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Does financial incentive for diabetes management in primary care setting reduce avoidable hospitalizations and mortality in high-income countries? A systematic review

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Abstract

Effective diabetes management can prevent avoidable diabetes-related hospitalizations. This review paper examines the impact of financial incentives for diabetes management in primary care settings on diabetes-related hospitalizations, hospitalization costs, and premature mortality. To assess the evidence, we conducted a literature search of studies using five databases: Medline, Embase, Scopus, CINAHL and Web of Science. We examined results by health insurance systems, study quality or diabetes population (newly diagnosed diabetes). We identified 29 articles ranging from fair- to high-quality: 18 articles assessed the relationship between financial incentives for diabetes management and hospitalizations, 8 assessed hospitalization costs, and 13 assessed mortality. Many studies found that financial incentives for diabetes management reduced hospitalizations, while a few found no effects. Similar findings were evident for hospitalization costs and mortality. The results did not differ by the type of health insurance system, but the quality of the studies did matter; most high-quality studies reported reduced hospitalizations and/or mortality. We also found that financial incentives tend to have been beneficial patients with newly diagnosed diabetes We conclude that diabetes management incentives may reduce diabetes-related hospitalizations, especially in newly diagnosed diabetes patients.

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Introduction

In 2021, an estimated 537 million individuals between the ages 20 and 79 years lived with diabetes mellitus worldwide,[1] and diabetes is predicted to increase to 643 million by 2030.[1] Diabetes related complications (diabetic ketoacidosis, hypoglycemia and hyperosmolar hyperglycemic symptoms,[2,3] retinopathy, foot ulcers, kidney failure and non-traumatic limb amputations)[4,5] can lead to costly hospitalizations and premature death.[5,6] It is no wonder that diabetes places a substantial economic burden on health care systems; in 2021, diabetes-related global health expenditure for adults was estimated to be $966 billion US dollars.[1] According to the World Health Organization (WHO), approximately 1.5 million deaths were caused by diabetes in 2019,[7] making it one of the top 10 causes of death globally.[1]

Diabetes is an ambulatory care sensitive condition,[8–10] meaning that most hospitalizations in patients under 75 years can be avoided through better access to diabetes care in a primary care setting.[8,9,11,12] Primary care physicians (PCPs) can diagnose and manage diabetes by ordering necessary tests, prescribing appropriate medications, making timely referrals to specialists, and intervening on modifiable risk factors. Effective primary care can lead to prevention of complications,[13] reduced risk of diabetes-related hospitalizations,[8,12–14] shorter lengths of stay if hospitalized, and reduced hospitalization costs.[15]

To promote chronic disease management in primary care settings, many high-income countries introduced pay-for-performance (P4P) financial incentives.[12,16–18] These incentives reward PCPs for the achievement of various processes of care such as periodic glycated hemoglobin testing, ordering recommended tests, prescribing necessary medications, and managing blood pressure and cholesterol.[19,20] A number of studies found that P4P schemes are positively associated with the provision of diabetes-related services.[20–25] However, some also found the effects to decline over time,[21,24] or had no effects.[26,27] Whether incentivizing PCPs can reduce avoidable hospitalizations and mortality remains an important area of research.

Previous systematic reviews examining the effect of P4P incentives on patient health and healthcare utilization, found mixed results, [28–35] and to date, only one systematic review focused on the effects of P4P incentives for diabetes management on outcomes in single-payer health insurance systems.[35] The purpose of this systematic review is to undertake a comprehensive

evaluation of the effect of financial incentives for diabetes management on diabetes-related avoidable hospitalizations, hospitalization costs, and mortality. We were able to review several recent papers, examine for differences in effects between single-payer and multi-payer health insurance systems; evaluate the quality of published studies, and differentiate effects between newly diagnosed diabetes patients and those who had lived with the condition for longer.

Methods

Search Strategy and Study Selection

We conducted the literature search using five databases: MEDLINE, EMBASE, Scopus, CINAHL, and Web of Science. The search was performed by combining specific keywords and subject headings that addressed each of the following: diabetes, financial incentive, hospitalizations, and/or mortality (Appendix Table A1). Keywords along with subject headings specific to each database were combined using AND/OR to enter a final search statement. Reference lists of studies eligible to be included in this review were subsequently searched to identify any additional articles. The search was conducted in August 2023.

Two co-authors independently screened the articles identified from the database search to identify studies eligible for inclusion. We included English studies that focused on the impact of financial incentives targeted to PCPs (general practitioners or family physicians) for diabetes management on diabetes-related avoidable hospitalizations, hospitalization costs, or mortality as an outcome. Studies could include patients with type 1 or type 2 diabetes.

Studies were first screened by title and abstract and were excluded if the exposure was not related to financial incentives targeting PCPs, and/or the outcome variable did not measure hospitalizations, hospitalization costs or mortality. We also excluded duplicate articles, and those that were not primary research articles (e.g., review articles, editorials, and letters). At full-text screening, studies were reviewed and further excluded following the exclusion criteria indicated above and if their hospitalization or hospitalization cost were not diabetes-related.

Data Extraction and Quality Assessment

Two reviewers independently extracted data from the included articles including the author, year of publication, country or region of study, the exposure measure(s) or financial incentives

assessed, the outcome(s) measured, study design, time period, study population, intervention and comparison group (if any), covariates (if any), statistical techniques used, and the main findings. The two reviewers also independently assessed the methodological quality of each included using a modified version of the Downs and Black Checklist.[36] This checklist consists of 27 questions with a total score of 32, covering the quality of reporting, external validity, internal validity (includes bias and confounding) and the statistical power of the study.[36] Studies in our review were scored out of 27, by modifying the following: (i) we simplified question 5 (original score of 2 points), by assigning a single point if the distribution of principal confounders in each group of subjects to be compared is described, and (ii) we simplified question 27 (original score of 5 points), by instead assigning a single point if the study has sufficient power to detect a clinically important effect based on the sample size. The modifications were done to keep the assessment for these criteria simpler, and to align our work with previous reviews.[37–39] Disagreements between the reviewers were resolved by consensus. The final score obtained from each article was divided by the maximum score of 27 and multiplied by 100 to obtain a quality percentage.[40] This percentage was used to classify the articles by quality: high (66.7% or higher), fair (between 50.0% and 66.6%), and low (< 50.0%).[40,41]

Stratified Analysis

In addition to synthesizing the overall results, we conducted three stratified analyses. First, we examined the impact of financial incentives for diabetes management in single-payer versus multi-payer health insurance systems. In a single-payer national health insurance system, the vast majority of health services is paid for by a single government entity.[42] A multi-payer system is financed by more than one entity (e.g., public and private (for-profit and not-for-profit) insurance systems).[42] P4P incentives may sometimes lead to physicians avoiding high-risk or non-compliance patients that could negatively affect clinical performance metrics tied to receiving the incentive.[43,44] Given the ongoing policy debates around single versus multi-payer systems, it is useful to see if P4P incentives differ in their effectiveness across the two regimes. Second, we stratified the analyses by study quality as high-quality studies form the backbone of evidence-based health policy formulation. Finally, we examined the effect of incentives in patients who were identified and recruited to be newly diagnosed with diabetes (diagnosis of diabetes within 1-6 years) in the included studies. This is because patients with long versus short diabetes duration had poorer glycaemic control,[45] had an increased risk of microvascular- and

macrovascular complications and all-cause death,[46] and had a higher prevalence of diagnosed cancer which could impact associations.[47] We did not perform a meta-analysis due to the heterogeneity of both exposures and outcomes across studies.

