Application of Evidence-Based Hospital Emergency Incident Command System (HEICS) in Taipei

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Abstract

Although re-evaluation of Hospital Emergency Incident Command System (HEICS) plans revealed great improvement in Taipei, it still deserves further investigation whether the improvement continues. The other issue is the evidence on which the hospitals depend to revise their plans. Of the 53 plans, there were about 53 (100%) that had predictable chain of management, and the average score was 78±9 points (*P*=NS v 79±8 points for last version). As to accountability of position function, there were almost as many as plans that met with the criteria (n=32; 61% v 58%, *P*=NS) compared with last version, as the average score was (71±7 v 68±5, *P*=NS). The performance were better in the part of flexible organizational chart (n=31; 58% v 58%, *P*=NS) that allows flexible response to specific emergencies (average scores 78±20 v 68±13, *P*<0.05), improved documentation of facility (72±16 v 64±10, *P*<0.05) and also common language to facilitate outside assistance (80±18 v 60±6, *P*<0.01). Thirty-eight hospitals (71.7%) have provided prioritized response checklists, cost effective emergency planning within health care corporations, and complete governmental requirements (71.7% vs. 45.3%, *P*<0.001). The scores were thus 78±20, 83±21 and 76±19 points respectively. There were in average about 21±6% major changes in HEICS plans. The greatest change was in the part of accountability of position function (33±10%), followed by the part of flexible organizational chart improved documentation of facility and common language to facilitate outside assistance. In conclusion, there was still no sufficient data on which the hospitals modify their response plans. It is thus critical for all of these hospitals to implement principles of EBM into the revision of disaster response planning.*(Ann Disaster Med. 2006;4:54-59)*

Key words: HEICS; Emerging Disease; Disaster; Hospitals

Introduction

Evidence-based medicine (EBM) is an integration of the best research evidences concerning clinical expertise and patient values. Recent development in EBM such as strategies for efficiently tracking down and appraising evidence, evidence-based journals of secondary publication, systemic reviews and concise summaries of the effects of health care, and the identification and application of effective strategies for lifelong learning and quality improvement, has made itself popular and rapid spread

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globally.[1,2] The same situation has also been met in Taiwan. Although training and education have long been accepted as integral to disaster preparedness, many currently taught practices are neither evidence-based nor standardized.

We ever mentioned that the Hospital Emergency Incident Command System (HEICS) has been developed to assist the operation of a medical facility in a time of crisis in recent years.[3-5] The main structure of the system is a chain of command that incorporates four sections under the overall leadership of an emergency incident commander.[3-5] The four sections including planning, finance, logistics, and operations, have their specific leader assigned by the incident commander. HEICS does not take any specific type of disaster as the essentials of the operation. In other words, it can be applied to any kind of mass casualty incidents (MCIs) using so-called general management model. Taipei City government has begun to request the emergency response hospitals to implement HEICS in their disaster response planning since 2002. However, our past survey revealed that there are still many engagements in training, understanding of HEICS and the overwhelming idea of changing out an entire disaster plan in our systems.[4] Our past report also demonstrated that SARS endemic in Taiwan has also make these hospitals revise their plans with a tendency of implementation of HEICS in their response system.[5] We recently re-evaluated the emergency response plans again from these response hospitals and analyzed the degree of modifications for these plans. Whether the modifications or revisions were derived from EBM was the main issue to be elucidated.

Material and Methods

Study hospitals

There were 53 emergency response hospitals accounting for 20,160 beds in Taipei City in 2003. Of these hospitals, seven were the tertiary care medical centers and the remaining 46 secondary referral hospitals. We then evaluated the disaster response plans and compared them with the last version. Two experts reviewed independently all the plans under the guidelines of HEICS that concentrated upon: predictable chain of management; accountability of position function; flexible organizational chart; documentation of facility; communication to facilitate outside assistance; prioritized response checklists; cost-effective emergency planning within health care institutes; governmental requirements as was the case with public hospitals. For these 8 categories, there were about 5 to 7 items to evaluate the adequacies of the plans. Four individual experts evaluated the plans to determine the scoring. The final scores were summed up and averaged 4 individual scores. The scoring was then compared according to the different levels (or rankings) of these hospitals.

The final results of evaluation were compared with the performance demonstrated in our previous studies.[4,5]

Statistical analysis

All the data were processed and analyzed with Microsoft Excel 2000 for Windows. The techniques applied to data analysis included descriptive statistics generating and independent samples by *t*-test and chi-square test.

