POLISH HEART JOURNAL

Kardiologia Polska
The Official Peer-reviewed Journal of the Polish Cardiac Society since 1957

Online first
This is a provisional PDF only. Copyedited and fully formatted version will be made available soon

ISSN 0022–9032 e-ISSN 1897–4279

Temporal trends in in-hospital mortality of 7628 patients with myocardial infarction complicated by cardiogenic shock treated in the years 2006–2021. An analysis from the SILCARD Database

Authors: Przemysław Trzeciak, Mateusz Tajstra, Wojciech Wojakowski, Daniel Cieśla, Zbigniew Kalarus, Krzysztof Milewski, Tomasz Hrapkowicz, Katarzyna Mizia-Stec, Grzegorz Smolka, Klaudiusz Nadolny, Marek Deja, Tomasz Kukulski, Krzysztof Wilczek, Jacek Kowalczyk, Andrzej Bochenek, Piotr Przybyłowski, Krystian Wita, Mariusz Gąsior

Article type: Short communication

Received: July 21, 2024

Accepted: September 12, 2024

Early publication date: October 1, 2024

Temporal trends in in-hospital mortality of 7628 patients with myocardial infarction complicated by cardiogenic shock treated in the years 2006–2021. An analysis from the SILCARD Database

Short title: Temporal trends in in-hospital mortality of cardiogenic shock

Przemysław Trzeciak[1], Mateusz Tajstra[1], Wojciech Wojakowski[2], Daniel Cieśla[3], Zbigniew Kalarus[4], Krzysztof Milewski[5], Tomasz Hrapkowicz[6], Katarzyna Mizia-Stec[7, 8], Grzegorz Smolka[7, 9], Klaudiusz Nadolny[10], Marek Deja[11], Tomasz Kukulski[12], Krzysztof Wilczek[1], Jacek Kowalczyk[4], Andrzej Bochenek[13, 14], Piotr Przybyłowski[6], Krystian Wita[15], Mariusz Gąsior[1]

[1]3rd Department of Cardiology, Faculty of Medical Sciences in Zabrze, Medical University of Silesia in Katowice, Silesian Center for Heart Diseases, Zabrze, Poland
[2]Division of Cardiology and Structural Heart Diseases, Medical University of Silesia, Katowice, Poland
[3]Department of Science and New Technologies, Silesian Centre for Heart Diseases, Zabrze, Poland
[4]Department of Cardiology, Congenital Heart Diseases and Electrotherapy, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Katowice, Poland, Silesian Center for Heart Diseases in Zabrze, Zabrze, Poland
[5]Cardiology and Cardiac Surgery Center in Bielsko-Biala, American Heart of Poland, Bielsko-Biała, Poland
[6]Department of Cardiac Surgery, Transplantology, Vascular and Endovascular Surgery, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Silesian Center for Heart Diseases, Zabrze, Poland
[7]Upper-Silesian Medical Centre, Katowice, Poland
[8]1st Department of Cardiology, School of Medicine in Katowice, Medical University of Silesia, Katowice, Poland
[9]Department of Cardiology, Faculty of Health Science, Medical University of Silesia, Katowice, Poland
[10]Department of Emergency Medical Service, Faculty of Medicine, Silesian Academy in Katowice, Katowice, Poland
[11]Department of Cardiac Surgery, Upper Silesian Heart Center, Medical University of Silesia, Katowice, Poland

[12]2nd Department of Cardiology, Medical University of Silesia, Katowice, Specialist Hospital, Zabrze, Poland
[13]1st Department of Cardiac Surgery, American Heart of Poland, Bielsko-Biała, Poland
[14]Faculty of Medicine, University of Technology, Katowice, Poland
[15]1st Department of Cardiology, School of Medicine in Katowice, Medical University of Silesia, Katowice, Poland

Correspondence to:
Przemysław Trzeciak, MD, PhD,
3rd Department of Cardiology,
Faculty of Medical Sciences in Zabrze,
Medical University of Silesia in Katowice,
Silesian Center for Heart Diseases,
Curie-Skłodowskiej 9, 41–800 Zabrze, Poland,
phone: +48 32 373 36 19,
e-mail: przemyslaw.t@wp.pl

