International Journal of the Cardiovascular Academy 3 (2017) 85–93

Contents lists available at ScienceDirect

International Journal of the Cardiovascular Academy

journal homepage: www.elsevier.com/locate/ijcac

Short communication

A real life registry to evaluate patient profile, diagnostic and practice patterns in Acute Coronary Syndrome in Turkey: TURK-AKS study

Ömer Kozan [a,*], Oktay Ergene [b], Ali Oto [c], A. Keskin Kaplan [d], on behalf of the TURK-AKS Investigators

[a] Sağlık Bilimleri University, Siyami Ersek Hospital for Cardiology and Cardiovascular Surgery, Istanbul, Turkey
[b] Izmir Dokuz Eylul University, Faculty of Medicine, Izmir, Turkey
[c] Hacettepe University, Faculty of Medicine, Ankara, Turkey
[d] Turkish Foundation of Family Medicine, Istanbul, Turkey

ARTICLE INFO

Article history:
Received 14 February 2017
Received in revised form 20 August 2017
Accepted 22 August 2017
Available online 31 August 2017

Keywords:
Acute coronary syndrome
Patient profile
Practice patterns
STEMI
NSTEMI
Hospital admission

ABSTRACT

Background and objective: Evaluation of patient characteristics and the patterns of diagnostic therapeutic practices of acute coronary syndromes (ACS) in Turkey.
Methods: A total of 3695 ACS patients (mean age: 60 ± 12 years, 73% males) were included in this prospective, multicenter, non-interventional registry.
Results: ST-segment elevation and non-ST segment elevation myocardial infarction (NSTEMI) were identified in 57% and 43% of patients, respectively. In 65% of cases admission was directly to the index hospital. Ambulance transport was higher in rural sites comparing to urban areas (53.4 vs. 38.4%, $p < 0.001$).
Admission to a hospital within the first 2 h of symptom onset was 42% while after 12 h was 24%. Spontaneous anginal relief (44%) was the leading cause of late hospital admission. Fibrinolytic treatment was administered in 23% of the patients. The most common in-hospital interventions were coronary angiography for NSTEMI (18%), primary percutaneous transluminal coronary angioplasty for STEMI (17.5%) and coronary angiography after lytic therapy (12.1%).
Conclusions: In a representative sampling for Turkish population five years ago, this registry of ACS revealed the predominancy of male gender, urban settlement, and presentation with STEMI. The delay between onset of symptoms and hospital admission was more prominent in rural sites, among females and in NSTEMI patients when compared to urban areas, males and STEMI patients.

Disclosure statement: The authors have no financial support or conflicts of interest to disclose.

Introduction

Acute coronary syndrome (ACS) represents a broader clinical spectrum ranging from unstable angina (UA) to non-ST segment elevation, as well as ST segment elevation, or even myocardial infarction (STEMI-NSTEMI) with heterogeneity in diagnosis, while treatments, and prognoses stand at the different ends of this spectrum.[1–3] In this respect, aiming to reduce both the cardiovascular morbidity and mortality, as well as improving the quality of life; the current management of ACS is based on a combination of invasive revascularization strategies and pharmacologic treatments. According to current guidelines the earlier the patient receives treatment, revascularization in specific, the greater the survival benefit with less damage via lesser likelihood of heart failure as a late outcome.[4,5]

In the frame of EUROASPIRE-European Action on Secondary and Primary Prevention by Intervention to Reduce Events I, II and III, the European Society of Cardiology (ESC) has carried out three consequent surveys on leading characteristics lifestyles, risk factor management and the drug therapies in patients with coronary heart disease (CHD).[6–8] The comparison of the results between EUROASPIRE I and EUROASPIRE II with nine participating countries were examined, whereas the condition was described as a 'collective failure of medical practice'. Increasing adversive lifestyle trends, smoking, obesity, and no improvement in blood pressure management were noted as the contributing factors in these studies.[9]

Besides, On the other hand high incidence of atherosclerotic vascular diseases (5/100 person-years) in Turkey is notable despite the predominance of younger population as reported in TEKHARF, THS, TURDEP, PATENT and TURKSAHA studies, which further revealed substantial data on the association between risk factors and the increased incidence of ACS in Turkish population.[10–16]

* Corresponding author at: Sağlık Bilimleri University, Siyami Ersek Hospital for Cardiology and Cardiovascular Surgery, Department of Cardiology, Haydarpaşa, İstanbul, Turkey.
E-mail address: omer.kozan@deu.edu.tr (Ö. Kozan).
Peer review under responsibility of The Society of Cardiovascular Academy.

https://doi.org/10.1016/j.ijcac.2017.08.003

However, there have been great progresses in the field of acute and chronic care of coronary heart diseases and evidence-based ACS treatment strategies, yet still a vast gap in clinical practice does exist.[17]

In addition, former registry studies on ACSs in Turkey were based mainly on localized data. Predominant inclusion of highly specialized cardiovascular centers was less likely to represent the ACS patient population in Turkey. The present national real-life registry was designed to evaluate current data on sociodemographic profile and presentation characteristics of patients as well as the diagnostic and practice patterns in the management of ACS across the country.

Methods

Study population

This large scale prospective, multicenter, observational registry study aimed to evaluate baseline sociodemographic and clinical characteristics of patients presenting with ACS (STEMI, NSTEMI, UA) while depicting the current management practices of ACS in Turkey.

Participating healthcare centers were selected by the Project Advisory Board of the study based on the number of hospital beds across the country in relation to the hospital type (university/state/private) and distribution of specialists (cardiology/internal medicine) in each geographical region. Accordingly, a total of 383 physicians located in 6 geographic regions enrolled patients between January 2007 and August 2010. Patients admitted to a hospital with a presumptive diagnosis of ACS and consented to participate in this study were included.

Written informed consents were collected from each subject following detailed explanations of the protocol of the study which was conducted in accordance with the ethical principles stated in the "Declaration of Helsinki" and approved by the ethics committee and the Ministry of Health.

Data collection

During the hospital stay, patient demographics, medical history, concomitant medical conditions, clinical and laboratory data including electrocardiography (ECG) evaluation, cardiac symptoms, levels of creatine kinase-MB (CK-MB), troponin, biochemical and hematological parameters on admission and follow-up evaluations were recorded. Duration from symptom onset to hospital admission, reasons for delayed admission; pharmacological interventions (including fibrinolytic therapy, aspirin, clopidogrel, heparins, ACEIs, ARBs, calcium channel blockers, beta-blockers, and statins) during hospitalization and at the time of hospital discharge; coronary angiography, percutaneous coronary intervention (PCI), and coronary artery bypass grafting (CABG) were recorded for each patient.

Statistical analysis

Patient sampling method was based on geographic distribution of population variations and available beds for ACS patients on the basis of number of available intensive care units (ICU) and post ICU beds for ACS patients at each geographic region. Sampling stratifications were made to 6 geographical regions.

The patient sample size estimation was based on the number of ACS occurring each year since 1998 according to Ministry of Health of Turkey statistics as a "time-series analysis" for ACS including all discharged patients and deaths. Enrolling a minimum of 3650 patients across 6 geographic regions of Turkey was estimated to be sufficient to determine specific knowledge ratio of 5% based on a power of 80% at a type I error of 0.05.

Statistical analysis was performed by Stata software package (version 10.0, Texas, USA). Data were summarized by using descriptive statistics (mean, standard deviation, ratio, 95% confidence interval where appropriate). Since this was a non-interventional trial, only available data were included in the analysis; however, number of missing data is not mentioned unless it is higher than 10% of the patients. Chi-square test was used comparisons of categorical data and *t*-test for continuous variables. All tests were two-sided and $p < 0.05$ was considered as statistically significant.

Results

A total of 3695 (mean age: 60 ± 12 years, 73% males) patients were included in the study. Females were significantly older (mean age 59 ± 12 years for males and 67 ± 11 years for females; $p < 0.001$). Settlement was predominantly urban (77%). The Body Mass Index was 27.5 ± 4.09 kg/m^2 while mean height, weight and waist circumference were 171 ± 6 cm (n = 1704), 79 ± 12 kg (n = 1772) and 100 ± 13 cm (n = 638) in males; and 159 ± 6 cm (n = 489), 74 ± 13 kg (n = 528) and 102 ± 15 cm (n = 226) in females, respectively. Waist circumference was ≥88 cm in 83% of females.

High blood pressure at hospital presentation (SBP ≥ 140 mm Hg and DBP ≥ 90 mm Hg) was identified in 23% of the overall population and more commonly among females (26 vs. 22%, $p < 0.001$). Baseline demographics are presented in Table 1. Current smokers composed 69% of the study population. Family history of coronary artery disease was evident in 34%; and hypertension was the most common concomitant disease (48%) (Table 1).

