

Seeking Factors Associated to Effective Disaster Preparedness

Strategies at The University of Tokyo Hospital

by

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Abstract

Background: Japan is a country with a high natural disaster frequency. The University of Tokyo Hospital is one of the disaster base hospitals located in the capital city of Tokyo. Hence, developing effective disaster preparedness strategies and strengthening disaster response capacity of The University of Tokyo Hospital is important. To achieve that, understanding the factors associated with disaster response of the hospital staff is crucial. The purpose of this study is to investigate the factors associated with staff behavior toward disaster response.

Methods: Two different surveys were conducted, a paper-based questionnaire for the sections (i.e., hospital departments) and an online-based questionnaire for the individuals (i.e., hospital staff). In the paper-based questionnaire, 18 sections that are considered important to decide the hospital functions during a disaster were recruited. In the online-based questionnaire, the hospital staff also recruited staff employed by external partners for voluntary participation. Each questionnaire was developed based on validated questionnaires. Descriptive analyses were conducted on these surveys.

Results: Overall, 17 sections responded to the survey, where 16 out of 28 question items were prepared by more than 70% of the sections. There was no significant association between degree of preparedness and the section's work contents. Overall, 338 staff responded to the survey for individuals. The proportion of each profession among respondents was different from what it actually is at The University of Tokyo Hospital. Strong trends were observed in many items related to behavior and knowledge of local conditions and disaster response in hospitals. The majority of participants had basic

knowledge about disasters. Some background factors, such as age and profession, had significant associations with the respondents' behavior and knowledge.

Conclusion: The findings suggest that some factors in sections and individuals may influence the behavior of staff toward disaster response in the hospital. Some of them require changing measures at the organizational level. To fulfil the role of The University of Tokyo Hospital in society during a natural disaster, continuous efforts for improvement necessary.

Keywords: Disaster preparedness, BCP, University Hospital, Organizational Culture, Strategy development, Collaboration, Stakeholder engagement, Awareness raising

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List of abbreviations

| | |
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| MHLW | The Ministry of Health, Labour and Welfare |
| BCP | Business continuity plan |
| DPSN | Disaster Preparedness Scale for Nursing |
| JADM | Japanese Association for Disaster Medicine |

1. INTRODUCTION

1.1. Background: Disaster in Japan

Japan is a country with a high disaster frequency and one of the countries that are most affected by natural disaster ^{1 2}. Japan is located on the circum-Pacific mobile belt, and its land area is about 378,000 square kilometers ³. Although Japan's land is only 0.25% of the total world's land area, the number of earthquake occurrence is about 10% in the world, and it has about 7% of the world's active volcanoes ⁴. The frequency of short-term heavy rain, which is a cause of floods and landslides, has increased recently ⁵.

Japan has been experiencing several catastrophic disasters, which have increased the interest of the government in developing disaster preparedness plans. For this reason, Japan is expected to be a leader in disaster preparedness in the world ⁶. Since the United Nations General Assembly designated the 1990's as the "International Decade for Disaster Risk Reduction", all three World Conferences for Natural Disaster Reduction were held in Japan: ⁷ Yokohama in 1994, Kobe in 2005, and Sendai in 2015. In the latest conference in Sendai, the Sendai-Framework was agreed by all parties. One of the seven targets in the Sendai Framework was to "substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030" ⁸.

1.1.1. Disaster preparedness in healthcare provision in Japan

Japan has struggled to prevent disruption of healthcare provision and the significant impact on the health of people in affected areas during and after major disasters. The Japanese government has been taking actions to become a disaster-resistant country. For instance, the Great Hanshin-Awaji Earthquake occurred in 1995, where 6,432 people were killed and 43,792 were injured. Crucially, 500 of these deaths were estimated as preventable

disaster deaths. It, therefore, revealed the weakness of the medical system in emergencies at the immediate aftermath. In 1997, to strengthen the system, the Ministry of Health, Labour and Welfare (MHLW) announced the start of a project to establish disaster base hospitals all over the country. 770 disaster base hospitals were designated on April 1st in 2023.

Furthermore, the Great East Japan Earthquake occurred in 2011. Continuous healthcare provision was required over the medium-to long-term. The smooth recovery of the medical system from disaster response to normal operations was a major challenge. Since 2012, the MHLW has been promoting a disaster countermeasure manual and a business continuity plan (BCP) for all medical facilities. From 2017, all disaster base hospitals are required to have a BCP⁹.

The BCP is a plan for avoiding interruption of businesses and for recovering as quick as possible from a sudden change in the business environment or from unpredictable circumstances¹⁰. The BCP of disaster base hospitals recommend reducing decline response capacity through preparedness, early recovering response capacity, increasing the capacity for response mass casualties, and reducing the impact on local areas through interorganizational cooperation using regional agreements and systems¹¹. This suggests the importance of the continuity of the hospital function with management of minimum human resources and supplies. In contrast, the disaster countermeasure manual is a manual for disaster response from immediate aftermath to acute phase in detail. In other words, a major difference with the disaster countermeasure manual is that the BCP is more focus on recovery¹². In many instances, the disaster countermeasure manual and the BCP overlap with each other.

The MHLW reported that 25% of all hospitals (the number of responding is 7,294 out of 8,372 (87.1%)) have already prepared their BCP until 2018⁹. By 2021, all disaster base hospitals have been fully equipped with a BCP¹³. While preparations are underway, the feasibility of BCP is being questioned. The implementation of BCP is a key factor for the

function of disaster base hospital during disaster. Furthermore, the function of disaster base hospitals has a significant impact on the local healthcare provision.

1.1.2. Problem statement

The University of Tokyo Hospital is one of the biggest university hospitals in Japan, with 1,200 beds and about 4,000 staff employed by the hospital and other staff employed by external partners. Also, the disaster response booklet is a booklet that combines disaster countermeasure manual and BCP. In preparation for emergencies, regular drills (twice a year) are conducted, as stipulated by the government, and are aimed to strengthen response capability of each disaster based hospital and to promote effectiveness of the BCP and the disaster countermeasure manual. However, some challenges exist: First, some of the employees are required to participate in the drills as part of their job, but they seem to consider that disaster response preparedness is an additional workload; and second, the disaster response booklet is very thick, and therefore it takes a long time to read through, which makes it difficult to memorize. Attaching understandable index for easy access to information and providing a simple action guide called the "action card" would be a helpful way to reduce the difficulty of using the booklet physically. Also, involving the staff to develop the disaster response booklet items (e.g., who will work front line at the disaster), educating and training them constantly are important strategies. Therefore, to make the disaster response booklet effective and to strengthen the hospital's disaster response capability, it is essential to obtain cooperation from as many staff members as possible. However, it is not easy to motivate the staff to engage in disaster preparedness, which no one knows when it will occur. For this reason, understanding the factors associated with staff's behavior is crucial to develop effective disaster preparedness strategies.

1.2. Objectives

Understanding the factors associated with the staff's behavior requires understanding both in the characteristics of the organization they belong to and the individual's factors. Edgar Henry Schein, the psychologist, suggested that organization and staffs' behavior were strongly connected to organizational culture¹⁴. Here, "organization" refers to either The University of Tokyo Hospital, the hospital department, or any workplace in the hospital. Since uniqueness of huge university hospital, collection of various professions and various departments in one facility, each organization may have different culture. Potential organizational factors include leadership, incentives and engagement, inter-organizational collaboration, as well as organizational structure and decision-making processes. On the other hand, potential individual's factors include general background (age, sex), experience of work and disaster, education experience of disaster and family situation.

The purpose of this study was to investigate the individual's factors and the section's factors the staff were affiliated with during a disaster response in The University of Tokyo Hospital. Understanding the factors associated with staff's behavior related to disaster response and the barriers for disaster preparedness would help develop possible strategies that The University of Tokyo Hospital could provide as an organization in the future.

2. METHODS

Two different surveys were conducted in the University of Tokyo Hospital. One survey targeted important sections during disaster and another targeted individuals. In this study, the term section was defined as the place where the respondents mainly work for, since disaster countermeasures are taken place by place. As an exception, department was considered as section if respondent didn't have a main place to work but had multiple places to work as

staff of their department. This is because of the complexity of working system in hospital. In hospital every staff member belongs to one department each, but some of staff members have one place to work while others have several places to work. A section is a small organization most familiar to each staff member.

Survey for sections mainly focused on evaluating the relationship between disaster preparedness and the characteristics of each section's work contents, whereas survey for individuals included all professions of employees working in The University of Tokyo Hospital and mainly focused on evaluating the association between the characteristics of individuals, their knowledge, and their behavior toward disaster response.

2.1. Survey for sections

In The University of Tokyo Hospital, there are total of 107 sections. This survey was a cross-sectional survey targeting 18 sections that were considered important sections. The functions of these sections have a significant impact on the functions of the hospital during a disaster. The selection of sections was based on the disaster response booklet of The University of Tokyo Hospital, which included both clinical sections and management sections.

To ensure its validity, the questionnaire was developed based on the Disaster Preparedness Scale for Nursing (DPSN)¹⁵, which is a tool for disaster preparedness in nursing. However, the survey in this study targeted not only nurses but also various professions, considering that preparedness tends to depend on nurses in clinical sections where various professions work together. For this reason, the DPSN was referred for developing this survey. However, considering that the DPSN originally focused on nursing, significant modifications were required to make it suitable for evaluating different activities in various sections.

The questionnaire of the "survey for sections" had two parts: Part I consisted of 34 items

about the section's disaster preparedness, including four open-ended questions, and Part II consisted of 26 items about the section's work contents. This questionnaire was reviewed by four experts who were council members of the Japanese Association for Disaster Medicine (JADM). The survey questionnaire is attached in Appendix A.

2.1.1. Data collection

A Face-to-face explanation meeting was conducted with a supervisor or a person equivalent to the supervisor for each section. A set of paper questionnaire was handed over the supervisor in the meeting. After the explanation meeting, the supervisor selected one participant in their section to respond the survey. The participant read the explanation and consent form. If the participant agreed, they submitted their answers anonymously in an enclosed envelope through in-hospital delivery. The survey was conducted for 10 days from October to November 2023.

2.1.2. Data analysis

Descriptive analysis was conducted. To summarize the data, the items were divided into two groups. In the multiple-choice questions, the items, which had bilateral choices (total of four choices, two degrees toward positive and two degrees toward negative), were divided into positive and negative groups. The items selected as "not applicable" were removed from calculation. The ordinal data were divided into two groups to ensure that the number of respondents were balanced.

To assess the association between part I and part II, chi-square tests were conducted. The P-value of <0.05 was considered statistically significant. Stata/BE 18.0 was used for analysis.

2.2. Survey for individuals

This survey was a cross-sectional survey targeting all types of employment status and regardless of profession at The University of Tokyo Hospital. To ensure the questionnaire's

validity, it was developed based on a previous study by Sawsan et al (2023)¹⁶, but it required some modification to make it suitable for a Japanese hospital situation. The questionnaire had 58 items with multiple choices, and two open-ended questions about the type of work respondents experienced in the Great East Japan Earthquake and their own barrier to prepare for a disaster. This questionnaire was reviewed by four council members of the JADM, and it was improved after a pre-survey of 14 participants. The survey questionnaire is attached in Appendix B.

2.2.1. Data collection

This survey was an anonymous online questionnaire using Google Form. It was announced to employees via notification on the hospital intranet, poster display, flyers posted in all departments and places of work (e.g., wards and units), e-mail to individuals, and face-to-face promotion. It was also announced to the supervisors of each of the 18 sections, which were objects of the “survey for sections”. Because not all staff need to access an intranet in their work, it was announced in different ways. The survey was conducted for two weeks from October to November 2023.

2.2.2. Data analysis

A descriptive analysis was conducted. For clear interpretation, the items were divided into two groups except for professions and sections. The items in the multiple-choice questions, which had bilateral choices (total of four choices, two degrees toward positive and two degrees toward negative), were divided into positive and negative groups. Numerical items which assumed individual backgrounds were divided at the median value to ensure that the numbers of respondents were balanced. Other items were considered item by item. Professions were divided into four groups: physicians, nurses, other medical qualifications and others. Sections were divided into seven groups: Critical care section (intensive care unit and operation room), General ward, Clinical section (other clinical sections, e.g., section for

outpatient, sections for examinations), Support section (section for supporting clinical activities), Research section, Administration, and External section (independent department as outsourced contractors). The items selected as “not applicable” were removed from calculation.

To assess the association between background characteristics and other conditions, chi-square tests were conducted. The P-value of <0.05 was considered statistically significant. Stata/BE 18.0 was used for analysis.

