Booklet ACSIS 2016

June 2018

Contents

Introduction

We are proud to present in this booklet selected data from the ACSIS 2016 survey, an annual tradition since it was launched in 1992 by Prof. Shlomo Behar.

The ACSIS survey provides a state-of-the-art representation of the characteristics, management and outcome of ACS patients in Israel, and is a source of pride for the Israeli cardiology community.

ACSIS 2016 was carried out during February-March 2016 by the Israeli working group for intensive cardiac care and the Israeli Association for Cardiovascular Trials (IACT) in cooperation with the Israel Center for Disease Control (ICDC). During this 2-month period, detailed data was collected in all ICCU and cardiology wards in all public hospitals in Israel, and included 1,907 consecutive ACS patients admitted and diagnosed with ACS.

The ACSIS 2016 findings expand on prior surveys by showing a continuous improvement in in-hospital, 1 month, as well as 1 year mortality throughout the last decade.

New data about the management of survivors of out-hospital cardiac arrest and extended follow-up of patients from two large health management organizations "€ Clalit and Maccabi will be added soon to the electronic version of the booklet.

ACSIS data is used continuously for high-quality scientific research which is published in the major journals in the field. Participation of young investigators is very much encouraged.

In addition, the ACSIS 2016 registry partially was linked to ESC STEMI registry. The first results from this initiative will be presented during the upcoming ESC meeting later this year.

We would like to thank the study coordinators and the staff members of all CCU €™s and Cardiology wards, for their dedicated time and effort in collecting the data. We thank the pharmaceutical and industrial companies and the ICDC for their generous support of the survey.

Dr. Zaza Iakobishvili	Dr. Roy Beigel
Chairman	Secretary

Israeli working-group on Intensive Cardiac Care

Message from the Israeli Heart Society

We are delighted to present this summary of the results of ACSIS-2016 lead by the Working Group on Intensive Cardiac Care of the Israel Heart Society, and coordinated by the Israeli Association for Cardiovascular Trials. The ACSIS program, launched in 1992 by Prof. Shlomo Behar, has been the most significant Cardiology survey in Israel since 1992. ACSIS surveys are unique by the fact that they represent real world data collected from all the Cardiology Departments in Israel. By performing consecutive surveys every 2-3 years we are able to detect temporal changes in the presentation and management of patients with acute coronary syndromes (ACS) and use the information to improve the care of cardiac patients.

The prevalence of Cardiovascular diseases in Israel is among the lowest in Europe and age adjusted Cardiovascular mortality rate is among the lowest in the world, accounting for approximately 15% of all national deaths (leading cause is cancer, 25%). The world average is about 31% while Cardiovascular diseases account for approximately 40% of all mortality cases in Europeans who are younger than 75 years of age. Given this background, we hypothesized that it will be almost impossible to lower mortality even further. Gladly, we were wrong! ACSIS 2016 proved that acute coronary syndrome patients receive modern and excellent care in Israel and 30-day myocardial infarction fatality rate has decreased even further placing Israel as a country with one of the lowest MI mortality rate in the world.

Temporal changes in Cardiovascular mortality have been observed throughout the OECD countries but in Israel the decrease is even greater.

Careful analysis of the results of the ACSIS surveys demonstrates a significant improvement in outcome of patients hospitalized with ACS over the years, increased use of modern pharmacotherapy and state of the art revascularization techniques, better adherence to guidelines and an impressive improvement in outcomes of patients admitted with ACS. While primary prevention and national laws intended to improve public health have significantly contributed to the gradual decrease in Cardiovascular mortality in Israel, the dedicated work of our national society members in all 24 Cardiology departments as well as in the outpatients clinics have made a major contribution to this therapeutic success and created a safety net for all Israeli patients in need with ACS.

The Israel Heart Society takes real pride in the excellent cooperation among Working Groups and all the Cardiology departments in Israel. The coordinated effort yielded this very inclusive level of information, not easily found in most countries. Moreover, we were especially proud of our members after analyzing the results of the survey.

We would like to recognize and thank all those dedicated individuals who worked so hard to make ACSIS 2016 a reality. In 24 medical centers in Israel, physicians, nurses and coordinators worked day and night, not only to provide the best medical care for patients with ACS, but also to collect the information that is summarized here. We are grateful to each and every one of them. The survey could not have been materialized without the support of the Israeli Ministry of Health, represented by the Israel CDC, and without generous support from our industry collaborators, for which we are all very grateful.

We trust that this booklet will provide interesting and exciting information on the current diagnosis, management and outcome of acute coronary syndrome patients in Israel.

Respectfully yours,

Ran Kornowski	Ronen Rubinshtein
President, Israel Heart Society	Secretary General, Israel Heart Society

Chapter 1: Acute Coronary Syndrome in Cardiology

1.1 Distribution of Patients with ACS by ECG on Admission

Figure 1.1: Distribution of Patients with ACS by ECG on Admission

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                    ┌─────────────────────────┐
                    │ Total Number of Patients │
                    │      n = 1791            │
                    └─────────────────────────┘
              ┌──────────────┴──────────────┐
   ┌──────────────────┐           ┌──────────────────────┐
   │   ST elevation   │           │   Non ST elevation   │
   │ n = 712 (39.75%) │           │  n = 1079 (60.25%)   │
   └──────────────────┘           └──────────────────────┘
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New onset of LBBB
n =6 (0.34%)

No new ST–T changes
n =158 (8.82%)

Normal
n =310 (17.31%)

ST–Depression
n =320 (17.87%)

T inversion only
n =208 (11.61%)

Undetermined ECG findings
(LBBB, PACING, SEVERE LVH)
n =77 (4.3%)
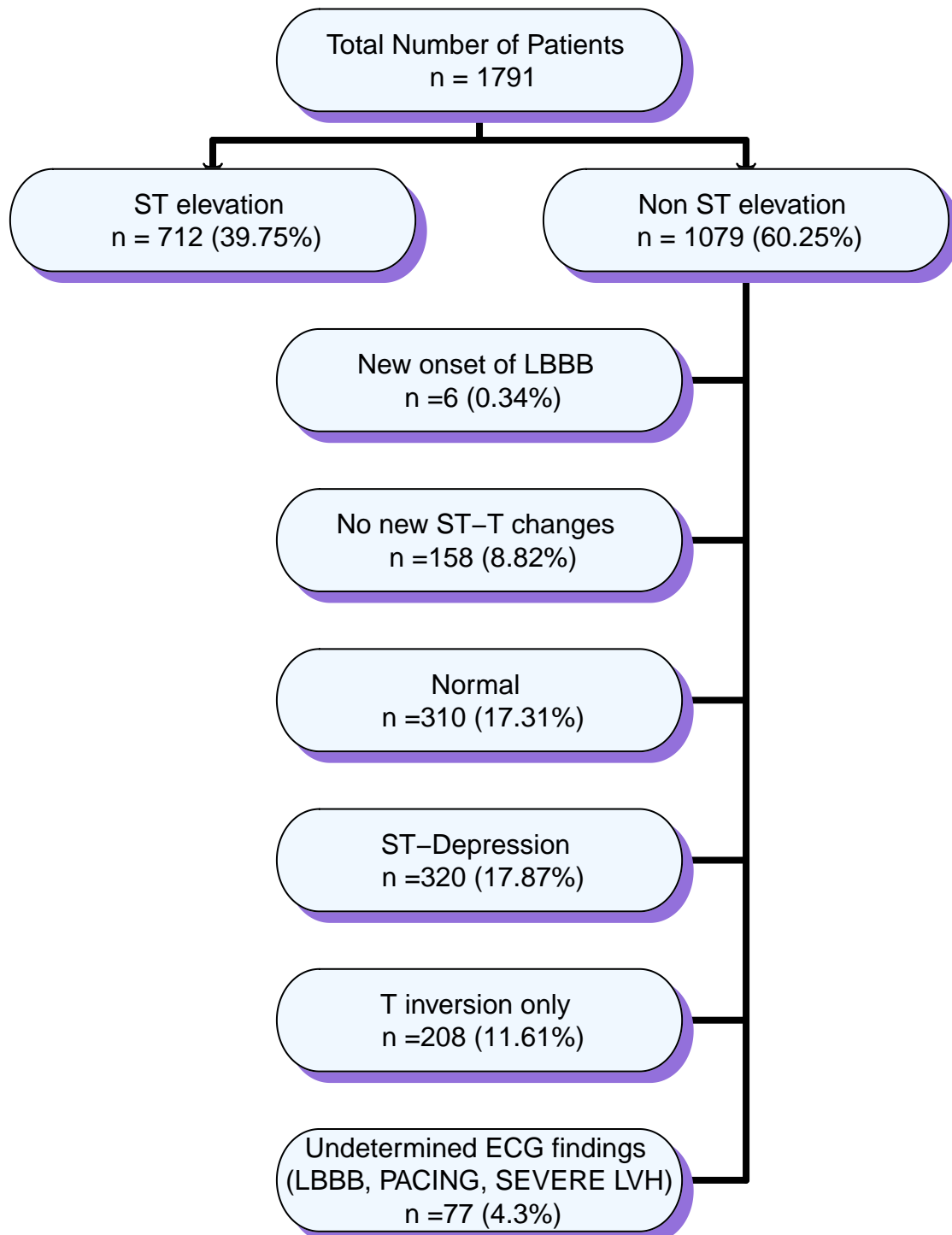
1.2 Demographic Characteristics

1.2.1 Age Distribution by ECG on Admission

Patients with ST elevation were younger (mean age: 61.39 ± 14.36) than those with non-ST elevation (mean age: 65.43 ± 12.94), and the age distribution of patients with ST elevation indicated a greater proportion of younger patients (60.9% were aged ≤ 65 years) than that of patients with non-ST elevation (44.8% aged ≤ 65 years).

