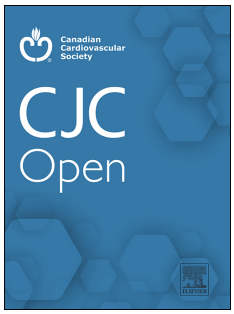

Frequencies and trends of myocardial infarction symptoms from the year 1985 to 2019: a register-based real-world analysis

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Frequencies and trends of myocardial infarction symptoms from the year 1985 to 2019: a register-based real-world analysis

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Short title: Trends in myocardial infarction symptoms

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Abstract

Background: To investigate the frequencies of typical and atypical acute myocardial infarction (AMI) symptoms over the past 35 years as well as age- and sex-differences.

Methods: This study used data from the population-based Augsburg Myocardial Infarction Registry. All cases of hospitalized AMIs occurring between 1985 and 2019 and aged 25 to 74 years were included (n=23,905 patients) in the analysis. During hospital stay patients were interviewed about their symptoms at the acute event and information from patient records was utilized. Multivariable adjusted logistic regression analyses were conducted to investigate the trends of AMI symptoms over time.

Results: Comparing the time-intervals 1985-1995 with 2006-2019, there was a decrease in frequencies (all p-values <0.001) for the symptoms typical chest pain (83.5% vs. 80.0%), pain left shoulder/arm/hand (52.1% vs. 44.9%), pain between shoulder blades (23.8% vs. 19.5%), nausea/vomiting (36.0% vs. 30.1%), and fear of death/feeling of annihilation (30.7% vs. 14.7%), while shortness of breath increased significantly over time (43.8% vs. 48.4%; p-value <0.001). Multivariable logistic regression analysis confirmed the decrease of frequencies AMI symptoms over the last decades. The only exception was the occurrence of shortness of breath, where a significantly independent increase was observed comparing 1985-1995 and 2006-2019 (OR 1.22; 95% CI 1.13-1.32). Atypical symptoms occurred more frequently in older patients and women.

Conclusions: Although there has been a decrease in the frequency of most AMI symptoms over almost four decades, AMIs are still commonly accompanied by typical chest pain. In particular, AMI must be considered if shortness of breath is present.

Key words: acute myocardial infarction, chest pain, atypical symptoms, shortness of breath, registry

Introduction

According to the World Health Organization (WHO) cardiovascular diseases (CVD) remain one of the most common causes of death today[1]. Currently around one third of all deaths in Germany are attributable to CVD and in Europe the CVD mortality is approximately 2.5 times higher for men than for women[2]. Although in recent years there has been a decrease in CVD mortality due to improved early detection and treatment, myocardial infarctions still rank second among the most common causes of death from CVD [3]. It is well known that in acute myocardial infarction (AMI) the extent and type of tissue damage is associated with an increased risk of adverse events such as arrhythmia, heart failure and death [4]. The development of necrosis follows a temporal pattern, so that approximately 90 minutes after the infarction 80% of the affected area is necrotic and complete necrosis occurs after about 6 hours [5]. Primary percutaneous coronary intervention (PCI) is recommended for ST-segment elevation myocardial infarction (STEMI) patients, with guidelines suggesting a first medical contact (FMC) to device time of 90 minutes or less[6]. To meet this time frame the correct assessment and interpretation of symptoms is essential [7]. Typical symptoms include chest, arm, or jaw pain, alongside a range of other atypical symptoms such as nausea, vomiting, and shortness of breath [7]. It is assumed that the symptomatology of an AMI differs between women and men, with women expected to exhibit more atypical symptoms [8]. There are also indications that the leading symptoms of an AMI change depending on age [9].

In recent decades, more and more efforts have been made in cardiovascular prevention with lifestyle changes and preventive medications to reduce incidence and mortality and the cost burden of CVD [10]. At the same time, educating the population and CVD risk patients about the symptoms of a heart attack and the importance of prompt treatment has also become increasingly substantial [11]. Whether these measures and changes have influenced the types and extent of reported symptoms of a heart attack and whether the reported symptoms have changed over the past decades remains unclear and has not yet been investigated. The extent to which sex- and age-specific differences in symptomatology have emerged in this context was also not examined so far. Studies indicated that

females and elderly present with more atypical symptoms of myocardial infarction compared to males and younger patients, respectively[8,12,13]. Atypical symptoms may contribute to the lower likelihood of a diagnosis and delayed treatment and result in poorer outcomes. The purpose of this study was to analyse the prevalence of typical symptoms including chest pain, pain left shoulder/arm/hand, or jaw pain, and atypical symptoms, such as pain between shoulder blades or at the upper abdomen, nausea/vomiting, dizziness/vertigo, and shortness of breath in patients with AMI over the last four decades using data of a population-based myocardial infarction registry. In addition, it was examined whether there are age- and sex-specific differences in this regard.

