

Brief Report

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Difficulties in Accessing Medication Records at the Time of a Large-Scale Disaster

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Abstract

Objective: In a large-scale disaster, medical professionals need to access medication records and provide medicines to people who cannot return home to take their daily medicines. We investigated the proportion of carrying the paper notebook or availability of the smartphone application of the medication record among people who are assumed to have difficulty in taking their medicines during large-scale disasters.

Methods: In Japan, a web-based survey was conducted in 2018 by randomly selecting adults ≥ 20 years of age.

Results: There were 2286 medication record owners in 3082 participants. Of the medication record owners, 784 (34.3%) took medicines that could not be missed for even a day. Among them, 724 used paper notebooks alone, 26 used smartphone applications alone, and 34 used both. Among the 724, 208 (28.8%) always carried a paper notebook. Among the 26, 16 (61.5%) could use their applications anytime. Therefore, among the 784, at least 560 (71.4%) could not always access their medication information.

Conclusions: An awareness campaign to carry paper notebooks and install applications for medication records should be held, since only a limited number of people carry their medication records and always have access to their medication information.

Introduction

When a large-scale disaster occurs, many people will be faced with difficulties in returning to their homes or will be forced to evacuate.¹ For people taking insulin, anticonvulsants, and other medicines that cannot be skipped (even for 1 day),² they frequently lose access to such important medication in a disaster or do not carry enough doses to cover the duration of the evacuation period.³ An important role of pharmacists during a disaster is to supply medication for chronic disease management.⁴ Under the ‘Act on Securing Quality, Efficacy, and Safety of Products Including Pharmaceuticals, and Medical Devices’ in Japan, individuals are usually unable to obtain prescription medication from a pharmacy without an appropriate prescription, except when valid reasons are presented. However, in the event of a large disaster, a person who needs prescription medication can access such drugs without a prescription, because a large disaster is considered a valid reason in Japan for being exempt from the need for a prescription.⁵ In such situations, pharmacists must identify which medicines are needed (usually via patients’ self-reporting or by the packaging of the medicines brought forth by patients).

Japan has a system known as a medication record. It is a kind of personal health record owned voluntarily by each person that accumulates usage and dosage records of what medicines have been taken, where they were taken, and when. A medication record is submitted to the pharmacist when a person receives a prescription at the pharmacy. The record is used as a reference to check for duplicate prescriptions of the same drug or drug interactions when the patient visits multiple medical facilities. Once a pharmacist dispenses a prescription medicine based on a physician’s prescription, they sign on the medication record. From a public health perspective, medication records avoid excessive prescriptions, curb side effects, and reduce medical costs. Therefore, when a person faces a large-scale disaster (such as a large earthquake with or without a tsunami), they can identify the needed medicines via their medication record (if they have 1). In line with this reasoning, there is a report that some people who had medication records were able to receive their medicines without delay during the Great East Japan Earthquake of 2011.⁶ Although the usefulness of the medication record has been reported upon, it is unclear what proportion of people have access to it in the wake of the Great East Japan Earthquake.

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We sought to identify the proportion of individuals who carry a paper notebook or have access to the smartphone application concerning the medication records for those who take medicines (which must be taken every day). We were primarily concerned with people who might have difficulties returning home at the time of a large-scale disaster. A major health problem associated with an unexpected disaster strike is the interruption of daily medications. This study clarifies the magnitude of this problem.

Method

Eligibility criteria

The eligibility criteria for the survey included adults aged ≥ 20 years, who live in the capital area (including Tokyo, Kanagawa, Saitama, and Chiba prefectures), or the Miyagi prefecture; who are likely to face potential difficulties in returning home at the time of a large-scale disaster; and who can complete the online survey from a computer or a smartphone. We selected these prefectures because Tokyo, Kanagawa, Saitama, and Chiba prefectures were capital areas, whereas the Miyagi prefecture was 1 of the representative provincial prefectures. During the Great East Japan Earthquake, 5.15 million people in the capital area, and 14000 people in Miyagi prefecture, were estimated to have faced difficulties returning to their homes because public transportation was suspended.⁷

