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Repeat prescriptions of guideline-based secondary prevention medication in patients with type 2 diabetes and previous myocardial infarction in Dutch primary care

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Abstract

Background. Secondary prevention is efficient in reducing morbidity and mortality after a myocardial infarction (MI). However, both short-term and long-term mortality after MI remains relativity high in type 2 diabetes patients.

Objective. To evaluate repeat prescriptions of secondary prevention medication (anti-thrombotic agent, beta-blocker and statin) in type 2 diabetes patients with a previous MI.

Methods. Data of 1009 type 2 diabetes patients with a previous MI were extracted from the Julius General Practitioners' Network database. The proportion of patients with recent repeat prescriptions of guideline-based medication was determined. Furthermore, repeat prescriptions was determined 6 months, 1 year, 2 years and 5 years after MI. Generalized linear models were used to examine changes over time. Multivariate logistic regression analysis was used to analyse the association between patient characteristics and prescription.

Results. Only 46% of all type 2 diabetes patients with a previous MI had a recent repeat prescription for all three medicines. An increase in prescription over time was found for statins (P = 0.001). Older aged people [odds ratio (OR): 0.99, 95% confidence interval (CI): 0.98–1.00] were less likely to receive the combination of all three.

Conclusion. A substantial proportion of type 2 diabetes patients with a previous MI did not receive guideline-based secondary prevention. Prescription rates were quite stable over time. This study confirms the need for a different approach to achieve an improvement of secondary prevention in type 2 diabetes patient with a previous MI. GPs can play an important role in this respect by being extra alert that prescription occurs according to the guidelines.

Key words: Hospital discharge, multidisciplinary care, myocardial infarction, secondary prevention, type 2 diabetes.

Introduction

Patients with type 2 diabetes mellitus are at higher risk of cardiovascular events, compared with patients without diabetes. Over the last decades, mortality rates after myocardial infarction (MI) have decreased in the Netherlands due to improved treatment in the acute phase and more aggressive secondary prevention (1). Nevertheless, mortality is relatively high among type 2 diabetes patients compared with patients without diabetes, especially after recurrent events (1). Evidence-based secondary prevention

medication is efficient in reducing mortality and morbidity after MI (2). Guidelines on secondary prevention therapy include a lifelong repeat prescription of at least a combination of an anti-thrombotic agent, a beta-blocker and a statin to all patients (3). In the Netherlands, the cardiologist is responsible for the initial prescription of secondary prevention therapy. After hospital discharge, the GP manages lifelong repeat prescriptions. It has been found that although the combination of these medicines is initially prescribed in 70% of the patients at discharge, after 1 month only 48% continues to use all three (4).

Previous research in Dutch primary care showed that the quality of diabetes care has improved over the past years, with improvements in adherence to management guidelines in terms of recommended process measures and good intermediate cardiometabolic outcomes (including HbA1c, blood pressure, cholesterol levels) in type 2 diabetes (5). However, undertreatment for blood pressure and glucose remained prevalent in 61% and 53% of the patients (6). In other countries, secondary prevention therapy was unsatisfactory in cardiovascular patients, especially patients with type 2 diabetes did not reach treatment targets (7,8). This insufficient secondary prevention has been associated with several patient characteristics such as older age, female gender, less comorbidity and a low social-economic status (9,10). Against that background, and taking into account that mortality remains relatively high in type 2 diabetes after an MI, the aim of this study was to evaluate the level of ongoing secondary prevention in type 2 diabetes patients with previous MI in Dutch primary care. It should be noted that in the Netherlands anti-thrombotic agents, beta-blockers and statins are in principle all fully reimbursed for all patients. We aimed to examine whether type 2 diabetes patients with a previous MI have ongoing repeat prescriptions of guideline-based preventive medication and to assess the association between patient characteristics and the above-mentioned medicines. Furthermore, we assessed the changes in prescription rates over time after the MI.

Methods

Study population

Data were obtained from the Julius General Practitioners' Network (JGPN) database, which contains routine health care data anonymously extracted from electronic primary care settings in the area of Utrecht (11). The database includes data on medication prescribed by both primary care and secondary care physicians. We used data from 56 general practices, covering a population of 11 267 type 2 diabetes patients [coded according to the International Classification of Primary Care (ICPC) as T90.02]. Inclusion criteria were (i) a diagnosis of type 2 diabetes and (ii) a previous MI. Exclusion criteria were (i) a diagnosis of type 2 diabetes before the age of 35 years; (ii) no or incorrect data on date of birth, type 2 diabetes diagnosis and/or occurrence of MI; and (iii) no longer registered at one of the general practice included in the JGPN (Fig. 1).

