

Super-aged society: Constructing an integrated information platform of self-recording lifelogs and medical records to support health care in Japan

Kenji Karako¹, Yu Chen^{1,*}, Peipei Song^{2,*}, Wei Tang³

¹ Department of Human and Engineered Environmental Studies, Graduate School of Frontier Sciences, The University of Tokyo, Chiba, Japan;

² The Institute for Global Health Policy Research, Bureau of International Health Cooperation, National Center for Global Health and Medicine, Tokyo, Japan;

³ International Health Care Center, National Center for Global Health and Medicine, Tokyo, Japan.

Summary

As the super-aged society, Japan is facing challenges in health care system. As one of measures to cope with challenges, the Ministry of Health, Labor, and Welfare started to construct an open medical information platform, named PeOPLE, in 2016 for personalized medical care, improvement of medical services, and the redistribution of medical resources. The Ministry plans to build the platform infrastructure by 2020 and put the platform into full-scale operation by 2025. PeOPLE collects only medical records, but it should collect lifelogs as well in order to better improve the health, especially for elderly. A lifelog is a record of a person's activity and it has potential to predict the probability a person will suffer a lifestyle-related disease as a result of the person's lifestyle. This prediction could help to maintain the health of the elderly. In addition, constructing a self-recording platform integrated with the medical platform is the best way to collect lifelogs since collecting a large amount of lifelogs for a long time from various people at public or medical agencies is difficult. A self-recording platform is a place where people can post and manage their lifelogs. In return for posting lifelogs, people will receive personalized health advice, which will attract more people.

Keywords: Japan, population aging, medical platform, deep learning

1. Introduction

According to the Cabinet Office, the current proportion of people aged 65+ years in the total population is 27.7% in Japan, and will reach 38.4% in 2016 (1). One of the big challenges faced by the super-aged society is the burden on the health care system. The types

of diseases that people develop change with age. A greater proportion of elderly will change the prevalence of diseases requiring specialized care. The elderly are likely to develop a lifestyle-related disease. In addition, the demand for health care in rural areas with a large percentage of elderly differs from that in urban areas. Doctor will need to be redeployed to meet local demand.

As one of measures to cope with above challenges, Japan is trying to construct a new medical information platform named PeOPLE (2,3). The Ministry of Health, Labor, and Welfare started the project in 2016. It plans to build the platform's infrastructure by 2020 and put the platform into full-scale operation by 2025. PeOPLE collects personal medical information from medical facilities such as hospitals and pharmacies as well as from local governments. A doctor can make a diagnosis and decide a treatment tailored to a

*Address correspondence to:

Dr. Yu Chen, Department of Human and Engineered Environmental Studies, Graduate School of Frontier Sciences, The University of Tokyo, 5-1-5 Kashiwa-no-ha, Kashiwa Chiba, 227-8568, Japan.

E-mail: chen@edu.k.u-tokyo.ac.jp

Dr. Peipei Song, The Institute for Global Health Policy Research, Bureau of International Health Cooperation, National Center for Global Health and Medicine, Tokyo, 1-21-1 Toyama Shinjuku-ku, Tokyo 162-8655, Japan.

E-mail: psong@it.ncgm.go.jp

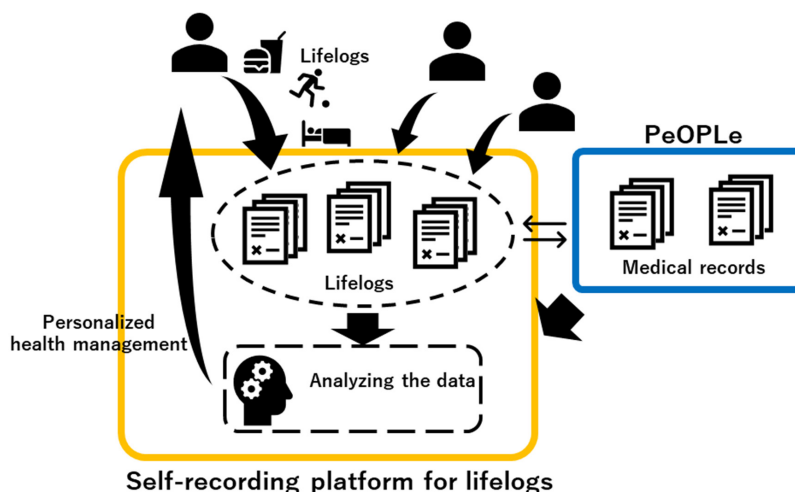


Figure 1. Architecture of the self-recording platform for lifelogs.

person by receiving the person's medical information from PeOPLE. Moreover, the massive amount of data collected by PeOPLE will be used to improve medical services and redistribute medical resources. Typically, the redistribution of medical resources plays a big role in addressing the medical problems faced by the super-aged society. Analyzing the collected data while focusing on the prevalence of diseases and patients in an area will help to resolve the uneven distribution of doctors (4).

