What Kinds of Skills Are Necessary for Physicians Involved in International Disaster Response?

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Abbreviations:
DITAC: disaster training curriculum
FMT: foreign medical team
I-CVI: item-content validity index
JGSDF: Japan Ground Self-Defense Force
JRCS: Japanese Red Cross Society
S-CVI: scale-content validity index
WHO: World Health Organization

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Abstract

Introduction: Physicians are key disaster responders in foreign medical teams (FMTs) that provide medical relief to affected people. However, few studies have examined the skills required for physicians in real, international, disaster-response situations.

Problem: The objectives of this study were to survey the primary skills required for physicians from a Japanese FMT and to examine whether there were differences in the frequencies of performed skills according to demographic characteristics, previous experience, and dispatch situations to guide future training and certification programs.

Methods: This cross-sectional survey used a self-administered questionnaire given to 64 physicians with international disaster-response site experience. The questionnaire assessed demographic characteristics (sex, age, years of experience as a physician, affiliation, and specialty), previous experience (domestic disaster-relief experience, international disaster-relief experience, or disaster medicine training experience), and dispatch situation (length of dispatch, post-disaster phase, disaster type, and place of dispatch). In addition, the frequencies of 42 performed skills were assessed via a five-point Likert scale. Descriptive statistics were used to assess the participants' characteristics and total scores as the frequencies of performed skills. Mean scores for surgical skills, health care-related skills, public health skills, and management and coordination skills were compared according to the demographic characteristics, previous experience, and dispatch situations.

Results: Fifty-two valid questionnaires (81.3% response rate) were collected. There was a trend toward higher skill scores among those who had more previous international disaster-relief experience ($P = .03$). The more disaster medicine training experience the participants had, the higher their skill score was ($P < .001$). Physicians reported involvement in 23 disaster-relief response skills, nine of which were performed frequently. There was a trend toward higher scores for surgical skills, health care-related skills, and management and coordination skills related to more disaster medicine training experience.

Conclusion: This study's findings can be used as evidence to boost the frequency of physicians' performed skills by promoting previous experience with international disaster relief and disaster medicine training. Additionally, these results may contribute to enhancing the quality of medical practice in the international disaster relief and disaster training curricula.

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Introduction

The World Health Organization (WHO; Geneva, Switzerland) has recently responded to growing concerns about the standards and competencies of foreign medical teams (FMTs) in the event of sudden-onset disasters. The WHO defines a FMT as a group of health professionals and supporting staff outside their country of origin, who aim to provide health care specifically to disaster-affected populations, including governmental (both civilian and military) and non-governmental teams;[1] however, the primary skills needed for physicians in these settings have not yet been established. Natural disasters occur frequently worldwide

and affect large populations, along with the numbers of FMTs deployed to provide relief. Following large-scale disasters and major, complex emergencies, especially in resource-poor settings, emergency surgery is practiced by FMTs sent by governmental and non-governmental organizations. For example, the government of Japan decided to dispatch the Japan Disaster Relief Medical Team, which consists of approximately 45 people, to Nepal on April 28, 2015, in response to a request from the Government of Nepal following the damage caused by the massive earthquake. The team conducted medical operations for those injured in the region.[2]

Physicians are key people as far as FMTs are concerned, and they are required to meet specific technical standards according to FMT type. All FMTs are expected to be self-sufficient in arriving at and operating within the disaster site, and a physician must have not only the ability to treat patients, but also that of living and working with the other FMT team members. However, a number of qualitative studies concerning the skills or competencies for physicians in terms of international disaster response concentrated primarily on expert opinion. Likewise, a majority of the disaster reports from FMTs have focused on disaster survivors receiving surgical procedures.[3-6] There is a shortage of, and thus a need for, quantitative, empirical research into the primary skills required for physicians involved in international disaster response.

Furthermore, the factors that influence the frequencies of international disaster response physicians' skills remain unclear. According to the decision-making model of helping in an emergency,[7] the judgmental process in an emergency is affected by personal variables, situational variables, the characteristics of the people in need, and cultural variables. Based on the decision-making model of helping in an emergency, this study hypothesized that personal (demographic characteristics and previous experiences) and situational variables (dispatch situations; ie, the situation at time of dispatch) influenced the frequency of physicians' performed skills at a dispatch site.