Table 1.1: Age Distribution by ECG on Admission

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
Age groups (%)				<0.001
< 50	215 (12.0)	97 (9.0)	118 (16.6)	
50-65	678 (37.9)	371 (34.4)	307 (43.1)	
66-79	639 (35.7)	441 (40.9)	198 (27.8)	
≥ 80	258 (14.4)	169 (15.7)	89 (12.5)	
Age (mean(sd))	64.67 (12.82)	66.26 (12.19)	62.27 (13.38)	<0.001

Percentages are calculated out of available data

Figure 1.2: Age Distribution by ECG on Admission
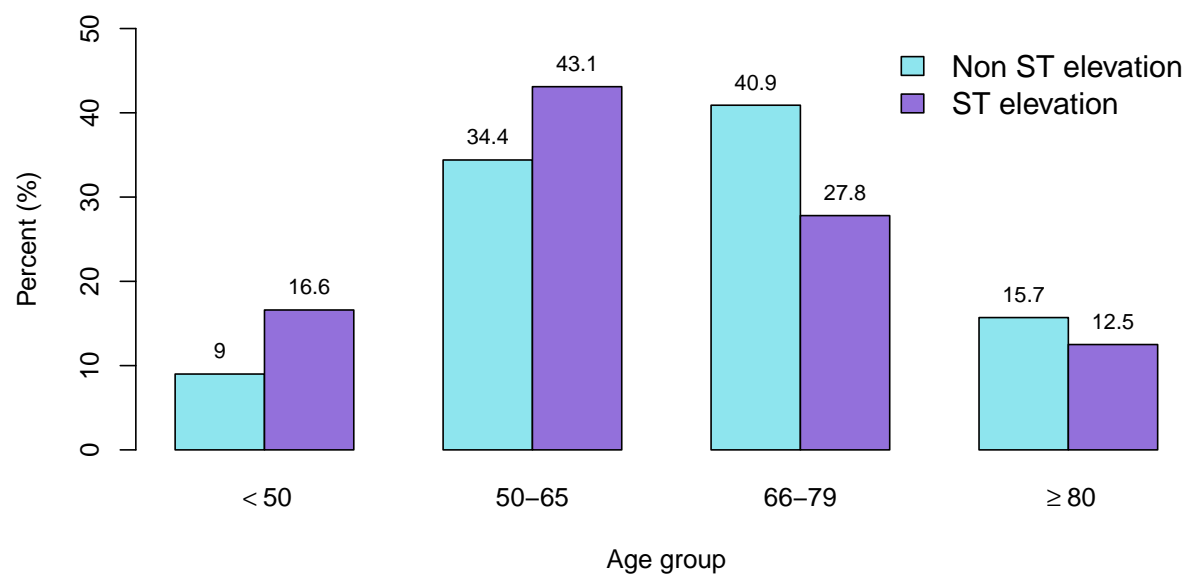
1.2.2 Age Distribution by Gender

The age distribution of male patients was significantly different from that of female patients. The majority of men (56.6%) were in the younger age groups (≤ 65) and only 10.3% were aged 80 or above. 16% of men were less than 50 years old. By contrast, the majority of the female patients were in the older age groups > 65 (69.2%). The number of women under the age of 50 was significantly less than of their male counterparts (6.5%), and 27.3% were aged 80 or above. Only 6.5 % of women were under the age of 50.

Table 1.2: Age Distribution by Gender

	Total	Women	Men	p-value
n	1791	377	1414	
Age groups (%)				<0.001
< 50	215 (12.0)	23 (6.1)	192 (13.6)	
50-65	678 (37.9)	88 (23.3)	590 (41.8)	
66-79	639 (35.7)	159 (42.2)	480 (34.0)	
$\geq$ 80	258 (14.4)	107 (28.4)	151 (10.7)	
Age (mean(sd))	64.67 (12.82)	70.86 (12.37)	63.02 (12.43)	<0.001

Percentages are calculated out of available data

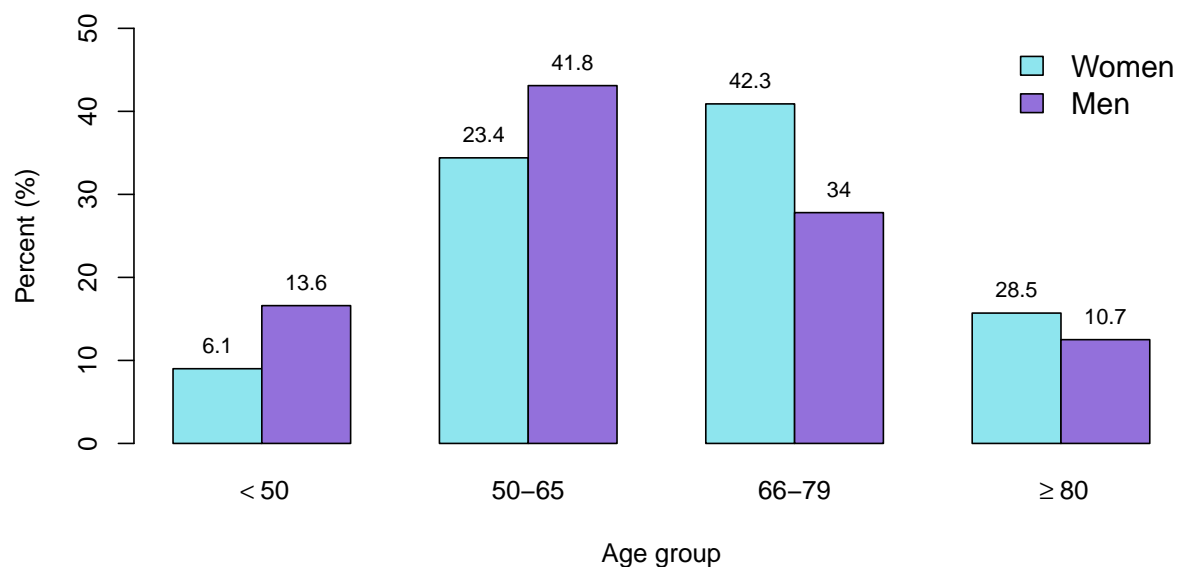Figure 1.3: Age Distribution by Gender

1.2.3 Gender Distribution

For both ST and non-ST segment elevation ACS we observed clear male predominance.

Table 1.3: Gender Distribution

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
Women (%)	377 (21.0)	240 (22.2)	137 (19.2)	0.143
Men (%)	1414 (79.0)	839 (77.8)	575 (80.8)	

Percentages are calculated out of available data

Figure 1.4: Gender Distribution

Patients with ST Elevation

Women 19 %
Men 81 %

Patients with Non–ST Elevation

Women 22 %
Men 78 %
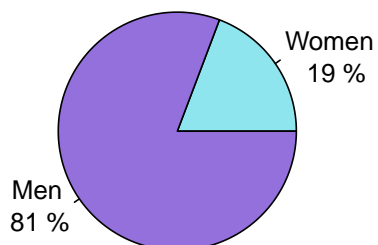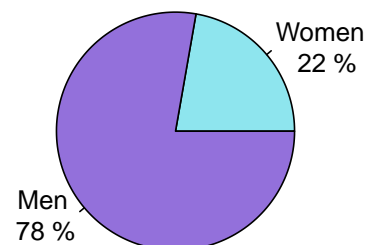
1.3 Cardiovascular History

1.3.1 Cardiovascular History

A history of ACS, Prior AP $\geq$ 24 hours, cardiomyopathy, heart failure (CHF), chronic renal failure, PVD, stroke/TIA and atrial fibrillation was significantly more frequent among patients with non-ST elevation ACS. Similarly, more patients with non-ST elevation MI had undergone percutaneous interventions (PCI) or coronary artery bypass grafting (CABG) prior to hospitalization.

Table 1.4: Prior Cardiovascular History

|	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
ACS (%)	662 (37.2)	481 (45.0)	181 (25.5)	<0.001
Prior AP $\geq$ 24 hours (%)	500 (28.1)	389 (36.3)	111 (15.7)	<0.001
CABG (%)	158 (8.8)	136 (12.6)	22 (3.1)	<0.001
PCI (%)	594 (33.4)	427 (39.8)	167 (23.6)	<0.001
Cardiomyopathy (%)	115 (6.5)	84 (7.8)	31 (4.4)	0.005
CHF (%)	119 (6.7)	101 (9.4)	18 (2.5)	<0.001
Chronic renal failure (%)	203 (11.4)	147 (13.6)	56 (7.9)	<0.001
PVD (%)	108 (6.0)	80 (7.4)	28 (3.9)	0.003
Stroke/TIA (%)	146 (8.2)	105 (9.7)	41 (5.8)	0.004
Biologic valve (%)	5 (0.3)	4 (0.4)	1 (0.1)	0.656
COPD (%)	86 (4.8)	58 (5.4)	28 (3.9)	0.200
Atrial fibrillation/Flutter (%)	115 (6.4)	83 (7.7)	32 (4.5)	0.009
AICD/CRT implant (%)	28 (1.6)	18 (1.7)	10 (1.4)	0.824
Any malignancy (%)	122 (6.9)	84 (7.9)	38 (5.4)	0.059
Active malignancy (%)	26 (1.5)	13 (1.2)	13 (1.9)	0.371
Thyroid disease (%)	97 (5.6)	62 (5.9)	35 (5.1)	0.557
Other life limiting disease (%)	100 (5.8)	61 (5.9)	39 (5.8)	1.000

Percentages are calculated out of available data

Figure 1.5: Cardiovascular history
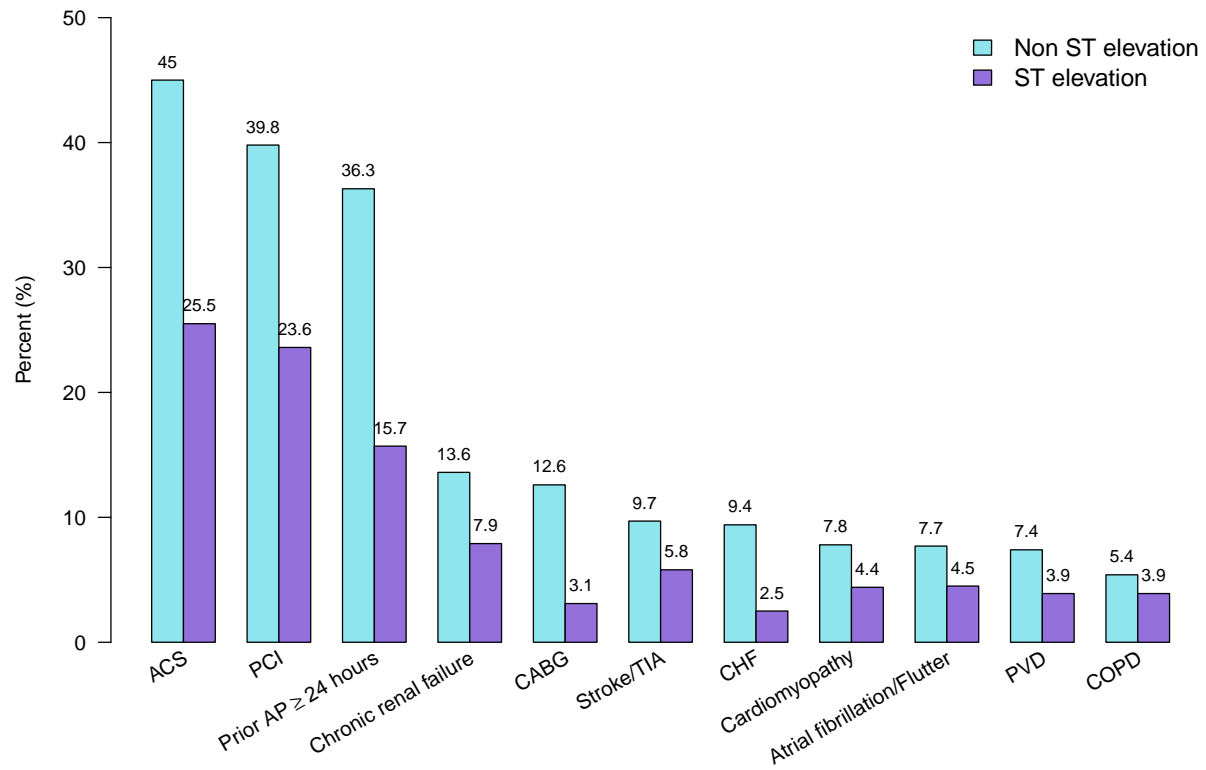
1.3.2 Risk Factors

Current smoking was more prevalent among patients presenting with ST-elevation ACS, while other risk factors were generally more prevalent among patients presenting with non-ST elevation ACS. The rates of newly diagnosed hypertension, diabetes and dyslipidemia were higher among those with ST-elevation. No difference was found in the prevalence of family history of coronary artery disease (CAD).