Measures

Data were extracted between March 2012 and July 2012. From all included patients, data were retrieved with regard to patient characteristics, prescribed medicines, date of diagnosis of type 2 diabetes and date of occurrence of MI (ICPC K75.00 or K76.00).

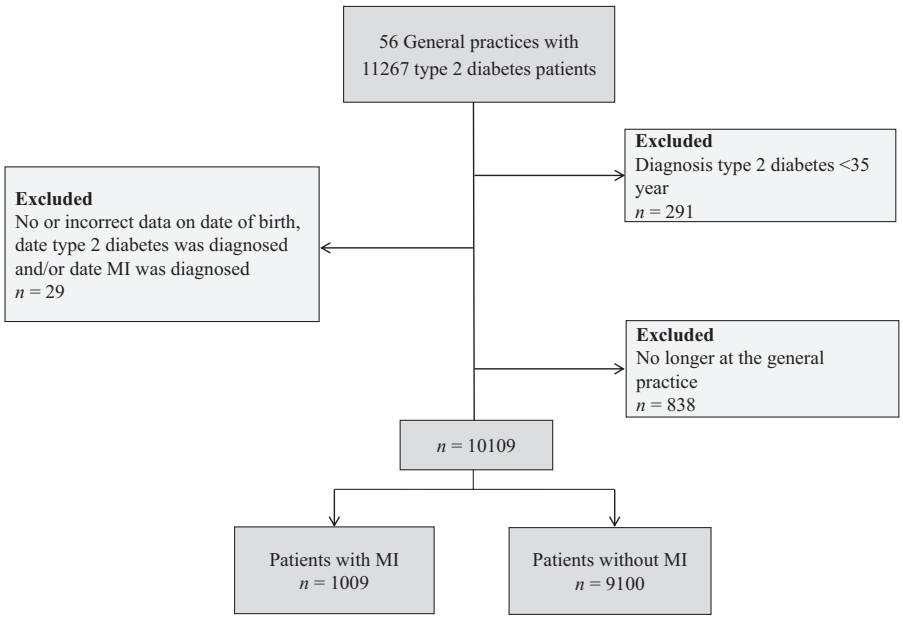


Figure 1. Patient enrolment.

Patient characteristics included age, gender and socioeconomic status (SES). Low SES was defined as whether the patient lives in a areas with postal codes belonging to disadvantaged areas (12). Prescription of guideline-based medication was defined as a prescription of an anti-thrombotic agent (ATC B01A), a statin (ATC C10AA) and a beta-blocker (ATC C07A). Recent (i.e. at date of data extraction) repeat prescription was defined as being present if any beta-blocker, any statin and any platelet aggregation inhibitor or oral anticoagulant had been prescribed within 6 months before data extraction.

Statistical analysis

Baseline characteristics are presented as mean values with standard deviations or numbers with percentages. The proportion of patients with recent repeat prescriptions of the above-mentioned classes of drugs was calculated. In addition, prescription rates were determined at different time points after MI (after 6 months, 1 year, 2 years and 5 years). Generalized linear models for repeated measures were used to examine changes over time. When appropriate, a Bonferroni test for multiple comparisons was used for *post-hoc* analysis.

To evaluate the association between age, gender, SES and duration of type 2 diabetes on the one hand and repeat prescription on the other, multivariate logistic regression analysis was performed. To determine if the prescription rate was influenced by whether the MI occurred before or after type 2 diabetes diagnosis, chi-square tests were used to compare recent prescription rates of the three medicines and the combination in the group who first had type 2 diabetes with the group who first had the MI. All analyses were performed using SPSS version 20.0 (IBM SPSS statistics).

Results

Baseline characteristics

The study population consisted of 1009 patients (mean age 71.2 ± 10.8 years; 68% male) with type 2 diabetes and previous MI (Table 1). The median [inter quartile range (IQR)] duration since diagnosis of type 2 diabetes was 6.0 (3.0–9.0) years. The median (IQR) time since MI was 6.1 (3.1–12.5) years. A low SES score was found in 15% of the patients (n = 154).