Research process

The survey was conducted between October 15 and 19, 2018. The questionnaire was web-based and was outsourced to DoCoMo Insight Marketing, Inc. NTT DoCoMo Inc., has more than 87 million members. Japan has a population of 120 million. Those who met the eligibility criteria were randomly selected (using the added criteria of sex and age) alongside those who were users of and had a contract with NTT DoCoMo Inc. (a mobile network operator in Japan). DoCoMo Insight Marketing Inc., had sent out survey recruiting emails to enlist participants. Recruitment was terminated when the number of respondents to the survey reached 2000 in the capital area and 1000 from the Miyagi prefecture. Participants in this study were defined as those who responded to the survey. Informed consent was obtained via email, which carried an explanation of the survey. Participants were considered to have agreed to participate in the survey when they clicked the 'start' button on the questionnaire. The questionnaire asked for participants' biographical details, including age (20s, 30s, 40s, 50s, 60s, and above), sex (male or female), marital status (Married or Not married), the prefecture of residence (Tokyo, Kanagawa, Saitama, and Chiba, or Miyagi prefecture), the name of the station usually used (Sendai, Izumi-Chuo, Nagamachi, Shinjuku, Shibuya, Ueno, Tokyo, Ikebukuro, or Yokohama), usual means of transportation (public transportation, automobile, motorcycle, or bicycle, walking), whether or not they made use of a medication record, the medium of the medication record (paper notebook or smartphone application), whether they always carried the medication record with them, whether they remember their medication record application login ID and password, and whether they take any medication which cannot be missed for even a day.

Statistical analysis

The characteristics of those with and without a medication record were compared using the chi-square test. The chi-square test was

also performed to compare the proportion of patients who took medication which was self-recognized as that which could not be missed for even a day and those who did not. R (version 4.0.2) (The R foundation, Indianapolis, Indiana, USA) was used for the statistical tests.

Results

Recruitment emails were sent to 16977 eligible individuals, resulting in 3082 (18.2%) participants participating in our study. Among the participants, 2949 (95.7%) responded via their smartphones. The participants' characteristics are presented in [Table 1](#). Of the 3082 participants, 1766 (57.3%) were male, most were between 40–59 years old, and 1825 (59.2%) were married. In addition, 2016 (65.4%) lived in the capital area, 2462 (79.9%) used a train station daily, and 2386 (77.4%) made use of public transportation as their usual means of transportation. The sample included a sufficient number of people who may find it difficult to return home in a large-scale disaster. A total of 2286 owned medication records (74.2%) and more women (80.9%) owned medication records than men (69.2%). The older the age of the participants, the higher the proportion of ownership of the medication record: 66.7% of 20–29 years old had a medication record, while 84.8% of participants aged 60 and older had a medication record. Married participants had a higher proportion of ownership of the medication record (77.3%) than those who were not married (69.6%).

[Table 2](#) shows the accessibility of medication records among those who own medication records. Among the 2286 medication record owners, 2156 (94.3%) only had a paper notebook, 64 (2.8%) only had a smartphone application, and 66 (2.9%) had both a paper notebook and smartphone application. Among those who had the paper notebook alone, 391 (18.1%) always carried it with them, while 32 (50.0%) of participants who only had the smartphone application remembered their login ID and password; 3 (4.7%) participants used the smartphone application with no login ID and password. [Table 2](#) also shows the status of accessibility of the medication record among those who took any medicine that could not be skipped for even a day. Of the 2286 medication record owners, 784 (34.3%) took medicines that could not be missed for even a day. Among this group, 724 (92.3%) had paper notebooks alone, 26 (3.3%) only had smartphone applications, and 34 (4.3%) had both paper notebooks and smartphones. Among the 724 persons of this subset of the study sample, only 208 (28.8%) reported that they always carry a paper notebook. Among the 26 smartphone-only participants, 16 (61.5%) could use their applications anytime. Therefore, among the 784 participants, at least 560 (71.4%) could always access their medication information.

