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Cardiovascular and cancer mortality in very elderly post-infarction patients receiving statin treatment

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Abstract

Objective To study if statin treatment is effective and safe in very elderly (≥ 80 years) AMI patients.

Background Elderly individuals constitute an increasing percentage of patients admitted to hospitals for acute myocardial infarction (AMI). Despite that these patients have a higher mortality risk the application of evidence based medicine remains much lower than for younger patients.

Methods We included all patients with an age ≥ 80 years who were admitted with the diagnosis of AMI in the Register of Information and Knowledge about Swedish Heart Intensive care Admissions (RIKS-HIA) between 1999 and 2003 (n=21,410). Out of these complete covariate and follow-up data were available for 14,907 patients (study population A). To limit the bias related co-morbidity on statin prescription we also performed analyses excluding patients who died within 14 days of the acute event (study population B) and all patients who died within 365 days (study population C). A propensity score was used to adjust for initial differences between treatment groups.

Results All cause mortality was significantly lower in patients with statin treatment at discharge in study population A (relative risk (RR) =0.55, 95% CI 0.51-0.59), in study population B (RR=0.65; 95% CI 0.60-0.71) and in study population C (RR=0.66; 95% CI 0.59-0.76). Similar observations were made for cardiovascular mortality as well as for AMI mortality. There was no increase in cancer mortality in statin-treated patients.

Conclusions Statin treatment is associated with lower cardiovascular mortality in very elderly post-infarction patients without increasing the risk development of cancer.

Abbreviations

AMI=acute myocardial infarction

PROSPER= PROspective Study of Pravastatin in the Elderly at Risk

RIKS-HIA= Register of Information and Knowledge about Swedish Heart Intensive care Admissions

RR= relative risk

With increased life expectancy the population of older patients is growing and cardiovascular disease remains the major cause of mortality in this age group. More than 80% of all coronary deaths occur in patients over the age of 65 years (1). Despite that elderly patients with acute coronary syndromes have a higher short and long-term mortality risk the application of evidence based medicine remains much lower than for younger patients (2-6). A large number of clinical trials have established that treatment with lipid-lowering statins significantly reduces cardiovascular mortality in post-myocardial infraction (MI) patients (7). However, data from observational studies such as the Global Registry of Acute Coronary events (GRACE)(8) and the Euro heart ACS survey (9) suggest that less than 40% of MI patients older than 75 years are prescribed stains at discharged. Several circumstances may to contribute to a lower use of statins in elderly post-MI patients. The association between plasma cholesterol and cardiovascular risk diminishes with increasing age (10,11) and most lipid trials have excluded older patients. There may also be a fear for more side effects when treating older patients. PROSPER is the only randomized controlled trial that specifically studied the effect of statin treatment in older (70-82 years) patients (12). In this trial treatment with 40 mg pravastatin daily was found to reduce fatal/non-fatal cardiovascular events by 15% and fatal/non-fatal AMI by 19%, but pravastatin treatment was also associated with a 25% increase in cancer incidence. Although meta-analysis of all major statins trials have shown no increase in cancer incidence (12) it can not be excluded that older patients are at higher risk in this respect. In the present study we used the Register of Information and Knowledge about Swedish Heart intensive care Admissions (RIKS-HIA) to analyze the

association of statin treatment with all cause mortality, cardiovascular mortality and cancer mortality in a cohort of 14,907 very elderly (≥ 80 years) MI patients.

Methods

RIKS-HIA

The "Register of Information and Knowledge about Swedish Heart Intensive care Admissions" (RIKS-HIA) includes all consecutive patients admitted to the coronary care units of all participating Swedish hospitals. Data on about 100 different variables regarding baseline characteristics, examinations, interventions and complications in hospital, and discharge medication and diagnosis were reported in case record forms as has been described elsewhere (13). The variables in RIKS-HIA comply with the international Cardiology Audit and Registration Data Standards (CARDS). The full protocol is available at http://www.riks-hia.se. To ensure the validity of the information entered into the database a single specially trained monitor visited participating hospitals and compared information in the patient records, including ECG, with the information entered into the RIKS-HIA database in 30–40 randomly chosen patients for each hospital. Data quality was monitored in 5,446 random records from all participating hospitals comprising 299,530 measurements there was a 94 % overall agreement between the registered information and patient records. Between 1999 and 2001 the number of participating hospitals increased from 65 to 72, out of all 74 Swedish hospitals, where it remained through 2003.

All patients for whom data were entered into RIKS-HIA were informed of their participation in the registry (patients could request to be excluded) and the long-term follow-up. The registry, and the merging with other registries, was approved by the National Board of Health and Welfare and the Swedish Data Inspection Board. The Ethics Committee of Uppsala University Hospital approved the study.

