

# Bundled Payments for Diabetes Care and Healthcare Costs Growth: A 2-Year Follow-up Study

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## ABSTRACT

**Objectives:** In the Netherlands, disease management programs (DMPs) for chronic diseases were formerly financed by fee-for-service payments supplemented by management fees (MFs). To stimulate diabetes DMPs nationwide, a bundled payment (BP) system was implemented alongside the existing system. We assessed the effects of diabetes DMPs and related payment systems on healthcare costs growth.

**Study Design:** We had access to all Dutch health claims data in order to study, in a longitudinal-retrospective design, the nationwide BP experiment. To the best of our knowledge, we are the first to study the differentiation between 2 alternative payment schemes for DMPs.

**Methods:** To answer our research question, we used the curative healthcare costs (sum of general practice costs, hospital-based specialist care, and pharmacy) from 64,011 adult patients with type 2 diabetes of 3062 different general practitioners (GPs). We performed multi-level regression analyses with difference in costs of 2008 to 2009 as the dependent variable, adjusting for baseline costs, age, sex, and comorbidity.

**Results:** Results showed an increase of €172 (\$219) per patient in curative healthcare costs and an additional increase of €287 (\$366) per patient enrolled in BP DMPs from the first to the second year after implementation. The cost increase in the MF group did not differ from the care as usual. Cost increases did not vary between GPs or insurers. We found that an increase in costs was much more likely for multimorbid adult patients with diabetes.

**Conclusions:** The BP model was associated with increasing cost growth, at least in the start-up phase.

The healthcare systems of western countries face the increasing challenge of providing high-quality care while simultaneously keeping their healthcare systems affordable and accessible. In many countries, including the USA and the Netherlands, integrated care in combination with payment reforms are increasingly seen as the main tools in meeting these challenges. The aim of all payment reforms is to establish the financial alignment of care providers in order to enhance the quality and continuity of integrated care, while simultaneously slowing down the growth of costs. One such payment reform in the United States that is targeting primary care is the Alternative Quality Contract (AQC).<sup>1</sup> Research has shown that patients of primary care physicians enrolled in AQC showed a slower cost increase than patients in the control group.<sup>2,3</sup> In the Netherlands, integrated care for chronically ill patients is organized similarly into disease management programs (DMPs) (see **eAppendix 1** for more information [eAppendices available at [www.ajmc.com](http://www.ajmc.com)]). In the Netherlands, DMPs were introduced 2 decades ago, but a nationwide establishment of DMPs was hampered by a fragmented Dutch funding system.

In order to eliminate these financial obstacles, in 2007, the Minister of Health, Welfare and Sport approved the introduction of a bundled payment (BP) system for diabetes care, to be implemented on a 3-year trial basis (2007-2009). Under this BP system, health insurers paid a single fee to a principal contracting entity—a new legal entity called a care group—to cover all the elements of primary diabetes care for patients with diabetes. These provider-led integrated care organizations are comparable



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to accountable care organizations in the United States. The care groups play an active role in supporting and coordinating the contracted diabetes services between the subcontracted providers. This managing role manifests itself in activities like the arrangement of multidisciplinary consultations with subcontracted care providers and the drafting of multidisciplinary protocols based on the Dutch Diabetes Federation Health Care Standard.<sup>4</sup> These protocols create clarity for all care providers and establish which healthcare providers are to deliver which items of care, as well as what criteria of referral and back-referral should apply (eAppendix 1).

The concept of the Dutch care groups is comparable not only to the AOCs in the United States, but also to the Clinic Commission Groups in England because of their partial shifting of the commissioning role from the insurers to the providers.<sup>5</sup> Furthermore, the Dutch BP system seems comparable to the US episode-based payment systems because of its BP character. However, there is a fundamental difference in focus: the Dutch BP model aims to strengthen primary care, thus avoiding hospital-based care utilization, whereas the US BP model starts with a hospital admission and focuses on inpatient costs and the hospital discharge period, with the aim of reducing the number of readmissions. For general practitioners (GPs), some reasons to participate in these groups included the potential for quality improvement, strengthening their position and the future role of primary care in the healthcare system, and the financial incentives of the BP model. However, not all insurers were in favor of the BP system since these insurers were of the opinion that commissioning must be exclusively done by insurers. Consequently, these insurers set up an alternative payment system for diabetes DMPs. In this alternative system, doctors were still paid according to the former pricing mechanism for DMPs, which reimbursed providers for the provision of direct healthcare on a fee-for-service basis, supplemented by a management fee (MF) for the care group. The MF covered the costs of activities other than the direct provision of healthcare, such as overhead costs, benchmark information and communication technologies, and the coordination of the delivery of the integrated care.