Hence, the objectives of this study were to survey the primary skills required for physicians from a Japanese FMT who worked in international disaster response and to compare these primary skills in terms of demographic characteristics, previous experiences, and dispatch situations to guide future disaster medicine training and certification programs.

Methods

Study Subjects and Data Collection

Japanese physicians were recruited via purposive sampling from eight Self-Defense Force hospitals and 30 medical corps throughout Japan, in addition to six hospitals that have special international disaster-response departments: five Japanese Red Cross Society (JRCS; Tokyo, Japan) hospitals and one private hospital. In those facilities, the Ministry of Defense Ground Staff Office Medicine Department (Tokyo, Japan) and six directors of international assistance departments agreed to distribute the questionnaire among physicians who had been dispatched to international disaster sites.

All subjects gave their written informed consent, and the study protocol was approved by the ethics committees at Saga University Faculty of Medicine (Saga, Japan; approval no. 25-22). The inclusion criteria were physicians who had engaged in international disaster response at least once from 1993 through 2013. The questionnaire was posted at the workplaces of these physicians, and after they were completed, they were mailed back to the principal researcher (NN). The data were collected from September through December 2013.

Measures

The participants were asked to complete a self-administered questionnaire concerning demographic characteristics (sex, age, years of experience as a physician, affiliation, and specialty), the numbers of previous experiences (domestic disaster-relief experience, international disaster-relief experience, or disaster medicine training experience), dispatch situations (periods of experience in disaster relief at sites, post-disaster phase, disaster type, and geographical region), and the frequency of performed skills at the dispatched site. The post-disaster phase was the duration of time from the occurrence of the disaster to the day of dispatch for the disaster site, in weeks. Participants' dispatched geographical regions were categorized according to the geographical region and composition of the United Nations Statistics Division (New York USA).[8]

The kinds of performed skills they evidenced were based on those observed in previous studies,[9-11] and the Japan Medical Team for Disaster Relief training curriculum was employed to assess the frequency of performed skills at a dispatch site. Prior to the start of this study, a preliminary survey of 12 disaster management experts (seven physicians and five nurses) was conducted to confirm the appropriateness of each of the skills. These experts represented different fields of disaster management, including emergency care, trauma care, infectious disease, anesthesia, disaster medicine and disaster nursing academic teaching, and humanitarian aid, which included field mission experience. Finally, 42 skills were selected for evaluation in this study.

Using a 4-point rating scale (1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, and 4 = very relevant), the seven experts gave these 42 skills ratings of three or four, which resulted in a scale-content validity index (S-CVI) of 0.91. The item-content validity index (I-CVI) ranged from 0.71 to 1.00. The content validity index is a barometer of item and instrument clarity, homogeneity, and relevance. The recommended S-CVI minimum score for evaluating the overall validity of the instrument is ≥ 0.9,[12] and an I-CVI value of ≥ 0.78 is therefore considered acceptable.[13] Overall reliability of the 42 skills, as assessed by Cronbach's α coefficient, was 0.91. These values indicate high internal consistency.

Furthermore, the skills were divided into four categories semantically described as: "surgical skills" (numbers 1-8); "health care-related skills" (numbers 9-24), "public health skills" (numbers 25-31), and "management and coordination skills" (numbers 32-42; Table 1). A high degree of internal consistency was observed for each of the four skills in this study: Cronbach's α coefficient of 0.94 for "surgical skills," 0.81 for "health care-related skills," 0.74 for "public health skills," and 0.91 for "management and coordination skills," respectively. In response to "How often did you perform the 42 skills needed for international disaster response at the dispatch sites?" the participants were asked to report the frequency of each of the skills using five-point Likert scales, with answers ranging from one to five ("1 = never," "2 = seldom," "3 = sometimes," "4 = often," and "5 = always"). A total score was achieved by summing each of the skill scores. Similarly, each of the scores for the four skills was achieved by summing the composite scores. A higher score reflected higher frequency of performance skills at a dispatch site.