INTRODUCTION

Cardiogenic shock (CS) is a low-cardiac-output state characterized by life-threatening end-organ hypoperfusion and hypoxia. Myocardial infarction (MI) with left ventricular failure remains one of the most frequent causes of CS [1]. The widespread implementation of early revascularization has decreased mortality from the previous 70%–80% to 40%–50% [2, 3]. Despite significant advances in percutaneous coronary interventions (PCI) and mechanical circulatory support (MCS) techniques, outcomes for patients with MI complicated by CS (MI-CS) remain unsatisfactory. Although some data suggest that treatment outcomes in this population have improved in recent years [4, 5], many authors highlight that in-hospital mortality of CS complicating MI has remained unchanged [2, 3]. Moreover, some recent registries have even shown an increase in mortality rate, which may be a consequence of the aging patient population and increasing risk profiles of CS patients [6, 7]. There is a paucity of comprehensive data concerning changes in treatment strategies and outcomes for all-comer MI-CS patients in recent years.

Therefore, we aimed to analyze the recent trends in the mortality of patients hospitalized with a diagnosis of MI-CS, as recorded in the Silesian Cardiovascular Database (SILCARD).

MATERIAL AND METHODS

General information on the SILCARD database (ClinicalTrials.gov identifier, NCT02743533) was described previously [8]. In brief, the SILCARD database was created under an agreement between the Silesian Center for Heart Diseases in Zabrze and the Silesian branch of the National Health Fund (NHF), the only health provider in Poland supplying data on patients with cardiovascular diseases. It contains records from all hospitals (n = 310) in the Silesian Province, a highly industrialized administrative region in Poland with a population of 4.4 million (11.6% of Poland's total population).

The Silesian Province provides a well-developed hospital network with two tertiary cardiology hospitals, three cardiac surgery departments, and 20 catheterization laboratories. The NHF has supplied all data to the database since 2006. The inclusion criteria were as follows: each hospitalization in the departments of cardiology, cardiac surgery, vascular surgery, or diabetology, and hospitalization with a cardiovascular diagnosis in the department of intensive care or internal medicine. The exclusion criteria were hospitalizations of patients younger than 18 years at admission or patients living outside of the Silesian Province.

The analysis included all patients from the SILCARD database hospitalized with a principal diagnosis of CS (R57.0 code according to the International Classification of Diseases, 10th Revision [ICD-10] and a diagnosis of MI [I21–I22 code according to ICD-10]) between 2006 and 2021. Medical procedures were defined by the ICD-9 classification. The diseases diagnoses involved in the table were based on data submitted to the NHF. It should be assumed that heart failure included patients diagnosed both before and during hospitalization without differentiating into types (reduced, mildly reduced or preserved ejection fraction).

The clinical characteristics, management, in-hospital, and one-year mortality were analyzed as trends across the years. Both all-cause mortality data and medical procedures during 1-year follow-up were obtained from the NHF records. Vital status at 12 months after MI-CS was available for all patients.

Statistical analysis

Continuous variables were presented as mean with standard deviation or median with interquartile range and categorical variables as counts and percentages. The significance of the time trends in the studied years was calculated using ANOVA with linear trend contrasts set for age, Jonckheere–Terpstra trend test for in-hospital stay and the Cochran–Armitage test for categorical variables. The significance of the difference between the two groups was assessed using the t-test

or the χ^2 test, depending on the type of data. TIBCO Software Inc. (2017) Statistica (data analysis software system), version 13.3, was used for all calculations.

RESULTS AND DISCUSSION

The analysis involved 7628 residents of the Silesian Province hospitalized with a diagnosis of CS from January 1, 2006, to December 31, 2021. Trends in patient characteristics, in-hospital, and 12-month outcomes are presented in Table 1. There was a significant decrease in the percentage of patients with CS complicating ST-segment elevation MI (P <0.001) and the use of MCS with intra-aortic balloon pump (P <0.001) over the years 2006–2021. Despite the increase in the frequency of coronary angiography and percutaneous revascularization, there were no significant changes in in-hospital and 1-year mortality trends. At the same time, there were increasing trends in occurrences of hypertension, diabetes, co-existing comorbidities, and previous revascularization procedures. Although a significant trend was found in the increasing percentage of patients undergoing rehabilitation after MI-CS (P <0.001), the rate remains relatively low.