Material and Methods

Data Collection

The data used in this study were derived from the population-based Augsburg Myocardial Infarction Registry. The registry was implemented in 1984 as part of the World Health Organization (WHO) under the name MONICA (Monitoring trends and determinants in cardiovascular disease), aimed to completely capture hospitalized AMIs and their associated features such as symptoms, diagnostic procedures, invasive and non-invasive treatments between 1985 and 1995[14]. From the MONICA study, the Myocardial Infarction Registry of the Cooperative Health Research in the Augsburg Region (KORA) emerged in 1996, initiated by the Helmholtz Zentrum Munich [15]. Since 2021, the myocardial infarction registry has been continued as the Augsburg Myocardial Infarction Registry and is based at the University Hospital of Augsburg. All AMIs in individuals aged 25 to 74, who had their primary residency within the study region, were included, with the age expanded up to 84 years starting in 2009 [16-18].

Since October 1985 (until today), all AMI cases in the Augsburg study region have been recorded under effectively the same criteria over the whole study period. The study region of Augsburg, Bavaria, Southern Germany, includes the city of Augsburg, the county of Augsburg, and the county of Aichach-Friedberg (approximately 700,000 inhabitants). In this study region, eight hospitals closely cooperate to ensure comprehensive data collection.

For the present analysis, all cases of hospitalized AMIs occurring between 1985 and 2019 and aged 25 to 74 years were included (n=23,905 patients). After exclusion of patients with missing data on the symptom typical chest pain (n=362), a maximum of 23,543 patients could be included in the present study. Patient data were collected by trained study nurses via a face-to-face interview using standardized questionnaires during the patient's hospitalization period. To ensure complete data, information from patient records were also utilized. This facilitated the creation of a comprehensive dataset on the onset and duration of AMI symptoms as well as diagnostic parameters, information from electrocardiographic and laboratory analyses. The choice of treatment method and treatment course, as well as various comorbidities and risk factors potentially predisposing to AMI, were also recorded [19,20]. Ethical approval for the original data collection was obtained from the Bavarian Medical Association (approval number: 12057), following the ethical guidelines of the Helsinki Declaration. All patients provided written informed consent for data collection and processing [15,20,21].

Exposure

In the present analysis the time-period 1985 to 2019 was considered as the exposure. To investigate an association between time-period and the prevalence of symptoms, the entire time frame was divided into three (roughly equal) intervals based on the years in which the AMI occurred. The first interval covers the years from 1985 to 1995, comprising 5,126 cases. In the second interval from 1996 to 2005, there are 5,835 cases, and in the third interval, from 2006 to 2019, there are 12,582 patients included.

Outcomes

The outcomes of this study were various AMI symptoms. During the face-to-face interview patients were questioned about their symptoms in the context of the acute event and could respond with “yes” or “no”. Several typical symptoms possibly occurring during an AMI were queried, including the presence of chest pain and radiation of pain to the left or right arm, shoulder, or hand, as well as pain between the shoulder blades. Additionally, atypical symptoms were recorded, such as upper abdominal pain, jaw pain, sweating, nausea and vomiting, shortness of breath, and a feeling of

annihilation/fear of death. Typical chest pain symptoms were defined according to the WHO MONICA project as following: Symptoms are definite if sudden onset of chest pain (defined as pain or a feeling of pressure or tightness behind the breastbone) last longer than 20 minutes.

Statistical analysis

Primary analysis

Characteristics of the study sample and frequencies of each symptom were calculated for all three time-intervals. Subsequently, chi-square tests were conducted to test for differences between the intervals. Logistic regression analyses were conducted with the different time-intervals as independent variable and the respective symptoms as outcome variable. The interval 1985 to 1995 was used as the reference interval. Based on prior literature, the logistic regression models were adjusted for the following confounders, which may influence the exposure, the outcome, or both [22-24]: infarction type (ST-segment elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI), or bundle branch block), age, sex (male, female), smoking status (current smoker, ex-smoker, never smoker), diabetes mellitus (yes, no), first AMI or reinfarction, and type of treatment. The two symptom variables 'dizziness' and 'loss of consciousness' were excluded from the logistic regression analyses, because information on these symptoms was not available for the whole study period.