Categories	No.	Skill
Surgical Skills (8 items; α = 0.94)	1	Wound irrigation or assistance with wound irrigation.
	2	Surgical debridement or assistance with surgical debridement.
	3	Small incisions or assistance with small incisions.
	4	Suture removal or assistance with suture removal.
	5	Suturing or assistance with suturing.
	6	Surgeries or assistance with surgeries.
	7	Cast immobilization or assistance with cast immobilization.
	8	Application of medical dressing or assistance with medical dressing.
Health Care-related Skills (16 items; α = 0.81)	9	Mass-casualty triage.
	10	Taking care of otological patients.
	11	Taking care of patients with eye problems.
	12	Taking care of patients with skin conditions.
	13	Taking care of patients with infections.
	14	Taking care of patients with internal diseases.
	15	Taking care of pediatric patients.
	16	Taking care of expectant or nursing mothers.
	17	Taking care of neonates.
	18	Medical interviews and patient histories.
	19	Efficient storage and consignment of medical equipment in the dispensary.
	20	Disinfection of a variety of equipment.
	21	Statistical analysis of patient data in the medical dispensary.
	22	Management of medical waste.
	23	Management of patient medical records.
	24	Explanations to the patients about the drugs.
Public Health Skills (7 items; α = 0.74)	25	Assessment of medical needs at the disaster site.
	26	Screening of infectious diseases.
	27	Vaccinations for local residents.
	28	Provision of health education to local residents.
	29	Water examinations.
	30	Nutritional assessments.
	31	Medical education for the local staff members.
Management and Coordination Skills (11 items; α = 0.91)	32	Liaison and coordination with international organizations.
	33	Liaison and coordination with relevant organizations in Japan.
	34	Management of medical personnel's working shifts and job descriptions.
	35	Responding to the media.
	36	Management of medical drugs.
	37	Maintenance of medical equipment.
	38	Use of communication equipment.
	39	Maintenance of life support equipment.
	40	Health management of dispatched personnel.
	41	Mental health care for dispatched personnel.
	42	Dealing with illegal intruders.

Table 1 *(continued)*. The 42 Skills Assessed by the Questionnaire
Abbreviation: α, Cronbach's alpha coefficient

Data Analysis

Descriptive statistics were used to assess the participants' characteristics and the "total score" as the frequency of the performance of the skills. Data were expressed as numbers and percentages for the participants' characteristics, means and standard deviations for the skills performance, and a portion of the participants' characteristics, including age, years of experience as a physician, and length of dispatch. Total scores and the scores for each of the four skills were compared according to the participants' demographics and previous experiences, as well as the dispatch situations, using Mann-Whitney U tests for sex (male/female), disaster type (natural/man-made), one-way analysis of variance with the Games-Howell post hoc test for affiliation (private hospital, JRCS, or Japan Ground Self-Defense Force [JGSDF]), specialty

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(surgeon, internist, or other), and place of dispatch (Asia, Africa, or America). In addition, a Jonckheere-Terpstra trend test examined age (25-34, 35-44, or 45-54), years of experience as a physician (≤10, 11-20, or ≥21), domestic disaster-relief experience (none, once, or ≥ twice), international disaster-relief experience (none, once, or ≥ twice), disaster medicine training experience (none, once, or ≥ twice), length of dispatch (≤30 days, 31-90 days, or ≥ 91 days), and post-disaster phase (< one week, one to three weeks, or ≥ three weeks).

The statistical significance level was set at $P < .05$, and all analyses were conducted using IBM SPSS Statistics version 21 (IBM Japan; Tokyo, Japan).

Results

A total of 64 questionnaires were administered, and 52 (81.3%) valid questionnaires were collected. The characteristics of the participants and total score are summarized in Table 2. The majority of the participants were male, and approximately 56% of them were between the ages of 35 and 44. A large proportion had 11-20 years of experience as a physician at the time of dispatch. More than 78% were affiliated with the JGSDF, and most of the participants specialized in surgery. Furthermore, most participants had no previous experience with international disaster relief, and more than one-half of them were dispatched to international disaster settings without receiving specific disaster medicine training.