Results

Modification of HEICS plans

Of the 53 plans, there were about 53 (100%) that had predictable chain of management, and

the average score was 78±9 points (*P*=NS v 79±8 points for last version). As to accountability of position function, there were almost as many as plans that met with the criteria (n=32; 61% v 58%, *P*=NS) compared with last version, as the average score was (71±7 v 68±5, *P*=NS). The performance were better in the part of flexible organizational chart (n=31; 58% v 58%, *P*=NS) that allows flexible response to specific emergencies (average scores 78±20 v 68±13, *P*<0.05), improved documentation of facility (72±16 v 64±10, *P*<0.05) and also common language to facilitate outside assistance (80±18 v 60±6, *P*<0.01). Thirty-eight hospitals (71.7%) have provided prioritized response checklists, cost effective emergency planning within health care corporations, and complete governmental requirements (71.7% vs. 45.3% last version, *P*<0.001). The scores were thus 78±20, 83±21 and 76±19 points respectively.

We compared the performances of 7 tertiary-care medical centers with another 46 secondary hospitals. The average score was significantly higher in tertiary centers than in other hospitals (89±8 vs. 66±14, *P*<0.001). However, the average score was better than that done last year (66±14 vs 40±12, *P*<0.05).

Dependent factors affecting modification of HEICS plans

According to the decisions made by the two experts, there were in average about 21±6% major changes in HEICS plans, which were determined by the evaluation checklist item by item. The greatest change was in the part of accountability of position function (33±10%), followed by the part of flexible organizational chart (22±6%), improved documentation of facility (18±10%) and common language to facilitate outside assistance (15±6%).

There were only 42% of the disaster response plans that documented clearly the reason of modifications. The review disclosed that there were about 34% of the revisions were based upon EBM.

Discussion

This study demonstrated that there was still no sufficient data on which the hospitals modify their response plans. It is thus critical for all of these hospitals to implement principles of EBM into the revision of disaster response planning.

There are several problems or issues that should be emphasized when clinicians practice EBM in Taiwan. First, although many clinicians and researchers have been engaged in EBM for years, these clinical investigators and educators usually have just accepted and utilized the well-established guidelines or clinical practices built up by EBM investigations from other countries. In other words, almost all of the clinicians in Taiwan practice according to the guidelines established by the database or meta-analyses from other countries, whereas the differences in race, gene, socioeconomical status and others may deeply influence the applicability of these so-called EBM in our country. There are few or even no databases in Taiwan to prove or disprove the conclusions derived from global evidence-based medicine surveys.

Second, there is in fact still no well-established evidence-based emergency medicine in Taiwan, either concerning practice guidelines, diagnosis/screening, outcome, patient safety or cost-effectiveness. Each emergency physician here has to provide their services according to the international guidelines because of lacking in database of emergency medicine in Taiwan.

Third, even the most famous EBM database or library in the world such as MEDLINE, Cochrane Library (CL) (update.cochrane.co.uk; www.update-software.com) and Best Evidence (BE) (www.wacponline.org) did not have sufficient database concerning clinical practice in emergency medicine. For example, there are only three articles (including reviews and protocols) that are directly associated with emergency medicine in CL review database. In other words, most of the so-called practice guidelines or emergency medicine are lacking in evidences or are established only under the experts' consensus. When the emergency clinicians in Taiwan perform their clinical practice accordingly, it is uncertain if there are still some pitfalls in clinical management or even harmful to the patient safety. It is therein urgent for us to establish our own database in this filed and furthermore consolidate the necessary guidelines in clinical practice at ED.

Fourth, a recent study reveals that only less than 10% of emergency departments in the United States have adopted evidence-based medicine as their guidelines of clinical practice.[6] Although the data are comparable to the above description, they also suggest that evidence-based emergency medicine is a newly-evolving category in clinical medicine and deserves further development.

There would be several disadvantages for our emergency physicians to practice in this way:

First, some or even most of the international guidelines in the field of emergency medicine are derived from insufficient "evidence" or even only from expert consensus. One of the notorious examples is the BLS guidelines derived from American Heart Association/American College of Cardiology (AHA/ACC) Emergency Cardiac Care (ECC) guidelines.[7,8] The significant changes of performing BLS/CPR described in 2005 ECC guidelines (such as ratio of compression/ventilation 30:2 instead of 15:2) are mostly concluded by animal studies or so-called "expert consensus". There are no randomized control studies to prove or disprove the consensus. It would be difficult for us to accept such major revisions confidently.

Second, some conclusions derived from EBM are not always followed in most countries including us but the practice guidelines still remain unchanged. For example, most studies revealed that door-to-balloon time exceeds 90 minutes that is defined by AHA/ACC either in Taiwan or other countries when treating the patients with acute myocardial infarction. It is difficult for us to determine whether the guideline is correct and should be still fulfilled accordingly or why we still follow the guideline if it is not correct.

