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Prognosis and outcomes of elderly (75–84 years) patients with acute myocardial infarction 1–2 years after the event — AMI-elderly study of the MONICA/KORA Myocardial Infarction Registry

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ABSTRACT

Background: With increasing life expectancy the management of acute myocardial infarction (AMI) in patients of an older age is of growing importance. However, long-term data are limited regarding 'hard' endpoints and quality of life in unselected elderly patients in 'real world' settings.
Methods and results: From March 2005 to March 2006 all 75–84-year old patients consecutively hospitalised due to an incident AMI in a large community teaching hospital were analyzed ($N=235$). Evidence-based therapy included the treatment with aspirin (93%), clopidogrel (65%), betablockers (93%), angiotensin-converting enzyme inhibitors/angiotensin receptor blockers (84%), and statins (83%). Percutaneous coronary intervention (PCI) was performed in 45.5% and bypass grafting (CABG) in 10.2%. The 28-day-case fatality was 17.4%. Long-term follow-up was obtained in 95.9% of all hospital survivors at a mean of 18.7 ± 6.4 months; during this time 19.9% of patients died. After multivariate analysis the only significantly negative predictor for survival and MACCE was diabetes, and the only significantly positive predictor was revascularisation during hospital stay. Patients with PCI/CABG had lower NYHA class (81% vs. 48%; $p<0.04$). Patients with PCI also had a higher EQ-5D index score (75 ± 18 vs. 67 ± 17, $p<0.04$) compared to patients not receiving PCI.
Conclusion: The positive long-time effect of revascularisation procedures during hospitalisation, not only on 'hard' endpoints but also on functional outcome and quality of life emphasizes that invasive therapies should not be considered less valuable in elderly people and that age alone should not preclude aggressive treatment during AMI.

1. Introduction

The population of elderly patients is often underrepresented in clinical trials of acute myocardial infarction (AMI) which serves as source of evidence-based data used subsequently for formulation of practice guidelines [1,2]. If not excluded by age, many elderly patients are excluded from clinical trials because of existing co-morbidities or other serious systemic illnesses. For example, when the inclusion and exclusion criteria for the GUSTO-I trial were rigorously applied to a contemporary cohort of patients with ST-Elevation AMI in an US infarction registry, only 15.4% of the elderly patients would have been eligible for trial enrolment [3]. In addition, studies examining the implementation of guideline-recommended treatment strategies showed that particularly elderly patients tend to be undertreated [4,5]. However, with increasing life expectancy of the population, especially in industrialized countries, the management of AMI patients of an older age is of growing importance. While a number of clinical studies as well as 'real life' scenarios exist showing positive effects of a more aggressive therapy on short term prognosis in elderly patients, data about predictors of long-term prognosis and especially about quality of life in the long-term are scarce. Accordingly, the American Heart Association has recently claimed the need for more data on quality of life and outcomes in elderly AMI patients [2].

We, therefore, investigated all elderly (75–84 years old) patients with AMI consecutively hospitalised in our tertiary care hospital over a period of one year and followed them for a mean of 18.7 ± 6.4 years after the event.

2. Methods

2.1. Study population

The population-based Augsburg Coronary Event Registry was implemented in October 1984 as part of the WHO MONICA (monitoring trends and determinants on cardiovascular diseases) project [6]. Since 1996 the registry has been carried on within

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the framework of KORA (Cooperative Health Research in the Region of Augsburg). All cases of fatal coronary events and non-fatal AMIs of the 25–74-year old inhabitants of the city of Augsburg and the two adjacent counties (about 400,000 inhabitants) are continuously registered. Methods of case finding, diagnostic classification of events and data quality control have been described elsewhere [7–9]. All patients with a suspected diagnosis of AMI are followed, who were hospitalised in the study region's major hospital (Klinikum Augsburg, academic teaching hospital of the University of Munich and tertiary care centre offering angiography, PCI, as well as heart surgery facilities). Approximately 85% of all AMI-cases of the study region are treated in this institution.

For the present study, in addition to the registration of the younger patients, all AMI patients aged 75–84 years who were consecutively hospitalised with AMI from March 2005 to March 2006 were prospectively registered. Detailed demographic, clinical, laboratory, and treatment-information was gained from the hospital databases and a concluding chart review.

