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Scientific Framework for Research on Disaster and Mass Casualty Incident in Korea: Building Consensus Using Delphi Method

Chu Hyun Kim,[1,2] Ju Ok Park,[3] Chang Bae Park,[4] Seong Chun Kim,[5] Soo Jin Kim,[6] and Ki Jeong Hong[7]

[1]Department of Emergency Medicine, Inje University College of Medicine Seoul Paik Hospital, Seoul; [2]Department of Social and Preventive Medicine, Inha University School of Medicine, Incheon; [3]Seoul National University Hospital Biomedical Research Institute, Seoul; [4]Department of Emergency Medicine, Jeju National University School of Medicine, Jeju; [5]Department of Emergency Medicine, Gyeongsang National University Hospital, Jinju; [6]Department of Epidemiology, Graduate School of Public Health, Seoul National University, Seoul; [7]Department of Emergency Medicine, Seoul National University College of Medicine, Seoul National University Boramae Medical Center, Seoul, Korea

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Address for Correspondence:
Ju Ok Park, MD
Seoul National University Hospital Biomedical Research Institute, 101 Daehak-ro, Jongro-gu, Seoul 110-744, Korea
Tel: +82.2-2072-3968, Fax: +82.2-744-3967
E-mail: juok.park@gmail.com

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We aimed to determine the scientific framework for research on disaster and mass casualty incident (MCI) in Korea, especially Korean terminology, feasible definition, and epidemiologic indices. The two staged policy Delphi method was performed by instructors of National Disaster Life Support (NDLS®) with the constructed questionnaire containing items based on the literature review. The first-stage survey was conducted by 11 experts through two rounds of survey for making issue and option. The second-stage survey was conducted by 35 experts for making a generalized group based consensus. Experts were selected among instructors of National Disaster Life Support Course. Through two staged Delphi survey experts made consensus: 1) the Korean terminology "jaenan" with "disaster" and "dajung-sonsang-sago" with "MCI"; 2) the feasible definition of "disaster" as the events that have an effect on one or more municipal local government area (city-county-district) or results in ≥ 10 of death or ≥ 50 injured victims; 3) the feasible definition of MCI as the events that result in ≥ 6 casualties including death; 4) essential 31 epidemiologic indices. Experts could determine the scientific framework in Korea for research on disaster medicine, considering the distinct characteristics of Korea and current research trends.

Keywords: Disasters; Mass Casualty Incidents; Terminology; Epidemiology; Delphi Technique

INTRODUCTION

Disaster is generally defined as an event that demands more resources than the community can provide in natural or man-made incidents (1). In Korea, according to the Act No. 7188 (March 11, 2004) the framework act on the management of disaster and safety, disaster is defined as a natural event (e.g. a typhoon, a flood, etc.), a technical event (e.g. a fire, a collapse, an explosion, etc.), and any events which can damage the life, the health, and the property of the people (2). In medical concerns, disaster can be defined as an event that requires excess medical resources than the local health system can afford such as Mass Casualty Incident (MCI) (3, 4).

Disasters and MCIs occur more frequently in various types, such as pandemic diseases, traffic accidents, industrial accidents, terrors, mass gatherings, and natural catastrophes due to outbreaks of new infectious diseases, the evolution of mass transportations and the global climate changes (5). According to the report by the Centre for Research on the Epidemiology of Disasters (CRED), the number of natural disasters multiplied at least 10 times from 1900 to 2000. When disasters and MCIs are not properly prepared, these can cause high mortality and failure rate, although we are spending the whole medical resources of the local community in short or long term period. In addition, disaster and the MCI impact on such a broad population in the community so that they cannot be managed without supports from outside (6-8). Thus the epidemiologic approach for the public health concerns is mandatory by recognition of the impact on the population, verification of the risk factor of the population, and allocation of the medical resources for the response to disasters and MCI.