Study population

We included all patients with an age $\geq$ 80 years who were admitted with the diagnosis of AMI in the RIKS-HIA between January 1st 1999 and December 31st 2003 (n=21,410). To be included in the endpoint analyses, we required complete data on all covariates that were adjusted for and specific cause of death in those who died during follow-up, leaving 14,907 patients for survival analyses (study population A; table 1).

Furthermore, to limit the bias related to effects of short life expectancy and co-morbidity on physicians choice of treatment, we excluded patients who died within fourteen days from baseline (study population B; supplementary table 1) and all patients who died within 365 days (study population C; table 1). The study design is summarized in figure 1. Cardiovascular drug therapies were entered in a structured formula on admission and at discharge. We used data from the Swedish National Patient Register (NPR) to record a diagnosis of stroke, kidney failure, chronic obstructive pulmonary disease, dementia, congestive heart failure, myocardial infarction, peripheral artery disease and cancer prior to the registration in RIKS-HIA.

Follow-up and endpoints

Patients were followed for endpoints with a median follow-up time of 296 days (inter-quartile range: 44 to 738 days, and a maximum of 5 years) by linking the Swedish 10 digit personal number with the Swedish National Cause of Death Register (SNCDR) and the NPR from baseline until the time of first event, death or until December 31st 2003. Endpoints were defined according to the International Classification of Disease 10 (ICD10). Mortality endpoints were retrieved from the SNCDR with codes I21-I22 defining AMI mortality, codes I00-I99 defining cardiovascular mortality and codes C00-D48 defining cancer mortality. In analyses of fatal and non-fatal AMI, endpoints were defined as codes I21-I22 in the NPR or SNCDR. The date of hospital discharge was defined as the baseline.

Statistics:

Apart from exclusion of patients with short survival time (i.e. restricting the study population to study populations B and C), we attempted to further decrease bias related to co-morbidities and the physicians probability to prescribe statins at discharge by creating and adjusting for a propensity score.

The propensity score is defined as the conditional probability to receive treatment given the known baseline characteristics. At best the propensity score captures all the initial differences between the treatment groups in one single score that can be used for adjustments in subsequent analyses. The propensity score was estimated using a logistic

regression model including the baseline variables, including cardiovascular medications at admission, as presented in table 1.

We used Cox-regression models to establish the relationship between statin treatment at the time of discharge and time to event. The models included other cardiovascular medications at discharge (beta-blockers, acetyl salicylic acid, other platelet inhibitors and angiotensin converting enzyme inhibitors), statin treatment upon admission, the propensity score and year of admission. The results are presented as relative risks (RR) and 95% confidence intervals (95% CI). All statistical analyses were done using R version 2.8.1 (R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL http://www.R-project.org).

Results

Of the total number of patients in study population A (n=14,907), 8817 patients (59.1%) died during follow-up. Of those who died, 6,929 patients (78.6%) died from cardiovascular causes (myocardial infarction, other ischemic heart diseases, congestive heart failure, stroke, cardiac arrhythmias and other cardiac causes), 4,423 patients (50.2%) died from myocardial infarction and 477 patients (5.4%) died from cancer. As a significant proportion of the original study population was excluded due to missing data, we compared demographic and risk factor variables between those with complete data (n=14,907) and those excluded due to missing data (n=6,503). In general, the patients with missing data (supplementary table 2) had a higher burden of prevalent disease compared with patients with complete data (table 1).

All cause mortality was markedly lower in patients with statin treatment at discharge in study populations A, B and C (table 2 and figure 2). However, the RR for mortality associated with statin treatment was clearly dependent on whether patients who died early after discharge were excluded or not (figure 3). The RR reduction for mortality in statin treated as compared to non-statin treated patients seemed to be less pronounced in study population B than in study population A, and it decreased even further as we excluded patients who died during the first 180 days from baseline in a step-wise manner. This suggested that part of the statistical relationship between statin treatment and mortality was attributed to bias related to co-morbidities and the physicians' inclination to prescribe statins at discharge. Exclusion of all patients who died during the first year from baseline did not seem to further influence RR for mortality in statin treated versus non statin treated patients, suggesting that such bias was of less importance in study population C as compared to study populations A and B (figure 3).

We subsequently performed stratified analyses in patients belonging to different quartiles of the propensity score, in those with and without myocardial infarction or congestive heart failure prior to admission and by gender in study population C. The lower risk of all-cause mortality in patients treated with statins versus those not treated with statins was significant in all of these subgroups except in the lowest quartile of the propensity score (table 3).

In study population C, the RR of cardiovascular mortality as well as AMI mortality was markedly lower in patients treated with statins as compared to patients not treated with statins at discharge (figures 4 and 5). Results were similar in study populations A and B (table 2). The RR for the combination of fatal and non-fatal AMI during follow-up was reduced to a somewhat lesser degree compared to the RR for AMI mortality in study population C (RR=0.69; 95% CI 0.56-0.84), study population B (RR=0.84; 95% CI 0.76-0.92) and study population A (RR=0.70; 95% CI 0.65-0.76).