Secondary prevention

Of all patients with type 2 diabetes and previous MI, only 46% were recently (i.e. at date of data extraction) registered with prescriptions of all three recommended medicines (Table 1). The proportion of patients with a repeat prescription for at least one of the three guideline-based medications was much higher, namely 87%. Of the three medications, beta-blockers were the least prescribed (60%) and anti-thrombotic agents were most often prescribed (78%; Table 1). Regarding time elapsed since MI, no differences were found for anti-thrombotic agent, beta-blocker and the combination for the three medications (Fig. 2). Change in prescription rates over time was found for statin prescription (P = 0.001). *Post-hoc* analyses revealed significant increases between prescription rates at 6 months and 1 year (61% versus 69%, P = 0.019), and between 6 months and 5 years (61% versus 71%, P = 0.002), with the lowest prescription rates at 6 months after MI. In 45% of the patients, the occurrence of MI was before the date type 2 diabetes was diagnosed. In these patients, the MI was diagnosed on average 8.6 ± 7.0 years before the diagnosis of type 2 diabetes. Whether the occurrence of MI was before or after the type 2 diabetes diagnosis had no impact on the prescription rates (anti-thrombotic agent: chi-square = 0.092, P = 0.762; beta-blocker: chi-square = 0.306, P = 0.580; statin: chi-square = 1.497, P = 0.762; all three: chi-square = 0.125, P = 0.724).

Table 1. Characteristics of type 2 diabetes patients with MI and proportion ongoing (i.e. between March 2012–July 2012) prescription rates of secondary prevention medication

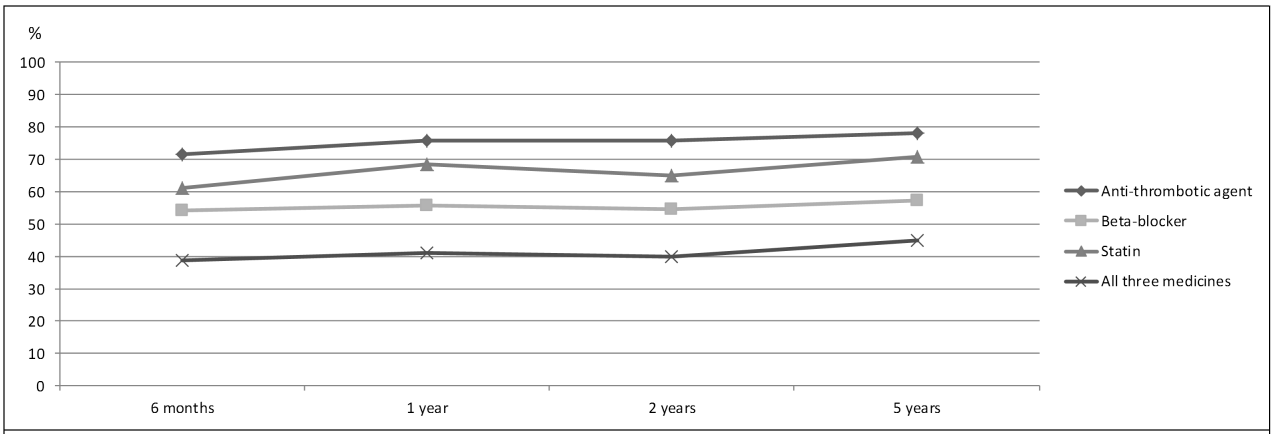
	n = 1009
Age (mean, SD)	71.2 ± 10.8
Male gender (%, n)	67.6 (682)
Median (IQR) duration since type 2 diabetes diagnosis (years)	6.0 (3.0–9.0)
Median (IQR) duration since MI (years)	6.1 (3.1–12.5)
Low social-economic status (%, n)	15.3 (154)
Occurrence MI before diagnosis type 2 diabetes (%, n)	45.1 (455)
Medication type (%, n)	
Anti-thrombotic agent	77.8 (785)
Beta-blocker	60.2 (607)
Statin	70.4 (710)
All three	45.9 (338)

Determinants of treatment

A 1-year increase in age decreases the odds of getting all medicines prescribed by ~1.3% (OR: 0.99, 95% CI: 0.98–1.00; Table 2). Analysis of determinants for a repeat prescription of one of the three medicines showed that women were less likely than men to have a repeat prescription of an anti-thrombotic agent (OR: 0.73, 95% CI: 0.53–0.99). Older aged patients had less frequently a repeat prescription for a statin (OR: 0.98, 95% CI: 0.97–0.99; Table 2).