In addition to BP and MF payment for diabetes DMP, diabetes care was also provided on a fee-for-service (FFS) basis without any additional fees; in this case, the care provided was not part of an organized DMP; it was considered care as usual (CAU). Between 2007 and 2009, it was up to the GPs to decide whether or not to join a care group. In 2010, BP was introduced as the standard payment system for DMPs, and currently, most patients with diabetes are enrolled in a BP-based DMP.

Although the BP system was structurally implemented in 2010, the scientific evidence behind the BP system is still lacking, most probably because it is difficult to separate the effects of DMP

from the effects of BP. Initial studies suggested that the introduction of the BP system for DMPs improved the delivery of diabetes care,<sup>6</sup> and resulted in slight to modest improvements in patient outcomes (eg, systolic blood pressure and cholesterol levels).<sup>7</sup> The effects of the BP system on cost growth are, however, still unknown. At the time of implementation, the BP group might have, on average, the highest patient healthcare expenses. This is because the BP fee of approximately €400 per year may exceed the sum of the fees of separate diabetes healthcare services of the CAU group. However, it is expected that BP will result in cost savings both in the short and the long run.

In the long run, the improved quality and continuity of care within the primary care setting should lead to more patients with well-controlled diabetes. Subsequently, fewer patients would need to utilize ambulatory specialist care or inpatient care, resulting in cost reductions in specialist and hospital care in the middle or long run. However, BP may also lead to short-term cost savings. BP stimulates task delegation and relocation from more expensive secondary care toward less-costly primary care with concomitant instant cost reduction. Next to that, BP stimulates the introduction of a uniform IT system, which may decrease unnecessary duplicated services, which, in turn, may lead to cost reductions in the mid-term as well. The present study examined whether diabetes DMPs, and related payment reforms, in particular, resulted in a slowdown in the growth of costs in the Netherlands.

Our research questions are formulated as follows: 1) How do the curative healthcare costs of diabetes patients develop over time? 2) What is the effect of DMPs on the growth of curative healthcare costs for diabetes patients? 3) What is the effect of BP on the growth of curative healthcare costs for diabetes patients?

## METHODS

### Data

Our analyses were based on 2008 to 2009 health insurance claims data, which were obtained from Vektis, the healthcare information center in the Netherlands. Vektis collects and manages health claims data from all Dutch insurance companies on all healthcare procedures covered by the Dutch basic statutory insurance package, including the costs for compulsory deductibles.<sup>8</sup> Vektis data also contain personal information on the policyholders, including date of birth and gender. Due to data restrictions, we were not able to perform this analysis with data from 2006 and 2007 because the quality of the hospital cost data were not guaranteed. The coverage rates of Vektis databases in 2008 and 2009 were 83% and 92%, respectively, of all insured people living in the Netherlands, and the data quality of these years was good. We selected 64,011 cases from about 700,000 patients with diabetes living in the Netherlands with complete and reliable information, which were continuously enrolled by the same GP during 2008

**Table 1. Overview of the Study Population Groups**

Name of Group	Delivery of Diabetes Care	Payment of Diabetes Care	Diabetes Care Organized by	Classification GPs
BP	Disease management program	BP	Care groups	Any patient with a BP procedure code number
MF	Disease management program	Fee-for-service + additional MF	Care groups	Any patient with an MF procedure code number
CAU	Care as usual	Fee-for-service (without additional MF)	Not applicable	No patients with a BP or MF procedure code number

BP indicates bundled payment; CAU, care as usual; GP, general practitioner; MF, management fee.

For more details, see eAppendix 2.

and 2009 (eAppendix 2).