Despite of the necessity of the epidemiologic research, little research has been conducted since there is no international standardized definition of the disaster and MCI (9). Moreover, the reality is that the epidemiologic approach has been very difficult because of the lack of a standardized epidemiologic index for the national or international data collection. Although there are some research for disaster and MCI, those were dealt with

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just each single case.

Therefore, we aimed to determine the Korean terminology, definition and classification, and useful indicators of disasters and MCIs for measuring the epidemiologic outcomes using the Delphi method.

MATERIALS AND METHODS

Study design

This study was designed by using two staged policy Delphi method (10) through structured the questionnaire.

Development of questionnaire

Extensive literature review was preceded to develop the questionnaire of the first-stage survey. For terminology, electric and non-electric Korean language dictionary, Korean act, Korean government documents and previous research articles in Korean were reviewed. There were many different terminology were used to translate MCI. For example at least 3 Sino-Korea words (dajung, daeryang, and jibdan) were used to translate "mass". Therefore the questionnaire for MCI terminology were composed 3 subsets for each word; mass, casualty and incident. In each question, options of Korean word were shown to answer. To compose the questionnaire of definition and epidemiologic indices, systematic literature review in MEDLINE using Medical Subject Headings (MeSH) and general web search in English and Korean were preceded. Also Korean government documents were reviewed including documents of Korean National Emergency Management Agency (NEMA). Definition of disaster and MCI were divided into categories, size of the affected area and number of involved victims. In each question, respondents chose the size of the area and the number of victims among provided options. After making the questionnaire, multiple examples of the definition and classification of disaster and MCI which international academic or administrative research institutes are currently in use, and the emergency response protocols of NEMA were provided to respondents as references. In the literature review for epidemiologic indices, total 20 articles (including 6 review articles) published in English from 1990 to 2010 were searched when using MeSH ("Mass Casualty Incident", "Disasters" and "Epidemiology") and 3 articles were searched additionally by manual search. One of the authors reviewed and summarized these 23 articles using whole text and extracted 39 indices used in these articles. The indices were categorized into three aspects of outcomes; health effects (24 indices), incidence of events (4 indices) and resource usage (11 indices). In each item, respondents rated the necessity of indices using 9-point Likert-type scale ranging from 'entirely unnecessary (point 1)' to 'very necessary (point 9)'. Finally total 48 items were decided for first-stage Delphi questions. Questions for the second-stage survey were made after getting the core consensus through the first-stage survey. Second-stage survey focused on the definition of disaster and MCI based on the number of victims. Respondents chose the item that is needed to define as disaster and MCI. Next, if respondents chose "need to define", respondents answered the minimum number of victims that correspond to disaster and MCI as they thought. The questionnaire of first-stage and second-stage also consisted of demographic information of experts such as sex, age, professional, and research career of disaster. Surveyed items of each questionnaire are listed in Tables 2-6 by subject.

Survey

Two staged Delphi method was utilized for creating a core group based consensus from the first-stage Delphi and for producing a generalized group based consensus from the second-stage Delphi. All respondents were instructors of the National Disaster Life Support (NDLS®) Course who certified by National Disaster Lifer Support Foundation (NDLSF) and American Medical Association (AMA). In the first-stage survey, the first round was answered by 11 instructors who were recommended by the authors and the second round was answered by 10 instructors because one male physician who was in an academic hospital gave up answering. The second-stage survey was answered by 35 instructors including 10 instructors who participated in the second round of the first-stage survey among 67 instructors who received the questionnaire. The first-stage survey was conducted by two rounds, the first round by e-mail and the second round by on-scene interview. Between first and second round, there was workshop that 10 respondents participated to define and discuss issues on this subject based on the results of the first round survey (10). The second-stage survey was conducted by one round by e-mail (Fig. 1).

