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## Predictors of hyperglycaemic individuals who do not follow up with physicians after screening in Japan: A cohort study

Yuka Tsujimura<sup>a,\*</sup>, Yoshimitsu Takahashi<sup>a</sup>, Tatsuro Ishizaki<sup>b</sup>,  
Akira Kuriyama<sup>a</sup>, Kikuko Miyazaki<sup>a</sup>, Toshihiko Satoh<sup>c</sup>, Shunya Ikeda<sup>d</sup>,  
Shinya Kimura<sup>e</sup>, Takeo Nakayama<sup>a</sup>

<sup>a</sup>Department of Health Informatics, Kyoto University School of Public Health, Yoshidakonoe-cho, Sakyo-ku, Kyoto City 606-8501, Japan

<sup>b</sup>Tokyo Metropolitan Institute of Gerontology, 35-2 Sakaecho, Itabashi-ku, Tokyo 173-0015, Japan

<sup>c</sup>School of Social Informatics, Aoyama Gakuin University, 5-10-1 Fuchinobe, Chuo-ku, Sagami-hara City 252-5258, Japan

<sup>d</sup>Department of Pharmaceutical Sciences, School of Pharmacy, International University and Health Welfare, 2600-1 Kitakanemaru, Ohtawara City 324-8501, Japan

<sup>e</sup>Japan Medical Data Center Co., Ltd., 3-1, Koujimachi, Chiyoda-ku, Tokyo 102-0083, Japan

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### ABSTRACT

**Aims:** Although people screened as being hyperglycaemic often fail to follow up with physicians for clinical assessment, epidemiologic findings on the frequency and predictors of not following up (hereafter, “no follow-up”) are lacking. The purpose of this study was to examine the no follow-up rate with physicians after screening for diabetes and predictors of no follow-up.

**Methods:** We assessed cases of no follow-up with physicians within six months after screening based on medical claims data from employee-based social health insurance programs in Japan, for people aged 20 to 68 years from 2005 to 2010.

**Results:** Among 3878 screened participants with hyperglycaemia, 2527 (65%) did not follow up with their physicians within six months after screening. Multiple logistic regression analysis revealed that younger age and lower blood glucose level predicted no follow-up among both men and women, while lower body mass index and negative proteinuria also predicted no follow-up among men. Treatment for dyslipidaemia facilitated follow-up among both genders, and treatment for hypertension or depression facilitated follow-up among men.

**Conclusions:** Approximately two thirds of individuals screened as having hyperglycaemia did not follow up with their physicians within six months after screening. Predictors of no follow-up were younger age and milder hyperglycaemia. Being on treatment for co-morbidities tended to facilitate follow-up.

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\* Corresponding author. Tel.: +81 75 753 9477/+81 90 9728 5036; fax: +81 75 753 9478/+81 75 751 0670.

E-mail addresses: [tsujimura.yuka.67z@st.kyoto-u.ac.jp](mailto:tsujimura.yuka.67z@st.kyoto-u.ac.jp), [yukatsujipress@yahoo.co.jp](mailto:yukatsujipress@yahoo.co.jp), [yukanakatani11@gmail.com](mailto:yukanakatani11@gmail.com) (Y. Tsujimura).

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## 1. Introduction

Diabetes mellitus is associated not only with the occurrence of vascular complications but also with impaired quality of life and increased health care costs [1–3]. In 2013, 382 million people had diabetes in the world and this number is expected to rise to 592 million by 2035 [4]. The total number of excess deaths attributable to diabetes in 2010 was estimated to be 3.96 million in the age group of 20–79 years [5]. Approximately 17% of the Japanese population is estimated to have diabetes, and this number increases every year [6].

The effectiveness of screening for diabetes remains controversial [7–14]. In Japan, a unique system of general health screening that includes glucose testing was established by the Health and Medical Service Act for the Aged in 1983. Screenings have been conducted primarily at worksites or local community facilities, and patients who screen positively are advised to follow up with a physician. Thus, following up with a physician is a requisite for this screening system to work. A Japanese national survey based on self-report revealed that 39% of people with diabetes had not been treated [6], indicating that many individuals who potentially have diabetes neither visited nor followed up with physicians.

