Contents lists available at ScienceDirect

Primary Care Diabetes

journal homepage: http://www.elsevier.com/locate/pcd

Original research

Diabetes-related avoidable hospitalizations in Taiwan

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ARTICLE INFO

Article history:
Received 18 November 2013
Received in revised form
28 January 2014
Accepted 2 February 2014
Available online 4 March 2014

Keywords:
Diabetes mellitus
Avoidable hospitalization
Ambulatory care
Primary health care

ABSTRACT

Background: An avoidable hospitalization (AH) is a condition that could have been prevented through effective treatment in outpatient care. Diabetes is often referred to as an ambulatory care-sensitive condition, and its associated hospitalizations are often referred to as avoidable hospitalizations. There are limited data on avoidable hospitalizations for individuals with diabetes in Taiwan.

Method: We used the National Health Interview Survey (NHIS) dataset to obtain diabetes-related avoidable hospitalizations for subjects aged above 12 years. We included data from 20,826 subjects who had completed the interview between 2004 and 2005. Data were collected from a total of 15,574 people, who had agreed to link their health information to the Taiwan National Health Insurance Research Database, including basic demographic variables, inpatient or outpatient medical events, admission date, discharge date, and diagnosis. The 1005 individuals who self-reported having diabetes or had at least 1 hospitalization or 2 physician service claims for diabetes mellitus with an ICD-9 diagnosis of 250 were included in the analysis. We divided those with diagnosis of diabetes into two groups: never hospitalized and hospitalized. The never hospitalized group served as the control group. We further identified hospitalized subjects with long-term complications due to diabetes (PQI-3) that included ICD-CM codes 250.4–250.9.

Results: The mean ages of patients with diabetes-related long-term complications in the hospitalized and never hospitalized groups were 65 years and 58 years, respectively (p-value < 0.01). More than half (52%) of the patients with diabetes-related long-term complications had a body mass index (BMI) lower than 24. The hospitalized group also had lower

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http://dx.doi.org/10.1016/j.pcd.2014.02.001

educational status compared with that of patients in the never hospitalized group (equal to or lower than elementary school, 63% vs. 50%; junior high school, 23% vs. 14%; equal or higher than senior high school, 14% vs. 36%). Furthermore, hospitalized patients tended to have lower household monthly income, were unmarried, and did not have private medical insurance. There were no significance differences in ethnic composition between the groups. Interestingly, patients with frequent retinal examination, and those with lower body mass index had higher frequency of avoidable hospitalization ($p < 0.01$).

Conclusion: We found that the following factors were associated with a higher frequency of avoidable hospitalization among patients with type 2 diabetes: elderly, male, lower body mass index, lower household income, non-exercise, higher disease comorbidity, and frequent retinal examination.

1. Introduction

An avoidable hospitalization (AH) is a condition that could have been prevented through effective treatment in outpatient care. The conditions for which a hospitalization can be considered avoidable are often referred to as ambulatory care sensitive conditions (ACSCs). ACSCs include chronic diseases, such as diabetes, asthma, and acute diseases, such as pneumonia with complications [1,2]. The occurrence of AH has been widely used as an indicator of the quality of diagnosis and treatment in primary care [3], as well as the quality of chronic disease management [4].

Multiple determinants of AH include access to hospital care [5], healthcare quality [6,7] preventive care [8,9], health insurance [9,10], continuity with the same care provider, educational status, socio-economic status [9–11], location-specific conditions (such as physical accessibility to healthcare) [12,13], and environmental factors (such as air quality) [14]. Age, gender, race and other demographic characteristics have also been identified as factors linked with potentially avoidable hospitalizations [15,16].

Hospitalizations related to diabetes are costly and account for a major portion of the total expenditure on healthcare. In Taiwan, Lin et al. found that diabetic patients used 22.1% of the total inpatient hospital days and that treatment of diabetes amounted to 11.5% of all healthcare expenditures during the period from July 1997 to June 1998 [17]. In 2007, hospitalizations in the U.S. attributable to diabetes cost $58 billion or 50% of the total direct medical expenditure for diabetes [18]. Nevertheless, a large portion of hospitalizations for diabetes may be preventable if primary care is effectively delivered [2,19,20]. The Agency for Healthcare Research and Quality (AHRQ) developed sets of disease and procedure codes using the ICD-9-CM to identify 14 sets of preventable hospitalization conditions. Of the 14 conditions, four were for diabetes: uncontrolled diabetes, diabetes short-term complications, diabetes long-term complications, and lower-extremity amputations. Examining the trends of avoidable hospitalization would improve our understanding of the quality of primary care for diabetes patients [21]. Thus, we used data from the National Health Interview Survey in Taiwan to examine the factors that affect diabetes-related avoidable hospitalizations.

2. Methods

2.1. Study data

This data used in this cross-sectional study were collected from the 2005 National Health Interview Survey (NHIS) in Taiwan. The study was conducted by the National Health Research Institutes, the National Bureau of Controlled Drugs, and the Bureau of Health Promotion, Department of Health, Taiwan. The study sample was selected using a multi-stage stratified systematic sampling design to ensure that the dataset was nationally representative. All selected individuals were interviewed by well-trained interviewers. The whole dataset has been released for public use and can be obtained through the website http://nhis.nhri.org.tw (Chinese). The questionnaire is divided into several categories based on age groups: <12 years old, 12–64 years old, and >65 years old. In the present study, only patients above 12 years old were selected because the majority of type 2 diabetes patients are adult. Informed consent was obtained from all participants. This study was reviewed and approved by the institutional review board (IRB) of Chung Shan Medical University, Taichung, Taiwan.

Permission was sought from the survey participants to link their health information to Taiwan's National Health Insurance Research Database (NHIRD) in order to obtain specific data, such as demographic characteristics, inpatient or outpatient medical events, admission date, discharge date, and diagnosis. Diagnoses were classified according to the International Classification of Diseases, Ninth Revision (ICD-9). Sampling weights were available to produce nationally representative estimates. We adopted the conditions for preventable hospitalization of patients with diabetes-related long-term complications defined in the AHRQ report (Preventable quality index-3 (PQI-3)), including ICD-CM codes 250.4–250.9, as the most responsible or primary diagnosis.

Of the 20,826 people who had completed the interview between 2004 through 2005, 15,574 individuals agreed to link their health information to Taiwan's NHIRD during 1.1.2004–31.12.2007 and were included in the analysis. Furthermore, 1005 patients who self-reported having type 2 diabetes or had at least 1 hospitalization or 2 physician service claims for diabetes mellitus with an ICD-9 diagnosis