Data analysis

In the first-stage survey, the consensus should be equated with over 60% agreement among experts for the questions of terminology in Korean and definition. For the questions of epidemiologic indices, the answers were on a scale of 1 to 9, then were categorized into three groups; unnecessary (point 1 to 3), intermediate (point 4 to 6), necessary (poinst 7 to 9). If any category had over 60 % of agreement (7 or more respondents in the first round and over 6 respondents in the second round) the consensus for the each index was regarded. In the second-stage survey, the consensus should be equated with over 80% agreement among experts for the question of definition because each question was answered by only two options. For each item that had over 80% agreement, the median value of the number that respondents answered for question of the minimum number of victims was calculated to define disaster and MCI.

Table 1. Characteristics of respondents for Delphi survey for building scientific framework for research on disaster and MCI in Korea

Characteristics	First stage				Second stage (n = 35)	
	First round (n = 11)		Second round (n = 10)			
Demographic factor						
Male sex (No., %)	5	45.5	4	40.0	20	57.1
Age (mean, SD)	36.9	5.1	36.5	5.2	33.3	6.5
Type of profession						
Physician in an academic hospital (No., %)	5	45.5	4	40.0	5	14.3
Physician in a non-academic hospital (No., %)	3	27.3	3	30.0	10	25.7
Regular nurse (No., %)	2	18.2	2	20.0	12	34.3
Emergency medical technician (No., %)	1	9.1	1	10.0	8	22.9
Experience of research on disaster or MCI (No., %)	3	27.3	3	30.0	4	11.4
Experience of disaster or MCI education (No., %)	6	54.5	6	60.0	Not asked	

MCI, mass casualty incident.

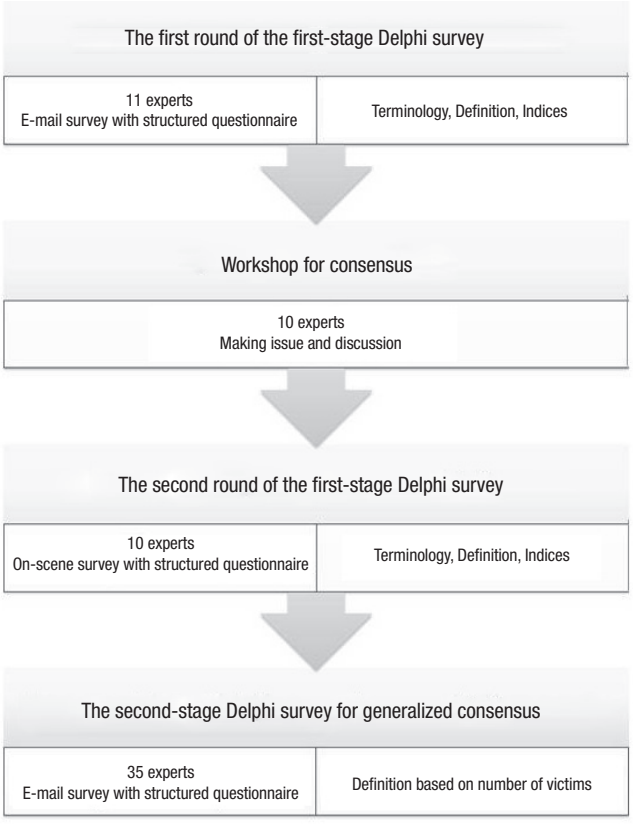

Fig. 1. Summary of two-staged Delphi survey in this study.

Ethics statement

Since this study would involve no more than minimal risk to subjects and the rights, safety and welfare of study subjects would not be adversely affected, the authors did not ask for institutional review board.

RESULTS

Characteristics of respondents of the first-stage survey and the second-stage survey were summarized in Table 1. Most of them were physicians. Among them three or four respondents had an experience of research on disaster or MCI and 6 had period an experience of disaster or MCI education for 1-6 yr.

There was a consensus among respondents about the terminology in Korean for disaster and MCI in the first-stage Delphi survey. Respondents agreed that "jaenan" (90% agreement) and "dajung sonsang sago" (80%, 80%, and 90% agreement, respectively) is proper the Korean terminology for disaster and MCI (Table 2).

