



Invited Commentary | Emergency Medicine

Patient Outcomes From Ground vs Helicopter Emergency Medical Services: The Challenges of an Accurate Comparison

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Every line is the perfect length if you don't measure it.

Marty Rubin, *The Boiled Frog Syndrome*

The first dedicated civilian helicopter emergency medical services (HEMS) made their debut in Europe and the United States in the early 1970s. The obvious driving force behind this innovation was to provide rapid transport to definitive care. This concept had been previously proven by the military, so the logical assumption was that it could be successfully applied to the civilian world.

The obvious question was—and still is—“which is the optimal mode of prehospital transport?” The answer is quite complicated.

In the 1980s, the concept of severity scores for trauma was developed and refined.¹ For research purposes, this facilitated consistency of field triage and rapid assessment of injury. Trauma patients used in research could be sorted and stratified, but what about the level and type of prehospital interventions?

The first study of HEMS vs ground emergency medical services (GEMS) outcomes in the United States was published in 1983.² Most of the early studies focused on the transport of trauma patients from the field. Since then, more than 70 research papers have been published, examining the transport of patients experiencing not only trauma but almost every aspect of emergency medicine pathology.

Most of the research on this subject during the last 40 years has been done using retrospective analyses of hospital and transport data. Some use a single hospital or region with a few hundred patients,³ while others use nationwide pooled data with nearly 500 000 patients.⁴

When examining past research on this subject, there are several confounding factors. Many of the studies were done several decades ago. The tasking, technology, and education surrounding prehospital care has changed radically, especially during the last 20 years. A very legitimate conclusion based on data from the 1990s or even 2000s may be irrelevant today.

There is a major problem with almost all large studies that use national and/or state-level trauma data banks: the comparison of HEMS and GEMS is based on the common faulty premise that HEMS and GEMS are each uniform, homogenous entities. The prehospital environment is inaccurately classified as air or ground, with no further stratification. It cannot realistically be painted with such a broad brush.

Because of multiple economic and regulatory issues in the United States, there can be a huge disparity in the education, training, and qualifications of HEMS medical crews from program to program. This is further exacerbated by the fact that payment for HEMS service is based only on the distance transported. There is no financial incentive for medical or aviation quality beyond the bare minimum. During the last 2 decades there has been a massive shift in HEMS from the traditional hospital-based model to for-profit, free-standing community bases. More than half of the US HEMS programs are now owned and operated by 2 large private equity firms. The financial structure of a HEMS program has a tremendous influence not only on the type of aircraft and medical equipment used but also the education, level of experience, and specialty training of the personnel. Quality, aviation or medical, comes with a price.

Because of the inherent nature of its regulation and funding, GEMS in the United States is even more fragmented. It can be roughly classified as basic, advanced, and sometimes critical care.

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However, the educational requirements, equipment, capabilities, and availability can vary dramatically, not only from state to state but even within a given city.

The article by Alstrup et al⁵ stands out from prior research on this subject for several reasons. Owing to inherent ethical concerns, an actual randomized clinical trial of HEMS vs GEMS has never been and most likely never will be done. Although the study by Alstrup et al⁵ is retrospective, by using adverse weather to naturally select HEMS vs GEMS, it is 1 of only 2 studies found in the literature⁶ that use weather to approximate a randomized design.

Another unique aspect of this article is that the level of medical care provided on the ground and in the air is well defined and, more importantly, identical. In Denmark, as in many countries with socialized medicine, the education of personnel and the structure of prehospital care tends to be more standardized than in the United States. For research purposes, this can effectively eliminate the inherent difference in HEMS vs GEMS staffing as a major factor shaping research results.

Consider the pharmaceutical industry. Results of published research studies can have huge financial implications. This is also true for many aspects of medicine, including prehospital transport. Conclusions from such research have been used to justify funding, utilization, and expansion of the HEMS industry in the United States. It is important to examine not only the end results and take-home message but also the structure of the study and data analysis. The validity of the conclusion is only as good as the validity and bias of the research.

It is impossible to make a blanket statement regarding the superiority of HEMS to GEMS or vice versa for any medical condition. There are just too many variables that must be considered: the type and severity of illness, the transport distance, the training and capabilities of the GEMS crew compared with the HEMS crew, and the availability of GEMS compared with HEMS. Probably, the best that can be done is research like this Danish study,⁵ which limits its scope to a specific region and patient population in which the structure and capabilities of HEMS and GEMS were well defined.

ARTICLE INFORMATION

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