Table 1.5: Risk Factors

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
Hypertension (%)	1154 (64.7)	767 (71.2)	387 (54.8)	<0.001
* Newly diagnosed (%)	40 (3.4)	23 (2.9)	17 (4.3)	0.300
Diabetes (%)	740 (41.5)	508 (47.2)	232 (32.8)	<0.001
* Newly diagnosed (%)	54 (7.1)	26 (4.9)	28 (11.9)	0.001
Dyslipidemia (%)	1295 (72.7)	826 (76.8)	469 (66.4)	<0.001
* Newly diagnosed (%)	108 (8.2)	51 (6.1)	57 (11.9)	<0.001
Current smoker (%)	690 (38.5)	357 (33.1)	333 (46.8)	<0.001
Past smoker (%)	378 (21.1)	244 (22.6)	134 (18.8)	0.062
Family history of CAD (%)	480 (33.4)	278 (33.3)	202 (33.6)	0.945

Percentages are calculated out of available data
Newly diagnosed expressed as percentage of total patients with specific risk factor

Figure 1.6: Risk Factors
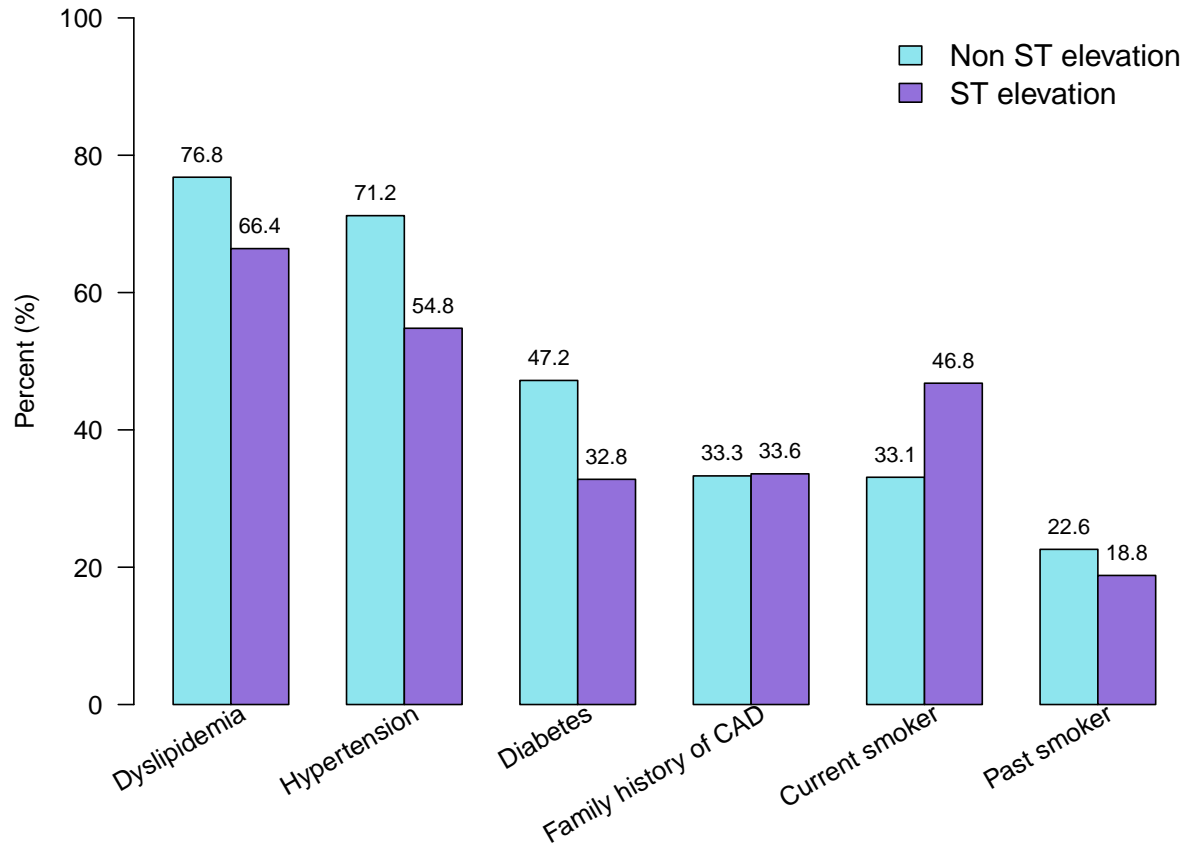
1.4 Prior Chronic Treatment

Prior to the index hospitalization, a higher proportion of patients with a non-ST elevation ACS (50.1%) were being treated with aspirin compared to those with STelevation (33.6%). Other drugs in common use were ACE Inhibitors and ARB's, betablockers, lipid-lowering drugs (primarily statins), antihyperglycemic drugs and diuretics all of which were in use more frequently among patients presenting with non-ST elevation ACS. 13.6% of patients with non-ST elevation and 5.7% of those with ST elevation were being treated with clopidogrel.

Table 1.6: Prior Chronic Treatment

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
Anti-platelets				
Aspirin (%)	804 (44.9)	559 (51.8)	245 (34.4)	<0.001
Clopidogrel (%)	196 (10.9)	153 (14.2)	43 (6.0)	<0.001
Prasugrel (%)	23 (1.3)	18 (1.7)	5 (0.7)	0.118
Ticagrelor (%)	26 (1.5)	19 (1.8)	7 (1.0)	0.252
Anticoagulants				
Warfarin (%)	37 (2.1)	24 (2.2)	13 (1.8)	0.681
Dabigatran (%)	5 (0.3)	5 (0.5)	0 (0.0)	0.173
Rivaroxaban (%)	15 (0.8)	12 (1.1)	3 (0.4)	0.192
Apixaban (%)	24 (1.3)	20 (1.9)	4 (0.6)	0.034
LMWH (%)	15 (0.8)	11 (1.0)	4 (0.6)	0.438
Heparin (UFH) (%)	4 (0.2)	1 (0.1)	3 (0.4)	0.352
Fondaparinux (%)	1 (0.1)	1 (0.1)	0 (0.0)	1.000
Other				
ACE-I (%)	490 (27.4)	336 (31.1)	154 (21.6)	<0.001
ARB (%)	275 (15.4)	191 (17.7)	84 (11.8)	0.001
ACE-I/ARB (%)	755 (42.2)	523 (48.5)	232 (32.6)	<0.001
Beta Blockers (%)	624 (34.8)	463 (42.9)	161 (22.6)	<0.001
CCB (%)	369 (20.6)	257 (23.8)	112 (15.7)	<0.001
Nitrates (%)	67 (3.7)	60 (5.6)	7 (1.0)	<0.001
Diuretics (%)	242 (13.5)	190 (17.6)	52 (7.3)	<0.001
Insulin (%)	246 (13.7)	182 (16.9)	64 (9.0)	<0.001
Antihyperglycemic drugs[1] (%)	467 (26.1)	327 (30.3)	140 (19.7)	<0.001
Statins[2] (%)	908 (50.7)	619 (57.4)	289 (40.6)	<0.001
Ezetimibe (%)	43 (4.3)	32 (5.6)	11 (2.6)	0.035

[1] Antihyperglycemic drugs include: Glibenclamide, Glipizide, Glimepiride, Metformin, Sitagliptine, Saxagliptine, Vidagliptine, Linagliptine, Exenatide, Liraglutide, Dapagliflozine, Acarbose, Meglinitides, TZDs, Rosiglitazone
[2] Statins include: Simvastatin, Pravastatin, Atorvastatin, Rosuvastatin

Figure 1.7: Prior Chronic Treatment
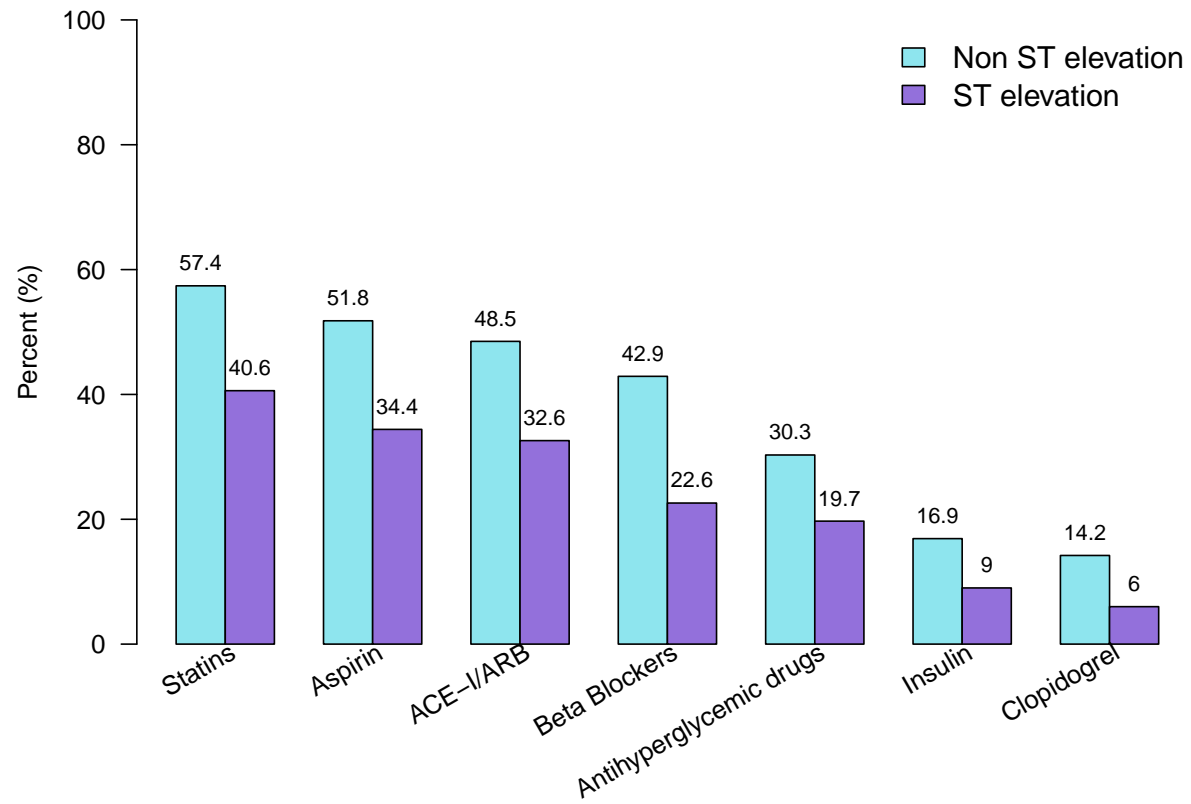
1.5 Transportation, Pre-Admission and Admission Information

1.5.1 Mode of Transportation by ECG on Admission

44.6% of all patients arrived at the hospital by means of private transportation. Patients with ST elevation were more frequently transported to hospital with mobile CCU, and patients with non-ST elevation arrived more frequently by means of private transportation.

