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Original Study

Effects and Factors Related to Adherence to A Diabetes Pay-for-Performance Program: Analyses of a National Health Insurance Claims Database

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A B S T R A C T

Objectives: To compare the effects of a diabetes pay-for-performance (P4P) program on diabetes-related/nondiabetes-related healthcare utilization/expenses between participants who adhered to the program and those who did not, and explore factors related to program adherence.
Design: A secondary data analysis with a natural experimental design.
Setting: Taiwan's National Health Insurance claims database (2001–2011) of newly diagnosed patients with diabetes in 2001 was used for the analyses.
Participants: The database under analyses contained 119,970 patients who were newly diagnosed with diabetes in 2001. Longitudinal data from 2001 to 2011 were obtained. A sample of 5592 patients who were enrolled in the diabetes P4P program during 2003–2006 was identified. After a 3-year follow-up of the enrolled patients, 2647 (47.3%) of them adhered to the program. To minimize the differences between the characteristics of the patients who adhered to the program and those who did not, propensity score matching was adopted. A total of 5294 patients (adherence: 2647 vs nonadherence: 2647) were included for analyses.
Measurements: We estimated utilization/expenses of healthcare services for both groups at 6 time points and applied *t* tests to test each utilization and expense of healthcare services between the 2 groups. A repeated-measures analysis of variance was applied to examine changes in the annual diabetes-related healthcare service expenses and total annual expenses by group. Logistic regression models were used to examine factors related to program adherence. Covariates included participant age, gender, diabetes-related complications, Charlson Comorbidity Index, Continuity of Care Index, time since diagnosis of diabetes, hospitalization in the previous year, and location receiving healthcare services.
Results: Total annual healthcare expenses spent by the adherence group were significantly lower than those of the nonadherence group. Gender, continuity of care, time since diagnosis of diabetes, hospitalizations in the previous year, and location receiving healthcare services were factors related to program adherence.
Conclusions: Long-term, beneficial effects of the diabetes P4P program might have been present if patients had adhered to the program. Interventions and strategies which could improve program adherence and continuity of care are suggested to achieve optimal disease control and clinical outcomes.

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Diabetes affects more than 300 million individuals globally.[1] Diabetes is one of the top 10 causes of death worldwide[2]; it is Taiwan's fourth or fifth leading cause of death.[3] The population coverage rate of Taiwan's National Health Insurance (NHI) has reached 99.9%.[4] Analyses of Taiwan's NHI claims database revealed that the prevalence of diabetes increased 35% from 2000 to 2009, and the total population with diabetes increased more than 70%.[5] Health spending on diabetes accounted for 10.8% of the worldwide total health expenditure.[6] In Taiwan, the total healthcare cost for individuals with diabetes was approximately 2.8 times of the cost spent by the age-matched and sex-matched individuals without diabetes, and the total expenditure of diabetes to society is about US$2.96 billion.[7,8]

In Taiwan, a diabetes shared-care program was initiated in 1996; it is a comprehensive, integrated approach to provide healthcare and reimbursement based on a disease's natural course.[9] Interest in pay-for-performance (P4P) as a strategy to stimulate the delivery of quality care is increasing; P4P provides financial rewards to healthcare providers for quality improvements.[10] To enhance the operation of Taiwan's diabetes shared-care program, a diabetes P4P program was implemented in 2001. In Taiwan's diabetes P4P program, financial incentives include additional physician fees for providing comprehensive care, fees for dispensing refillable prescriptions to patients with chronic illnesses, and care management fees for enrolling new cases and performing follow-up/annual evaluations.[11–13] Enrolled individuals are identified as adhering to the first-stage diabetes P4P program through the following criteria: (1) 1 comprehensive claim report during the initial enrollment, (2) $\geq$5 follow-up visits, and (3) $\geq$2 annual evaluations. Individuals who adhered to the first-stage program are qualified to participate in the second-stage program. The first-stage and second-stage diabetes P4P programs involve the same important healthcare components: taking comprehensive medical histories, performing needed physical examinations/laboratory evaluations, initiating/evaluating management plans, and providing self-management education. Individuals with diabetes can voluntarily decide whether they want to participate in the program or not after they receive a full description about the program by P4P-participating physicians. Neither the first-stage nor the second-stage diabetes P4P program is mandatory.[11]