Secondary analyses

In additional descriptive analyses, the frequencies of symptoms by time-interval were also determined separately for different age groups and for men and women. To investigate whether there are differences between younger and older AMI patients in terms of acute symptoms over the period studied, patients were divided into three groups, namely the 25 to 54 age group, the 55 to 64 age group and the 65 to 74 age group. Since the rate of AMI rises with age, the first age group must cover a wider age range of 30 years which ensure enough cases within this group. Differences between the time-intervals were also tested using chi-square tests. All analyses were performed

using the IBM SPSS Statistics (version 29.0.1.). Reporting follows the STROBE (Strengthening the Reporting of Observational studies in Epidemiology) Statement-Checklist [25].

Results

In Table 1 the characteristics of the study sample for the three time-intervals are given. Comparing the time-intervals 1985-1995 with 2006-2019 the proportion of patients with hypertension (54.9% vs. 79.5%) and diabetes (23.6% vs. 35.0%) increased significantly over time (p<0.001), while the proportion of current smokers decreased (35.4% vs. 29.1%; p<0.001). Furthermore, the proportion of NSTEMIs (46.7% vs. 55.2%) and of patients receiving reperfusion therapy (36.6% vs. 81.9%) increased over time (p<0001).

Table 2 shows the frequencies (in numbers and percentage of patients) of the different AMI symptoms for the total sample by time-intervals. In all three time-intervals typical chest pain was the most frequently reported symptom, followed by the also commonly occurring symptoms pain left shoulder/arm/hand, sweating, and shortness of breath. Almost all AMI symptoms differed significantly (p-values <0.05) between the 1985-1995 and 2006-2019 periods with the proportion of patients reporting typical chest pain (83.5% vs. 80.0%), pain left shoulder/arm/hand (52.1% vs. 44.9%), pain right shoulder/arm/hand (27.1% vs. 24.9%), pain between shoulder blades (23.8% vs. 19.5%), nausea/vomiting (36.0% vs. 30.1%), and fear of death/feeling of annihilation (30.7% vs. 14.7%) decreased. Only the frequency of the symptom shortness of breath increased significantly over the study period (43.8% vs. 48.4%); p-value <0.001). Regarding the frequencies of the symptoms sweating and pain throat/jaw, no significant differences could be observed between the time-intervals. The frequency of the symptom dizziness/vertigo increased, and the frequency of the symptom syncope/unconsciousness decreased from the second to the third time-interval (a statement could be made only for these time-intervals, because both symptoms were not completely assessed during the first time-interval).

Logistic regression analyses

Multivariable logistic regression analyses based on the total sample showed an inverse relationship of the second and third time-interval compared to the first time-interval and the reported symptoms, except for the symptom shortness of breath (Table 3). The lowest odds was found for the symptom fear of death/feeling of annihilation (OR 0.35; 95% CI 0.32-0.38) comparing the third with the first time-interval. Contrary, a significantly higher odds was observed for the third time-interval compared to the first interval regarding the symptom shortness of breath (OR 1.22; 95% CI 1.13-1.23).

Results of secondary analyses

There was a downward trend in the frequencies of the symptom typical chest pain, pain left shoulder/arm/hand, and pain throat/jaw among the 55- to 64-year-olds and the 65- to 74-year-olds over time (Supplemental Tables S1, S2, and S3). In contrast, such a trend was not observed in the younger age group of 25- to 54-year-olds, where these symptoms tended to develop in the opposite direction (Supplemental Table S1). Regarding shortness of breath, an increased occurrence was noted in all age-groups over the past years. Across all age groups, the symptoms dizziness/vertigo were observed with increasing frequency over the entire period, whereby they occurred particularly more frequently in the two younger age groups.

Typical chest pain was the most frequently reported symptom for both men and women (Supplemental Tables S4 and S5), but there were no significant differences between the time-intervals for women (Supplemental Table S5), whereas men showed a noticeable decrease in the frequency of this symptom (Supplemental Table S4). The frequency of the symptom pain in the left shoulder/arm/hand decreased significantly in men and women. In contrast, the frequencies of the symptom shortness of breath increased in both sexes over time, with a more pronounced increase in women. The symptom dizziness/vertigo became more frequent over time and was less frequently present in men than in women. The frequency of the symptom upper abdominal pain increased over

time in women, whereas it decreased in men. Furthermore, over time women were more likely to experience vomiting, nausea, and pain between the shoulder blades than men.