Hospital admission

In 65% of cases admission was directly to the index hospital. As expected, referred cases were more prevalent in rural areas when compared to urban settlement (50% vs 30%, $p < 0.001$). Referral from the index hospital to another hospital was also more prevalent in rural areas (16 vs. 12%, $p < 0.01$) Transportation by an ambulance was more frequent for patients living in rural areas (53 vs. 38%, $p < 0.001$) (Table 2). Requirement for an invasive intervention was the most common reason (83.7%) for referral to another hospital (Table 2).

Chest pain (93%) was the most commonly identified symptom at hospital admission. The presentation of patients was STEMI in 57% (mean age: 59 ± 10 years) and NSTEMI in 43% (mean age: 63 ±

Table 1
Vital signs and medical history at hospital admission.

	Male	Female	Overall
Vital signs	Mean (±SD)		
Systolic blood pressure (mm Hg)	129.3 (25.5)	134.9 (28.1)**	130.8 (26.3)
Diastolic blood pressure (mm Hg)	78.3 (14.9)	78.8 (16.4)	78.4 (15.3)
Pulse (beat/min)	79.5 (16.8)	82.5 (17.4)**	80.3 (17.0)
SBP ≥ 140 and DBP ≥ 90 mm Hg	n (%)		
	555 (21.6)	236 (25.6)*	791 (22.6)
Smoking status			
Ex-smoker	621 (30.9)	59 (38.3)	680 (31.4)
Current smoker	1388 (69.1)	95 (61.7)	1483 (68.6)
Total	2009 (73.9)	154 (15.8)**	2163 (58.5)
Family history of coronary disease	923 (34.0)	321 (32.8)	1244 (33.7)
Concomitant diseases			
Hypertension	1080 (39.8)	677 (69.2)**	1757 (47.6)
Hyperlipidemia	781 (28.7)	377 (38.6)**	1158 (31.3)
Diabetes mellitus	549 (20.2)	384 (39.3)**	933 (25.3)
Past history of			
Myocardial infarction	550 (20.2)	164 (16.8)*	714 (19.3)
Heart failure	321 (11.8)	166 (17.0)**	487 (13.2)
Transient ischemic attack	67 (2.5)	41 (4.2)*	108 (2.9)
Stroke	92 (3.4)	56 (5.7)*	148 (4.0)
Peripheral artery disease	64 (2.4)	14 (1.4)	78 (2.1)
Coronary artery bypass graft	175 (6.4)	45 (4.6)	220 (6.0)
Percutaneous coronary intervention	323 (11.9)	89 (9.1)	412 (11.2)
Stable angina pectoris	680 (25.0)	300 (30.7)**	980 (26.5)

* $p < 0.01$; compared to males.
** $p < 0.001$; compared to males.

Table 2
Hospital admission in ACS patients with respect to location of residence.

	Location of residence		Overall
	Urban (n = 2802)	Rural (n = 858)	
Admission type	n (%)		
Referred	854 (30.5)	430 (50.1)**	1.293 (35.0)
Direct	1.948 (69.5)	428 (49.9)**	2.402 (65.0)
Transport vehicle			
Ambulance	867 (38.4)	386 (53.4)**	1.261 (42.1)
Private transportation	1.389 (61.6)	337 (46.6)**	1.736 (57.9)
Referral to another hospital			
Overall	330 (11.8)	142 (15.9)*	472 (12.8)
Reason for referral			
Cardiogenic shock	10 (3.0)	3 (2.1)	13 (2.8)
Invasive intervention	285 (86.4)	110 (77.5)	395 (83.7)
Pericarditis	–	2 (1.4)	2 (0.4)
Cerebrovascular accident	–	1 (0.7)	1 (0.2)
Conduction disorders[a]	8 (2.4)	7 (4.9)	15 (3.3)
Post-myocardial infarction angina	15 (4.6)	11 (7.8)	26 (5.5)
Other	42 (12.7)	13 (9.2)	55 (11.7)

[a] Includes ventricular tachycardia/fibrillation, atrioventricular block, rhythm disorder and atrial fibrillation.
* $p < 0.01$; compared to urban location.
** $p < 0.001$; compared to urban location.

11 years) of the patients. Half of the patients were in New York Heart Association Class I (59%) and Canadian Cardiovascular Society Class II (55%); most of them were in sinus rhythm (96%) and Killip status was Class I (82%) (Table 3).

Mean duration of symptoms was 136 (±503) min in the overall population and there was no significant difference with respect to gender, settlement (Table 4) and the diagnosis (mean 152 (508) min in STEMI vs. 115 (496) min in NSTEMI.

Data concerning the duration between symptom onset and hospital admission in the overall population with respect to gender, settlement location and the diagnosis are summarized in Fig. 1. Figs. 2 and 3 show the detailed evaluation of the delay in hospital admission. The major reason for the delay in hospital admission was waiting for spontaneous relief (45%) (Table 4).

Hospitalization

Time from hospital admission to hospitalization was found to be mean 2.0 ± 5 h. Majority of the patients were hospitalized to the coronary intensive care unit (ICU) (98%) with a mean length of overall hospitalization for 5 ± 3 days (Table 5). In-hospital mortality was 3% (107 cases) in the overall population. In-hospital mortality within the first 24 h was significantly higher in STEMI patients (42 vs. 21%, $p < 0.05$) while mortality after 24 h was more common among NSTEMI patients (79 vs. 58%, $p < 0.05$) (Table 5). Sudden cardiac death/ventricular fibrillation (VF) (32%) and heart failure (30%) were the most common reasons for in-hospital mortality (Table 5). Change in levels of CK-MB and troponin I/T during hospital stay are shown in Table 6.

Fibrinolytic treatment, primary PCI and rescue PCI were all determined to be performed more frequently in earlier hospital admissions (Fig. 4). Overall 39.3% (n = 826) of STEMI patients and 3.5% (n = 55) of NSTEMI patients received in-hospital fibrinolytic therapy (Table 7). Coronary angiography was performed in 18% of NSTEMI patients, 12.1% of post-lytic patients and primary PCI in 17.5% of STEMI patients (Table 7).

Representing the first large scale attempt to describe the patient profile, presentation characteristics and the diagnostic and practice patterns in ACS across Turkey, the present national registry revealed predominancy of male gender (73.5%), age of 51 to 70 years (55.4%), urban location (76.6%) and STEMI (56.9%) among ACS patients.

Besides, females were associated with older age, higher incidence of concomitant diseases and the increased likelihood of NSTEMI diagnosis

Table 3
Symptoms and cardiological status at hospital admission.

	Male (n = 2717)	Female (n = 978)	Overall
Symptoms at hospital admission	n (%)		
Chest pain (angina)	2560 (94.2)	911 (93.2)	3471 (93.4)
Dyspnea	546 (20.1)	263 (26.9)	809 (21.9)
Syncope	87 (3.2)	45 (4.6)	132 (3.6)
Sweating	914 (33.6)	280 (28.6)	1194 (32.3)
Palpitation	271 (10.0)	160 (16.4)	431 (11.7)
Nausea/vomiting	514 (18.9)	229 (23.4)	743 (20.1)
At admission or in-hospital sudden death	14 (0.5)	2 (0.2)	16 (0.4)
Other	235 (8.7)	106 (10.8)	341 (9.2)
Type of ACS			
STEMI	1656 (61.0)	446 (45.6)	2102 (56.9)
NSTEMI	1061 (39.1)	532 (54.4)	1593 (43.1)
Rhythm disorder			
Sinus rhythm	2613 (96.2)	904 (92.4)	3517 (95.2)
Atrial fibrillation	68 (2.5)	60 (6.1)	128 (3.5)
Other	70 (2.6)	37 (3.8)	107 (2.9)
New York Heart Association class			
1	203 (63.2)	86 (51.8)	289 (59.3)
2	84 (26.2)	54 (32.5)	138 (28.3)
3	31 (9.7)	25 (15.1)	56 (11.5)
4	3 (0.9)	1 (0.6)	4 (0.8)
Canadian Cardiovascular Society class			
I	204 (30.0)	78 (26.0)	282 (28.8)
II	372 (54.7)	168 (56.0)	540 (55.1)
III	79 (11.6)	49 (16.3)	128 (13.1)
IV	25 (3.7)	5 (1.7)	30 (3.1)
Killip status			
I	1.529 (84.3)	472 (75.0)	2.001 (81.9)
II	202 (11.1)	120 (19.1)	322 (13.2)
III	63 (3.5)	30 (4.8)	93 (3.8)
IV	20 (1.1)	7 (1.1)	27 (1.1)
Unknown	903	349	1.252

Table 4
Duration of symptoms and reasons for the delay in hospital admission.