### Study Population

We distinguished 3 groups of patients with type 2 diabetes: 1) the BP group—patients registered with GPs enrolled in DMPs and participating in care groups paid by BPs; 2) the MF group—patients registered with GPs enrolled in DMPs paid by a supplemented MF; and 3) the CAU group—patients registered with GPs not enrolled in DMPs and paid on an FFS basis. **Table 1** summarizes the assignment procedure (eAppendix 2).

### Curative Healthcare Costs

Cost data were confined to the curative healthcare costs reimbursed under the basic statutory insurance package and the compulsory deductibles paid by the patients. Curative healthcare costs were defined as the sum of the general practice costs (consultation fees, capitation allowances, costs for practice nurses, and costs for integrated care [ie, BPs or MFs]), costs of hospital-based specialist care (outpatient costs, day-patient costs, and inpatient costs), and other curative costs (pharmacy, medical aids, physiotherapy, exercise therapy, speech therapy, occupational therapy, dietetics, patient transport, and mental healthcare) per patient. To enable meaningful cost comparisons between years, we adjusted all healthcare costs using the consumer price indexes published by Statistics Netherlands. All costs reported in this study were adjusted to real prices in the 2010 reference year (deflators employed for 2008: 1.0258 and for 2009: 1.0134). The results are presented in euros (US dollars).

### Statistical Analyses

To answer our research questions, we performed several regression analyses, where the dependent variable was the difference in curative healthcare costs between 2008 and 2009. To answer the first research question, the cost difference, controlled for curative healthcare costs of the baseline year 2008, is presented. The costs of the 2 years were not likely to be statistically independent.

To assess the cost effects of DMPs of any kind in compar-

ison to the CAU group (research question 2), we performed a regression analysis, without making a distinction between DMPs reimbursed by BP or MF. We performed a multivariate regression analysis in which the BP group and the MF group was combined and compared with the CAU group (the reference group), while considering patient characteristics as confounding variables.

Finally, to investigate whether the payment system affects the cost growth (research question 3), we compared the 2008 to 2009 cost increase of patients from the BP group and MF group with patients from the CAU group (reference group). In all analyses, we adjusted, at the patient level, for age (measured in years and centered on the mean of 67.6 years), gender (1 = male, 0 = female), and the number of additional chronic conditions (0-16). The Anatomical Therapeutic Chemical classification was used to detect additional chronic conditions<sup>9</sup> (eAppendix 3).

We performed additional sensitivity analyses. First, we studied the potential impact of cluster effects at the GP and the insurer levels. Patients were nested in GPs and in insurers. This clustering in the data structure should not be ignored because that might lead to false conclusions.<sup>10</sup> We used intra-class correlation coefficients (ICCs) to test for significant patient cost variations between GPs and between insurers. We did not perform any multi-level analyses with the care groups as a level because the CAU group has no units on this level. Second, since only patients of the CAU group were classified on the basis of their medication, we carried out a sensitivity analysis. Patients from the BP and MF group were classified according to their health claims data; hence unmedicated patients with diabetes, managing their disease with diet only, may have also been included. In this sensitivity analysis, we exclusively included patients taking oral medication in the BP and MF group to ensure an optimal comparison with the CAU group.

### RESULTS

**Table 2** presents the characteristics of the total study population (N = 64,011) and of the different study groups, including the average crude healthcare costs per patient with diabetes for 2008

**Table 2. Characteristics of the Study Population (N = 64,011) and Curative Healthcare Costs<sup>a</sup> (€) per Group, 2008**