Discussion

Our results suggest that between 1985 and 2019 there were changes in the frequency of reporting of typical and atypical symptoms associated with an AMI. There was a decrease in frequencies for the symptom typical chest pain, pain left shoulder/arm/hand, pain between shoulder blades, nausea/vomiting, and fear of death/feeling of annihilation, while shortness of breath increased over time (43.8% vs. 48.4%; p-value <0.001). In additional analyses, these findings were confirmed for both sexes and largely also for the individual age groups. Furthermore, atypical symptoms occur more frequently in older patients and women with AMI. The consistently observed and most frequently occurring symptom over the whole time-period in the whole sample as well as both men and women and in all age-groups was typical chest pain. Several studies have reached the same conclusion that chest pain is the main symptom in both sexes with AMI [26,27]. In addition, more atypical symptoms are reported by women, which occur in higher variety than in men [27-31]. In the present study, women with AMI also suffered more frequently from symptoms such as pain between shoulder blades, nausea/vomiting, pain throat/jaw, and shortness of breath in comparison to men. Although the frequency of these atypical symptoms decreased over time in both sexes (except for shortness of breath, which increased over time in both men and women), the sex differences remained. Possible explanations for these differences include different pain tolerance in men and women, various pathophysiologic mechanisms in the development of an AMI, and pre-existing comorbidities [8]. Women with AMI more frequently than men suffer from diabetes mellitus, hypertension, heart and kidney diseases, and depression [8,32]. In the INTERHEART study, a large international case-control study, the importance of risk factors for coronary heart disease and the strength of the association between various risk factors and AMI in the entire study population and stratified by geographic region, ethnicity, gender or age were investigated. It could be shown that the risk factors classified in the INTERHEART study have a significantly higher impact on the development of an AMI in women

compared to men [32,33]. Instead of the primary cause, the atherosclerotic plaque-induced AMI, the pathophysiology in women may be altered; microvascular changes and comorbidities may increase the risk of a type 2 AMI, which is caused by a mismatch between oxygen supply and demand and thereby triggers atypical symptoms [8,34].

Some previous studies have found that older patients have less typical chest pain compared to younger patients [35,36], which was confirmed in the present study. Furthermore, we observed that other classical AMI symptoms, such as pain left shoulder/arm/hand as well as atypical symptoms (e.g. pain right shoulder/arm/hand) were also less frequently reported among older age groups in all three time-intervals. In accordance with prior investigations, shortness of breath was more frequently present in older compared to younger patients with AMI [37,38].

The data from the Augsburg Myocardial Infarction Registry showed, that the frequency of almost all AMI symptoms significantly declined over time independent of infarction type age, sex, smoking status, diabetes mellitus, first or recurrent AMI, and type of treatment. However, it is notable that the symptom shortness of breath significantly increased during period. A possible explanation could be that patients today are older when experiencing an AMI and are more likely to suffer from comorbidities such as hypertension and diabetes mellitus [39]. This can lead to distorted perception and interpretation of symptoms when the origin of the complaints is no longer clearly identifiable. In contrast, multimorbidity or existing heart failure can more frequently lead to shortness of breath in the context of an AMI. It is essential to pay more attention to the symptom of dyspnea, as studies have shown that the occurrence of shortness of breath is associated with poorer short- and long-term survival outcomes [17,40].

Since the introduction of high-sensitive cardiac troponin I or T diagnostics, minor myocardial infarctions associated with mild symptoms are diagnosed more frequently. This may be a further explanation for the decrease in most typical and atypical AMI symptoms. Furthermore, compared to the 1980s and 1990s, today's faster and better (pain) medication (immediate administration of

morphine, aspirin, etc.) in case of an AMI may mean that pain is not perceived as strongly and remembered less in the interview during hospitalization [41].