For the definition of disaster, respondents made a consensus for the size of affected area (Table 3) upon more than one municipal area (city, county and district) (100% agreement) but did not make an agreement for the number of involved victims (Table 4) in the first-stage survey. For the definition of MCI, respondents did not make an agreement for both the size of affected area (Table 3) and the number of involved victims (Table 4) except 'no matter with minimum number of hospital patients visited' (70% agreement) and 'no matter with the minimum number of patients transported by the ambulance and/or helicopter' (70% agreement) in the first-stage survey. In the second-stage survey, there was a consensus about the definition of disaster and MCI based on the number of victims. They made a consensus that to define a disaster an event should have a death (85.7% agreement) or injured (97.1% agreement) and the minimum number of victims is 10 in death or 50 in injured. Moreover, they made a consensus that to define an MCI an event should have any injured (100% agreement) and the minimum number of victims is 6 in injured (Table 5).

In the first-stage survey, for epidemiologic indices respondents showed over 60% agreement on necessary for 17 among 24 health effects indices, 4 among 4 incidences of event indices and 4 among 11 resource usage indices in the second round survey (Table 6). Any indices were not agreed as an unessential item.

DISCUSSION

Whenever the new area of research was introduced to Korea, the language or translation into Korean might be a barrier to

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Table 2. Items and results of first-stage survey for the Korean terminology

Items	Responses*	First round		Second round		Consensus
		No.	%	No.	%	
Disaster	Jaenan	8	72.7	9	90.0	Yes
	Jaehae	2	18.2	1	10.0	
	Other suggestion	1	9.1	0	0.0	
Mass	Dajung	5	45.5	8	80.0	Yes
	Daeryang	5	45.5	1	10.0	
	Jibdan	1	9.1	1	10.0	
Casualty	Sonsang	7	63.6	8	80.0	Yes
	Sonsangja	1	9.1	1	10.0	
	Huisaengja	2	18.2	0	0.0	
	Sasangja	1	9.1	1	10.0	
	Pihaeja	0	0.00	0	0.0	
	Busangja	0	0.00	0	0.0	
Incident	Sago	9	81.80	9	90.0	Yes
	Sageon	1	9.10	1	10.0	
	Chamsa	0	0.00	0	0.0	
	Other suggestion	1	9.10	0	0.0	

*All responses in questionnaire were provided in Korean and Chinese. In this table responses showed pronunciation of Korean word in English.

Table 3. Items and results of the first-stage survey for definition of disaster and MCI by the size of affected area*

Items	Responses	First round		Second round		Consensus
		No.	%	No.	%	
Disaster should be affected	More than one municipal area	7	63.7	10	100	Yes
	More than two municipal area	1	9.1	0	0.0	
	More than three municipal area	1	9.1	0	0.0	
	More than one metropolitan or province	0	0.0	0	0.0	
	No matter	0	0.0	0	0.0	
	Other suggestion	2	18.2	0	0.0	
MCI should be affected	More than one municipal area	6	54.6	5	50.0	No
	More than two municipal area	1	9.1	1	10.0	
	More than three municipal area	0	0.0	0	0.0	
	More than one metropolitan or province	0	0.0	0	0.0	
	No matter	0	0.0	4	40.0	
	Other suggestion	4	36.4	4	40.0	

*Municipal area means a level of "si", "gun" and "gu" in Korea (si, gun and gu: same as city, county and district). Metropolitan or provinces means "tukbyulsi", "kwangyeoksi" and "do".