		Overall	Location of residence		Gender	
			Urban (n = 2802)	Rural (n = 858)	Female (n = 978)	Male (n = 2717)
Duration of symptoms (min)	Mean (SD)	136.0 (503)	136.7 (557)	136.9 (279)	153.5 (675)	129.6 (423)
		n(%)				
Waiting for spontaneous relief		563 (44.7)	410 (45.9)	147 (41.1)	185 (47.6)	378 (43.6)
Ignored		186 (14.8)	136 (15.2)	48 (13.4)	47 (12.1)	139 (16.0)
Transport difficulties		141 (11.2)	61 (6.8)	80 (22.4)	48 (12.3)	93 (10.7)
It was thought to be gastric pain		133 (10.6)	105 (11.8)	27 (7.5)	34 (8.7)	99 (11.4)
It was thought to be muscle pain		94 (7.5)	80 (9.0)	14 (3.9)	37 (9.5)	57 (6.6)
Low socioeconomic status		78 (6.2)	36 (4.0)	42 (11.7)	32 (8.2)	46 (5.3)
Living alone		37 (2.9)	20 (2.2)	16 (4.5)	20 (5.1)	17 (2.0)
Other		111 (8.8)	72 (8.1)	38 (10.6)	38 (9.8)	73 (8.4)

compared to males. The delay between onset of symptoms and hospital admission was more prominent in rural locations, among females and in NSTEMI patients when compared to urban location, males and STEMI patients.

In this respect, patient profile determined in our national registry is in line with the results of EUROASPIRE III[8] concerning the lifestyle, risk factors and use of cardioprotective drug therapies in coronary patients from 22 European countries which indicates the population sample to include 27.4% (3821) women with overall the mean (SD) age of 61.9[10] years as well as results of the Turkey arm of EUROASPIRE III survey[16] that indicated 23.8% of the population was composed to females. Likewise our finding of 21.1% of the study population was composed of patients that were younger than 50 years of age seems compatible with the higher rates of young patients with MI (<50 years, 20% vs. 12.7%) reported in Turkey arm of EUROASPIRE III study[16] as well as the consistently reported unexpectedly high incidence of atherosclerotic vascular diseases (5/100 person-years)[10] in Turkey in TEKHARF,[11] THS,[12] TURDEP,[13] PATENT[14] and TURKSAHA[15] studies despite having much younger population than in other European countries.[16]

Indeed, the most important differences specific to Turkey compared to other countries included in EUROASPIRE III study were reported to be higher rates of young patients with MI (<50 years, 20% vs. 12.7%), persistence in smoking (23.1% vs. 17.2%), immobility, low HDL-cholesterol (50.2% vs. 36.7%), insufficient follow-up by physicians after the index event (12% vs. 2.2%-except Turkey), and the insufficient patient education.[16]

According to our findings, female gender seems to associate with older age (66.6 vs. 58.9 years), higher incidence of concomitant diseases including hypertension (69.2 vs. 39.8%), hyperlipidemia (38.6 vs. 28.7%) and diabetes mellitus (39.3 vs. 20.2%) as well as increased diagnosis of NSTEMI (54.4 vs. 39.1%) in comparison to males.

A number of sociodemographic, clinical, social and proximal factors have been associated with pre-hospital delay that includes the time required to recognise the presence of abnormal symptoms, attribute the symptoms to a condition requiring medical attention, to decide to seek care, arrange transportation, and travel to the hospital.[18,19]

Accordingly, admission within the first 2 h of symptom onset (42.5%) was more common for males and urban location, while admission after ≥12 h of symptom onset was more common in females, rural location and NSTEMI diagnosis in our study population.

In relation identification of "waiting for symptoms to go away on its own" in almost half of our patients as the reason for the delay, patients who attributed symptoms to a heart attack rather than some other cause were reported to be more likely to have short decision times in the literature.[26]

Therefore, besides the failure in attribution of symptoms to a heart attack by half of our patients, arrival of almost 60% of them to the hospital with the use of private cars rather than ambulance seems notable regarding the critical role of making initial contact with the EMS in promoting short pre-hospital delays.[26] Hence, our findings seem to highlight the need for improved education of the general public on the

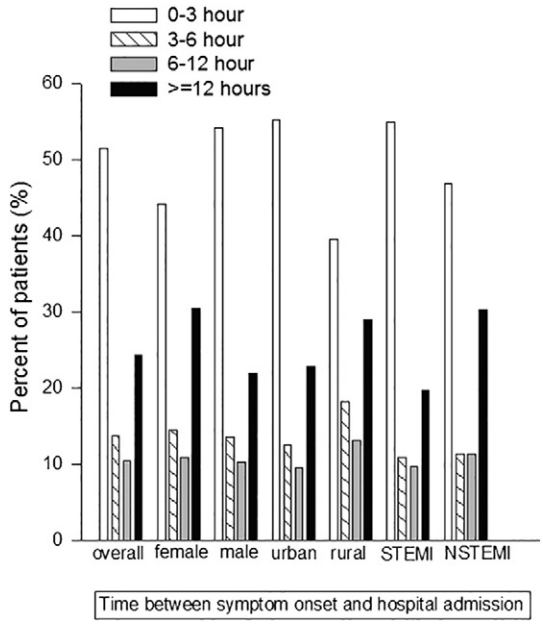

Fig. 1. Time between symptom onset and hospital admission in the overall population with respect to, gender, location of residence and the diagnosis.

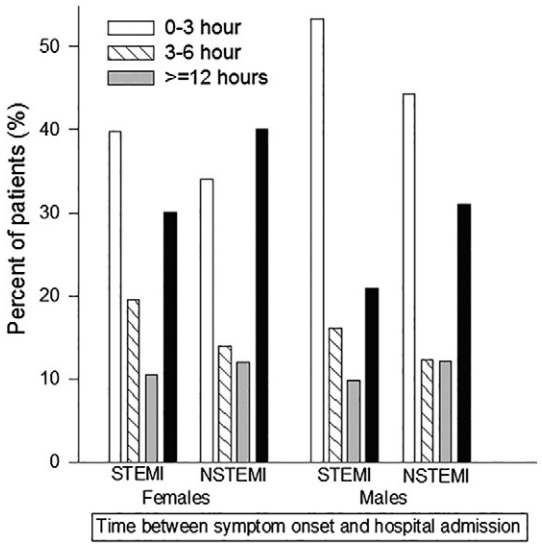

Fig. 2. Time between symptom onset and hospital admission in STEMI and NSTEMI patients with respect gender.

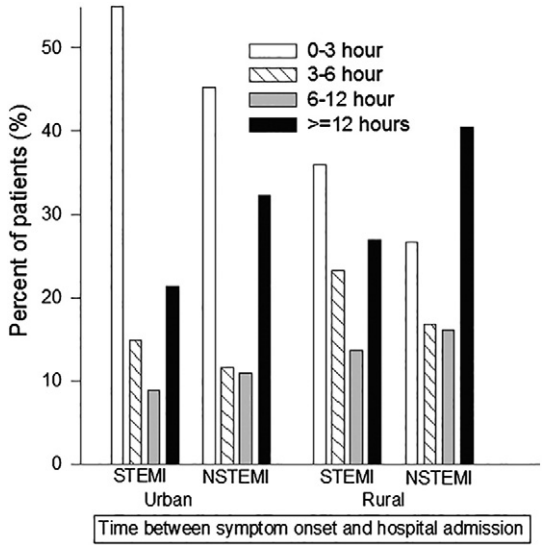

Fig. 3. Time between symptom onset and hospital admission in STEMI and NSTEMI patients with respect location of residence.

importance of seeking for medical attention early after the onset of acute ischemic symptoms.

Alike to short decision times for patients who had an STEMI rather than NSTEMI reported in the literature,[18] our data showed that patients with STEMI, who are the most likely to benefit from coronary reperfusion strategies, presented to hospital earlier than patients with NSTEMI. Accordingly, our findings revealed that lytic treatment and primary PCI was possible in half of the patients admitting within the first 2 h of symptom onset while rescue PCI was the leading intervention in one third of patients admitting after ≥ 12 h of symptom onset. In this regard, delayed admission and contraindications were identified as the reasons for lower prescription rates for fibrinolytic treatment (23.0%) in our study population when compared to ENACT[20] and GRACE[21] studies.

Table 5
Hospitalization and mortality related findings with respect to diagnosis of STEMI or NSTEMI.