Results

Search Results

Our literature search identified 1,314 articles from five databases, 1,006 remained after duplicates were removed. After additional exclusions (Figure 1), there were 46 articles for full-text screening and a final 29 articles included (Figure 1).

Study Characteristics

Studies were conducted across several high-income countries: Taiwan $(n = 17)$, Canada $(n = 5)$, Italy $(n = 3)$, the US $(n = 2)$, England $(n = 1)$, and Portugal $(n = 1)$. Eighteen studies examined the relationship between financial incentives for diabetes management and diabetes-related hospitalizations, eight focused on hospitalization costs, and thirteen articles focused on mortality. Details of the included studies are summarized in Table 1.

We found wide variation in financial incentives for diabetes management. There were two dominant types of P4P incentives:[48,49] (1) *high-powered incentives* (incentive payments to physicians aligned with the achievement of verifiable targets for patients like Taiwan's P4P program), and (2) *low-powered incentives* (physicians rewarded for participating in care improvement activities with no required targets). There was also variation in the hospitalization outcome measures used in the studies including: all-cause hospitalizations, avoidable hospitalizations, diabetes-related avoidable hospitalizations, and hospitalizations for diabetes-related complications. The mortality outcome measure was captured in two ways: all-cause, and diabetes-related mortality.

Quality of Included Studies

Based on the modified version of the Downs and Black Checklist, the included studies scored between 16 and 22 points out of a maximum of 27 (Table 1). A detailed breakdown of the score for each included study is given in the Appendix (Table A2). Based on the scores, the studies were of fair to high quality. All studies clearly described the objectives, main outcomes, patient characteristics, intervention of interest, and main findings of the study. The studies used

appropriate statistical tests for the analysis, had valid outcome measures, and included patients in different intervention groups from the same population. However, not all studies provided estimates of random variability in the data for the main outcome, reported the actual probability values for the main outcomes, adjusted for different lengths of follow-up in the analyses, or had adequate adjustments for confounding. Blinding and randomization were not possible due to the way financial incentive programs were rolled out in various jurisdictions.

Effects of Financial Incentives for Diabetes Management

Diabetes-related hospitalizations. Eighteen articles evaluated the relationship between financial incentives for diabetes management and diabetes-related hospitalizations. The effect of financial incentives was evaluated using various approaches, including comparing patients enrolled in a P4P program to a control group, and comparing patient outcomes before and after P4P implementation.

Twelve of these studies found financial incentives for diabetes care to be associated with reduced diabetes-related hospitalizations.[20,21,23,24,49–56] Studies using longitudinal data revealed that patients who saw a physician who was receiving financial incentives for diabetes care were less likely be hospitalized for diabetes-related complications in Italy[49] and from all causes in the US state of Hawaii.[20] In British Columbia, Canada, a cross-sectional study observed fewer hospital admissions in those whose providers received incentive-based care compared to those who did not.[54]

In Taiwan, nine studies found that a "high-powered" P4P was associated with reduced diabetes-related hospitalizations.[21,23,24,50–53,55,56] Two were cross-sectional, seven were longitudinal. One cross-sectional study found that the net effect of the P4P program was a decrease of 2.70 diabetes-related hospitalizations per 100 enrolled patients per year.[23] Similarly, a recent longitudinal cohort study from Taiwan found that P4P reduced the risk of hospitalization for cardiovascular events in patients with type 2 diabetes diagnosed at a young age (20 - 40 years of age) (adjusted Hazard Ratio [aHR]: 0.63; 95% confidence interval [CI]: 0.5, 0.79).[50] The magnitude of effect of the Taiwanese diabetes P4P program in reducing hospitalizations appeared greater in patients who were continuously enrolled in the program over a longer period of time.[21,55] For example, one study found that the magnitude of effect of P4P in reducing

hospitalizations was larger when comparing patients who were continuously enrolled in the program throughout the study period to their respective comparison group (Difference-in-differences [DID] Coefficient: -0.06; Standard error [SE]: 0.01) versus when examined in patients who at least stayed in the P4P program during the first year, regardless of the subsequent years, compared to their comparison group (DID Coefficient: -0.01; SE: 0.01).[21] The P4P program implemented across Taiwan entails high-powered incentives designed to align PCP's behaviour directly to policymakers' expectations of improvements in process measures and intermediate outcomes for diabetes patients.[48,49]

Four studies found that financial incentives had no effect on diabetes-related hospitalizations.[12,26,57,58] Two studies used longitudinal administrative data from Canada; one took an ecological perspective (where the unit of observation is at the population-level, instead of at the individual-level)[12] and the other took an interrupted time series approach. Both found that the introduction of financial incentives for diabetes management in British Columbia (a low-powered incentive) did not have a significant effect on hospitalizations.[12,58] The financial incentive implemented in British Columbia is a low-powered incentive. Similar results were found in the US state of New York, for their high-powered diabetes P4P program,[26] and in Portugal for the implementation of Family Health Units, which were partially financed through P4P for conditions such as diabetes.[57]

Lastly, two studies in Italy found mixed results when different forms of low powered financial incentives were examined to improve care for patients with chronic diseases:[10,11] P4P, paid based on the achievement of specific targets; Pay-for-Participation (P4Pa), paid based on the number of patients with specific chronic conditions under their care; and Pay-for-Compliance (P4C), where PCPs are paid based on the number of collaborative activities in which they participated.[10,11,49] Fiorentini *et al*.[10] found that P4P and P4C programs reduced the probability of avoidable hospitalizations for 27 medical diagnostic-related groups in the general patient population; however, the P4Pa program was only significant when examined only in people with type 2 diabetes.[10] Another study reported that of the two forms of incentives, P4Pa and P4C, only the P4Pa incentive for diabetes care significantly reduced the probability of being hospitalized for a hyperglycemic emergency.[11]

Diabetes-related hospitalization costs. Eight studies evaluated the relationship between financial incentives for diabetes management and diabetes-related hospitalization costs. Four studies were conducted in Taiwan,[21,23,52,53] of which two were longitudinal[21,53] and two were cross-sectional.[23,52] All four Taiwanese studies found that the P4P program was associated with lower hospitalization costs for diabetes patients. One longitudinal study found lower hospitalization costs only when comparing patients continuously enrolled in the P4P program vs never enrolled.[21] Hospital expenses decreased by 1993 New Taiwan (NT) dollars (59 US dollars) per patient over time in 2006.[21] In British Columbia, Canada, two studies found the incentive for diabetes management was also associated with reduced hospital costs.[54,58]