The admission electrocardiograms were coded by specially trained coders and were classified in 3 pre-specified mutually exclusive groups: ST-elevation AMI (STEMI), when significant ST-elevation was found, non-ST-elevation AMI (NSTEMI), when ST-depression without concomitant ST-elevation was present or, when electrocardiogram was normal or showed non-specific ST-segment or T-wave changes, and bundle-branch block, when left or right bundle-branch block was present [9]. Renal insufficiency was diagnosed when diagnosis was recorded in the chart or the creatinine value at admission was >2.0 mg/dl. Diabetes was diagnosed when diagnosis was made in the chart or antidiabetic medication was given. Ejection fraction was derived from either echocardiography or ventriculography during catheterisation. The decision about patients' treatment was due to the most responsible treating physician. In our institution, physicians are trained closely to follow the ACC/AHA and ESC practice guidelines, and invasive therapy is preferred in all patients with STEMI and in all NSTEMI-patients with high-risk indicators, including recurrent angina, ischemia with low level of activity despite anti-ischemic therapy, elevated cardiac markers, ST-segment depression, chronic heart failure or depressed ejection fraction (<0.40), prior coronary artery bypass grafting, or prior PCI within 6 months, as well as in patients without high-risk markers, but a positive stress test [1,2].

The local ethics committee approved the study, and all participants gave written informed consent during inclusion of the study. For long-term follow-up patients signed informed consent for follow-up-interviews. Thirty-one patients did not give consent for interview (Fig. 1).

2.2. Long-term follow-up

Long-term follow-up information was achieved by personal contact (95%) or by contact with relatives or the patients general practitioner at a mean of 18.7± 6.4 months after the event. Survival status and validation of other outcomes were confirmed through patient contact, contacts with patients' relatives, patients' primary care or cardiovascular physicians, or hospital records. During the inclusion period over 12 months 254 cases with AMI were gathered of whom 19 cases were patients with one or more reinfarctions in the observed time period leaving 235 patients for further analysis. After exclusion of all patients dying within the first 28 days (17.4%) and those who dropped out (4.1%) 186 remained for further follow-up regarding survival status or MACCE (death, reinfarction, rehospitalisation with unstable angina with or without revascularisation procedures, rehospitalisation with congestive heart failure, stroke or severe bleeding complications) including a standardized interview in surviving patients (Fig. 1). Quality of life (QoL) was assessed at the time of long-term follow-up using EQ-5D, a generic health status instrument that has been validated in both the general population and the post-myocardial infarction population [10–12]. EQ-5D is an instrument for describing and valuing health states. It comprises five questions asking for the current health state in five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression [10]. The categories of the response offer three levels: no, moderate, and extreme problems. The EQ-5D health states can be combined into a single index using valuation formulas that are based on the health state valuation exercises of representative population samples. In addition, a summary score (EQ-5D index) can be calculated using the algorithm developed by Shaw et al. [10] and available through the Agency for Healthcare Research and Quality [13]. This score can range from −0.11, indicating health status worse than death, to 1.0, indicating perfect health. The questionnaire was followed by EQ VAS, a visual analogue scale that ranges from 0 (worst imaginable health state) to 100 (best imaginable health state).

2.3. Statistical analysis

Continuous data were expressed as mean values and categorical variables as percentages. The Chi^2-Test was used to test the differences in prevalences. Survival curves were constructed according to the method of Kaplan and Meier and compared using the log-rank statistic. Cox-proportional hazards modeling was used to determine independent predictors of long-term mortality. A 2-sided $p<0.05$ was considered to represent statistical significance. All analyses were carried out with the SAS ® System for Windows Release 9.1.

3. Results

3.1. Characteristics and in-hospital course of all patients

The baseline characteristics of the 235 cases with a first AMI during the observation period March 2005 until March 2006 are given in Table 1. The rate of co-morbidities with a proportion of 22.2% of patients with renal insufficiency and 34.5% with diabetes was relatively high. Most of the elderly patients presented with NSTEMI (50.6%).