There was no increase in cancer mortality in statin treated versus non-statin treated patients regardless of whether patients who died at different times during the first year from baseline were excluded and it was even lower in statin treated patients in study population B and in study population A (table 2). The RR for cancer mortality was similar in statin treated versus non-statin treated patients in study population C (table 2 and figure 6).

Discussion

This large observational study with complete long-term follow-up for up to 5 years (median 296 days) provides strong evidence for an association between statin treatment in very elderly (≥ 80 years of age) post myocardial infarction patients and reduced cardiovascular mortality. Statin treatment at hospital discharge following AMI was associated with a reduction of all cause mortality by 42% in the entire study cohort and by 34% if the analysis was restricted to patients that survived at least one year after the event. A total of 9,576 patients died during follow-up and 76.3% of these died of

cardiovascular disease. Statin treatment was associated with a reduction of cardiovascular mortality by 41% and AMI mortality by 44% in the entire cohort and by 37% and 37%, respectively, in the cohort of patients surviving at least one year. Collectively, these observations suggest that the protective effect of statin treatment in very elderly post-myocardial infarction patients is of a similar relative magnitude as that demonstrated in randomized clinical trial for middle-aged subjects (7) and that it may in absolute terms be even greater . Although the present study did not include patients younger than 80 years it is of interest to note that a previous study of RIKS-HIA patients younger than 80 years revealed a 25% reduction of mortality in subjects prescribed statin at discharge (13).

Patients discharged on statin were more likely to have been taking statins on hospital admission (table 1). It has been reported that pretreatment with statins is associated with smaller myocardial infarction size (14,15) and there is also evidence from the follow-up of randomized trials of a long term protective carry-over effect of statins (16). Accordingly, there is a possibility that a more frequent statin pretreatment may have contributed to the increased survival observed in patients discharged with statins. However, we did not observe an association between statin treatment at hospital admission and increased follow-up survival in the present study (data not shown).

Despite a higher risk (3,8 ,9) older AMI patients are less likely to receive evidence-based medication (4). In accordance, only one out four patients in the present study population received statins at discharge. One factor that may contribute to the lower use of evidence-based medicine in this age group is that controlled intervention trials mostly have

excluded older patients. Only one randomized clinical statin trial, PROSPER (12), has been restricted to older patients (70 to 82 years). This study, which included both primary and secondary prevention cohorts, showed a 15% reduction in cardiovascular events in the statin group but no effect on all cause mortality. The Heart Protection Study was not designed to specifically address the effect of statin treatment in elderly patients but a subgroup analysis of subjects between 70-80 years at baseline demonstrated an equal relative risk reduction as for younger patients in the trial (17). Another factor that may have contributed to the lower prescription of statins to elderly post-AMI patients is the concern for an increased risk of cancer. The potential of increased risk of cancer by cholesterol-lowering treatment was widely debated in the pre-statin era. Although meta-analysis of long-term statin trials have reveled no support for an increased cancer risk (18-20) the observation of a higher incidence of cancer in the pravastatin group of the PROSPER trial raised concerns that elderly patients could be at particular risk. Reports of inverse associations between plasma cholesterol and cancer rates in older persons (10) have also argued for precautions in treating elderly patients with statins. In the present studies which included statin-treated post-AMI patients older than 80 years we observed no increase in cancer mortality. Contrarily, in analysis including the entire population of post-AMI patients for whom complete data were available (study population A; n=14,907) we observed a decreased incidence of cancer mortality among subjects receiving statin treatment (RR=0.65; 95% CI 0.49-0.86). However, no reduction of cancer mortality rates were observed in statin-treated patients if the study population was restricted to subjects surviving at least one year after the acute event.

There are several limitations of the present study that need to be considered. First, the inherent limitations of a nonrandomized, registry study should be acknowledged. Despite appropriate statistical adjustments, unknown confounders may have affected the results. Although our analyses included controlling for prevalence of cancer at the original admission it is likely that the lower incidence of cancer mortality among patients given statins in study population A in some way reflects a bias in not prescribing preventive treatment to patients with decreased life expectancy. It is also necessary to critically consider whether the reduced cardiovascular mortality observed among elderly statin-treated post-AMI patients in the present study can be explained by a similar bias. However, the fact that statin-treatment remained significantly associated with lower cardiovascular mortality risk also when all subjects that died during the first year were excluded argues against this possibility. Moreover, a propensity score was used to statistically control for the possible influence of baseline factors associated with increased probability to receive statin prescription. Another limiting factor of this study is that data regarding drug treatment is based solely on hospital discharge records. Accordingly, it can be assumed that part of the patients prescribed statins stopped taking the medication during that follow-up period and also that some patients discharged without statins began taking the medication at a later stage. However, assuming that this is correct, such a bias is likely to reduce the difference in cardiovascular mortality between the groups. It has also been reported that elderly patients have a higher compliance to statin medication (21,22). Finally, it should be kept in mind that the short median follow-up time of the present study may not be sufficient to accurately assess a possible association between statins and cancer mortality in elderly patients. In spite of

these limitations, the present observational study strongly supports the concept that statin treatment provides cardiovascular protection in very elderly post-infarction patients without increasing the risk development of cancer.