Conclusions

The results of this study show that a substantial proportion of type 2 diabetes patients who experienced an MI did not receive



	6 months (n = 753)	1 year (n = 712)	2 years (n = 643)	5 years (n = 502)	P-value
Anti-thrombotic agent (%)	71.6	75.7	75.9	78.1	0.052
Beta-blocker (%)	54.2	55.9	54.7	57.4	0.7
Statin (%)	61.2	68.5	64.9	70.9	0.001
All three medicines (%)	38.9	41.3	40.1	45.2	0.153

Figure 2. Proportion of prescriptions for guideline-based medication—changes over time after the MI.

Table 2. Independent determinants for prescription of anti-thrombotic agent, beta-blocker, statin or the combination of all three

	Anti-thrombotic agent	Beta-blocker	Statin	All three
Determinant	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age	0.99 (0.98–1.04)	0.99 (0.98–1.01)	0.98 (0.97–0.99)**	0.99 (0.98–1.00)**
Gender (female ref)	0.73 (0.53–0.99)**	0.83 (0.64–1.08)	0.90 (0.67–1.19)	0.79 (0.61–1.03)*
SES (low ref)	0.79 (0.50–1.23)	0.75 (0.52–1.08)	0.90 (0.61–1.01)	0.78 (0.55–1.10)
Duration type 2 diabetes	1.01 (0.98–1.04)	1.01 (0.98–1.01)	0.99 (0.97–1.01)	1.00 (0.98–1.02)

*P < 0.10; **P < 0.05.

optimal evidence-based secondary cardiovascular prevention. Only 46% of the patients was found to have ongoing repeat prescriptions for the combination of an anti-thrombotic agent, a beta-blocker and a statin. The lowest recent repeat prescription rates were found in older patients. The prescription rates were quite stable over time, with only a significant increase in the proportion of patients with a repeat prescription of a statin.

The proportion of patients with prescriptions for guideline-based medication in our study is within range of previously found proportions (for beta-blocker and statin). In a study in India among 2290 patients with heart disease (45% with type 2 diabetes), 89% had a prescription for aspirin, 59% for a beta-blocker and 67% for a statin (13). In Ireland, a study among 1746 diabetic patients with ischemic heart disease reported that 77% had a prescription for aspirin, 35% for a beta-blocker and 37% for a statin (14). These studies did not report the proportion of patients with the combination of the three medicines. The low percentage of patients with repeat prescriptions of guideline-based medication in our study might be the result of an omission of prescribing at different moments. First, it is possible that the hospital-based physician responsible for secondary prevention did not initially prescribe all three drugs. However, it was previously found that prescription rates at discharge were much higher (anti-thrombotic agent: 91%; beta-blocker: 86%; statin: 80%) (15). In that study, the combination of all three medicines was prescribed in 70% of the patients, but after 1 month only 48% continues to use all three. Moreover, which medication is prescribed by the GP depends strongly on the initially prescribed medication in the hospital (16). A second possibility might be that patients do not visit the GP for repeat prescriptions and decide by themselves to discontinue the medication. A previous study showed that in 61% of the patients who discontinue medicines, this was self-determined (17). In that study, an important factor associated with self-discontinuation was having no pharmacy coinsurances. Since Dutch diabetes patients get full reimbursement, the proportion of patients self-discontinuing in our study is likely to be <61%. A third option is that the GP might decide together with the patient not to prescribe some of the medicines, for example because of side effects or drug interactions. As described above, it is known that prescriptions rates are much higher at discharge and discontinuing occurs mostly in the first month after discharge without involvement of the GP.

This might be the result of patients experiencing difficulties in coping with pharmacotherapy, especially in the first period after discharge, which in turn might induce discontinuation and the absence of repeat prescriptions on the long term. In a focus group study, we indeed found that patients with the combination of type 2 diabetes and MI, experienced difficulties after discharge from hospital on coping with the amount of medicines and the adverse effects of pharmacotherapy (18). In our study, the proportion of patients receiving the guideline-based medication was already low in the first year after discharge and no further decrease was seen in the following years. Moreover, a small increase over the years is found with higher prescription rates 5 years after MI, especially for a statin. This increase might be explained by the fact that type 2 diabetes patients visit their GP regularly to control the diabetes and cardiovascular risk factors in a time period in which statin prescription has become more 'common' and target levels decreased.