	STEMI		NSTEMI	
Hospitalization unit	N	n (%)	N	n (%)
Coronary ICU	2057	2018 (98.1)	1537	1388 (90.3)
Regular ward		39 (1.9)		149 (9.7)
Length of hospitalization (day)		Mean (SD)		Mean (SD)
Coronary ICU	1839	3.0 (2.0)	1206	2.8 (2.0)*
Regular ward	1313	3.0 (2.0)	968	3.1 (2.3)
Overall hospital stay	1889	5.0 (2.9)	1390	4.6 (2.9)**
In-hospital mortality	n (%)		n (%)	
First 24 h	33 (42.3)		6 (20.7)*	
After 24 h	45 (57.7)		23 (79.3)*	
Reasons for mortality				
Sudden cardiac death/ventricular fibrillation	20 (22.7)		14 (48.3)*	
Pump failure	26 (29.5)		6 (20.7)	
Atrioventricular block	9 (10.2)		–	
Cerebrovascular accident	5 (5.7)		–	
Other **	28 (31.9)		9 (31.0)	
*p < 0.05 and **p < 0.001 compared to STEMI				
**Other reasons for death	n			
Acute/chronic renal insufficiency	4			
Aspiration pneumonia	3			
Intracranial bleeding	3			
Papillary rupture/other ruptures	2			
Re-infarct	8			
CABG related complications	8			
Gastrointestinal bleeding	4			
Not recorded	5			

Table 6
Creatinine kinase-myocardial band (CK-MB) and troponin I/T levels in consecutive measurements in the overall study population during their hospital stay.

	N	Mean (±SD)	N	Mean (±SD)
	CK-MB (IU/L)		CK-MB (ng/L)	
1st measurement	2085	65.0 (114.9)	1009	44.7 (137.2)
2nd measurement	1749	136.2 (557.7)**	773	102.9 (298.9)**
3rd measurement	1235	95.8 (369.8)**,+	454	78.9 (176.4)*
	Troponin I (ng/mL)		Troponin T (μg/L)	
1st measurement	2636	8.5 (27.6)	143	7.0 (31.7)
2nd measurement	1976	22.6 (60.0)**	111	11.3 (21.7)
3rd measurement	1139	23.2 (50.8)**	69	9.4 (23.4)*

* $p < 0.05$; compared to first measurement.
** $p < 0.001$; compared to first measurement.
\+ $p < 0.05$; compared to second measurement.

Patients treated with early invasive management were more likely to be treated with medications and interventions recommended by the ACC/AHA guidelines and had a lower risk of inhospital mortality after adjusting for differences in clinical characteristics and after comparing propensity-matched pairs.[22] Hence, pronounced use of ASA (93.6%), ACE inhibitors (71.6%) and statins (72.7%) in our patients seem to be in line with the drug classes recommended in the Joint European Societies' guidelines for CVD prevention including aspirin or other platelet-modifying drugs in all patients except those who are aspirin intolerant, beta-blockers in those after MI, ACE inhibitors/angiotensin receptor blockers in those with impaired left ventricular function, lipid-lowering drugs (statins) in all patients and anticoagulants in those at risk of systemic embolization.[8,23]

While PCI was performed more commonly than ENACT[20] but comparably lesser than GRACE[24] studies, giving the fact that 13% of our patients have been transferred to other hospitals mainly for the need of invasive intervention (90.0%). While no follow-up data were available for these patients, it is fair to assume that an additional 11% of TURKAKS study population to undergo PCI.

Accordingly, our findings related to identification of left bundle branch block (LBBB) in 4.3% of patients with NSTEMI is in line with a past report indicating that a substantial proportion of patients diagnosed with NSTEMI had core LBBB or clinically significant ST-segment deviation on admission ECG that was not recognized in actual clinical practice.[25]

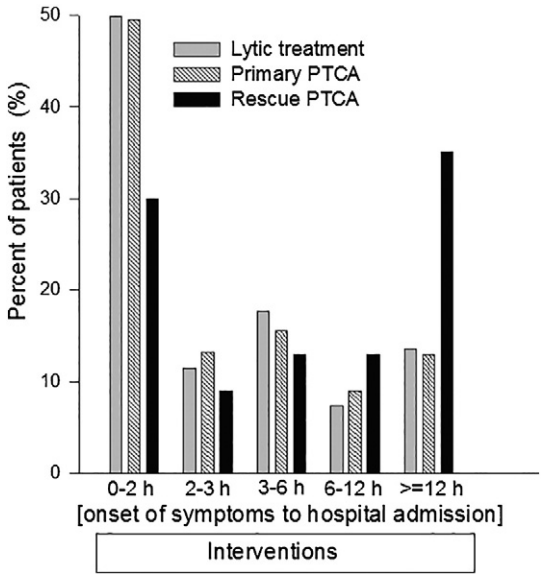

Fig. 4. Type of treatment (lytic drugs, primary or rescue percutaneous coronary intervention (PCI)) according to admission time after the onset of symptoms.

Table 7
Type of treatment with respect to the diagnosis of STEMI or NSTEMI.

	STEMI (n = 2102)	NSTEMI (n = 1593)
Fibrinolytic treatment	n (%)	
Prior to admission	65 (3.1)	4 (0.3)
In-hospital	826 (39.3)	19 (1.2)[a] + 36 (2.3)[b]
Streptokinase	362 (44.5)	6 (37.5)
Tissue plasminogen activator	451 (55.5)	10 (62.5)
None	559 (26.6)	753 (47.2)
Delayed admission	121 (21.7)	368 (48.9)
Contraindication	181 (32.4)	289 (38.4)
In-hospital interventions		
Coronary angiography after fibrinolytic therapy		
First 24 h	130 (33.6)	11 (18.6)
Between 24 and 72 h	115 (29.7)	14 (23.7)
After 72 h	142 (36.7)	34 (57.6)
Total	387 (18.4)	59 (3.7)
Coronary angiography-NSTEMI		
First 24 h	4 (6.3)	35 (5.7)
Between 24 and 72 h	28 (43.8)	395 (64.8)
After 72 h	32 (50.0)	180 (29.5)
Total	64 (3.0)	610 (38.3)
Primary percutaneous transluminal coronary angioplasty		
Within the first 3 h	383 (65.3)	25 (43.1)
Between 3 and 6 h	128 (21.8)	16 (27.6)
Between 6 and 12 h	76 (13.0)	17 (29.3)
Total	587 (27.9)	58 (3.6)
Rescue percutaneous transluminal coronary angioplasty	92 (4.4)	10 (0.6)
PTCA in cardiogenic shock	10 (0.5)	3 (0.2)
Coronary artery bypass graft surgery	40 (1.9)	49 (3.1)

[a] Before diagnosis.
[b] After diagnosis.

A complete LBBB in the setting of ischemic chest pain that is presumably new has been recommended to be managed as STEMI and considered also as an indication for thrombolytic therapy.[33] Therefore identification of fibrinolytic treatment in 1.2% of patients diagnosed with NSTEMI in our study population may be associated with the administration of lytic treatment for this group of patients with LBBB or change of clinical picture from NSTEMI to STEMI in some patients. This underscores the urgent need for more accurate categorization of ACS according to current practice guidelines to maximize delivery of potentially life-saving reperfusion therapy to all eligible patients.[25]

Given the fact that high prevalence of low HDL-cholesterol levels specific to our country,[16] our findings related to significant reduction in total cholesterol (mg/dL; $p < 0.001$) and LDL (mg/dL; $p < 0.001$) from admission to discharge in the overall population seem to indicate appropriate prescribing of cardioprotective medications through the study period in our population.

In this regard, reduction in prescription of stains from 57.0% at admission to 21.0% at discharge while increase in prescription of other lipid lowering drugs from 5.0% at admission to 33.0% at discharge in our study population seem reasonable considering significant improvement in cholesterol levels at discharge in our study as well as compatible with the achievement of recommended total and LDL cholesterol goals in 67.1% of patients included in the Turkey arm of EUROASPIRE III study.[16]

The biochemical identification of myocardial injury has long been used as a diagnostic aid in ACS patients with serum markers providing vital information regarding diagnosis and prognosis.[26] In this regard, the significant reduction in CK-MB and troponin I/T levels during consecutive measurements in our study population with more predominant improvement in STEMI group than NSTEMI group seems to be in line with the statement that although the presence of troponin in a patient with NSTEMI has been considered as an indicator of increased risk of an adverse outcome suggesting the need for aggressive antithrombotic management, the same aggressive anti-thrombotic treatment should also be applied in the absence of a positive serum troponin with other high-risk features like ST-segment shift.[27]

Despite the fact that the incidence of NSTEMI is known to be high and it is the principal cause of admission among patients with ischemic heart disease,[28] our results revealed the diagnosis of STEMI in 57.0% vs. NSTEMI in 43.0% of Turkish population composed of ACS patients. This seems to indicate the importance of continuing education of practicing physicians to the significance of troponin elevation and to the new AMI definition with a substantial influence on their triage practices,[29] since the introduction of troponin, the new AMI definition and the revised NSTE ACS guidelines was reported to lead to the identification of a much larger population as high risk with a substantial increase in the overall number of patients admitted with NSTE.[29]

Of 107 cases (2.9%) with in-hospital mortality in the overall population, STEMI was associated with mortalities within the first 24 h of admission and due to pump failure were more common among patients with STEMI whereas mortalities after 24 h of admission and due to sudden cardiac death/VF were more common in patients with NSTEMI. Accordingly, being higher for STEMI than NSTEMI patients, overall mortality rates were reported to be 3.7% in Euro Heart Survey,[30] 4.5% in the GRACE registry[31] and 7.4% in the BLITZ survey.[32] While the overall mortality rate in our population is lesser than these reports, it has to be kept in mind that since the outcome of the patients that were transferred to other hospitals was not available for TURKAKS, the death rate might possibly have been underrated.