Table 1.7: Mode of Transportation by ECG on Admission

	Total	Non ST elevation	ST elevation
n[1]	1727	1031	696
Mobile ICCU (%)	715 (41.4)	313 (30.4)	402 (57.8)
Private car/ independently (%)	747 (43.3)	540 (52.4)	207 (29.7)
Regular ambulance (%)	265 (15.3)	178 (17.3)	87 (12.5)

p-value <0.001
[1] Excluded in-patients

Figure 1.8: Mode of Transportation by ECG on Admission
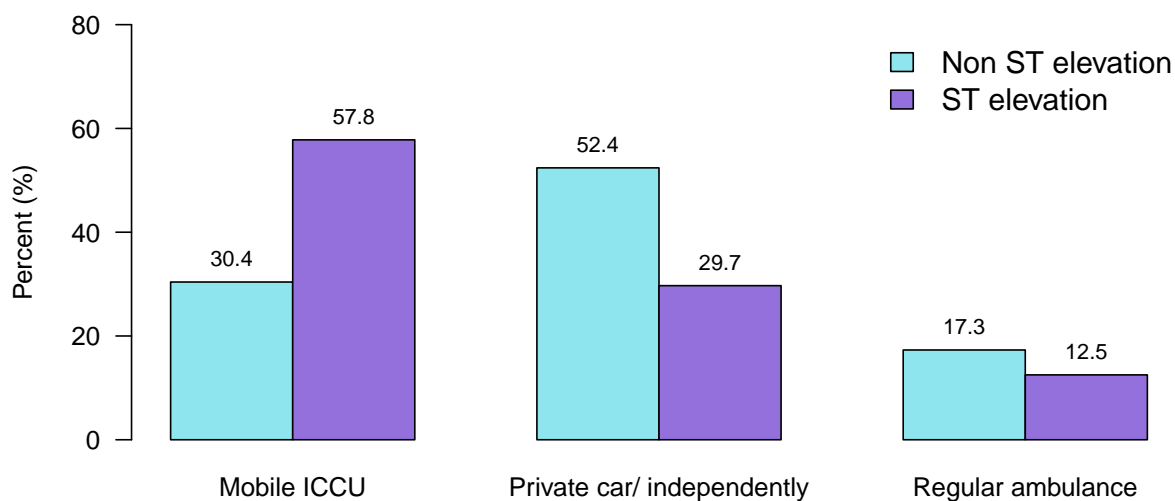
1.8-1.bb

1.5.2 Mode of Transportation by Gender

41.1% of patients, both men and women, arrived by means of a mobile ICCU. Women were more frequently transported to hospital with regular ambulance and men arrived more frequently by means of private transportation.

Table 1.8: Mode of Transportation by Gender

	Total	Women	Men
n[1]	1727	360	1367
Mobile ICCU (%)	715 (41.4)	150 (41.7)	565 (41.3)
Private car/ independently (%)	747 (43.3)	136 (37.8)	611 (44.7)
Regular ambulance (%)	265 (15.3)	74 (20.6)	191 (14.0)
p-value = 0.004			
[1] Excluded in-patients			

Figure 1.9: Mode of Transportation by gender
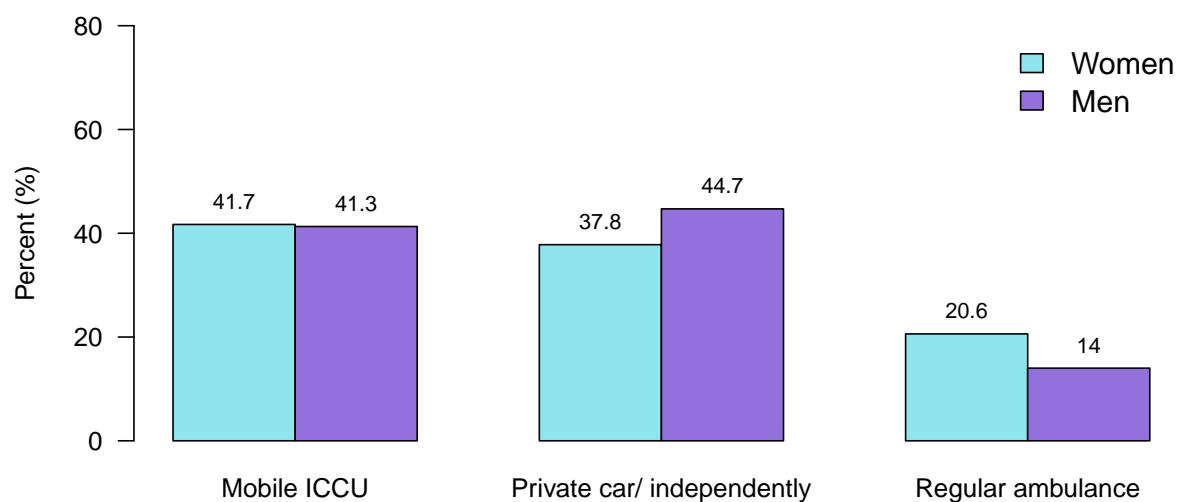
1.5.3 Drugs administered at ED

Table 1.9: Drugs administered at ED

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
Aspirin (%)	810 (45.2)	529 (49.0)	281 (39.5)	<0.001
Clopidogrel (%)	276 (15.4)	218 (20.2)	58 (8.1)	<0.001
Prasugrel (%)	118 (6.6)	26 (2.4)	92 (12.9)	<0.001
Ticagrelor (%)	199 (11.1)	122 (11.3)	77 (10.8)	0.805
Heparin (%)	453 (25.3)	222 (20.6)	231 (32.4)	<0.001
LMWH (%)	245 (13.7)	216 (20.0)	29 (4.1)	<0.001

Figure 1.10: Drugs administered at ED
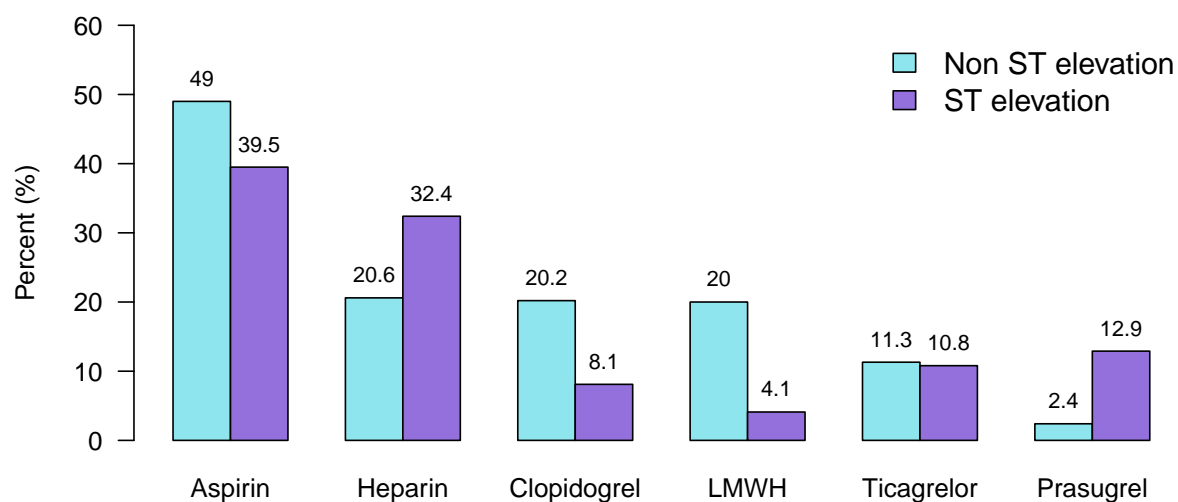
1.5.4 Ward of First Arrival by ECG on Admission

Most patients with ACS present to the emergency room (ER). However, a higher number of patients with an ST elevation ACS present directly to the cardiac care unit (CCU) and the catheterization laboratory than those with non-ST elevation ACS.

Table 1.10: Ward of First Arrival by ECG on Admission

	Total	Non ST elevation	ST elevation
n	1791	1079	712
Catheterization laboratory (%)	137 (7.6)	11 (1.0)	126 (17.7)
CCU (%)	191 (10.7)	42 (3.9)	149 (20.9)
ER (%)	1463 (81.7)	1026 (95.1)	437 (61.4)
Difference in ward of first arrival, ST elevation vs. non-ST elevation, p <0.001			

1.5.5 Ward of First Arrival by Gender

For the greater majority of both male (82.2%) and female patients (81.8%), the ward of first arrival was the emergency room (ER). Men were more likely to be transferred directly to the catheterization laboratory and less to the cardiac care unit (CCU) than women.

Table 1.11: Ward of First Arrival by Gender

	Total	Women	Men
n	1791	377	1414
Catheterization laboratory (%)	137 (7.6)	22 (5.8)	115 (8.1)
CCU (%)	191 (10.7)	46 (12.2)	145 (10.3)
ER (%)	1463 (81.7)	309 (82.0)	1154 (81.6)
Difference in ward of first arrival, men vs. women, p = 0.211			

1.5.6 First Ward of Hospitalization

As expected, the majority of patients presenting with ST elevation were hospitalized in the cardiac care unit (CCU) (89.3%). 38.5% of the patients who presented with non-ST elevation were admitted to the CCU and an additional 41.1% to a cardiology department, with the remaining 18.7% being admitted to internal medicine departments.

Table 1.12: First Ward of Hospitalization

	Total	Non ST elevation	ST elevation
n	1791	1079	712
Cardiology (%)	485 (27.1)	435 (40.3)	50 (7.0)
CCU (%)	1064 (59.4)	417 (38.6)	647 (90.9)
Chest pain unit (%)	6 (0.3)	6 (0.6)	0 (0.0)
Internal medicine (%)	220 (12.3)	209 (19.4)	11 (1.5)
Other (%)	16 (0.9)	12 (1.1)	4 (0.6)

Difference in first ward of hospitalization, ST elevation vs. non-ST elevation, p <0.001

Figure 1.11: First Ward of Hospitalization
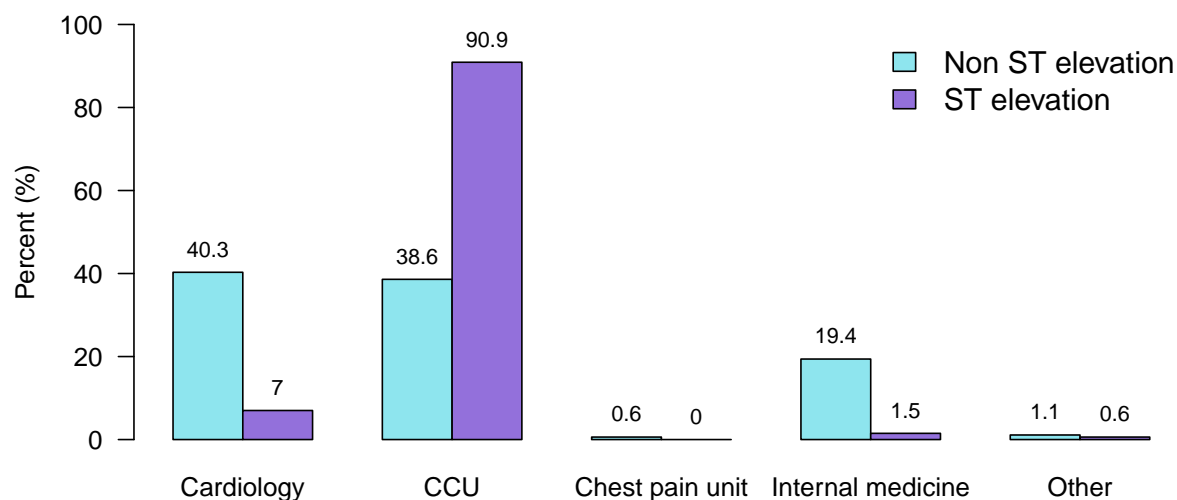
1.5.7 Time from Symptom Onset to Hospital Arrival, by ECG on Admission

All time frames were significantly shorter for patients with ST elevation. Patients with ST elevation sought help more rapidly when compared to patients with non-ST elevation.