Regarding dispatch situation, one-half of the participants experienced a dispatch of less than 30 days, and more than one-half of them were dispatched for three weeks or longer following the occurrence of the disaster. In regards to the total score, the surgeon specialty revealed a higher mean score than did the internist specialty ($P < .05$). Notably, there was a trend toward higher mean scores as international disaster-relief experience increased ($P = .03$). A similar relationship with the mean score was observed regarding domestic disaster-relief experience and disaster medicine training experience. In particular, the more training experience the participants had, the higher their scores were ($P < .001$).

Table 3 shows the rankings of the 42 skills in order of frequency of performance at the dispatched site. The mean value for the total score was 3.0 or above for nine of the 42 skills, which indicated that they were implemented at a high frequency. Of these, the three skills that were most often performed were "medical interviews and patient histories," "taking care of patients with internal diseases," and "health management of dispatched personnel." Additionally, 23 skills achieved a mean score of 2.1 or higher, while 19 skills had a mean score below 2.0.

Table 4 shows the mean score of four skills and compares them according to demographics, previous experiences, and dispatch situations. The mean surgical skill score tended to increase for the surgeons more so than for the internist ($P < .001$). In regards to the management and coordination skills, surgeons had a higher mean score than did the internists or others ($P < .01$ vs $P < .001$, respectively). Notably, there was a trend toward higher surgical, health care-related, and management and coordination skill scores with more disaster medicine training experience, but this same trend was not seen for the public health skills.

The management and coordination skill scores tended to increase with increases in age, years of experience as a physician, and international disaster-relief experiences. Surgical, health care-related, and management and coordination skills showed significant differences in relation to the demographic variables. A stepwise decrease in the mean health care-related skill score was observed with the lengthening of dispatch. None of the other comparisons regarding the public health skills were significant.

Discussion

This study focused on the primary skills required for physicians involved in international disaster response. The main findings were that physicians performed 23 skills at the dispatch site. Moreover, nine of these skills were performed frequently. The actual skills the physicians performed at the disaster sites positively changed according to differences in demographic characteristics, previous experiences, and dispatch situations.

There are no standardized curricula for training on disaster management, and FMTs often are not competent during the response phase because of education and training deficiencies.[14] A study in the European Union showed that only 61% of disaster and emergency training initiatives had a competency-based curriculum design.[15] To have an evidence-based disaster training curriculum (DITAC), it is important to incorporate 23 skills as essential competencies for international disaster relief. Moreover, FMTs may require special training according to the realities of the medical care scene, including differences in language, cultures, religions, and sanitary conditions at the dispatch site. Hereby, physicians can fulfill the expectations of the affected area by providing high-quality medical care. Additionally, it is essential for physicians to understand the past illness information of the personnel who are dispatched to the international disaster-relief site, because it is useful for the "health management of dispatched personnel," and it will help them maximize their medical skills to better assist the affected people.

Several previous studies have assessed the effectiveness of disaster training.[16-20] However, a statistically significant increase of a few points, pre-test to post-test, may not have clinical or operational significance. Furthermore, increases in test scores may or may not correlate with improvements in true readiness to respond to an actual disaster.[21] In regards to disaster nursing, nurses who receive prior training in typhoon disaster-relief work are more likely to hold positive attitudes about participating in typhoon disaster-relief work.[22] On the other hand, this finding proves that disaster medicine training experience is statistically positively associated with medical relief activities in the affected area. Additionally, surgeons were over-represented, according to these results, and this implies that surgeons more frequently perform relief efforts at disaster location sites compared to other medical professionals. Surgeons involved in future peacekeeping missions should be aware of the broad variety of clinical problems they may encounter, and they may need to undergo refresher training in relevant sub-specialties.[23] These results suggest that surgeons have been equipped with multiple skills needed for international disaster relief through actively participating in disaster-response training and daily medical care.