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Figure legends

Figure 1 Flow-chart of current study populations. The target population was composed of patients ≥ 80 years who were admitted with the diagnosis of AMI in the Register of Information and Knowledge of Swedish Heart Intensive care Admissions (RIKS-HIA).

Figure 2 Adjusted cumulative risk of all cause mortality/CVD/Cancer estimated at the mean of each covariate included in the model. RR= relative risk, “trunc=0 days”=all patients included in analysis, “trunc=14 days”=patients who died with in 14 days after discharge were excluded from analysis, “trunc=365”=patients who died in 365 days after discharge were excluded from analysis.

Figure 3 Relative risk for mortality after stepwise exclusion of patients who died early after discharge.

Figure 4 Adjusted cumulative risk of CVD (cardio vascular disease) mortality estimated at the mean of each covariate included in the model. RR= relative risk, “trunc=0 days”=all patients included in analysis, “trunc=14 days”=patients who died with in 14 days after discharge were excluded from analysis, “trunc=365”=patients who died in 365 days after discharge were excluded from analysis.

Figure 5 Adjusted cumulative risk of AMI mortality estimated at the mean of each covariate included in the model. RR= relative risk, “trunc=0 days”=all patients included in analysis, “trunc=14 days”=patients who died with in 14 days after discharge were excluded from analysis, “trunc=365”=patients who died in 365 days after discharge were excluded from analysis.

Figure 6 Adjusted cumulative risk of cancer mortality estimated as the mean of each covariate included in the model. RR= relative risk, “trunc=0 days”=all patients included in analysis, “trunc=14 days”=patients who died with in 14 days after discharge were excluded from analysis, “trunc=365”=patients who died in 365 days after discharge were excluded from analysis.

Study design

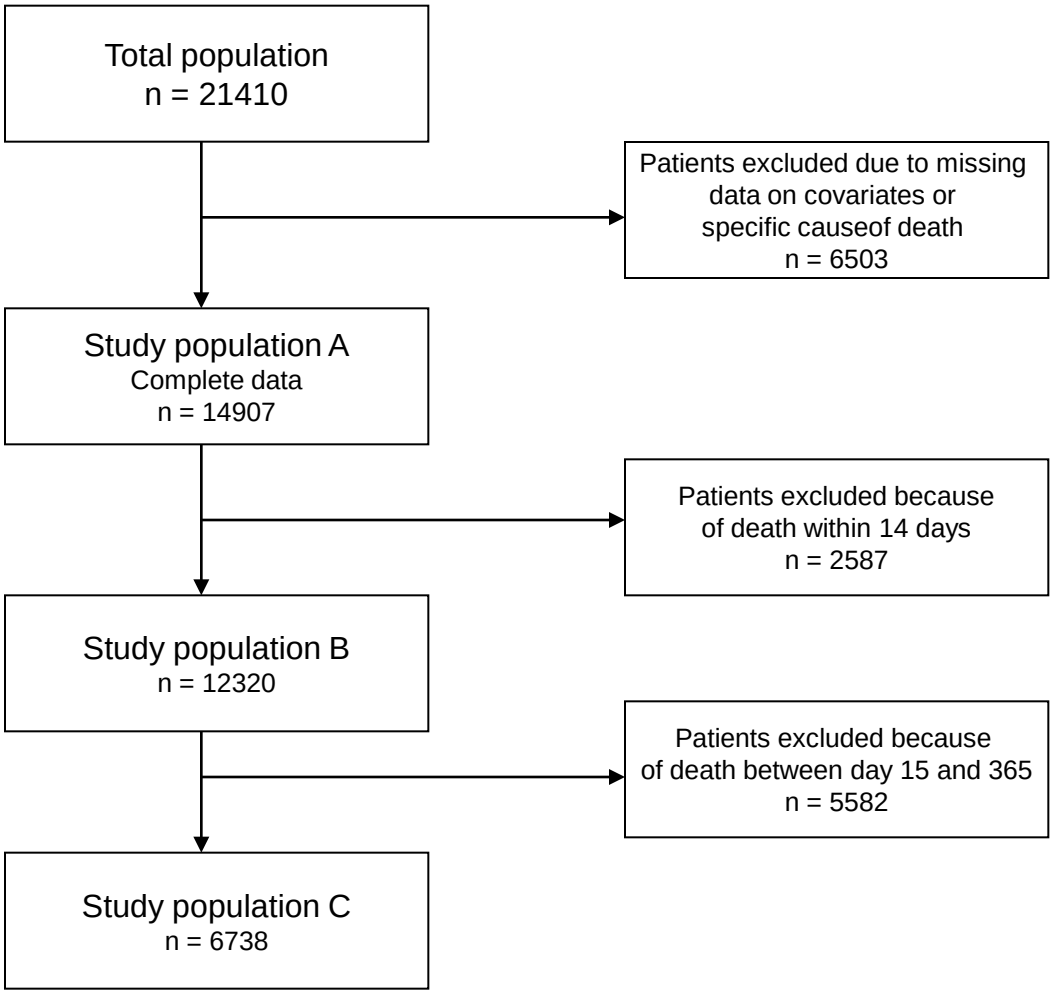
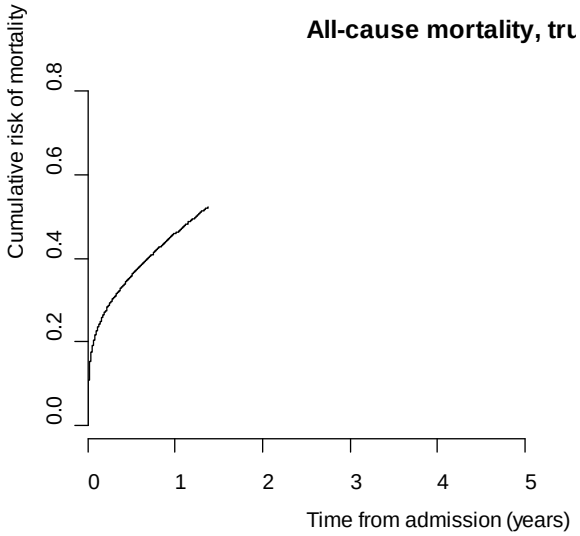


