Recurrence of Major Adverse Cardiovascular Events in Patients with Multivessel Disease Who Had a Prior Myocardial Infarction: An Analysis Based on German Claims Data

Starry A[1], Hardtstock F[1], Domke T[2], Gabriel S[3], Maywald U[4], Dittmar A[5], Spitzer SG[6]

[1]Cytel, Berlin, Germany; [2]CSL Behring GmbH, Hattersheim, BE, Germany; [3]CSL Behring, King of Prussia, PA, USA; [4]AOK PLUS, Dresden, Germany; [5]IPAM, University of Wismar, Wismar, MV, Germany; [6]Praxisklinik Herz und Gefäße, Dresden, Germany

Introduction

- It is well established that a substantial risk of recurrent cardiovascular (CV) events remains in patients with an acute myocardial infarction (AMI).[1]
- Additionally, there is evidence that a substantial proportion of the major adverse cardiovascular events (MACE) occur in the early 90-day period after AMI[2] and the risk of recurrent CV events is higher in patients with multivessel disease (MVD) compared to patients without MVD.[3,4]
- Post-AMI MACE are associated with additional resource utilization and economic burden for healthcare systems.[5,6]

Objective

- This study aimed to estimate the prevalence of recurrent MACE within 90 days and 1 year amongst patients who experienced a myocardial infarction (MI) and had evidence of MVD utilizing German claims data.

Methods

- This retrospective study utilized German claims data (AOK PLUS, the 6th largest German sickness fund covering approximately 3.5 million insured persons in the regions of Saxony and Thuringia in central-eastern Germany) covering the period from 1 Jan 2010 to 31 Dec 2020. Patients were included if they:
  - Had at least one inpatient diagnosis of an MI (ICD-10: I21; acute MI) from 1 Jan 2012 to 31 Dec 2019
  - Were ≥ 18 years of age on the date of the index event (index date = first observed AMI)
  - Had evidence of MVD at the index event (ICD-10-GM codes I25.12, I25.13, I25.14).
  - Had diabetes or met two of the following: ≥ 65 years old, prior MI or peripheral arterial disease.
- Acute kidney injury/failure, hemodynamic instability, hepatobiliary disease, severe chronic kidney disease or coronary artery bypass graft surgery at baseline led to exclusion.
- MACE was defined as MI, stroke or CV-related death (defined as having a CV-related diagnosis within 30 days of death).

Results

Study population

- 5,158 patients were included in the analysis **(Table 1)**

Table 1. Characteristics of study population

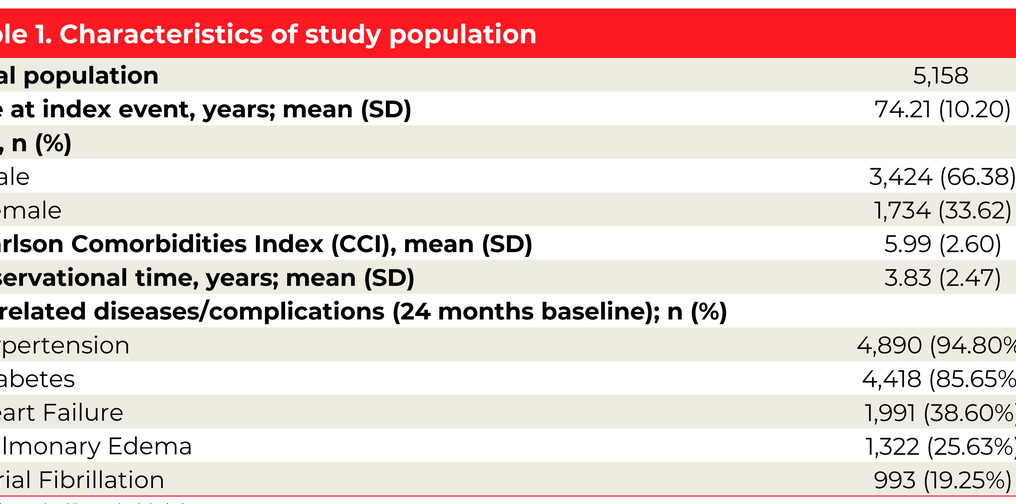
Total population	5,158
Age at index event, years; mean (SD)	74.21 (10.20)
Sex, n (%)	
Male	3,424 (66.38)
Female	1,734 (33.62)
Charlson Comorbidities Index (CCI), mean (SD)	5.99 (2.60)
Observational time, years; mean (SD)	3.83 (2.47)
CV-related diseases/complications (24 months baseline); n (%)	
Hypertension	4,890 (94.80%)
Diabetes	4,418 (85.65%)
Heart Failure	1,991 (38.60%)
Pulmonary Edema	1,322 (25.63%)
Atrial Fibrillation	993 (19.25%)

CV, cardiovascular; SD, standard deviation.