Table 1.13: Time (minutes) from Symptom Onset to Admission, by ECG on Admission

	Total	Non ST elevation	ST elevation	p-value
n[1]	1252	726	526	
Onset to contact (median [IQR])	92.00 [41.00, 248.00]	140.00 [59.50, 467.50]	71.00 [35.00, 155.75]	<0.001
Contact to arrival (median [IQR])	51.00 [35.00, 81.00]	57.00 [36.00, 99.00]	49.00 [33.00, 66.00]	<0.001
Onset to arrival (median [IQR])	154.50 [92.00, 372.50]	208.50 [110.25, 629.50]	130.00 [80.00, 226.00]	<0.001

[1] Excluded in-patients or patients whose first medical contact was in ER

Figure 1.12: Median Length of Time from Symptom Onset to Admission (minutes)

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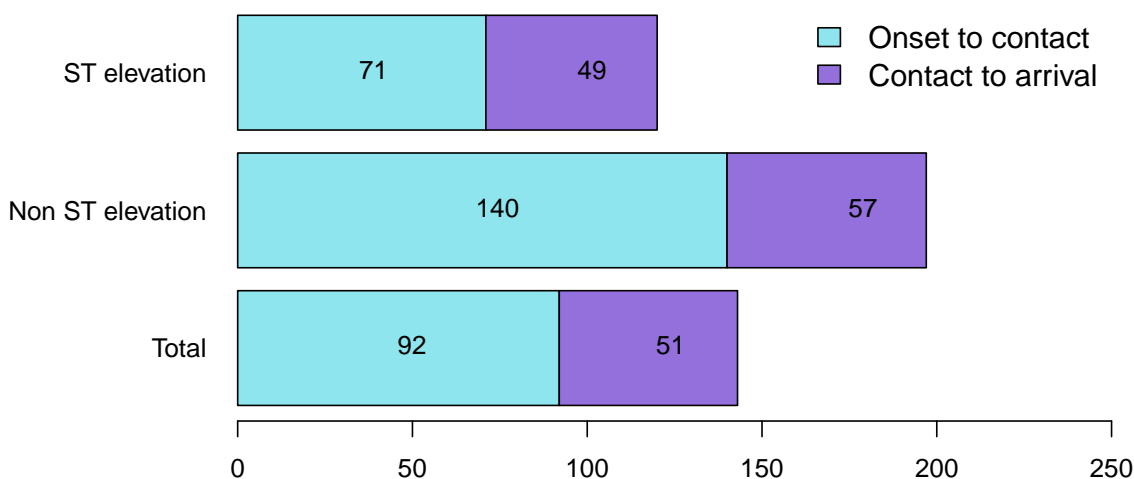
1.5.8 Time from Symptom Onset to Hospital Arrival, by gender

Men were more likely to seek help earlier than women. After seeking for help arrival time to the emergency room (ER) were similar for men and women.

Table 1.14: Time (minutes) from Symptom Onset to Admission by gender

	Total	Women	Men	p-value
n[1]	1252	285	967	
Onset to contact (median [IQR])	92.00 [41.00, 248.00]	127.00 [60.00, 334.00]	85.00 [36.00, 230.50]	0.013
Contact to arrival (median [IQR])	51.00 [35.00, 81.00]	51.00 [33.00, 77.00]	51.00 [35.00, 81.25]	0.700
Onset to arrival (median [IQR])	154.50 [92.00, 372.50]	181.00 [105.00, 416.50]	148.00 [89.00, 327.50]	0.028

[1] Excluded in-patients or patients whose first medical contact was in ER

Figure 1.13: Median Length of Time from Symptom Onset to Admission (minutes)
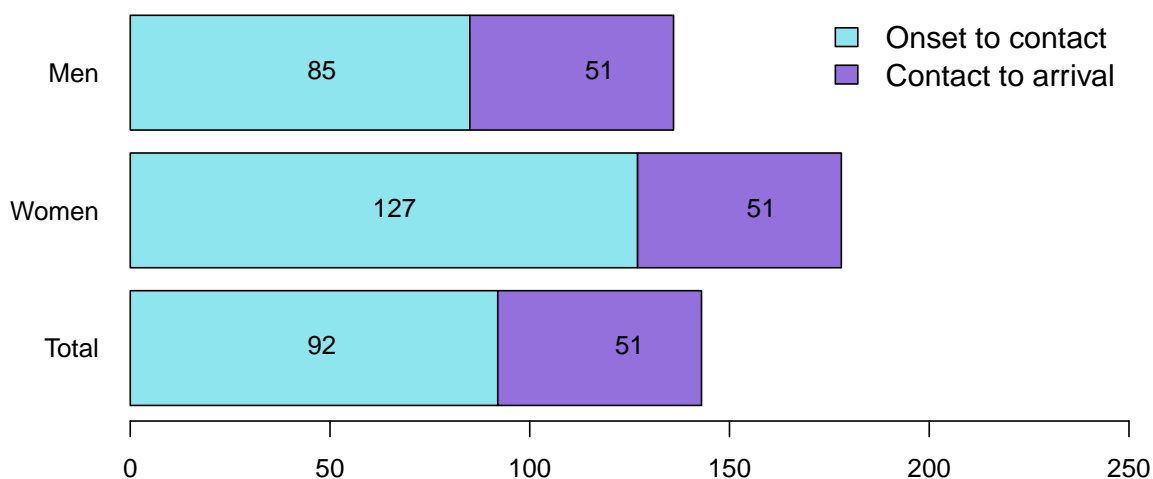
1.5.9 First Medical Contact

26.6% of patients had the first medical contact at the emergency room (ER) and about 40% at a primary clinic/"Moked". For an additional 21% the primary medical contact was with a mobile intensive care unit (ICCU). Patients with ST elevation were more likely to have their first medical contact with an ICCU (29.5%) than those with non-ST elevation (15.4%).

Table 1.15: First Medical Contact

	Total	Non ST elevation	ST elevation
n	1791	1079	712
ER (%)	489 (27.3)	313 (29.0)	176 (24.7)
HMO Out-Pts. clinic/'Moked' (%)	680 (38.0)	460 (42.6)	220 (30.9)
Home visit (%)	31 (1.7)	14 (1.3)	17 (2.4)
In-patient (%)	50 (2.8)	40 (3.7)	10 (1.4)
Mobile ICCU (%)	374 (20.9)	163 (15.1)	211 (29.6)
Other hospital (%)	22 (1.2)	12 (1.1)	10 (1.4)
Regular ambulance (%)	145 (8.1)	77 (7.1)	68 (9.6)

Difference in location of first medical contact, ST elevation vs. non-ST elevation, p <0.001

1.5.10 Presenting Symptoms and Killip Class

Typical angina was significantly more frequent in petients presenting with ST elevation (87.3%) than those presenting with non-ST elevation (74.3%). However, atypical chest pain was more common in patients presenting with non-ST elevation (14.9%) than in those with ST elevation (7.8%). Also dyspnea was more common in patients with non-ST elevation (30%) than those with ST elevation (20.2%)

Table 1.16: Presenting Symptoms at First Medical Contact

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
Typical angina (%)	1473 (82.2)	832 (77.1)	641 (90.0)	<0.001
Atypical chest pain (%)	173 (9.7)	138 (12.8)	35 (4.9)	<0.001
Syncope (%)	53 (3.0)	23 (2.1)	30 (4.2)	0.016
Aborted SCD (%)	25 (1.4)	6 (0.6)	19 (2.7)	<0.001
Arrhythmia (%)	50 (2.8)	30 (2.8)	20 (2.8)	1.000
Dyspnea (%)	468 (26.1)	330 (30.6)	138 (19.4)	<0.001
Other (%)	273 (15.2)	147 (13.6)	126 (17.7)	0.023

Figure 1.14: Killip Class on Admission
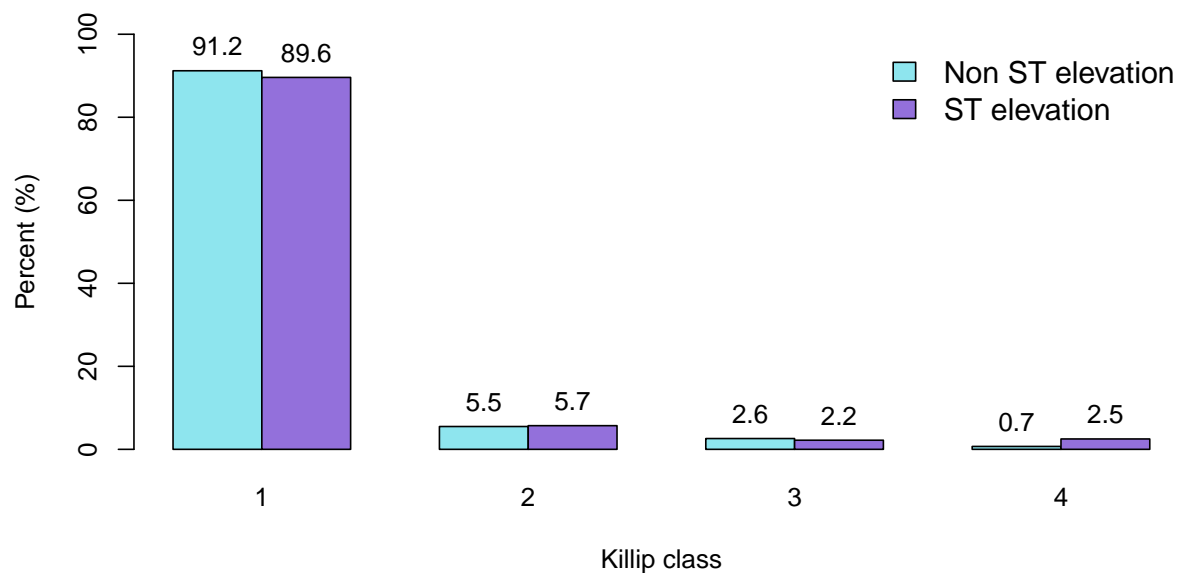
1.5.11 Pre-Hospital Treatment (before ED arrival)

At first medical contact, patients with ST elevation were significantly more likely to receive therapy with: aspirin, prasugrel and heparin than patients with non-ST elevation.

