Demonstration of Information-Sharing via the Internet Satellite *Kizuna*: Report from the JMA Disaster Medicine Liaison Council[*1]

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On July 26, 2012, the Japan Medical Association (JMA) conducted a demonstration of information-sharing via TV conferencing and cloud computing based on a disaster simulation at the JMA Disaster Medicine Liaison Council in conjunction with the Hokkaido Medical Association and the Saitama Medical Association. In the demonstration, the super high-speed Internet satellite *Kizuna* was used with the cooperation of the Japan Aerospace Exploration Agency (JAXA). This experiment was conducted as part of preparedness measures for future disasters because it is currently predicted that there is a high probability of major earthquakes occurring directly beneath the Tokyo metropolitan area and the Nankai Trough.

This demonstration was followed by lectures on disaster medicine and reports on Japan Medical Association Team (JMAT) activities in the aftermath of the Great East Japan Earthquake.

Immediately after the Great East Japan Earthquake, the JMA strove to ascertain the situation and needs in disaster-afflicted areas by conducting TV conferences with medical associations in the affected prefectures. In large-scale disasters that could occur in the future, it will again be important to share information via TV conferencing among the JMA, prefectural medical associations in the disaster areas, and prefectural medical associations providing assistance.

In particular, the sharing of patient information and information about the disaster-affected areas was imperative at the time of the 2011 earthquake and tsunami. Since JMAT and medical support teams are dispatched to disaster sites alternately within a short period of time, it is important that information is sufficiently shared between outgoing and incoming teams as well as between medical associations in the disaster-affected areas and medical associations dispatching JMAT. There is also a need to transfer patients from the care of medical support teams to that of local medical institutions when the health care system in the devastated area has recovered.

Following the 2011 disaster, the Internet was utilized more than ever before in ascertaining the situation in the disaster zone from every perspective and in conducting support activities. However, it is possible that a disaster could disrupt Internet access in disaster-stricken areas.

For this reason, the JMA planned a demonstration of disaster emergency communications in cooperation with JAXA, which contributed to Internet communication in the disaster-affected areas after the 2011 earthquake and tsunami using the *Kizuna* satellite.

In the demonstration, first of all JAXA gave an overview of the *Kizuna* satellite. *Kizuna* was developed with the aim of building a super high-speed communications network. Because communications antennas for *Kizuna* can be more easily downsized compared to conventional satellites, they are highly disaster-resistant and portable, enabling the provision of ad hoc network connections. At the time of the 2011 disaster, *Kizuna* enabled the sharing of information between Iwate response headquarters and local response headquarters in the cities of Kamaishi and Ofunato as assistance in providing communication links to disaster-stricken areas.

For the demonstration, communications antennas were installed at the office of the JMA, Hokkaido Medical Association, and Saitama

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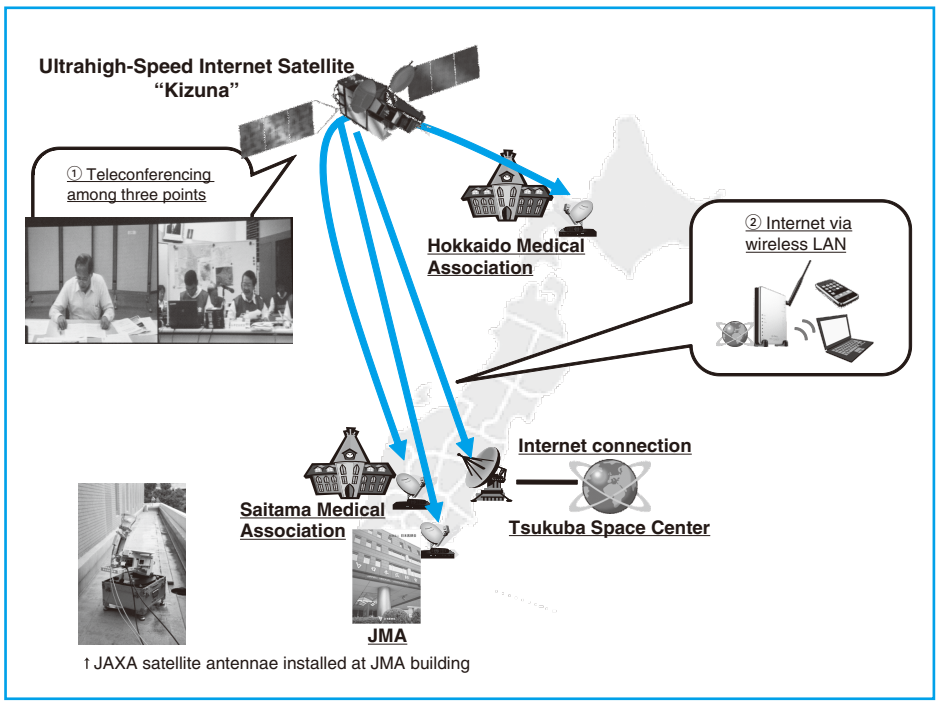