Two quasi-experimental studies from New Brunswick, Canada, reported that their low powered P4P for diabetes care did not reduce the overall hospitalization costs for diabetes patients.[48,59] However, one study found that for newly diagnosed people with diabetes (i.e., patients who were diagnosed with diabetes a year before P4P was introduced), hospitalization costs fell by 7.96%,[48] while the other study observed a downward trend in hospital costs (not statistically significant).[59]

Mortality. Thirteen studies investigated the relationship between financial incentives for diabetes management and mortality. Twelve reported a reduction in mortality,[18,50,51,55,56,60–66] while one found no effect.[17] All twelve studies were from Taiwan and used longitudinal data from the same health research database. One study reported that the risk of all-cause mortality (HR: 0.45, 95% CI: 0.45, 0.46) and infection-related mortality (HR: 0.46, 95% CI: 0.45, 0.47) was significantly lower in the P4P group than the non-P4P group for people with type 2 diabetes.[56] Lower risks of all-cause and diabetes-related mortality were also reported among type 2 diabetes patients who were cancer survivors enrolled in the P4P program.[63] Another study found that the effect of P4P in reducing the risk of death in type 2 diabetes patients was the most significant in those who were underweight (i.e., Body Mass Index < 18.5) (HR: 0.11, 95% CI: 0.04, 0.38).[60] The diabetes P4P program in Taiwan was associated with a lower risk of all-cause mortality in both patients with full and partial participation in the program; however, the risk of mortality was lowest in full participants.[55]

In contrast, Kontopantelis *et al*.'s longitudinal spatial study in England used an ecological perspective, and found no statistically significant relationship between a primary care practice's performance on the UK's Quality and Outcomes Framework (QOF) indicators (a high-powered incentive) and all-cause mortality or cause-specific mortality for six conditions including diabetes.[17] However, the authors indicate that the limitations in the spatial analysis may have attenuated the relationship between the QOF and mortality.[17]

Effects of Financial Incentives for Diabetes Management by Study Quality, Health Insurance System, and in Newly Diagnosed Diabetes Patients

Twenty-six of the 29 studies in total were of high methodological quality based on Downs and Black scores. Sixteen high quality studies examined the effect of the incentives on hospitalizations, and the majority of these (12 studies)[20,21,23,24,49–56] reported that incentives reduced hospitalizations, while the remainder found either no effect[57,58] or mixed results.[10,11] All high-quality studies that evaluated the effect of the incentives on mortality (12 studies)[18,50,51,55,56,60–66] reported a reduction. None of the fair-quality studies reported data on the effect of the incentives on hospitalization costs, thus, we are unable to assess the effect of the incentives on this outcome by study quality. The three fair-quality studies,[12,17,26] all found that financial incentives for diabetes management had no effect on diabetes-related hospitalizations or mortality.

The effect of financial incentives for diabetes management on diabetes-related hospitalizations in countries with single- versus multi-payer health insurance system was also examined. There were 16 studies that examined diabetes management incentives in countries with a single-payer health insurance system (Canada,[12,54,58] Italy,[10,11,49] Taiwan,[21,23,24,50–53,55,56] and Portugal[57]), and two studies in a multi-payer health insurance system (US[20,26]). Overall, most of the articles in countries with single-payer health system found the incentives to be associated with reduced hospitalizations, but some found no effect. Of the two studies reported in the US, one found a decrease in hospitalizations while the other reported no effect. Therefore, whether a single payer versus a multi-payer health insurance system affects the hospitalization outcomes of P4P incentives for patients with diabetes is unclear. No studies reported on the effect of the incentives on hospitalization costs and mortality in a multi-payer health insurance system.

We also examined the effect of the incentives on the outcomes of patients newly diagnosed with diabetes, either first diagnosed during the specified study period, or newly diagnosed (defined as diagnosis of diabetes within 1-6 years) before the introduction of the incentive in the study. Seven studies examined the effect of diabetes management incentives among newly diagnosed patients, five from Taiwan[50,53,55,64,66] and two from Canada.[48,59] All studies but one[59] found that the incentives were associated with reduced hospitalizations, hospitalization costs, or mortality. The outlier study[59] did find a trend towards lower hospital costs among newly diagnosed patients.

Discussion

In this comprehensive systematic review of the literature on the impact of primary care diabetes management incentives, we found mixed evidence of their efficacy on health and healthcare outcomes. Most high-quality studies found that incentives were associated with reduced hospitalizations and mortality, highlighting the importance of accounting for confounding factors when ascertaining the effect of financial incentives on outcomes. The effect of incentives on hospitalizations did not appear to differ by the type of health insurance system (i.e., single- versus multi-payer health systems), although the number of studies in the multi-payer system was small. Targeting patients newly diagnosed with diabetes appears to yield a large payoff when it comes to reducing diabetes-related hospitalizations and hospitalization costs. Studies that evaluated high-powered and low-powered incentives also had differing results. The P4P program in Taiwan is an example of a high-powered incentive, where the bonus was provided to physicians who improved process measures, improved intermediate outcomes, and whose performance ranked within the top 25% of physicians.[18,62,67] In contrast, low-powered incentives were introduced in British Columbia, Canada, where PCPs received a set-payment per year per patient for diabetes management following British Columbia's Clinical Practice Guidelines rather than being linked to intermediate outcomes and target indicators.[58,68]

Other reasons for observed differences may be related to the study design or study settings. In addition, if policy initiatives were already introduced, and policy or system changes occurred simultaneously during the study period, then this may have also affected the effect of diabetes management incentives. The population studied is another potential explanation for the diverging conclusions; we found that incentives were most effective for newly diagnosed

diabetes patients. Finally, specific limitations of individual studies in this review, such as unmeasured confounding, selection bias, and smaller sample size, can also explain the differing results.

Previous systematic reviews in this research area[32,33,35] have also documented inconsistent results regarding the effectiveness of P4P on improving patient outcomes. One of the reviews examined the effect of a wide range of P4P incentives, including those implemented for diabetes care and other chronic diseases,[33] one focused on the QOF P4P scheme in the UK alone,[32] and the remainder review focused on the effect of the P4P on diabetes outcomes in a single-payer health system.[35] Like our review, Gupta and Ayles[35] observed that high-powered incentives reduced the risk of long-term mortality in diabetes patients, while low-powered did not consistently improve patient outcomes.

One interesting observation found in this review was that almost all studies[48,50,53,55,64,66] that focused on people with newly diagnosed DM found that incentives for diabetes management reduced diabetes-related hospitalizations and hospitalization costs. However, it is important to note that most studies were conducted in Taiwan. One potential explanation for this finding may be that, since the longer a patient lives with diabetes, the higher the risk they have of microvascular- and macrovascular complications,[46] coronary heart disease death,[69] and all-cause death,[46] zeroing in on the newly diagnosed group helps attenuate the impact of these longer-run effects. In patients with newly diagnosed diabetes, the effectiveness of incentives may also be related to the detection and prevention of diabetes-related complications. A few studies report that patients with a shorter duration of diabetes were less likely to adhere to antidiabetic drug therapy and a large proportion of them did not have regular diabetes-related outpatient visits,[52,70] suggesting that there may be additional room to optimize the potential effects of incentives in this patient population. Financial incentives can improve physician continuity of care,[66] reinforcing the patient compliance with diabetes management which in turn can result in higher adherence to the physician prescribed management plan and better health outcomes for patients.[71] Early studies conducted by the UK Prospective Diabetes Study (UKPDS) Group have shown that diabetes management, such as tight blood glucose and blood pressure controls, in patients with newly diagnosed type 2 diabetes can reduce the risk of diabetes-related

complications and subsequent deaths.[72–74] This shows the importance of early detection and effective diabetes management at the onset of diabetes.