2.3. Ethical considerations

The study was approved by St. Luke’s International University Research Ethics Review Committee (registration number: 23-RC054) and received a permission of implementation from The University of Tokyo Graduate School of Medicine/Faculty of Medicine Ethics Committee (registration number: 2023186NIe). The respondents were informed of the purpose, procedure, potential publication, and potential presentation in an academic conference. The consent form was attached to the first page of each survey. In the survey for sections, if participants disagreed to answer, they selected “disagree” on the consent form and sent back blank sheets with an enclosed envelope through in-hospital delivery. In the survey for individuals, if participants disagreed, they either exited the website or selected “disagree” on the consent forms. Both surveys were conducted anonymously, so it was impossible to identify the respondent for each answer. Under these processes participants would not be forced to answer.

3. RESULTS

3.1. Survey for sections

A total of 17 sections responded to the survey out of the 18 recruited sections (Figure 1). Six sections had their own patients, five sections dealt with patients in their units and six sections did not deal with patients directly.

Results of part I (questions about the section's disaster preparedness) are shown in Table 1. 16 question items out of 28 items

were answered as "Agree" (including "Agree" and "Somewhat agree") by more than 70% of the sections. In part I, the number of questions items that were answered as "Agree" (include "Agree" and "Somewhat agree") in one section varied from 7 to 28 items, depending on the sections. Some sections answered "not applicable" or "don't know" for some items. After excluding the items selected as "not applicable" and "don't know", the percentage of items selected as "Agree" were calculated. Overall, the median percentage was 71.4%. The sections were divided into two groups depending on the degree of preparedness. Eight sections above 71.4% were assigned to the "well prepared" group (median: 89.8%), nine sections below 71.4% were assigned to the "less prepared" group (median: 57.1%).

To assess the association between degree of preparedness and sections' work contents, chi-square tests were conducted in the "well prepared"/ "less prepared" group and Part II items (Table 2). In Part II, after excluding the answer "not applicable", the answers "agree" and "somewhat agree" were classified into "agree", the answers "disagree" and "somewhat

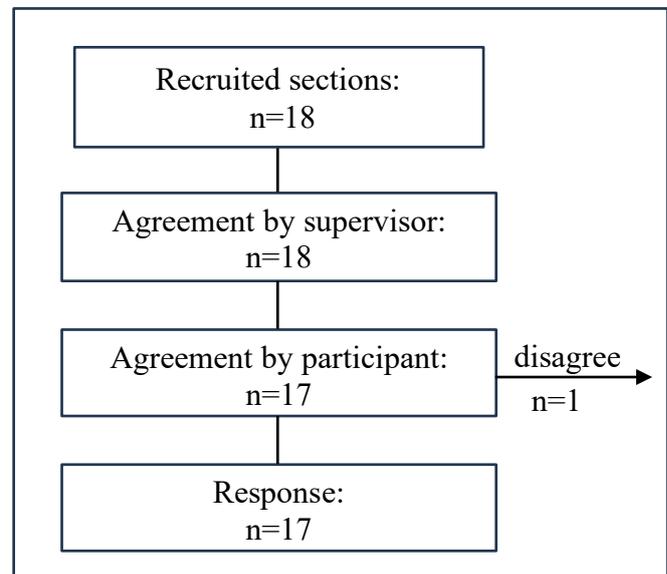


Figure 1: Study sample

disagree” were classified into “disagree” in question A-E and G. In question F, the answers “more than half”, “30-40%” and “10-20%” were classified into “10% and more”, the answers “non” and “less than 10%” were classified into “less than 10%”.

16 sections (94.1%) had a larger workload compared to human resources (A3), 17 sections (100.0%) considered that following established procedures for sectional operations was important (B1), 16 sections (94.1%) had the break space for staff (D5) and an atmosphere where staff can easily communicate with each other (D6), in 17 sections (100%), it was clear who would make a decision in an emergency (E1), and 17 sections (100%) always required collaborations with other sections (G1). As a result of the chi-square test, there were no significant associations between work contents and the degree of preparedness.

Table 3 shows some of the answers for section E in Part I (i.e., Regarding the items that you chose *somewhat agree*, *somewhat disagree*, *disagree*, what do you think as barrier?). The answers could be categorized into 7 similar groups.

Table 1: Part I summary of the numbers (percentages) of sections in Agree/ Disagree

| Questions about disaster preparedness in your section | Agree n (%) | Disagree n (%) | Don't know n (%) | Not applicable n (%) |
|--|----------------|-------------------|------------------------|----------------------------|
| A1. A disaster preparedness plan for equipment and supplies is prepared and regularly inspected. | 15 (88.2) | 2(11.8) | 0 | 0 |
| A2. The evacuation plan is well known among staff in the section. | 13 (76.5) | 4 (23.5) | 0 | 0 |
| A3. Safety of evacuation route is regularly inspected. | 11 (64.7) | 6 (35.3) | 0 | 0 |
| A4. A contact network of managers and staff has been prepares and is used on a daily basis. | 16 (94.1) | 1 (5.9) | 0 | 0 |
| A5. A system to secure staff during disaster is prepared. | 15 (88.2) | 2 (11.8) | 0 | 0 |
| A6. Methods to confirm the safety of patients and other outsiders in the event of a disaster is in place. | 9 (52.9) | 5 (29.4) | 1 (5.9) | 2 (11.8) |
| A7. The damage that is likely to occur in your section and the patients' characteristics in your section are well-known. | 14 (82.4) | 2 (11.8) | 1 (5.9) | 0 |
| A8. A business action plan for disaster is prepared. | 15 (88.2) | 2 (11.8) | 0 | 0 |
| A9. A business action plan considers the damage that is likely to occur in your section and the patients' characteristics in your section. | 10 (58.8) | 7 (41.2) | 0 | 0 |
| A10. A business action plan consistent with the hospital's disaster response booklet is prepared. | 13 (76.5) | 4 (23.5) | 0 | 0 |
| B2. The equipment necessary to provide medical care (service) during a disaster is ready for use at any time. | 13 (76.5) | 3 (17.7) | 1 (5.9) | 0 |
| B4. All staff are aware of how to use equipment and supplies in the event of a disaster. | 13 (76.5) | 4 (23.5) | 0 | 0 |
| B5. The necessary space for disaster response is secured in advance. | 9 (52.9) | 6 (35.3) | 1 (5.9) | 1 (5.9) |
| B6. Equipment for providing medical care (services) is prepared with collecting information on hospital characteristics. | 7 (41.2) | 7 (41.2) | 0 | 3 (17.7) |

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Table 1 is continued

| Questions about disaster preparedness in your section | Agree n (%) | Disagree n (%) | Don't know n (%) | Not applicable n (%) |
|--|----------------|-------------------|------------------------|----------------------------|
| C1. The necessary equipment, educational materials, supplies, etc., are prepared to provide disaster education. | 12 (70.6) | 5 (29.4) | 0 | 0 |
| C2. An ICT (Information and communications Technology) environment is prepared so that can be used for disaster education. | 11 (64.7) | 5 (29.4) | 1 (5.9) | 0 |
| C3. Staff in charge of disaster education is available. | 13 (76.5) | 4 (23.5) | 0 | 0 |
| C4. External parties (from other sections, etc.) to provide disaster education are available. | 7 (41.2) | 9 (52.9) | 0 | 1 (5.9) |
| C5. Staff who can provide disaster education is systematically trained. | 11 (64.7) | 6 (35.3) | 0 | 0 |
| C6. A system which employees are exempted from duties during the time they participate in disaster education are provided. | 12 (70.6) | 3 (17.7) | 1 (5.9) | 1 (5.9) |
| C7. Disaster education considering the characteristics of hospitals and sections is conducted. | 14 (82.4) | 3 (17.7) | 0 | 0 |
| C8. Opportunities for information exchange between staff (or professionals) involved in disaster education are available. | 14 (82.4) | 3 (17.7) | 0 | 0 |
| C9. Disaster education is conducted in regularly. | 14 (82.4) | 3 (17.7) | 0 | 0 |
| C10. Disaster response training in your section is planned and conducted at least once a year. | 12 (70.6) | 5 (29.4) | 0 | 0 |
| D1. A budget for disaster preparation is estimated and considered. | 4 (23.5) | 8 (47.1) | 2 (11.8) | 3 (17.7) |
| D2. Evaluation of proper plan execution is carried out. | 6 (35.3) | 7 (41.2) | 2 (11.8) | 2 (11.8) |
| D3. Section's representatives are participating in the revision of the hospital's disaster response booklet as part of their duties. | 9 (52.9) | 3 (17.7) | 4 (23.5) | 1 (5.9) |
| D4. Staff contribution to/ participation in disaster countermeasures for the hospital and their sections are encouraged. | 6 (35.3) | 10 (58.8) | 1 (5.9) | 0 |

"Agree" includes the answer "Agree" and "Somewhat agree". "Disagree" includes the answer "Disagree" and "Somewhat disagree". B1 and B3 were removed because these were duplicated questions.

Table 2: The association between preparedness and sections' work contents

| Questions about section's work contents | answered "agree" n (%) | | | p value |
|--|------------------------|---------------|---------------|---------|
| | Total | Well prepared | Less prepared | |
| A1. The daily workload of the entire section is constant | 2 (11.76) | 1 (12.5) | 1 (11.1) | 0.929 |
| A2. The daily workload of the entire section is unpredictable | 12 (70.6) | 5 (62.5) | 7 (77.8) | 0.490 |
| A3. The section has a larger workload compared to human resources on a daily basis | 16 (94.1) | 8 (100.0) | 8 (88.9) | 0.331 |
| A4. More than half of the staff are forced to work outside of normal work hours | 13 (76.5) | 7 (87.5) | 6 (66.7) | 0.312 |
| B1. It is important that sectional operations follow established procedures | 17 (100.0) | 8 (100.0) | 9 (100.0) | |
| B2. It is important that sectional operations choose the means to achieve results | 15 (88.2) | 7 (87.5) | 8 (88.9) | 0.929 |
| B3. The section often provides services to people who have difficulty communicating | 8 (50.0) | 4 (50.0) | 4 (50.0) | 1.000 |
| C1. In sectional operations, the daily chain of command and its personnel are fixed | 12 (70.6) | 5 (62.5) | 7 (77.8) | 0.490 |
| C2. In sectional operations, the chain of command and its personnel change daily (or for each matter) | 12 (70.6) | 7 (87.5) | 5 (55.6) | 0.149 |
| C3. The assignment of personnel within a section is often changed depending on the workload | 13 (76.5) | 6 (75.0) | 7 (77.8) | 0.893 |
| D1. The work of the section is carried out by the cooperation of multiple occupations | 14 (82.4) | 7 (87.5) | 7 (77.8) | 0.600 |
| D2. During normal operations, cooperation between multiple professions within the section is carried out smoothly | 14 (82.4) | 7 (87.5) | 7 (77.8) | 0.600 |
| D3. During temporary operations, cooperation between multiple professions within the section is carried out smoothly | 15 (88.2) | 8 (100.0) | 7 (77.8) | 0.156 |

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Table 2 is continued

| Questions about section's work contents | answered "agree" n (%) | | | p value |
|--|------------------------|---------------|---------------|---------|
| | Total | Well prepared | Less prepared | |
| D4. Opportunities are regularly set up for related professions to exchange opinions across professions regarding the work of the section | 13 (76.5) | 7 (87.5) | 6 (66.7) | 0.312 |
| D5. A shared break space is provided within the section for staff | 16 (94.1) | 8(100.0) | 8 (88.9) | 0.331 |
| D6. The break space has an atmosphere where staff can easily communicate with each other | 16 (94.1) | 8 (100.0) | 8 (88.9) | 0.331 |
| D7. Within the section, there are differences in the right to speak depending on the profession | 7 (43.8) | 4 (50.0) | 3 (37.5) | 0.614 |
| D8. Within the section, there are differences in the right to speak depending on years of experience | 9 (52.9) | 4 (50.0) | 5 (55.6) | 0.819 |
| E1. It is decided (or clear) who will make decisions in an emergency | 17 (100.0) | 8 (100.0) | 9 (100.0) | |
| E2. There are multiple people within the section who can make decisions in an emergency | 15 (88.2) | 7 (87.5) | 8 (88.9) | 0.929 |
| E3. Human resources who can make decisions in emergencies are consciously cultivated | 8 (47.1) | 4 (50.0) | 4 (44.4) | 0.819 |
| F1*. Non-regular employees are working | 7 (41.2) | 2 (25.0) | 5 (55.6) | 0.201 |
| F2*. Short-time staff are working | 10 (58.8) | 5 (62.5) | 5 (55.6) | 0.772 |
| G1. Sectional operations always require collaboration with other sections | 17 (100.0) | 8 (100.0) | 9 (100.0) | |
| G2. The section receives operational support from other sections on daily basis | 6 (35.3) | 1 (12.5) | 5 (55.5) | 0.064 |
| G3. The section supports other sections on daily basis | 6 (35.3) | 2 (25.0) | 4 (44.4) | 0.402 |

*F1 and F2 shows numbers and percentage of sections with 10% and more non-regular employee or short-time staff.