Previous studies have suggested that a positive perception of individual preparedness is associated with prior experience in disaster response.[24] However, few studies have considered whether prior experience in disaster response is associated with subsequent international disaster-relief missions. This study shows that there is a trend toward higher total scores for most skills when there is more experience with international and domestic disaster-relief. Particularly, there was a trend toward significantly higher scores of management and coordination skills with more

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	Total Score[a]		
	n (%)	Mean (SD)	P Value[b]
Sex			
Male	50 (96.2)	97.2 (23.7)	.8
Female	2 (3.8)	88.0 (2.8)	
Age (years)[c]			
Mean (SD)	38.7 (6.7)		
25-34	15 (28.8)	89.8 (16.3)	.1[d]
35-44	29 (55.8)	96.8 (25.0)	
45-54	8 (15.4)	110.5 (24.7)	
Years of Experience as a Physician (years)[e]			
Mean (SD)	13.6 (7.1)		
≤10	18 (34.6)	93.2 (18.3)	.2[d]
11-20	26 (50.0)	93.9 (23.9)	
≥21	8 (15.4)	114.9 (26.1)	
Affiliation			
Private Hospital	2 (3.8)	131.5 (21.9)	.001
JRCS	9 (17.3)	115.0 (19.8)	*
JGSDF	41 (78.8)	91.2 (20.9)	
Specialty			
Surgeon	25 (48.1)	106.4 (25.5)	.01
Internist	13 (25.0)	84.2 (17.2)	**
Others	14 (26.9)	91.6 (17.4)	
Previous Experience			
Domestic Disaster-relief Experience (number of deployments)			
None	23 (44.2)	92.8 (20.3)	.2[d]
Once	18 (34.6)	94.8 (20.3)	
≥Twice	11 (21.2)	108.7 (31.1)	
International Disaster-relief Experience (number of deployments)			
None	36 (69.2)	93.5 (23.1)	.03[d]
Once	10 (19.2)	95.4 (21.4)	
≥Twice	6 (11.5)	119.5 (17.5)	
Disaster Medicine Training Experience (number of participations)			
None	29 (55.8)	86.4 (17.7)	<.001[d]
Once	8 (15.4)	107.8 (18.3)	

Table 2. Respondent Demographic Information and Total Scores for Participants' Characteristics *(continued)*

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	Total Score[a]		
	n (%)	Mean (SD)	P Value[b]
≥Twice	15 (28.8)	111.4 (25.9)	
Dispatch Situation[f]			
Length of Dispatch			
Mean (SD)	77 (66)		
≤30 days	26 (50.0)	98.0 (24.2)	.7[d]
31-90 days	10 (19.2)	100.6 (29.6)	
≥91 days	16 (30.8)	92.7 (18.0)	
Post-disaster Phase[g]			
<1 week	11 (21.2)	93.1 (25.5)	.6[d]
1-3 weeks	12 (23.1)	103.0 (28.1)	
≥3 weeks	29 (55.8)	95.8 (20.6)	
Disaster Type			
Natural	32 (61.5)	99.7 (24.1)	.3
Man-made	20 (38.5)	92.4 (21.9)	
Place of Dispatch[h]			
Asia	30 (57.7)	97.5 (25.7)	.5
Africa	9 (17.3)	89.1 (19.3)	
America	13 (25.0)	100.9 (20.2)	

Table 2 *(continued)*. Respondent Demographic Information and Total Scores for Participants' Characteristics
Abbreviations: JGSDF, Japan Ground Self-Defense Force; JRCS, Japanese Red Cross Society.
(Data are expressed as numbers (percentages) and means (standard deviations). Multiple comparison result significance is expressed as: $^{*}P < .05$; $^{**}P < .01$. Total value may not add up to 100%, due to rounding off.)
[a] The total score is obtained by summing the frequency of skills used by the participants at the disaster sites (see the "Methods").
[b] The P value calculated using a Mann-Whitney U test and a one-way analysis of variance with the Games-Howell post hoc test (for continuous variables).
[c] Age at the time of dispatch to the disaster site.
[d] The P trend calculated using the Jonckheere-Terpstra trend test (for ordinal variables).
[e] Years of experience as a physician at the time of dispatch to the disaster site.
[f] The situation at the time of dispatch to the disaster site.
[g] Time from disaster occurrence to day of dispatch in weeks.
[h] Based on geographical region and composition from the United Nations Statistics Division (see the "Methods").

international disaster-relief experiences. Disaster medical relief missions of FMTs should be coordinated carefully.[25] There is a lack of both coordination and integration among FMTs and their activities during disasters.[14] It is important to improve management and coordination skills by adding to international disaster-relief experiences and participating in disaster medicine training.