Our analysis found no significant changes in in-hospital mortality trends in MI-CS patients treated in the Silesian Province from 2006 to 2021. Although such results may seem disappointing, it is necessary to emphasize the increasing trends in the incidence of co-existing comorbidities in MI-CS patients, including heart failure, diabetes, previous MIs, strokes, and renal failure. Theoretically, these factors should lead to an increased mortality rate in the analyzed period. The growing availability of PCI procedures and advancements in CS treatment have likely prevented an increase in the mortality rate.

There are few data assessing trends in in-hospital mortality in the population of CS patients in recent years [4, 5]. Osman et al. [4] showed a reduction in in-hospital mortality in MI-CS American patients from 44% in 2004 to 35% in 2018 (P trend <0.001). In the analysis of 441 696 patients with CS treated in Germany between 2005 and 2017, the in-hospital mortality rate remained around 60%. There was a trend towards lower mortality in patients with MI-CS without clear improvements in patients without MI [5]. Generally, the unsatisfactory outcomes of MI-CS treatment have not substantially changed in the past 25 years [1–3, 6, 9, 10].

The only available method of treatment in this group of patients with proven clinical efficacy is early revascularization [9]. We showed a trend in the increase in the frequency of PCI procedures with a much lower and stable percentage of patients undergoing coronary artery bypass grafting. This may be surprising if we assume that a certain proportion of patients may have had multivessel coronary artery disease. In another study from the SILCARD database, MI-CS patients undergoing coronary artery bypass grafting had lower in-hospital mortality than those

undergoing PCI [11]. In our analysis, the trend in the use of intra-aortic balloon pump decreased significantly over the years and the use of extracorporeal membrane oxygenation remained marginal. In the mentioned German analysis, the more frequent use of extracorporeal membrane oxygenation and other percutaneous MCS techniques did not significantly improve treatment results [5].

The treatment of patients with MI complicated by CS remains a problem requiring not only therapeutic but also logistical solutions. One of them might be the direct transfer of patients to specialized centers called Cardiac Shock Centers. These centers should provide access not only to a catheterization laboratory but also to the highest level of specialized care and cardiothoracic surgery [11–13]. A network of such centers seems necessary in Poland [11, 12].

It should be noted that this study has some limitations. First, the analyses included all-cause mortality. Second, an impossibility to establish a causal relationship due to lack of multivariate analyses.

Article information

Conflict of interest: None declared.

Funding: None.

REFERENCES

1. Thiele H, Zeymer U, Neumann FJ, et al. Intraaortic balloon support for myocardial infarction with cardiogenic shock. N Engl J Med. 2012; 367(14): 1287–1296, doi: 10.1056/NEJMoa1208410, indexed in Pubmed: 22920912.
2. Mebazaa A, Combes A, van Diepen S, et al. Management of cardiogenic shock complicating myocardial infarction. Intensive Care Med. 2018; 44(6): 760–773, doi: 10.1007/s00134-018-5214-9, indexed in Pubmed: 29767322.
3. Thiele H, Ohman EM, de Waha-Thiele S, et al. Management of cardiogenic shock complicating myocardial infarction: an update 2019. Eur Heart J. 2019; 40(32): 2671–2683, doi: 10.1093/eurheartj/ehz363, indexed in Pubmed: 31274157.
4. Osman M, Syed M, Patibandla S, et al. Fifteen-year trends in incidence of cardiogenic shock hospitalization and in-hospital mortality in the United States. J Am Heart Assoc. 2021; 10(15): e021061, doi: 10.1161/JAHA.121.021061, indexed in Pubmed: 34315234.