Compared with control groups, individuals who enrolled in the diabetes P4P program showed significant improvements in the laboratory test results[14] and quality of life,[15] decreases in the average rate of chronic complications,[15] overall medical expenditures and hospitalization costs,[16] and better compliance with self-care and better satisfaction with the quality of care.[13] Analyses of Taiwan's NHI claims database showed that (1) individuals in the diabetes P4P program showed significant increases in regular follow-up visits/utilization of evidence-based services and significantly lower hospitalization costs/total medical costs,[17–19] (2) although individuals in the diabetes P4P program spent more on overall healthcare expenses than the comparison group in the first year after enrollment, healthcare expenses for the comparison group were higher in the subsequent 3 years,[17] (3) individuals in the diabetes P4P program or those being treated by P4P-participating physicians received more-comprehensive guideline-recommended tests/examinations than those who were not in the program,[8,20] and (4) individuals in the diabetes P4P program showed a lower risk of hospital admission and better medication adherence/cost-saving than those who were not in the program.[8,18] Controversial findings were also reported. Diabetes-related or overall healthcare costs for individuals in the diabetes P4P program were significantly higher than those of the controls.[19,21]

Systematic reviews concluded that effects of P4P programs might range from absent or negligible to strong beneficial.[22,23] Inconsistent findings and a lack of long-term evaluations of P4P[23,24] led us to conduct further analyses of the effects of the diabetes P4P program. A previous longitudinal examination of Taiwan's NHI claims database (2005–2009) used program enrollment or participation and staying in the program as a classification criterion to conduct comparisons of program effects regardless of disease duration.[17] Our analyses included individuals who were all newly diagnosed with diabetes in 2001 and individuals' longitudinal data from 2001 to 2011. Enrolled participants were classified into 2 groups: those who did and those who did not adhere to the first-stage diabetes P4P program. We aimed to identify factors related to program adherence because (1) few studies had been conducted to investigate possible factors related to program adherence, (2) program adherence might play an essential role on the estimations of program effects, and (3) adherence had a beneficial effect on quality of life for individuals with diabetes.[25] Study objectives were to (1) compare the effects of the diabetes P4P program on diabetes-related/nondiabetes-related healthcare utilization/expenses between participants who did adhere to the program and those who did not, and (2) explore factors related to program adherence.

Methods

Design and Ethical Consideration

This study was a secondary data analysis with a natural experimental design. Ethical approval was obtained from the authors' institute.

Data Source

The NHI research database (2001–2011) of newly diagnosed patients with diabetes in 2001 was used for the analyses. Insured people were defined as individuals with diabetes who satisfied one of the following conditions: (1) had been hospitalized with a diabetes diagnosis or had received hypoglycemic agents during hospitalization, (2) had an outpatient visit with a diabetes diagnosis twice in a year, or (3) had 1 outpatient visit with a diabetes diagnosis and received 1 prescription for an oral hypoglycemic medication. Insured individuals who had a diabetes diagnosis in 2001 and did not use diabetes-related healthcare services in the previous 3 years were defined as individuals who were newly diagnosed with diabetes in 2001.[26] The database under analyses contained 119,970 patients randomly sampled by Taiwan's National Health Research Institutes from the total of 168,904 patients who were newly diagnosed with diabetes in 2001.[26]

Selection of Participants

All participants included in the analyses were at least 18 years old. We did not include the patients who were enrolled in the diabetes P4P program in 2002 because Taiwan's P4P program was implemented in November 2001, and the utilization/expenses of healthcare services at the baseline were estimated by patients' utilization/expenses in the previous 12 months before enrollment. We accumulated 4 cohorts ($n = 5592$) who were enrolled in the diabetes P4P program in 2003 ($n = 956$), 2004 ($n = 1270$), 2005 ($n = 1608$), and 2006 ($n = 1460$), respectively. Information about these participants' healthcare utilization/expenses in the subsequent 5 years after their enrollment was obtained. The indices of enrolling and adherence were defined as the dates when a new case report and a second annual evaluation report were claimed, respectively.

After a 3-year follow-up of the enrolled patients, 2647 (47.3%) of them did adhere to the first-stage diabetes P4P program. To minimize the differences between the characteristics of the patients who adhered to the program and those who did not, propensity score matching was adopted. The covariates included the age, gender, and