out, but I really just tried to blow it off. He did not let up and we proceeded to have lunch weekly for the next few months. During those lunch meetings, Thom and I talked about a wide variety of things, many times not mentioning EMS at all. It was at one of these meetings that he used a phrase that has stuck with me to this day and is ever present when I am working in EMS. We were talking about customer service in EMS and why I was worried that I stopped caring about my patients. He specifically challenged me by saying "why not." What he meant by that was much more complicated than I initially appreciated. He was really asking my why I was not willing to go the extra mile anymore to take care of people and why was I staying in this job if that was the case. This was the point that I realized that a career in emergency services is not about you, it's about the people that need you. This is when I finally understood that being an EMS professional was not about the person that could put an endotracheal tube in upside down with a patient stuck in a car that was hanging off a cliff in a snowstorm. It was about knowing that someone is calling 911 because they need your help. That might be taking them to the hospital because they are having chest pain, but it also might mean helping them clean up after falling on the way to the toilet. You don't get into this career because you want to help an elderly person change out of urine soaked clothes and then start a load of laundry. You do stay in this career because you realize that those are the patients that need your help the most and you are the person that they turned to in their moment of need. I would encourage you to take Thom's advice and ask yourself "why not" if you ever have a question about customer service and the needs of the citizens that we are charged to care for in their time of crisis.

In the next issue, this column will address why finding and maintaining the right mentor is important if you expect to stick with this career and make a difference. If you have any questions about this column, I can be reached at christopher_galton@urmc.rochester.edu.

EKG Challenge - Conclusion

Maia Dorsett MD, PhD

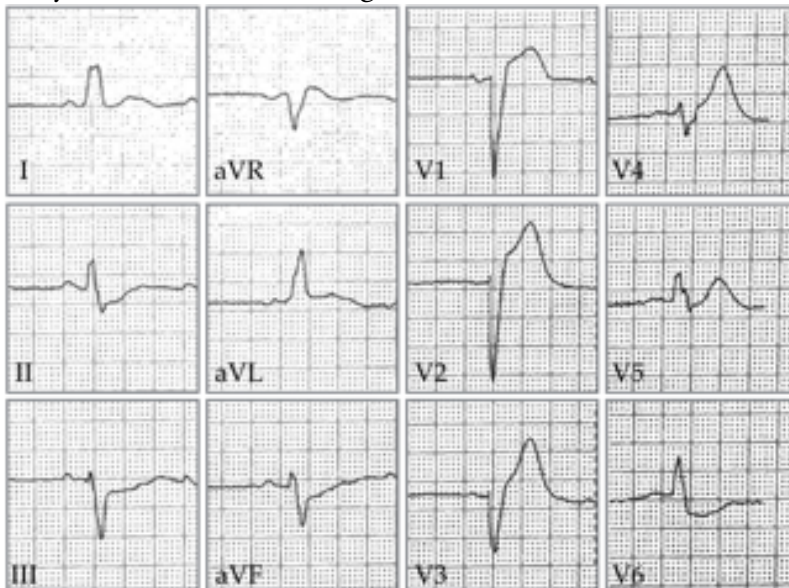
When you first look at the ECG, you note that there appears to be an abundance of PVCs... ventricular trigeminy actually. Given the patient's clinical appearance, you suspect an acute MI. You administer aspirin and begin transport to the hospital. Now to just sort out the ECG to support your clinical gestalt and decide whether to call a STEMI...

Given the prevalence of ventricular ectopy, you begin your analysis by identifying sinus beats to evaluate for ischemia:



Sinus beats outlined in blue. Other beats are premature ventricular contractions (PVCs)

If you take one sinus tracing for each lead:

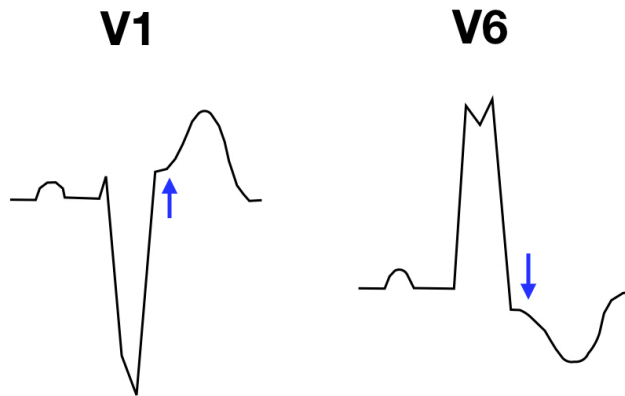


Secondly, you observe that the tracing follows left bundle branch block ([LBBB](#)) morphology. New LBBB may be considered the criteria "formerly known as" an indication for cath lab activation.

The 2004 ACC/AHA STEMI guidelines included new LBBB as an indication for Cath lab activation in patients presenting with symptoms suspicious for acute MI. This was changed in 2013, largely due to data suggesting that this was responsible for a large number of "false positive" cath lab activations [1]. Two separate studies involving patients with LBBB evaluated for suspected STEMI found an overall low prevalence of coronary lesions amenable to PCI [2,3].

In "normal" LBBB, repolarization is characterized by ST segment and T wave deviation away from the major direction of the terminal QRS waveform - also known as "appropriate discordance" [1]. In leads where the QRS is positive, the ST segment (and often the T wave) are deflected in the opposite direction and vice versa:

Appropriate Discordance

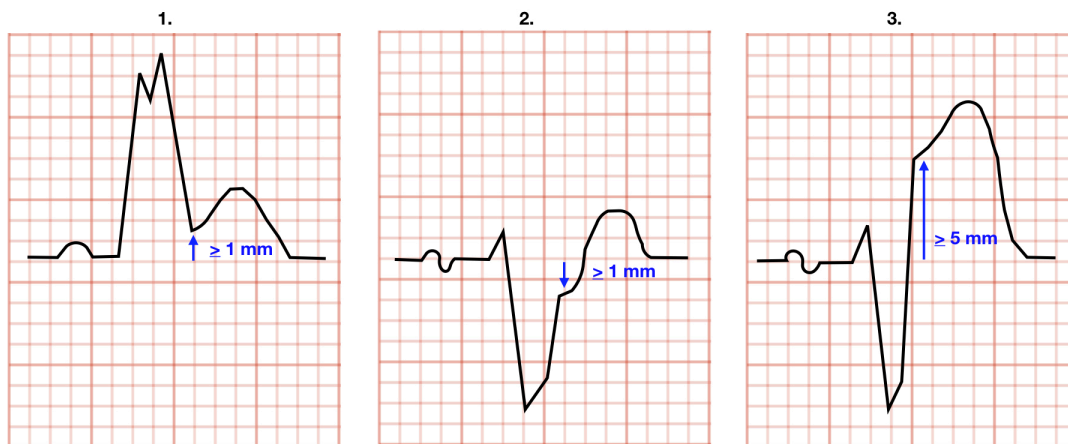


In the presence of a LBBB, small amount of ST elevation or ST depression that is opposite the direction of the QRS complex is a **normal** finding.

Appropriate discordance makes it more difficult, but not impossible, to assess for acute myocardial infarction with underlying LBBB. In 1996, Sgarbossa and colleagues derived a clinical prediction rule for ECG diagnosis of acute myocardial infarction in the context of LBBB using positive biomarkers as a gold standard [4]. These three criteria are illustrated in the figure below:

Sgarbossa's Criteria

Consider STEMI in the presence of a LBBB if any of the following are present:



1. ST segment elevation ≥ 1 mm and concordant with the QRS complex

2. ST segment depression ≥ 1 mm in lead V1, V2, or V3

3. ST segment elevation ≥ 5 mm and discordant with QRS complex ("excessive discordance")

Importantly, *Sgarbossa criteria only need to be met in a single lead.*

Sgarbossa criteria are specific but not sensitive for acute myocardial infarction. What this means is that when present, the patient is likely to have a myocardial infarction (especially with Sgarbossa criteria #1 and #2 which are the most specific), but a patient with a LBBB may be having an MI even if Sgarbossa criteria are not present.