3.2. Survey for individuals

A total of 338 staff, who were employed by the hospital and external partners, responded. The characteristics of the respondents are shown in Table 4. Among the respondents, 207 (61.2%) were women (n=207); the mean age (Standard Deviation, SD) was 42.56 (10.62) years old. The largest number of professions were nurses. For occupation status, not only regular employees but also non-regular employees, temporary employees, and staff employed by external partners responded this survey. The largest number of sections affiliated were clinical sections; general ward and critical care sections followed it. The mean years (SD) of experience in the profession was 15.32 (9.65) years, the mean years (SD) of working in The University of Tokyo Hospital was 10.30 (8.66) years. The majority of the respondents have experienced the Great East Japan Earthquake in an area with seismic intensity “5 Lower” as defined by the Japan Meteorological Agency and more. 32.3% of the respondents worked in The University of Tokyo Hospital during the Great East Japan Earthquake. 38.2% of the respondents had a family member needed of care (29.9% lived with and 8.3% didn’t lived with). About half of the respondents estimated to reach The University of Tokyo Hospital within 60 minutes on foot. 36.1% of the respondents worked in multiple areas, 25.7% of the respondents had experience a disaster response in the hospital. About half of the respondents thought they were expected to take on leadership roles. Some of the respondents felt that they had learned sufficiently in schooldays about disaster medicine (9.8%).

The University of Tokyo Hospital has announced the number of their employees by profession¹⁷ as of 2023. This information is limited to personnel employed by the hospital, including physicians (39.5%), nurses (31.8%), health staff with other medical qualification (10.1 %), and other professions (18.6 %, from which 89.3% consists of clerks). After excluding external partners and unknown affiliations from the respondents, the proportion of professions in the respondents was different from the actual proportion of employees working

at The University of Tokyo Hospital (tested by Chi-Square Goodness-of-fit test, $p=0$).

The associations between these characteristics (background factors) and behavior/knowledge are shown in Table 4. The summary of all results is shown in Appendix B. In many items, there were strong trends in the answers obtained. After excluding the background factors, 11 items with less trending answers were used for analysis. The results of chi-square tests were described in Table 5. As a result, the younger generation had less knowledge (B5, C2) and less experience to think about disaster countermeasures and felt more troublesome to participate in a study session about disaster response (F5). Women thought more that Tokyo is high risk (B2), had more knowledge on disaster response and the disaster response booklet (B8, C2), whereas men felt more troublesome to participate in a study session about disaster response (F5). Furthermore, years of professional experience, years of work in The University of Tokyo Hospital, and working at The University of Tokyo Hospital during the Great East Japan Earthquake had positive associations with considering disaster countermeasures (B9) and knowledge about The University of Tokyo Hospital (C2, C7). The respondents who needed 60 minutes and more to get to The University of Tokyo Hospital on foot considered to know the disaster types in Tokyo better than others (B4). Respondents expected to play a leadership role had positive associations with six items that were about disaster in Tokyo and preparation in The University of Tokyo Hospital (B2, B4, B9, C2, C5, C7). Respondents with enough learning experience in school had positive associations with preparation for disaster response (C5). In open-ended questions about barrier to prepare for disaster response (optional response item), 23 of the respondents thought they did not have enough time or energy to prepare, 11 of the respondents had difficulty with family.

Table 4: Characteristics of the respondents

| Characteristics | Overall(n=338) | |
|--|--|----------|
| | n | % |
| Age | Mean (SD), 42.56 (10.62) | |
| | <43 | 169 50.0 |
| | 43+ | 169 50.0 |
| Gender | Male | 130 38.6 |
| | Female | 207 61.4 |
| Profession | Physician | 66 19.5 |
| | Nurse | 115 34.0 |
| | Clerk | 62 18.3 |
| | Other medical qualification | 53 15.7 |
| | Other | 42 12.4 |
| Employment status | Regular employee | 254 75.2 |
| | Non-regular employee | 41 12.1 |
| | Temporary employee | 16 4.7 |
| | External Partner | 25 7.4 |
| Type of work of affiliation | Department for critically ill patients | 57 17.2 |
| | General ward | 64 19.3 |
| | Clinical department other than above two | 101 30.4 |
| | Department that supports clinical activities | 22 6.6 |
| | Department for research | 26 7.8 |
| | Administration | 37 11.1 |
| | External partner | 25 7.5 |
| Years of professional experience (years) | Mean (SD), 15.32 (9.65) | |
| | <15 | 169 50.0 |
| | 15+ | 169 50.0 |

Continued to next page

Table 4 is continued

| Characteristics | Overall(n=338) | |
|--|--|----------|
| | n | % |
| Years of work in The University of Tokyo Hospital (years) | Mean (SD) 10.30 (8.66) | |
| | <10 | 178 52.7 |
| | 10+ | 160 47.3 |
| Where were you in Great East Japan Earthquake? | | |
| | Area of intensity <5 | 52 15.4 |
| | Area of intensity “5 Lower” and more | 286 84.6 |
| What did you do at Great East Japan Earthquake? | | |
| | Work at The University of Tokyo Hospital | 109 32.3 |
| | other | 229 67.8 |
| Family structure (I have family needed of care) | | |
| | Living with family not needed of care | 129 38.2 |
| | Living with family needed of care | 101 29.9 |
| | Having family needed of care but not living together | 28 8.3 |
| | Living alone and no family needed of care | 80 23.7 |
| Time required to reach The University of Tokyo Hospital on foot, in minutes) | | |
| | <60 | 151 44.7 |
| | 60+ | 145 42.9 |
| | I don't know | 19 5.6 |
| | Not applicable | 23 6.8 |
| Number of working areas | | |
| | Single | 216 63.9 |
| | two and more | 122 36.1 |
| I have experience of disaster response | | |
| | Yes | 87 25.7 |
| | No | 251 74.3 |
| I am expected to play a role of leader in my section | | |
| | Agree | 165 48.8 |
| | Disagree | 173 51.2 |
| I learned about disaster medicine sufficiently in my school | | |
| | Agree | 33 9.8 |
| | Disagree | 305 90.2 |

Table 6 shows the comparison between professions and 11 items (behavior/ knowledge). For items with p-value <0.05 in chi-squared, pairwise comparison tests were conducted with significance level at 0.0083. The pairs that had significant level of p-values were the following; in B2 physician-nurse (p=0.006) and physician-others (p=0.001); in B4 physician-nurse (p=0.001); in B8 nurse-others (p=0.001); in B9 physician-nurse (p=0.002), nurse-MQ (MQ: Other medical qualification) (p=0.008), and nurse-others (p=0.000); in C2 physician-nurse (p=0.000), nurse-MQ (p=0.000), and nurse-others (p=0.000); in C5 physician-nurse (0.001), nurse-others (p=0.003); in C7 physician-nurse (p=0.000), nurse-others (p=0.000), MQ-others (0.002); in F4 nurse-others (p=0.001); and in F5 physician-nurse (p=0.001) and physician-others (p=0.000).

Table 7 shows the comparison between affiliations and 11 items. Since B8 included a cell with only one respondent, it was excluded for analysis. Pairwise tests were conducted with a significance level of 0.0024. There was no other pair with significant association.

Table 8 shows some of the answers for F6 (i.e., Please tell us what the barriers are to prepare for disaster response?). The answers were categorized into 6 similar groups.

Table 6: Association between profession and behavior/knowledge

| | Physician n=66 | Nurse n=115 | MQ* n=53 | Other n=104 | p-value |
|---|-------------------|----------------|-------------|----------------|---------|
| B2. I think Tokyo is high risk area being impacted by disaster | | | | | |
| Very high | 35 (53.0) | 84 (73.0) | 31 (58.5) | 80 (76.9) | 0.003 |
| B4. I know better than others what type of disaster will occur in Japan | | | | | |
| Agree | 31 (47.0) | 82 (71.3) | 31 (58.5) | 64 (61.5) | 0.013 |
| B5. I know that some people are more vulnerable than others during disasters | | | | | |
| Know well | 40 (60.6) | 65 (56.5) | 23 (43.4) | 55 (52.9) | 0.272 |
| B8. I know there are prioritization method called <i>triage</i> for disaster medicine | | | | | |
| Know well | 61 (92.4) | 110 (95.7) | 45 (84.9) | 84 (80.8) | 0.003 |
| B9. I have ever thought about hospital disaster countermeasures | | | | | |
| Agree | 41 (62.1) | 95 (82.6) | 34 (64.2) | 55 (52.9) | <0.001 |
| C2. I know where I can reach the disaster response booklet | | | | | |
| Agree | 30 (45.5) | 101 (87.8) | 33 (62.3) | 54 (51.9) | <0.001 |
| C5. I have prepared for disaster response sufficiently | | | | | |
| Agree | 17 (25.8) | 59 (51.3) | 25 (47.2) | 33 (31.7) | 0.001 |
| C7. I understand my role in emergency in my section | | | | | |
| Agree | 33 (50.0) | 91 (79.1) | 32 (60.4) | 36 (34.6) | <0.001 |
| C11. I have an arrangement for emergency with my family | | | | | |
| Agree | 35 (53.0) | 60 (52.2) | 26 (49.1) | 56 (53.9) | 0.953 |
| F4. The working system of my section is a barrier for my participation in a study session | | | | | |
| Agree | 29 (43.9) | 54 (47.0) | 23 (43.4) | 26 (25.0) | 0.005 |
| F5. Participating in a study session about disaster response is troublesome | | | | | |
| Agree | 37 (56.1) | 35 (30.4) | 19 (35.9) | 28 (26.9) | <0.001 |

The numbers and percentages in each profession. *MQ: medical qualifications other than physician and nurse

Table 7: Association between affiliation and behavior/knowledge

| | n (%) | Critical* n=57 | General* n=64 | Clinical* n=101 | Support* n=22 | Research n=26 | Admin* n=37 | External* n=25 | p-value |
|---|-----------|-------------------|------------------|--------------------|------------------|------------------|----------------|-------------------|---------|
| B2. I think Tokyo is a high risk area being affected by disaster | Very high | 40 (70.2) | 46 (71.9) | 60 (59.4) | 15 (68.2) | 22 (84.6) | 27 (73.0) | 16 (64.0) | 0.245 |
| B4. I know better than others what type of disaster will occur in Japan | Agree | 36 (63.2) | 43 (67.2) | 62 (61.4) | 10 (45.5) | 13 (50.0) | 23 (62.2) | 17 (68.0) | 0.514 |
| B5. I know that some people are more vulnerable than others during disasters | Know well | 36 (63.2) | 37 (57.8) | 47 (46.5) | 13 (59.1) | 18 (69.2) | 18 (48.7) | 13 (52.0) | 0.267 |
| B9. I have ever thought about hospital disaster countermeasures | Agree | 45 (79.0) | 46 (71.9) | 64 (63.4) | 12 (54.6) | 14 (53.9) | 23 (62.2) | 18 (72.0) | 0.163 |
| C2. I know where I can reach the disaster response booklet | Agree | 42 (73.7) | 39 (60.9) | 68 (67.3) | 15 (68.2) | 13 (50.0) | 28 (75.7) | 11 (44.0) | 0.063 |
| C5. I have prepared for disaster response sufficiently | Agree | 26 (45.6) | 30 (46.9) | 39 (38.6) | 5 (22.7) | 9 (34.6) | 11 (29.7) | 12 (48.0) | 0.282 |
| C7. I understand my role during emergency in my section | Agree | 43 (75.4) | 37 (57.8) | 60 (59.4) | 14 (63.6) | 6 (23.1) | 17 (46.0) | 14 (56.0) | <0.001 |
| C11. I have an arrangement for emergency with my family | Agree | 36 (63.2) | 33 (51.6) | 48 (47.5) | 11 (50.0) | 15 (57.7) | 18 (48.7) | 14 (56.0) | 0.637 |
| F4. The working system of my section is a barrier for my participation in a study session | Agree | 31 (54.4) | 31 (48.4) | 38 (37.6) | 6 (27.3) | 6 (23.1) | 11 (29.7) | 8 (32.0) | 0.030 |
| F5. Participating in a study session about disaster response is troublesome | Agree | 24 (42.1) | 22 (34.4) | 35 (34.7) | 8 (36.4) | 6 (23.1) | 12 (32.4) | 8 (32.0) | 0.793 |

The numbers and percentages in each affiliation group.