TURKAKS Study provides the first large scale data on hospital management of acute coronary syndromes in Turkey based on real-life practice from a mixture of academic and non-academic institutions. It has generated valuable data on the reasons of delays in hospital admission of ACS patients and made us consider the need for increased awareness in the society. Moreover, it is reassuring that in general, the TURKAKS findings are consistent with other international data, wherever such data are available.

Concluding remarks

As a result, this national registry conducted as a first large scale attempt to describe the patient profile, presentation characteristics and the diagnostic and practice patterns in ACS in a representative sampling for Turkish population revealed predominancy of male gender (73.5%), age of 51 to 70 years (55.4%), urban location (76.6%) and STEMI type of ACS (56.9%). Besides, females were associated with older age, higher incidence of concomitant diseases and the increased likelihood of NSTEMI diagnosis compared to males. The delay between onset of symptoms and hospital admission was more prominent in rural locations, among females and in NSTEMI patients when compared to urban location, males and STEMI patients. Leading substantial amount of ACS patients to miss the critical period for the therapeutic interventions, hence the opportunity to prevent future disease related morbidity, the misattribution of the symptoms to a non-cardiac and potentially less serious cause and the neglect of the condition by the patient was remarkable.

In conclusion, though a multidisciplinary programme appropriately adapted to the medical, cultural and economic setting of our country to achieve a higher standard of preventive care for coronary patients through more effective lifestyle intervention; yet, control of risk factors, appropriate use of cardioprotective medication, furthermore educational and counseling interventions that encompasses both the public clinical staff health seem crucial for faster admission as well as the accurate diagnosis of ACS.

Limitations of the study

This study has been initiated during the last quarter of 2009 and completed in 2010. Despite various presentations at congresses at

Table 8
Hematological and biochemical findings in the overall population with respect to gender and the location of residence.

	Overall			Gender					Location of residence				
				Male		Female			Urban		Rural		
Hematological findings	N	Mean (±SD)	p	N	Mean (±SD)	N	Mean (±SD)	p	N	Mean (±SD)	N	Mean (±SD)	p
Hemoglobin (g/dL)													
Admission	3426	13.8 (1.9)		2527	14.3 (1.7)	899	12.6 (1.7)		2604	13.8 (1.9)	798	13.8 (2.0)	
Discharge	1278	13.1 (1.9)	0.000	953	13.5 (1.8)	325	11.9 (1.5)		997	13.1 (1.9)	270	13.2 (2.0)	
Hematocrit (%)													
Admission	3423	41.2 (5.2)		2527	42.4 (4.9)	896	37.9 (4.8)		2600	41.2 (5.1)	798	41.2 (5.6)	
Discharge	1271	38.8 (5.4)	0.000	950	39.9 (5.2)	321	35.5 (4.6)		993	38.7 (5.3)	267	39.1 (5.7)	
Thrombocyte (10^3/mL)													
Admission	3386	254.5 (80.3)		2499	248.2 (76.9)	887	272.0 (86.7)		2575	255.1 (78.7)	790	252.5 (85.4)	
Discharge	1269	249.1 (81.9)	0.000	947	243.4 (79.3)	322	265.8 (87.1)		990	249.4 (81.3)	269	248.3 (84.6)	
Biochemical findings	N	Mean(SD)	p	N	Mean (SD)	N	Mean (SD)	p	N	Mean(SD)	N	Mean(SD)	p
FBG (mg/dL)													
Admission	3199	152.6 (85.0)		2.338	145.4 (78.3)	861	171.9 (98.5)	0.000	2427	154.2 (86.1)	772	147.5 (81.4)	0.157
Discharge	1206	122.5 (50.2)	0.000	877	119.5 (47.8)	329	130.6 (55.5)	0.048	940	123.3 (51.0)	266	119.7 (47.3)	0.312
HbA1c (%)													
Admission	243	7.3 (2.5)		162	7.1 (2.5)	81	7.8 (2.4)	0.693	201	7.4 (2.5)	42	7.1 (2.4)	0.947
Discharge	114	6.7 (2.0)	0.050	83	6.4 (1.9)	31	7.5 (2.0)		93	6.7 (1.9)	21	6.6 (2.3)	
Creatinine (mg/dL)													
Admission	3436	1.1 (0.6)		2527	1.1 (0.6)	909	1.0 (0.5)	0.000	2628	1.1 (0.6)	808	1.0 (0.5)	0.457
Discharge	1462	1.1 (0.7)	0.000	1069	1.2 (0.7)	393	1.0 (0.5)	0.900	1136	1.1 (0.7)	326	1.1 (0.6)	0.043
Total cholesterol (mg/dL)													
Admission	2439	191.9 (48.0)		1796	187.9 (45.8)	643	203.1 (52.2)	0.000	1799	192.5 (48.2)	640	190.2 (47.7)	0.579
Discharge	538	180.1 (44.0)	0.000	419	179.1 (43.6)	119	183.3 (45.4)	0.401	432	180.2 (44.0)	106	179.5 (44.2)	0.861
Triglyceride (mg/dL)													
Admission	2461	154.7 (99.5)		1810	153.9 (100.9)	651	156.8 (95.7)	0.127	1821	157.7 (102.0)	640	146.2 (91.8)	0.090
Discharge	531	153.4 (85.9)	0.535	413	156.2 (88.6)	118	143.2 (75.6)	0.502	428	151.1 (79.3)	103	162.9 (109.1)	0.987
LDL (mg/dL)													
Admission	2566	124.4 (47.6)		1902	122.3 (44.8)	664	130.3 (54.5)	0.022	1896	125.0 (50.1)	670	122.7 (39.7)	0.159
Discharge	535	113.6 (43.4)	0.000	416	114.1 (45.0)	119	111.9 (37.6)	0.309	431	114.6 (45.6)	104	109.6 (32.9)	0.898
HDL (mg/dL)													
Admission	2481	40.0 (14.1)		1829	38.7 (13.9)	652	43.5 (13.9)	0.000	1833	39.9 (14.1)	648	40.2 (14.2)	0.808
Discharge	517	39.1 (14.5)	0.000	402	37.9 (12.8)	115	43.0 (18.7)	0.284	418	39.2 (15.2)	99	38.7 (10.7)	0.879

national level, a publication was not realized and this paper presents a cross-sectional data on the diagnosis and treatment for acute coronary syndrome for the years 2009–2010 for Turkey.

Hematological and biochemical findings

There was significant reduction in hemoglobin (g/dL; $p < 0.001$), hematocrit (%; $p < 0.001$) and thrombocyte (10^3/mL; $p < 0.001$) levels as well as FBG (mg/dL; $p < 0.001$), HbA1c (%; $p < 0.05$), creatinine (mg/dL; $p < 0.001$), total cholesterol (mg/dL; $p < 0.001$), LDL (mg/dL; $p < 0.001$) and HDL (mg/dL; $p < 0.001$) from admission to discharge in the overall population. Most of the reductions were specific to female gender rather than males (Table 8).

Acknowledgement

The study is granted by IE Ulagay-Menarini Group, Turkey. We thank to Cagla Isman, MD and Prof. Sule Oktay, MD, PhD. from KAPPA Consultancy Training Research Ltd., Istanbul who provided editorial support and Dr. Oğuz Akbaş from Monitor CRO for statistical analysis.