One could assume that nowadays the general population is better informed than in the past about typical and atypical symptoms that can occur in the context of an AMI. A recent systematic review on the knowledge of AMI symptoms found a moderate to good knowledge of "classic" and insufficient knowledge of less obvious symptoms of AMI [42]. This lack of knowledge about atypical symptoms and the resulting lack of attribution of symptoms to an AMI - which may be more common in older age groups - could be a factor for the higher mortality in older patients with AMI[42]. A survey conducted in the USA in 1998 as part of the REACT Trial Study evaluated how many of the 11 symptoms listed as typical heart attack symptoms were perceived by respondents as a sign of their heart attack [43,44]. On average, patients experienced only 3 out of 11 symptoms, with chest pain being the most frequently mentioned. According to the authors, this result can be attributed to the previous lower level of public knowledge about the diverse manifestations of a heart attack, where only typical chest pain was widely known [43]. Similarly, a street survey conducted in Birmingham in 2009 showed that the public is inadequately informed about the variability of heart attack symptoms, particularly in lower socioeconomic classes. The most frequently mentioned symptoms were central chest pain, followed by arm pain and shortness of breath [45].

Study limitations

There are some limitations of the study to mention. Only patients aged 25 to 74 years living in the Augsburg region mainly with German nationality were included. Therefore, the results cannot be applied to older age groups and may not be generalizable to other regions or all ethnic groups. Another limitation may be that not all symptoms which could occur in connection with an AMI were recorded and therefore no statements can be made about other possible symptoms. A further limitation is that the symptoms were self-reported by the patients and recorded days after the acute event and therefore being highly subjective. Also, the possibility of recall bias due to medical history cannot be ruled out. Symptoms in the most severely ill patients, namely those who died within the

first few days, could not be recorded due to the lack of an interview; possibly more 'severe' symptoms would have been expected in this patient group. The lack of data on cardiac markers and the heterogeneity in the definition of AMI over time driven by using different assays is a further shortcoming of the study. The data collected by the registry does not tie into the fourth universal definition of myocardial infarction[46]. Unfortunately, renal function (or chronic kidney disease) was not available for the period 1985 to 2005. Therefore, we could not include it in the multivariable regression models. Furthermore, we could not distinguish whether the BBBs were long-standing or new ones. The ECGs at hospital admission were assessed by a physician, but the Sgarbossa criteria were not applied. Although the regression models were adjusted for several confounders, unmeasured confounding or residual confounding could not be entirely excluded.

Conclusions

Although there has been a decrease in the frequency of most AMI symptoms over more than the last three decades, acute heart attacks are still commonly accompanied by typical chest pain. This applies to both sexes and to all age-groups. Even though most symptoms became less frequent in AMI patients over the years, it is still important to note that atypical symptoms occur more often in women and with increasing age. The frequency of shortness of breath increased over the last decades and therefore must be considered as a potential angina equivalent. This also must be considered in the context of population-based awareness campaigns on AMI symptoms.

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Data availability

The data underlying this article cannot be shared publicly because the data are subject to national data protection laws and restrictions that were imposed by the ethics committee of the Bavarian Medical Association ("Bayerische Landesärztekammer") to ensure data privacy of the study participants because they did not explicitly consent to the data being made publicly available. The data will be shared on reasonable request to the corresponding author.

Disclosures

The authors have no conflicts of interest to disclose.

Patient Consent

The authors confirm that a patient consent form has been obtained for this article.

Ethics approval

The study complies with the Declaration of Helsinki. The study was approved by the Ethics Committee of the Bavarian Medical Association ("Bayerische Landesärztekammer"), approval number: 12057.

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Table 1: Description of the characteristics of patients with AMI (25-74 years) (n, %) by time-interval

Characteristics	1985 to 1995	1996 to 2005	2006 to 2019	p-value*
Sex (males)	3878 (74.2%)	4499 (76.2%)	9090 (71.2%)	<0.001
Age 25-54 years Age 55-64 years Age 65-74 years	1284 (24.6%) 1751 (33.5%) 2190 (41.9%)	1411 (23.9%) 1964 (33.2%) 2533 (42.9%)	2322 (25.3%) 2791 (30.4%) 4073 (44.3%)	<0.001
Incident infarction (yes)	4075 (78.5%)	4698 (79.8%)	10153 (79.6%)	0.212
NSTEMI STEMI BBB	2270 (46.7%) 2148 (44.2%) 443 (9.1%)	2900 (51.4%) 2344 (41.5%) 400 (7.1%)	6676 (55.2%) 4171 (34.5%) 1256 (10.4%)	<0.001
Hypertension (yes)	2827 (54.9%)	4219 (71.7%)	10146 (79.5%)	<0.001
Hyperlipidemia (yes)	2858 (58.0%)	3057 (52.1%)	4523 (35.4%)	0.307
Diabetes (yes)	1222 (23.6%)	1816 (30.8%)	4464 (35.0%)	<0.001
Current smoker Ex-smoker Never-smoker No information	1849 (35.4%) 1388 (26.6%) 1536 (29.4%) 452 (8.7%)	1900 (32.2%) 1708 (28.9%) 1610 (27.3%) 690 (11.7%)	3711 (29.1%) 3938 (30.8%) 3796 (29.7%) 2469 (10.4%)	<0.001
Reperfusion therapy (yes)	1890 (36.6%)	4195 (71.5%)	10418 (81.9%)	<0.001

