

## **Field survey of actual conditions for information collection and sharing at the hospitals in Kumamoto during the acute phase of the 2016 Kumamoto earthquake**

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### **Abstract**

On April 14, 2016, a strong earthquake occurred in Kumamoto Prefecture in Japan. In Kumamoto Prefecture, many buildings, including hospitals, collapsed and utilities were disrupted by the main shock and aftershocks. Previous studies have emphasized the importance of collecting and sharing information to continue the medical supply after the natural disasters. However, there are few reports on the actual conditions of information collection and sharing immediately after the disaster. We sent a questionnaire about the actual conditions for information collection and sharing at the time of Kumamoto earthquake to the top information managers of the four major hospitals in Kumamoto city. The results are as follows; Information on the damage situation of the building and human resources was quickly collected and was transferred to the information managers of the hospital; It was difficult to gather information on outpatient after triage or patients transferred from other hospitals. Especially, collecting the accurate information continuously on the congregating status of off-duty staff, situation of the outpatients and new patients transferred from other hospitals was difficult in all hospitals. To achieve medical service continuity, it is important to collect and share information effectively, and is necessary to make effective use of the information collection system and device.

## **Introduction**

Japan is an earthquake-prone country. According to earthquake research data, there is a very high probability that an earthquake of magnitude 8 or greater will occur in the next 30 years<sup>1</sup>. Therefore, drills to practice how to respond during a disaster are very important. Almost all Japanese hospitals, schools and commercial facilities conduct disaster drills. In particular, fire suppression departments and hospitals often practice responding to emergency triage situations. Previous studies report that it is important to collect accurate information to respond promptly and accurately in the wake of a disaster<sup>2</sup>. Hospitals need information to continue providing medical care for inpatients following a disaster. In addition, hospitals need information to provide first aid for victims of the disaster. Information is especially important for disaster base hospitals. Currently, information systems and devices are being developed to support information collection for disaster triage purposes. However, even though previous studies have described those information systems and devices, few have examined the on-the-ground situation of collecting and transferring information in the midst of a disaster. Therefore, we took advantage of the opportunity to examine the actual conditions for collecting and transferring information at medical facilities at the time of a real disaster.

Kumamoto Prefecture, located in the southern part of Japan, experienced two big earthquakes in April 2016. We investigated the conditions for collecting and sharing hospital information during the acute phase.

## Method

The Kumamoto earthquake occurred in the Kyushu region of Japan. This study focuses on Kumamoto Prefecture, located in the central part of Kyushu, which has over 1.7 million residents.

In July 2016, we sent a questionnaire about the actual conditions of information collection at the time of disaster to the key informants of five hospitals in Kumamoto city. We defined the key informant as the person responsible for coordinating information in the case of disaster. The hospitals included three disaster base hospitals, a disaster base medical center and two public hospitals. A disaster base hospital is one which can provide enhanced medical care and strengthen the initial emergency medical system in the case of a disaster.

The survey focused on four areas:

- 1) The information collected immediately after the earthquake occurred. We obtained responses about 14 items such as damage to the hospital building and the condition of inpatients.
- 2) Time needed to transfer information from wards to the key information coordinator. We obtained one of three answers (i.e. Within 15 min of the main earthquake, Within 30 min of the main earthquake, and within 60 min of the main earthquake).
- 3) We obtained one of time answer that the time spent collecting about information of outpatient, inpatient, and transfer patient. (i.e. We could obtain this information promptly; We needed more time to obtain this information; We needed to communicate between departments to obtain this

information; We were unable to collect this information; We did not collect this information).

4) About the information that it was difficult to collect: question items are same as question 1 plus free mention.

We defined primary information as information about the hospital's initial damage following the earthquake, such as building damage and human injuries. We defined secondary information as information about the hospital's subsequent situation, such as information about triage operations and outpatients or staff who flock to hospitals following a disaster.

In this study, it considered that they agreed to our survey by replying to a questioner.

## **Result**

In this survey, four out of the five hospitals responded, including two disaster base hospitals and two public hospitals. The present study found that primary information (e.g. damage to the hospital building and injuries to inpatients) was collected by all four hospitals. However, secondary information (e.g. the state of hospital operations and disaster response activities, or the availability of medical staff) was collected less consistently. Table 1 shows the types of information collected by the four hospitals during the Kumamoto earthquake.

In addition, we found that primary information was transmitted to the information coordinator from wards within 30 minutes at three hospitals and within 60 minutes at the fourth hospital. However, we also found that secondary information took longer to collect than

primary information or was not collected at all. In addition, all hospitals indicated having difficulties in collecting information about changing patient situations, and the status of staff members and their emergency assignments. Table 2 summarizes the challenges in collecting new patient information.