TURKAKS Study Group: Abdulkadir KERPETEN MD KÜTAHYA, Abdullah DOĞAN MD ISPARTA, Abdullah İÇLİ MD KONYA, Abdulsamet GÜLSÜM MD BATMAN, Abdurrahman ASLAN MD İZMİR, Abdurrezzak BÖREKÇİ MD ERZURUM, Abdusselam EMEK MD İZMİR, Abdüllatif İLBEY MD KONYA, Adife ÇETİNTÜRK MD İZMİR, Adnan KAPAĞAN MD ESKİŞEHİR, Adnan PINAR MD İZMİR, Ahmet TEMİZHAN MD ANKARA, Ahmet YILDIZ MD İSTANBUL, Ahmet BACAKSIZ MD KONYA, Ahmet KESER MD KONYA, Ahmet ORHAN MD ANTALYA, Ahmet SOYLU MD KONYA, Ahmet Arif YALÇIN MD ANKARA, Ahmet Muhammed ŞENTÜRK MD BURSA, Ahmet Oguz BAKTIR MD ANTALYA, Ahmet Ozan KINAY MD İZMİR, Alattın KALI MD ISPARTA, Ali AYDINLAR MD BURSA, Ali KARAGÖZ MD İSTANBUL, Ali YILDIZ MD ŞANLIURFA, Ali Fuat KARA MD DİYARBAKIR, Ali Rıza AKYÜZ MD TRABZON, Ali Selim YALÇINKAYA MD ANTALYA, Alim HAYRAN MD KAYSERİ, Alparslan KÜÇÜK MD TOKAT, Alparslan KURTUL MD ANKARA, Alpay ARIBAŞ MD KONYA, Alper AYGEN MD İZMİR, Alper KARAGÖZ MD GAZİANTEP, Alper SERÇELİK MD GAZİANTEP, Anıl AVCI MD İSTANBUL, Arzu KARAÇELİK MD İSTANBUL, Asife ŞAHİNARSLAN MD ANKARA, Aslan ÇELEBİ MD İSTANBUL, Asuhan KARA MD MERSİN, Asuman BİÇER YEŞİLAY MD ANKARA, Ataç ÇELİK MD TOKAT, Ayhan MUTLU MD KOCAELİ, Ayhan GÜRÇAĞAN MD EDİRNE, Aysun ERDEM MD KOCAELİ, Aytül BELGİ MD ANTALYA, Aziz KARABULUT MD DİYARBAKIR, Aziz KARADEDE MD DİYARBAKIR, Bahadır ŞARLI MD KAYSERİ, Bahar BOYDAK MD İZMİR, Barış ÇELEBİ MD MERSİN, Basri AMASYALI MD ANKARA, Baybars TÜREL MD BURSA, Behçet Kemal ENER MD ÇANAKKALE, Bernas ALTINTAŞ MD DİYARBAKIR, Birhan YILMAZ MD SİVAS, Birol ÖZKAN MD İSTANBUL, Burhan ÇABUK MD ZONGULDAK, Bülent AKÇA MD İZMİR, Bülent ÖZDEMİR MD BURSA, Bülent BOYACI MD ANKARA, Bülent İLÇÖL MD İSTANBUL, Bünyamin YAVUZ MD ANKARA, Cahıt AĞCAL MD ISPARTA, Cahide SOYDAŞ MD İZMİR, Celal KIRDAR MD ESKİŞEHİR, Celal KİLİT MD YOZGAT, Cem NAZLI MD İZMİR, Ceyhun CEYHAN MD AYDIN, Cihanşah AKDOĞAN MD ESKİŞEHİR, Cüneyt HAYRETDAĞ MD İZMİR, Cüneyt MÜDERRİSOĞLU MD İSTANBUL, Cüneyt TÜRKOĞLU MD İZMİR, Çağın ÜREYEN MD ANKARA, Davran ÇİÇEK MD ANTALYA, Deniz ŞAHİN MD ANKARA, Deniz ŞELECİ KURU MD GİRESUN, Dilek YEŞİLBURSA MD BURSA, Diyar KÖPRÜLÜ MD SAMSUN, Dogan ERDOĞAN MD ISPARTA, Dursun Çayan AKKOYUN MD GAZİANTEP, Ebru YETKİN TÜRKKAN MD İZMİR, Eda TOKUŞÇU MD ŞANLIURFA, Ednan BAYRAM MD ERZURUM, Ekrem KARAKAYA MD KAYSERİ, Ekrem GÜLER MD İSTANBUL, Embiya AKSAKAL MD ERZURUM, Emine GAZİ MD EDİRNE, Emir DOĞAN MD ADAPAZARI, Emre ERKUŞ MD TRABZON, Emre KUŞ MD GAZİANTEP, Emrullah BAŞER MD KAYSERİ, Engin BOZKURT MD ANKARA, Ercan TAŞTAN MD DİYARBAKIR, Ercan VAROL MD ISPARTA, Erdal DURU MD ANKARA, Erdal ESKİOĞLU MD ANKARA, Erdem DİKER MD ANKARA,