In terms of strengths, our updated review provides a clearer link between P4P incentives and hospitalizations, and/or mortality[50,51,56,60,61] and uncovered several new insights. The newly added studies were of high methodological quality and supported the importance of high-powered incentives in improving patient health outcomes.

This review has limitations. First, it only includes observational studies as no randomized controlled trials exist in the literature, hampering the inferred causal link between the P4P incentives and outcomes. Second, the evidence gleaned from the review suffers from the limitations of cross-sectional studies, including those associated with heterogeneity in the study population, study design, study setting, nature of financial incentives, and outcomes evaluated. Selection bias was a concern in some studies, as physicians often voluntarily participate in some P4P programs; it is possible that participating physicians may vary systematically from those who did not enroll into the program.[20] As a consequence, physicians who enroll could already be high-performing providers who follow the recommended diabetes care guidelines.[20,29] Most studies controlled for potential observable confounders, however, some residual confounding may have remained due to unobservable factors. Third, studies on the effect of incentives in multi-payer health insurance systems, were limited. Lastly, only studies published in the English-language were included in this review.

Conclusion

While the relationship between financial incentives for diabetes management and diabetes-related hospitalizations, hospitalization costs, and mortality was mixed, our review did point to some notable tendencies across the studies. Most high-quality studies reported that incentives reduced hospitalizations and mortality, and the effect of the incentives on the outcomes did not seem to differ by the type of the health insurance system. Moreover, most studies that examined high-powered incentives, especially in Taiwan, observed incentives to be effective versus low-powered incentives, implemented in other jurisdictions. Our review also revealed a reasonably clear association between P4P incentives and hospitalizations and hospitalization costs in newly diagnosed patients. This implies that targeting high-powered financial incentives to improve care

for the newly diagnosed patients may be a strategy for the policy makers to consider. Additional research on cost-effectiveness of incentives would help better identify the ideal incentive structure and context for reducing diabetes-related avoidable hospitalizations, associated costs, and premature mortality for all diabetes patients.

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Highlights

- Impact of financial incentives for diabetes management on patient health is mixed
- Effect of incentives on health outcomes did not vary by health insurance system
- High-quality studies reported incentives to reduce hospitalizations and mortality
- Effectiveness of incentives were beneficial to newly diagnosed diabetes patients

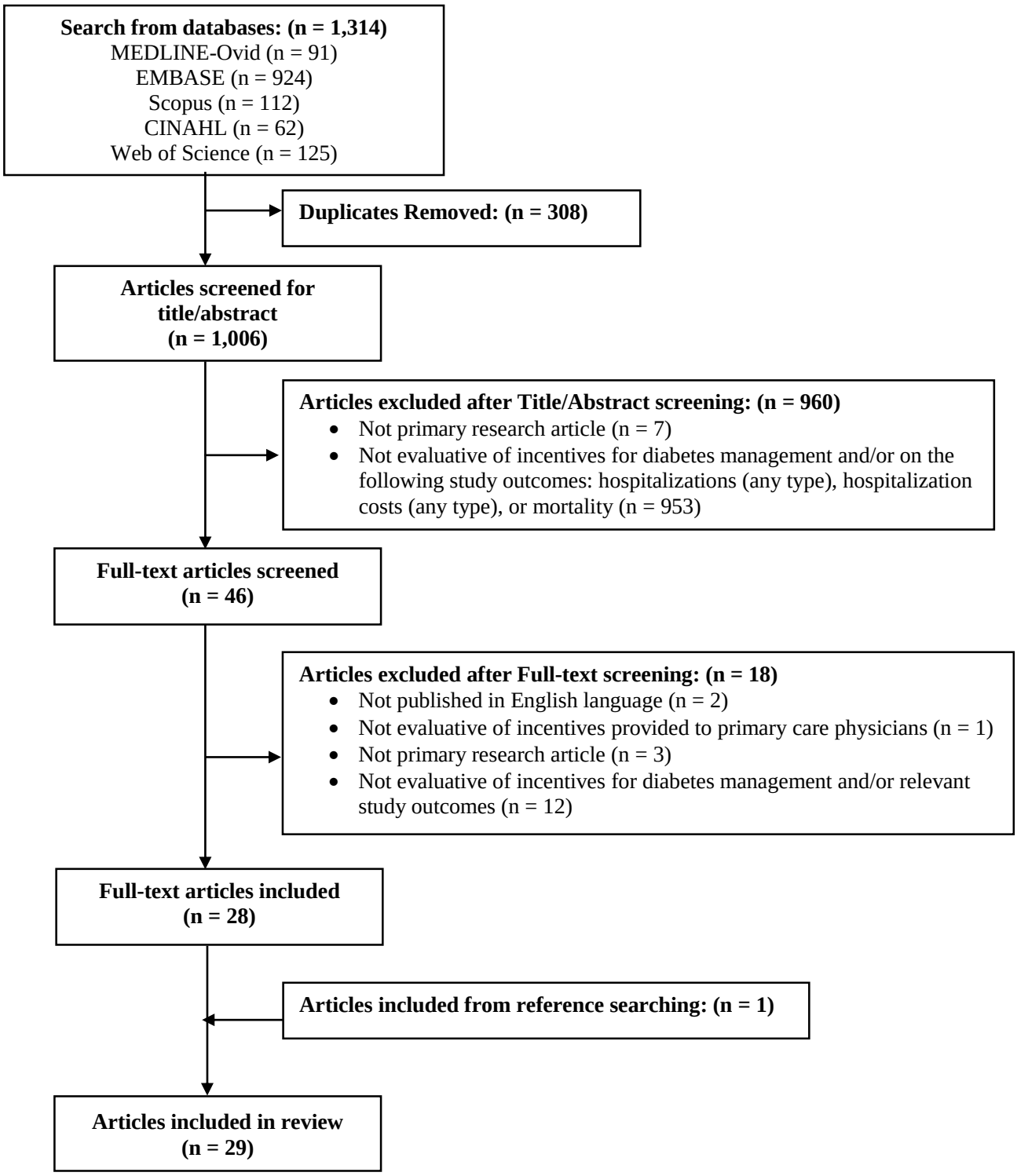

Figure 1. Flowchart depicting the process used to select the relevant articles for this review

Table 1. Findings from studies that assessed the relationship between financial incentives for diabetes management and diabetes-related hospitalizations, hospitalization costs, or mortality