5. Schrage B, Becher PM, Goßling A, et al. Temporal trends in incidence, causes, use of mechanical circulatory support and mortality in cardiogenic shock. ESC Heart Fail. 2021; 8(2): 1295–1303, doi: 10.1002/ehf2.13202, indexed in Pubmed: 33605565.
6. Redfors B, Angerås O, Råmunddal T, et al. 17-year trends in incidence and prognosis of cardiogenic shock in patients with acute myocardial infarction in western Sweden. Int J Cardiol. 2015; 185: 256–262, doi: 10.1016/j.ijcard.2015.03.106, indexed in Pubmed: 25814213.
7. Wayangankar SA, Bangalore S, McCoy LA, et al. Temporal trends and outcomes of patients undergoing percutaneous coronary interventions for cardiogenic shock in the setting of acute myocardial infarction: a report from the CathPCI Registry. JACC Cardiovasc Interv. 2016; 9(4): 341–351, doi: 10.1016/j.jcin.2015.10.039, indexed in Pubmed: 26803418.
8. Gąsior M, Pres D, Wojakowski W, et al. Causes of hospitalization and prognosis in patients with cardiovascular diseases. Secular trends in the years 2006-2014 according to the SILesian CARDiovascular (SILCARD) database. Pol Arch Med Wewn. 2016; 126(10): 754–762, doi: 10.20452/pamw.3557, indexed in Pubmed: 27650214.
9. Dzavik V, Sleeper LA, Picard MH, et al. Early revascularization in acute myocardial infarction complicated by cardiogenic shock. SHOCK Investigators. Should We Emergently Revascularize Occluded Coronaries for Cardiogenic Shock. N Engl J Med. 1999; 341(9): 625–634, doi: 10.1056/NEJM199908263410901, indexed in Pubmed: 10460813.
10. Thiele H, Møller JE, Henriques JPS, et al. Extracorporeal life support in infarct-related cardiogenic shock. N Engl J Med. 2023; 389(14): 1286–1297, doi: 10.1056/NEJMoa2307227, indexed in Pubmed: 37634145.
11. Gąsior M, Tajstra M, Cieśla D, et al. Management of patients with myocardial infarction complicated by cardiogenic shock: Data from a comprehensive all-comer administrative database covering a population of 4.4 million. Pol Heart J. 2024; 82(5): 534–536, doi: 10.33963/v.phj.99071, indexed in Pubmed: 38493458.
12. Trzeciak P, Stępińska J, Gil R, et al. Management of myocardial infarction complicated by cardiogenic shock: Expert opinion of the Association of Intensive Cardiac Care and Association of Cardiovascular Interventions of the Polish Society of Cardiology. Kardiol Pol. 2023; 81(12): 1312–1324, doi: 10.33963/v.kp.97817, indexed in Pubmed: 37823758.
13. Rab T, Ratanapo S, Kern K, et al. Cardiac shock care centers. J Am Coll Cardiol. 2018; 72(16): 1972–1980, doi: 10.1016/j.jacc.2018.07.074, indexed in Pubmed: 30309475.

Table 1. Trends in patients characteristics, in-hospital and 12 months outcomes

Patients characteristics	**Total n = 7628**	**2006 n = 523**	**2007 n = 466**	**2008 n = 422**	**2009 n = 432**	**2010 n = 455**	**2011 n = 523**	**2012 n = 549**	**2013 n = 499**	**2014 n = 493**	**2015 n = 469**	**2016 n = 446**	**2017 n = 511**	**2018 n = 494**	**2019 n = 477**	**2020 n = 456**	**2021 n = 413**	**Trend tests, *P*-value**
Age, years, mean (SD)	70.2 (11.3)	69.0 (11.5)	69.4 (11.8)	70.0 (12.4)	69.1 (11.3)	69.3 (11.3)	69.9 (11.5)	70.3 (11.6)	69.9 (10.8)	69.8 (11.7)	70.5 (11.3)	70.7 (11.3)	71.3 (10.4)	71.1 (10.6)	71.0 (11.3)	70.5 (11.0)	70.5 (11.3)	<0.001
In-hospital stay, days, median (IQR)	4 (2–9)	3 (2–8)	3 (1–9)	4 (2–8)	4 (2–10)	5 (2–10)	5 (2–9)	4 (2–9)	4 (2–10)	4 (1–9)	4 (1–9)	4 (2–10)	5 (2–10)	5 (2–11)	5 (2–11)	5 (2–11)	4 (1–10)	<0.001
Female sex, n (%)	3192 (41.8)	232 (44.4)	209 (44.8)	192 (45.5)	180 (41.7)	192 (42.2)	218 (41.7)	228 (41.5)	206 (41.3)	191 (38.7)	196 (41.8)	178 (39.9)	221 (43.2)	194 (39.3)	195 (40.9)	182 (39.9)	178 (43.1)	0.028
STEMI, n (%)	4976 (65.2)	385 (73.6)	340 (73.0)	311 (73.7)	314 (72.7)	309 (67.9)	352 (67.3)	346 (63.0)	300 (60.1)	323 (65.5)	280 (59.7)	276 (61.9)	308 (60.3)	301 (60.9)	279 (58.5)	278 (61.0)	274 (66.3)	<0.001
NSTEMI, n (%)	2485 (32.6)	98 (18.7)	102 (21.9)	105 (24.9)	110 (25.5)	133 (29.2)	160 (30.6)	189 (34.4)	192 (38.5)	166 (33.7)	182 (38.8)	163 (36.5)	194 (38.0)	184 (37.2)	197 (41.3)	177 (38.8)	133 (32.2)	<0.001
Non-identified MI, n (%)	167 (2.2)	40 (7.6)	24 (5.2)	6 (1.4)	8 (1.9)	13 (2.9)	11 (2.1)	14 (2.6)	7 (1.4)	4 (0.8)	7 (1.5)	7 (1.6)	9 (1.8)	9 (1.8)	1 (0.2)	1 (0.2)	6 (1.5)	0.003
Hypertension,	5442	172	247	250	277	323	394	412	363	379	367	354	405	387	393	375	344	<0.00

