

Research and Evaluation in Out-of-Hospital Emergency Medical Services

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When people dial 9-1-1 to request assistance for a medical emergency, they expect the responding paramedics and emergency medical technicians (EMTs) to provide safe, competent, and effective care. Competent practice in medicine and health care should be based on evidence that is substantiated by research. Such is far from the case for out-of-hospital emergency medical services (EMS), whose practitioners commonly utilize protocols and interventions that have limited substantiation from research. Instead, much of the EMS care delivered is based on expert opinion and consensus or has been taken directly from the hospital to the street with no investigation.

The gaps in EMS knowledge and the structural barriers to filling those gaps have been well-documented.¹⁻³

Investigators in North Carolina have a good track record in EMS research and are working toward filling those gaps. Research in EMS in North Carolina will be even better once investigators access a new statewide population-based data system that the state Office of EMS has implemented. There are, however, many more steps to take to allow EMS research to fill the gaps in knowledge.

Gaps in Knowledge

The gaps in EMS knowledge were made clear by a recent systematic review of the medical literature. Smith et al⁴ identified 400 out-of-hospital trials with steady increases in trials through the late 1990s. Nearly two-thirds (63%) of the 400 reports of trials concerned resuscitation and cardiac care. While resuscitation research has improved outcomes from cardiac arrest and demonstrated the benefit of different specialties collaborating on one disease entity, similar progress is lacking on

other fronts. As the authors point out: "The principal finding of this study is the contrast between the wide scope of the out-of-hospital field (resuscitation, airway diseases, injury, out-of-hospital medical treatments, etc) and the lack of high-quality evidence on which to guide practice. Although taking nothing away from the quality of research in this area, cardiac arrest and acute resuscitative attempts account for only 2% of all ambulance responses.... Therefore, the majority of interventions used in the out-of-hospital environment are not based on strong evidence...."⁴

There are many other EMS interventions that require study. The National EMS Research Strategic Plan³ assembled and prioritized an exhaustive list of core topics for which there is a

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need for investigation. Questions in need of research answers include: What are the most effective and safe EMS airway management strategies? Which EMS treatments, including destination decisions, are effective for acute cardiac ischemia? Does out-of-hospital therapeutic hypothermia mitigate brain injury? Which patients, if any, require spinal immobilization? What are the attributes of professional competency in EMS? Is air medical transport cost-effective? What is the impact of emergency department overcrowding on the delivery of EMS care?

Some questions have significant implications for North Carolina. For example, what is the right mixture of staffing an ambulance: one paramedic and one EMT, two paramedics, or two EMTs with backup from a paramedic-staffed quick response vehicle? This question is unimportant when resources are plentiful. However, resources for EMS are shrinking, volunteers are fewer, and paramedics are in short supply.⁵

Are the gaps in knowledge important? The answer is an unequivocal yes. While a call to 9-1-1 will likely produce an ambulance and a ride to the hospital, there is no guarantee the care will be consistent from one EMS system to another. A recent study comparing systems across the nation found that out-of-hospital care for trauma patients varied substantially.⁶ As Delbridge and March⁷ pointed out in their commentary on this study, "Rather than indicating areas of poor quality, variation in out-of-hospital care for trauma patients may indicate a collective uncertainty about the effectiveness of some interventions."

Structural Barriers

The National EMS Research Agenda¹ highlighted 5 impediments to high quality EMS research: (1) a paucity of highly skilled researchers; (2) inadequate funding; (3) failure of EMS professionals to understand the importance of conducting EMS research and translating the findings into clinical practice; (4) a lack of integrated information systems that provide for meaningful linkage with patient outcomes; and (5) logistical problems in obtaining informed consent.

Removing these barriers takes on a special urgency when one considers the impact they may be having on EMS research productivity. Since 2000 there has been a precipitous drop in the number of published EMS research trials.⁴ It is unclear why this decrease in studies has occurred. But the implication is very clear: the structural barriers to EMS research are effective.

North Carolina's Role in Filling the Gaps

The good news is that researchers in North Carolina are doing their part to bridge the gaps in EMS knowledge despite the barriers. The record of EMS contributions from North Carolina is too long to list here. As examples, investigators in our state are producing new knowledge on the effectiveness of out-of-hospital electrocardiograms,⁸ the role of EMS in public access defibrillation,⁹ the duty of EMS in reporting domestic violence,¹⁰ and the out-of-hospital care of stroke patients.¹¹ But much work remains.

Next Steps

What should we do here in North Carolina to facilitate research and evaluation of EMS interventions and to assure that the care provided on the streets and in the homes of our state is evidence-based? First, we should and do congratulate the emergency medicine programs on the work already accomplished and encourage them to keep EMS research as a priority in their departments. The academic departments of emergency medicine in this state have an obligation to lead the efforts to evaluate the evidence, conduct high quality EMS research, and make recommendations on what paramedics and EMTs should and should not be doing in the field. To this end, they should foster collaborative partnerships with other specialties that can be leveraged for external funding. In addition, they should seek EMS fellows with passion and energy and facilitate their learning and investigations. Emergency medical services research will take off when investigators with passion have the partnerships and resources in place to advance knowledge.

Second, these departments should work closely with their respective institutional review boards (IRBs) to jointly explore the problem of obtaining consent on EMS patients who are minimally to nonresponsive and who have no relatives at hand. Mutual understanding of the issues implicit in out-of-hospital informed consent will lead to stronger research protocols. The more EMS researchers interact with the IRB on the problem, the easier it will be to gain approval of out-of-hospital clinical research on unresponsive patients.

Third, while North Carolina has a good system for approving new therapies and practices, the system could benefit from a few modifications. In the current process, proposed additions are vetted by the state EMS medical director and the Office of EMS (OEMS). The medical director then makes a recommendation to the NC EMS Advisory Council. The members of that group will approve the recommendation, which then goes to the NC Medical Board. This system works well but could be improved with two modifications: (1) the state medical director should have the discretion of commissioning outside systematic reviews of proposed interventions, especially for those therapies that are controversial or are being pushed by a special interest group; and (2) the NC OEMS should develop a system for periodic examination of current approved therapies and practices to determine what should be eliminated due to a lack of support from research.

North Carolina is very fortunate to have a progressive Office of EMS. Because of its progressiveness, North Carolina now has a statewide, state-of-the-art population-based data system to which data are submitted by all EMS agencies in North Carolina.¹² Once this data is linked to outcomes, investigators will be able to study—on a broad scale—very important questions about the effectiveness of EMS interventions. This is one of the most important developments in EMS research and evaluation for our state in a long time.

Expectations

North Carolinians expect and receive a prompt response from EMS when they call 9-1-1. They have an equal expectation that EMS care will be the best possible and will be based

on evidence from credible research. North Carolina provides leadership for so many other fields and we should likewise be leaders in EMS research and help break down the barriers and advance EMS knowledge. The people of our state should expect nothing less. **NCMJ**

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