human beings are resistant to change, and radiology technologists are no exception. We have been performing supine oblique views routinely for traumatized patients for five years at my institution. Our radiology technologists now prefer trauma oblique projections to routine oblique views of the cervical spine because they are easier to perform consistently. From a radiologist's perspective, I find fewer repeat examinations with the trauma oblique views of the cervical spine as compared with routine oblique projections. This is explained by the elimination of patient rotation. Normal anatomic differences in foraminal position also create some variation in the adequacy of routine oblique cervical spine radiographs, even when these are obtained with appropriate positioning.

In summary, I am a strong advocate of the routine use of trauma (supine) oblique radiographs in evaluation of cervical spine injuries. I commend Dr Turetsky and his colleagues for their investigation and strongly believe, as a radiologist observing similar cases, that these additional views do increase diagnostic accuracy. Perhaps more importantly, diagnostic confidence, a factor difficult to measure quantitatively, is also increased. In concert with our clinical colleagues, these factors can only improve our insight into whether further, more costly radiologic studies such as CT are needed. The objective is the best initial evaluation of the injury to identify lesions amenable to correction and to provide a guide for further treatment.

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## EMS Systems: Opening the 'Black Box'

*See related article, p 638.*

Twenty years have passed since the Emergency Medical Services System (EMSS) Act of 1973 authorized the initial funding for EMS systems and spurred the development of modern EMS as we know it. EMS operations have proliferated and improved steadily. Concomitantly, EMS research has dealt with issues of training and system development. More recently, as systems have matured, EMS research has begun to be directed toward more narrowly focused questions regarding specifics of operations and accomplishments in order to provide new models on which to base future EMS system planning, development, and evaluation.

In its initial conceptualization, the prehospital phase of care was divided into on-site care and care en route.[1] Primarily for administrative reasons, time intervals associated with prehospital care were broken down into response time, time on scene, and transport time. The actual processes occurring in each of these intervals were not studied empirically. In a sense, these intervals were viewed as "black boxes."

In the late 1970s Eisenberg[2] and Polnitsky,[3] who were interested in prehospital cardiac care,were among the first to peer into the black box. They pointed out the lack of consistency of definitions, including time intervals, when reporting data on out-of-hospital cardiac arrest. Eventually, the development of the Utstein II cardiac arrest reporting model provided a more detailed definition of these time intervals; although this model is supported by substantial data, it is not derived from direct observation of interval processes.[4] In the area of noncardiac arrest prehospital care, there to date has been no concerted effort to refine reporting terminology based on direct empirical study of events in the field.

In this issue of *Annals,* Spaite and colleagues describe a new, empirically validated model for EMS evaluation. This model is generic and may be applied to any aspect of prehospital care (eg, cardiac arrest, trauma). Particularly noteworthy is the operational taxonomy scheme that divides the on-scene period into four clearly defined intervals: patient access, initial assessment, scene treatment, and patient removal. Also included is a system recovery interval, defined as the time required to return to service after the care of the patient is transferred to hospital personnel. This last interval is rarely addressed in studies of prehospital care, yet obviously has a major effect on system performance because long recovery times that may be associated with specific types of care may have an exaggerated negative impact on overall system response.

The authors also consider the effect of such nonmedical factors as operational and logistical problems or interagency events on interval duration. In the study reported in this issue, for example, almost 50% of the on-scene interval was attributable to patient removal. The authors found that operational problems were associated with a longer patient removal interval. As an investigator concerned with the regional variation in outcomes of trauma care, I also was interested in the finding that nearly every time interval in rural areas was longer than nonrural, not just response and transfer intervals as one might logically anticipate. It will be interesting to see if these findings are confirmed by data from other systems.

The flexibility of Spaite et al's model is found not only its applicability to all aspects of prehospital care but also in its ability to generate new data related to the temporal effects of specific interventions performed within an interval. For example, an increase in the on-scene interval of five minutes when an IV line was started was identified in the treatment interval, even though starting the line took only a little more than one minute. Further analysis demonstrated that operational problems were the main reason for the increased treatment interval.

My single concern about the model by Spaite et al is, paradoxically, what makes this model so unique: dependence on an in-field observer for data collection. While I was very impressed by this conceptually simple method, I am not optimistic regarding its general applicability as a data collection method. For example, in Michigan few EMS systems, large or small, have the resources to collect even simple outcome data, let alone hire an in-field observer. I believe that until an efficient sampling strategy is developed to accompany in-field observation, only a handful of researchers and EMS systems will be able to use Spaite et al's model.

Nevertheless, the authors have made an extremely valuable contribution to the field of EMS. I think the concepts in this model will be useful and will find wide application in EMS research by helping investigators or evaluators of prehospital care to appropriately identify the relevant factors relating to a particular process or outcome event. This work should facilitate the standardization and increase the comparability and value of clinical data on EMS system performance. I hope that Spaite and his colleagues will continue to refine this methodology, and I look forward to further guidance in implementing it in both EMS research and eventually in day-to-day operations.

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