*Critical: Intensive care unit and operation room, General: General ward, Clinical: Other clinical section, Support: Section for supporting clinical activities, Admin: Administrations, External: Independent department as outsourced contractors

4. DISCUSSION

To our knowledge, this is the first study to investigate factors in individuals and sections that are associated with disaster response, across professions and focusing on one of the biggest university hospitals in Japan, The University of Tokyo Hospital. Seeking possible strategies at the organizational level, as suggested in the present findings, is important.

4.1.1. Survey for sections

In part I, more than 70% of the sections answered “agree” for 16 out of 28 questions items, which means that most of the important sections for deciding the function of The University of Tokyo Hospital during a disaster already have basic disaster preparedness. However, there is some room for improvement. In items about preparedness tailored to the characteristics of the hospital or each section (A9, B6), only 58.8% (A9) and 41.2% (B6) of sections answered “agree”. Taking measures tailored to the characteristics of the hospital and each section is supposed to be the next step to make their preparedness effective. In items about section’s stance supporting the hospital’s disaster countermeasures (D3, D4), only 52.9% (D3) and 35.3% (D4) of sections answered “agree”. In the answers for open-ended questions about barrier to improve preparedness in part I, some respondents thought that hospital policy for disaster response was unclear, and a lack of organizational leadership were presented. Sharing missions and visions is one of the important factors for strong leadership¹⁸. If the missions and visions at each level of hospital and section are demonstrated, staff behavior may be changed. In addition, the answers for open-ended questions included the difficulty to secure consistency with the disaster response booklet and the needs for study session about the disaster response booklet.

In part II, the percentage of items about supporting between each section (G2, G3) were low (total 35.3%, total 35.3%). If the hospital is affected by the disaster, it is crucial to

support other sections flexibly and to receive support from other sections or external facility. Preparing both to support other sections and to receive support from others is important. Awareness activities at organizational level for importance of supporting and receiving support is considered effective. The difficulties to secure time for disaster preparedness activities due to shortage of staff and excessive workload were presented in Part II-A3, A4 and open-ended questions in Part I. These are difficult to solve without measures at an organizational level.

The association between preparedness and sections' work contents (Table 2) had no significant result; one possible reason could be the small sample size. In Part-II, the "well prepared" group tended to agree more than the "less prepared" group for A4 (i.e., More than half of the staff are forced to work outside of normal work hours), C2 (i.e., In sectional operations, the chain of command and its personnel change daily, or for each matter), D3 (i.e., During temporary operations, cooperation between multiple professions within the section is carried out smoothly), D4 (i.e., Opportunities are regularly set up for related professions to exchange opinions across professions regarding the work of the section), D5 (i.e., A shared break space is provided within the section for staff) and D6 (i.e., The break space has an atmosphere where staff can easily communicate with each other). Also, in Part-II, the "well prepared" group tended to agree less than the "less prepared" group in F1 (i.e., Non-regular employees are working) and in G2 (i.e., The section receives operational support from other sections on daily basis). The "well prepared" group seemed that they had excessive workload but rarely received operational support from other sections, instead, they had a flexible chain of command. They tended to have smooth cooperation between multiple professions even it was a temporary operation, and they had a good communication across professions. There were similar contents to disaster response in hospital. A natural disaster often leads to an increase in medical needs and relative shortage of human resources, and

working under the chain of command is important even it is not an ordinal one. Cooperation among multiple professions is essential during a disaster¹⁹. Because of this similarity, the sections in the “well prepared” group might be able to imagine the hospital situation during a disaster, and they could be aware of the importance of preparation for disaster response. In addition, cooperation of multiple professions is essential to develop disaster countermeasures in each section. Improving the communication in the workplace across professions is one possible intervention to improve disaster preparedness in the “less prepared” group. Some characteristics of the “well prepared” group include it had less non-regular employees. In open-ended questions about barriers in the survey for individuals, two respondents who were employed by external partners thought that modifying their contract was needed, and one respondent who worked part-time thought it was unreasonable to contribute to the disaster response without incentive. Further investigation is required to understand the details, but it is suggested that the need to take measures for non-regular employees include modification of employment contract and incentives.

4.1.2. Survey for individuals

Since study participation was voluntary, the proportion of professions in the respondents was not balanced. Therefore, the respondents might be the group that have interest in disaster preparedness more than the average of the target population. As a result, for the items about cognition and knowledge (in section B and C), most of the respondents had basic knowledge about disaster in the local area and the role of The University of Tokyo Hospital during disaster; in contrast, implementation of a disaster response seemed to be not ready. Many of the respondents thought that they need to attend study session on disaster response (D1 90.5% with “strongly agree” or “agree”) and were willing to attend such study session (D2 87.0% with “strongly agree” or “agree”). Despite this, only 30.5 % of the respondents had ever attended a study session. In open-ended question, two of the respondents felt difficulty

to find a study session. It is suggested that one of the keys to holding study sessions is on how disseminate information. 14 respondents felt time restriction to prepare for disaster due to their work. If the hospital organization can provide system for staff (include short-time worker and external partner) to participate during work hours as part of their job, the situation will be improved.

A small number of the respondents had enough learning experience about disaster medicine in their school. As of 2023, in Japan, only nursing schools have contents about disaster medicine as designated in their core curriculum by the MHLW among educational facilities for medical specialties including physicians. Nowadays, some universities and vocational schools provide lectures about disaster medicine, but the contents are not standardized. This is one possible reason that only 9.8% (strongly agree 1.5% (n=5), agree 8.3% (n=28)) of the respondents thought their learning experience in their school was sufficient (D7). For instance, radiology technicians, medical engineers and rehabilitation professions, all respondents answered disagree (“disagree” or “strongly disagree”). In open-ended question, 10 of the respondents considered low awareness of workplaces or surroundings about disaster as a barrier. If the organization provide regular study sessions for each profession and make attendance compulsory, awareness of disaster will be improved in a wide range of staff.

Only 25 of the staff employed by external partners participated in this survey. The official number of staff employed by external partners is not announced, but it is known that a huge number of staff employed by external partners work in The University of Tokyo Hospital. Some of them work with the staff employed by the hospital in each section, and some of them work in independent departments as outsourced contractors. Through open-ended question, their limitation to access to the disaster response booklet was because they could not have access to the hospital intranet, and they were not announced where they could

read the paper format of the disaster response booklet.

The associations between background factors and knowledge and behavior are described in Table 5. There were differences by gender in B2 (i.e., I think Tokyo is a high-risk area impacted by disasters), B8 (i.e., I know there are prioritization methods called *triage* for disaster medicine), C2 (i.e., I know where I can reach the disaster response booklet) and F5 (i.e., Participating in a study session about disaster response is troublesome). A similar trend was observed in comparison between physicians and nurses. 71.2% of physicians were men and 93.0% of nurses were women, which might have a confounding effect in this association.

The seismic intensity experienced during Great East Japan Earthquake was not associated with respondent's knowledge and behavior, contrary to expectations. Enough learning experience in school had positive association with C5 (I have prepared for disaster response sufficiently). The experience of disaster response and working at The University of Tokyo Hospital in Great East Japan Earthquake were positively associated with C7 (I understand my role in emergency in my section). In open-ended questions, four of the respondents considered that difficulty of imagining disaster situation was a barrier. Simulation training providing learners to a high-risk experience in a safe learning environment will improve their awareness^{20, 21}.

4.2. Limitations

In the survey for sections, some of the limitations include: Firstly, the number of sections was small to interpret statistical results accurately. Secondly, the respondents in each section were selected by the supervisor of each section. If respondents are evidently representatives of each section, this step is appropriate to find the person to response. However, in large university hospitals like The University of Tokyo Hospital, it is difficult to find representative respondents. Thirdly, the respondents biased toward nursing. If there are multiple professions in one section, including nurses, then the supervisor is likely the head nurse. For this reason,

most of the survey for clinical sections were explained to head nurse, and naturally they passed the questionnaire to the nursing staff. For this reason, the findings may not have reflected the reality across multiple professions. To overcome these points, developing simple questionnaires based on the findings of this study, such as conducting it on random samples by each section and expanding sample size are needed.

In the survey for individuals, the proportion of profession in the study sample differed from the target population because participation of this study was voluntary within the hospital. As a result, the proportion of physicians was less than it actually is in the hospital. Although there is a huge number of staff employed by external partners, we had only 25 respondents employed by external partners. Therefore, it is difficult to consider that our findings reflect our target population accurately. The proportion of nurses was high, and the proportion of staff employed by external partners was low. The method for disseminating information may have affected to the proportion of professions in the respondents. Since in The University of Tokyo Hospital, there is no standard way to announce something to all staff, we announced the survey study via intranet, poster displayed in authorized location, flyers posted in every section and so on. Also, all head nurses were asked to display the study posters in shared spaces for multiple professions in their section. Eventually, posters were displayed in the nurse breakroom of many sections. Dissemination of information regardless of the profession was one of the challenges to conduct this voluntary survey in The University of Tokyo Hospital.

In both surveys, for sections and for individuals, the questionnaires were developed based on previous validated questionnaires, but they needed major modifications to fit the purpose of this study, and as a result, more than half of the items were changed. To improve its validity, expert opinions were considered for both questionnaires.

The findings help suggest some interventions that may be effective to promote disaster

response among staff in a hospital setting. The open-ended question in both surveys about barrier to prepare for disaster response showed common issues such as excessive workload and time restrictions. Solutions to mitigate these issues are required to promote disaster response at the organizational level; otherwise, disaster preparedness will be big burden on staff. Therefore, not doing a timely solution will end up if having the staff losing their motivation to prepare for disaster response. This, in turn, will lead to The University of Tokyo Hospital not to fulfill its role in society during a disaster, which would be contrary to the society high expectations.

4.3. Implications for Practice

The strategies based on the present findings would be effective in enhancing disaster response in The University of Tokyo Hospital. A direct and immediate strategy is to hold study sessions on awareness-raising and education, and tangible action. One study session would be for knowledge-sharing about the disaster response booklet, another one would be for acknowledging the importance of collaboration (i.e., supporting and receiving support among sections), and another study session would be on simulation training to enhance imagination, which is necessary and effective in the event of a disaster. Simulation training could help improve learners' awareness, knowledge and confidence^{20, 22} as well as help to evaluate the existed action plans. Ideally, these study sessions would be held regularly within working time, and participation in these sessions is praised visibly in workplace. At the same time, it would be important to hold study sessions on basic knowledge of disaster response in The University of Tokyo Hospital when requested by each section. The target section should not be limited to internal sections but should involve independent departments as outsourced contractors. Through these activities, naturally improving preparation for disaster response in each section would help find the key person in such section. The relationships among key persons in each section are expected to be useful during an actual disaster.

To obtain proactive participation from each section, it is important to motivate the heads of sections and individuals. The strategy for this is to show the hospital's vision and mission clearly. The tangible action for it is setting gradual achievement goals for sections level with time goals. For implementation, feedback for contents of preparedness would be required. Disclosing the achievement level of each section to the entire hospital could be effective for encouragement. In the process of achieving these goals, each section would eventually consider that disaster preparedness is one of their important activities. It would promote participation in disaster preparedness as a part of their section's work.

Another strategy is not directly related to disaster preparedness, but to organizational approaches or day-to-day operations. According to the findings of survey for sections, arranging a place and promoting opportunities to improve communication across professions may be effective; for example, preparing a tidy room available to all types of staff with complimentary drinks and snacks on a table, having a bulletin board for important information, and holding events at seasonal milestones regardless of profession and occupational status. Considering the uniqueness of the hospital organization, which consists of multidisciplinary departments, multiple independent expertise groups and complex of different working system, it is essential for the hospital to create an open environment to facilitate communication among staff from various professions.

The most important challenge is mitigating excessive workload and time restrictions. By improving operational efficiency and human resource management, it is important to generate the necessary resources for disaster preparedness. This would have a positive impact, not only to strengthen disaster preparedness but also to all clinical and other activities in the hospital.