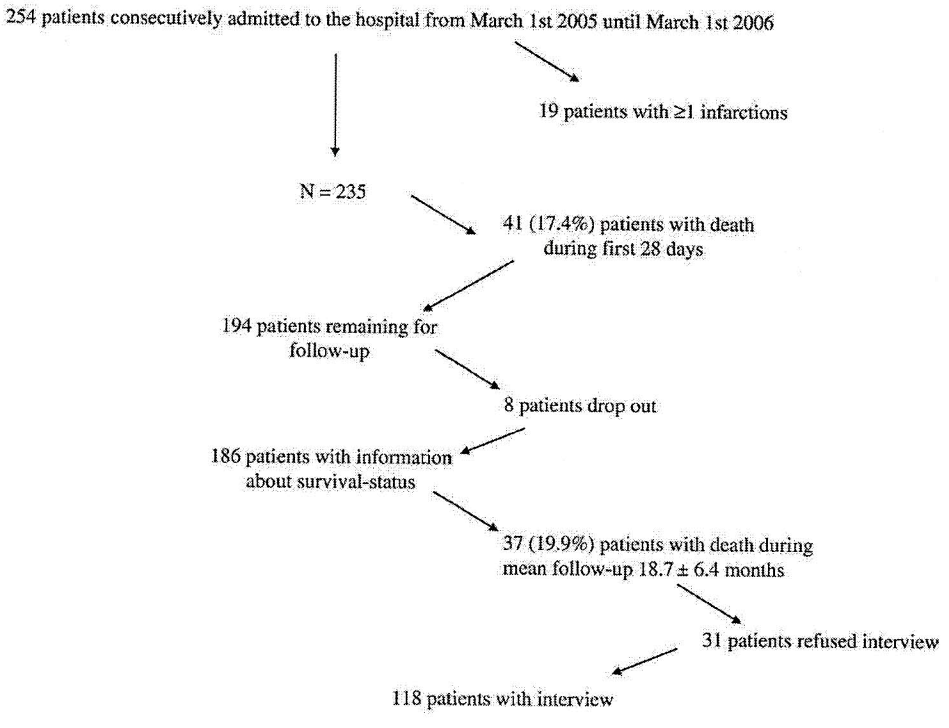

Fig. 1. Flow diagram of the entire patient cohort.

Table 1
Baseline and clinical characteristics.

Variable	N = 235
Baseline characteristics	
Men	140 (59.6%)
Age >79 years	117 (49.8%)
Renal insufficiency	52 (22.2%)
Prior myocardial infarction	59 (25.1%)
Diabetes	81 (34.5%)
COPD	27 (11.5%)
Clinical characteristics	
ST-elevation AMI	70 (29.8%)
Non-ST-elevation AMI	119 (50.6%)
Bundle-branch AMI	46 (19.6%)
Peak creatine kinase U/l	1022 ± 1608
Ejection fraction <40%[a]	65 (36.7%)
In-hospital therapy	
Heparin	233 (99.1%)
Aspirin	218 (92.8%)
Clopidogrel	153 (65.1%)
Glycoprotein inhibitors	107 (45.5%)
Betablockers	218 (92.8%)
Statins	196 (83.4%)
ACE-I or ARB	197 (83.8%)
Calcium channel blockers	86 (36.6%)
Coronary angiography during hospital stay	160 (68.1%)
PCI during hospital stay	107 (45.5%)
CABG during hospital stay	24 (10.2%)
Outcome	
CPR in the prehospital or hospital setting	48 (20.4%)
Cardiogenic shock	22 (9.4%)
28-day-case fatality	41 (17.4%)

COPD = chronic obstructive pulmonary disease; ACE-I = angiotensin-converting enzyme inhibitor, ARB = angiotensin receptor blocker, PCI = percutaneous coronary intervention; CABG = coronary artery bypass graft; CPR = cardio-pulmonary resuscitation.
[a] N = 58 missing.

Therapy with efficacy-proven medication, i.e. aspirin, β-blockers and ACE-inhibitors was relatively high, in 68.1% coronary angiography was done, and the majority of them were revascularised (Table 1). Only one patient was treated by thrombolysis (during ongoing resuscitation). In patients with STEMI 90% underwent coronary angiography, of whom 84% underwent PCI. From all attempted PCI-procedures 93.5% were successful, in 17% drug-eluting stents were used. Severe bleeding complications (cerebral bleeding, need for blood transfusion or need for surgery) occurred in 2.5% of all patients with no significant differences between conservatively vs. invasively treated patients.

Clopidogrel was given in 99% of all patients who underwent PCI vs. in 37% without PCI ($p<0.0001$). Forty one patients died during the first 28 days (28-day-case fatality 17.4%; 6.1% in patients with PCI/CABG vs. 31.7% in patients treated conservatively; $p<000.1$).