Table 1.17 Pre-Hospitalization Treatment

	Total	Non ST elevation	ST elevation	p-value
n[1]	1727	1031	696	
Aspirin (%)	676 (39.1)	300 (29.1)	376 (54.0)	<0.001
Clopidogrel (%)	22 (1.3)	14 (1.4)	8 (1.1)	0.873
Prasugrel (%)	8 (0.5)	1 (0.1)	7 (1.0)	0.018
Ticagrelor (%)	5 (0.3)	2 (0.2)	3 (0.4)	0.658
Heparin (%)	306 (17.7)	34 (3.3)	272 (39.1)	<0.001
LMWH (%)	11 (0.6)	8 (0.8)	3 (0.4)	0.565

[1] In-patients excluded

Figure 1.15: Pre–Hospitalization Treatment
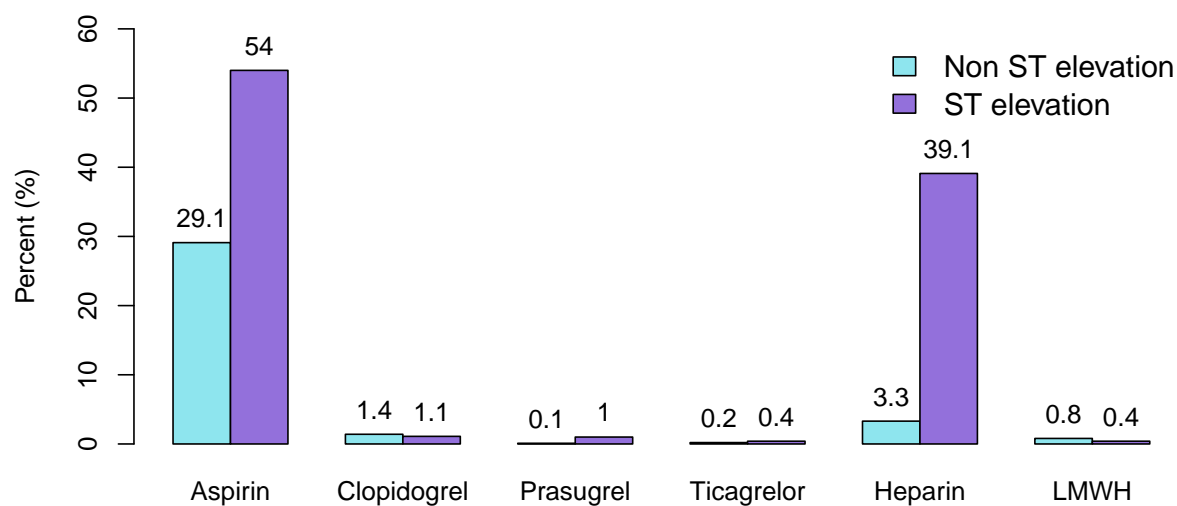
1.6 First Recorded ECG

1.6.1 Location of First ECG Recording

54.2% of patients presenting with non-ST elevation and 39.8% of patients presenting with ST elevation had their first ECG recorded in the emergency department (ED). With respect to the remaining patients, 36.4% of patients with ST elevation and 18.6% of those with non-ST elevation had the first ECG performed either at home or in an ambulance, and about 20% in both groups had it performed in a primary clinic.

Figure 1.16: Location of First ECG Recording
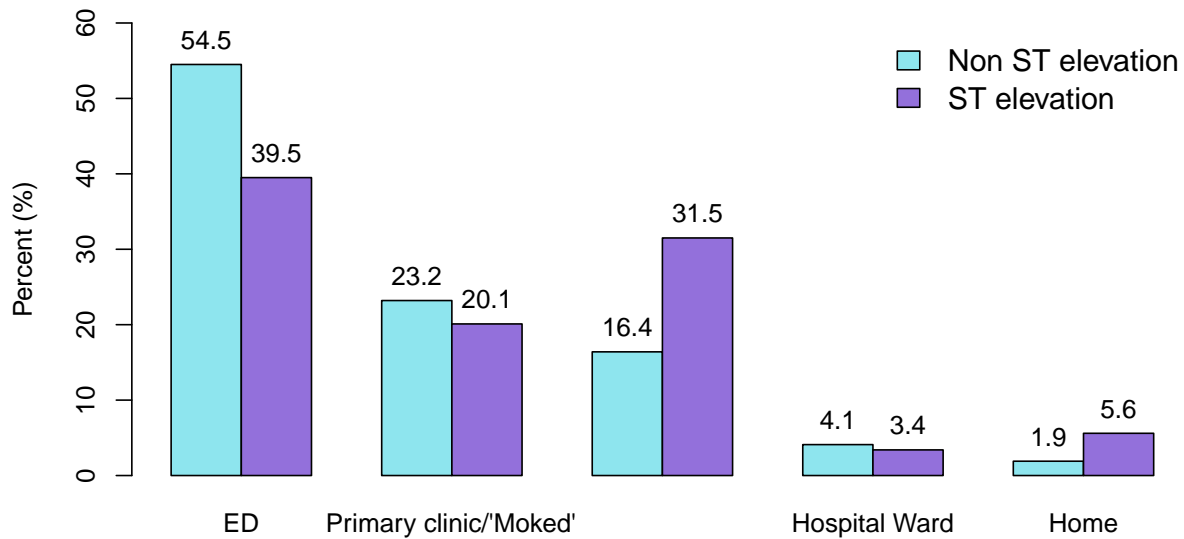
1.6.2 First ECG Rhythm

About 85% of patients, both with and without ST elevation, presented with a normal sinus rhythm. 2.7% of patients with ST elevation and 4.9% of those without ST elevation, presented with atrial fibrillation.

Table 1.18: First ECG Rhythm

	Total	Non ST elevation	ST elevation
n	1791	1079	712
NSR (%)	1537 (85.8)	919 (85.2)	618 (86.8)
AF (%)	74 (4.1)	53 (4.9)	21 (2.9)
S.Tachycardia (%)	91 (5.1)	61 (5.7)	30 (4.2)
S.Bradycardia (%)	28 (1.6)	15 (1.4)	13 (1.8)
VT/VF (%)	15 (0.8)	7 (0.6)	8 (1.1)
II/III AV Block (%)	20 (1.1)	6 (0.6)	14 (2.0)
Other (%)	26 (1.5)	18 (1.7)	8 (1.1)

Difference in first ECG rhythm, ST elevation vs. non-ST elevation, p = 0.013

1.7 Primary Reperfusion

1.7.1 Primary Reperfusion Therapy in Patients with ST Elevation

About 80% of patients with ST elevation underwent primary reperfusion within 12 hours from onset of symptoms, mainly primary PCI. In 91.3% of these cases, stents were deployed as follows: 92.1% patients with drug eluting, 3.65% bare metal and 1.2% MGuard stents.

Figure 1.17: Primary Reperfusion in Patients with ST Elevation
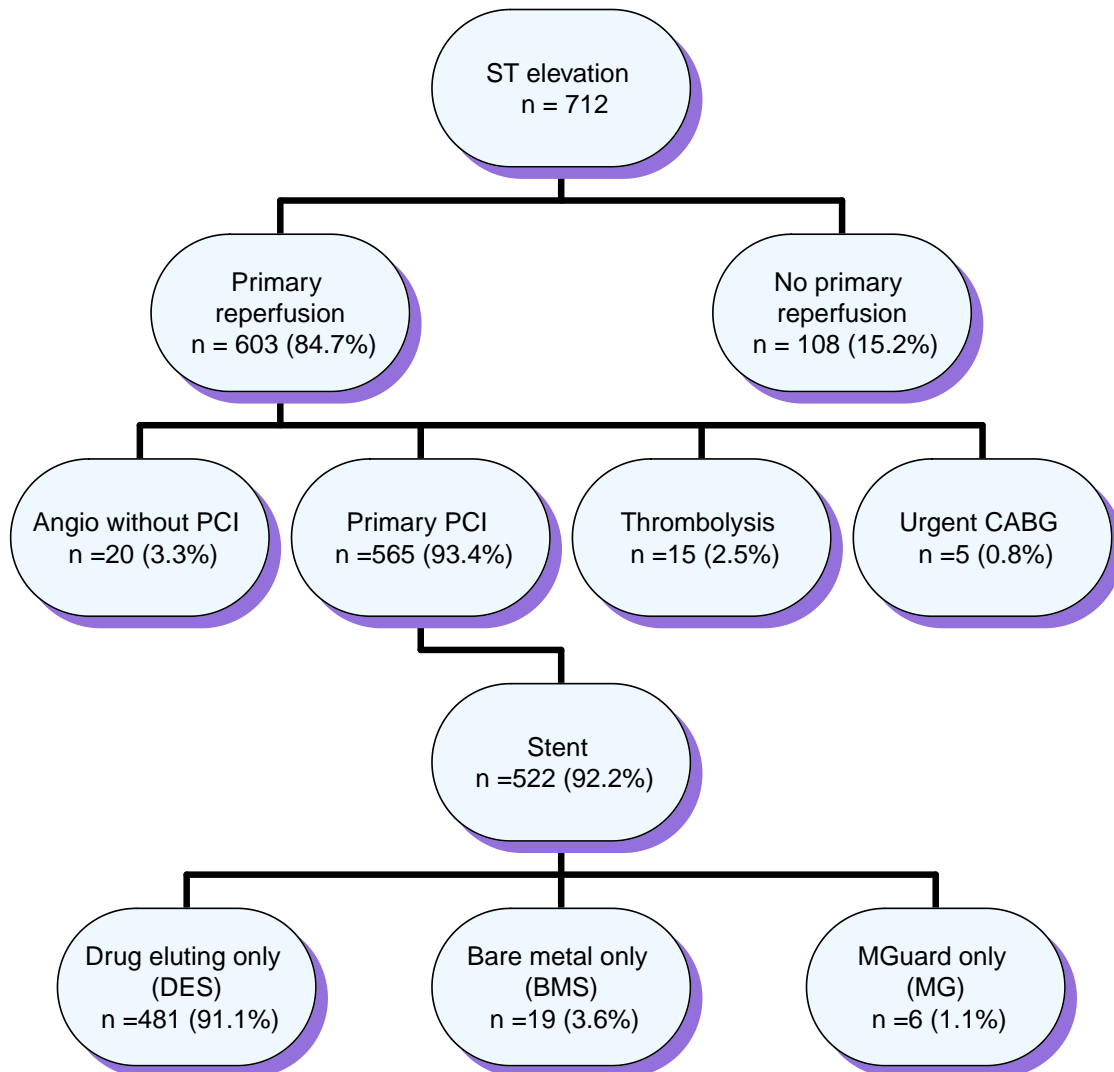
1.7.2 Length of Time from Arrival to Primary Reperfusion

The median time from arrival to primary reperfusion was less than one hour (52 munutes). The median length of time for thrombolysis was shorter (34.5 minutes) than for primary PCI (51 minutes).