Surgical care is the most frequent procedure performed during the early phases after disaster strikes.[26-30] After the first few days, medical needs shift from patients requiring care for injuries caused directly by the earthquake to treating diseases and injuries related to the hazardous environment left in the wake of the disaster.[31] The mean surgical skills score was the highest among all the post-disaster phases at more than three weeks following the disaster. Previous findings are inconsistent with the current results. This finding indicates that physicians who participate in international disaster relief need to prepare for surgical procedures, regardless of the post-disaster phase in which they operate.

There were within-affiliation differences in terms of the surgical and health care-related skills and the management and coordination skills. To the authors' knowledge, no previous study has found any similar results. This study is the first, using the same scale assessment, to demonstrate that the frequency of skills the

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	Mean (SD)
Medical interviews and patient histories.	4.0 (1.1)
Taking care of patients with internal diseases.	3.9 (1.0)
Health management of dispatched personnel.	3.7 (1.3)
Taking care of patients with infections.	3.5 (1.0)
Explaining to patients about drugs.	3.3 (1.5)
Taking care of patients with skin conditions.	3.2 (1.0)
Statistical analysis of patient data in the medical dispensary.	3.1 (1.6)
Management of medical personnel's working shifts and job descriptions.	3.1 (1.4)
Mental health care for dispatched personnel.	3.1 (1.2)
Assessment of medical needs at the disaster site.	2.8 (1.4)
Wound irrigation or assistance with wound irrigation.	2.7 (1.2)
Liaison and coordination with relevant organizations in Japan.	2.6 (1.5)
Management of medical drugs.	2.6 (1.5)
Liaison and coordination with international organizations.	2.6 (1.3)
Efficient storage and consignment of medical equipment in the dispensary.	2.6 (1.2)
Management of patient medical records.	2.5 (1.5)
Taking care of pediatric patients.	2.4 (1.4)
Vaccinations for local residents.	2.3 (1.4)
Maintenance of medical equipment.	2.3 (1.4)
Use of the communication equipment.	2.3 (1.3)
Taking care of patients with eye problems.	2.3 (0.9)
Medical education for the local staff members.	2.2 (1.4)
Responding to the media.	2.1 (1.3)
Maintenance of life support equipment.	2.0 (1.3)
Surgical debridement or assistance with surgical debridement.	2.0 (1.2)
Screening for infectious diseases.	2.0 (1.1)
Taking care of otological patients.	2.0 (0.9)
Management of medical waste.	1.9 (1.2)
Suturing or assistance with suturing.	1.8 (1.1)
Application of medical dressing or assistance with medical dressing.	1.8 (1.1)
Small incisions or assistance with small incisions.	1.8 (0.9)
Suture removal or assistance with suture removal.	1.8 (0.9)
Provision of health education to local residents.	1.7 (1.0)
Mass-casualty triage.	1.6 (1.2)
Cast immobilization or assistance with cast immobilization.	1.6 (1.1)
Disinfection of a variety of equipment.	1.6 (0.8)
Dealing with illegal intruders.	1.5 (1.0)
Taking care of expectant or nursing mothers.	1.5 (0.9)
Surgeries or assistance with surgeries.	1.5 (0.9)
Water examinations.	1.4 (0.9)
Nutritional assessments.	1.4 (0.8)
Taking care of neonates.	1.3 (0.6)

Table 3. The 42 Skills Ranked in Order of Frequency of Performance in an International Disaster Response Situation *(continued)*

physicians perform differs significantly among FMTs. There is a need to develop a universal scale for measuring physicians' skills in international disaster relief because of the difficulties in evaluating the medical relief activities of the FMTs. Such a scale would lead to the improvement of training curriculum according to the characteristics of specific FMTs.

Limitations

The present study had several potential limitations. It used a very small sample size, and the study subjects were all Japanese. Furthermore, the majority of the participants were physicians who were affiliated with JGSDF, so these results may not be generalizable to FMTs from other countries.