In addition to collecting personal medical records, personal lifelogs should be collected to help maintain the health of elderly. A lifestyle-related disease develops as a result of lifestyle. A lifelog is the record of a person's daily activities, and it has the potential to predict the probability a person has of developing a lifestyle-related disease. The early prediction of disease based on lifelogs will help to manage the health of the elderly. In addition, predicting patients at risk of developing a lifestyle-related disease might improve the accuracy of the predicted demand for doctors in an area.

Here, the purposes of collecting lifelogs and the need for a new self-recording platform to collect a large amount of lifelogs to manage the health of the elderly will be described.

2. Purposes of collecting lifelogs

A lifelog has the potential to predict potential patients in an area, to predict lifestyle-related diseases, and to provide personally tailored information for health and disease prevention (5). A lifelog is a record of daily personal activities such as the amount of exercise, hours of sleep, and meals. Non-viral diseases such as lifestyle-related diseases are caused by lifestyle. Therefore, combining lifelogs with deep learning techniques

can help predict people who are likely to develop a disease. In medicine, deep learning has been studied in diagnostic imaging (6-9) as well as in predicting a patient's activities (10). Predicting a patient's activities based on medical records means predicting what will happen next to the patient, such as the worsening of symptoms, and when the patient will next visit the hospital. As with the prediction of a patient's activities, deep learning based on medical records and lifelogs will help to predict the development of lifestyle-related diseases. This provides people with the opportunity for prevention and early treatment.

Moreover, a lifelog helps a person to lead a healthier life. People can obtain information on living a healthier life by comparing their lifelogs to the lifelogs of healthy people. Analyzing the lifelogs of healthy people will reveal strategies to live healthier and longer.

3. A self-recording platform for lifelogs

A platform where people can post and manage the lifelogs they record will facilitate the collection of lifelogs. Lifelogs are records of a person's activities and are usually not preserved. To record their activities in logs, people should manually record their activities or use a device to automatically record their lifelogs. In addition, lifelogs should be continuously recorded by both healthy and unhealthy people for use in prediction and analysis. The government or a medical facility has difficulty collecting a large amount of lifelogs for a long time even though there are devices to help record lifelogs. That said, there are people who record lifelogs with recording devices to manager their health. They usually analyze the lifelogs themselves, but self-analysis has limitations since it only involves lifelogs and its does not involve medical records. If the government provides a platform where people can

post and manage all of the lifelogs they record, then the platform will provide integrated management of those lifelogs. In addition, combining lifelogs with medical records on PeOPLE will provide people with a comprehensive analysis. Therefore, the government should seek the cooperation of people who record their own lifelogs to manage their health.

The architecture of a self-recording platform for lifelogs is shown in Figure 1. The platform is a place where people can post their own lifelogs. The posted lifelogs are managed individually and linked to their own medical records on PeOPLE. Deep learning ascertains the causal relationships from posted logs and linked medical records to predict the probability of developing a lifestyle-related disease. Using trained deep learning models, the platform will provide people with personalized advice to prevent the development of a lifestyle-related disease.

There is another benefit provided by the self-recording platform for lifelogs. The platform provides a place for providing personal health advice. For example, a liver examination or better meals could be suggested to people who consume a large amount of alcohol. This benefit will attract the interest of people who actively manage their own health as well as people who are not interested in managing their health. The new service offering personalized health management will create the opportunity to obtain lifelogs from more people.

4. Conclusion

Coping with the super-aged society, Japan is constructing an open medical information platform that will collect personal medical records and share those records with doctors for personalized diagnosis and treatment. The collected data will also be used to resolve the uneven distribution of doctors. Lifelogs should also be collected. A lifelog is a record of a person's activities, and it has potential to predict the probability of developing a lifestyle-related disease caused by a person's lifestyle. This prediction will help to maintain the health of the elderly. Constructing a self-recording platform integrated with the medical platform is the best way to collect lifelogs. A self-recording platform is a place where people can post and manage their lifelogs. In return for posting lifelogs,

people will receive personalized health advice, which will attract more people.

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