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The effectiveness of a pay for performance program on diabetes care in Taiwan: A nationwide population-based longitudinal study

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ABSTRACT

Over the past two decades, studies have widely examined the effectiveness of pay-for-performance (P4P) programs by conducting biochemical tests and assessing complications; however, the reported effectiveness of such programs among participants selected through purposeful sampling is controversial. Therefore, the objective of the current study was to analyze the effectiveness of a P4P program on patients' prognoses, including hospitalization for chronic diabetic complications, and all-cause mortality during specific follow-up years by using a nationwide population-based database in Taiwan. Based on 125,315 newly diagnosed type 2 diabetes patient cohort during 2002–2006, two control sets were designed by propensity-score-matching strategy according to participation of P4P program and followed up to 2012. The results indicated that full participants demonstrated the lowest risks of developing complications and all-cause mortality compared with nonparticipants. These findings confirm the long-term effect of P4P programs on full participants and reveal that this effect is not due to confounding variables. The results indicate the importance of performance management and adherence to interventions for patients with chronic diseases in a long-term observation. Comprehensive and continuous care is suggested to improve patient prognosis and quality of care.

1. Introduction

Diabetes mellitus (DM) is one of the leading causes of disability and death in the elderly population, and the prevalence of DM has increased in recent decades [1]. The medical care cost for DM and its complications accounted for approximately 15% of total healthcare expenses [2]. Therefore, preventing the occurrence of DM complications is an important issue for health policy makers. To improve care quality and contain healthcare costs, many countries, including the United Kingdom, Germany, Canada, New Zealand, Australia, Argentina, Israel, and Taiwan [3], implemented pay for performance (P4P) systems for the care of selective diseases. Pay for performance is a pay-

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ment scheme that offers financial incentives to healthcare providers who achieve a pre-determined, benchmarked level of care quality or performance indicator [4].

Recent studies have assessed the effects of P4P programs on DM care and classified them into the two major categories of practice behaviors and patient outcomes [3,5–8]. Most studies reported positive effects of P4P interventions, including glucose control [9–13], blood pressure control [11,14–16], prevention of chronic diabetic complications [9,10,13,14], and prescription changes [15,16]. However, controversial results were found in assessing the effects on patients' adverse outcomes [17,18] by implementing P4P programs on DM care [17–19]. This controversy is due to the heterogeneity of medical settings, patient demographics, incentive designs, criteria for care quality, and other factors [8,19]. Likewise, most studies focused on process measures, such as the HbA1c test prescription rate. Few studies examined the outcome measures, such as HbA1c $\leq$7%, incidence of complications, and mortality [20].

Taiwan has implemented the National Health Insurance (NHI), a universal coverage of national compulsory health insurance system, in 1995 and implemented P4P programs for improving quality-of-care while decreasing medical expenditures. The DM P4P program was implemented in Taiwan in 2001. The P4P program provides participants interventions and services including medical history assessment, physical examination, biophysiological tests, creation of management plan, and DM self-management education [21,22]. In addition, Taiwan healthcare insurance system is a closed system in which outpatient and inpatient cares are integrated in a medical setting. Physicians can freely choose a hospital or a specialty department as their primary practice setting. Therefore, physicians who participated in the DM P4P program can be practicing in hospitals with different characteristics (and accreditation levels) that should be considered as confounders in examining the impact of P4P scheme. The reward payment to providers is designed in two parallel methods including individual physician (1000 NT dollars per qualified patient) and the medical setting (total of (1) 400 NT dollars per new enrolled patient; (2) 200 NT dollars per follow-up per patient; (3) annual reward 800 NT dollars per qualified patient). In addition, the program provides additional financial incentives and rewards for healthcare providers ranked as the top 25% in this country to enhance the medical management of DM when achieving relatively higher score derived from selected performance indicators including the percentage of recruiting new patients ($\geq$30%), HbA1C <7%, HbA1C >9.5%, and LDL >130 mg/dL in the year (Appendix S1). This additional incentive drives physicians to pursuit better quality of care. To our knowledge, although studies have documented the effectiveness of DM P4P program on improving essential examinations/tests or incidence of complications [21,22], little is known about the long-term effect of P4P program on patient's prognoses including complications, hospitalization, and mortality. It is valuable to examine the effectiveness of the DM P4P care program with this nationwide population-based observational study.

2. Methods

2.1. Database and study design

This study utilized a retrospective cohort design to examine the effects of the DM P4P program with the claims database provided by National Health Insurance Administration, Taiwan Ministry of Health and Welfare, which covers over 99% of the population of Taiwan. The data consisted of ambulatory care records, inpatient care records, and registration files. Patients who enrolled in the DM P4P program were required to be certified by a physician. According to the program, physicians are required to provide annual evaluations for the enrolled patients, including a management plan (such as goals, treatment, and monitoring instructions), medical history, examinations, and biochemical tests (including weight, blood pressure, HbA1C, fasting lipid profile, and urinalysis). The DM P4P program provides financial incentives for providers to strive for the predetermined criteria. This study was approved by the Internal Review Board of research ethic committee (#102-1130B).

2.2. Study subjects

To ensure sufficient time for follow-up and the effect of P4P program, a total of 149,888 DM patients who were aged above 30 years and first diagnosed as type 2 diabetes and with exclusion criteria free were enrolled, but only 125,315 patients diagnosed as ICD-9-CM code 250.0 and with DM-related drug prescriptions at least three times during the first diagnosis year were included during January, 2002-December, 2006 in Taiwan, and extended the observation period to the end of 2012. We have traced back a new diagnosed patient's claim data for two years before to ensure the time of new occurrence. The study excluded subjects who (1) were previously diagnosed with type 2 DM; (2) had insufficient outpatient follow-up records (less than one year or four times of visiting); (3) had catastrophic illness, (4) had been hospitalized due to DM-related complications, such as cardiovascular diseases, stroke, peripheral vascular diseases, kidney diseases, ophthalmic manifestations, and diabetic foot [23] before the first outpatient DM diagnosis appeared; and (5) had died within one year after diagnosis of type 2 DM.

Based on the 125,315 total patient cohort (Appendix S2), two control sets were designed to compare the effect of intervention: one for full participation and one for partial participation. To improve the comparability participation groups and the respective control, propensity score matching (PSM) by sex, age, DM severity score, Charlson Comorbidity Index (CCI) score, and insurance areas was made. The number of full participants (n = 30,522) and their respective controls (n = 61,044) were selected by a ratio of 1:2 while the number of partial participants (n = 18,162) and their respective controls (n = 54,486) were selected by a ratio of 1:3. The first diagnosed DM cases (ICD = 250.0) for full participation/partial participation were 5858/3475, 5870/3455, 6800/3880, 6137/3728, and 5857/3624 in the years of 2002, 2003, 2004, 2005, and 2006, respectively.