Prevalence of MACE

- 22.06% of patients experienced a MACE within 90 days following the index MI and 31.17% within 1 year (**Figure 1**).
- The individual components of MACE occurred in a similar proportion of patients; however, MI was the most common recurrent event at all time points.
- In a sensitivity analysis in which all-cause death rather than CV-related death was observed, 22.41% and 32.11% of patients experienced a MACE within 90 days and 1 year following the index MI, respectively.

Figure 1: Prevalence of MACE*



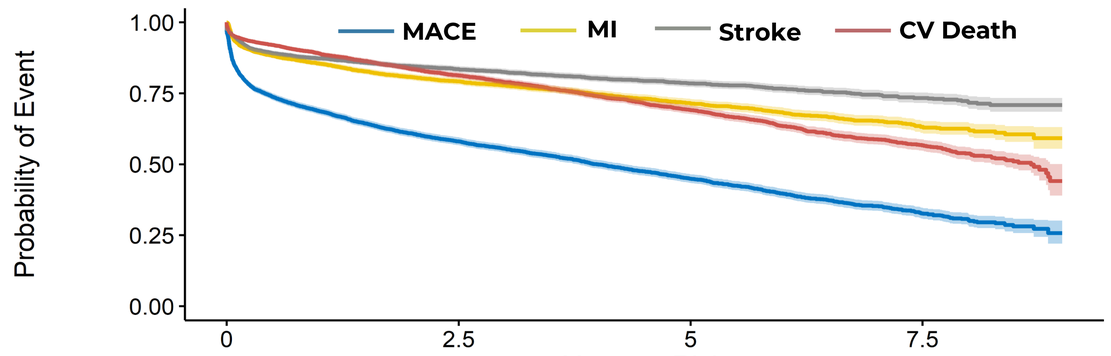
*MACE was defined as MI, stroke or CV-related death, these were not mutually exclusive.
CV, cardiovascular; MACE, major adverse cardiovascular events; MI, myocardial infarction.

- The average age of patients who had a recurrent event within 90 days was 76.65 years; 34.09% were females and their average CCI was 6.94.
- Time from index MI to the next recurrent MACE event is shown in **Figure 2.**

Results (continued)

- 50% of the population would have experienced a recurrent MACE within 4.5 years after an MI.

Figure 2: Kaplan-Meier curves: Time to recurrent MACE



Number at risk				
MACE	5,158	2,355	1,127	285
MI	5,158	2,710	1,337	354
Stroke	5,158	2,835	1,449	417
CV Death	5,158	3,286	1,735	514

CV, cardiovascular; MACE, major adverse cardiovascular events; MI, myocardial infarction.

Patient treatment after index MI

- Almost all patients (94.16%) received some form of CV-related treatment within 90 days of the index event as summarized in **Table 2.**
- This highlights that even though treatment is given early, recurrent event rates remain high.

Table 2. Patient treatment after index hospitalization

	90 days	1 year
Patients with any observed CV-related treatment	4,857 (94.16%)	4,904 (95.08%)
Top 10 prescriptions within 90 days of index hospitalization		
Antiplatelet Agents/ P2Y12 Inhibitors	4,416 (85.61%)	4,571 (88.62%)
Beta Blockers	3,742 (72.55%)	4,275 (82.88%)
Statins	3,820 (74.06%)	4,373 (84.78%)
ACE Inhibitors	2,315 (44.88%)	2,677 (51.90%)
Dual Antiplatelet Therapy: Acetylsalicylic acid + Oral P2Y12 Inhibitors	2,125 (41.20%)	2,689 (52.13%)
Calcium Channel Blockers	1,390 (26.95%)	1,805 (34.99%)
Angiotensin Receptor Blockers	1,086 (21.05%)	1,418 (27.49%)
Anticoagulants	811 (15.72%)	1,117 (21.66%)
Dual Antithrombotic Therapy: Antiplatelet Agent + Anticoagulant	536 (10.39%)	712 (13.80%)
Nitrates (Vasodilators)	441 (8.55%)	916 (17.76%)