Through this study, three main barriers to strengthening disaster response capacity in The University of Tokyo Hospital emerged. The first barrier was the lack of leadership and strategic vision; the second barrier was poor employee engagement; and the third barrier was

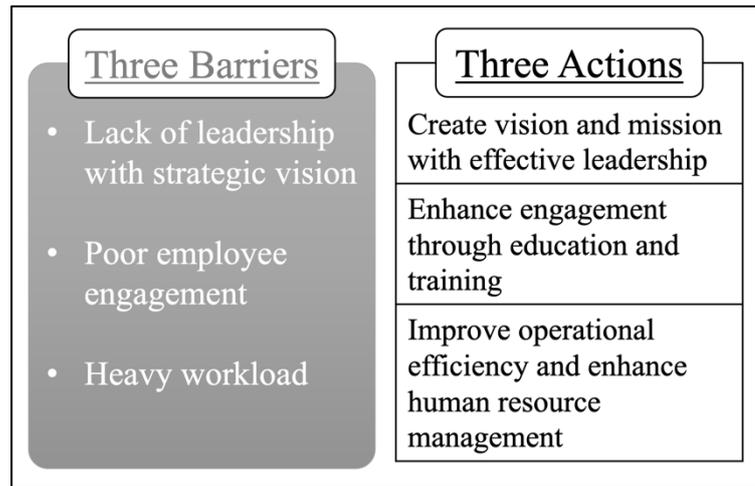


Figure 2: Three barriers and three actions

heavy workload. Although this is just a personal impression, to overcome these barriers, three actions can be suggested (Figure 2): First, creating vision and mission plans with effective leadership. The vision statement needs to be clear and understandable. If the mission statement is set at the organizational level, it would be good to present it with steps of achievable goals and with due date at the sectional level. Providing feedback for the staff's achievement is an important factor for vision sharing. Second, enhancing engagement through education and training. Education for superiors is a very important factor because superiors' awareness strongly influences staff's behavior. Therefore, introducing a system to participate in disaster preparedness as part of their job will be even more effectively engage a wide range of staff. Providing effective study sessions and simulation trainings is important. Third, improving operational efficiency and enhancing human resource management are crucial for all activities in The University of Tokyo Hospital.

4.4. Conclusions

This is the first study to investigate factors associated with disaster response across sections and professions, focusing in one of the biggest university hospitals in Japan, The University of Tokyo Hospital. The findings suggest that there seemed to be some certain trends depending on section and individual background factors (i.e. age, gender, profession,

employment status, working experience and so on). They may influence the behavior of staff toward disaster response in hospital. Furthermore, some challenges were consistently seen across sections and individuals.

Through this study, three barriers and three actions were suggested.; actions to strengthen disaster response capacity cannot be achieved by one section alone. Therefore, it is important to take action at the organizational level. To achieve this, further stakeholder engagement and persistent discussions are needed considering that we are living in a high-disaster-frequency country. In order to fulfil the societal mission that The University of Tokyo Hospital should accomplish in the event of a disaster, continuous efforts to make improvements are necessary.

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Table 3: Excerpts from the answers for open-ended question (survey for sections)

Question: Regarding the items that you chose "somewhat agree", "somewhat disagree" and "disagree" what do you think as barrier?

| Topic | Answer |
|-----------------------------|---|
| Time restriction | <p>Difficult to allocate work time to tasks that require continuous efforts.</p> <p>It is difficult to conduct training and education during working hours; even if we try to do it after work, only some employees who are interested in disaster prevention will participate.</p> <p>Due to workload, lack of human resources, etc., it is not possible to hold study sessions or simulations to raise awareness, and it is difficult to find time for activities other than work.</p> <p>There are many short-time staff and few opportunities for meetings.</p> |
| Shortage of human resources | <p>More than 50% of people are short-time staff, and it is unclear whether we will be able to secure enough personnel to continue treatment in the event of a disaster; securing personnel is an issue.</p> <p>There are few staff living in dormitories close to hospital (relatively many of the staff are older), and many have families, so there is little hope of securing manpower in case of an emergency.</p> <p>I think that barriers are the fact that many people are of the child-rearing generation, and many are short-time staff.</p> |
| Awareness | <p>Level of awareness regarding disaster prevention and response</p> <p>I think that barrier is the fact that our section is staffed by many people from many different professions, and each profession has a low awareness of disasters, and many staff members do not understand what is needed in disaster response due to a lack of enthusiasm for tackling disasters.</p> <p>There are large differences in awareness among staff, making it difficult to convey the level of risk.</p> |

continued to next page

Table 3 (continued)

| Topic | Answer |
|----------------|---|
| Leadership | <p>I don't see a strong leadership (as a hospital executive team)</p> <p>Please explain what the maximum disaster in our hospital is.</p> <p>Rough disaster countermeasures at the hospital level are not widely disseminated (especially for medical doctors).</p> |
| Budget | <p>It is difficult to purchase new items using the sections' operating expenses, and there are budgetary issues.</p> <p>It is difficult to ask hospitals for budget of the supplies needed during a disaster.</p> |
| Countermeasure | <p>As a hospital, I think it is important to compile the measures of each section, check their consistency with the hospital's BCP, and identify common measures that do not depend on the characteristics of each section.</p> <p>I would like to request regular information sharing and briefing sessions about our BCP.</p> <p>When creating a manual for a ward, is it possible to make decisions based solely on the opinions of the ward, or does consent from the section in charge is required to ensure consistency with the disaster response booklet?</p> |

Table 3 showed some real examples from the answers for E in Part I; Regarding the items that you chose, *somewhat doing, somewhat agree, disagree*, what do you think as barrier? The answers were categorized into similar topics.

Table 5: Association between factors and behavior/ knowledge (survey for individuals)

| | B2. I think Tokyo is a high-risk area of natural disasters | | B3. I know better than others what type of disaster will occur in Japan | | B5. I know that some people are more vulnerable than others during disasters | | B8. I know there is a prioritization method called triage for disaster medicine | | B9. I have ever thought about hospital disaster countermeasure | |
|--|--|---------|---|---------|--|---------|---|---------|--|---------|
| | <u>Very high(n=230)</u> | | <u>Agree(n=208)</u> | | <u>Know well (n=183)</u> | | <u>Know well(n=300)</u> | | <u>Agree (n=225)</u> | |
| | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value |
| Age | | | | | | | | | | |
| <43 | 107 (63.3) | 0.062 | 102(60.4) | 0.655 | 82 (48.5) | 0.038 | 148 (87.6) | 0.491 | 107 (63.3) | 0.205 |
| 43+ | 123 (72.8) | | 106(62.7) | | 101 (59.8) | | 152 (89.9) | | 118 (69.8) | |
| Gender | | | | | | | | | | |
| Male | 78 (60.0) | 0.013 | 80 (61.5) | 0.973 | 64 (49.2) | 0.163 | 107 (82.3) | 0.003 | 88 (67.7) | 0.706 |
| Female | 151 (73.0) | | 127 (61.4) | | 118 (57.0) | | 192 (92.8) | | 136 (65.7) | |
| Employment status | | | | | | | | | | |
| Regular employee | 162 (63.8) | 0.002 | 153 (60.2) | 0.363 | 142 (55.9) | 0.260 | 229 (90.2) | 0.228 | 180 (70.9) | 0.007 |
| Others | 67 (81.7) | | 54 (65.9) | | 40 (48.8) | | 70 (85.4) | | 45 (54.9) | |
| Years of professional experience | | | | | | | | | | |
| <15 | 112 (66.3) | 0.484 | 101 (59.8) | 0.502 | 88 (52.1) | 0.445 | 145 (85.8) | 0.085 | 96 (56.8) | 0.00 |
| 15+ | 118 (69.8) | | 107 (63.3) | | 95 (56.2) | | 155 (91.7) | | 129 (76.3) | |
| Years of work in The University of Tokyo Hospital | | | | | | | | | | |
| <10 | 119 (66.9) | 0.62 | 110 (61.8) | 0.918 | 93 (52.3) | 0.461 | 155 (87.1) | 0.303 | 101 (56.7) | 0.00 |
| 10+ | 111 (69.4) | | 98 (61.3) | | 90 (56.3) | | 145 (90.6) | | 124 (77.5) | |

continued to next page

Table 5 (continued)

| | B2. I think Tokyo is a high-risk area of natural disasters | | B3. I know better than others what type of disaster will occur in Japan | | B5. I know that some people are more vulnerable than others during disasters | | B8. I know there is a prioritization method called <i>triage</i> for disaster medicine | | B9. I have ever thought about hospital disaster response | |
|---|--|---------|---|---------|--|---------|--|---------|--|---------|
| | <u>Very high (n=230)</u> | | <u>Agree (n=208)</u> | | <u>Know well (n=183)</u> | | <u>Know well (n=300)</u> | | <u>Agree (n=225)</u> | |
| | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value |
| Where are you in Great East Japan Earthquake? | | | | | | | | | | |
| Area in intensity <5 | 35 (67.3) | 0.901 | 32 (61.5) | 1.00 | 33 (63.5) | 0.143 | 50 (96.2) | 0.066 | 39 (75.0) | 0.161 |
| Area in intensity “5 Lower” and more | 195 (68.2) | | 176 (61.5) | | 150 (52.5) | | 250 (87.4) | | 186 (65.0) | |
| What did you do at Great East Japan Earthquake? | | | | | | | | | | |
| Working at The University of Tokyo Hospital | 73 (67.0) | 0.770 | 69 (63.3) | 0.646 | 61 (56.0) | 0.643 | 97 (89.0) | 0.925 | 87 (79.8) | 0.00 |
| Other | 157 (68.6) | | 139 (60.7) | | 122 (53.3) | | 203 (88.7) | | 138 (60.3) | |
| I have a family needed of care | | | | | | | | | | |
| Have | 136 (65.1) | 0.135 | 82 (63.6) | 0.547 | 112 (53.6) | 0.795 | 182 (87.1) | 0.214 | 141 (67.5) | 0.657 |
| No | 94 (72.9) | | 126 (60.3) | | 71 (55.0) | | 118 (91.5) | | 84 (65.1) | |
| Time required to get The University of Tokyo Hospital (on foot, in minutes) | | | | | | | | | | |
| <60 | 104 (68.9) | 0.716 | 85 (56.3) | 0.046 | 81 (53.6) | 0.701 | 134 (88.7) | 0.800 | 100 (66.2) | 0.527 |
| 60+ | 97 (66.9) | | 98 (67.6) | | 81 (55.9) | | 130 (89.7) | | 101 (69.7) | |

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Table 5 (continued)

| | B2. I think Tokyo is a high-risk area of natural disasters | | B3. I know better than others what type of disaster will occur in Japan | | B5. I know that some people are more vulnerable than others during disasters | | B8. I know there is a prioritization method called <i>triage</i> for disaster medicine | | B9. I have ever thought about hospital disaster response | |
|---|--|---------|---|---------|--|---------|--|---------|--|---------|
| | Very high (n=230) | | Agree (n=208) | | Know well (n=183) | | Know well(n=300) | | Agree (n=225) | |
| | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value |
| The numbers of working areas | | | | | | | | | | |
| Single | 157 (72.7) | 0.015 | 136 (63.0) | 0.474 | 118 (54.6) | 0.811 | 192 (88.9) | 0.919 | 145 (67.1) | 0.771 |
| Two and more | 73 (59.8) | | 72 (59.0) | | 65 (53.3) | | 108 (88.5) | | 80 (65.6) | |
| I have experience of disaster respond | | | | | | | | | | |
| Agree | 172 (68.5) | 0.749 | 60 (69.0) | 0.098 | 136 (54.2) | 0.979 | 220 (87.7) | 0.273 | 149 (59.4) | 0.00 |
| Disagree | 58 (66.7) | | 148 (58.9) | | 47 (54.0) | | 80 (92.0) | | 76 (87.4) | |
| I am expected to play a role of leader in my section | | | | | | | | | | |
| Agree (expected leader) | 121 (73.3) | 0.042 | 116 (70.3) | 0.001 | 98 (59.4) | 0.058 | 149 (90.3) | 0.380 | 143 (86.7) | 0.00 |
| Disagree | 109 (63.0) | | 92 (53.2) | | 85 (49.1) | | 151 (87.3) | | 82 (47.4) | |
| I learned about disaster medicine sufficiently in my school | | | | | | | | | | |
| Agree | 22 (66.7) | 0.858 | 23 (69.7) | 0.311 | 20 (60.6) | 0.433 | 31 (93.9) | 0.321 | 26 (78.8) | 0.117 |
| Disagree | 208 (68.2) | | 185 (60.7) | | 163 (53.4) | | 269 (88.2) | | 199 (65.3) | |