Author, Year & Country	Exposure Variable(s)	Outcome Variable(s)	Methods	Study Findings	Downs and Black Score*	Study Quality (Percentage)[a]
Chen *et al.* (2010) Hawaii, USA	• P4P provided to physicians for performing quality of care process in diabetes patients • Receipt of quality of care processes (Yes vs. No)	• Number of hospitalizations from all-causes	• Longitudinal study • **Time:** 1999 to 2006 • **Population:** Diabetes patients aged between 18 to 75 who saw P4P or non-P4P physician • Compared patients who saw P4P-participating physician vs. non-P4P-participating physician • **Covariates:** Age, sex, comorbidity index, number of outpatient visits, number of distinct primary care physicians seen, visit to an endocrinologist, insulin dependence, calendar year • **Analysis:** Random-effects negative binomial models for hospitalization, Poisson and zero-inflated models for sensitivity analysis	• Patients who received quality of care were significantly less likely to be hospitalized • During one year, there was no significant difference in hospitalization rates for patients who consulted P4P-physicans compared to those who did not consult them • Patients who consulted P4P physician for 3 consecutive years were significantly less likely to be hospitalized	18	High (66.7%)

Chen *et al.* (2016) Taiwan	• P4P program for diabetes care	• All-cause mortality	• Retrospective cohort study • **Time:** 2004 • **Population:** Type 2 diabetes patients diagnosed prior to December 31, 2003 • **Intervention group:** Patients 18 years and older enrolled newly in P4P in 2004; **Comparison:** Patients not in P4P using propensity score matching • **Covariates:** Demographic, utilization, clinical parameters • **Analysis:** Propensity score matching, Kaplan-Meier method, time-dependent Cox regression model, competing risk adjusted cox regression, GEE	• Mortality rate was lower in P4P group vs. non-P4P group (HR: 0.76; 95% CI: 0.64, 0.92)	22	High (81.5%)
Cheng *et al.* (2012) Taiwan	• P4P program for diabetes care	• Health care use (includes diabetes-related hospitalizations), health care expenses (includes diabetes-related hospitalizations)	• Natural experiment and longitudinal design • **Time:** 2004 to 2009 • **Population:** Diabetes patients over the age of 18 • **Intervention group:** Patients enrolled in P4P in 2005; **Comparison:** Patients from same physicians but not enrolled in P4P • **Covariates:** Patient's sex, age, DCSI score, CIC index, hospital location, hospital accreditation • **Analysis:** Propensity score matching, DID method, Poisson distribution, negative binomial	• Net effect of P4P on hospitalizations suggest fewer hospitalizations over time in the intervention group, and marginally significant. No difference was observed in hospitalization expenses • For patients who stayed in P4P throughout the observation period from 2005 to 2009, the net effect of P4P reached significance	19	High (70.4%)

			distribution, GEE model with logarithmic link function with gamma distribution	throughout the study period. Lower hospital expenses was also reported in the intervention group than the comparison group		
Cheng *et al.* (2015) Taiwan	• Trends and factors in Taiwan's healthcare system • P4P status for diabetes care	• Healthcare use and costs of services such as hospital admissions	• Retrospective cross-sectional study • **Time:** 2000, 2005, 2010 • **Population:** Type 2 diabetes patients aged 20 years and above matched to non-diabetes individuals • Compared P4P vs. non-P4P • **Covariates:** Patient characteristics, time, disease severity, policy intervention, and care seeking pattern • **Analysis:** 2-part model used to evaluate the use and cost of inpatient services: (1) logistic regression model, and (2) GLM with log-link and gamma distribution; trend analyses	• P4P enrollment associated with lower risk of hospital admissions (OR: 0.71; 95% CI: 0.60, 0.83), and lower inpatient costs by (-33,343 NTD; SE: 2,205) in patients with diabetes	20	High (74.1%)

Chi *et al.* (2016) Taiwan	• Adherence to diabetes P4P program	• Diabetes-related/non-diabetes-related healthcare use or expenses (includes hospitalizations)	• Longitudinal natural experimental design • **Time:** 2001 to 2011 • **Population:** Newly diagnosed diabetes patients in 2001 who are at least 18 years old. There were 4 cohorts: Those enrolled in the P4P in 2003, 2004, 2005, and 2006 • In P4P patients there were 2 groups: (1) those who adhered and (2) those who did not adhere to the first-stage diabetes P4P • **Covariates:** Patient demographics, diabetes complications CCI, COCI, time since diagnosis, hospitalization in previous year and location receiving health services • **Analysis:** T-tests, repeated-measures analysis of variance	• Total healthcare expense by the adherence group was significantly lower than nonadherence group at 6 time points (T0-T5) • During the overall study, average number of hospitalizations was significantly lower in adherence P4P group at 6 time points (T0-T5)	18	High (66.7%)

Chien *et al.* (2012) New York, USA	• Hudson Health Plan, not-for-profit Medicaid-focused managed care health plan with P4P for diabetes care	• Diabetes-related health care utilization which included hospitalizations	• Quasi-experimental and cross-sectional study • **Time:** 2003 to 2007 • **Population:** Diabetes patients from the Hudson Health plan, focusing on patients continuously enrolled in P4P for six months or more for interrupted time-series design • **Covariate:** Patient demographics, comorbidity, type or practice, language spoken, time trend • **Analysis:** Interrupted-time series with post-intervention period beginning in 2005	• Post-intervention was not significantly associated with being hospitalized for diabetes (OR: 1.32; SE: 0.45)	17	Fair (63.0%)

Dimitrova *et al.* (2020) Portugal	• Implementation of Family Health Unit who are partly financed through pay-for-performance for conditions including diabetes	• Hospitalization for ACSCs, and certain disease-specific hospitalization for ACSC (includes diabetes)	• Longitudinal study • **Time:** 2000 to 2015 • **Population:** Inpatient stays at all public non-specialized Portuguese hospitals. Data were used from 276 Portuguese municipalities. • **Covariates:** Municipality-level purchasing power, proportion of elderly, number of inhabitants in each municipality, year, and regional differences • Treatment variable: Municipality with at least one Family Health Unit vs. none during 2006 to 2015 • **Analysis:** DID regression analysis with municipality fixed-effects, municipality-specific linear time trend	• No significant impact of Family Health Unit on the hospitalization for ACSC, and disease-specific incentivized ACSC (i.e. circulatory-related, diabetes-related)	20	High (74.1%)
Fiorentini *et al.* (2011) Emilia Romagna region, Italy	• Financial incentives in primary care focusing on P4P, P4Pa, and P4C	• Avoidable hospitalizations using two indicators: 27 medical DRGs and ACSCs	• Cross-sectional study • **Time:** 2005 • **Population**: Patients aged 18 and 74 years • **Covariates:** Patient-, physician-, and district level covariates • **Analysis:** Multilevel modeling, 3-level logit model	• P4P and P4C had a statistically significant effect on the probability of avoidable admissions using 27 DRGs. However, P4Pa did not have a significant effect • P4Pa is only significant when conducted with a subpopulation of type 2 diabetes patients, and using an outcome variable of admissions via acute	21	High (77.8%)