Figure 1


All-cause mortality, tru
Cumulative risk of mortality
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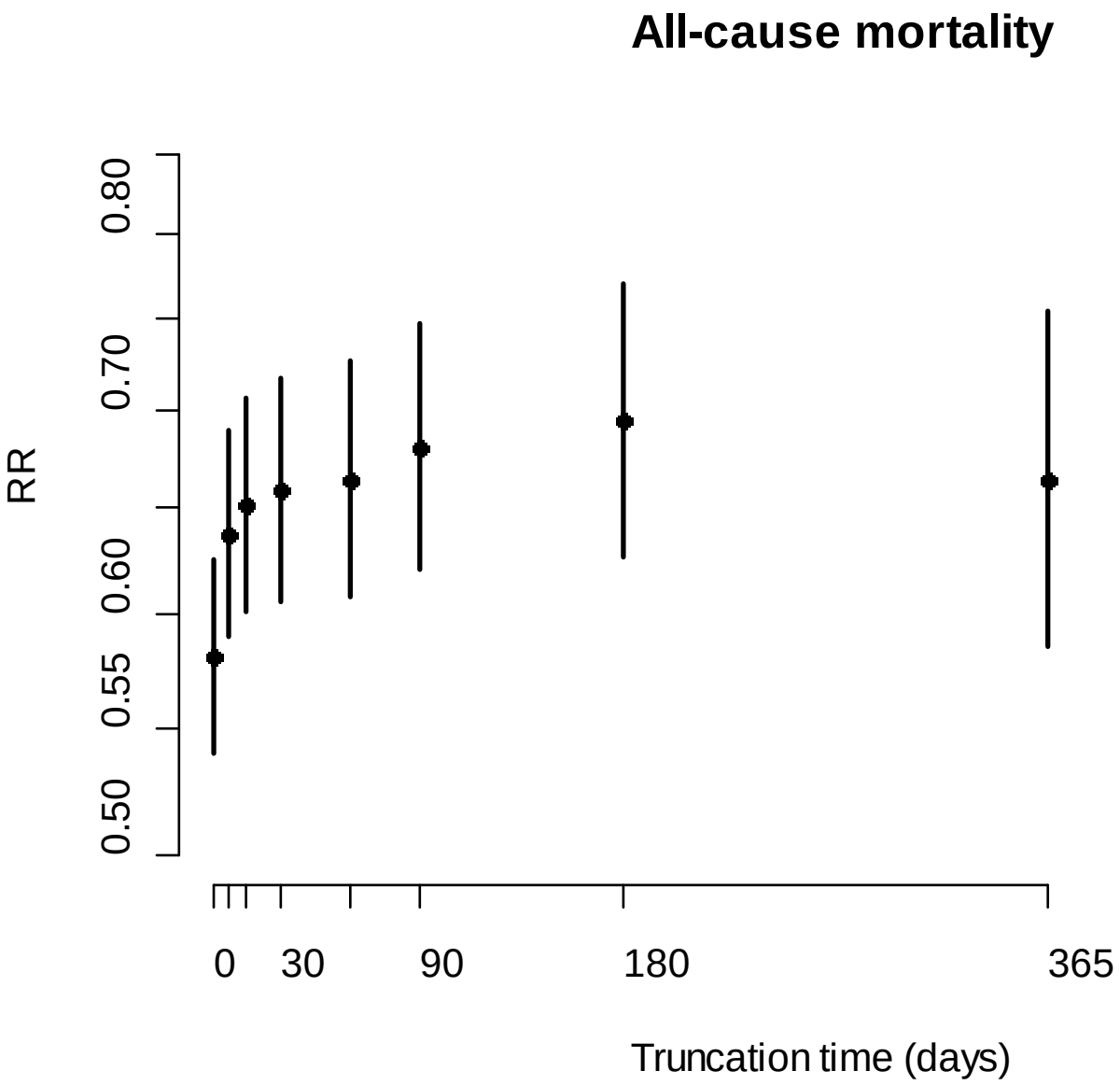
0.4
0.6
0.8
0
1
2
3
4
5
Time from admission (years)