	BP <sup>b</sup> Group	MF <sup>b</sup> Group	CAU Group	Total
<b>Patients</b>				
N (%)	20,257 (31.7)	13,611 (21.3)	30,143 (47.1)	64,011
Average age, years <sup>c</sup> (SD)	67.4 (11.2)	68.3 (11.4)*	67.5 (11.4)	67.6 (11.3)
Gender (man), %	48.3*	50.6	50.3	49.7
Average number of comorbid conditions, <sup>c,d</sup> (SD)	0.5 (0.7)	0.5 (0.7)	0.5 (0.7)	0.5 (0.7)
A10B <sup>a</sup> medication use, %	90.4	95.0	100.0	95.9
<b>GPs of patients</b>				
N (% of total patients)	544 (17.8)	472 (15.4)	2046 (66.8)	3062 (100)
Gender (man), N (% per group)	284 (52.2)	383 (81.1)	1499 (73.3)	2266 (74.0)
Care groups, N	36	18	N/A	54
<b>Insurance companies of patients</b>				
N	24	22	23	24
<b>Mean (SD) costs per patient with diabetes</b>				
Curative costs 2008 <sup>e</sup>	4438 (6776)*	4083 (6228)	4149 (6664)	4227 (6611)
Curative costs 2009 <sup>e</sup>	4688 (7169)*	4225 (6304)	4283 (6482)	4399 (6674)
Cost difference 2008/2009 <sup>e</sup>	248.8 (7756)	141.8 (6635)	133.9 (7320)	171.9 (7323)

BP indicates bundled payment; CAU, care as usual; GPs, general practitioners; MF, management fee; N/A, not applicable; “\*” indicates  $P < .001$ , highly significant.

<sup>a</sup>Curative healthcare costs were defined as the sum of general practice costs, costs of specialist (hospital-based) care, and other curative costs (ie, pharmacy, medical aids, physiotherapy, exercise therapy, speech therapy, occupational therapy, dietetics, patient transport, and mental healthcare) per patient.

<sup>b</sup>BP and MF are 2 payment systems of disease management programs.

<sup>c</sup>For this variable, the unadjusted significant differences between BP or MF, and CAU were estimated.

<sup>d</sup>Only 2010 data was available.

<sup>e</sup>A10B is according to the Anatomical Therapeutic Chemical classification system, and includes blood glucose-lowering drugs (excluding insulins).

and 2009. Our study population was comparable to that of other studies, with the average age being around 67 years and a sex distribution of 50% men.<sup>11,12</sup> In the MF group, people were significantly older, and in the BP group, there were more women. The prevalence of comorbidity did not differ between groups. The average yearly costs per patient with diabetes was €4227 (\$5385) for the entire population. Average crude healthcare costs were highest for patients enrolled in the BP group in 2009, namely €4688 (\$5972).

### Cost Development of Patients With Diabetes From 2008 to 2009

Overall, the curative healthcare costs of the average patient with diabetes increased €172 (ie, 5%; \$219) from 2008 to 2009. The negative association between the difference of curative healthcare costs between 2008 and 2009 and 2008 baseline cost implies the higher the cost in 2008, the smaller the increase over time (Table 3, Model 1). Thus, €1 above average baseline costs corresponds with a 60 cent–smaller increase in the cost difference between 2008 and 2009.

### Effect of DMP on Cost Growth

The 2008 to 2009 cost trend for patients in DMPs (BP + MF group) diverged from that of the patients receiving CAU. After adjustment for 2008 baseline cost, the costs for patients in DMPs increased by €161 (\$205) more than the costs for patients receiving CAU (Table 3, Model 2).

### Effect of BP Model on Cost Growth

Independent of baseline costs in 2008, curative healthcare costs for the BP group increased significantly more (€290; \$369) than the costs for the CAU group (Table 3, Model 3). Also, after adjusting for patient characteristics, the difference remained significant in contrast to the cost increase for patients in the MF group, which did not significantly diverge from that of the patients from the CAU group (Table 3, Model 4). These findings suggest that the larger cost increase for patients enrolled in a DMP (either reimbursed by BP or MF) as compared with patients in the CAU group, can be completely attributed to those in the BP group. Moreover, Table 3, Model 4 shows that having a chronic condition in addition to diabetes is significantly associated with strong cost growth.

### Sensitivity Analyses

Neither the level of GP (Table 4, Model 2) (ICC, 0.09%;  $P = .1552$ ) nor the level of insurance (Table 4, Model 3) (ICC, 0.06%;  $P = .0865$ ) affected our finding that the cost growth is largest for patients in the BP group. Table 4, Model 4 shows that including unmedicated diabetes patients in our study population did not affect our findings either.

