Journal of Epidemiology xxx (2016) 1–6

Contents lists available at ScienceDirect

Journal of Epidemiology

journal homepage: http://www.journals.elsevier.com/journal-of-epidemiology/

Personal status of general health checkups and medical expenditure: A large-scale community-based retrospective cohort study

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ARTICLE INFO

Article history:
Received 22 December 2015
Accepted 9 June 2016
Available online xxx

Keywords:
Health behavior
General health checkups
Medical consultation
Medical expenditures
Retrospective cohort study

ABSTRACT

Background: We sought to clarify the association between the personal utilization of general health checkups (GHCs) and medical expenditures (MEs) in a middle-aged Japanese population.
Methods: A retrospective cohort study was conducted. Subjects were 33,417 residents (15,819 males and 17,598 females) aged 48 years or older in 2010 who were invited to undergo GHCs every year. Official records on GHCs from 2002 to 2007 and MEs from 2008 to 2010 were provided by Soka City, Saitama Prefecture, Japan. The utilization of GHCs was divided into zero times (non-utilizers), 1–3 times (low-frequency utilizers), and 4–6 times (high-frequency utilizers). Tweedie distributions in the generalized linear model were used to analyze the association between MEs and the subgroups of GHC utilization after adjustment for age and sex.
Results: Of the 33,417 subjects, 20,578 (61.6%) were non-utilizers, 5,777 (17.3%) were low-frequency utilizers, and 7,062 (21.1%) were high-frequency utilizers, based on the attendance to GHCs from 2002 to 2007. Compared with the non-utilizers, the high-frequency utilizers showed significantly higher outpatient MEs (JPY394,700 vs. JPY373,100). The low- and high-frequency utilizers showed significantly lower inpatient MEs (JPY224,000 and JPY181,500 vs. JPY309,300) and total MEs (JPY610,600 and JPY580,700 vs. JPY689,600) than the non-utilizers based on the pooled data from 2008 to 2010.
Conclusions: This study suggests that the outpatient MEs rise when annual GHCs are increasingly attended (not including the GHC cost), but inpatient and total MEs are lower. To reduce MEs, increasing the rates of attendance at GHCs by the general public may be important.
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Introduction

Non-communicable diseases (NCDs) are the most important health and financial issues of the century worldwide. In 2008, 63% of global deaths were due to NCDs, and expenditure greater than $6.3 trillion United States dollars was estimated due to the five major NCDs: cardiovascular disease, diabetes, cancer, chronic obstructive pulmonary disease, and mental illness.[1,2] These health and economic burdens due to NCDs have been predicted to rise sharply by 2030 on a global scale.[2] In Japan, the burdens of increasing national health expenditures have caused major public health problems. According to the reports of the Japan's Ministry of Health, Labour and Welfare, the total medical expenditure (ME) in 2013 was 40.06 trillion yen, of which approximately 40% was attributable to NCDs, including cancer, coronary heart disease, and stroke.

Undergoing general health checkups (GHCs) is a common activity in many countries because the early diagnosis and treatment of NCDs is a principle of preventive medicine. Some previous studies have reported that not undergoing health checkups was associated with higher mortality in women,[3] and health checkups may increase survival[4] or decrease overall mortality among the elderly.[5] However, recent studies have indicated that health checkups for an adult population were not associated with lower rates of all-cause mortality in a systematic review and meta-analysis.[6–8] Therefore, the benefits of GHCs are still not clear.

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http://dx.doi.org/10.1016/j.je.2016.06.001
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Please cite this article in press as: Haruyama Y, et al., Personal status of general health checkups and medical expenditure: A large-scale community-based retrospective cohort study, Journal of Epidemiology (2016), http://dx.doi.org/10.1016/j.je.2016.06.001

Some previous cross-sectional studies reported that an association between the rate of utilizing health checkups and the hospital inpatient fee or average MEs was found across municipalities.[9–11] Takeuchi et al. reported that examinees aged over 70 years who had undergone health checkups for the past 3 years had lower MEs per capita as outpatients and inpatients than non-examinees,[12] but this study did not investigate the individual frequency of heath checkups. For outpatient MEs, there was no reported difference between participants with low or high rates of health checkups in cities in one study.[13] Although one study among 1,811 middle-aged workers reported that the total medical expenditure was lower in those who had a higher frequency of health checkups over a period of 3 years,[14] the sample size was small and the study was limited to occupational health. To our knowledge, there have been insufficient studies to clarify the relationship between the rate of utilizing GHCs and MEs including outpatient, inpatient, and total fees in community populations involving large-scale cohort studies.

The aim of the present study was to clarify the association between the rate of undergoing GHCs and subsequent MEs using a large-scale retrospective cohort study in a middle-aged Japanese population living in the community.