spread idea widely. Disaster is common in non-medical research area, for example social science or engineering, but is emerging subject in medical research. According to the literature review, the Korean terms for "disaster" and "mass casualty incident" are various and are not formally defined in the Korean medical dictionary or the Korean emergency medical dictionary. Since the enforcement of the provisions of the act on the management of disaster and safety, Korean term "jaenan" is mainly used for "disaster", which the agreement of experts in our study was the same as well, reflecting the statement of the law. In the aspect of MCI, even though respondents agreed to use "dajung sonsang sago", there is still controversy. As a matter fact, "dajung" that authors suggest means "crowds" or "a great number of people". However "dajung" that made by other Chinese means "multiple" so that there could be confused if "dajung sonsang sago" were used without additional Chinese characteristics. In other aspect "sonsang" means "injury" as well as "trauma". Therefore, "dajung sonsang sago" include a meaning of the wide range of event that result in trauma and all kinds of injury. We hope that the "dajung sonsang sago" takes root because language can have a power to survive by itself when many people use.

The agreement on the definition of disaster was the events that have minimum death 10 and/or minimum injured 50, reflecting the influence of the epidemiologic definition of international research institutes. Using this definition, researchers can be fallen a pitfall because if 9 deaths are occurring by a single event, this event is not disaster by this definition. Some experts also pointed this problem in the workshop or survey, however, many of the experts said that they understand the definition is not for a real response or preparedness but for research or surveillance of disaster and MCI. That is the reason why the definition of this study is different from the protocol of NEMA.

As to the definition of MCI, experts agreed in the event that results in 6 injured at least and the number of deaths are no matter to define MCI. That can be interpreted that the experts

Table 4. Items and results of the first-stage survey for definition of disaster & MCI by number of involved victims

Items	Responses	First round		Second round		Consensus	Items	Responses	First round		Second round		Consensus
		No.	%	No.	%				No.	%	No.	%	
Disaster													
Minimum number of death	1	1	9.1	1	10.0	No	Minimum number of patients who are admitted to hospital	1	0	0.0	0	0.0	No
	5	0	0.0	0	0.0	No		5	0	0.0	0	0.0	No
	10	6	54.5	4	40.0	No		10	4	36.4	3	30.0	No
	15	1	9.1	1	10.0	No		15	3	27.3	0	0.0	No
	20	1	9.1	2	20.0	No		20	1	9.1	3	30.0	No
	50	1	9.1	1	10.0	No		50	3	27.3	2	20.0	No
	100	0	0.0	0	0.0	No		100	0	0.0	0	0.0	No
	NM	1	9.1	1	10.0	No		NM	3	27.3	2	20.0	No
Minimum number of injured	1	0	0.0	0	0.0	No	Minimum number of hospital patient visited	1	0	0.0	0	0.0	No
	10	2	18.2	2	20.0	No		2	0	0.0	0	0.0	No
	20	2	18.2	2	20.0	No		3	1	9.1	0	0.0	No
	50	4	36.4	2	20.0	No		4	0	0.0	0	0.0	No
	100	3	27.3	3	30.0	No		5	4	36.4	4	40.0	No
	150	0	0.0	0	0.0	No		6	0	0.0	0	0.0	No
	200	0	0.0	0	0.0	No		7	0	0.0	0	0.0	No
	NM	0	0.0	1	10.0	No		NM	9	81.8	6	60.0	No
Minimum number of patients who visited ED	1	0	0.0	0	0.0	No	Minimum number of patient transported by the ambulance and/or helicopter	1	0	0.0	0	0.0	No
	10	1	9.1	1	10.0	No		2	0	0.0	0	0.0	No
	20	3	27.3	1	10.0	No		3	0	0.0	0	0.0	No
	50	3	27.3	4	40.0	No		5	1	9.1	0	0.0	No
	100	2	18.2	2	20.0	No		10	5	45.5	5	50.0	No
	150	0	0.0	0	0.0	No		15	0	0.0	0	0.0	No
	200	0	0.0	0	0.0	No		20	1	9.1	1	10.0	No
	NM	2	18.2	2	20.0	No		NM	4	36.4	4	40.0	No
MCI													
Minimum number of death	1	0	0	0	0	No	Minimum number of patients who are admitted to hospital	1	0	0	0	0	No
	2	1	9.1	0	0	No		2	1	9.1	0	0	No
	3	1	9.1	1	10	No		3	0	0	0	0	No
	4	0	0	0	0	No		5	1	9.1	2	20	No
	5	2	18.2	2	20	No		10	6	54.6	6	60	No
	6	1	9.1	1	10	No		15	0	0	0	0	No
	10	2	18.2	2	20	No		20	1	9.1	1	10	No
	15	0	0	0	0	No		30	0	0	0	0	No
	NM	4	36.4	4	40	No		NM	2	18.2	1	10	No
Minimum number of injured	1	0	0	0	0	No	Minimum number of hospital patients visited	1	0	0	0	0	No
	2	0	0	0	0	No		2	1	9.1	0	0	No
	3	0	0	0	0	No		3	2	18.2	2	20	No
	5	3	27.2	2	20	No		4	0	0	0	0	No
	10	1	9.1	1	10	No		5	1	9.1	1	10	No
	15	6	54.6	6	60	No		6	0	0	0	0	No
	20	1	9.1	1	10	No		7	0	0	0	0	No
	NM	0	0	0	0	No		NM	7	63.7	7	70	No
Minimum number of patients who visited ED	1	0	0	0	0	No	Minimum number of patients transported by the ambulance and/or helicopter	1	0	0	0	0	No
	2	0	0	0	0	No		2	1	9.1	0	0	No
	3	1	9.1	0	0	No		3	0	0	0	0	No
	5	1	9.1	1	10	No		5	2	18.2	2	20	No
	10	1	9.1	4	40	No		10	1	9.1	1	10	No
	15	0	0	0	0	No		15	0	0	0	0	No
	20	2	18.2	2	20	No		20	0	0	0	0	No
	30	1	9.1	1	10	No		30	0	0	0	0	No
	NM	2	18.2	2	10	No		NM	7	63.7	7	70	No