Table 1.19: Length of Time (minutes) from Arrival to Reperfusion

	N	Time in minutes (median [IQR])
From arrival to reperfusion	573	52.00 [26.00, 86.00]
From arrival to thrombolysis	14	34.50 [27.25, 66.00]
From arrival to primary PCI	532	50.50 [26.00, 85.00]

Figure 1.18: Length of Time from Arrival to Reperfusion
(Median, 25%–75%)
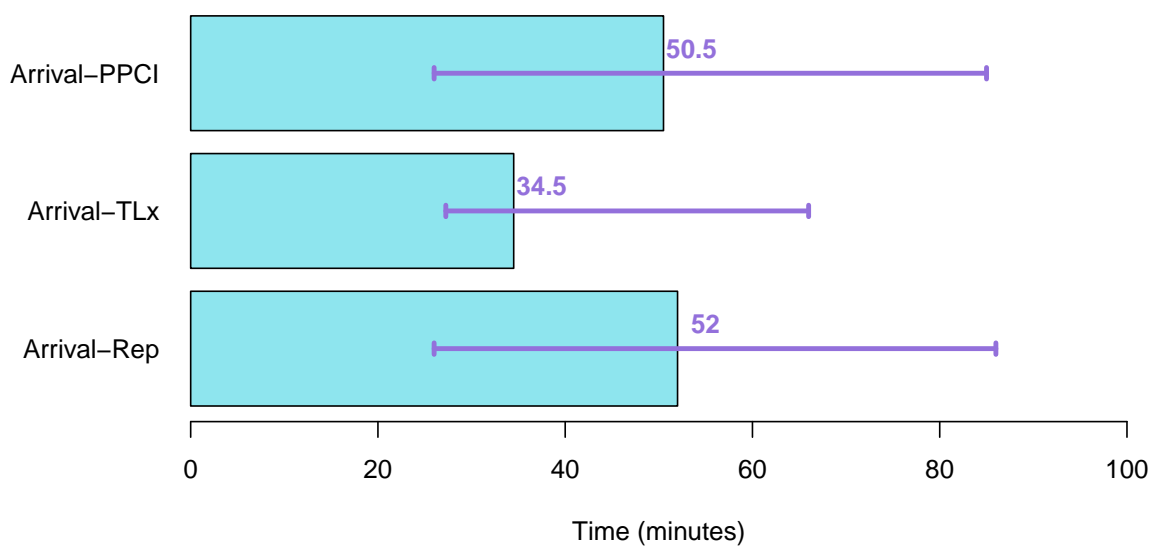
1.7.3 Length of Time from Arrival to Primary Reperfusion, by Gender

The time delay from arrival to primary reperfusion was nearly identical between men and women.

Table 1.20: Length of Time (minutes) from Arrival to Reperfusion, by gender

	Women		Men		
	Time in minutes (median [IQR])	N	Time in minutes (median [IQR])	N	p-value
From arrival to reperfusion	59.00 [30.00, 125.50]	106	50.00 [26.00, 85.00]	467	0.061
From arrival to thrombolysis	NA [NA, NA]	0	34.50 [27.25, 66.00]	14	NA
From arrival to primary PCI	58.50 [30.00, 94.00]	102	50.00 [25.25, 85.00]	430	0.088

Figure 1.19: Length of Time from Arrival to Reperfusion by gender
(Median, 25%–75%)
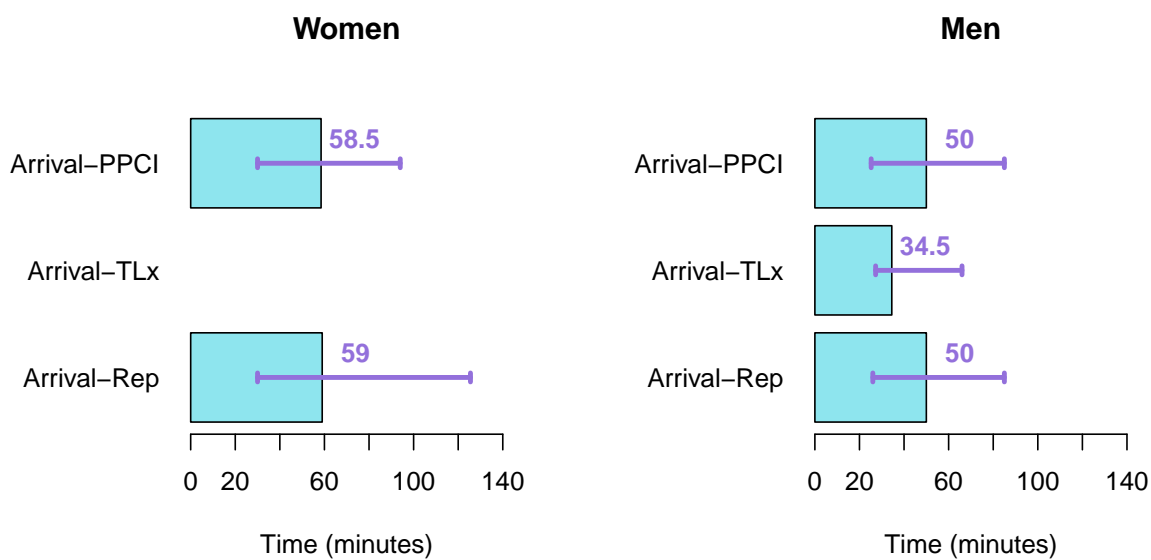
1.7.4 Use of drugs and protective devices during Primary PCI

Table 1.21: Drugs and Protective Devices during Primary Reperfusion

	Overall
n	603
Aspirin (%)	22 (3.6)
Clopidogrel (%)	37 (6.1)
Prasugrel (%)	126 (20.9)
Ticagrelor (%)	51 (8.5)
IIb/IIIa antagonists (%)	210 (34.8)
Bivalirudin (Angiomax) (%)	36 (6.0)
Aspiration device (%)	108 (17.9)

1.7.5 TIMI Grade Flow of IRA

In 60.3% of cases, a TIMI flow grade of zero was observed on first injection to the infarct related artery. Following revascularization, a TIMI grade flow of 3 was achieved in the majority of patients (88.5%).

Table 1.22: TIMI Grade Flow of IRA before and after revascularization

	Before revascularization[1] (%)	After revascularization (%)
n	529	587
0	329 (62.2)	22 (3.7)
1	56 (10.6)	12 (2.0)
2	60 (11.3)	36 (6.1)
3	84 (15.9)	517 (88.1)

[1] 60 patients with missing data

1.7.6 Reasons for Not Performing Primary Reperfusion

17.8% of patients presenting with ST elevation did not receive primary reperfusion therapy. In 27.1% the reason was spontaneous reperfusion, in 28.6% the reason was late arrival at the hospital, and in 9% of cases primary reperfusion was considered not indicated.

Figure 1.20: Reasons for Not Performing Primary Reperfusion
Number of Patients = 108
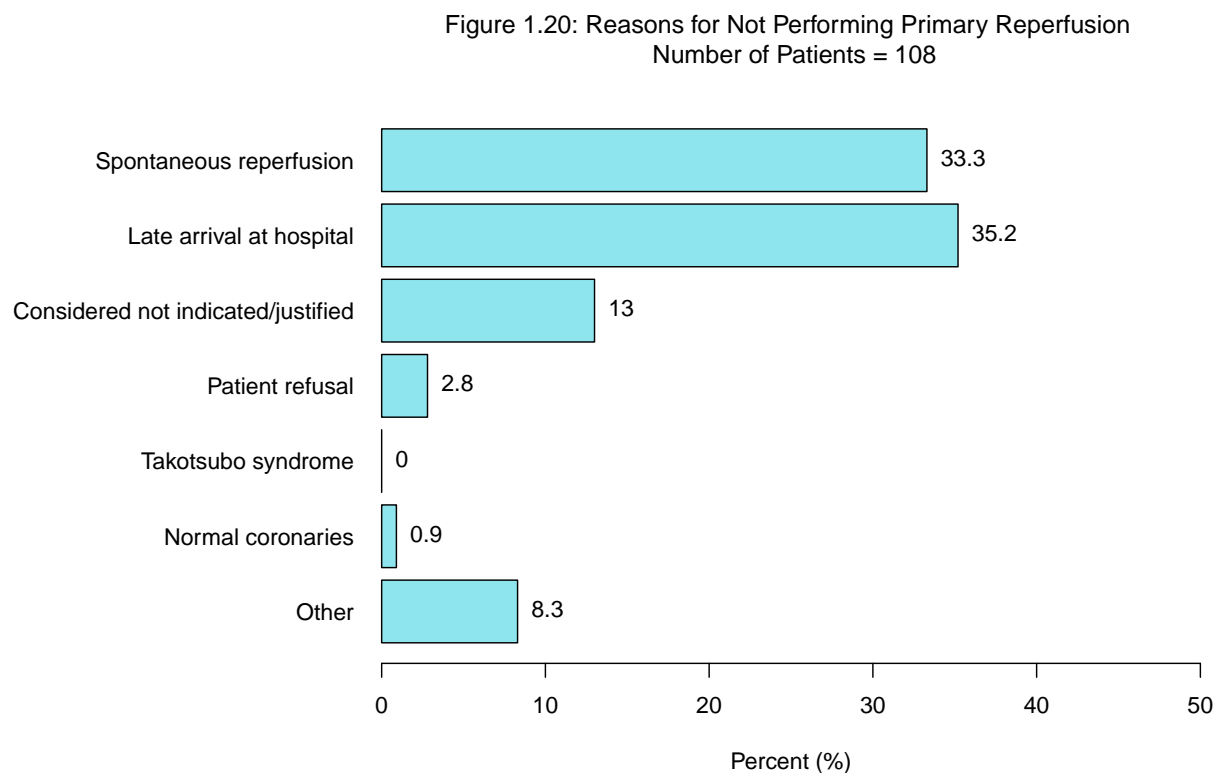
- There were no patients with contraindication to thrombolysis and no patient died before decision.

1.8 Coronary Interventions and Procedures during Hospitalization

1.8.1 Coronary Angiography and Interventions

Patients with ST elevation were more likely than those with non-ST elevation to undergo coronary angiography and PCI. CABG during hospitalization was performed more frequently in patients with non-ST elevation.

