



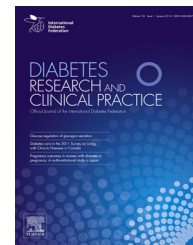
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Effect of prescription refill on quality of care among patients with type 2 diabetes: An exploratory study

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ABSTRACT

Aim: Prescription refill might be effective in saving health expenditures, but whether a refilled prescription that reduces physician consultation affects quality of diabetes care is unknown. This study sought to examine the effect of prescription refill on the outcome quality of diabetes care.

Methods: A quasi-experiment design with repeated HbA1c measures for the pretest and posttest periods for a total of 2 years was used. HbA1c functions as an outcome quality indicator. Prescription refill was measured dichotomously and also in times. Retrospective data of 1005 patients with type 2 diabetes were analyzed mainly by repeated measure General Linear Modeling at the multivariate level with difference-in-difference (DID) statistics.

Results: Patients using prescription refills ($n = 779$) experienced a significant decrease in HbA1c (from 8.4% to 7.8%, $P < 0.001$), compared with those without refill ($n = 226$, from 8.5% to 8.3%, $P = 0.171$), with 0.3% of DID ($P = 0.043$). Compared with non-refill peers, a greater percentage of patients refilling their prescriptions met the American Diabetes Association standards goal of ($<7\%/53$ mmol/mol, $P = 0.037$). Certain patients and physician characteristics were associated with the use of refills.

Conclusions: Clinically appropriate use of prescription refill would not result in a deterioration in glycemic control. On this basis, continuous refills may further benefit diabetic patients in treatment outcome and future cost. More attention is needed on the quality-effectiveness of prescription refill.

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1. Introduction

Diabetes imposes large economic burdens on families and countries, with 12% of the global health expenditures spent on diabetes in 2010 [1]. Diabetes is a common chronic disease in Taiwan and was the fifth leading cause of death in 2011 [2,3]. Untimely diagnoses and inadequate treatment may lead to a rise in complications and morbidity of diabetes. Lowering blood glucose decreases the incidence of diabetes complications [4]. Therefore, effective glycemic control for the diabetes-specific laboratory test, glycated hemoglobin A1c (HbA1c), and reduction of related complications are pivotal to diabetes care in reducing disease and economic burdens [5,6]. Previous literature documented that many diabetic patients in Taiwan still did not receive adequate quality care, especially with regard to regular checkups [7].

Prescription refill was proved effective in the control of health expenditures [8]. To curb the health expenditure growth in chronic diseases, the Taiwan Bureau of National Health Insurance started to encourage the use of prescription refill by slightly increasing the physician consulting fee, a financial incentive, in 2002. By the annual increase of physician consulting fee, the overall percentage of the use of prescription refill increased from 8.6% in 2003 to 21.0% in 2007 and, with an annual 4% growth, has reached 30% in 2010 and 2011, an anticipated usage under the goal of this important policy [9]. Besides a concern for expanding health expenditures, a refilled prescription is expected to realize the notion of patient-centered practices. When a chronic disease is clinically stable, a prescription that specifies regular medication for the following 3 months without the necessity of a physician consultation may not only minimize travel and out-of-pocket economic burden but also eliminate wait time cost for patients and their families.

Prescription refill or repeat dispensing/prescribing has been widely practiced in many developed countries. Previous research reported that among diabetic patients who used prescription refills, high refill adherence was associated with higher odds of HbA1c lower than 7%/53 mmol/mol [10,11]. However, this relationship might not be consistent across different diabetes treatments. The glucose-lowering effect by compliance was found among patients receiving oral medication only or insulin only but was not shown among those receiving both oral medication and insulin [10]. Furthermore, prescribing behavior was found to be associated with physician consultation and treatment outcome [12]. Patients receiving pill calendar refilled their prescriptions on time more frequently, had higher medication possession ratio (MPR), and had lower diastolic blood pressure (DBP) than patients who received their medication packaged in the traditional bottles of loose tablets [13]. Regular pharmaceutical consultations by refill might enhance communications between patients and pharmacists, thus leading to better control of a chronic disease [14]. It is broadly known that there is a marked association between physician prescribing behavior and health outcome or quality of care [15,16]. Nevertheless, prior studies on prescription refill are limited to the domain of patient compliance and medication adherence and to those patients who received prescription refills [13]. Complex

diabetes care requires frequent communication between care providers and patients. Knowledge is lacking on whether prescription refills, which reduce visits and thus physician consultations, affect the quality of diabetes care by comparing prescription refill users to nonusers. The present study sought to investigate the effect of prescription refill on the outcome quality of diabetes care in a comparative approach, to further assist in ensuring that changes in physicians' prescribing behaviors achieve cost-effective and quality-effective practices, by providing empirical evidence.

2. Methods

The present study employed a quasi-experiment design by the nonequivalent comparison group, pretest-posttest method. Subjects included patients diagnosed with type 2 diabetes (ICD-9-CM codes 250 as the primary or secondary diagnosis) at a large-scale medical center located in a metropolitan area of middle Taiwan. Patients who were diagnosed with type 1 diabetes (ICD-9-CM 250.1), already using prescription refills in 2006, or who did not return to outpatient services in 2007 were excluded from the study to ensure reliable data quality and thus enhance the rigidity of the research. The 2-year observation period comprised the half year of pretest, the 1 year of intervention, and the half year of posttest. The intervention group was first-time users of prescription refill in 2007 and the comparison group was the nonusers throughout the same period. To maintain a more reliable measure of HbA1c, both groups in receipt of diabetes medication had at least two HbA1c tests for both the pretest and posttest periods, with a test interval of 3 months in one period. Retrospective data were extracted from the clinical data warehouse by ORACLE Hyperion IR 11.0. The initial number of diabetic patients with type 2 in the data warehouse was 3518. After removing patients who did not qualify for the study, a valid sample of 1005 regular return patients that were observed for the 2 years, July 1, 2006 to June 30, 2008, was eligible for analysis.

HbA1c serves as an outcome quality indicator for diabetes care [17,18]. The treatment generally aims for an HbA1c value less than 7%/53 mmol/mol, a glycemic target suggested by both the American Diabetes Association and the International Diabetes Federation [19]. Existing literature documented that a 1% decrement in HbA1c reduces by 12% and 14% the risk of incident stroke and myocardial infarction, respectively, in 10 years [5]. The average of HbA1c values for the pretest period was obtained from two test results between July 1, 2006 and December 31, 2006. Another average HbA1c was measured by two test values between January 1, 2008 and June 30, 2008. Consequently, each subject had three HbA1c measures: mean HbA1c before the intervention (pre-HbA1c), mean HbA1c after the intervention (post-HbA1c), and post-pre-HbA1c difference. Existing diabetes research indicated that fluctuations of HbA1c results from many factors including diet, physical activity, medication, and disease conditions [20]. Apart from the prescription refill variables, this study, exploratory in nature, incorporated the five major categories of independent variables that may be associated with HbA1c based on the corresponding literature: (1) characteristics of the patient

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