MCI, mass casualty incident; NM, no matter with this item to define an event; ED, emergency department.

suggested if the minimum number casualties including death and injured is over 6, the event can be defined as MCI. In another aspect, based on the fact that 1,350 ambulances are operated by NEMA in 285 municipal government, prehospital medical resources in the most of a single municipal are limited to maximum 5 casualties simultaneously, thus more than 6 simultaneous casualties need to be supported prehospital medical resources from nearest local area (11). Therefore the definition of MCI suggested this survey is useful for research or surveillance as well as for an emergency response. If an event related with over 6 casualties is occurred, the local agency for MCI response has to operate an emergency response system till the situation is resolved.

Basically simple and clear indices are needed to express and

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Table 5. Items and results of the second-stage survey for definition of disaster and MCI by number of involved victims

Items		Responses				Consensus	Minimum number of victims*
		unnecessary		necessary			
		No.	%	No.	%		
To define a disaster an event should have	Death	5	14.3	30	85.7	Yes	10
	Injured	1	2.9	34	97.1	Yes	50
	Patients who visited ED	12	34.3	23	65.7	No	-
	Patients who are admitted to hospital	18	51.4	17	48.6	No	-
	Hospital patients visited	27	77.1	8	22.9	No	-
	Patients transported by the ambulance and/or helicopter	20	57.1	15	42.9	No	-
To define a MCI an event should have	Death	26	74.3	9	25.7	No	-
	Injured	0	0.0	35	100.0	Yes	6
	Patients who visited ED	10	28.6	25	71.4	No	-
	Patients who are admitted to hospital	15	42.9	20	57.1	No	-
	Hospital patients visited	29	82.9	6	17.1	Yes	-
	Patients transported by the ambulance and/or helicopter	24	68.6	11	31.4	No	-

*Minimum number of victims was a median value of answers for the question "How many victims are the minimum number of victims?" for each item. MCI, mass casualty incident; ED, Emergency department.