### DISCUSSIONS

Our study aimed to estimate the effects of DMPs on the curative healthcare costs growth of patients with diabetes in the Netherlands, and to specifically gauge the effects of the new BP system as a pricing model for such DMPs. Our study showed that as early as 2008, the average crude healthcare costs were highest for patients enrolled in the BP group. Furthermore, curative healthcare costs of patients with diabetes increased 5% in the period from 2008 to 2009, which corresponds with the overall increase in curative healthcare costs in the Netherlands. Our study suggests that DMPs did not slow down the cost growth. On the

contrary, our findings show that during the first years after the introduction of the BP model for diabetes care, the costs increased significantly for the BP group compared with the CAU group, while this strong increase was not seen in the MF group. Beside the effect of DMPs and their payment systems on costs, we also found that an increase in costs was much more likely for multimorbid adult patients with diabetes.

The general assumption of the Dutch BP approach was that it stimulates the collaboration between care providers, and, by doing so, improves the quality and continuity of care while simultaneously reducing healthcare expenditures.<sup>13</sup> However, the evidence that DMPs result in healthcare cost savings is inconclusive.<sup>14-16</sup> The present study shows that diabetes DMPs in the Netherlands have not resulted in healthcare costs savings during the first years after the introduction of BP, but that they actually resulted in an increase when DMPs were paid via BPs. Our conclusions are consistent with those of another analysis of claims data by a Dutch insurer.<sup>17</sup> In this non-peer reviewed study, which included claims data from only one Dutch insurer, the conclusion

**Table 3. Effects of DMPs and Their Payment Systems on Curative Healthcare Costs Growth From 2008 to 2009 for Patients With Diabetes (N = 64,011)**

	Model 1 <sup>b</sup>	SE	P	Model 2	SE	P	Model 3	SE	P	Model 4	SE	P
Intercept	171.4	23.9	<.0001	86.4	35.4	.0145	86.4	35.4	.0146	-881.3	45.9	<.0001
2008 baseline costs	-0.6	0.004	<.0001	-0.6	0.004	<.0001	-0.6	0.004	<.0001	-0.7	0.004	<.0001
Age <sup>a</sup> (centered)										16.7	2.2	<.0001
Gender (ref = female)										296.1	48.2	<.0001
Number of comorbid conditions (0-15)										1813.5	36.1	<.0001
DMP: Yes				160.6	48.6	.0010						
No				ref								
Group: BP							290.0	55.8	<.0001	287.4	54.6	<.0001
MF							-31.8	63.3	.6154	-75.4	62.1	.2247
CAU							ref			ref		
-2 Res log likelihood	1,298,309			1,298,288			1,298,256			1,295,519		

DMP indicates disease management program; ref, reference; SE, standard error.

Curative healthcare costs were defined as the sum of general practice costs, costs of specialist (hospital-based) care, and other curative costs (ie, pharmacy, medical aids, physiotherapy, exercise therapy, speech therapy, occupational therapy, dietetics, patient transport, and mental healthcare) per patient.

<sup>a</sup>The reference age is 67.8 years.

<sup>b</sup>In the null-model without correction for baseline costs the intercept was €171.2 (SE = 28.9);  $P < .0001$ ; and -2 res log likelihood 1,320,887.

**Table 4. Sensitivity Analyses for Payment System Effects on Differences in Curative Care Costs<sup>a</sup> (€) From 2008 to 2009 for Patients With Diabetes**

	Model 1	SE	P	Model 2	SE	P	Model 3 <sup>b</sup>	SE	P	Model 4	SE	P
Intercept	-350.2	84.4	<.0001	-879.7	46.2	<.0001	-844.1	66.0	<.0001	-885.8	46.2	<.0001
2007 baseline costs	-0.7	-0.007	<.0001									
2008 baseline costs				-0.65	0.004	<.0001	-0.7	0.004	<.0001	-0.7	0.004	<.0001
Age, years (centered)	16.3	3.7	<.0001	16.7	2.2	<.0001	16.7	2.2	<.0001	16.7	2.2	<.0001
Gender (ref = female)	273.1	81.3	.0008	296.2	48.2	<.0001	297.4	48.2	<.0001	298.6	49.1	<.0001
N, comorbid conditions (0-15)	1926.5	60.5	<.0001	1813.6	36.1	<.0001	1813.8	36.1	<.0001	1819.6	36.7	<.0001
DMP: Yes	323.8	83.8	<.0001									
No	ref											
Group: BP				286.6	55.8	<.0001	314.8	58.7	<.0001	296.6	56.2	<.0001
MF				-75.6	63.2	.2407	-49.6	64.4	.4406	-74.8	63.0	.2353
CAU				ref			ref			ref		
ICC				0.09%		.1552	0.06%		.0865			
-2 Res log likelihood										1,241,768		
N, level-1 patients				64,011			64,011			61,370		
N, level-2 GPs				3062								
N, level-2 insurers							24					
Average number of patients per level 2				20.9			2667.1					