The suitability of guidelines to the individual patient care can be questioned. On the one hand, an individualized treatment approach and shared decision-making between patient and GP regarding treatment is important and appreciated by patients (19). On the other hand, guidelines are developed to be applicable to the majority of the patients. Since discontinuation of secondary medication is associated with a higher mortality (15), it can be thought that it is important to prescribe medication according to the evidence-based guidelines. Although GPs may have good reasons not to prescribe the combination of all three medicines (e.g. the possible adverse effects could be considered being disproportionate to the benefits in prolonging life expectancy), it is unlikely that they have such a good reason in the majority (in our study >50%) of the patients. Future studies should investigate the reasons for not prescribing according to the guidelines to provide insight into whether guidelines regarding secondary prevention are not suitable to most of the type 2 diabetes patients, and therefore should be adjusted, or whether strategies are needed to increase the adherence to guidelines.

Our findings concerning the determinants of secondary prevention are comparable to other studies (9,10). Differential treatment patterns for women compared with men have been described earlier. Previous research showed that in type 2 diabetes, than women, men were more likely to receive a prescription for aspirin than women (9). A possible explanation could be that physicians believe that men have a higher risk of future cardiovascular events than women. However, female gender is associated with a more adverse cardiovascular profile compared with male gender in diabetes (20). In Ireland women with type 2 diabetes did not achieve the same decline in cardiovascular events and mortality as men (21). Insufficient therapy could at least partially explain the slower decline in male compared with female. Older patients were also less likely to receive preventive medicines, both in our study and in previous reports (10). In these patients, the possible adverse effects could be considered being disproportionate to the benefits in prolonging life expectancy. According to Dutch GPs, prescribing preventive drugs in older patients also depends on the patient's wishes and should be based on shared decision-making between GPs and patients (22).

In our study, 46% of the patients actually were diagnosed with MI before they were diagnosed with type 2 diabetes. It can be thought that having the diagnosis diabetes before having the MI can influence prescription. However, no differences were found between the proportion of repeat prescriptions of the group with a type 2 diabetes diagnosis before or after the occurrence of an MI.

It is important to note that we only focussed on the prescription of medication. Medication adherence is at least as important. Approximately, a third of all patients who have had an MI do not adhere to cardiovascular preventive treatment in the long term (23). Our study does not provide information about the adherence to the prescribed drugs. However, to decrease mortality and recurrence rates, guideline-based medication should be at least prescribed (4). In the National Institute for Health and Care Excellence guidance, the importance of the role of primary care in secondary prevention is emphasized (24). GPs and nurses are largely responsible for prescription and monitoring of ongoing drug therapy. This requires effective communication between secondary and primary care and management plans should be fine-tuned between involved physicians. Also, the American Diabetes Association recommends structured discharge planning that should include (i) medication reconciliation; (ii) structured discharge communication; (iii) discharge summary transmitted to primary care physician; (iv) follow-up visits scheduled with both primary and secondary care providers (25).

Our study had some limitations. First, we had no data on comorbidity. Therefore, we were not able to investigate the possible role of for example signs and symptoms of heart failure peripheral arterial disease and hypertension next to the determinants used in this study. Furthermore, the updated guidelines on secondary prevention suggest to prescribe also an angiotensin receptor blocker instead of an angiotensin converting enzyme (ACE)-inhibitor in patients who are intolerant for ACE-inhibitors (24). Since this was not in the guidelines when our data were extracted, prescription rates of ACE-inhibitors/angiotensin-II-inhibitors are likely to be biased in our study, and therefore we did not take these prescription rates into account in this study. Including ACE-inhibitors/angiotensin-II-inhibitors in our analysis would results in an unrealistic low proportion of patients with prescriptions of the combination of all four guideline-based medicines, by all means lower than the 46% found for the combination of all three.

In conclusion, a substantial proportion of patients with type 2 diabetes and previous MI did not receive repeat prescriptions

of guideline-based secondary prevention medication. This is worrisome, since patients who do not receive repeat prescriptions of guideline-based medication are at increased risk of future cardiovascular events. Older age was associated with less prescription of preventive medicines. Given the high risk of future cardiovascular disease, this study confirms the need for a different approach to achieve an improvement of secondary prevention in patients with type 2 diabetes and previous MI, especially in older patients. GPs can play an important role in this respect by being extra alert that secondary prevention therapy occurs according to the guidelines. This issue could possibly be incorporated in the annual diabetes check-up.

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Declaration

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Conflict of interests: none to declare

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