International Journal of Cardiology 219 (2016) 387–393

Contents lists available at ScienceDirect

International Journal of Cardiology

journal homepage: www.elsevier.com/locate/ijcard

Outcomes following acute hospitalised myocardial infarction in France: An insurance claims database analysis☆

Patrick Blin [a,1], François Philippe [b,1], Stéphane Bouée [c,*,1], Caroline Laurendeau [c,1], Elodie Torreton [b,1], Julie Gourmelin [d,1], Sandy Leproust [e,1], Laurie Levy-Bachelot [e,1], Philippe Gabriel Steg [f,g,1]

[a] Bordeaux PharmacoEpi, CIC Bordeaux CIC 1401, Service de Pharmacologie Médicale, Université Bordeaux, Bordeaux, France
[b] Département de Pathologie Cardiaque, Institut Mutualiste Montsouris, Paris, France
[c] CEMKA-EVAL, Bourg-la-Reine, France
[d] INSERM UMS 011, Villejuif, France
[e] Merck Sharpe &Dohme, Courbevoie, France
[f] Université Paris Diderot, Sorbonne-Paris Cité, and INSERM U-1148, Paris, France
[g] FACT, an F-CRIN network, DHU FIRE, Département de Cardiologie, Hôpital Bichat, Assistance Publique - Hôpitaux de Paris, France

ARTICLE INFO

Article history:
Received 9 March 2016
Received in revised form 14 June 2016
Accepted 21 June 2016
Available online 23 June 2016

Keywords:
Myocardial infarction
France
Recurrence
Cost
Treatment
Death

ABSTRACT

Background: Mortality and complications of acute myocardial infarction (AMI) in France have declined over the last twenty years, but still remain high. Practice guidelines recommend secondary prevention measures to reduce these. Insurance claims databases can be used to assess the management of post MI and other cardiovascular outcomes in everyday practice.

Methods: A cohort study was performed in a 1/97 representative sample of the French nationwide claims and hospitalisation database (EGB database). All adults with a documented hospitalisation for MI between 2007 and 2011 were included, and followed for three years. Data was extracted on demographics, the index admission, reimbursed medication, comorbidities, post-MI events and death.

Results: During the study period, 1977 individuals hospitalised for an MI were identified, with a mean (±SD) age of 63.8 (±14.3) years, 65.8% were men, 82.4% had hypertension and 37.6% hypercholesterolaemia. The mean duration of hospitalisation was seven days and 8.3% of patients died during hospitalisation. After discharge, the majority of patients received secondary prevention with statins (92.2%), anti-platelet drugs (95.6%), beta-blockers (86.0%) and angiotensin converting enzyme inhibitors (71.4%). After three years of follow-up post-discharge, cumulative mortality was 20.5% [18.4%;22.5%] and the cumulative incidence of reinfarction and stroke/TIA were 4.7% [95% CI: 3.7%;5.7%] and 4.1% [3.1%;5.0%], respectively.

Conclusions: Despite high use of secondary prevention at discharge, mortality and incidence of serious cardiovascular events following MI remain high. This underscores the need to improve secondary prevention.

1. Introduction

Acute myocardial infarction (MI) remains a major cause of mortality. In France, 15,728 deaths were attributed to MI in 2012 [1]. Recent studies have indicated that between 80,000 and 100,000 patients are hospitalised for acute coronary syndromes each year [2–4], of whom two-thirds are patients with MI [2–4]. In addition, sudden death due to MI before the victims reach hospital may account for approximately 20,000 to 30,000 additional deaths each year [5].

Given the high mortality and morbidity associated with MI, prevention of underlying risk factors such as smoking, diabetes, hypercholesterolaemia and hypertension through lifestyle measures or medication is an important public health priority. Moreover, for people who survive a first MI, rigorous secondary prevention measures are important in order to prevent reinfarction or other serious cardiovascular events such as stroke. In this context, practice guidelines have been developed to help physicians provide optimal secondary prevention measures to their patients [6–10].

It is important to monitor the implementation and impact of such practice guidelines in everyday clinical practice. In France, a one month nationwide survey of patients hospitalised for MI has been performed at five-yearly intervals since 1995 with the goal of assessing

☆ Acknowledgement of grant support: Laboratoire MSD.
* Corresponding author at: CEMKA-EVAL, 43, boulevard du Maréchal Joffre, 92340 Bourg la Reine, France.
E-mail address: Stephane.bouee@cemka.fr (S. Bouée).
[1] This author takes responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

http://dx.doi.org/10.1016/j.ijcard.2016.06.102
0167-5273/

clinical characteristics, management and outcomes (FAST-MI programme [4,11–13]). These surveys have indicated that both mortality and complication rates have declined markedly since 1995 and that the rates of prescription of recommended medications are currently relatively high. Nonetheless, patient registries such as FAST-MI have a number of drawbacks for assessing standards of care, notably potential lack of generalisability of the centres, since participation was voluntary, the risk of incomplete or missing information on healthcare resource use outside the participating centre and the risk of modification of care provision by physicians due to participation in the registry. Recently, it has become possible to access data from the nationwide claims and hospitalisation databases in France, which enables collection of more representative data than patient registries. In 2009, Tuppin et al. described a prescription claims analysis of medication delivery in patients hospitalised for MI during the first semester of 2006, and reported that medication use following the MI was not fully compliant with practice guidelines in approximately one-third of cases and identified factors associated with non-compliance [14].