3.2. Follow-up

All patients surviving the index-hospitalisation were followed for a mean of 18.7 ± 6.4 months, and long-term survival was obtained for all except 8 patients. From the remaining 186 patients there were 37 additional deaths during long-term follow-up (19.9%). At least one MACCE (including death) was observed for 65 patients. Tables 2 and 3 show the baseline characteristics of the patients who experienced an adverse outcome. While age (above or below 79 years), renal impairment or depressed ejection fraction were not significantly associated with an adverse long-term outcome, the type of infarction (STEMI vs. NSTEMI or infarction with bundle-branch block), diabetes and the performance of a revascularisation procedure were associated with outcome. Accordingly, patients with an initial NSTEMI as well as patients with diabetes experienced significantly more MACCE and – at least diabetic patients – died significantly more often. On the other hand, the performance of a revascularisation procedure (PCI or CABG) was associated with a significantly better outcome. Figs. 2 and 3 show the respective Kaplan–Meier-curves of survival or MACCE-free survival for patients with or without PCI/CABG (log-rank tests $p<0.001$).

After putting all potential influencing factors in a multivariate Cox-proportional hazards model, the only significant predictor for worse outcome was diabetes, and for better outcome, the performance of a revascularisation procedure during hospital stay (Table 4).

Table 2
Baseline characteristics of 28-day-survivors according to long-term outcome (MACCE).

Variable	MACCE N = 65	No MACCE N = 121	p for difference
Men	42 (64.6%)	67 (55.4%)	0.22
Age >79 years	33 (50.8%)	57 (47.1%)	0.63
Renal insufficiency	13 (23.2%)	18 (16.8%)	0.32
Ejection fraction <40%[a]	17 (34.7%)	33 (31.1%)	0.66
Prior myocardial infarction	23 (35.4%)	23 (19.0%)	< 0.02
Diabetes	31 (47.7%)	38 (31.4%)	0.03
COPD	3 (4.6%)	13 (10.7%)	0.15
Reanimation in the prehospital or hospital setting	2 (3.1%)	8 (6.6%)	0.31
ST-elevation AMI	12 (18.5%)	45 (37.2%)	
Non-ST-elevation AMI	43 (66.1%)	54 (44.6%)	0.02[b]
Bundle-branch AMI	10 (15.4%)	22 (18.2%)	
Treatment with betablockers at discharge	64 (98.5%)	120 (99.2%)	0.65
Treatment with ACI/ARB at discharge	61 (93.9%)	110 (90.9%)	0.48
Treatment with statins at discharge	55 (84.6%)	101 (83.5%)	0.84
Treatment with clopidogrel at discharge	48 (73.9%)	91 (75.2%)	0.48
Coronary angiography during hospital stay	45 (69.2%)	97 (80.2%)	0.09
PCI or CABG during hospital stay	29 (44.6%)	90 (74.4%)	<0.0001

MACCE = reinfarction, rehospitalisation with unstable angina with or without revascularisation procedures, rehospitalisation with congestive heart failure, stroke, and severe bleeding complications.
[a] N = 31 missing.
[b] p-value for Chi²-Test for differences between the infarction-types.

Table 3
Baseline characteristics of 28-day-survivors according to long-term survival.

Variable	Death during follow-up N = 37	Survivors N = 149	p for difference
Men	25 (67.6%)	84 (56.4%)	0.22
Age >79 years	20 (54.1%)	70 (47.0%)	0.44
Renal insufficiency	8 (28.6%)	23 (17.0%)	0.16
Ejection fraction <40%[a]	11 (44.0%)	39 (30.0%)	0.17
Prior myocardial infarction	12 (32.4%)	34 (22.8%)	0.22
Diabetes	21 (56.8%)	48 (32.2%)	0.006
COPD	2 (5.4%)	14 (9.4%)	0.44
Reanimation in the prehospital or hospital setting	1 (2.7%)	9(6.0)	0.42
ST-elevation AMI	6 (16.2)	51 (34.2%)	
Non-ST-elevation AMI	25 (67.6%)	72 (48.3%)	0.07[b]
Bundle-branch AMI	6 (16.2%)	26 (17.4%)	
Treatment with betablockers at discharge	36 (97.3%)	148 (99.3%)	0.28
Treatment with ACI/ARB at discharge	36 (97.3%)	135 (90.6%)	0.18
Treatment with statins at discharge	31 (83.8%)	125 (83.9%)	0.98
Treatment with clopidogrel	26 (70.3%)	113 (75.8%)	0.48
Coronary angiography during hospital stay	21 (56.8%)	121 (81.2%)	<0.002
PCI or CABG during hospital stay	11 (29.7%)	108 (72.5%)	<0.0001

[a] N = 31 missing.
[b] p-value for Chi²-Test for differences between the infarction-types.