We did not have details for the 34 persons who used both paper notebooks and smartphones. If a participant indicated that 'I use both paper notebooks and smartphones,' the next question failed to ask whether they always carry their medication record. If we had access to this information, the proportion of accessibility to medication records might be more significant.

Discussion

We investigated the accessibility of medication records in 2 different formats (paper notebooks and smartphone applications) among people who might face difficulties returning to their homes in a large-scale disaster due to the suspension of public transportation. The difficulty of returning home is an important experience

Table 1. Characteristics of the participants by the owner and non-owner of the medication notebook

Characteristic	All participants (N = 3,082)	Medication record		p-value
		Owners (n = 2,286)	Not owners (n = 796)	
Gender — no. (%)				<0.001
Male	1,766 (57.3)	1,222 (69.2)	544 (30.8)	
Female	1,316 (42.7)	1,064 (80.9)	252 (19.1)	
Age — no. (%)				<0.001
20-29 years	153 (5.0)	102 (66.7)	51 (33.3)	
30-39 years	542 (17.6)	390 (72.0)	152 (28.0)	
40-49 years	1,072 (34.8)	776 (72.4)	296 (27.6)	
50-59 years	908 (29.5)	673 (74.1)	235 (25.9)	
≥60 years	407 (13.2)	345 (84.8)	62 (15.2)	
Marital status — no. (%)				<0.001
Married	1,825 (59.2)	1,411 (61.7)	414 (52.0)	
Not married	1,257 (40.8)	875 (69.6)	382 (30.4)	
Place of the residence — no. (%)				0.032
Capital area (Tokyo, Kanagawa, Saitama, and Chiba prefecture)	2,016 (65.4)	1,470 (72.9)	546 (27.1)	
Miyagi prefecture	1,066 (34.6)	816 (76.6)	250 (23.4)	
Devices responding to the survey				
Smartphone	2,949 (95.7)	2,195 (96.0)	754 (94.7)	0.148
Personal computer	133 (4.3)	91 (4.0)	42 (5.3)	
Use the train station daily — no. (%)				0.028
Yes	2,462 (79.9)	1,848 (75.1)	614 (24.9)	
No	620 (20.1)	438 (70.7)	182 (29.3)	
Usual means of transportation ^a — no. (%)				
Public transportation	2,386 (77.4)	1,784 (74.8)	602 (25.2)	0.176
Automobile	991 (32.2)	767 (77.4)	224 (22.6)	0.006
Motorcycle	107 (3.5)	83 (77.6)	24 (22.4)	0.481
Bicycle	462 (15.0)	337 (72.9)	125 (27.1)	0.551
Walking	1172 (38.0)	879 (75.0)	293 (25.0)	0.436

^aThis is a multiple-choice question.

during and after a disaster. Among the 3082 participants enlisted, the number of those who owned a medication record was 2286 (74.2%). Among them, 784 (34.3%) took medication that could not be missed for even a day. Among these 784 persons, at least 560 (71.4%) did not always have access to their drug use information. To the best of our knowledge, (although such data are helpful, especially in the context of a large-scale disaster) no study has investigated the proportion of individuals with access to their medication record to those who took compulsory daily medication.

There are 2 main reasons for this low level of accessibility. The first was the medium of the medication record. Our data indicate that among the 724 participants who use paper notebooks alone, only 208 (28.7%) always carry it, whereas among the 26 participants who only use the smartphone application, only 16 (61.5%) could use it at any time. A plausible explanation may be the nature of the paper notebook – which is both bulky and less portable. During a disaster and urgent evacuation, we should also pay attention to these records, which could be lost, forgotten, or destroyed. Second, it can be difficult to recognize that disasters can occur at any time and maintain a constant readiness to be prepared for disasters. According to the Japanese government, 51% of respondents think it is a serious matter to be prepared for disasters; however, these respondents had made little effort to prepare for disasters.⁹ Furthermore, they did not know that if they have medication records, they can obtain medicines without a prescription in the event of a large-scale disaster. Therefore, there is a need to

highlight the importance of maintaining the accessibility of medication records. If there is no such system in other countries, we recommend establishing a social system for receiving prescription medicine when a large-scale disaster occurs, such as that used in Japan.