Fig. 1 Demonstration of disaster emergency communications

Medical Association. An environment for holding a TV conference using a link with *Kizuna* and an environment enabling use of the Internet via the Tsukuba Space Center were installed in each medical association office (**Fig. 1**). The JMA has signed agreements with the Hokkaido Medical Association and the Saitama Medical Association to transfer communication and contact operations if the JMA cannot function due to a disaster.

The demonstration was based on the two scenarios.

In Scenario 1, a large earthquake with its epicenter on the Western Sapporo Fault strikes the City of Sapporo, disrupting information transmission and the Internet. This scenario postulates numerous patients with conditions including burns, fractures, limb amputations, and crush syndrome; fires over a wide area in multiple locations including residential neighborhoods and shopping districts; damage to core hospitals; and the hottest heat wave the area has ever experienced.

The three medical associations held a TV conference via the *Kizuna* satellite and confirmed the procedures for setting up local response headquarters and requesting the dispatch of JMAT. In addition, testing of systems for sharing electronic medical charts and information about evacuation shelters as well as referencing patient images were conducted via the *Kizuna* network using cloud computing as a way of explaining the situation in the disaster-stricken areas. Specifically, medical charts (electronic and scanned paper charts) at first-aid centers in one district of Sapporo, the disaster situation (results of an initial rapid survey), and information on shelters in another district of Sapporo were uploaded to the cloud computing platform. Those files were then reviewed by the JMA, the decision made to dispatch JMAT, and the dispatch request sent to the Saitama Medical Association, which had also reviewed the files.

In Scenario 2, a large earthquake suddenly strikes a Tokyo area just as a major typhoon is hitting the city. A tsunami is triggered in Tokyo Bay and batters the city at a height greater than anticipated because it is coupled with the high tide caused by the large typhoon. Buildings collapse and fires break out in areas dense with

wooden houses. Areas on steep slopes crumble as the violent earthquake strikes while the ground is soft due to the torrential rain. Evacuation and relief efforts are hampered by the widespread occurrence of serious ground liquefaction.

The JMA building is damaged and loses functioning. The JMA is not able to obtain damage information about the city, but Internet access via *Kizuna* is possible and the JMA manages to make contact with the Hokkaido Medical Association and the Saitama Medical Association. The JMA then learns the situation (national government functions have been transferred to the Disaster Preparedness Base in the City of Tachikawa, Tokyo, etc.) from the Hokkaido Medical Association, which saw the TV news of the disaster and is also provided with information about prefectural response headquarters by the Saitama Medical Association.

Furthermore, since the JMA is not expected to recover its functions in the immediate future, it entrusts communication and contact operations to the Hokkaido Medical Association and requests permission for JMA disaster response headquarters to be set up in the Hokkaido Medical Association's building. The JMA also asks the Hokkaido Medical Association to contact the national government and request all medical associations nationwide to dispatch JMAT. The Saitama Medical Association is asked to set up the JMA's local response headquarters and to serve as the hub for the JMAT network from the Tohoku and Northern Kanto regions and from Niigata Prefecture.

In light of the results of the demonstration, the JMA signed an agreement with JAXA on January 30, 2013, concerning demonstration experiments for using the super high-speed Internet satellite *Kizuna* in disaster medical activities.