

# New Type of Preventable Death

Takashi Ukai, MD

Senior Consultant, Hyogo Emergency  
Medical Center, Kobe, Hyogo, Japan

**Correspondance:**

Takashi Ukai, MD  
Senior Consultant  
Hyogo Emergency Medical Center  
1-3-1, WakahamaKaigandori, Chuoku  
Kobe, Hyogo 651-0073  
Japan  
E-mail: ukai-t@mxr.mesh.ne.jp

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**Abbreviations:**

DVT = deep vein thrombosis

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Dear Editor:

The Niigata-Chuetsu earthquake, which hit the Niigata Prefecture of Japan on 23 October 2004, claimed 40 deaths. Of these victims, 27 were killed almost instantly by trauma, and 23 were killed by so-called disaster-related death. At least 11 people suffered from pulmonary embolism and five died within two weeks of the disaster. All of them had been using motor vehicles as their shelter, because the officially designated evacuation centers (gymnasiums) were too crowded. Many people thought that their small cars were more comfortable than the evacuation centers, that afforded very little privacy. Some preferred to stay outside of the buildings because of the repeated strong aftershocks. Although tents were distributed to the evacuees, it was too cold to stay in them at night.

Sudden death and illness by pulmonary embolism now is popularly known as "Economy Class Syndrome", as seating arrangements in economy class are too narrow for passengers to stretch their legs. The development of deep vein thrombosis (DVT) among people spending a long time crowded in their small cars is predicted easily.

Using ultrasonography, Dr. K. Hanzawa of Niigata University Medical School checked 69 evacuees who used their cars as shelter for >3 days and found DVT in 22 of them. Of these, three showed clinical symptoms of DVT. Elderly people were prone to restrain themselves from drinking water, as they hesitated to use the public toilet frequently. This also might be one of the causes of the high incidence of DVT.

Death by pulmonary embolism among evacuees in their cars must be a new type of preventable death that may be avoided by the public education and preparation of more comfortable evacuation environment. It may likely be seen in places other than a densely populated country like Japan.

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# Measures of Effectiveness of Hospital Incident Command System Performance

Jeffrey L. Arnold, MD; James Paturas, EMT-P; Ülkümen Rodoplu, MD

**Keywords:** effectiveness; emergency manage-  
ment; hospital emergency incident command  
system (HEICS); incident command system  
(ICS); performance; triage

**Abbreviations:**

HEICS = hospital emergency incident com-  
mand system

ICS = incident command system

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Dear Editor:

The article by Thomas, Hsu, Kim, *et al* entitled "The Incident Command System in Disasters: Evaluation Methods for a Hospital-based Exercise" in the January-February 2005 issue of *Prehospital and Disaster Medicine* raises important questions about what constitutes a relevant measure for hospital Incident Command System (ICS) performance in real or simulated emergencies or disasters.<sup>1</sup> In this article, the authors suggest that the comparative time intervals to triage, treatment, or transportation are relevant measures of ICS performance in a hospital disaster exercise. Unfortunately, this study and its underlying assumptions have several important limitations.

A first concern is that the authors never define what they mean by a hospital ICS or show us the configuration of the one that they studied. This seems particularly important if we are to generalize their results to other settings. For example, the hospital ICS in this study does not appear to be the Hospital Emergency Incident Command System (HEICS), since its nomenclature is unique (e.g., "Staging Area Coordinator"), there is no report that job actions sheets were used, and unusual responsibilities are reported, such as the Incident Commander designating the triage