Although smartphone applications will be a useful medium for the accessibility of medication records, there are still several problems with smartphone applications. First, there is no standard operating practice concerning medication recording via smartphone applications.¹⁰ This has led to many un-informed smartphone applications being designed and distributed, resulting in pharmacies which may not be compatible with the individual's application of choice. Second, smartphone applications may be difficult to use. The application must be easy to use daily for the user and the pharmacist. Third, the user may not even know that the application exists, therefore, it is necessary to publicize that smartphones can be used to manage medication records. Fourth, the importance of accurate recording of use and dosage should be confirmed by an individual's physician before disasters to optimize preparedness.

Our study has some limitations. The first concern is the bias of enlisted participants. This survey was conducted via the Internet, and people who did not have an Internet connection were excluded. However, the population of smartphone users has been increasing over the decade, and the prevalence of smartphone users in Japan was 67% by 2019.⁸ Second, the low response rate suggests

Table 2. Accessibility of the medication record among owners

The medium of the medication record	Medication record owners (N = 2,286)	Taking any medicines that cannot be missed even a day			p-value
		Yes (n = 784)	No (n = 1,413)	I don't want to answer (n = 89)	
Paper notebook alone — no. (%)	2,156 (94.3)	724 (92.3)	1347 (95.3)	85 (95.5)	0.011
Whether you always carry the medication notebook ? no./total no. (%)					
Always carry	391/2156 (18.1)	208/724 (28.7)	165/1347 (12.2)	18/85 (21.2)	<0.001
Not always carry	1,765/2,156 (81.9)	516/724 (71.3)	1,182/1,347 (87.8)	67/85 (78.8)	
Smartphone application alone — no. (%)	64 (2.8)	26 (3.3)	34 (2.4)	4 (4.5)	
Whether you remember the medication record app login ID and password ? no./total no. (%)					
I remember	32/64 (50.0)	16/26 (61.5)	15/34 (44.1)	1/4 (25.0)	0.004
I don't remember	18/64 (28.1)	2/26 (7.7)	13/34 (38.2)	3/4 (75.0)	
I don't remember, but I have a note of it	11/64 (17.2)	8/26 (30.8)	3/34 (8.8)	0/0 (0.0)	
There is no login ID and password in the app.	3/64 (4.7)	0/26 (0.0)	3/34 (8.8)	0/0 (0.0)	
Both paper and application — no. (%)	66 (2.9)	34 (4.3)	32 (2.3)	0 (0.0)	
Whether you remember the medication record app login ID and password ? no./total no. (%)					
I remember	30/66 (45.5)	17/34 (50.0)	13/32 (40.0)	0/0 (0.0)	0.44
I don't remember	13/66 (19.7)	6/34 (17.6)	7/32 (21.9)	0/0 (0.0)	
I don't remember, but I have a note of it	12/66 (18.2)	4/34 (11.8)	8/32 (25.0)	0/0 (0.0)	
There is no login ID and password in the app.	11/66 (16.7)	7/34 (20.6)	4/32 (12.5)	0/0 (0.0)	

some bias. Specifically, since the survey was answered via smartphones and the Internet, it may include many people who are accustomed to using smartphone applications regularly. Therefore, it is likely that the percentage of respondents who used the application of the medication handbook was high. Third, the type of medication was unknown among participants who took medicines that could not be missed for even a day. Individuals who take insulin, antiepileptic drugs, and antiarrhythmic drugs (among others) are at risk of seriously worsening their symptoms if they miss even 1 dose.² However, our data indicate a serious issue: a gap between recognition of the necessity of medicine and preparedness for a potential disaster. Among the 784 people who took medicines that could not be missed at all, at least 560 (71.4%) could not always access their medication information. Fourth, these data were not collected during a disaster because they did not indicate the extent to which their records were accessed and used during an actual disaster. Although only a third of the persons in our study could access medication records, this proportion was measured during peacetime; therefore, the proportion may be much lower in large-scale disasters. Therefore, it is important to educate people about the importance of having access to medical records, and community and public health leaders should conduct training to access medication records. Fifth, since this is a pilot study, the reliability and validity of the questions have not been fully examined. However, the questions are short, simple sentences that the average adult can understand.