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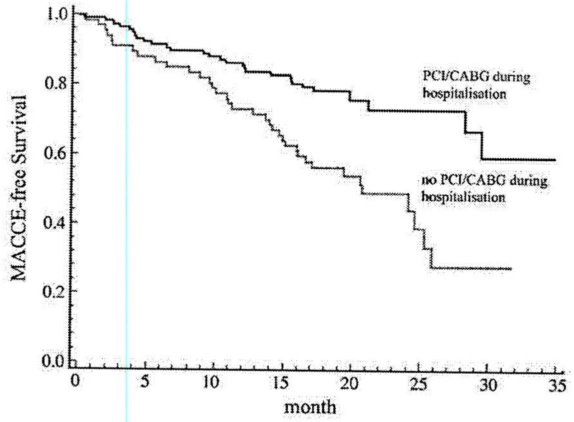

Fig. 2. Cumulative survival or being free of any event (death of any cause or other MACCE including reinfarction, rehospitalisation with instable angina with or without revascularisation procedures, rehospitalisation with congestive heart failure, stroke or severe bleeding complications) for patients with vs. without revascularisation procedure during hospitalisation (log-rank test $p<0.0001$).

From all surviving patients with follow-up ($N=118$) 41% were still living completely alone, 53% together with their partner or family, and only 6% in a nursery home. 67% were able to take care of themselves completely alone, and 16% with only mild help by others. Self assessment of their general health was judged to be very good by 3%, good by 27%, satisfactory by 47%, so that 77% had assessed their general health as at least satisfactory. There were no significant differences of self general health assessment between patients with or without revascularisation procedures. The prevalence of angina pectoris overall was low (9.6%) with no significant differences between the two groups. Patients with revascularisation overall had lower NYHA I or II class (81%) as compared to those without revascularisation (48%; $p<0.04$). Mean EQ VAS score was 56.7 (SD 19.1) vs. 52.3 (SD 19.0) in patients with vs. without revascularisation, respectively ($p=0.34$). The EQ-5D index score was 74 (SD 18) vs. 66 (SD 17), respectively ($p=0.08$). Fig. 4 shows the results of the EQ-5D for the respective dimensions. A significant difference in favor of the revascularisation group was only observed in the dimension mobility and self-care. When only patients with PCI as the revascularisation procedure vs. the others were considered, the respective numbers were: mean EQ VAS score 56.4 (SD 19.1) vs. 54.4 (SD 19.0), respectively ($p=0.62$), and mean EQ-5D index score 75 (SD 18) vs. 67 (SD 17), respectively ($p<0.04$).

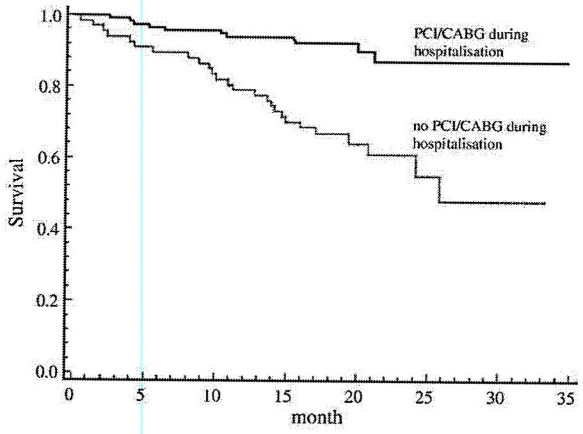

Fig. 3. Cumulative survival for patients with vs. without revascularisation procedure during hospitalisation (log-rank test $p<0.0001$).

Table 4
Predictors of long-term outcome in 28-day-survivors (multivariable Cox-proportional hazards analysis).