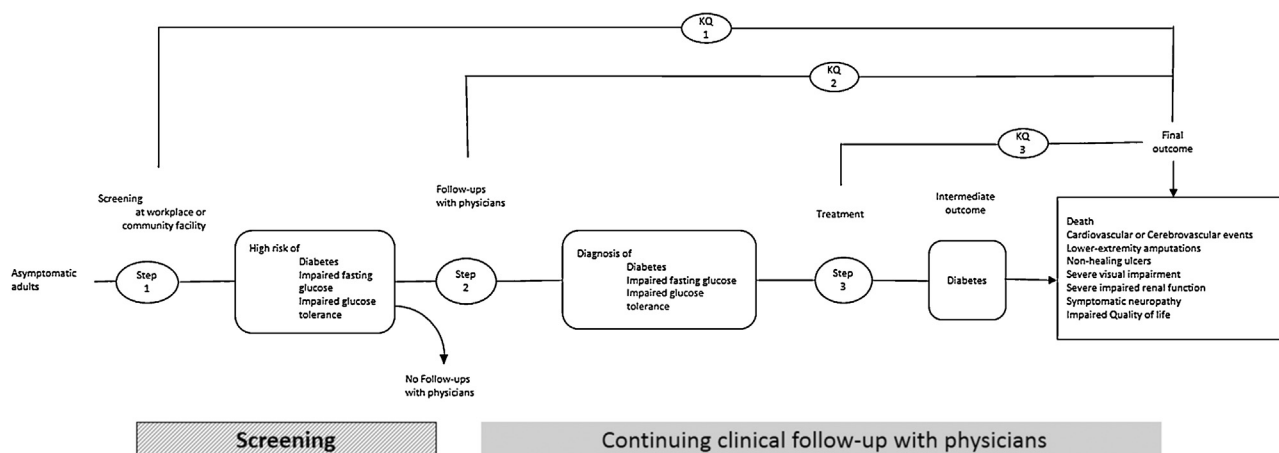
A previous cross-sectional study based on self-report suggested that younger people and those with lower risk were more likely to drop out from screenings [15]. Another cross-sectional study reported that individuals with type 2 diabetes who suffer from depression poorly adhere to self-care [16]. Yet, no study has reported longitudinal findings using objective data to address this issue. To this end, we conducted a cohort study to examine the characteristics of people who did not follow up with physicians for clinical assessment after they were screened as being hyperglycaemic, with a focus on age, severity of hyperglycaemia and comorbidities.

## 2. Materials and methods

### 2.1. Setting

In Japan, all people have been insured under universal health coverage since 1961, which primarily consists of employee-based and community-based social health insurance programs [17]. The Industrial Safety and Health Law enacted in 1972 requires that public screening services be provided at worksites or local community facilities, rather than taking place at a family or attending physician's office as in the United States and other countries.

In order to obtain a confirmed diagnosis or to initiate treatment after screening, screened individuals with a positive test result must follow up with physicians (Fig. 1). In Japan, standard screening for adults was implemented by the Law of Health and Medical Services for the Elderly from 1983 to 2008, although it is now under the control of the Act on Assurance of Medical Care for Elderly People, which was enacted in 2008. Our data include both periods. Both laws instruct those whose examined values exceed cut-off values to visit physicians, and most health insurance programs advise them to do so simply by mail. Disease management, including education, monitoring or feedback, for screened people is not proactively carried out by the government. Rather disease management differs by the particular health insurance system. Screened people generally receive instructions to consult with a physician within about two months of the screening, although a medical institution or timing of the visit is not specified. That is, in Japan, although health insurance plans provide screening to insured people, the plans fall short of designating a hospital. This reflects the disconnect between health insurance programs and hospitals, although regular health check-ups are the norm and



**Fig. 1 – Japanese diabetes screening process. Note: Screenings are primarily taken place at work sites or local community facilities, and screened patients are advised to follow up with physicians after screening. KQ, key question(s); KQ1: is there direct evidence that systematic screening for diabetes among asymptomatic adults improves health outcomes?; KQ2: does follow-up with physicians early after screening for diabetes provide an incremental benefit in health outcomes?; KQ3: does initiating early treatment for type 2 diabetes as a result of screening provide an incremental benefit in health outcomes? Does initiating early treatment of impaired fasting glucose or impaired glucose tolerance as a result of screening provide an incremental benefit in final health outcomes? Step 1: attending diabetes screening; step 2: follow-up with physicians after screening; step 3: initiation of appropriate treatment.**

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