## **Discussion**

The present study shows that all hospitals were able to collect primary information about damage to the hospital building and injuries to inpatients. Previous study reported that it is important that primary information be collected quickly<sup>3</sup>. Information management is critical at the acute stage of a disaster. Hospital disaster drills therefore emphasize the goal of collecting primary information within 10 to 30 minutes of the main earthquake<sup>4,5</sup>. The results of this study show that primary information was transmitted to the information coordinator from the wards within 30 minutes of the main earthquake at three hospitals but took an hour at the fourth hospital. The timeframe for collecting and sharing primary information found in this research is consistent with that of previous study of disaster drills. This primary information is critical to continue medical care at a hospital. Similarly, secondary information is important for providing medical care needed as a result of the disaster. In this study, we found two issues with secondary information. First, some hospitals took more time to collect information about triaged patients. Previous studies have reported that it is difficult to collect information about outpatients<sup>6</sup>. Our study shows that in the confusion of a real disaster, it is difficult to collect

and share accurate information on unstable patient information. Recently, electronic triage tags have been developed<sup>7</sup>. In addition, progress is being made on a study to build an autonomous reporting system and a unified management system for triage information<sup>8</sup>. Nevertheless, in fact it was difficult to collect secondary information at the time of disaster.

Second, it is difficult to collect information on the availability and skills of off-duty staff who report to a hospital. In an investigation about staff availability during a large-scale disaster in Japan, 55% of staff responded that they would report to work even if they were off-duty<sup>9</sup>. Furthermore, the previous study reported that the number of off-duty staff who comes to the hospital voluntarily are different by the type of job<sup>10</sup>. It is important that the headquarters for disaster control can accurately track the availability of off-duty staff at any location. More effective use of attendance confirmation systems can offer benefits in this area.

In a disaster, hospitals need to first secure the lives of their inpatients by continuing to provide medical care. At the same time, they must take care of new patients injured in the disaster. It is reported that it is too late to collect and share information after it was ordered from disaster countermeasure headquarters.<sup>5</sup> Both primary information and secondary information, even if the latter is still changing, should be shared information in a timely way to ensure continued medical care. Since disasters are unpredictable, it is expected that only a small number of staff will be available to collect key information. Therefore, it is important that disaster management practices include effective methods for collecting and transferring

information during the course of a disaster.

This paper contributes to the research on disaster management by focusing on the conditions for collecting critical disaster information. Our findings are limited in two ways, however. First, we focused on disaster center hospitals and larger hospitals with at least 300 beds. There may have been a possibility selection bias, as these hospitals are considered more practiced at disaster prevention and more ready to activate disaster systems, than smaller hospitals. Second, our study focused only on the situation of collecting and transferring information following the main Kumamoto earthquake shock. However, the main earthquake had been preceded by a significant foreshock with a maximum seismic intensity 7 two days before. There was thus a possibility that disaster information collection and transfer methods were already being reviewed, because one of the four study hospitals had already taken action due to the foreshock. Therefore, this study may overestimate the timeliness of disaster information collection. Nevertheless, our study shows that even disaster center hospitals, which are specifically intended to augment the initial emergency medical care system in the event of a disaster, face problems in collecting and transferring information once a disaster has struck.

## **Conclusion**

All hospitals are able to collect primary information about building damage and human injury at the time of the disaster in a relatively short timeframe. On the other hand, we have identified issues with collecting information about off-duty staff availability and patients in triage. As noted before, helping disaster victims is a key part of medical care continuity following a disaster. Therefore, for effective medical continuity, it is important to focus on information sharing about newly admitted patients, including those transferred from other hospitals. In addition, it is also important to manage staff effectively and consider the appropriate distribution of manpower. Therefore, it is necessary to make effective use of the information collection system and device.

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Table1. A summary of the extent of information collection

Types of information	Number of study hospitals able to collect information
<b>Primary information</b>	
Damage to the hospital building	4/4
Disaster response systems (disaster prevention system, fire detectors, etc.)	3/4
Damage to the sprinkler system? (presence/ absence of Damaged sprinkler System)	3/4
Operating condition of electronic medical charts	4/4
Condition of the essential utilities in the ward (water, electricity, gas)	4/4
Condition of the medical utilities in the ward (medical gas, suction equipment, etc.)	4/4
Number of inpatients	4/4
Injuries to inpatients	4/4
Evacuation of inpatients needed/ not needed?	4/4
Number of on-duty medical staff	2/4
Injuries to on-duty medical staff	4/4
<b>Secondary information</b>	
Number of available hospital beds	4/4
Number of staff members on hand, including volunteers and off-duty staff	4/4
Damage conditions at other hospitals	1/4

Table2. A summary of challenges to new patient information collection

Question item	Number of responses
<b>Information about patients in triage.</b>	
We could obtain this information promptly.	0/4
We needed more time	2/4
We needed to communicate between departments	2/4
We were unable to collect	0/4
We did not collect	0/4
<b>Information about patients admitted following triage.</b>	
We could obtain this information promptly.	2/4
We needed more time	1/4
We needed to communicate between departments	0/4
We were unable to collect	0/4
We did not collect	1/4
<b>Information about patients transferred from other hospitals.</b>	
We could obtain this information promptly.	2/4
We needed more time	1/4
We needed to communicate between departments	0/4
We were unable to collect	0/4
We did not collect	1/4