Methods

Study design and subjects

A community-based retrospective cohort study was conducted in Soka City, Saitama Prefecture, Japan. Soka City is an urban area adjacent to the northeast of Tokyo, with a population of about 240,000. In Japan, there are two kinds of public health insurance for the whole nation: Employee Health Insurance for employees and their families and National Health Insurance for those not enrolling in the Employee Health Insurance system. In Soka City, approximately 30% of the population belong to the National Health Insurance, and the others belong to the Employee Health Insurance. A total of 77,265 residents enrolled as Soka City National Health Insurance subscribers, and 49,854 residents (24,547 males and 25,307 females) aged from 40 to 74 years old were invited to undergo health checkups in 2010. Of the 49,854 subjects, 8,056 residents who were under 40 years old in 2002 and 8,381 residents who were Soka City National Health Insurance subscribers after 2002 were excluded. The subjects analyzed in the present study (67.0%) were 33,417 residents (15,819 males and 17,599 females) with complete datasets based on the records of MEs from 2008 to 2010, and the data of general health checkups from 2002 to 2007, which were combined using the ID of the Soka City National Health Insurance subscribers.

Medical expenditures (MEs) and medical consultation (MC)

Records on MEs and MC in 2008, 2009, and 2010 were provided by Saitama National Federation of Health Insurance Societies, an agency of Soka City National Health Insurance. Per capita outpatient, inpatient, and total MEs were calculated with 2008, 2009, and 2010 data, and the 3-year data (2008–2009) were pooled. The MC was determined based on visiting a medical institute more than once as an outpatient or for hospitalization from 2008 to 2010.

Status of general health checkups (GHCs)

According to the Health Services for the Elderly Act in Japan, those aged 40 years old or older are recommended to undergo GHCs every year. Although GHCs are encouraged, each individual has no obligation to attend, and there is no penalty for not undergoing GHCs. In Soka City, the insurer pays about 10,000 yen and individuals payed about 1,200 yen to undergo a GHC. Annual GHCs in Japan include the following: past medical history, anthropometric examination (weight, height, and blood pressure), laboratory examination (red blood cell count, hemoglobin concentration, packed cell volume, total serum cholesterol concentration, blood glucose concentration, aspartate aminotransferase and alanine aminotransferase activities, and serum uric acid), and electrocardiography. In this study, GHC utilization was assessed using 6-year records from 2002 to 2007, which were provided by Saitama National Federation of Health Insurance Societies, an agency of Soka City National Health Insurance, and three utilization subgroups were assigned: non-utilizers (zero times), low-frequency utilizers (1–3 times), and high-frequency utilizers (4–6 times).

Statistical analysis

The number of GHCs was counted from 2002 to 2007, non-utilizers were excluded, and the other two subgroups were divided using a cutoff point of 3.7 times (the median value). Per capita outpatient, inpatient, and total MEs of 2010, 2009, 2008, and the mean of the pooled 3-year data from 2008 to 2010, are expressed as means (ranges). In this study, cost equivalents are reported using exchange rates in which one United States dollar ($) was equivalent to 120 Japanese yen (JPY) and one euro was equivalent to JPY133 based on the rates in October 2015. The unit of Japanese yen (JPY) of the present study is one thousand. Because the frequency distributions of MEs are often zero, and others are continuous, MEs are mixed data that include compound Poisson and Gamma distributions. So, Tweedie distributions[15–17] in the generalized linear model (GLM) were used to analyze the association of MEs and MEs plus the GHC cost with the GHCs utilization subgroups after adjustment for age and sex. The estimated marginal mean and 95% confidence interval (CI) are shown, and three pairwise comparisons among utilization groups using the Bonferroni's post-hoc test in the GLM were employed. For analysis of medical consultation, a multivariate logistic regression model was used, with adjustment for age and sex.

All statistical analyses were performed using an assumed type I error rate of 0.05. Statistical analyses were performed using SPSS Statistics 22 for Windows (SPSS Japan Inc., Tokyo, Japan).

Ethical consideration

Ethical approval was given by the ethics committee at Dokkyo Medical University (University 27006). The identities of subjects remained anonymous, in compliance with the Ethical Guidelines for Epidemiological Research (Ministry of Education, Culture, Sports, Science and Technology, and Ministry of Health, Labour and Welfare, Japan, 2013).[18]

Results

Table 1 shows the characteristics of sex and age in 2002; the status of participation in health checkups; outpatient and inpatient MC; and per capita outpatient, inpatient, and total MEs in the 3-year period of 2008–2010. Of the 33,417 participants, 20,578 (61.6%) were non-utilizers, 5,777 (17.3%) were low-frequency utilizers, and 7,062 (21.1%) were high-frequency utilizers based on the number of GHCs in the 6-year period from 2002 to 2007.

Table 2 shows that, based on the results of the multivariate logistic regression model, undergoing more health checkups was significantly correlated with a higher frequency of any outpatient MC, and a lower frequency of any inpatient MC in 2008, 2009, and 2010. The trend tests on the adjusted OR of outpatient and inpatient

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