In order to update and extend these observations, we performed a cohort study to assess management and outcomes of patients hospitalised for acute MI in France 2007–2011, using a representative sample of the nationwide claims and hospitalisation database.

2. Methods

It was a cohort study of patients hospitalised for a MI between 2007 and 2010, identified and followed-up for three years in the "*Echantillon Généraliste des Bénéficiaires*" (EGB) database. The EGB is a 1/97 random sample of the French nationwide claims and hospital database, that concerned, at the time of the study, around 600,000 salaried workers and their relatives, and fully representative of the French population in terms of gender, age and mean expenditure reimbursed by individuals [15]. The EGB contains individual pseudoanonymised information on i) gender, age, residence area, date of death (but not causes of death), ii) long-term disease registration allowing full reimbursement (100%) with the corresponding ICD-10 code, iii) private and public healthcare resources delivered and reimbursed with date, code and cost but neither the corresponding medical indication nor the outcome, notably consultations, paraclinical tests, drugs and devices, and iv) hospital discharge summaries for all stays in public and private establishments with the corresponding ICD-10 diagnosis and diagnosis-related group [15].

2.1. Subjects

The study included adults for whom a hospitalisation for MI (ICD-10 codes I21.0-I21.9 and I22.0–22.9 documented as a primary diagnosis) was identified in the EGB database between 1st January 2007, and 31st December 2011. This hospitalisation was considered to be the index event. For patients hospitalised for MI more than once over the study period, the earliest event was considered as the index event. The analysis population consisted of all eligible subjects in the previous twelve months, or who were covered for a long-term disorder related to a history of stroke or TIA. The analysis was restricted to patients without a history of stroke since medication options are different in patients with and without stroke history, notably several recent antithrombotic medications are not indicated in patients with a history of stroke or TIA. Restricting the analysis to patients without a history of stroke, who comprise the large majority of patients experiencing MI, thus simplified the comparison of observed patient care with practice guidelines. In the particular case of medication use, patients with less than six months' follow-up in the database after the index MI were also excluded.

2.2. Data collection

For each eligible patient, information was extracted from the database on demographics (gender and age at the time of index hospitalisation), hospitalisation for MI (admission, duration and discharge), reimbursed medication, comorbidities, post-MI events and death. Reimbursed medications of interest were limited to lipid-lowering agents (ATC code C10), antiplatelet drugs (B01AC), oral anticoagulants (B01AE, B01AA), other cardiovascular medicines (C) and antidiabetic drugs (A10).

Comorbidities of interest were hypercholesterolaemia, diabetes, hypertension, peripheral artery disease (PAD) and stroke in the twelve months preceding the index MI. These were identified from three sources, namely hospitalisations in which these comorbidities were identified as a diagnosis through the relevant ICD-10 disease classification code, the presence of serial reimbursements for prescription of relevant specific medications, and eligibility for full reimbursement of heath care due to of long-term disability (LTD) status identified through the relevant ICD-10 disease classification code. The specific criteria applied for each disease are provided in the Supplementary Material.

Post-MI events of interest were reinfarction, stroke, transient ischaemic attacks (TIA) and death. Reinfarction was identified as a second hospitalisation for MI (ICD-10 codes I21.0-I21.9 and I22.0–22.9) subsequent to the index event. In order to avoid selecting readmissions for the same index infarction (for example, in the event of discharge and readmission to hospital for surgery), only hospitalisations for which "initial management" was specified with the ICD-10 code in the EGB database were considered. Stroke and TIA were identified from hospitalisations subsequent to the index event with the relevant ICD-10 codes (I60–I64 or G45).

2.3. Statistical analysis

Data presentation is principally descriptive. Continuous data are presented as mean values ± standard deviation (SD) or as median values, and categorical data as frequency counts and percentages. Time to reinfarction, stroke and death was evaluated using actuarial survival analysis. These analyses were performed using the Kaplan Meier method, taking death into account as a competitive risk, as described by Beyersmann et al. [16]. The proportion of patients delivered different classes of medication was compared between the six months preceding and the six months following the index MI using the χ^2 test. Demographic features and comorbidities were compared between subjects who experienced a post-MI cardiovascular event and those that did not using Student's *t*-test for age and the χ^2 test for other variables. A bilateral probability threshold of 0.05 was used to determine statistical significance. All statistical analyses were performed using SAS© software Version 9.2 (Cary, USA).

2.4. Ethical considerations

Since this was a study of an anonymised database and had no influence on patient care, ethics committee approval was not required.

3. Results

3.1. Patients

During the five-year study period (2007–2011), 1977 individuals were identified in the EGB database who had been hospitalised for an MI coded as a primary diagnosis. Of the subjects with MI, 57 (2.9%) had either been hospitalised for stroke in the year preceding the index event or were eligible for LTD status for stroke or TIA. These individuals were excluded from the analysis, the remaining 1920 patients therefore correspond to the analysis population. These subjects were followed up for a mean duration of 32.8 months (median: 32 months) after the index MI, representing a total of 5251 patient-years. In the analysis population, 295 (15%) individuals had died or were lost to follow-up in the six months following the index MI, and these subjects were excluded from the analysis of medication use. The distribution of subjects across the analysis populations is presented in Fig. 1.