*Chi^2-test

Table 2: Presenting symptoms, total sample **aged 25 to 74 years** (n, %) by time-interval

Symptom	1985 to 1995	1996 to 2005	2006 to 2019	p-value*
Typical chest pain† (yes)	4279 (83.5%)	4895 (83.9%)	7246 (80.0%)	<0.001
Pain left shoulder/arm/hand (yes)	2660 (52.1%)	2777 (47.1%)	4097 (44.9%)	<0.001
Pain right shoulder/arm/hand (yes)	1370 (27.1%)	1498 (25.4%)	2268 (24.9%)	0.013
Pain between shoulder blades (yes)	1198 (23.8%)	1272 (21.6%)	1775 (19.5%)	<0.001
Pain upper abdomen (yes)	640 (12.7%)	521 (8.8%)	970 (10.7%)	<0.001
Pain throat/jaw (yes)	1230 (24.4%)	1335 (22.7%)	2086 (22.9%)	0.057
Sweating (yes)	2474 (48.8%)	2834 (48.1%)	4308 (47.3%)	0.183
Nausea/vomiting (yes)	1834 (36.0%)	1822 (30.9%)	2749 (30.1%)	<0.001
Shortness of breath (yes)	2252 (43.8%)	2550 (43.2%)	4426 (48.4%)	<0.001
Dizziness/vertigo (yes)	4 (0.9%)	651 (13.8%)	1748 (19.2%)	<0.001
Syncope/unconsciousness (yes)	4 (0.9%)	344 (7.3%)	457 (5.0%)	<0.001
Fear of death/feeling of annihilation (yes)	1547 (30.7%)	1267 (21.5%)	1343 (14.7%)	<0.001

*Chi^2-test

† sudden onset of chest pain (defined as pain or a feeling of pressure or tightness behind the breastbone) lasting longer than 20 minutes

Table 3: Associations between the different time periods (exposure; reference period 1985 to 1995) and specific symptoms (outcome) in the age group 25-74 years. Results from the multivariable adjusted analyses‡. A logistic regression model was calculated for each individual symptom as an outcome.

Symptom (outcome)	1996 to 2005		2006 to 2019	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Typical chest pain†	0.85 (0.76-0.95)	0.005	0.54 (0.48-0.60)	<0.001
Pain left shoulder/arm/hand	0.75 (0.69-0.81)	<0.001	0.62 (0.57-0.67)	<0.001
Pain right shoulder/arm/hand	0.87 (0.80-0.96)	0.004	0.78 (0.72-0.86)	<0.001
Pain between shoulder blades	0.87 (0.79-0.96)	0.004	0.71 (0.64-0.78)	<0.001
Pain upper abdomen	0.68 (0.60-0.77)	<0.001	0.82 (0.73-0.92)	0.001
Pain throat/jaw	0.86 (0.78-0.94)	0.002	0.79 (0.72-0.87	<0.001
Sweating	0.90 (0.82-0.97)	0.009	0.76 (0.70-0.83)	<0.001
Nausea/vomiting	0.79 (0.73-0.86)	<0.001	0.74 (0.68-0.80)	<0.001
Shortness of breath	1.02 (0.94-1.11)	0.626	1.22 (1.13-1.32)	<0.001
Fear of death/feeling of annihilation	0.61 (0.55-0.67)	<0.001	0.35 (0.32-0.38)	<0.001

‡Adjusted for: infarction type, age, sex, smoking status, diabetes mellitus, first AMI or reinfarction, and type of treatment

† sudden onset of chest pain (defined as pain or a feeling of pressure or tightness behind the breastbone) lasting longer than 20 minutes