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Table 5 (continued)

| | C2. I know where I can reach the disaster response booklet | | C5. I have prepared for disaster response sufficiently | | C7. I understand my role in emergency in my section | | C11. I have an arrangement for emergency with my family | | F4. The working system of my section is a barrier for my participation in study session | |
|--|--|---------|--|---------|---|---------|---|---------|---|---------|
| | <u>Agree (n=218)</u> | | <u>Agree (n=134)</u> | | <u>Agree (n=192)</u> | | <u>Agree (n=177)</u> | | <u>Agree (n=132)</u> | |
| | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value |
| Age | | | | | | | | | | |
| <43 | 100 (59.2) | 0.041 | 62(36.7) | 0.266 | 95 (56.2) | 0.826 | 83 (49.1) | 0.231 | 68 (40.2) | 0.656 |
| 43+ | 118 (69.8) | | 72 (42.6) | | 97 (57.4) | | 94 (55.6) | | 64 (37.9) | |
| Gender | | | | | | | | | | |
| Male | 75 (57.7) | 0.042 | 48 (36.9) | 0.449 | 77 (59.2) | 0.453 | 72 (55.4) | 0.404 | 48 (36.9) | 0.561 |
| Female | 142 (68.6) | | 85 (41.1) | | 114 (55.1) | | 105 (50.7) | | 83 (40.1) | |
| Employment status | | | | | | | | | | |
| Regular employee | 179 (70.5) | 0.00 | 102 (40.2) | 0.705 | 166 (65.4) | 0.00 | 128 (50.4) | 0.140 | 108 (42.5) | 0.011 |
| Others | 39 (47.6) | | 31 (37.8) | | 25 (30.5) | | 49 (59.8) | | 22 (26.8) | |
| Years of professional experience | | | | | | | | | | |
| <15 | 95 (56.2) | 0.001 | 63 (37.3) | 0.374 | 78 (46.2) | 0.00 | 84 (49.7) | 0.327 | 64 (37.9) | 0.656 |
| 15+ | 123 (72.8) | | 71 (42.0) | | 114 (67.5) | | 93 (55.0) | | 68 (40.2) | |
| Years of work in The University of Tokyo Hospital | | | | | | | | | | |
| <10 | 97 (54.8) | 0.00 | 68 (38.2) | 0.567 | 80 (44.9) | 0.00 | 91 (51.1) | 0.629 | 69 (38.8) | 0.908 |
| 10+ | 121 (75.6) | | 66 (41.3) | | 112 (70.0) | | 86 (53.8) | | 63 (39.4) | |

continued to next page

Table 5 (continued)

| | C2. I know where I can reach the disaster response booklet | | C5. I have prepared for disaster response sufficiently | | C7. I understand my role in emergency in my section | | C11. I have an arrangement for emergency with my family | | F4. The working system of my section is a barrier for my participation in study session | |
|---|--|---------|--|---------|---|---------|---|---------|---|---------|
| | <u>Agree (n=218)</u> | | <u>Agree (n=134)</u> | | <u>Agree (n=192)</u> | | <u>Agree (n=177)</u> | | <u>Agree (n=132)</u> | |
| | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value |
| Where are you in Great East Japan Earthquake? | | | | | | | | | | |
| Area in intensity <5 | 34 (65.4) | 0.884 | 22 (42.3) | 0.67 | 31 (59.6) | 0.656 | 26 (50.0) | 0.71 | 21 (40.4) | 0.831 |
| area in intensity “5 Lower” and more | 184 (64.3) | | 112 (39.2) | | 161 (56.3) | | 151 (52.8) | | 111 (38.8) | |
| What did you do at Great East Japan Earthquake? | | | | | | | | | | |
| working at The University of Tokyo Hospital | 85 (78.0) | 0.00 | 49 (45.0) | 0.169 | 76 (69.7) | 0.001 | 57 (52.3) | 0.985 | 45 (41.3) | 0.562 |
| Other | 133 (58.1) | | 85 (37.1) | | 116 (50.7) | | 120 (52.4) | | 87 (38.0) | |
| I have a family needed of care | | | | | | | | | | |
| Have | 85 (65.9) | 0.674 | 46 (35.7) | 0.239 | 75 (58.1) | 0.697 | 103 (49.3) | 0.148 | 45 (34.9) | 0.217 |
| No | 133 (63.6) | | 88 (42.1) | | 117 (56.0) | | 74 (57.4) | | 87 (41.6) | |
| Time required to get The University of Tokyo Hospital (on foot) | | | | | | | | | | |
| <60 | 102 (67.6) | 0.621 | 62 (41.1) | 0.853 | 83 (55.0) | 0.215 | 72 (47.7) | 0.1 | 68 (45.0) | 0.108 |
| 60+ | 94 (64.8) | | 58 (40.0) | | 90 (62.1) | | 83 (57.2) | | 52 (35.9) | |

continued to next page

Table 5 is continued

| | C2. I know where I can reach the disaster response booklet | | C5. I have prepared for disaster response sufficiently | | C7. I understand my role in emergency in my section | | C11. I have an arrangement for emergency with my family | | F4. The working system of my section is a barrier for my participation in study session | |
|---|--|---------|--|---------|---|---------|---|---------|---|---------|
| | <u>Agree (n=218)</u> | | <u>Agree (n=134)</u> | | <u>Agree (n=192)</u> | | <u>Agree (n=177)</u> | | <u>Agree (n=132)</u> | |
| | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value | n (%) | p-value |
| The numbers of working areas | | | | | | | | | | |
| Single | 145(67.1) | 0.178 | 85 (39.4) | 0.883 | 122 (56.5) | 0.873 | 107 (49.5) | 0.166 | 79 (36.6) | 0.214 |
| Two and more | 73(59.8) | | 49 (40.2) | | 70 (57.4) | | 70 (57.4) | | 53 (43.4) | |
| I have experience of disaster respond | | | | | | | | | | |
| Agree | 63 (72.4) | 0.073 | 40 (46.0) | 0.161 | 62 (71.3) | 0.002 | 127 (50.6) | 0.269 | 33 (37.9) | 0.803 |
| Disagree | 155 (61.8) | | 94 (37.5) | | 130 (51.8) | | 50 (57.5) | | 99 (39.4) | |
| I am expected to play a role of leader in my section | | | | | | | | | | |
| Agree (expected leader) | 128 (77.6) | 0 | 83 (50.3) | 0 | 143 (86.7) | 0 | 93 (56.4) | 0.151 | 72(43.6) | 0.092 |
| Disagree | 90(52.0) | | 51 (29.5) | | 49 (28.3) | | 84 (48.6) | | 60(34.7) | |
| I learned about disaster medicine sufficiently in my school | | | | | | | | | | |
| Agree | 23 (69.7) | 0.511 | 21 (63.6) | 0.003 | 23 (69.7) | 0.116 | 18 (54.6) | 0.792 | 17 (51.5) | 0.122 |
| Disagree | 195 (63.9) | | 113 (37.1) | | 169 (55.4) | | 159 (52.1) | | 115 (37.7) | |

continued to next page

Table 5 (continued)

| | | F5. Participating in a study session about disaster response is troublesome | |
|---|---|---|---------|
| | | <u>Agree (n=119)</u> | |
| | | n (%) | p-value |
| Age | | | |
| | <43 | 74 (43.8) | 0.001 |
| | 43+ | 45 (26.6) | |
| Gender | | | |
| | Male | 58 (44.6) | 0.005 |
| | Female | 61 (29.5) | |
| Employment status | | | |
| | Regular employee | 92 (36.2) | 0.343 |
| | Others | 25 (30.5) | |
| Years of professional experience | | | |
| | <15 | 64 (37.9) | 0.305 |
| | 15+ | 55 (32.5) | |
| Years of work in The University of Tokyo Hospital | | | |
| | <10 | 65 (36.5) | 0.595 |
| | 10+ | 54 (33.8) | |
| Where are you in Great East Japan Earthquake? | | | |
| | Area in intensity <5 | 22 (40.4) | 0.244 |
| | Area in intensity "5 Lower" and more | 97 (33.9) | |
| What did you do at Great East Japan Earthquake? | | | |
| | Working at The University of Tokyo Hospital | 34 (31.2) | 0.286 |
| | Other | 85 (37.1) | |
| I have a family needed of care | | | |
| | Have | 50 (38.8) | 0.283 |
| | No | 69 (33.0) | |

continued to next page

Table 5 (continued)

| | | F5. Participating in a study session about disaster response is troublesome | |
|---|-------------------------|---|---------|
| | | <u>Agree (n=119)</u> | |
| | | n (%) | p-value |
| Time required to get The University of Tokyo Hospital (on foot, in minutes) | | | |
| | <60 | 57 (37.8) | 0.831 |
| | 60+ | 53 (36.6) | |
| The numbers of working areas | | | |
| | Single | 69 (31.9) | 0.095 |
| | Two and more | 50 (41.0) | |
| I have experience of disaster respond | | | |
| | Agree | 31 (35.6) | 0.923 |
| | Disagree | 88 (35.1) | |
| I am expected to play a role of leader in my section | | | |
| | Agree (expected leader) | 56 (33.9) | 0.634 |
| | Disagree | 63(36.4) | |
| I learned about disaster medicine sufficiently in my school | | | |
| | Agree | 11 (33.3) | 0.812 |
| | Disagree | 108 (35.4) | |

Table 8: Excerpts from the answers for open-ended question (survey for individuals)

Question: What are the barriers to prepare for disaster response?

| Topic | Answer |
|--|---|
| Time restriction | <p>I can't take time for myself outside of working hours</p> <p>Unless it becomes mandatory, it will be difficult in terms of time.</p> <p>It is impossible to attend the sessions during working hours because there is no one else to work in our place.</p> <p>Work doesn't suit the sessions schedule (often unable to attend study sessions due to holidays or night shifts)</p> |
| Family | <p>It is difficult for me to go to work and continue working because I have a young child (at the time of disaster).</p> <p>Parental care</p> <p>I have a family member to take care of, so that may be an obstacle.</p> <p>Childcare</p> |
| Workload | <p>It is difficult to suggest disaster preparation because the people around me are busy with work.</p> <p>There is an extensive amount of work during the day and after hours</p> <p>Disaster response is important, but there are many deficiencies and areas for improvement in the medical system during normal times, and these take priority in labor and time.</p> |
| Difficulty to imagine a disaster emergency | <p>There are so many things that can occur, and it is difficult to imagine.</p> <p>I don't have experience in disaster preparedness, and therefore, I don't get an image.</p> <p>Because I work as a clerk, I don't know what to do regarding medical care in the event of a disaster.</p> |
| Section's awareness/ norm | <p>Lack of awareness of disaster countermeasures among staff</p> <p>Superior's thoughts</p> |

continue to next page

Table 8 (continued)

| Topic | Answer |
|---------------------------------------|---|
| Section's awareness/ norm (continued) | <p>The normalcy bias that says: “<i>Disasters rarely occurs in our own hospitals</i>” has led to ridicule towards those who prepare for disaster response. In addition, this trend may be because middle managers (chief, deputy chief engineer), who should normally take the lead in preparing emergency response within an organization, have been working for a long time without experience in disaster response. Therefore, normalcy bias is strong.</p> <p>If your superiors believe that the work at hand should take priority over disaster countermeasures, it will be difficult to prepare for disaster response, which is treated as a <i>secondary</i> task.</p> <p>Understanding the workplace and surroundings</p> <p>Awareness of managers</p> |
| others | <p>In the event of a disaster, I have no intention of cooperating with disaster medical care because I work part-time and am not paid a decent salary. The hospital's obligation in the event of a disaster is unreasonable.</p> <p>Even when considering evacuation routes, preparations do not go as planned because it is not possible to freely receive advice from people who can evaluate whether the evacuation route is appropriate (such as the fire department). I'm not sure if what I've prepared is appropriate.</p> <p>The other day, a disaster drill was held at The University of Tokyo Hospital, and in the event of damage similar to the Great Hanshin-Awaji Earthquake or the Tohoku Earthquake, the current manuals and reporting methods to the disaster response headquarters would not be enough to deal with it. I strongly felt how difficult it was. Additionally, there is no feedback after that drill, making it difficult to imagine how to prepare in the field and how to make decisions in the event a disaster actually occurs.</p> <p>Lack of access to intranet because I employed by external partner.</p> <p>Lack of cooperation from external partners.</p> <p>Because I am employed by an external partner, unless change contract and secure time by employer, it is impossible to participate the activities.</p> |

Appendix A: Questionnaire (the survey for sections)

*The survey was conducted in Japanese

This questionnaire include 0: Basic information, and followed two areas: I and II. It will take about 15 minutes to answer all questions.
Please select the appropriate column for your answer. However, please answer 0, I-E-1 to 4 in written form.