CV-related treatment was defined by ATC codes and classified into ATC groups: Anticoagulants, Antiplatelet Agents/ P2Y12 Inhibitors, Thrombolytics (Fibrinolytics), ACE Inhibitors, Beta Blockers, Calcium Channel Blockers, Statins (cholesterol-lowering drugs), Nitrates (Vasodilators), Angiotensin receptor blockers (ARB), PCSK9 inhibitors, Sodium-glucose Cotransporter-2 (SGLT2) Inhibitors, Dual Antiplatelet Therapy, Dual Antithrombotic Therapy, Cyanides, Antiarrhythmics, Heart-Glycosides, Hormones, Parasympatholytics, Vasoconstrictors, Benzodiazepines.
ACE, angiotensin-converting enzyme; CV, cardiovascular.

- The most common CV-related procedures and rehabilitation after the index hospitalization due to MI are summarized in **Table 3.**
- Kaplan Meier estimation showed that within 5 years after the index hospitalization the patients will have close to a 42% probability of having subsequent percutaneous coronary intervention (PCI).

Table 3. CV-related surgical procedures and rehabilitation after index hospitalization

	90 days	1 year
Patients with any observed CV-related procedure/surgery	1,339 (25.96%)	2,086 (40.44%)
Transarterial left heart catheterization	1,028 (19.93%)	1,621 (31.43%)
Percutaneous coronary intervention	898 (17.41%)	1,360 (26.37%)
Other diagnostic catheter examinations of the heart/vessels	166 (3.22%)	248 (4.81%)
Electrocardioversion/Defibrillation	66 (1.28%)	126 (2.44%)
Cardiopulmonary resuscitation	80 (1.55%)	123 (2.38%)
Coronary artery bypass graft surgery	120 (2.33%)	162 (3.14%)
Pace maker implantation	31 (0.60%)	72 (1.40%)
Cardiopulmonary rehabilitation	77 (1.49%)	136 (2.64%)

CV, cardiovascular.

Conclusions

- **The risk of recurrent MACE is high at both 90 days and 1 year following MI in patients with evidence of MVD.**
- **Rates of CV events at 90 days are disproportionately high compared with 1-year outcomes.**
- **Further research should be conducted:**
  - **To estimate the burden of disease in MI patients with evidence of MVD who experience a MACE.**
  - **To establish whether the treatment of these patients has been optimized according to clinical guidelines or whether more effective treatment alternatives are needed to lower the risk of recurrent events in the early period after AMI.**

References

1. Culler, SD, et al. J Am Heart Assoc, 2019; 8(21): e013513.
2. Chi G, et al. Clin Cardiol. 2022;45(3):299-307.
3. Varenhorst C, et al. J AM Heart Assoc. 2018;7(1):e007174.
4. Stone GW, et al. N Eng J Med. 2011;364(3):226–35.
5. Johnston SS, et al. J Occup Environ Med. 2011;53:2–7.
6. Allen K, et al. PharmacoEconomics Open. 2022; https://doi.org/10.1007/s41669-022-00328-4.

Author Disclosures

A.S. and F.H. are employees of Cytel. A.D. is an employee of IPAM. The work of Cytel and IPAM within this study was financed by CSL Behring. T.D. and S.G. are employees of CSL Behring. S.G.S has received honoraria in the last 12 months for lectures and advisory board activities from Medtronic, Abbott, Daiichi Sankyo, Edwards, AstraZeneca, BayerVital, Bristol Myers Squibb, Pfizer, Boehringer Ingelheim, Amgen, and Ingress Health HWM GmbH and participated in clinical trials funded by Abbott, Ablacon, and Medtronic. U.M. has nothing to disclose. Editorial assistance was provided by Meridian HealthComms.

Presented virtually at the ISPOR 2022 in Vienna, Austria; November 6–9, 2022.

CSL Behring