All-cause mortality
RR
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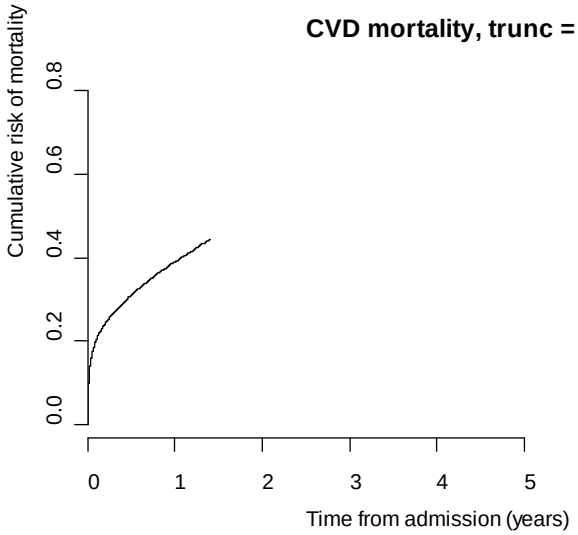
0.55
0.60
0.70
0.80
0
30
90
180
365
Truncation time (days)


CVD mortality, trunc =
Cumulative risk of mortality
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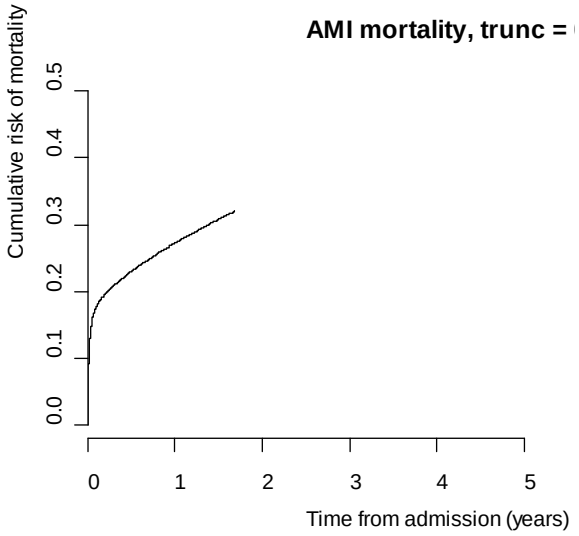
0.2
0.4
0.6
0.8
0
1
2
3
4
5
Time from admission (years)


AMI mortality, trunc =
Cumulative risk of mortality
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0.2
0.3
0.4
0.5
0
1
2
3
4
5
Time from admission (years)

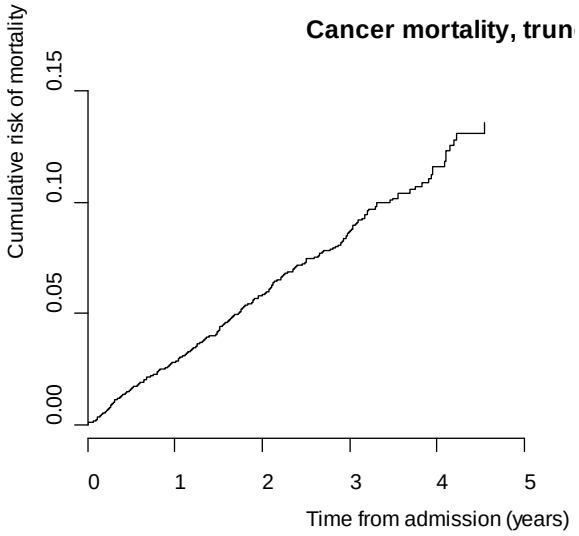
Cancer mortality, trun
Cumulative risk of mortality
0.00
0.05
0.10
0.15
0
1
2
3
4
5
Time from admission (years)

