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Acute Critical Care Medicine

Field Study in Hokkaido Prefecture after the 2018 Hokkaido Eastern Iburi Earthquake

Youichi Yanagawa MD, PhD[1*]., Hiroki Nagawasa MD[1]., Ikuto Takeuchi MD[1]., Kei Jitsuiki MD[1]., Shunsuke Madokoro MD[1]., Hiromichi Ohsaka MD. PhD[1], Kouhei Ishikawa MD. PhD[1]., Kazuhio Omori MD. PhD[1]., Shin-ichiro Iwamoto MD. PhD.[2], Yoshiro Ohshika MD.PhD[2]
[1]Department of Acute Critical Care Medicine, Shizuoka Hospital, Juntendo University, Japan
[2]Sapporo Hospital, Self Defense Force, Japan

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***Corresponding author**
Youichi Yanagawa

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Abstract: An earthquake measuring 6.6 MW on the moment magnitude scale struck Iburi Subprefecture in Hokkaido, Japan, on 6 September 2018. The earthquake caused electrical power failure in all households in Hokkaido. Such long-lasting, severe power failure forced medical facilities located in this area to use in-house power generation systems. Accordingly, four of the six disaster-base hospitals located in the Higashi-Iburi area had to reduce their treatment of patients. One hospital in Muroran City had to transport patients who needed mechanical ventilation due to a shortage of fuel for the in-house power generation system. The Japan Self Defense Forces Sapporo Hospital was equipped with a complete in-house power generation system and plenty of fuel for providing typical medical treatments, even in cases of power failure, so this hospital responded to the sharp increase in the number of patients requiring emergency medical treatment due to the earthquake. The present survey showed that electric power failure can have a profound influence on the function of hospitals, even if the hospitals themselves are relatively undamaged. The disruption and reduction of hospital functions in the event of a disaster may be minimized by ensuring preparedness with an in-house power generation system.
Keywords: earthquake; interruption of electric service; household power generation system; auxiliary power system.

INTRODUCTION

An earthquake measuring 6.6 MW on the moment magnitude scale struck Iburi Subprefecture in Hokkaido, Japan, on 6 September 2018 at 3:08 a.m. (Figure 1). The earthquake caused electrical power failure in all households in Hokkaido as the Hokkaido Electric Power Company's coal-fired power plant in Atsuma was severely damaged by the earthquake. The damage to the plant triggered an imbalance in the supply and demand of electricity across Hokkaido, thus leading to a blackout.

METHODS

The protocol of this study was approved by our institutional review board, and the examinations were conducted according to the standards of good clinical practice and the Declaration of Helsinki.

We collected information on medical organizations and problems associated with the Emergency Medical Information System established by the Ministry of Health, Labour and Welfare and interviewed staff at Sapporo Hospital as well as members of the Japan Self Defense Force and Atsuma Town Hall employees.

RESULTS

While the 41 fatalities were attributed to the landslides caused by the earthquake (Figure 2), many victims were merely injured, albeit severely. The medical facilities were also badly damaged by the earthquake, although 30 of the 32 medical facilities were able to re-start treatment by 2 days after the earthquake. However, long-lasting, severe power failure forced medical facilities located in this area to use in-house power generation system. Accordingly, four of the six disaster-base hospitals located in the Higashi-Iburi area had to reduce their treatment of patients. Two fatal cases of carbon monoxide poisoning due to incomplete combustion of the in-house power generation system was one of the side effects of this disaster. One hospital in Muroran City had to transport

patients who needed mechanical ventilation due to a shortage of fuel for the in-house power generation system. The Japan Self Defense Forces Sapporo Hospital was equipped with a complete in-house power generation system and plenty of fuel for providing typical medical treatments, even in cases of power failure, so this hospital responded to the sharp increase in the number of patients requiring emergency medical treatment due to the earthquake (Figures 3 and 4).

Fig-1: Map of Japan. An earthquake measuring 6.6 MW on the moment magnitude scale struck Iburi Subprefecture in Hokkaido, Japan, on 6 September 2018. The red mark indicates the epicenter of the earthquake

Fig-2: Atsuma Town. Many landslides occurred, burying victims and resulting in fatalities

Fig-3: On the day of the 2018 Hokkaido Eastern Iburi earthquake Cities and towns across Hokkaido fell dark due to power failure. However, the Japan Self Defense Forces Sapporo Hospital and its outskirts were relatively unaffected by this outage

Fig-4: On the day of the 2018 Hokkaido Eastern Iburi earthquake. The Japan Self Defense Forces Sapporo Hospital provided unlimited medical treatment in response to the sharp increase in the number of patients needing emergency medical treatment due to the earthquake

DISCUSSION

This study shows that long-lasting power failure can adversely affect the management of a hospital. However, if hospitals are sufficiently prepared for such incidents, they can expect relatively little trouble concerning the management of patients during such disasters.

Many machines and systems in hospitals require electrical power. However, lights, communication tools, computer-dependent patient management systems (including order management systems for biochemical analyses and radiological and physiological studies), electrical knives and life-saving equipment (e.g. monitors, infusion pumps, ventilators, hemodialysis and percutaneous cardiopulmonary support) became useless under conditions of power failure [1-4]. The number of patients abruptly increases in the acute phase after a huge earthquake, and even undamaged hospitals can experience difficulty managing the sudden increase in victims following a large-scale disaster. Accordingly, at the very least disaster-base hospitals should ensure their preparedness by establishing an in-house power generation system.

CONCLUSION

The present survey showed that electric power failure can have a profound influence on the function of hospitals, even if the hospitals themselves are undamaged. The disruption and reduction of hospital functions in the event of a disaster may be minimized by ensuring the preparedness with an in-house power generation system.

Conflict of interest statement

The authors declare no conflicts of interest in association with this study.

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