	MACCE			Death during follow-up		
	p-value	RR	95% C.I.	*p*-value	RR	95% C.I.
Man vs. women	0.11	1.54	0.91–6.1	0.07	1.95	0.96–3.97
Age >79 years yes/no	0.92	1.03	0.61–1.72	0.95	1.02	0.51–2.1
Renal insufficiency yes/no	0.60	1.22	0.58–2.6	0.88	1.10	0.36–0.24
Diabetes mellitus	0.02	1.86	1.12–3.06	0.001	3.14	1.57–6.27
Prior myocardial infarction yes/no	0.38	1.32	0.77–2.27	0.79	1.10	0.53–2.29
ST-elevation AMI	–	1	–	–	1	–
Non-ST-elevation AMI	0.09	1.79	0.90–3.53	0.27	1.69	0.66–4.33
Bundle-branch AMI	0.67	1.37	0.58–2.3	0.64	1.31	0.41–4.01
Coronary angiography during hospital stay yes/no	0.70	1.14	0.59–2.1	0.70	0.85	0.38–0.92
PCI or CABG during hospital stay yes/no	0.01	0.42	0.22–0.77	0.0003	0.20	0.08–0.48

4. Discussion

In this 'real world' study of consecutive elderly patients representing the whole spectrum of AMI, we were able to show that – after surviving the first 28 days – a reasonable number of patients are still alive 1 to 2 years after the initial event, with performance of a revascularisation procedure during initial hospitalisation being the only positive predictor of long-term outcome. In comparison to other studies, in our study it was unique to provide data about functional status and measures of quality of life. Therefore, we could show that, at least in part, PCI during the acute AMI-phase not only improves survival, but also improves NYHA class as well as quality of life, at least as measured by EQ 5-D index.

Regarding the acute phase, a 28-day CF of 17.4% is considerably higher than that for younger patients which was 7% in the same time period for the 25- to 74-year old AMI patients [14]. This is comparable with data from another German myocardial infarction registry reporting hospital mortality of 23.7% in AMI patients above 75 years vs. 7.3% in those younger than 75 years [15] or to another European centre from Toulouse (3.2% vs. 18.2% with an age of 80 as cutpoint for identifying elderly patients) [16]. Other European registries report lower hospital mortality rates in the elderly, i.e. Euro Heart Survey (8% in 75- to 84-year olds, 16.8% in those aged 85 and over) [17] or the Grace studies (9.3% in 75- to 84-year olds; 18.4% in those aged 85 and over) [18]. However, as may be the case with the latter, many registries, especially those with self-reporting of the participating

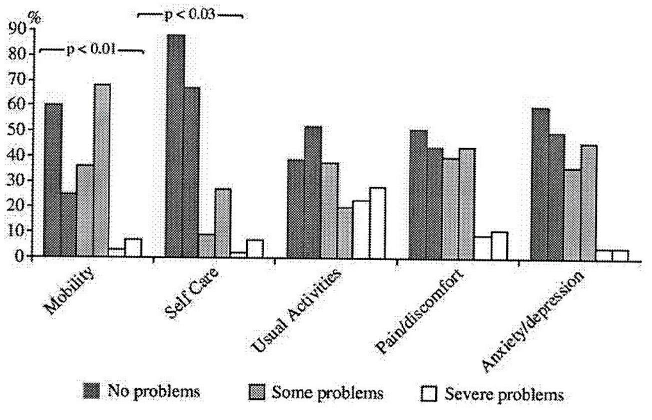

Fig. 4. Distribution of responses to the EQ-5D questionnaire (left side of each separately coloured bar with, right side without PCI/CABG during hospitalisation).

centres, fail to represent the complete manifestation of AMI often leading to the exclusion of very early deceased patients [7,14]. Similarly, few studies investigating AMI in the elderly incorporate both AMI-manifestations, most include only patients with STEMI or bundle-branch infarction [15,19].

Of interest, while recent data from studies examining the implementation of guideline-recommended treatment strategies showed that the elderly tend to be undertreated [4,5], in our population, the application of proven therapy was high with a prescription rate of 93% for betablockers, 93% for aspirin, 84% for ACE-inhibitors or angiotensin receptor blockers and 83% for statins. The prescriptions of these medications were nearly identical when compared with a 25- to 74-year old population from the same hospital investigated in 2004 [20]. As compared to other AMI-populations in Germany as well as other European elderly AMI-populations, the prescription of evidence-based medication was significantly higher [15,21], so that, at least in the setting of a contemporary tertiary care centre medical undertreatment in the elderly does not seem to exist.

