Interim Report of Healthcare Delivery after East Japan Earthquake-Tsunami Disaster – Does EHR Help?

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1. Introduction – Revival of Economy of Japan and Medical Revival Situation

On March 11, 2011, the earthquake of the magnitude 9.1 occurred with the focus located offshore of the North Japan Eastern Pacific Ocean. Forty minutes after that, the tsunami with the maximum height of 30 m hit the Pacific coast, mainly Miyagi, Iwate and Fukushima prefectures. A half year has passed. As of August 27, a total of 20,202 persons are dead or missing.

Figure 1 shows a growth rate for every quarter of GDP [1]. It includes the preliminary figures of the period from April to June 2011. At the beginning, GDP decreased because of the damage of factories, the shortage of fuel, the obstacle of transportation networks, etc. But, we already see signs of recovery. If we consider the whole Japanese economy, then the adverse effect by the disaster is only 1/5 or 1/6 of the Lehman Shock that we experienced in 2009.

On the other hand, Figure 2 shows transition for every week of the healthcare delivery in Iwate Prefecture after the disaster occurrence [2]. In the fourth week after the disaster, about 90 percent of medical facilities resumed the healthcare delivery.

Table 1 shows the results of the questionnaire conducted by Miyagi Prefectural Medical Association one month after the disaster occurrence and addressed to its members [3]. Five or six percent of the facilities still remained closed. In such areas where many facilities were destroyed, personnel dispatched from other areas continue medical delivery at the shelters or the first-aid stations.

2. Symposium on Continuation of Healthcare Record over Disaster – July 30, 2011 at Aizu-Wakamatsu, Fukushima

On July 30, at Aizu-Wakamatsu City, Fukushima Prefecture, Symposium on “Continuation of Healthcare Record over Disaster” was held by Japan Association for Medical Informatics (JAMI). At the symposium, the dispatch team that arrived on the spot for support activity reported the actual situation, the members of Japan Medical Association reported the continuous support activity, and the members compared this disaster with the 1995 Hanshin Earthquake. The symposium also had a panel discussion over the continuation of medical information at the time of disaster and the information infrastructure required for continuity.

DMAT (Disaster Medicine Assistance Team) that arrived at the spot immediately after the earthquake reported as follows. In the 1995 Hanshin Earthquake, the main damage was destruction of buildings by the earthquake and subsequent fire. So, at the initial stage, surgical procedures were most...
necessary. On the contrary, in this disaster, the damage caused by the earthquake was relatively small thanks to the improved building regulations and the ongoing replacement of old buildings. The tsunami that attacked the coast immediately resulted in many missing people. On the other hand, the survivors, who were able to evacuate, required less surgical procedures. They required more care of chronic diseases or mental diseases.

When we had the Hanshin Earthquake 16 years ago, different dispatching organizations used different color codes for triage cards for identification of patient conditions. It resulted in confusion on the spot. Based on this bitter experience, standardization of triage cards had finished, which we used this time.

DMAT offers support for several weeks from immediately after the occurrence of a disaster. Even after that, the Japan Medical Association continues the dispatch of personnel. From the viewpoint of continuation of medical information, it is remarkable that they invented the summary card describing each patient’s condition and they relayed the card to the successor medical staff coming to the same first-aid station. Being similar to the triage card, this card has color-coding for identification of the seriousness of a patient’s condition.

3. Continuation of Post-disaster Healthcare

3.1 Problems

In the 1995 Hanshin Earthquake, there were 1100 refugee stations for 310,000 people at the peak period. Many healthcare
relief teams, from local physician’s associations from all over the country, to medical university hospitals, attended their allocated stations in the disaster area to give healthcare. In this 2011 East-Japan Earthquake, there were 2000 refuge stations for 490,000 people at peak period.

The relief team said that past medications and interventions should be noted. Without them, doctors have to interview the patient from the beginning. However, a refuge station medical facility is only a temporal office and has no medical record keeping and searching methods. In this situation, only the patient’s hand can keep the continuity of healthcare record.

Even in the critical period, medical records should be kept by providers, not only for healthcare itself, but also for a business record for many purposes, such as to report the amount of healthcare needed and provided, or for patient’s later requirement of aide money applications.

### 3.2 Medical Record Duplicating-paper Sheet for Disaster

To fulfill both requirements, on both the patient’s and provider’s side, in the case of no electricity and network access, the only way was by using duplicating-paper sheets, one for the patient, and one for the provider’s record. This lesson was reported [4] in 2000, after investigation of 1995 Hanshin disaster.

Many relief teams fetched duplicating-paper sheet for medical record. Red cross and defense force made document format for this use [5].