Table 6. Items and results of the first-stage survey for health effect indices

Items	First round							Second round							Consensus
	N		I		U		Med	N		I		U		Med	
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%		
Health effect indices															
Total number of the patients	9	81.8	1	9.1	1	9.1	8	8	80.0	1	10.0	1	10.0	7	Yes
Number of the patients by the type	10	90.9	0	0.0	1	9.1	8	9	90.0	0	0.0	1	10.0	7	Yes
Number of the age specific patients	5	45.5	4	36.4	2	18.2	6	6	60.0	3	30.0	1	10.0	7	No
Number of the sex specific patients	4	36.4	5	45.5	2	18.2	6	5	50.0	4	40.0	1	10.0	6	No
Number of the Injury Severity Sore (ISS) specific patients	8	72.7	2	18.2	1	9.1	7	8	80.0	1	10.0	1	10.0	7	Yes
Number of the area specific patients	10	90.9	0	0.0	1	9.1	7	9	90.0	0	0.0	1	10.0	7	Yes
Number of the patients by the type	10	90.9	0	0.0	1	9.1	8	9	90.0	0	0.0	1	10.0	8	Yes
Number of the sex specific patients by the type	4	36.4	6	54.5	1	9.1	6	5	50.0	4	40.0	1	10.0	6	No
Number of the death	8	72.7	3	27.3	0	0.0	8	8	80.0	2	20.0	0	0.0	8	Yes
Number of the death in the early phase (12)	8	72.7	3	27.3	0	0.0	8	9	90.0	1	10.0	0	0.0	9	Yes
Number of the death in the late phase (12)	8	72.7	3	27.3	0	0.0	8	9	90.0	1	10.0	0	0.0	8	Yes
Number of the death of patient in the prehospital setting	9	81.8	2	18.2	0	0.0	8	10	100.0	0	0.0	0	0.0	8	Yes
Number of the death in 1 month after event (8)	9	81.8	2	18.2	0	0.0	7	9	90.0	1	10.0	0	0.0	8	Yes
Number of the patients by the type	8	72.7	3	27.3	0	0.0	8	8	80.0	2	20.0	0	0.0	8	Yes
Incident rate of patients	8	72.7	2	18.2	1	9.1	8	7	70.0	2	20.0	1	10.0	8	Yes
Mortality rate of patients	8	72.7	2	18.2	1	9.1	8	7	70.0	2	20.0	1	10.0	8	Yes
Incident rate of patients by the area	6	54.5	3	27.3	2	18.2	7	5	50.0	2	20.0	3	30.0	6	No
Mortality rate of patients by the area	6	54.5	4	36.4	1	9.1	7	5	50.0	3	30.0	2	20.0	6	No
Age and sex controlled mortality rate of patients by the area	4	36.4	5	45.5	2	18.2	5	4	40.0	3	30.0	3	30.0	5	No
Mortality rate of patients of the type	7	63.6	4	36.4	0	0.0	7	6	60.0	4	40.0	0	0.0	7	No
Mortality rate of patients in the early phase (12)	8	72.7	2	18.2	1	9.1	7	8	80.0	1	10.0	1	10.0	7	Yes
Mortality rate of patients in the late phase (12)	6	54.5	4	36.4	1	9.1	7	7	70.0	2	20.0	1	10.0	7	Yes
Mortality rate of patients in the prehopital setting	7	63.6	4	36.4	0	0.0	7	8	80.0	2	20.0	0	0.0	8	Yes
Mortality rate of patients in 1 month after event (8)	7	63.6	3	27.3	1	9.1	7	7	70.0	2	20.0	1	10.0	7	Yes
Incidence of event indices															
Number of incidence of event	10	90.9	1	9.1	0	0.0	8	9	90.0	1	10.0	0	0.0	8	Yes
Number of incidence of event by type	10	90.9	0	0.0	1	9.1	8	9	90.0	0	0.0	1	10.0	9	Yes
Number of incidence of event by the affected area	10	90.9	0	0.0	1	9.1	7	9	90.0	0	0.0	1	10.0	7	Yes
Number of monthly incidence of event	9	81.8	1	9.1	1	9.1	7	8	80.0	1	10.0	1	10.0	7	Yes
Usage of resources															
Total number of dispatched ambulance	6	54.5	4	36.4	1	9.1	7	4	40.0	5	50.0	1	10.0	6	No
Average number of dispatched ambulance by event	4	36.4	7	63.6	0	0.0	6	4	40.0	6	60.0	0	0.0	6	No
Average number of dispatched ambulance by patients	4	36.4	6	54.5	1	9.1	6	4	40.0	5	50.0	1	10.0	6	No
Arrival time of first patient at medical facilities by type of event (14)	8	72.7	3	27.3	0	0.0	7	8	80.0	2	20.0	0	0.0	7	Yes
Arrival time of last patient at medical facilities by type of event (14)	7	63.6	3	27.3	1	9.1	7	8	80.0	2	20.0	0	0.0	7	Yes
Number of on-scene treatment per patient (12)	6	54.5	5	45.5	0	0.0	7	6	60.0	4	40.0	0	0.0	7	No
Number of transported hospitals by type of event	7	63.6	4	36.4	0	0.0	7	7	70.0	3	30.0	0	0.0	7	Yes
Number of patients per transported hospital by type event	6	54.5	5	45.5	0	0.0	7	7	70.0	3	30.0	0	0.0	8	No
Average number of patients per transported hospital by type of event	6	54.5	5	45.5	0	0.0	7	7	70.0	3	30.0	0	0.0	7	No
Number of patients admitted to hospital	7	63.6	4	36.4	0	0.0	7	7	70.0	3	30.0	0	0.0	7	Yes
Admission rate of patients	6	54.5	4	36.4	1	9.1	7	6	60.0	3	30.0	1	10.0	7	No

