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News and Views

Disaster Pharmacists' Support and Challenges Faced by Hospital Pharmacy Departments in the Disaster Response for the 2024 Noto Peninsula Earthquake

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The 2024 Noto Peninsula Earthquake, which reached a maximum intensity of 7, led to the deterioration of critical services including electricity, water, communication, and roads, resulting in 241 fatalities. The medical response of pharmacists during disasters has gained attention since the 2011 Great East Japan Earthquake. However, few studies have evaluated the challenges that hospital pharmacy departments face during disasters. T.T., the author, supported the hospital pharmacy department of the Anamizu General Hospital from February 2 to 4, 2024. He handled medication dispensing for inpatients, provided medication and instructions to outpatients, and reported to the local coordination headquarters. Furthermore, he stayed overnight in the department to handle on-call activities. Daily tasks included reporting and information sharing with the coordination headquarters. Regarding pharmacist support activities in medical facilities, challenges arose from the malfunctioning of automated tablet dispensing machines after the earthquake, worsening dispensing conditions and pharmaceutical supply issues. To avoid these problems, pharmacists should provide swift and continuous medical support until automated tablet dispensing machines' systems are restored after an earthquake. Additionally, it is considered beneficial for medical institutions to include in their business continuity plans a stockpile of medicines that can last for 7 days, as preparation for coping with earthquakes and similar emergencies. The findings of this report could be useful to all countries facing the possibility of disasters.

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Introduction

Japan, which is prone to natural disasters, experienced a powerful earthquake with a magnitude of 7.5 in the Noto region (GLIDE # EQ-2024-000001-JPN). The earthquake caused severe damage, resulting in 241 fatalities and considerable infrastructure deterioration, including that to electricity, water supply, communication, and roads. Medical facilities experienced water and power supply losses, which hindered access to medical gas (Cabinet Office, Government of Japan 2024; Ishikawa Prefecture 2024).

Medical systems that involve pharmacists during disasters have garnered attention since the 2011 Great East Japan Earthquake (Nagase et al. 2012). The Japan Society of Hospital Pharmacists developed and refined guidelines titled "Guidelines for Disaster Medical Support" based on pharmacists' experiences during the Great East Japan Earthquake (Japan Hospital Pharmacists Association 2016). However, few studies have evaluated the issues concerning hospital pharmacy departments during disasters. As a disaster pharmacist registered with the Japan Society of Hospital Pharmacists, T.T., the author, was dispatched to Anamizu General Hospital to participate in disaster relief activities following the Society's instructions on January

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29th. This report comprehensively discusses the support activities performed by pharmacists and the issues faced by hospital pharmacy departments during disasters.

The Medical Response of the Japan Society of Hospital Pharmacists

In response to the 2024 Noto Peninsula Earthquake on January 1, 2024, the Japan Society of Hospital Pharmacists promptly established disaster medical support headquarters at the Ishikawa Prefectural Office. Additionally, the Society stationed the local coordination headquarters set up at the Ishikawa Prefectural Office. Registered disaster pharmacists (Japan Hospital Pharmacists Association 2016), who had received specialized training, were dispatched to the affected areas following Disaster Medical Assistance Team (DMAT) operations. Requests for pharmacist deployment were subsequently sent to the pharmaceutical association chairpersons in each prefecture after the earthquake.

T.T., the author, a registered disaster pharmacist, was dispatched alone to Anamizu General Hospital in Ishikawa Prefecture from February 1 to February 5, 2024. The dispatch to Anamizu was a team formed by T.T. as the first team dispatcher and other dispatchers joined later, including the local coordination team. The reason for dispatching the team was to alleviate the workload related to pharmacy duties resulting from the reopening of outpatient clinics at the same hospital. T.T. worked in the pharmacy department, handling medication dispensing, providing instructions to patients, and reporting to the local coordination headquarters. T.T.'s presence alleviated workload and stress for local pharmacists, who could take breaks while T.T. managed on-call duties and stayed overnight. After each day's support work, T.T. diligently recorded the operational status of dispensing equipment and procedures, using Google Spreadsheets to share this crucial information with the local coordination headquarters.