Erdem ÖZEL MD İZMİR, Erden GÜLCÜ MD VAN, Erkan ÖZTEKİN MD İSTANBUL, Erol ASLAN MD MALATYA, Ersin İMREN MD ANKARA, Ersin GÖZÜTOK MD ÇANAKKALE, Ertan URAL MD KOCAELİ, Evren DESTEGÜL MD YOZGAT, Eyyüp AYGÜL MD SAMSUN, Ezgi KALAYCIOĞLU MD ZONGULDAK, Ezgi Mert YAŞA MD MERSİN, Faruk AYAN MD İSTANBUL, Fatih KOÇ MD TOKAT, Fatih AKYAZICI MD BURSA, Fehmi KAÇMAZ MD BİNGÖL, Feray KOCA MD İZMİR, Fikret BESNİLİ MD GAZİANTEP, Filiz ÖZERKAN MD İZMİR, Füsun İNCEER MD ÇORUM, Füsun ERDENEN MD İSTANBUL, Gökhan CİN MD MERSİN, Gül GÜRSOY MD ANKARA, Gülcan ABALI MD MERSİN, Güliz ERDEM YAZICI MD KIRIKKALE, Gülten SOP MD İZMİR, Hakan BAHADIR MD BURSA, Hakan DEMİR MD KOCAELİ, Hakan KÜLTÜRSAY MD İZMİR, Hakan ÖZKAN MD BURSA, Hakan AKILLI MD KONYA, Hakan ÇETİN MD ÇANAKKALE, Hakan GÜRÇINAR MD İZMİR, Hakan ÖNCEL MD ŞANLIURFA, Hakan SARI MD İSTANBUL, Haksun EBİNÇ MD KIRIKKALE, Halil HALİL MD İZMİR, Halil KAHRAMAN MD KONYA, Halim ÖNEY MD ESKİŞEHİR, Hamza DUYGU MD İZMİR, Harun KILIÇ MD ANKARA, Harun KOCA MD İSTANBUL, Hasan TURHAN MD MALATYA, Hasan Korkmaz MD ELAZIĞ, Hasan Ali GÜMRÜKÇÜOĞLU MD VAN, Hasan Murat UĞURLU MD DİYARBAKIR, Hatem ARI MD KONYA, Hazel BEŞİKTEPE MD İZMİR, Hürkan KURŞAKLIOĞLU MD ANKARA, Hüsamettin ATASEVER MD ADAPAZARI, Hüseyin BOZDEMİR MD İZMİR, Ilgın KARACA MD ELAZIĞ, Isık ERDOGAN MD İSTANBUL, İbrahim AKSOY MD GAZİANTEP, İbrahim DEDEOĞLU MD ŞANLIURFA, İbrahim SARI MD GAZİANTEP, İlksen ATASOY MD TOKAT, İlyas GÖKŞEN MD GAZİANTEP, İlyas KAYA MD DİYARBAKIR, İnan SOYDAN MD İZMİR, İsmail ATEŞ MD ANTALYA, İstemihan TENGİZ MD İZMİR, Jülide UZUNONAT MD ÇORUM, Jülide YAĞMUR MD MALATYA, Kaan OKYAY MD ÇORUM, Kenan İLTÜMÜR MD DİYARBAKIR, Lale KOLDAŞ MD İSTANBUL, Leyla ASLAN MD İZMİR, M.Zihni BİLİK MD DİYARBAKIR, M.Zülküf KARAHAN MD DİYARBAKIR, Mahir ÇİFTÇİ MD MARDİN, Mahmut AÇIKEL MD ERZURUM, Mahmut ŞAHİN MD SAMSUN, Makbule Kutlu KARADAĞ MD ELAZIĞ, Mecdi ERGÜNEY MD İSTANBUL, Mehdi ZOGHİ MD İZMİR, Mehmet BOSTAN MD RİZE, Mehmet AKSOY MD GAZİANTEP, Mehmet AYDIN MD İZMİR, Mehmet BOYUNSUZ MD GAZİANTEP, Mehmet DEMİR MD ISPARTA, Mehmet ERTÜRK MD İSTANBUL, Mehmet FIRAT MD MERSİN, Mehmet ÖZAYDIN MD ISPARTA, Mehmet SONBAHAR MD İZMİR, Mehmet Erdinç ARIKAN MD İZMİR, Mehmet Ziya MOCAN MD İSTANBUL, Memet BALİN MD ELAZIĞ, Memet Vedat ÇALDIR MD K.MARAŞ, Meral KAYIKÇIOĞLU MD İZMİR, Mert ÖZBAKKALOĞLU MD İZMİR, Meryem AKTOZ MD EDİRNE, Metin GÜRBÜZ MD BURSA, Mikail YARLIOĞLUEŞ MD KAYSERİ, Mohammad AMANCAN MD BURSA, Muhammed AKSOY MD ESKİŞEHİR, Murat AKÇAY MD ANKARA, Murat FAZLIOĞLU MD GİRESUN, Murat ÖZDAMAR MD İZMİR, Murat TULMAÇ MD KIRIKKALE, Murat SAKALLI MD KONYA, Murat SUCU MD GAZİANTEP, Murtaza ŞERİFİ MD KOCAELİ, Mustafa AKIN MD İZMİR, Mustafa ERKUL MD ADAPAZARI, Mustafa ŞAN MD BURSA, Mustafa KAPLANGÖRAY MD DİYARBAKIR, Mustafa OYLUMLU MD GAZİANTEP, Mustafa ÖZGÜL MD VAN, Mustafa TUNCER MD VAN, Mustafa YURTDAŞ MD BATMAN, Mustafa Aydın DİNÇER MD BALIKESİR, Mustafa Kemal EROL MD ERZURUM, Mutlu GÜNGÖR MD ANKARA, Mümin ETEMOĞLU MD İZMİR, Naci COŞKUN MD ELAZIĞ, Nazan BİTİR MD İSTANBUL, Nazan KANAL MD İSTANBUL, Nazmi GÜLTEKİN MD İSTANBUL, Necati DAĞLI MD ELAZIĞ, Nezire GÜLLÜ MD KONYA, Nihan KAHYA EREN MD İZMİR, Nihat AKÇAY MD SAMSUN, Nihat KALAYCI MD YOZGAT, Nihat ÖZER MD İSTANBUL, Nizamettin TOPRAK MD DİYARBAKIR, Nuri CÖMERT MD İSTANBUL, Nurtaç ÖZER MD KIRIKKALE, Oğuz YAVUZGİL MD İZMİR, Oğuzhan BARAN MD KAYSERİ, Oktay BİLGİR MD İZMİR, Onur AKPINAR MD GAZİANTEP, Orhan DOĞRU MD BURSA, Orhan BERKER MD İSTANBUL, Orhan MADEN MD ANKARA, Orhan ÖZER MD GAZİANTEP, Osman MUTLU MD ESKİŞEHİR, Osman MAVİŞ MD İSTANBUL, Osman Akın SERDAR MD BURSA, Osman Alper ONBAŞILI MD AYDIN, Ömer ALYAN MD DİYARBAKIR, Ömer Özkan DUMAN MD İZMİR, Ömür KURU MD GİRESUN, Önder ÖZTÜRK MD DİYARBAKIR, Öner ÖZDOĞAN MD İZMİR, Özcan ÖZDEMİR MD ANKARA, Özcan YILMAZ MD SAMSUN, Özgür Yaşar AKBAL MD KIRIKKALE, Özlem ÖZCAN MD ANKARA, Ramazan ÖZDEMİR MD MALATYA, Ramazan TOPSAKAL MD KAYSERİ, Recep DEMİRBAĞ MD ŞANLIURFA, Refik BAYSAL MD MERSİN, Regaip ZEHİR MD İSTANBUL, Remzi YILMAZ MD ŞANLIURFA, Reşat AYALP MD ADANA, Rıdvan UÇAR MD GİRESUN, Rıdvan YALÇIN MD ANKARA, Rıza HAKİKİ MD ANKARA, S.Murat ASLAN MD ISPARTA, Sabahattin TOKTAŞ MD ADANA, Sabri GAZİ MD EDİRNE, Sadık DURAN MD BALIKESİR, Sait ALAN MD DİYARBAKIR, Salman ÇELİK MD ÇANAKKALE, Savaş ÇELEBİ MD ANKARA, Sebahattin ATEŞAL MD İSTANBUL, Selim KUL MD TRABZON, Semir ÖZTOPRAK MD MARDİN, Serdar BİÇEROĞLU MD İZMİR, Serkan MENEKŞE MD İZMİR, Süleyman AYSEL MD VAN, Şeref ULUCAN MD KONYA, Şerife AKSOY MD GAZİANTEP, Şükrü KARAASLAN MD KONYA, Şükrü ÜNAL MD NEVŞEHİR, Tahir DURMAZ MD ANKARA, Tarık YILDIRIM MD EDİRNE, Tarkan TEKTEN MD AYDIN, Taylan Erdem ŞAHİN MD AFYON, Tayyar GÖKDENİZ MD İSTANBUL, Telat KELEŞ MD ANKARA, Tezcan PEKER MD BURSA, Tolga ÖZYİĞİT MD İSTANBUL, Tunay ŞENTÜRK MD BURSA, Turan TURHAN MD TRABZON, Türkay ÖZCAN MD MERSİN, Uğur TAŞBAŞ MD BURSA, Ünal GÜNTEKİN MD VAN, Vedat KOCA MD BURSA, Veli KALA MD İZMİR, Yekta GÜRLERTOP MD ERZURUM, Yeşim HOŞCAN MD ANTALYA, Yıldız DOGAN MD ŞANLIURFA, Yılmaz YALÇINKAYA MD İZMİR, Yuksel DOGAN MD İSTANBUL, Yunus EMİROĞLU MD VAN, Yusuf YAKAR MD TOKAT, Yusuf TAVİL MD ANKARA, Zafer Nart BAYTUGAN MD KARS, Zehra GÜVEN ÇETİN MD ANKARA, Zerrin YİĞİT MD İSTANBUL, Zeynep ENGİN SAÇAR MD İSTANBUL, Ziya KURHAN MD İZMİR, Kürşat ASLAN MD İSTANBUL, Hasan Çetin AYDIN MD İZMİR, İlke AKYILDIZ MD İZMİR, Pelin PINAR MD MANİSA, Halim SÖZCÜER MD İZMİR, Zafer ULUSAN MD İZMİR, Hikmet FEYİZOĞLU MD İSTANBUL, Hüseyin ARINÇ MD KAYSERİ, Savaş BEYAZTAŞ MD KAYSERİ, Selçuk DOĞAN MD KAYSERİ, Kenan MİNARECİ MD ANTALYA, Haluk YEĞİN MD ANTALYA, Serkan KAVAKLI MD ANTALYA, Ali BOYACI MD ISPARTA, Hakan TIKIZ MD MANİSA, Nihat PEKEL MD İZMİR, Osman ERK MD İSTANBUL, Osman KARAKAYA MD İSTANBUL, Ömer YEĞİNER MD İSTANBUL, Eralp ULUSOY MD İSTANBUL, Şenay BANK AKYILDIZ MD İSTANBUL, Serdar AKYÜZ MD ESKİŞEHİR, Çağatay ERTAN MD AFYON, Önder AKÇİ MD AFYON, Muhammed TAHTA MD AFYON, Zeydin ACAR MD TRABZON, Muhittin GÜNDOĞDU MD SAMSUN, Beyhan ERYONUCU MD ANKARA, Şengül ÇEHRELİ MD ANKARA, Ömer AKYÜREK MD AFYON, Yüksel AKSOY MD ANKARA, Ersel ONRAT MD AFYON, Merih AKBAŞ MD KOCAELİ, Selçuk BAŞÇIL MD KOCAELİ, Murat ERSANLI MD İSTANBUL, Dursun ARAS MD ANKARA, Mustafa ÖZKAN MD ANKARA, Cemal SAĞLAM MD ANKARA, Atilla İYİSOY MD ANKARA, Ömer GÖKTEKİN MD ESKİŞEHİR, Emine RIZAOĞLU MD İSTANBUL, Ali DENİZ MD BARTIN, Erol SAĞATLİ MD ZONGULDAK, İzzet TANDOĞAN MD SİVAS, Okan Onur TURGUT MD SİVAS, Can YONTAR MD SİVAS, Güllü MERT AMİOĞLU MD SİVAS, Alim ERDEM MD SİVAS, Zehra ERKAL MD ANTALYA, Özkan DEDE MD ANTALYA, Atilla KESKİN MD MANİSA, Seyhan ÇETİN MD BALIKESİR, Selçuk YAZICI MD BALIKESİR, Erkan EKİCİBAŞI MD İSTANBUL, Sinan DAĞDELEN MD İSTANBUL, Eren GÜRSOY MD ANKARA, Abdurrahman KALE MD ORDU, İSTANBU, Fevzi ALO MD İSTANBUL, Alpaslan BİRDANE MD ESKİŞEHİR, Erol ÜNLÜER MD İZMİR.