				complications for diabetes		
Gupta *et al*. (2019a) New Brunswick, Canada	• P4P for diabetes management for family physicians	• Costs for potentially avoidable hospitalizations, and hospitalization costs for ACSCs concordant with diabetes	• Quasi-experimental study • **Time:** 2009-2010 to 2014-2015 • **Population:** 35 years and older residents diagnosed with type 1 or type 2 diabetes prior to the study, and 35-years and older residents newly diagnosed with type 2 diabetes • **Exposed group:** Patients exposed to physicians' uptake of incentive; **Comparison group:** Patients not exposed • **Covariates:** Patient demographics, comorbidity, physician's remuneration model, physician practice size • **Analysis:** Logarithms for cost data, DID with matching and controlling for unobserved factors	• P4P introduction was associated with significant reduction in hospitalization cost for diabetes only in those who were newly diagnosed with diabetes (DID estimate: -0.083; $p < 0.01$) • No cost reduction observed in medium-term and longer-term diabetic patients, or for hospitalization costs for ACSCs concordant with diabetes	18	High (66.7%)
Gupta *et al.* (2019b) New Brunswick, Canada	• Gender-specific effects of P4P for diabetes care among family physicians	• Diabetes healthcare costs (includes potentially avoidable hospitalization costs attributable to diabetes)	• Quasi-experimental study • **Time:** 2009/10 to 2014/15 • **Population:** 35 years and older residents diagnosed with type 1 or type 2 diabetes prior to the study, and 35-years and older residents newly diagnosed with type 2 diabetes • Compares patients exposed to physician uptake of	• Trends in potentially avoidable hospitalization costs for diabetes and for other common comorbid conditions was not significantly different between patients exposed to physician uptake of P4P vs. not exposed in baseline cohort. The	18	High (66.7%)

			incentive vs. those not exposed • **Covariates:** PSM observed patient- and physician-characteristics • **Analysis:** PSM-adjusted DID econometric model	P4P effects did not also differ by physician gender. • Similar results seen in those newly diagnosed with type 2, however there was some indication of a trend towards lower hospital costs		
Hollander *et al.* (2015) British Columbia, Canada	• Incentives provided to physicians in the FFS primary care funding model for providing care to patients with chronic conditions including diabetes	• Healthcare costs including hospitalization costs, and hospital utilization (days, admissions, readmissions, and length of stay)	• Cross-sectional study • **Time:** Fiscal year 2010-2011 • **Population:** Patients with diabetes, congestive heart failure, COPD, hypertension • **Intervention group:** Those who received incentive-based care; **Comparison:** Those who received standard (non-incentive based) care • **Covariates:** Patient demographics, resource utilization band, attachment to practice • **Analysis:** PSM with the use of probit regression, paired sample t-tests	• Cost adjusted results revealed healthcare costs were higher in those who received incentive-based care vs. those who did not for diabetes. However, hospital costs were lower for diabetes patients with incentive-based care • Among patients with diabetes, those who received incentive-based care had fewer hospital admissions, fewer days in hospital, fewer readmissions, and shorter length of stay	20	High (74.1%)

Hsieh *et al.* (2017a) Taiwan	• P4P program for diabetes care	• Risk of all-cause, and diabetes-related mortality	• Longitudinal study • **Time:** 2000 to 2010 • **Population:** Patients with type 2 diabetes aged 18 and over using data from 2003-2005 • **Intervention group:** Patients enrolled in P4P; **Comparison:** Patients not enrolled in P4P • **Covariates:** Patient demographic variables, DCSI, CIC, baseline antidiabetes drug use, most frequent health institution characteristics • **Analysis:** PSM approach, multivariable Cox proportional hazard model, competing risk regression models	• Patients in P4P program had lower risk of all-cause mortality (HR: 0.59; 95% CI: 0.55, 0.63), and diabetes-related mortality (HR: 0.54; 95% CI: 0.49, 0.60)	19	High (70.4%)

Hsieh *et al.* (2017b) Taiwan	• P4P program for diabetes care	• All-cause, and diabetes-related mortality	• Longitudinal study • **Time:** 2000 to 2010 • **Population:** Cancer survivors with Type 2 diabetes • **Intervention group:** Patients enrolled to P4P; **Comparison:** Patients who did not enroll to P4P during patient identification or follow-up • **Covariates:** Patient covariates, DCSI, CIC, baseline density of diabetes and cancer care and time since cancer diagnosis, health institution characteristics • **Analysis:** PSM, multivariate Cox proportional hazard models, and competing risk regression models for sensitivity analysis	• P4P cancer survivors had lower risk of all-cause (HR: 0.581; 95% CI: 0.447, 0.756) and diabetes-related mortality (SHR: 0.451; 95% CI: 0.266, 0.765) than non-P4P survivors	21	High (77.8%)
Huang *et al.* (2016) Taiwan	• P4P program for diabetes care	• Hospitalization rate due to diabetes-related ACSCs	• Longitudinal study • **Time:** 2003 to 2011 • **Population:** Type 2 diabetic patients age 20 years and older • Looked at patients with MCC vs. those without • **Intervention group:** Patients newly enrolled to P4P from 2004 to 2007; **Comparison:** Patients never enrolled in P4P • **Covariates:** Patient demographics, DCSI, Medication Possession	• **Non-MCC:** Hospitalizations increased for non-P4P but P4P had lesser admissions after P4P implementation • **MCC:** P4P had fewer admissions after P4P implementation, and the effect of P4P was significant • P4P's effect was stronger in MCC patients	18	High (66.7%)

			Ratios, hospital accreditation level, hospital location • **Analysis:** PSM- DID model, GEE model with logit link function and binomial distribution			
Huang *et al.* (2021) Taiwan	• Effect of BMI and diabetes management P4P program	• Mortality	• Retrospective cohort study • **Time**: 2000 to 2014 • **Population:** Type 2 diabetes and ≥ 20 years old • Looked at diabetic patients participated in P4P vs not and patient's BMI (underweight, normal, overweight, mild obesity, and obesity) • **Covariates:** Patient characteristics, social and economic status, health status, diabetes complications severity index, health behavior, and level of primary care healthcare organizations • **Analysis:** Univariate Poisson regression, Cox proportional hazard model	• Irrespective of the BMI, there were significantly lower mortality rates in P4P diabetic patients compared to non-P4P patients within same BMI ($p< 0.05$) • The risk of death was lower in the P4P participants compared to the non-participants (HR: 0.55, 95% CI: 0.44, 0.69). The effect of P4P on reducing the risk of death was most significant in the underweight diabetic patients (HR: 0.11, 95% CI: 0.04, 0.38)	21	High (77.8%)