Third, there are sometimes dissociation between education and practice in clinical aspects, including emergency medicine. For example, there are very limited cases that underwent endotracheal intubation with secondary confirmation by end-tidal CO2 measurements and fixed with a commercial device that are strongly recommended by ACLS guidelines and well known by most of the emergency staffs. It deserves elucidation the underlying causes of such dissociations or performance bias.

Fourth, some impact of decision making is obviously from socio-economical differences in different countries. The examples will be impacts of health insurance policies, ranking of management ability and capacity among emergency response hospitals, and fulfillment of full-time board-certified emergency physicians.

To our knowledge, there are five critical steps in practice of EBM, including coverting the need for information into answerable questions, tracking down the best evidence with which to answer that question, appraising critically that evidence for its validity, impact, and applicability or usefulness, integrating the critical appraisal with clinical expertise and with the patients' unique biology, values and circumstances, and evaluating the effectiveness and efficiency in executing the above steps and seeking ways to improve them. According to the current status in Taiwan, most of the clinicians or researchers involved in EBM may always perform the first two steps but did not check critically the last three steps. It may create further bias in clinical implications of these EBM-derived guidelines and may even result in medical disadvantages or errors. The situation is the same in the field of emergency medicine in Taiwan. We therein urge to establish our own database of emergency medicine, or "Taiwan Evidence-Based Emergency Medicine Database" (TEBEMD), to resolve the above dilemma which we have to face day after day.

Because EBM is usually implied in the problem-solving of (1) diagnosis and screening; (2) applicability of (practice) guidelines; (3) treatment or therapy; (4) harm (patient safety); (5) outcome or prognosis; (6) cost-effectiveness; and (7) impact of policy (institutional or governmental), TEBEMD is also designed to be implemented covering these fields. In this 3-year prospective study, we shall set up at least 3 critical issues for each category every year (or possibly in a crescendo manner, e.g. 3, 4, 5 issues for 1st, 2nd and 3rd yr) as its central theme. For each category, the following issues or specific aims of this study should be throughout investigated and answered:

1. What is the evidence provided by current global database? The complete search and summary in important EBM databases such as MEDLINE, Cochrane Library (CL) (update.cochrane.co.uk; www.update-software.com) and Best Evidence (BE) (www.wacponline.org) shall be performed and definite conclusions should be drawn and summarized.
2. What is the current practice principle in the related field in Taiwan? We shall completely collect the data concerning the current status in clinical practice in 5 or more medical centers for comparison.
3. Are these global evidences comparable to real practice status in Taiwan? If yes, do these EBM conclusions have positive effects on our health care system (such as improving patient outcome, increasing diagnostic accuracy, promoting cost-effectiveness, and decreasing patient hazard)? If no, what are the factors for us not to apply these global evidences or international guidelines? Is there any scientific evidence for us to prove or disprove these global conclusions?
4. We'd prospectively collected comparable clinical data from 5 medical centers in Taiwan as the database of TEBEMD which shall act as the basis of further EBM survey in Taiwan.

From this study, we have decided to include disaster medicine as one of the major categories in TEBEMD.

In conclusion, there was still no sufficient data on which the hospitals modify their response plans. The need for effective evidence-based disaster training of healthcare staff at all

levels, including the development of standards and guidelines for training in the multi-disciplinary health response to major events, has been designated by the disaster response community as a high priority.

References

1. Fraser RC, Lakhani MK, Baker RH (Ed). Evidence-based audit in general practice : from principles to practice. Butterworth and Heinemann press. 1998.
2. Ridsdale L (Ed.). Evidence-based general practice: a critical reader. New York: Saunders Co. press. 1995.
3. International City Management Association. Emergency planning: an adaptive approach. Baseline Data Report 1988;20:1-14.
4. Wang TL, Chang H. Appraisal of disaster response plan of hospitals in Taipei judged by Hospital Emergency Incident Command System (HEICS). Ann Disaster Med 2003;2:104-11.
5. Choy CS, Wang TL, Chang H. Spontaneous implementation of Hospital Emergency Incident Command System (HEICS) in Taipei emergency response hospitals after SARS epidemics. Ann Disaster Med 2003;2:14-9.
6. Doherty S. Evidence-based implementation of evidence-based guidelines. Int J Health Care Qual Assur Inc Leadersh Health Serv 2006;19:32-41.
7. 2005 International consensus on cardiopulmonary resuscitation (CPR) and emergency cardiovascular care (ECC) science with treatment recommendations. Circulation 2005;112(Suppl I):III-1-136.
8. 2005 American Heart Association Guide lines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Cir culation 2005;112(Suppl I):IV-1-211.