In 2012, Smith et. al published a paper addressing the low sensitivity of the initial Sgarbossa criteria by postulating that changing the third component (excessive discordance) to a proportional rule instead of a 5 mm absolute cutoff would increase both the sensitivity and specificity of the criteria. They defined "Abnormal, excessive discordance" as a ST/S ratio of < 0.25.

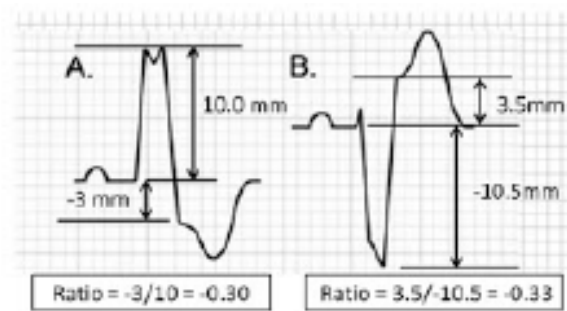


Figure 1. Abnormal, excessive discordance, with the ST segment and T wave in the opposite direction from QRS. Method of measurement: ST segment is measured at the J point, relative to the PR segment. R wave and S wave are also measured relative to the PR segment.

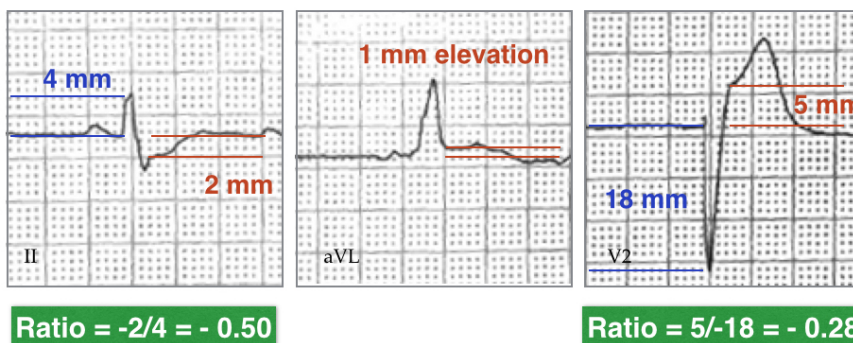
Image Source: Smith et. al. (2012)

The authors proposed a "modified" unweighted Sgarbossa criteria:

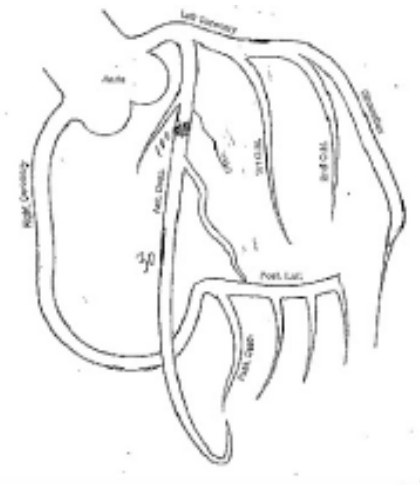
- 1. Concordant ST elevation ≥ 1 mm in any lead**
- 2. ST segment depression ≥ 1 mm in V1, V2 or V3**
- 3. ST/S ratio < -0.25 in any lead with > 1 mm of ST segment elevation or depression**

The ECG was considered positive for ischemia if any of the above criteria were met. The rule was found to be more sensitive for myocardial infarction than the original Sgarbossa criteria.

If we apply the Sgarbossa and Modified Sgarbossa criteria to our patient's EKG, the patient meets criteria for acute myocardial infarction.



The patient was taken to the cardiac catheterization laboratory and was found to have a 100% occlusion of the mid-LAD:



Take Home Points: Left bundle branch block makes the diagnosis of acute myocardial infarction more difficult. The Sgarbossa criteria allow for identification of acute MI in the presence of a LBBB and cath lab activation should be strongly considered when they are present.

We are looking for interesting prehospital ECG Cases. Got one? Please e-mail
Maia_Dorsett@URMC.Rochester.edu

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