Iezzi *et al.* (2014) Emilia-Romagna region, Italy	• Diabetes Management program with financial incentives	• Hospitalizations for diabetic ACSCs, long-term, and short-term diabetes complications	• Longitudinal study • **Time:** 2003 to 2005 • **Population:** Type 2 diabetes diagnosed patients • Compared physicians of patients who received incentives ever year vs. never incentivized • **Covariates:** Physician level, and district level variables • **Analysis:** Poisson regression negative binomial model, with fixed and random effects	• Financial incentives have a negative and statistical significant effect on all three diabetes-related hospitalization outcomes	21	High (77.8%)
Kontopantelis *et al.* (2015) England, United Kingdom	• National P4P program for primary care, QOF, for managing chronic diseases including diabetes	• All-cause and cause-specific premature mortality for QOF-linked conditions (includes diabetes)	• Longitudinal spatial study • **Time:** 2007 to 2012 • **Population:** English general practices that participate in the QOF for at least one year in the study • **Covariates:** 2010 deprivation, urbanity vs rurality, ethnicity, morbidity load • **Analysis:** Multiple linear regression models with spatial weighted estimation	• All-cause and cause-specific mortality rates decreased over time • No statistical significant relationship between practice's performance on QOF indicators and all-cause and cause-specific mortality rates	17	Fair (63.0%)

Kung *et al.* (2020) Taiwan	• P4P program for diabetes care	• All-cause mortality	• Longitudinal study • **Time**: 2002 to 2011 • **Population:** Newly diagnosed type 2 diabetes patients • **Intervention group:** Patients enrolled to P4P within 5 years after diabetes diagnosis between January 1, 2002 and December 31, 2010; **Comparison:** Patients never enrolled to P4P • **Covariates:** Age, outpatient visits, antidiabetic agents, hospital level, geographic region, comorbidities • **Analysis:** Multivariate Cox proportional hazards model with robust sandwich variance	• P4P group had significantly lower mortality rate (HR: 0.58; 95% CI: 0.48, 0.69) • Compared to those that were matched controls, better adherence to P4P program was linked with greater reduction in mortality rate	20	High (74.1%)
Laberge & Pefoyo (2016) British Columbia & Alberta, Canada	• Primary care policy changes introduced in 2003 to improve diabetes care (i.e. Financial incentives in British Columbia, while in Alberta they transformed primary care and provided funding for PCNs)	• Hospitalization rate for diabetes	• Longitudinal study • **Time:** 1996 to 2010 • **Population:** Individuals less than 75 years old with diabetes at each index date over the study period in Alberta and British Columbia • **Covariates:** Age, sex, and year of observation • **Analysis:** Regression model with a before-and-after design with a fixed-effects model	• There was a decrease in hospitalization rate before and after 2003 • The period after 2003, (i.e. when the primary care policy changes occurred), did not have a statistically significant effect of the hospitalization rates in both provinces	16	Fair (59.3%)

Lavergne *et al.* (2018) British Columbia, Canada	• Implementation of incentives for chronic disease management (including diabetes in 2003) to primary care physicians	• Hospitalizations, total health spending (includes hospital spending)	• Quasi-experimental study • **Time:** 2001 to 2012 • Examined 2 years before and 2 years after each incentive program • **Population:** Patients who qualified for each incentive program, excluding those who moved out of the province during the study, and who received care from primary care physicians not paid by FFS • **Covariates:** Seasonality • **Analysis:** Segmented linear regression, generalized least squares model	• No significant changes in hospitalizations for diabetes (Average annual change: -4.9; 95% CI: -19.7, 9.8) comparing before and after incentive was introduced • No significant changes in total health spending among diabetes patients (Average annual change: -180; 95% CI: -450, 88). There was an increase in the spending on primary care physician services but this was counterbalanced by the decrease in acute care spending	20	High (74.1%)
Lee *et al.* (2010) Taiwan	• P4P program for diabetes care	• Hospital admissions, and health care expenses (includes fees for inpatient services)	• Natural experimental study • **Time:** 2005 to 2006 • **Population:** Patients diagnosed with diabetes every year between 2004 to 2006, and filled diabetes prescription claims for at least 3 months each year • **Intervention group:** Patients enrolled in P4P in 2006; **Comparison:** Patients with diabetes who never joined P4P • **Analysis:** DID regression, negative binomial distribution, normal distribution in regression models, and GEE	• P4P group had fewer diabetes-related hospitalizations (Coefficient: -0.027; $p = 0.03$) • P4P group had lesser expenses for diabetes-related inpatient services, a difference of -3,878 New Taiwan Dollars ($p < 0.001$)	18	High (66.7%)

Liao *et al.* (2016) Taiwan	• The P4P programs for diabetes, and Chronic Kidney Disease (CKD)	• All-cause mortality	• Longitudinal study • **Time:** 2011 to 2014 • **Population:** Patients with early CKD, and already diagnosed diabetes • There were four study groups: both diabetes and early CKD P4P; only diabetes P4P; only early CKD P4P; without any P4P • **Covariates:** Patient demographics, provider's characteristics, eGFR • **Analysis:** Multivariable Cox regression model	• Comparing to patients with both P4P programs, the risk of all-cause mortality was higher for the following groups: those without any P4P (HR: 2.42; 95% CI: 2.02, 2.91), and those with only CKD P4P (HR: 2.00; 95% CI: 1.66, 2.42). No statistical significance difference was seen when compared to diabetes P4P only (HR: 1.22; 95% CI: 1.00, 1.50) • Lowest likelihood of mortality observed in those with both P4P programs	19	High (70.4%)
Lin *et al.* (2016) Taiwan	• P4P program for diabetes care	• Hospitalizations for diabetic complications, and all-cause mortality	• Retrospective longitudinal cohort study • **Time:** 2002 to 2012 • **Population:** Diabetes patients above 30 and first diagnosed with Type 2 diabetes • Two sets: Full P4P participation and Partial participation; each group was matched with a control group • **Covariates:** Characteristics of patient, provider, and the cohort (i.e. program enrolled year) • **Analysis:** Multivariable Cox regression	• Full participation of diabetes P4P had a significant lower risk of being hospitalized for complications compared to control group (HR: 0.751, 95% CI: 0.704, 0.801). While the risk of being hospitalized was non-statistically significant in partial-participation of P4P (HR: 1.071, 95% CI: 1.000, 1.147). • Hazard ratio for all-cause mortality was lower for those in full and partial P4P	21	High (77.8%)

				programs versus controls; Full participants (HR: 0.4111, 95% CI: 0.742, 0.841); Partial participants (0.773; 95% CI: (0.737, 0.812)		
Lippi Bruni *et al.* (2009) Emilia Romagna region, Italy	• P4Pa and P4C incentives provided to primary care physicians for participating in collaborative activities or for following best practices for diabetes and other complex disease	• Hyperglycaemic admissions linked with ketoacidosis and hyperosmolar nonketotic coma	• Cross-sectional study • **Time:** 2003 • **Population:** Type 2 diabetics above the age of 35 • **Covariates:** Patient-physician-, and district level variables • **Analysis:** Multilevel logit model with three hierarchal levels (patient, GP, district)	• Larger share of diabetes-related payment is associated with lower probability of hyperglycaemic emergency admissions • P4Pa coefficient is significant while P4C coefficient is never significant	19	High (70.4%)