Table 1

Baseline characteristics in study population A & C

	Study population A		Study population C	
	No statins n=11522	Statins n=3385	No statins n=4967	Statins n=1771
Age (years)*	84 (82-87)	82 (81-84)	84 (81-86)	82 (80-84)
Women, % (n)	51.3 (5909)	51.0 (1727)	51.1 (2538)	52.1 (923)
Diabetes, % (n)	21.2 (2442)	21.4 (725)	18.8 (936)	19.2 (340)
Hypertension, % (n)	37.4 (4304)	44.3 (1500)	37.0 (1836)	42.5 (752)
Current smoker, % (n)	6.8 (779)	6.3 (213)	6.7 (332)	5.5 (97)
History of stroke, % (n)	17.3 (1990)	14.4 (489)	13.9 (688)	12.0 (212)
History of kidney failure, % (n)	1.9 (224)	1.7 (56)	1.2 (61)	1.0 (18)
History of COPD, % (n)	7.6 (876)	5.4 (184)	6.7 (332)	4.9 (87)
History of dementia, % (n)	0.6 (73)	0.1 (5)	0.4 (21)	0.4 (1)
History of heart failure, % (n)	25.0 (2876)	18.7 (632)	19.0 (946)	15.6 (276)
History of MI, % (n)	26.7 (3081)	30.1 (1018)	25.2 (1253)	28.1 (497)
History of peripheral artery disease, % (n)	7.8 (894)	7.4 (251)	5.6 (278)	5.8 (103)
History of cancer, % (n)	5.0 (572)	4.0 (134)	4.2 (208)	3.6 (63)
History of PCI/CABG, % (n)	6.4 (738)	21.0 (712)	7.6 (378)	19.3 (341)
Statins adm, % (n)	1.8 (202)	28.8 (974)	1.3 (65)	25.8 (457)
Betablockers adm, % (n)	39.8 (4588)	49.0 (1657)	38.8 (1927)	47.2 (836)
ASA adm, % (n)	50.9 (5870)	54.3 (1839)	49.8 (2475)	51.6 (914)
ACE-inhibitors adm, % (n)	20.8 (2401)	24.4 (826)	18.9 (973)	20.9 (370)
Clopidogrel adm, % (n)	1.7 (199)	3.8 (127)	1.3 (66)	2.6 (46)
Beta-blockers dis, % (n)	65.3 (7521)	85.3 (2888)	76.2 (3787)	85.5 (1515)
ASA dis, % (n)	72.6 (8363)	86.2 (2918)	84.0 (4174)	87.3 (1546)
ACE-inhibitors dis, % (n)	36.7 (4234)	53.2 (1800)	42.9 (2129)	51.9 (920)
Clopidogrel dis, % (n)	7.9 (912)	24.9 (838)	8.3 (414)	18.4 (326)

* Given as median (inter quartile range), COPD=chronic obstructive pulmonary disease, MI=myocardial infarction, PCI=percutaneous coronary intervention, CABG=coronary artery bypass grafting, adm= at admission, dis= at discharge

Table 2

		Events		Time at risk*		Events per 1000 patient years		Crude†	Cox-regression‡		
Mortality	Study population**	No Statin	Statin	No Statin	Statin	No Statin	Statin	RR	RR	LCL	UCL
Total	A	7718	1099	13.96	4.63	552.7	237.3	0.43	0.55	0.51	0.59
	B	5392	926	13.94	4.63	386.8	200.1	0.52	0.62	0.57	0.67
	C	2198	374	12.27	3.99	179.2	93.8	0.52	0.64	0.57	0.73
CVD	A	6070	859	13.96	4.63	434.7	185.5	0.43	0.55	0.51	0.60
	B	3945	702	13.94	4.63	283.0	151.7	0.54	0.64	0.58	0.70
	C	1478	244	12.27	3.99	120.5	61.2	0.51	0.61	0.52	0.72
AMI	A	3910	513	13.96	4.63	280.2	110.8	0.40	0.53	0.48	0.59
	B	1901	375	13.94	4.63	136.4	81.0	0.59	0.67	0.59	0.77
	C	627	105	12.27	3.99	51.1	26.3	0.52	0.62	0.49	0.79
Cancer	A	399	78	13.96	4.63	28.6	16.9	0.59	0.62	0.47	0.82
	B	385	77	13.94	4.63	27.6	16.6	0.60	0.63	0.47	0.83
	C	203	49	12.27	3.99	16.6	12.3	0.74	0.83	0.59	1.19

RR=Relative risk; LCL=lower 95% confidence interval; UCL=upper 95% confidence interval; CVD=cardiovascular disease; AMI=acute myocardial infarction.

*Expressed as multiples of 1000 person-years.

†Crude RR is calculated as the ratio of “events per 1000 person years” between the Statin and the No statin treatment groups.

‡All Cox regression models were adjusted for cardiovascular medications other that statins at discharge (beta-blockers, acetyl salicylic acid, other trombocyte inhibitors and angiotensin converting enzyme inhibitors), statin treatment upon admission, the propensity score and year of admission.

**Study population A refers to entire study population; Study population B refers to patients who survived at least 14 days after discharge; Study population C refers to patients who survived at least 365 days after discharge.