| | |
|--|--------|
| 0 Pleas tell us your profession | answer |
|--|--------|

I In here, you will be asked about your section's disaster preparedness.(Questions range from A to E)

| | Question | agree | somewhat agree | somewhat disagree | disagree | I don't know | not applicable |
|---|---|-------|----------------|-------------------|----------|--------------|----------------|
| sample | We have created a facility and supplies plan that assumes disasters and regularly inspect it | | ✓ | | | | |
| A) Asking about the preparations in advance | | | | | | | |
| A-1 | A disaster preparedness plan for equipment and supplies is prepared and regularly inspected | | | | | | |
| A-2 | The evacuation plan is well known among staffs in the section | | | | | | |
| A-3 | Safety of evacuation route is regularly inspected | | | | | | |
| A-4 | A contact network of managers and staff has been drawn up and is used on a daily basis | | | | | | |
| A-5 | A system to secure staff during disaster is prepared (Contact system to confirm availability) | | | | | | |
| A-6 | Methods to confirm the safety of patients and other outsiders in the event of a disaster is in place | | | | | | |
| A-7 | The damage that is likely to occur in your section and patients' characteristics in your section are understood | | | | | | |
| A-8 | A business action plan for disaster is prepared <small>*A business action plan is a plan that outlines the tasks that will be required in the event of a disaster and the section of roles.</small> | | | | | | |
| A-9 | A business action plan considered the damage that is likely to occur in your section and patients' characteristics in your section is prepared | | | | | | |
| A-10 | A business action plan consistent with hospital's disaster response booklet is prepared | | | | | | |
| B) Asking about equipment and goods | | | | | | | |
| B-1 | A disaster preparedness plan for equipment and supplies is prepared and regularly inspected | | | | | | |
| B-2 | The equipment necessary to provide medical care (service) during disaster are ready for use at any time | | | | | | |
| B-3 | Safety of evacuation route is regularly inspected | | | | | | |
| B-4 | All staff are made aware of how to use equipment and supplies in the event of a disaster. | | | | | | |
| B-5 | The necessary space for disaster response is secured in advance (Whiteboard installation location, disaster storage room, space that can be expanded, visitor waiting area, etc.) | | | | | | |
| B-6 | Equipment for providing medical care (services) are prepared with collecting information on hospital characteristics | | | | | | |
| C) Asking about your efforts to improve disaster response capabilities | | | | | | | |
| | <small>*The term "disaster education" in this section refers to anything that improves awareness, knowledge, and skills, such as training and study sessions</small> | | | | | | |
| C-1 | The necessary equipment, educational materials, supplies, etc. are prepared to provide disaster education | | | | | | |
| C-2 | An ICT (Information and communications Technology) environment is prepared that can be used for disaster education | | | | | | |
| C-3 | Staff in charge of disaster education are existed | | | | | | |
| C-4 | External parties (other sections, etc.) to provide disaster education are asked | | | | | | |
| C-5 | Staff who can provide disaster education are systematically trained. | | | | | | |
| C-6 | A system which employees are exempted from duties during the time they participate in disaster education are provided. | | | | | | |
| C-7 | Disaster educations considered the characteristics of hospitals and sections are conducted | | | | | | |
| C-8 | Opportunities for information exchange between staff (or professions) involved in disaster education are existed. | | | | | | |
| C-9 | Disaster educations are conducted in regularly | | | | | | |
| C-10 | Disaster response training of your section is planned and conducted at least once a year. | | | | | | |
| D) Asking about the operation of disaster countermeasures | | | | | | | |
| D-1 | A budget for preparations is estimated and accounted | | | | | | |
| D-2 | Evaluating whether proper execution is being carried out | | | | | | |
| D-3 | Sections representatives are participating in the revision of the hospital's disaster response booklet as part of their duties | | | | | | |
| D-4 | Staff's contribution to/ participation in disaster countermeasures for the hospital and their sections are visibly encouraged * Examples for visible encouragement: setting up a reporting session, participation sticker on name tag | | | | | | |

I Here "about disaster preparedness" is continued

| | |
|-----|--|
| E) | Regarding the items that you chose "somewhat agree" "somewhat disagree" "disagree", what do you think as barrier? |
| | Please describe the factors specifically that are considered to be impediments for each of the following categories: E-1) hospital level, E-2) section level, and E-3) individual level. Also, please answer E-4) items for which you do not feel necessary. |
| E-1 | Hospital level: Issues that cannot be resolved within the section |
| | (answer space) |
| E-2 | Section level: section's business characteristics, organizational characteristics, culture, etc. |
| | (answer space) |
| E-3 | Individual level: Individual circumstances of section members (living with children, etc.), personal characteristics, etc. |
| | (answer space) |
| E-4 | Items for which you do not feel necessary *Please list up items that you feel strongly feel unnecessary (e.g. A-5, B-2, or none) |
| | (answer space) |

II In here, you will be asked about current situation in you section(the questions are from A to G)

| | Question | atrongly agree | agree | disagree | strongly disagree | not applicable |
|-----|--|----------------|---------|----------|-------------------|----------------|
| A) | Asking about workload of section | | | | | |
| A-1 | The daily workload of the entire section is constant | | | | | |
| A-2 | The daily workload of the entire section is unpredictable | | | | | |
| A-3 | The section has a larger workload compared to human resources on a daily basis | | | | | |
| A-4 | More than half of the staff are forced to work outside of normal work hours | | | | | |
| B) | Asking about the characteristics of work in section | | | | | |
| B-1 | It is important that sectional operations follow established procedures | | | | | |
| B-2 | It is important that sectional operations choose the means to achieve results | | | | | |
| B-3 | The section often provides services to people who have difficulty communicating <u>The people who have difficulty communication</u> includes those who have difficulty communicating verbally, infants and young children, those who do not use Japanese as a communication tool, those with visual and hearing impairments, children who have difficulty understanding or expressing themselves, and those with intellectual disabilities or mental disabilities. etc. | | | | | |
| C) | Asking about the chain of command within the section | | | | | |
| C-1 | In sectional operations, the daily chain of command and its personnel are fixed | | | | | |
| C-2 | In sectional operations, the chain of command and its personnel change daily (or for each matter) | | | | | |
| C-3 | The assignment of personnel within a section is often changed depending on the workload | | | | | |
| D) | Asking about cooperation within the section | | | | | |
| D-1 | The work of the section is carried out by the cooperation of multiple occupations | | | | | |
| D-2 | During normal operations, cooperation between multiple professions within the section is carried out smoothly | | | | | |
| D-3 | During temporary operations, cooperation between multiple professions within the section is carried out smoothly | | | | | |
| D-4 | Opportunities are regularly set up for related professions to exchange opinions across professions regarding the work of the section | | | | | |
| D-5 | A shared break space is provided within the section for staff | | | | | |
| D-6 | The break space has an atmosphere where staff can easily communicate with each other | | | | | |
| D-7 | Within the section, there are differences in the right to speak depending on the profession | | | | | |
| D-8 | Within the section, there are differences in the right to speak depending on years of experience | | | | | |
| E) | Asking about decision-making in emergencies within section | | | | | |
| E-1 | It is decided (or clear) who will make decisions in an emergency | | | | | |
| E-2 | There are multiple people within the section who can make decisions in an emergency | | | | | |
| E-3 | Human resources who can make decisions in emergencies are consciously cultivated | | | | | |
| F) | Asking about the working style of employees (please select the appropriate percentage range) | 50 % + | 30-40 % | 10-20 % | < 10% | non |
| F-1 | Non-regular employees are working | | | | | |
| F-2 | Short-time staff are working | | | | | |
| G) | Asking about cooperation between sections | atrongly agree | agree | disagree | strongly disagree | not applicable |
| G-1 | Sectional operations always require collaboration with other sections | | | | | |
| G-2 | The section receives operational support from other sections on daily basis | | | | | |
| G-3 | The section supports other sections on daily basis | | | | | |

Appendix B: Questionnaire and Summary (the survey for individuals)

| Question (n=338) | n | % |
|--------------------------------|--|-------------|
| A About yourself | | |
| A1 Age | | |
| | <30 | 38 11.2 |
| | 30-39 | 99 29.1 |
| | 40-49 | 105 30.9 |
| | 50-59 | 79 23.2 |
| | 60+ | 19 5.6 |
| A2 Gender | | |
| | Male | 130 38.6 |
| | Female | 207 61.4 |
| | Neither | 1 exclusion |
| A3 Profession | | |
| | Physician | 66 19.5 |
| | Nurse | 115 34.0 |
| | Clerk | 60 17.8 |
| | Laboratory technician | 31 9.2 |
| | Radiology technician | 7 2.1 |
| | Pharmacist | 1 0.3 |
| | Rehabilitation specialist | 1 0.3 |
| | Social worker | 2 0.6 |
| | Other qualification | 13 3.9 |
| | Other | 42 12.4 |
| A4 Employment status | | |
| | Regular employee | 254 75.6 |
| | Non-regular employee | 41 12.2 |
| | Temporary employee | 16 4.8 |
| | Outsourcer | 25 7.4 |
| A5 Type of work of affiliation | | |
| | Department for critically ill patients | 57 17.2 |
| | General ward | 64 19.3 |
| | Clinical department other than above two | 101 30.4 |
| | Department that supports clinical activities | 22 6.6 |
| | Department for research | 26 7.8 |
| | Administration | 37 11.1 |
| | External partner | 25 7.5 |
| | Unknown | 6 exclusion |

| A6 | Years of professional experience (years) | n | % |
|------|---|-----|------|
| | 5< | 50 | 14.8 |
| | 5-14 | 119 | 35.2 |
| | 15-24 | 108 | 32.0 |
| | 25+ | 61 | 18.1 |
| A7 | Years of work in the University of Tokyo Hospital (years) | | |
| | 5< | 101 | 29.9 |
| | 5-14 | 152 | 45.0 |
| | 15-24 | 58 | 17.2 |
| | 25+ | 27 | 8.0 |
| A8-a | Where were you in Great East Japan Earthquake? | | |
| | Area in intensity <5 | 52 | 15.4 |
| | Area in intensity 5 lower and more | 286 | 84.6 |
| A8-b | What did you do at Great East Japan Earthquake? | | |
| | Working at The University of Tokyo Hospital | 109 | 32.3 |
| | Other | 229 | 67.8 |
| A9 | Family structure (I have family needed of care) | | |
| | Living with family but not needed of care | 129 | 38.2 |
| | Living with family needed of care | 101 | 29.9 |
| | Having family needed of care but not living with | 28 | 8.3 |
| | Living alone and no family needed of care | 80 | 23.7 |
| A10 | Time required to reach the University of Tokyo Hospital | | |
| | On foot | | |
| | <15 | 39 | 11.5 |
| | 15-<30 | 43 | 12.7 |
| | 30-<45 | 27 | 8.0 |
| | 45-<60 | 42 | 12.4 |
| | 60<= | 145 | 42.9 |
| | I don't know | 19 | 5.6 |
| | Not applicable | 23 | 6.8 |