Overview of and Infrastructure Damage to the Anamizu General Hospital

The Anamizu General Hospital, one of four public hospitals in the Okunoto area, has 100 beds. It initially served as a shelter for 900 people after the disaster and outpatient services resumed from January 28th. During the support period, medical treatment was managed by the DMAT, with plans to transition to the Japan Medical Association Team (JMAT) and other units in the future. At the time when T.T. was dispatched to the hospital, electricity was available; however, there was a water outage that led to the installation of temporary toilets. The Self-Defense Forces provided bathing support to local residents from the 12th day after the earthquake. Postal and courier confusion has restricted medication supply, limiting prescriptions to one week.

Summary of Patients Attended to at the Hospital during the Assignment Period

Dispensing of medications and provision of pharmaceutical information for outpatients

Outpatients were prescribed medications for cold symptoms (tranexamic acid and carbocisteine) and fever symptoms (acetaminophen), antiviral drugs for COVID-19, Rikkunshito for appetite loss, as well as mosapride. Some patients needed to be prescribed their usual medications. Pharmacists explained to patients that, due to insufficient medications, different brand and generic names were being used instead of their usual prescriptions. The other patients with diabetes were anorexic, and needed information about the treatment with antidiabetic medications. For them, pharmacists offered guideline-based guidance, considering the risk of hypoglycemia.

Characteristics of hospitalized patients

During the support activities, the hospital had 35 patients aged 65-103 years. Water shortages made treatment difficult, leading to the transfer of critically ill patients, those on dialysis, and pregnant women to hospitals in Kanazawa 10 days after the earthquake (Cabinet Office, Government of Japan 2024). In 35 patients hospitalized at the time of the support activities, respiratory infections were the leading cause of admission (31.4%), followed by urinary tract infections (11.4%), urinary retention/acute renal failure (5.7%), and anxiety disorders (5.7%). Hospitalization duration varied, with 34.3% staying for less than 7 days, 14.3% for 8-14 days, 37.1% for 15-29 days, and 14.3% for > 30 days. Medications were administered accordingly.

The Preparedness, Response, and Reconstruction of the Pharmacy Department in Anamizu General Hospital

Dispensing status of the hospital pharmacy department

Pharmacists working in the hospital pharmacy department reported damage to the department the earthquake. Before the earthquake, all tablet dispensing was done using an automatic tablet dispensing machine (Xana-4001U2 Advance®, TOSHO Corporation, Tokyo), with pharmacists conducting audits after packaging. Despite the hospital pharmacy department being a seismic-resistant structure, the automatic tablet dispensing machine collapsed due to the earthquake and leakage from the second floor. Consequently, a replacement was arranged. Furthermore, because of the earthquake, the tablets inside the dispensing machine were damaged, necessitating the refilling of all tablets. No damage was caused to the tablets outside. While waiting for the replacement machine, dispensing continued using a bulk packaging machine (Ai-8080win®, TOSHO Corporation, Tokyo) in coordination with the dispensing system. Medications were manually loaded into the bulk packaging machine. On January 14th, the replacement machine (Xana-2720EU®, TOSHO Corporation,

Tokyo) was received, but it was older than the equipment in the hospital pharmacy department. This caused compatibility issues with drawers and necessitated medication refilling.

Before the earthquake, injection medication dispensing at the hospital was managed by an external Supply Processing and Distribution (SPD) subcontractor, with pharmacists dispensing and auditing the medications. After the earthquake, the SPD staff were still able to work, and there was no damage to the ampules or medication shelves, allowing for continued dispensing.

Inventory status of medications

Due to worsened road conditions after the earthquake, replenishing medication stocks at the hospital and local pharmacies became difficult for a week. Postal and delivery services were suspended during this time. As a result, outpatient prescriptions were limited to 1 week immediately after the earthquake. Initially, only three nearby pharmacies could accept outpatient prescriptions; however, after 30 days, all seven nearby pharmacies resumed their outpatient prescription services.

Staffing in the hospital pharmacy department

Three pharmacists were on duty, and there was no reduction in staff owing to the earthquake.