n (%)	(71.3)	(32.9)	(53.0)	(59.2)	(64.1)	(71.0)	(75.3)	(75.0)	(72.7)	(76.9)	(78.3)	(79.4)	(79.3)	(78.3)	(82.4)	(82.2)	(83.3)	1
Diabetes, n (%)	2667 (35.0)	95 (18.2)	119 (25.5)	126 (29.9)	129 (29.9)	131 (28.8)	183 (35.0)	200 (36.4)	183 (36.7)	172 (34.9)	173 (36.9)	183 (41.0)	204 (39.9)	203 (41.1)	196 (41.1)	213 (46.7)	157 (38.0)	<0.001
Atrial fibrillation, n (%)	826 (10.8)	15 (2.9)	35 (7.5)	22 (5.2)	31 (7.2)	38 (8.4)	61 (11.7)	68 (12.4)	53 (10.6)	47 (9.5)	57 (12.2)	64 (14.3)	62 (12.1)	64 (13.0)	71 (14.9)	72 (15.8)	66 (16.0)	<0.001
Heart failure, n (%)	518 (33.0)	108 (20.7)	111 (23.8)	116 (27.5)	127 (29.4)	151 (33.2)	174 (33.3)	193 (35.2)	179 (35.9)	181 (36.7)	147 (31.3)	161 (36.1)	189 (37.0)	164 (33.2)	186 (39.0)	179 (39.3)	152 (36.8)	<0.001
Renal failure, n (%)	592 (7.8)	9 (1.7)	11 (2.4)	20 (4.7)	28 (6.5)	29 (6.4)	37 (7.1)	34 (6.2)	43 (8.6)	34 (6.9)	43 (9.2)	44 (9.9)	54 (10.6)	53 (10.7)	60 (12.6)	53 (11.6)	40 (9.7)	<0.001
PVD, n (%)	3237 (42.8)	106 (20.3)	151 (32.4)	134 (31.8)	168 (38.9)	175 (38.5)	223 (42.6)	241 (43.9)	217 (43.5)	217 (44.0)	239 (51.0)	212 (47.5)	247 (48.3)	229 (46.4)	233 (48.8)	241 (52.9)	204 (49.4)	<0.001
Previous MI, n (%)	1114 (14.6)	27 (5.2)	39 (8.4)	35 (8.3)	57 (13.2)	58 (12.7)	76 (14.5)	99 (18.0)	74 (14.8)	77 (15.6)	74 (15.8)	74 (16.6)	86 (16.8)	84 (17.0)	91 (19.1)	83 (18.2)	80 (19.4)	<0.001
Previous PCI, n (%)	1161 (15.2)	13 (2.5)	18 (3.9)	27 (6.4)	46 (10.6)	68 (14.9)	64 (12.2)	86 (15.7)	79 (15.8)	74 (15.0)	81 (17.3)	84 (18.8)	107 (20.9)	110 (22.3)	111 (23.3)	99 (21.7)	94 (22.8)	<0.001
Previous CABG, n (%)	166 (2.2)	0 (0.0)	1 (0.2)	2 (0.5)	4 (0.9)	5 (1.1)	6 (1.1)	10 (1.8)	10 (2.0)	13 (2.6)	21 (4.5)	14 (3.1)	9 (1.8)	16 (3.2)	18 (3.8)	20 (4.4)	17 (4.1)	<0.001