Moreover, while in many other studies an underutilisation of invasive therapies in elderly patients has been reported [15,22,23], this has not been the case in our population, where 68.1% had undergone coronary angiography, 45.5% were treated with PCI and 10.2% with CABG during hospitalisation. Especially, patients with STEMI in our population were treated more frequently invasively (90% with angiography, 84% with PCI) reflecting the recommendations of contemporary guidelines [2]. And, in fact, similar to our study, in earlier studies it could be demonstrated that treatment by invasive therapy improved long-term survival in elderly STEMI-patients [24]. Less data exist about the influence of invasive therapy on long-term outcome in elderly patients with NSTEMI. Of interest, in the TACTICS-TIMI 18 study the long-term benefits (composite endpoint mortality, non-fatal MI, rehospitalisation, stroke, and hemorrhagic complications over 6 months) of invasive therapy were even more pronounced in the elderly (≥65 years) compared to younger patients, however the endpoint mortality alone was similar for the invasive and conservative groups. In addition, the rates of long-term mortality were relatively low in this clinical study population (5.3% and 5.9% respectively for the elderly population) [25]. In our real world study, we could demonstrate that in multivariate analysis – irrespective of the type of infarction – the performance of invasive therapy during hospital stay was associated with less MACCE as well as improved survival over a mean period of 1 to 2 years. The proportion of female patients was relatively high in our population (40.4%) as compared to registries including younger patients, but compares favourably with registries including older patients [19,23]. However, because there were no differences between man and women regarding invasive therapy (data not shown), as well as no significant effect when entering gender in the multivariable Cox-proportional hazards analysis for predictors of long-term outcome (Table 4), we believe that the observed effects of our study are not gender-specific.

Of course, although controlling for potential confounding factors, we cannot exclude the influence of other unmeasured factors, which could have influenced treatment decisions regarding invasive therapy during hospitalisation contributing also to a better outcome of invasively treated patients [26]. On the other hand, there were no significant differences in the prescription of evidence-based beneficial medication between those with vs. without MACCE (Table 2), indicating, at least, less potential influence of severe co-morbidities like severe dementia or other life-threatening or quality of life compromising illnesses on physicians decision for providing medical therapy [27]. There also were no significant differences in co-morbidities between patients with vs. without coronary angiography during hospital stay (data not shown), so that withholding the patient for potential invasive therapy was largely driven by co-morbidities which itself could serve as a major confounding factor for long-term outcomes.

In addition, while mean EQ VAS was not different between the revascularisation groups, patients with revascularisation during hospital stay showed a better functional status reflected by NYHA class as well as improved quality of life, as measured by EQ 5-D index which was especially caused by better rates regarding the dimension mobility and self-care. The prevalence of angina pectoris overall was low (9.6%), an observation which confers to previous findings of – as compared to younger patients – less angina in elderly postinfarction patients (10.9% in age group ≥75 vs. 23.4% in age group 19–49) [28]. Of interest, 77% of patients from the whole study population assessed their general health as at least satisfactory. In comparison to earlier investigations on post-AMI patients from the same study region, where only two thirds of even younger patients (70–74-year old patients 10 years post-AMI) assessed their general health as at least satisfactory [29], the results of the present study show that the majority of elderly people nowadays have a good functional outcome at 1–2 years post-MI. These findings support the widespread use of evidence-based therapy in these patients. Moreover, the positive long-time effect of revascularisation procedures during hospitalisation emphasizes that aggressive and invasive therapies should not be considered less valuable in elderly people and that age alone should not preclude aggressive treatment during AMI.

The only negative predictor for long-term outcome besides the absence of revascularisation procedures during hospitalisation was the presence of diabetes. This correlates well with observations from earlier investigations from our population [30,31] as well as others in younger AMI patients. There are, however, only few studies about long-term prognosis in older diabetic AMI patients [32] which also underscore the importance of diabetes as an important prognostic factor after AMI even in elderly patients.

5. Conclusions

The results of the present study show that the majority of elderly people nowadays have a good functional outcome at 1–2 years post-AMI. The only significant negative predictor for long-term outcome was the presence of diabetes, which highlights the need for further research on this topic in elderly AMI patients. The positive long-time effect of revascularisation procedures during hospitalisation not only on 'hard' outcomes like MACCE and death but also on functional outcome and quality of life emphasizes that aggressive and invasive therapies should not be considered less valuable in elderly people and that age alone should not preclude aggressive treatment during AMI.

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