Discussion

The 2024 Noto Peninsula earthquake resulted in challenges stemming from the malfunctioning of automated tablet dispensing machines after the earthquake, exacerbating dispensing conditions and pharmaceutical supply issues. This report discusses a registered disaster pharmacist's responses and emphasizes the importance of pharmacist-led disaster support, recommending medical institutions to stockpile medicines and ensure continuous support until automated systems are restored.

At the Anamizu General Hospital, all tablet dispensing relied on automatic machines, which were out of service after the earthquake. To prevent damage, the machines should be secured to the wall and the tablet drawers should be locked daily. The location of water pipes should be investigated, and the machines and medications should be repositioned away from the pipes. It took 14 days to receive the replacement. Recently, the adoption of automated dispensing machines has increased in facilities to enhance workflow efficiency and prevent medical errors (Takahashi et al. 2020). An automated machine will increase the workload if it fails. But it will also decrease the workload and prevent errors. Thus, BCPs for preventing the collapse of machine and alternative methods, in this case, the bulk packaging machine, will decrease the workload of pharmacists. In the context of the 2024 Noto Peninsula earthquake, support activities continued until 1 month after the earthquake, by which time the systems were repaired and the dispensing conditions improved. Despite the hospital staff working under post-earthquake stress, pharmacist support alleviated their burden. Emergency responses during night-time shifts also aided in reducing staff workload.

During the support activities, it became evident that having a 7-day medication stockpile is essential, because replenishing medications was a challenge in the first 7 days after the disaster. This aligns with past findings (Japan Pharmaceutical Association 2012). While Japan's Ministry of Health recommends a 3-day medication stockpile for disaster base hospitals (Ministry of Health, Labour and Welfare, Japan 2023), the rugged terrain of the Noto Peninsula led to longer-than-expected logistics delays owing to road damage from the earthquake (Ichii et al. 2011). Patients affected by the Great East Japan Earthquake needed more than 7 days of medication owing to difficulties in accessing hospitals or pharmacies caused by gasoline shortages and poor road conditions (Kobayashi et al. 2016). Disasters such as earthquakes have broad effects on stockpiles of neighboring facilities (Japan Pharmaceutical Association 2012). However, a survey by the Cabinet Office revealed insufficient medication stockpile preparation in the business continuity plans of medical institutions (Cabinet Office, Government of Japan 2013).

During the disaster relief efforts, prescriptions for both inpatients and outpatients included antibiotics, antivirals, expectorants, and analgesics, similar to those during previous earthquakes (Inaba and Amagata 2020). Interruptions in medication therapy due to disasters have been problematic in the past (Okumura et al. 2008). Increased patient visits during disasters are expected, and potential disruptions in medication supply owing to damages to manufacturing facilities need to be considered (Mori et al. 2012). Therefore, pre-established agreements with local organizations and suppliers are crucial for ensuring medication supply readiness.

The limitations of this work stem from its focus on activities conducted solely by registered disaster pharmacists from the Japan Hospital Pharmacists Association. The recommendation for a 7-day medication stockpile may have been influenced by the unique geography of the Noto Peninsula. To enhance the applicability of the learnings, data from multiple facilities are required. The impact of disasters varies; however, this report may offer useful insights to countries facing similar challenges.

This report summarizes the disaster support efforts of registered disaster pharmacists following the 2024 Noto Peninsula earthquake. The findings emphasize the need for timely pharmacist assistance and maintenance of a 7-day medication stockpile to address post-disaster challenges effectively.

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Author Contributions

All the authors met the ICMJE authorship criteria. Tatsuya Tai participated in supporting the hospital pharmacy department of the Anamizu General Hospital from February 2nd to 4th, 2024 and contributed to the manuscript preparation. Sayaka Yamashita and Masahiro Watanabe participated in the study design and manuscript editing. Takahiro Motoki, Kazunori Yamaguchi, Hiroaki Tanaka, and Shinji Kosaka assisted with manuscript preparation.

Conflict of Interest

The authors declare no conflict of interest.

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