Previous stroke, n (%)	455 (6.0)	5 (1.0)	12 (2.6)	18 (4.3)	8 (1.9)	23 (5.1)	25 (4.8)	30 (5.5)	31 (6.2)	40 (8.1)	43 (9.2)	28 (6.3)	46 (9.0)	31 (6.3)	34 (7.1)	45 (9.9)	36 (8.7)	<0.001
In-hospital outcomes																		
Coronary angiography, n (%)	6179 (81.0)	287 (54.9)	269 (57,7)	251 (59.5)	329 (76.2)	347 (76.3)	438 (83.7)	465 (84.7)	437 (87.6)	420 (85.2)	399 (85.1)	397 (89.0)	453 (88.6)	441 (89.3)	444 (93.1)	418 (91.7)	384 (93.0)	<0.001
PCI, n (%)	5409 (70.9)	225 (43.0)	208 (44.6)	215 (50.9)	290 (67.1)	293 (64.4)	390 (74.6)	419 (76.3)	368 (73.7)	374 (75.9)	364 (77.6)	352 (78.9)	393 (76.9)	387 (78.3)	396 (83.0)	385 (84.4)	350 (84.7)	<0.001
CABG, n (%)	199 (2.6)	9 (1.7)	6 (1.3)	12 (2.8)	8 (1.9)	13 (2.9)	17 (3.3)	18 (3.3)	11 (2.2)	13 (2.6)	7 (1.5)	16 (3.6)	14 (2.7)	17 (3.4)	15 (3.1)	16 (3.5)	7 (1.7)	0.05
IABP, n (%)	1835 (24.1)	115 (22.0)	101 (21.7)	104 (24.6)	110 (25.5)	146 (32.1)	185 (35.4)	177 (32.2)	121 (24.2)	120 (24.3)	83 (17.7)	103 (23.1)	107 (20.9)	96 (19.4)	93 (19.5)	100 (21.9)	74 (17.9)	<0.001
ECMO, n (%)	38 (0.5)	0 (0.0)	0 (0.0)	2 (0.5)	0 (0.0)	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)	3 (0.6)	8 (1.8)	0 (0.0)	2 (0.4)	9 (1.9)	8 (1.8)	1 (0.2)	<0.001
Respiratory therapy, n (%)	4235 (55.5)	326 (62.3)	308 (66.1)	223 (52.8)	194 (44.9)	259 (56.9)	295 (56.4)	300 (54.6)	289 (57.9)	302 (61.3)	275 (58.6)	272 (61.0)	271 (53.2)	245 (49.6)	241 (50.5)	239 (52.4)	195 (47.2)	<0.001
In-hospital mortality, n (%)	4955 (65.0)	342 (65.4)	328 (70.4)	283 (67.1)	261 (60.4)	297 (65.3)	330 (63.1)	344 (62.7)	308 (61.7)	323 (65.5)	297 (63.3)	312 (70.0)	338 (66.1)	315 (63.8)	309 (64.8)	298 (65.4)	270 (65.4)	0.43
Outcomes at 12 months																		

Rehabilitation, n (%)	929 (12.2)	56 (10.7)	48 (10.3)	45 (10.7)	44 (10.2)	40 (8.8)	58 (11.1)	61 (11.1)	69 (13.8)	52 (10.5)	61 (13.0)	44 (9.9)	73 (14.3)	86 (17.4)	84 (17.6)	61 (13.4)	47 (11.4)	<0.001
1-year mortality, n (%)	5513 (72.3)	373 (71.3)	351 (75.3)	313 (74.2)	301 (69.7)	335 (73.6)	359 (68.6)	388 (70.7)	353 (70.7)	367 (74.4)	327 (69.7)	343 (76.9)	371 (72.6)	350 (70.9)	346 (72.5)	338 (74.1)	298 (72.2)	0.36

Abbreviations: CABG, coronary artery bypass grafting; decr., decreasing; ECMO, extracorporeal membrane oxygenation; IABP, intra-aortic balloon pump; incr., increasing; IQR, interquartile range; MI, myocardial infarction; NSTEMI, non-ST elevation myocardial infarction; PCI, percutaneous coronary intervention; PVD, peripheral vascular disease; SD, standard deviation; STEMI, ST-segment elevation myocardial infarction