CLINICAL RESEARCH STUDY

THE AMERICAN JOURNAL of MEDICINE®

The Diabetes Shared Care Program and Risks of Cardiovascular Events in Type 2 Diabetes

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ABSTRACT

OBJECTIVE: The Diabetes Shared Care Program (DSCP) is an integrated diabetes care model designed to increase the quality of diabetes care in Taiwan. The efficacy of this program is unknown. Therefore, we evaluated whether participating patients had reduced risks of cardiovascular events, including coronary heart disease, stroke, and all-cause mortality.

METHODS: All 120,000 diabetes patients' data in this retrospective cohort study were obtained from Taiwan's National Health Insurance Research Database. DSCP participants received integrated care from a physician, diabetes educator, and dietitian. Otherwise, non-DSCP participants visited a physician without instruction from a diabetes educator or dietitian. We followed these patients until the first hospitalizations due to cardiovascular events. The Kaplan-Meier method was used to estimate the survival curves, and the Cox proportional hazards model was applied to determine the risk of cardiovascular events.

RESULTS: A total of 4458 participants and 4458 matched controls were enrolled in this study. Mean age of both participants and nonparticipants was 56 years. DSCP participants had significantly lower risks of cardiovascular events (hazard ratio [HR] 0.86; 95% confidence interval [CI], 0.78-0.95), including stroke (HR 0.84; 95% CI, 0.73-0.98) and all-cause mortality (HR 0.78; 95% CI, 0.63-0.95), compared with nonparticipants. Older age, male, history of hypertension, chronic lung disease, and prescription for insulin secretagogues or insulin tended to have higher cardiovascular risks. Nevertheless, the following drugs reduced the cardiovascular risks: biguanides, alpha-glucosidase inhibitors, and thiazolidinediones.

CONCLUSIONS: Participation in the DSCP was associated with lower risks of cardiovascular events, stroke, and all-cause mortality.

 • *The American Journal of Medicine (2015) 128, 977-985*

KEYWORDS: Cardiovascular events; Diabetes Shared Care Program; Mortality; P4P; Taiwan

Diabetes mellitus is a chronic endemic disease and its prevalence is increasing in Taiwan and globally due to aging populations and rising prevalence rates of obesity and sedentary lifestyle.[1,2] When left untreated, diabetes will lead to premature death[3] and complications such as blindness,[4] end-stage renal disease,[5] foot ulceration,[6,7] and cardiovascular diseases.[8,9] Cardiovascular disease events, including coronary heart disease and stroke, are the leading causes of mortality and disability in diabetes patients. Patients with type 2 diabetes showed a two- to fourfold increase in the risk of cardiovascular disease events.[10] Therefore, an early and effective treatment model for diabetes is mandated.

Ideally, a care model for diabetes patients should be individualized, multifactorial, comprehensive, and easy to access. Shared care is an integrated and comprehensive care model that was developed several decades ago to improve the quality of care for chronic diseases, such as asthma, chronic obstructive pulmonary disease, psychiatric disease,

Funding: None.

Conflict of Interest: None.

Authorship: We verified that all authors had access to the data and a role in writing the manuscript.

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0002-9343/$ -see front matter
http://dx.doi.org/10.1016/j.amjmed.2015.03.025

and diabetes mellitus.[11] Joint participation and information exchange between the general practitioner and the relevant specialist are required. Studies on the efficacy of the shared care model for diabetes have yielded mixed results.[12-15]

The Diabetes Shared Care Program (DSCP) was implemented nationally in Taiwan in 2001 to increase the quality of diabetes care, to provide continuity of care, and to reduce the occurrence of diabetes complications.[16] Integrated care for diabetes patients involving a multidisciplinary approach and qualified diabetes caregivers was implemented. However, the association between DSCP participation and risks of cardiovascular disease events in clinical practice are unknown. Therefore, we designed a retrospective cohort study using data from Taiwan's National Health Institute Research Database (NHIRD) to evaluate whether DSCP participation reduced the risk of cardiovascular disease and all-cause mortality.

CLINICAL SIGNIFICANCE

- Participation in the Diabetes Shared Care Program in Taiwan was associated with a 14% reduction of cardiovascular disease events, a 16% reduction of stroke risk, and a 22% reduction of all-cause mortality.
- Older age, male sex, history of hypertension, and chronic lung disease were linked with higher risk of cardiovascular disease events.
- Improved cardiovascular outcomes were observed in patients treated with biguanides, alpha-glucosidase inhibitors, and thiazolidinediones.

RESEARCH DESIGN AND METHODS

Study Population

This observational, retrospective cohort study was conducted using a Longitudinal Cohort of Diabetes Patients 1999 dataset, which was obtained from Taiwan's National Health Insurance (NHI) program. Taiwan's NHI program is a universal insurance system that provides health care coverage for almost 99% of its population of 23 million people. The NHIRD comprises detailed information pertaining to patients' disease diagnosis, drug prescriptions, medical expenses, outpatient visits, emergency department visits, and hospital admission record. All data from the NHIRD were anonymized to protect patients' privacy. Data were extracted and analyzed by one independent reviewer. This study was reviewed and approved by the Institutional Review Board of Chung Shan Medical University, Taichung, Taiwan.

Diabetes Shared Care Program (DSCP). The DSCP is a form of pay-for-performance program (P4P) model, a health care management strategy that links the payment for services to desirable health outcomes. The DSCP was implemented nationally in 2001. All diabetes caregivers—including diabetologists, physicians, dietitians, and diabetes educators—who participate in the DSCP must be validated and certified by specific diabetes training courses. Qualified physicians at hospitals and community clinics can enroll diabetes patients into the program.

The DSCP compensates participating physicians for additional case management fees and desirable health outcomes. Participating patients are required to attend a clinic or hospital every 3 months for adjustment of drugs by a physician, and to receive diabetes education from a diabetes educator, as well as a diet consultation with a dietitian. Also, blood pressure and blood xaminations, such as glycated hemoglobin (HbA1c) and blood sugar, are arranged every 3 months. Furthermore, retinal examination, foot examination, lipid profile, and renal function examination are arranged annually.[17] In addition, the DSCP education model for patients includes appropriate lifestyle modification, encouragement of patients to exercise, frequent self-monitoring of blood sugar, proper foot care, use of subcutaneous insulin injection technique, and appropriate nutritional intake for diabetes according to clinical guidelines.[18] A detailed description of the DSCP purpose, eligibility, qualifications, and recruitment criteria are provided in Figure 1, while the detailed requirements for the initial DSCP visit, follow-up, and annual visit are shown in Supplementary Tables 1-3 (available online).

Patients who do not participate in the DSCP received conventional treatment, that is, they sought medical attention from a physician in a community clinic or hospital based on their individual preferences. Patients who did not participate in the DSCP regularly visited a physician, but received treatment without instruction from a diabetes educator or dietitian. All physicians treat their patients according to their professional knowledge and clinical guideline, including, for example, routine glycemic control and peripheral neuropathy. The main difference between the DSCP participants and nonparticipants is the integrated diabetes team care, frequent monitoring and well-written protocol for initial recruitment analysis, follow-up analysis, and annual examination for the DSCP participants, which was needed for reimbursement. Incomplete clinical and laboratory data will result in failure to receive the benefits of the DSCP.

Study Design

We designed a cohort study using 120,000 randomly selected, newly diagnosed cases of diabetes mellitus between January 1, 1999 and December 31, 1999 (Figure 2). A detailed description of the diabetes patients' recruitment and sampling procedure is available on the NHIRD Web site.[19] We excluded patients according to the following criteria: type 1 diabetes (n = 1277), gestational