Incident Command System function	Measure of Effectiveness	Independent Variable	Dependent Variable
Command	Whether commands from the Incident Commander produce actions by Subordinate Section Leaders	Command by Incident Commander to Subordinate Section Leader to perform action <sup>a</sup>	Action by Subordinate Section Leader
	Whether commands from section leaders produce actions by Subordinate Unit Leaders	Command by Section Leader to Subordinate Unit Leader to perform action <sup>b</sup>	Action by Subordinate Unit Leader
Control	Whether commands from the Incident Commander prevent actions by Subordinate Section Leaders	Command by Incident Commander to Subordinate Section Leader not to perform action <sup>a</sup>	Action by Subordinate Section Leader
	Whether commands from section leaders prevent actions by Subordinate Unit Leaders	Command by section leader to Subordinate Unit Leader not to perform action <sup>b</sup>	Action by Subordinate Unit Leader
Coordination	Whether commands from the Incident Commander produce coordinated actions by Subordinate Section Leaders	Command by Incident Commander to two or more Subordinate Section Leaders to perform interdependent actions within defined time frame and at defined location	Interdependent actions by two or more Subordinate Section Leaders within defined time frame and at defined location
	Whether commands from section leaders produce coordinated actions by Subordinate Unit Leaders	Command by section leader to two or more Subordinate Unit Leaders to perform interdependent actions within defined time frame and at defined location <sup>c</sup>	Interdependent actions by two or more Subordinate Unit Leaders within defined time frame and at defined location

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**Table 1**—Potential measures of the hospital emergency incident command system (HEICS) effectiveness (<sup>a</sup>Overall effectiveness of command and control functions optimally evaluated through commands to Subordinate Section Leaders in each major HEICS section; <sup>b</sup>Overall effectiveness of command and control functions optimally evaluated through commands to Subordinate Unit Leaders within each branch of chain of command; <sup>c</sup>Overall effectiveness of coordination function optimally evaluated through commands to Subordinate Unit Leaders within each major HEICS section to perform interdependent actions.

area (an extremely unlikely event in HEICS).<sup>2</sup> Without understanding the incident management system that was studied, we have no idea of its bearing on their results.

A second concern centers on the use of comparative times to triage, transportation, and treatment (temporal patterns) as measures of the *effectiveness* of ICS performance. According to the Task Force on Quality Control in Disaster Medicine, the *effectiveness* of an intervention “relates to how closely the output (effects) matches the specified goal”.<sup>3</sup> A key methodological problem is the author’s failure to specify the desired outcomes of hospital ICS with which their results can be compared. We are left to infer that they believe that the time intervals to triage, transportation, and treatment should result in a temporal pattern in which “red” patients have the shortest time intervals, while “green” patients should have the longest, yet they make no attempt to convince us that this is the gold standard for hospital triage (let alone for ICS performance). For example, in the triage system now taught in the American Medical Association’s National Disaster Life Support course, “green” patients are rapidly dispensed with by ordering them to walk to designated sites.<sup>4</sup> A related concern is that other triage outputs, such as timeliness (whether triage takes place within the desired time interval) or accuracy (whether triage accurately assigns patients to the correct triage category) may be more relevant measures of triage

effectiveness than comparative triage times.<sup>5-7</sup> In a similar manner, the timeliness of decontamination (whether all patients are decontaminated within a certain time interval) or the accuracy of decontamination (whether all of the contaminant is removed) may constitute more relevant measures of the effectiveness of decontamination than does the temporal pattern of decontamination.

Another problem is that the “time to triage” is likely to be influenced by many factors, including environmental factors (e.g., accessibility, lighting, scene hazards), technical factors (e.g., type of triage system, type of triage tags), and human factors (e.g., competencies of those performing triage), in addition to how the overall process is controlled and coordinated. Competencies depend not only on the participants’ backgrounds, but also on whether they have been adequately educated and trained. The provision of adequate education and training depends on adequate emergency preparedness, which in turn relates to whether the hospital has an adequate emergency management plan and adequate emergency management leadership prior to the event. The time to treatment (arrival in the treatment area) is likely to be even more complex, depending on a number of communication and transportation factors as well. Even if the authors had selected the temporal pattern of other operational functions as measures of ICS performance, such as hemostasis in the operating room or sec-

ondary distribution to other hospitals, similar confounding factors would render the results of dubious value.