Public health policy could help maintain access to critical medication records in a large-scale disaster, and technology may be beneficial. Individual-level strategies may be effective, for example, awareness-raising activities such as subsidizing the use and accessibility of smartphone applications for medication registers, which are already available to the public. At the community level, developing a system that allows individuals to access their medication records by storing them in a database and using biometrics to identify individuals may be helpful.

Conclusions

In Japan, if people have access to their own information about their prescribed medicines, they can receive them when a large-scale disaster occurs. Nevertheless, our data suggest that only a limited number of people carry their medication records and have access to their medication history information at all times. In Japan, if a person has a medication record, he/she can continue taking medication even during a large-scale disaster. Therefore, it is important to carry the medication records and conduct educational activities to ensure that people can access their medication history information at all times. If such a resource does not exist, it would be important to develop it in the community first.

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References

- Osaragi T, Morisawa T, Oki T. Simulation model of evacuation behavior following a large-scale earthquake that takes into account various attributes of residents and transient occupants. Weidmann U, Kirsch U, Schreckenberg M eds. In: *Pedestrian and evacuation dynamics*. Springer International Publishing; 2014:469-484. doi: 10.1007/978-3-319-02447-9_39
- World Health Organization. *World Health Organization model list of essential medicines, 21st list*; 2019. http://www.who.int/selection_medicines/list/en/. Accessed December 14, 2020.
- Ochi S, Hodgson S, Landeg O, Mayner L, Murray V. Disaster-driven evacuation, and medication loss: a systematic literature review. *PLoS Curr.* 2014;6(1). doi: 10.1371/currents.dis.f4a17630b566a0c7dfdbf945910edd96
- Watson KE, Singleton JA, Tippett V, Nissen LM. Defining pharmacists' roles in disasters: a Delphi study. *PLoS One.* 2019;14(1):e0227132. <https://doi.org/10.1371/journal.pone.0227132>

5. **Ministry of Health, Labor, and Welfare.** *Handling of prescription drugs in the event of the 2011 earthquake off the pacific coast of Tohoku (Request for notification to medical institutions and pharmacies)* [Translated from Japanese]. Published March 12, 2011. <https://www.mhlw.go.jp/stf/houdou/2r985200000163yl.html>. Accessed December 14, 2020.
6. **Japan Pharmaceutical Association.** *Examples of the use of the Medication Handbook during the Great East Japan Earthquake* [Translated from Japanese]. Published June 2012. https://www.nichiyaku.or.jp/assets/uploads/activities/shinsai_techo.pdf. Accessed December 14, 2020.
7. **Torayashiki T, Marutani H.** Research on how to deal with the problem of people who have difficulty returning home after a disaster in a local city and on cooperation within the community [Translated from Japanese]; 2018. <http://www.maruya-laboratory.jp/blog/wp-content/uploads/2018/07/0fa4aa30bbb457d100e3580f46691034.pdf>. Accessed March 15, 2021.
8. **Ministry of Health, Labor, and Welfare.** 4th study group on the appropriate use of medicines for the elderly: current status and issues of electronic medication handbooks, October 30, 2017 [Translated from Japanese]; 2017. <https://www.mhlw.go.jp/file/05-Shingikai-11121000-Iyakushokuhinkyoku-Soumuka/0000183061.pdf>. Accessed March 15, 2021.
9. **Ministry of Internal Affairs and Communications.** *Reiwa 2nd White Paper on information and communication* [Translated from Japanese]; 2020. <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r02/html/nd252110.html>. Accessed March 15, 2021.
10. **Cabinet Office, Government of Japan.** *Heisei 28th white paper on disaster prevention/ chart 20 importance of disaster preparedness: disaster prevention information page* [Translated from Japanese]; 2016. <http://www.bousai.go.jp/kaigirep/hakusho/h28/index.html>. Accessed March 15, 2021.