Second, the factors affecting the frequency of physicians' skills in international disaster settings may be variable, but this study employed a univariate analysis of a limited number of variables. Thus, it cannot be determined whether there are differences in the scores for each skill among demographic characteristics, previous experiences, and dispatch situations, or if these differences merely occurred by chance. Therefore, future studies should conduct multivariate analyses with large sample sizes.

Third, the validity and reliability of the questionnaire was not confirmed to be sufficient. Finally, the 42 skills selected might not reflect all of the medical relief activities performed by physicians working in an international disaster setting. Further studies will need to explore other aspects of physicians' competency needs at disaster sites, and much more worldwide evidence needs to be gathered regarding medical relief activities by physicians in various other kinds of disasters. When interpreting the results of this present study, readers should bear these limitations in mind.

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	Surgical Skills		Health Care-related Skills		Public Health Skills		Management and Coordination Skills	
	Mean (SD)	P[a]	Mean (SD)	P[a]	Mean (SD)	P[a]	Mean (SD)	P[a]
Sex								
Male (n = 50)	13.4 (6.4)	.8	37.3 (8.8)	.6	11.9 (4.5)	.5	26.7 (9.9)	.4
Female (n = 2)	10.7 (0.8)		40.3 (5.7)		9.6 (5.0)		20.6 (7.8)	
Age (years)								
25-34 (n = 15)	10.8 (2.8)	.2[b]	39.1 (6.7)	.6[b]	10.5 (3.4)	.3[b]	21.7 (7.2)	.003[b]
35-44 (n = 29)	13.6 (6.1)		36.5 (7.8)		12.3 (4.7)		26.5 (9.1)	
45-54 (n = 8)	16.8 (9.9)		37.6 (14.1)		12.5 (5.39		35.3 (11.6)	
Years of Experience as a Physician								
≤10 (n = 18)	12.7 (4.9)	.4[b]	39.1 (6.6)	.8[b]	11.1 (3.2)	.8[b]	22.1 (7.1)	.007[b]
11-20 (n = 26)	11.9 (5.3)		35.0 (7.7)		12.1 (5.0)		27.5 (10.1)	
≥21 (n = 8)	19.0 (9.2)		41.7 (13.3)		12.4 (5.3)		33.0 (11.2)	
Affiliation								
Private Hospital (n = 2)	16.8 (9.4)	.01	53.3 (1.5) *	.02	17.7 (5.1)	.13	35.2 (12.9)	.001
JRCS (n = 9)	18.4 (9.2)		38.4 (12.9)	***	12.4 (3.2)		36.2 (8.8) **	
JGSDF (n = 41)	12.0 (4.9)		36.5 (7.0)		11.4 (4.6)		24.0 (8.5)	
Specialty								
Surgeon (n = 25)	16.0 (7.2)	.003	37.0 (10.2)	.5	12.5 (4.9)	.5	31.8 (9.7) **	< .001
Internist (n = 13)	9.0 (2.2) ***		36.0 (6.9)		11.0 (3.8)		21.8 (8.5)	
Others (n = 14)	12.3 (4.8)		39.5 (7.0)		11.2 (4.3)		21.3 (6.0)	***
Previous Experience								
Domestic Disaster Relief (no. deployments)								
None (n = 23)	11.5 (4.3)	.1[b]	35.7 (6.7)	.1[b]	11.8 (4.9)	.7[b]	26.1 (9.8)	.4[b]
Once (n = 18)	13.3 (5.1)		37.7 (8.5)		11.4 (3.5)		24.7 (7.8)	
≥Twice (n = 11)	17.0 (9.8)		40.7 (11.9)		12.5 (5.3)		30.1 (12.6)	
International Disaster Relief (no. deployments)								
None (n = 36)	12.1 (4.7)	.1[b]	37.7 (8.0)	.8[b]	11.5 (4.6)	.4[b]	24.4 (9.3)	.008[b]
Once (n = 10)	14.2 (6.8)		34.8 (7.8)		12.0 (4.1)		27.0 (8.0)	
≥Twice (n = 6)	19.1 (11.0)		40.3 (13.5)		13.0 (5.0)		37.9 (9.7)	
Disaster Medicine Training (no. deployments)								
None (n = 29)	11.1 (4.2)	.01[b]	34.8 (6.4)	.003[b]	10.9 (4.3)	.8[b]	22.7 (8.1)	.001[b]
Once (n = 8)	14.5 (5.1)		42.6 (7.0)		14.1 (5.0)		27.8 (9.1)	
≥Twice (n = 15)	16.9 (8.5)		39.9 (11.4)		12.4 (4.2)		33.2 (10.2)	
Dispatch Situation								