Five days after this East-Japan Earthquake, JAMI dispatched a recommendation to all members who are going as relief team that duplicating-paper sheet should be used for medical record, one for patient, one for record. In Japan, even in “paperless EMR hospital”, there are many duplicating paper documents for “written consent”. These document sheets can be used.

### 3.3 Lessons Learned

Continuation of healthcare may be maintained only by the patient during times of no electricity or no network. Therefore, duplicating-paper sheet can be useful in such situations.

However, “Document sheet for disaster” may become useless over many years, as their existence may be forgotten, or duplication ink could die out. It is recommended that some sort of duplication paper be maintained, even in “paperless EMR” hospitals, for the purpose of, i.e., emergency records, or written consent documents, which could be for daily use in regular situations, and for the above-mentioned use in disaster.

### 4. Does EHR (Electronic Healthcare Record) Help?

In various countries in the world, they have started EHR projects that electronically gather individual medical records into a single database. After this earthquake disaster, the expectation for this system is growing in two meanings. One is the hospital’s request that the data should be maintained as a backup outside a disaster area. The other is the victim patient’s request that past medical records should be referenced at the time and after the disaster.

As to the hospital’s request, many hospitals and clinics in the areas of serious disaster had difficulty using paper or server information. But, since February 2011, one month before the East-Japan Earthquake, Ishinomaki City Hospital, which is in severely damaged area, has mutually shared a hospital information system data with Yamagata City General Medical Center that is 86 km away from Ishinomaki. Thanks to this arrangement, it is reported that they were able to quickly spread the medical records [6]. Its usefulness is obvious.

As to the victim patient’s request, it is fundamentally useful, but it has several problems to be solved.

One aspect is to identify whether the infrastructures such as electric power, network etc. are available, whether the operation information terminals exist ready for use, or whether the supporting personnel can learn quickly how to operate such terminals. If the terminals are not the ones used routinely, they cannot be easily used in times of disaster. This should be kept in mind.

Another aspect is to decide how much information should be saved. The patient medical information contains two categories of information. The first category costs less for information import, because of standardized data format, such as machine-output lab test data. Prescription history can be saved equally easily as long as there is an CPOE (Computerized Physician’s Order Entry) system operating. The second category costs more for information import because of human-generated data such as doctor’s findings and clinical summary.

In 2007, the association for promotion of Public Local Information Communication reported “Healthcare, Welfare application working group proposal” [7]. In this, by means of interviewing to disaster

### Table 1

Survey to Miyagi Prefecture Medical Association members on the effect of the East-Japan earthquake

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<th></th>
<th>a. Open as before</th>
<th>b. Some difficulties, but already overcome</th>
<th>c. Still somewhat difficulties</th>
<th>d. Open at relocated place</th>
<th>e. Still closed</th>
<th>Grand Total</th>
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<tbody>
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<td></td>
<td></td>
<td>b.1 Limited hours</td>
<td>b.2 Limited operation/examination</td>
<td>b.3 Limited operation/examination</td>
<td>b.4 Limited clinic specialty</td>
<td>b.5 Multiple and other limitations</td>
</tr>
<tr>
<td>a. Open as before</td>
<td>339</td>
<td>700</td>
<td>44</td>
<td>228</td>
<td>30</td>
<td>114</td>
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<td>b. Some difficulties, but already overcome</td>
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teams, priority of healthcare information in disaster is listed as

- **High**: Severity of injury/disease, Prescription history, Type of injury/disease
- **Middle**: Images of the patient (visible or X-ray), Past disease history (incl. examination results), Past progress notes
- **Low**: Past health checkup record.

The above-mentioned report also says that a prescription history is of first priority rather than test results or medical record descriptions. In some countries, the history of prescriptions is recorded by e-prescription. The medical information format is standardized by HL7. If the problem of drug code is solved, then realization will be relatively easy.

### 5. Final Remarks

Until now, many arguments have been made about EHR, such as usefulness, feasibility, cost-effectiveness, problems etc. The authors of this paper expect that such arguments should cover also the viewpoint of the usefulness and realization of EHR at the time of disaster. Immediately after the 1995 Hanshin Earthquake, everybody was enthusiastic about such arguments. But, in several years after that, the motivation was halved. This is our bitter experience in Japan. The authors are grateful for the opportunity given to write this paper in an earlier stage after the disaster. We sincerely hope that we do not repeat the folly of the Japanese proverb: After hot water running through your throat, you forget the heat (Vows made in storms are forgotten in the calm.)

### References

2. Compiled from weekly reports of Iwate Nippo newspaper.