N, Necessary; I, Intermediate; U, Unnecessary; Med, median; MCI, Mass Casualty Incident.

explain an event and outcome of health properly. In disaster and MCI, it is not easy to show many indices because the data collection is very limited. Therefore important indices should be settled before the development a surveillance system or data collecting system for disaster and MCI. We try to decide the indices that are needed basically to study disaster or MCI based on the expert consensus. Some indices have been used in previous research for disaster or MCI (12, 13) and others have been used to show the general characteristics of trauma, for example severity using the Injury Severity Score. Resource usage indices are special for disaster and MCI because the recruitment and allocation of the resource are the key in emergency response. If prehospital agency can apply these indices retrospectively, they can estimate the amount of the resource by scale of event. That is very useful way to prepare future event because utilization and response of prehospital EMS is an important index for local disaster preparedness and influential to the prognosis of victims. In this way, the cooperation with the fire department is very important to build the data collection system and produced meaningful indices. Also, the hospital medical record survey should be included in the further survey and surveillance system of disasters and MCIs in order to calculate the severity of casualties as well as other medical related indices.

This study has several possible limitations. First, there could be limited to the selection and representation of experts. Recently disaster medicine has emerged in Korea and related not only to the emergency medicine, but also to multidiscipline. In reality, experts in various fields of disaster medicine are few. Therefore, experts in our study, most of whom are board certified emergency physician, are the instructor of NDLS® course, official disaster training course of the AMA. They are involved with the education, training and/or research on the disaster and MCI and their experience period ranges 1 to 6 yr. Further academic interchanges and co-works are mandatory in order to achieve the consensus among the disaster researchers in the various disciplines. Second, because items in this survey were determined based not on strict scientific evidences but on literature reviews and expert opinions, several problematic issues could be occurred in the development and the application of further surveillance system. This should be complemented by comparing the arrangement of database with international and national. In conclusion, experts could determine the scientific terminology in Korean and definition for research on disaster medicine considering the distinct characteristics of Korea and current research trends. The data collection system and research on patients who related to MCI and disaster should be constructed and standardized considering these definitions and indices.

DISCLOSURE

The authors have no conflicts of interest to disclose.

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