Table 4. Comparisons of Participants' Characteristics with the Mean Scores for Each Skill *(continued)*

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	Surgical Skills		Health Care-related Skills		Public Health Skills		Management and Coordination Skills	
	Mean (SD)	P[a]	Mean (SD)	P[a]	Mean (SD)	P[a]	Mean (SD)	P[a]
Length of Dispatch								
≤30 days (n = 26)	13.7 (7.4)	.9[b]	39.1 (9.9)	.04[b]	11.9 (3.4)	.3[b]	25.7 (10.5)	.4[b]
31-90 days (n = 10)	13.5 (5.7)		38.7 (7.8)		12.7 (5.7)		27.2 (12.5)	
≥91days (n = 16)	12.5 (4.7)		34.0 (6.1)		11.2 (5.3)		27.3 (7.3)	
Post-disaster Phase								
<1 week (n = 11)	10.7 (4.8)	.1[b]	39.2 (7.4)	.07[b]	11.8 (2.5)	.2[b]	24.1 (12.6)	.3[b]
1-3 weeks (n = 12)	13.7 (6.3)		40.8 (11.7)		12.6 (4.9)		27.9 (11.5)	
≥3 weeks (n = 29)	14.1 (6.7)		35.4 (7.2)		11.5 (4.9)		26.8 (8.1)	
Disaster Type								
Natural (n = 32)	13.4 (7.0)	.7	39.5 (9.4)	.01	12.3 (3.8)	.06	26.8 (10.8)	1.0
Man-made (n = 20)	13.1 (5.2)		34.2 (6.2)		11.0 (5.4)		26.0 (8.4)	
Place of Dispatch								
Asia (n = 30)	12.8 (6.6)	.7	37.7 (8.6)	.5	12.6 (5.0)	.3	26.6 (10.3)	.8
Africa (n = 9)	12.9 (5.6)		34.5 (7.0)		9.9 (3.5)		24.5 (5.1)	
America (n = 13)	14.6 (6.4)		38.8 (9.9)		11.4 (3.3)		27.6 (11.6)	

Table 4 *(continued)*. Comparisons of Participants' Characteristics with the Mean Scores for Each Skill
Abbreviations: JGSDF, Japan Ground Self-Defense Force; JRCS, Japanese Red Cross Society.
(Data are expressed as the numbers and means (standard deviations). Multiple comparison result significance is expressed as: $^{*}P < .05$; $^{**}P < .01$; $^{***}P < .001$.)
[a] The *P* value calculated using one-way analysis of variance with the Games-Howell post hoc test or Mann-Whitney U test.
[b] The *P* trend calculated using the Jonckheere-Terpstra trend test.

Despite its limitations, this study's findings indicate that training experience in disaster medicine and international disaster-relief experience are statistically positively related to real medical relief activities at the affected area. This study enumerates the required skills physicians need to carry out in a dispatch site, and it uses statistical analyses to provide scientific results. This study also provides reliable empirical evidence that holds great implications for the future planning of disaster medicine education and care training, and for the development of DITAC.

Conclusion

The findings of this study elucidate the primary skill needed for international disaster-relief physicians, as well as the most frequently performed skills of physicians at disaster sites. Furthermore, it was found that these skills positively changed according to differences in demographic characteristics, previous experiences, and dispatch situations. These findings may contribute to enhancing the quality of medical practice in international disaster relief and DITAC.

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Author Contributions

NN and KS contributed to the conception and design of this study; NN performed the statistical analysis and drafted the manuscript; CS provided statistical advice on the study design and analyzed the data; SI, KS, HM, ST, and AI critically reviewed the manuscript and supervised the whole study process; NN takes responsibility for the paper as a whole.

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