Lu *et al.* (2021) Taiwan	• P4P program for diabetes care	• **Primary outcome:** Major adverse limb events (MALE) • **Secondary outcomes:** Major adverse cardiac events (MACE), systemic thromboembolism, composite infection, heart failure hospitalization, all-cause mortality	• Retrospective cohort study • **Time:** 2002 to 2013 • **Population:** Patients with type 2 diabetes between 2002 and 2013 • **Intervention group:** Patients completed 1 year of P4P program • **Control group:** Patients who did not participate in the P4P program • **Covariates:** Age, sex, residence, income, diabetes duration, comorbidity, history of 3 cardiovascular events, 7 types of antidiabetic agents, 11 types of other medication • **Analysis:** PSM, Cox proportional hazards model, Fine and Gray subdistribution hazard model,	• P4P had significantly lower risks of MALE (SHR: 0.73, 95% CI: 0.71, 0.76). P4P group also had significantly lower risk of MACE, systemic thromboembolism, infectious complications, HF hospitalization, all-cause mortality	20	High (74.1%)
Lu *et al.* (2023) Taiwan	• P4P program for diabetes management	• All-cause mortality risk, all-cause spending, net value (defined as value of life years gained minus cost of care)	• Economic cost-benefit analysis • Retrospective cohort study • **Time:** 2007 and 2013 • **Population:** Patients with diabetes • **Intervention group:** (1) Newly enrolled P4P patients who were enrolled in 2010 – new enrollment model (NEM), (2) P4P patients who have been enrolled since the beginning of the study (2007 – 2009) surviving to the final period (2010 – 2013) – continuous enrolled model (CEM)	• Among those in CEM, predicted risk of death was higher among P4P than non-P4P, but predicted risk of death increased at slower rate than usual care • P4P patients had a lower actual rate of death in final period of study despite higher baseline risk of death • P4P group had lower average spending and more consistent spending	19	High (70.4%)

			• **Control group:** Patients receiving usual care (non-P4P patients) • **Covariates:** Age, gender, duration in baseline period, total all-cause spending in the baseline period, medical history, and use of medications • **Analysis:** Propensity score matching using logistic regression, used a modified version of the net value approach developed by Cutler et al. and Eggleston et al.			
Pan *et al.* (2017) Taiwan	• Physician continuity or care in diabetes P4P participants vs. non-participants	• Mortality (indicated as survival status)	• Longitudinal study • **Time:** 1997 to 2009 • **Population:** Patients newly diagnosed with type 2 diabetes between 2001 and 2009 • Patient in P4P vs. those who weren't • **Covariates:** Personal characteristics, environmental factors, health condition, primary physician characteristics, primary healthcare organization • **Analysis:** PSM, Cox proportional hazard regression	• Compared to non-P4P, P4P participants had lower risk of death (HR: 0.43; 95% CI: 0.41, 0.44)	20	High (74.1%)

Wu *et al.* (2021) Taiwan	• P4P program for diabetes care	• **Primary outcomes: V**isit to emergency room (ER) due to infection and infection-related death • **Secondary outcomes:** All-cause ER visits, infection-related ER visits, all-cause hospitalization, infection-related hospitalization, and all-cause mortality	• Retrospective longitudinal cohort study • **Time:** 2002 to 2013 • **Population:** Patients diagnosed with type 2 diabetes between 2002 and 2013 • **Intervention group:** Patients in the P4P group • **Control group:** Patients who did not participate in P4P program • **Covariates:** Patient demographics, healthcare use, and medication intake • **Analysis:** PSM, Cox proportional hazard model, Fine and Gray subdistribution hazard model, Poisson model,	• Infection-related death was significantly lower in P4P group than non-P4P (4.1% vs. 7.6%; HR: 0.46, 95% CI: 0.45, 0.47) • P4P program associated with reduced events of all-cause hospitalization and infection-related hospitalization • Risk of all-cause mortality was significantly lower in P4P group than non-P4P (11.3% vs. 21.2%; HR: 0.45, 95% CI: 0.45, 0.46)	19	High (70.4%)
Yen *et al.* (2022) Taiwan	• P4P program for diabetes care	• All-cause mortality, hospitalization for cardiovascular events, and composite major microvascular outcomes	• Retrospective longitudinal cohort study • **Time:** January 2001 and December 2018 • **Population:** Newly diagnosed young onset type 2 diabetes patients between January 2001 and December 2017 • **Intervention group:** Patients enrolled in P4P after diabetes diagnosis • **Control group:** Never enrolled in P4P • **Covariates:** Age, sex, obesity, smoking, comorbidities, diabetes complications severity, medications, number of oral	• P4P significantly lowered the risk of mortality (aHR: 0.31, 95% CI: 0.25, 0.38) and hospitalization for cardiovascular events (aHR: 0.63, 95% CI: 0.5, 0.79), but had a significantly higher risk of major microvascular outcomes (aHR: 1.31, 95% CI: 1.07, 1.6)	19	High (70.4%)

antidiabetic drugs and antihypertensive drugs
- **Analysis:** PSM, Cox proportional hazards model with robust sandwich standard error estimates, Kaplan-Meier method

USA, United States of America; P4P, Pay-for-performance; GEE, General Estimated Equations; DCSI, Diabetes Complication Severity Index; CIC, Chronic illness with complexity; DID, Difference-in-Differences; ER, Emergency room; GLM, Generalized Linear Models; OR, Odds Ratio; NTD, New Taiwan Dollar; 95% CI, 95% Confidence Interval; SE, Standard Error; COCI, Continuity of Care Index; ACSC, Ambulatory Care Sensitive Conditions; P4Pa, Pay-for-participation; P4C, Pay-for-compliance; DRGs, Diagnostic related groups; PSM, Propensity score matching; FFS, Fee-for-service; COPD, Chronic obstructive pulmonary disease; HR, Hazard Ratio; SHR, Sub-distribution Hazard Ratio; MCC, Multiple Chronic Condition; QOF, Quality and Outcomes Framework; PCN, Primary Care Networks; CKD, Chronic Kidney Disease; eGFR, estimated glomerular filtration rate; GP, general practitioner; aHR, adjusted Hazard Ratio.
*Modified Downs and Black Checklist was used.

Does financial incentive for diabetes management in primary care setting reduce avoidable hospitalizations and mortality in high-income countries? A systematic review

Thaksha Thavam[1], Michael Hong[1], Rose Anne Devlin[2], Kristin K Clemens,[1,3,4] Sisira Sarma[1,4]

[1]Department of Epidemiology & Biostatistics, Western University, London, ON, Canada.
[2]Department of Economics, University of Ottawa, Ottawa, ON, Canada.
[3]Department of Medicine, Division of Endocrinology and Metabolism, Western University, London, ON, Canada.
[4]ICES, ON, Canada.

*** Corresponding Author**

Telephone: (519)-661-2111 x.87583, E-mail: ssarma2@uwo.ca, Address: Schulich School of Medicine & Dentistry, Western University, 1465 Richmond Street, London, Ontario N6G 2M1

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Conflict of Interest statement

Nome of the authors have any conflicts of interest to declare.