We believe that the authors would have been better off asking: "What is the purpose of a hospital-based ICS?" Hospital incident command systems do not exist in order to perform "effective" triage or "effective" decontamination or "effective" hemostasis in the operating room. Rather, they exist in order to provide "effective" command, control, and coordination of the healthcare organization's overall response to an event. While a major goal of hospital emergency response is to provide triage and treatment in order to produce healthy survivors, hospital emergency response has other important goals, including the provision of ongoing healthcare to existing patients, the protection of healthcare workers from potential hazards, the provision of mental health support to patients, guests, and healthcare workers, and the adequate communication of the event (and risk) to the public. Hospital incident command systems are the glue that holds the many disparate administrative, logistical, informational, financial, and operational elements of healthcare organizations together in order to facilitate overall hospital emergency response. Accordingly, the failure of one section or unit within the hospital ICS (i.e., an ineffective temporal pattern of triage, untimely triage, or even inaccurate triage) does not necessarily constitute a failure of the overall system.

If comparative "times to triage" or "times to treatment" are not the most relevant measure of the effectiveness of a hospital ICS, then what are? Since the primary purpose of a hospital ICS is to command, control, and coordinate, we believe that measures based on these critical functions are particularly relevant to hospital ICS performance. Table 1 shows potential measures of effectiveness of HEICS performance based on the overall functions of command, control, and coordination. Although generic variables are listed in Table 1, each pairing of a command with its desired action must be specified *a priori* in order to allow the comparison of each observed (or measured action) with the desired one. It is also noteworthy that the functions of command, control, and coordination depend on communication, which is often the most critical confounding factor in emergencies and disasters.

In the setting of real emergencies, this type of analysis is likely to be extremely complex, especially if the overall performance of the ICS is being examined (and not just the performance of specific sections or subsections).<sup>8</sup> Fortunately, disaster exercises provide the opportunity to monitor the effects of specific stimuli, which have been built into the scenario for the sake of evaluation. These stimuli may be provided as "injects" that the exercise controllers introduce into the exercise at pre-designated points. For example, if the goal is to evaluate whether a command by the incident commander leads to a specific action by subordinate section leaders, then the controllers may insert a prompt for this command into the exercise in the form of information or a request from another emergency response organization, local public safety, local public health authorities, other hospitals, the media, or even the public.

Recipients of injects in a disaster exercise may be blinded or unblinded to the purpose of the inject as a stimulus to issue a command. Blinded recipients of injects are at risk for not issuing the expected command, while unblinded recipients are at risk for revealing the ulterior purpose of the inject to other participants. One way to circumvent this problem is to introduce injects of sufficient quantity and types to various blinded leaders in the Incident Command System at various points during the exercise.

A final problem with this study is that the authors suggest that their measures of ICS effectiveness can be corroborated through a structured survey of the exercise participants' perceptions in a post-exercise debriefing session. On the one hand, they report an "ineffective" temporal pattern of triage, with the highest priority "red" patients having the longest delays, and conclude that the ICS was deficient. On the other hand, they report mean scores that ranged from 1.00–2.43 (on a 1–5 scale) on every question of their post-exercise survey of both groups of participants, suggesting that the participants' perceptions were largely favorable (to the extent these questions measured perceptions of ICS effectiveness).

How could triage have been so poorly performed, yet the participants felt that their Incident Command System performed so well? One possible explanation is that the participants didn't feel their ICS performed so poorly after all. Another possible explanation is bias from the "halo effect" of international developmental assistance. Similarly favorable perceptions were encountered when an American humanitarian group introduced HEICS into a Turkish hospital in 2000 and surveyed participants after the project, which included a disaster exercise.<sup>9</sup> A major limitation of this type of survey is that the participants in disaster exercises in developing countries staged by volunteer organizations from developed countries may have many reasons not to report their negative perceptions, including their appreciation for the efforts of the volunteer organization to come to their country and provide assistance.

Our preference is to conduct a systematic debriefing of all participants after a hospital disaster drill in two steps. In the first step, participants are anonymously surveyed regarding their experiences in the disaster drill through a standardized survey, which is sent home with them after the drill and encouraged to complete it as soon as possible. At the same time, several trained evaluators, who have monitored each major ICS section during the exercise, provide their written evaluations as well via a standardized tool. These surveys and evaluations are combined to produce an anonymous report, which then is provided to all participants. In the second step, a structured debriefing is held several days after the exercise. During this session, the anonymous report is discussed and modified as needed, with an aim to identifying lessons learned. Nevertheless, neither the results of our approach nor the results of the survey reported in this study should be construed as measuring the effectiveness of hospital ICS performance.

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