BP, bundled payment; CAU, care as usual; GP, general practitioner; ICC, intraclass correlation coefficient; MF, management fee; ref, reference; SE, standard error.

<sup>a</sup>Curative healthcare costs were defined as the sum of general practice costs, costs of specialist (hospital-based) care, and other curative costs (ie, pharmacy, medical aids, physiotherapy, exercise therapy, speech therapy, occupational therapy, dietetics, patient transport, and mental healthcare) per patient.

<sup>b</sup>Model 3 includes only diabetes patients using medication. Model 4 includes only diabetes patients enrolled in MF in 2008.

was that the costs for patients enrolled in DMPs under BP contract had increased more strongly than the costs for patients in programs supported by MFs.

The present findings are based on the period that could be considered as the start-up phase of the BP approach, as both care groups and health insurers were still gaining experience with contracting DMPs and organizing their payment systems. As a consequence, avoidable double payments may have occurred for certain medical procedures.<sup>11</sup> In 2007, neither insurers nor care groups had adequate experiences for estimating market-competitive fees for their care bundles. Therefore, it is likely that the

higher average medical spending of the BP group in 2008 is partly due to successful negotiations of care groups in the first years of BP. Likewise, the 2-year time frame of our study was probably too short to gauge the full impact of the BP approach. This “lag time” effect of payment reforms was also observed in a Taiwanese study investigating the payment reform in integrated care on healthcare costs. The 4-year follow-up study showed different findings than the 2-year follow-up.<sup>18,19</sup>

Based on our findings, the next step in the integration of care for the chronically ill might be to include more specialist care in integrated care programs. Early findings on US episode-based

payment systems in hospitals showed cost savings.<sup>20-22</sup> Another lesson learned from the BP-based DMPs in the Netherlands may be that the single-disease BP-based approach is not the way to go. The findings of our study suggest that cost growth is primarily due to multimorbidity in patients with diabetes.

### Limitations

Our study does have some limitations, as it may well be that well-controlled diabetes patients were slightly underrepresented. Healthier people are more likely to switch GPs,<sup>23</sup> and these people were excluded because of the multi-level data design (ie, guarantee of a constant 2-year exposure to the same GP). This resulted in a sample size of about 64,000 patients from the approximately 700,000 to 800,000 patients with diabetes in the Netherlands.<sup>12</sup> Even though this study does not encompass all diabetes patients from 2008 and 2009, it represents the early starting care groups ( $n = 54$ ) very well with constantly involved patients and no missing data.

Our study, like other observational studies, has the advantage of a real-life setting. However, a limitation that goes along with this design is the nonexperimental random choice of intervention and control groups. To balance the pre-intervention characteristics of patients, we would need access to information from before 2008; unfortunately, we have no data from this period. However, the balance between the characteristics of the groups in 2008 was good. Therefore, we assume that the effect of the balance bias on the cost growth is negligible and that groups were comparable.

### CONCLUSIONS

Our study advances existing literature on the effects of DMPs by its use of retrospective cost analyses with a 2-year intervention period. Other studies were based on estimated costs,<sup>24</sup> and some were lacking substantial amounts of curative costs.<sup>25</sup> We worked with actual health claims data that provide readily available information on large numbers of patients and healthcare providers.<sup>26</sup> Furthermore, in contrast to other studies,<sup>2,25,27</sup> we used data from more than one insurer and have, therefore, no sponsor bias and have achieved a better representation of the national population. A follow-up evaluation covering a longer time span is needed to address the research question of whether higher-quality care leads to fewer complications and, ultimately, to declining costs.

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