References

1. The GRACE Investigators. Rationale and design of the GRACE (Global Registry of Acute Coronary Events) project: a multinational registry of patients hospitalized with acute coronary syndromes. *Am Heart J* 2001;**141**:190–199.
2. D'Ascenzo F, Biondi-Zoccai G, Moretti C, et al. TIMI, GRACE and alternative risk scores in Acute Coronary Syndromes: a meta-analysis of 40 derivation studies on 216,552 patients and of 42 validation studies on 31,625 patients. *Contemp Clin Trials* 2012 Jan;**11** [Epub ahead of print], https://doi.org/10.1016/j.cct.2012.01.001.
3. Burzotta F, De Vita M, Gu YL, et al. Clinical impact of thrombectomy in acute ST-elevation myocardial infarction: an individual patient-data pooled analysis of 11 trials. *Eur Heart J* 2009;**30**:2193–2203.
4. Antman EM, Hand M, Armstrong PW, et al. 2007 Focused Update of the ACC/AHA 2004 Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines: developed in collaboration With the Canadian Cardiovascular Society endorsed by the American Academy of Family Physicians: 2007 Writing Group to Review New Evidence and Update the ACC/AHA 2004 Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction, Writing on Behalf of the 2004 Writing Committee. *Circulation* 2008;**117**:296–329.

5. Granger CB, Steg PG, Peterson E, et al. Medication performance measures and mortality following acute coronary syndromes. *Am J Med* 2005;**118**:858–865.
6. EUROASPIRE Study Group. EUROASPIRE. A European Society of Cardiology survey of secondary prevention of coronary heart disease: principal results. *Eur Heart J* 1997;**18**:1569–1582.
7. EUROASPIRE Study Group. Lifestyle and risk factor management and use of drug therapies in coronary patients from 15 countries. Principal results from EUROASPIRE II. Euro Heart Survey Programme. *Eur Heart J* 2001;**22**:554–572.
8. Kotseva K, Wood D, De Backer G, et al. EUROASPIRE III: a survey on the lifestyle, risk factors and use of cardioprotective drug therapies in coronary patients from 22 European countries. *Eur J Cardiovasc Prev Rehabil* 2009;**16**:121–137.
9. EUROASPIRE Study Group. Clinical reality of coronary prevention guidelines: a comparison of EUROASPIRE I and II in nine countries. *Lancet* 2001;**357**:995–1001.
10. Onat A. Risk factors and cardiovascular disease in Turkey. *Atherosclerosis* 2001;**156**: 1–10.
11. Onat A, Keleş İ, Çetinkaya A, et al. Prevalence of all-cause and coronary mortality in Turkish adults as assessed by 10-year follow-up data of the Turkish adult risk factor study (Article in Turkish). *Türk Kardiyol Dern Arş* 2001;**29**:8–19.
12. Mahley RW, Palaoğlu KE, Atak Z, et al. Turkish Heart Study: lipids, lipoproteins, and apolipoproteins. *J Lipid Res* 1995;**36**:839–859.
13. Satman I, Yılmaz T, Şengül A, et al. Population-based study of diabetes and risk characteristics in Turkey: results of the Turkish Diabetes Epidemiology Study (TURDEP). *Diabetes Care* 2002;**25**:1551–1556.
14. Altun B, Arıcı M, Nergizoğlu G, et al. Prevalence, awareness, treatment and control of hypertension in Turkey (the PatenT study) in 2003. *J Hypertens* 2005;**23**:1817–1823.
15. Abacı A, Oğuz A, Kozan O, et al. Treatment and control of hypertension in Turkish population: a survey on high blood pressure in primary care (the TURKSAHA study). *J Hum Hypertens* 2006;**20**:355–361.
16. Tokgözoğlu L, Kaya EB, Erol C. EUROASPIRE III: a comparison between Turkey and Europe. *Turk Kardiyol Dern Ars* 2010;**38**:164–172 [Article in Turkish].
17. Fox KAA, Goodman SG, Anderson Jr FA, et al. From guidelines to clinical practice: the impact of hospital and geographical characteristics on temporal trends in the management of acute coronary syndromes. The global registry of acute coronary events (GRACE). *Eur Heart J* 2003;**24**:1414–1424.
18. Perkins-Porras L, Whitehead DL, Strike PC, et al. Pre-hospital delay in patients with acute coronary syndrome: factors associated with patient decision time and home-to-hospital delay. *Eur J Cardiovasc Nurs* 2009;**8**:26–33.
19. Ottesen MM, Dixen U, Torp-Pedersen C, et al. Prehospital delay in acute coronary syndrome—an analysis of the components of delay. *Int J Cardiol* 2004;**96**:97–103.
20. Fox KA, Cokkinos DV, Deckers J, et al. The ENACT study: a pan-European survey of acute coronary syndromes. *Eur Heart J* 2000;**21**:1440–1449.
21. Fox KA, Eagle KA, Gore JM, et al. The Global Registry of Acute Coronary Events, 1999 to 2009—GRACE. *Heart* 2010;**96**:1095–1101.
22. Widimsky P, Zelizko M, Jansky P, et al. The incidence, treatment strategies and outcomes of acute coronary syndromes in the "reperfusion network" of different hospital types in the Czech Republic: results of the Czech evaluation of acute coronary syndromes in hospitalized patients (CZECH) registry. *Int J Cardiol.* 2007: 119–212-9.
23. Graham I, Atar D, Borch-Johnsen K, et al. European Guidelines on Cardiovascular Disease Prevention in Clinical Practice: Fourth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Prevention in Clinical Practice (Constituted by representatives of nine societies and by invited experts). *Eur J Cardiovasc Prev Rehabil* 2007;**14**(suppl 2):S1–S113 [Executive summary: Eur J Cardiovasc Prev Rehabil 2007; 14 (Suppl 2): E1–E40; Eur Heart J 2007; 28:2375–2414].
24. Devlin G, Anderson FA, Heald S, et al. Management and outcomes of lower risk patients presenting with acute coronary syndromes in a multinational observational registry. *Heart* 2005;**91**:1394–1399.
25. Yan RT, Yan AT, Allegrone J, et al. Differences between local hospital and core laboratory interpretation of the admission electrocardiogram in patients with acute coronary syndromes and their relation to outcome. *Am J Cardiol* 2007;**100**:169–174.
26. Braunwald E, Antman EM, Beasley JW, et al. ACC/AHA guidelines for the management of patients with unstable angina and non-ST-segment elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on the Management of Patients with Unstable Angina). *J Am Coll Cardiol* 2000;**36**:970–1062.
27. Fitchett D, Goodman S, Langer A. New advances in the management of acute coronary syndromes: matching treatment to risk. *CMAJ* 2001;**164**:1309–1316.
28. Bosch X, Verbal F, López de Sá E, et al. Differences in the management and prognosis of patients with non-ST segment elevation acute coronary syndrome according to the department of initial admission. *Rev Esp Cardiol* 2004;**57**:283–290 [Article in Spanish].
29. Zahger D, Hod H, Gottlieb S, et al. Influence of the new definition of acute myocardial infarction on coronary care unit admission, discharge diagnosis, management and outcome in patients with non-ST elevation acute coronary syndromes: a national survey. *Int J Cardiol* 2006;**106**:164–169.
30. Hasdai D, Behar S, Wallentin L, et al. A prospective survey of the characteristics, treatments and outcomes of patients with acute coronary syndromes in Europe and the Mediterranean basin—the Euro Heart Survey of Acute Coronary Syndromes. *Eur Heart J* 2002;**23**:1190–1201.
31. Fox KA, et al. Management of acute coronary syndromes. Variation in practice and outcome findings from the Global Registry of Acute Coronary Events (GRACE). *Eur Heart J* 2002;**23**:1177–1189.
32. DiChiara A, Chiarella F, Savonitto S, et al. Epidemiology of acute myocardial infarction in the Italian CCU network—the BLITZ study. *Eur Heart J* 2003;**24**:1616–1629.
33. Armstrong PW. New advances in the management of acute coronary syndromes: 2 Fibrinolytic therapy for acute ST-segment elevation myocardial infarction. *CMAJ* 2001;**165**:791–797 [Review].