A10 is continued(Time required to reach the University ofTokyo Hospital)

| | | n | % |
|---|----------------------------------|--------|------|
| by bicycle | <15 | 65 | 19.2 |
| | 15-<30 | 39 | 11.5 |
| | 30-<45 | 21 | 6.2 |
| | 45-<60 | 41 | 12.1 |
| | 60<= | 97 | 28.7 |
| | I don't know | 30 | 8.9 |
| | Not applicable | 45 | 13.3 |
| | by car | <15 | 79 |
| 15-<30 | | 44 | 13.0 |
| 30-<45 | | 49 | 14.5 |
| 45-<60 | | 40 | 11.8 |
| 60<= | | 54 | 16.0 |
| I don't know | | 19 | 5.6 |
| Not applicable | | 53 | 15.7 |
| by public transportation | | <15 | 37 |
| | 15-<30 | 49 | 14.5 |
| | 30-<45 | 52 | 15.4 |
| | 45-<60 | 97 | 28.7 |
| | 60<= | 86 | 25.4 |
| | I don't know | 0 | 0.0 |
| | Not applicable | 17 | 5.0 |
| | A11 The numbers of working areas | Single | 216 |
| Two and more | | 122 | 36.1 |
| | | | |
| B About disaster in local area | | | |
| B1 I have experience of disaster response | No | 251 | 74.3 |
| | Yes | 87 | 25.7 |
| | | | |

| B1-a What kind of work did you do? (n=87; answered yes in B1) | | n | % |
|---|---|-----|------|
| | Activities at headquarters | 6 | 6.9 |
| | Activities related to outpatient area after disaster occurs (including triage area) | 18 | 20.7 |
| | Activities related to hospitalized patients | 46 | 52.9 |
| | Activities related to visitors other than patients | 23 | 26.4 |
| | Others | 23 | 26.4 |
| B1-b What was others which you worked for | | | |
| | Activities related to outpatient who had existed before disaster | 9 | |
| | Activities in the disaster-stricken area | 4 | |
| | Equipment support in the operating room | 1 | |
| | Confirmation of infrastructure | 1 | |
| | logistic support | 1 | |
| | Ensuring safety | 1 | |
| | Remaining on standby after regular shift for case of emergency | 1 | |
| | Transportation of necessary items | 1 | |
| | Fire response | 1 | |
| | Evacuation | 1 | |
| | Flooding due to heavy rain | 1 | |
| B2 I think Tokyo is high risk area where will be impacted by disaster | | | |
| | Very high | 230 | 68.1 |
| | High | 85 | 25.2 |
| | Somewhat high | 19 | 5.6 |
| | Never | 4 | 1.2 |
| B3 I think disaster will come various forms | | | |
| | Strongly agree | 301 | 89.1 |
| | Agree | 32 | 9.5 |
| | Disagree | 3 | 0.9 |
| | Strongly disagree | 2 | 0.6 |
| B4 I know it better than others what type of disaster will occur in Japan | | | |
| | Strongly agree | 67 | 19.8 |
| | Agree | 141 | 41.7 |
| | Disagree | 111 | 32.8 |
| | Strongly disagree | 19 | 5.6 |

| | | n | % |
|-----|---|-----|------|
| B5 | I know that some people are more vulnerable than others during disasters | | |
| | Know well | 183 | 54.1 |
| | A little | 120 | 35.5 |
| | Not so much | 27 | 8.0 |
| | Not at all | 8 | 2.4 |
| B6 | I think healthcare services will be affected during great disaster | | |
| | Strongly agree | 303 | 89.6 |
| | Agree | 30 | 8.9 |
| | Disagree | 3 | 0.9 |
| | Strongly disagree | 2 | 0.6 |
| B7 | In affected area, local healthcare facility has response to support victims in physically and psychologically for a long time | | |
| | Strongly agree | 217 | 64.2 |
| | Agree | 103 | 30.5 |
| | Disagree | 16 | 4.7 |
| | Strongly disagree | 2 | 0.6 |
| B8 | I know there are prioritization manner called <i>triage</i> for disaster medicine | | |
| | Know well | 300 | 88.8 |
| | A little | 32 | 9.5 |
| | Not so much | 3 | 0.9 |
| | Not at all | 3 | 0.9 |
| B9 | I have ever thought about hospital disaster countermeasure | | |
| | Think and be involved | 102 | 30.2 |
| | Ever think | 123 | 36.4 |
| | A little | 98 | 29.0 |
| | Never | 15 | 4.4 |
| B10 | For effective disaster countermeasures, it is important to have training | | |
| | Strongly agree | 270 | 79.9 |
| | Agree | 67 | 19.8 |
| | Disagree | 1 | 0.3 |
| | Strongly disagree | 0 | 0.0 |

| | | n | % |
|---|---|-----|------|
| B11 | Since multiple stakeholders play in disaster medicine, well maintained command system are important | | |
| | Strongly agree | 291 | 86.1 |
| | Agree | 43 | 12.7 |
| | Disagree | 3 | 0.9 |
| | Strongly disagree | 1 | 0.3 |
| C About disaster response in workplace | | | |
| C1 | The University of Tokyo Hospital is expected to play a role as a local hospital | | |
| | Strongly agree | 269 | 79.6 |
| | Agree | 53 | 15.7 |
| | Disagree | 10 | 3.0 |
| | Strongly disagree | 6 | 1.8 |
| C2 | I know where I can reach the disaster response booklet | | |
| | Yes | 218 | 64.5 |
| | No | 120 | 35.5 |
| C3 | My section has something that corresponds to the disaster response manual | | |
| | Yes | 207 | 61.2 |
| | No | 30 | 8.9 |
| | Unknown | 101 | 29.9 |
| C4 | Necessity of disaster response is recognized sufficiently in my section | | |
| | Strongly agree | 69 | 20.4 |
| | Agree | 146 | 43.2 |
| | Disagree | 83 | 24.6 |
| | Strongly disagree | 40 | 11.8 |
| C5 | I have prepared for disaster response sufficiently | | |
| | Strongly agree | 16 | 4.7 |
| | Agree | 118 | 34.9 |
| | Disagree | 148 | 43.8 |
| | Strongly disagree | 56 | 16.6 |
| C6 | I am expected to play a role of leader in my section | | |
| | Strongly agree | 72 | 21.3 |
| | Agree | 93 | 27.5 |
| | Disagree | 64 | 18.9 |
| | Strongly disagree | 109 | 32.3 |

| | | | |
|-----|---|-----|------|
| C7 | I understand my role in emergency in my section | n | % |
| | Strongly agree | 56 | 16.6 |
| | Agree | 136 | 40.2 |
| | Disagree | 92 | 27.2 |
| | Strongly disagree | 54 | 16.0 |
| C8 | I can impliment BCP with confidence | n | % |
| | Strongly agree | 8 | 2.4 |
| | Agree | 64 | 18.9 |
| | Disagree | 148 | 43.8 |
| | Strongly disagree | 118 | 34.9 |
| C9 | I am prepared to respond any disaster | | |
| | Strongly agree | 9 | 2.7 |
| | Agree | 41 | 12.1 |
| | Disagree | 149 | 44.1 |
| | Strongly disagree | 139 | 41.1 |
| C10 | I can respond disaseter with confidence | | |
| | Strongly agree | 8 | 2.4 |
| | Agree | 71 | 21.0 |
| | Disagree | 147 | 43.5 |
| | Strongly disagree | 112 | 33.1 |
| C11 | I have an arrengement for emergency with my family | | |
| | Already decided | 42 | 12.4 |
| | Partially decided | 135 | 39.9 |
| | Going to decide | 118 | 34.9 |
| | Not going to decide | 43 | 12.7 |
| C12 | I've got an understanding about disaster respond in medicine by my family | | |
| | Strongly agree | 62 | 18.3 |
| | Agree | 144 | 42.6 |
| | Disagree | 65 | 19.2 |
| | Strongly disagree | 31 | 9.2 |
| | Not applicable | 36 | 10.7 |
| C13 | I will have ristriction due to caring for my family | | |
| | Yes | 85 | 25.2 |
| | A little | 68 | 20.1 |
| | Not so much | 71 | 21.0 |
| | Not at all | 114 | 33.7 |

| D About obtaining knowledge of disaster response | | | |
|---|--|-----|------|
| D1 | I need to attend study session in order to respond disaster | n | % |
| | Strongly agree | 153 | 45.3 |
| | Agree | 153 | 45.3 |
| | Disagree | 27 | 8.0 |
| | Strongly disagree | 5 | 1.5 |
| D2 | I will attend study session if provided | | |
| | Strongly agree | 133 | 39.4 |
| | Agree | 161 | 47.6 |
| | Disagree | 36 | 10.7 |
| | Strongly disagree | 8 | 2.4 |
| D3 | I am interested in study session about disaste response of the University of Tokyo Hosipital | | |
| | Strongly agree | 125 | 37.0 |
| | Agree | 157 | 45.5 |
| | Disagree | 46 | 13.6 |
| | Strongly disagree | 10 | 3.0 |
| D4 | I will attend study session of the University of Tokyo Hosipital disaseter response if it provided | | |
| | Strongly agree | 130 | 38.5 |
| | Agree | 148 | 43.8 |
| | Disagree | 51 | 15.1 |
| | Strongly disagree | 9 | 2.7 |
| D5 | I know there are study session about disaster medicine inside and outside the workplace | | |
| | Yes | 192 | 56.8 |
| | No | 146 | 43.2 |
| D6 | I have attended study session about disaster medicine | | |
| | Yes | 103 | 30.5 |
| | No | 235 | 69.5 |
| D6-a | The study session was sufficient for responding in actual disaster n=103 (answered yes in D6) | | |
| | Strongly agree | 29 | 28.2 |
| | Agree | 47 | 45.6 |
| | Disagree | 22 | 21.4 |
| | Strongly disagree | 5 | 4.9 |

| | | n | % |
|---|---|-----|------|
| D7 | I learned about disaster medicine sufficiently in my school | | |
| | Strongly agree | 5 | 1.5 |
| | Agree | 28 | 8.3 |
| | Disagree | 98 | 29.0 |
| | Strongly disagree | 207 | 61.2 |
| D8 | It is difficult to find appropriate information for disaster response | | |
| | Strongly agree | 63 | 18.6 |
| | Agree | 176 | 52.1 |
| | Disagree | 76 | 22.5 |
| | Strongly disagree | 23 | 6.3 |
| D9 | External resources are useful for my preparation of disaster | | |
| | Strongly agree | 123 | 36.4 |
| | Agree | 175 | 51.8 |
| | Disagree | 30 | 8.9 |
| | Strongly disagree | 10 | 3.0 |
| E About strengthening of disaster countermeasure at University of Tokyo Hospital | | | |
| E1 | Cooperation with wide range of professions is essential for effective implementation of the disaster response booklet | | |
| | Strongly agree | 277 | 82.0 |
| | Agree | 53 | 15.7 |
| | Disagree | 6 | 1.8 |
| | Strongly disagree | 2 | 0.6 |
| E2 | Education for wide range of professions is essential for effective implementation of the disaster response booklet | | |
| | Strongly agree | 271 | 80.2 |
| | Agree | 62 | 18.3 |
| | Disagree | 4 | 1.2 |
| | Strongly disagree | 1 | 0.3 |
| E3 | Active participation is essential in training of disaster response | | |
| | Strongly agree | 249 | 73.7 |
| | Agree | 85 | 25.2 |
| | Disagree | 2 | 0.6 |
| | Strongly disagree | 2 | 0.6 |

| | | n | % |
|---|--|-----|------|
| E4 | Staff training during normal time is not necessary for strengthen of disaster response | | |
| | Strongly agree | 24 | 7.1 |
| | Agree | 13 | 3.9 |
| | Disagree | 66 | 19.5 |
| | Strongly disagree | 235 | 69.5 |
| E5 | Preparing for disaster response is hospital's responsibility | | |
| | Strongly agree | 226 | 66.9 |
| | Agree | 100 | 29.6 |
| | Disagree | 10 | 3.0 |
| | Strongly disagree | 2 | 0.6 |
| E6 | Preparation of individuals are not important for disaster response | | |
| | Strongly agree | 7 | 2.1 |
| | Agree | 7 | 2.1 |
| | Disagree | 76 | 22.5 |
| | Strongly disagree | 248 | 73.4 |
| E7 | Which one is important for making feasible disaster response booklet | | |
| | Bottom-up | 59 | 17.5 |
| | Top-down | 19 | 5.6 |
| | Combination | 255 | 75.4 |
| | Neither | 5 | 1.5 |
| F About your idea on preparing for disaster response | | | |
| F1 | Disaster medical respnse is not likely to happen in the University of Tokyo Hospital | | |
| | Strongly agree | 6 | 1.8 |
| | Agree | 5 | 1.5 |
| | Disagree | 54 | 16.0 |
| | Strongly disagree | 273 | 80.8 |
| F2 | Preparation takes effort | | |
| | Strongly agree | 228 | 67.5 |
| | Agree | 97 | 28.7 |
| | Disagree | 11 | 3.3 |
| | Strongly disagree | 2 | 0.6 |

| | | n | % |
|----|--|-----|------|
| F3 | Preparation takes time | | |
| | Strongly agree | 231 | 68.3 |
| | Agree | 95 | 28.1 |
| | Disagree | 9 | 2.7 |
| | Strongly disagree | 3 | 0.9 |
| F4 | Working system of my section is a barrier for my participation in study session | | |
| | Strongly agree | 44 | 13.0 |
| | Agree | 88 | 26.0 |
| | Disagree | 107 | 31.7 |
| | Strongly disagree | 99 | 29.3 |
| F5 | Participating in study session about disaster response is troublesome | | |
| | Strongly agree | 25 | 7.4 |
| | Agree | 94 | 27.8 |
| | Disagree | 128 | 37.9 |
| | Strongly disagree | 91 | 26.9 |
| F6 | Please tell us what are the barriers to prepare for disaster response? (for detail please refer to Table 7) | | |
| | Time restriction (no information about reason) | 14 | |
| | Family | 11 | |
| | Workload | 9 | |
| | Environment of section (leadership and mood) | 8 | |
| | Difficulty to imagine | 4 | |
| | Lack of knowledge about disaster | 4 | |
| | Difficulty to find study session | 2 | |
| | Contraction of external partner | 2 | |
| | Others | 13 | |