Table 3

Relative risk of all cause mortality for different subgroups in population C*

Variable	**Level**	**RR**	**Low**	**High**
History of heart failure	No Yes	0.65 0.60	0.56 0.46	0.77 0.78
History of AMI	No Yes	0.63 0.66	0.53 0.53	0.74 0.82
Sex	Men Women	0.61 0.69	0.51 0.57	0.73 0.82
Propensity group Propensity group Propensity group Propensity group	Q1 Q2 Q3 Q4	0.93 0.61 0.55 0.70	0.67 0.46 0.44 0.55	1.29 0.79 0.70 0.89

RR=Relative Risk; AMI=Acute myocardial infarction;
Q1= first quartile;Q2=second quartile;Q3=third quartile;Q4= fourth quartile
* Study population C refers to patients who survived at least 365 days after discharge.

Supplementary table 1

Baseline characteristics in study population B

	Study population B	
	No statins n=9145	Statins n=3175
Age (years)*	84 (82-87)	82 (81-84)
Women, % (n)	51.0 (4667)	51.4 (1633)
Diabetes, % (n)	20.9 (1907)	20.8 (661)
Hypertension, % (n)	37.8 (3453)	44.0 (1397)
Current smoker, % (n)	6.8 (622)	6.1 (195)
History of stroke, % (n)	16.4 (1502)	13.9 (442)
History of kidney failure, % (n)	2.0 (181)	1.5 (49)
History of COPD, % (n)	7.7 (706)	5.4 (173)
History of dementia, % (n)	0.5 (49)	0.2 (5)
History of heart failure, % (n)	24.6 (2248)	18.3 (582)
History of MI, % (n)	27.3 (2499)	29.5 (938)
History of peripheral artery disease, % (n)	7.4 (678)	7.1 (224)
History of cancer, % (n)	5.0 (458)	3.8 (122)
History of PCI/CABG, % (n)	6.9 (632)	21.1 (671)
Statins adm, % (n)	1.5 (136)	27.9 (886)
Beta-blockers adm, % (n)	40.1 (3671)	48.4 (1538)
ASA adm, % (n)	51.5 (4712)	54.1 (1717)
ACE-inhibitor adm, % (n)	21.0 (1918)	23.9 (760)
Clopidogrel adm, % (n)	1.7 (158)	3.7 (118)
Beta-blockers dis, % (n)	73.5 (6718)	85.7 (2721)
ASA dis, % (n)	80.9 (7402)	86.4 (2743)
ACE-inhibitor dis, % (n)	42.3 (3866)	53.4 (1694)
Clopidogrel dis, % (n)	9.3 (847)	24.6 (781)

* Given as median (inter quartile range), COPD=chronic obstructive pulmonary disease, MI=myocardial infarction, PCI=percutaneous coronary intervention, CABG=coronary artery bypass grafting, adm= at admission, dis= at discharge

Supplementary table 2

Baseline characteristics in patients excluded due to missing data

	No statins n=5216	Statins n=1287
Age (years)*	84 (82-88)	82 (81-84)
Women, % (n)	50.2 (2616)	52.1 (671)
Diabetes, % (n)	23.3 (1216)	28.2 (363)
Hypertension, % (n)	39.2 (1874)	45.2 (538)
Current smoker, % (n)	7.0 (213)	8.2 (73)
History of stroke, % (n)	19.6 (1021)	17.6 (226)
History of kidney failure, % (n)	1.8 (92)	2.3 (30)
History of COPD, % (n)	7.4 (386)	7.8 (101)
History of dementia, % (n)	0.8 (44)	0.3 (4)
History of heart failure, % (n)	26.2 (1364)	27.0 (348)
History of MI, % (n)	28.0 (1459)	35.6 (458)
History of peripheral artery disease, % (n)	7.4 (678)	7.1 (224)
History of cancer, % (n)	4.8 (252)	5.7 (74)
History of PCI/CABG, % (n)	5.0 (262)	15.6 (201)
Statins adm, % (n)	1.6 (80)	32.7 (396)
Beta-blockers adm, % (n)	40.9 (2017)	53.8 (654)
ASA adm, % (n)	52.1 (2585)	53.1 (651)
ACE-inhibitor adm, % (n)	22.0 (1084)	28.8 (351)
Clopidogrel adm, % (n)	2.3 (115)	4.2 (52)
Beta-blockers dis, % (n)	69.3 (3600)	85.7 (1096)
ASA dis, % (n)	75.9 (3941)	86.2 (1062)
ACE-inhibitor dis, % (n)	40.8 (2116)	55.3 (698)
Clopidogrel dis, % (n)	8.7 (451)	22.9 (292)

* Given as median (inter quartile range), COPD=chronic obstructive pulmonary disease, MI=myocardial infarction, PCI=percutaneous coronary intervention, CABG=coronary artery bypass grafting, adm= at admission, dis= at discharge