Figure 1.21: In–Hospital Cardiac Interventions and Procedures
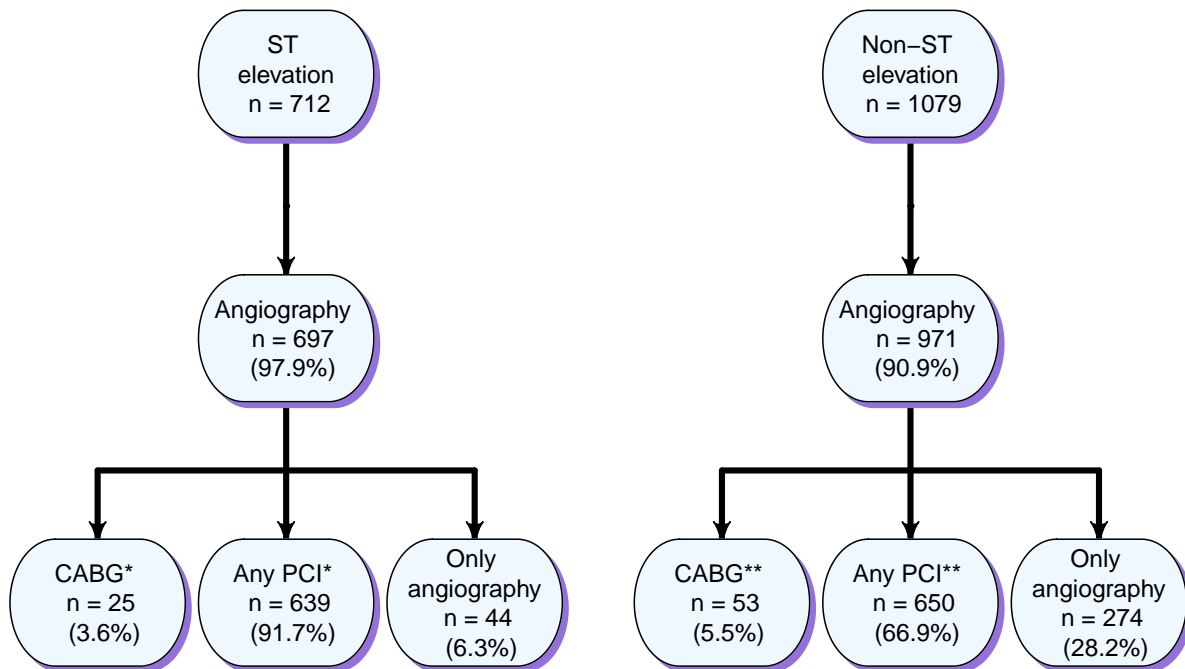
*11 patients underwent both CABG and PCI; ** 6 patients underwent both CABG and PCI.

1.8.2 Other Procedures

70.3% of patients with ST elevation and 53.9% of those with non-ST elevation underwent echocardiography. Patients with ST elevation were more likely to receive resuscitation, DC shocks, mechanical ventilation, intra-aortic balloon counter pulsation (IABP) and temporary pacemakers than those with non-ST elevation.

Table 1.23: Other Procedures

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
Echo (%)	1055 (59.0)	563 (52.3)	492 (69.1)	<0.001
DC shock (%)	40 (2.2)	12 (1.1)	28 (3.9)	<0.001
Resuscitation (%)	24 (1.3)	6 (0.6)	18 (2.5)	0.001
Ventilation (%)	48 (2.7)	15 (1.4)	33 (4.6)	<0.001
IABP (%)	40 (2.2)	11 (1.0)	29 (4.1)	<0.001
Dialysis (%)	35 (2.0)	25 (2.3)	10 (1.4)	0.235
EPS (%)	1 (0.1)	1 (0.1)	0 (0.0)	1.000
Stress test/SPECT (%)	28 (1.6)	22 (2.0)	6 (0.8)	0.072
Cardiac CT (%)	16 (0.9)	14 (1.3)	2 (0.3)	0.048
AICD/CRT (%)	4 (0.2)	2 (0.2)	2 (0.3)	1.000
Permanent pacemaker (%)	5 (0.3)	4 (0.4)	1 (0.1)	0.656
Temporary pacemaker (%)	21 (1.2)	3 (0.3)	18 (2.5)	<0.001
Therapeutic Hypothermia (%)	10 (0.6)	4 (0.4)	6 (0.8)	0.322

1.9 Ejection Fraction

Ejection fraction (EF) was determined in 86.6% of patients with ST elevation and in 76.2% of those with non-ST elevation. EF was normal in a larger proportion of patients with non-ST elevation (63.4%) than in patients with ST elevation (40.1%). 25.7% of patients with ST elevation and 16% of patients with non-ST elevation presented with an EF <40%.

Table 1.24: Ejection Fraction

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
EF determined (%)	1411 (80.0)	796 (75.5)	615 (86.6)	<0.001
EF (range) (%)				<0.001
Normal ($\geq 50\%$)	729 (51.7)	495 (62.2)	234 (38.0)	
Mild (40-49%)	391 (27.7)	171 (21.5)	220 (35.8)	
Moderate (30-39%)	208 (14.7)	94 (11.8)	114 (18.5)	
Severe ($< 30\%$)	83 (5.9)	36 (4.5)	47 (7.6)	

1.10 In-Hospital Complications

Hemodynamic complications, ventricular fibrillation (VF) and stent thrombosis were more frequent in patients with ST elevation.

Table 1.25: In-Hospital Complications

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
CHF mild-moderate (Killip-2) (%)	105 (5.9)	56 (5.2)	49 (6.9)	0.166
Pulmonary edema (Killip-3) (%)	56 (3.1)	36 (3.3)	20 (2.8)	0.626
Cardiogenic shock (Killip-4) (%)	35 (2.0)	11 (1.0)	24 (3.4)	0.001
Hemodynamically significant RV infarction (%)	11 (0.6)	2 (0.2)	9 (1.3)	0.011
Re-MI (%)	9 (0.5)	6 (0.6)	3 (0.4)	0.958
Post MI angina/re-ischemia (%)	23 (1.3)	14 (1.3)	9 (1.3)	1.000
Stent thrombosis (definite/probable/possible) (%)	13 (0.7)	4 (0.4)	9 (1.3)	0.058
Free wall rupture (%)	3 (0.2)	1 (0.1)	2 (0.3)	0.717
Tamponade (%)	3 (0.2)	1 (0.1)	2 (0.3)	0.717
VSD (%)	1 (0.1)	0 (0.0)	1 (0.1)	0.834
MR Moderate-severe (%)	20 (1.1)	14 (1.3)	6 (0.8)	0.505
Pericarditis (%)	9 (0.5)	0 (0.0)	9 (1.3)	0.001
Sustained VT (>125 bpm) (%)	19 (1.1)	7 (0.6)	12 (1.7)	0.063
Primary VF (%)	23 (1.3)	4 (0.4)	19 (2.7)	<0.001
Secondary VF (%)	11 (0.6)	2 (0.2)	9 (1.3)	0.011
New AF (%)	66 (3.7)	32 (3.0)	34 (4.8)	0.063
High degree (2-3) AVB (%)	25 (1.4)	10 (0.9)	15 (2.1)	0.060
Asystole (%)	24 (1.3)	6 (0.6)	18 (2.5)	0.001
TIA (%)	2 (0.1)	2 (0.2)	0 (0.0)	0.670
Stroke (%)	9 (0.5)	4 (0.4)	5 (0.7)	0.529
CVA/TIA in hospital (%)	11 (0.6)	6 (0.6)	5 (0.7)	0.937
Acute renal failure (%)	91 (5.1)	48 (4.5)	43 (6.0)	0.164
Sepsis (%)	35 (2.0)	12 (1.1)	23 (3.2)	0.003
Major bleeding (%)	32 (1.8)	14 (1.3)	18 (2.5)	0.082
Any transfusion (%)	25 (1.4)	10 (0.9)	15 (2.1)	0.061
Blood transfusions (%)	22 (1.2)	15 (1.4)	7 (1.0)	0.584
Minor bleeding (%)	29 (1.6)	21 (1.9)	8 (1.1)	0.246

1.11 In-Hospital Medical Treatment

Aspirin, prasugrel, llb/llla antagonists, bivalirudin, ACE-I, aldactone, beta blockers, colchicine, IV inotropic agent and statins were more frequently used in patients with ST elevation. Clopidogrel, ticagrelor, low molecular weight heparin (LMWH), fondaparinux, ARB, CCB, nitrates, and diuretics were more frequently used among patients with non ST elevation. Both groups of patients were equally treated with warfarin, NOACS, heparin (UFH), digoxin, PPI, steroids, and insulin.

Table 1.26: In-Hospital Medical Treatment

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
Anti-platelets				
Aspirin (%)	1742 (97.3)	1045 (96.8)	697 (97.9)	0.239
Clopidogrel (%)	880 (49.1)	651 (60.3)	229 (32.2)	<0.001
Prasugrel (%)	492 (27.5)	132 (12.2)	360 (50.6)	<0.001
Ticagrelor (%)	660 (36.9)	426 (39.5)	234 (32.9)	0.005
P2Y12 (%)	1684 (94.0)	991 (91.8)	693 (97.3)	<0.001
llb/llla antagonists (%)	163 (9.1)	43 (4.0)	120 (16.9)	<0.001
Anticoagulants				
Warfarin (%)	31 (1.7)	16 (1.5)	15 (2.1)	0.420
Dabigatran (%)	11 (0.6)	6 (0.6)	5 (0.7)	0.937
Rivaroxaban (%)	14 (0.8)	12 (1.1)	2 (0.3)	0.093
Apixaban (%)	50 (2.8)	33 (3.1)	17 (2.4)	0.486
LMWH (%)	599 (33.4)	467 (43.3)	132 (18.5)	<0.001
Heparin (UFH) (%)	797 (44.5)	467 (43.3)	330 (46.3)	0.219
Bivalirudin (%)	24 (1.3)	5 (0.5)	19 (2.7)	<0.001
Fondaparinux (%)	16 (0.9)	16 (1.5)	0 (0.0)	0.003
Other				
ACE-I (%)	1113 (62.1)	618 (57.3)	495 (69.5)	<0.001
ARB (%)	289 (16.1)	208 (19.3)	81 (11.4)	<0.001
ACE-I/ARB (%)	1373 (76.7)	806 (74.7)	567 (79.6)	0.018
Aldactone (%)	171 (9.5)	77 (7.1)	94 (13.2)	<0.001
Beta Blockers (%)	1428 (79.7)	845 (78.3)	583 (81.9)	0.075
Digoxin (%)	19 (1.1)	12 (1.1)	7 (1.0)	0.980
CCB (%)	332 (18.5)	251 (23.3)	81 (11.4)	<0.001
Amiodarone (%)	75 (4.2)	37 (3.4)	38 (5.3)	0.064
Other Anti-Arrhythmic (%)	14 (0.8)	9 (0.8)	5 (0.7)	0.971
Nitrates (%)	206 (11.5)	155 (14.4)	51 (7.2)	<0.001
Diuretics (%)	340 (19.0)	224 (20.8)	116 (16.3)	0.022
PPI (%)	872 (48.7)	523 (48.5)	349 (49.0)	0.859
H2 Blockers (%)	50 (2.8)	23 (2.1)	27 (3.8)	0.052
NSAIDS (%)	50 (2.8)	33 (3.1)	17 (2.4)	0.486
Colchicine (%)	17 (0.9)	6 (0.6)	11 (1.5)	0.062
Steroids (%)	42 (2.3)	28 (2.6)	14 (2.0)	0.483
Hormonal replacement therapy (%)	4 (0.2)	2 (0.2)	2 (0.3)	1.000
IV inotropic agent (%)	18 (1.0)	5 (0.5)	13 (1.8)	0.010
Insulin (%)	292 (16.3)	187 (17.3)	105 (14.7)	0.167
Antihyperglycemic (%)	308 (17.2)	202 (18.7)	106 (14.9)	0.041
Statins (%)	1496 (83.5)	867 (80.4)	629 (88.3)	<0.001
Ezetimibe (%)	25 (3.9)	19 (5.0)	6 (2.3)	0.136

1.12 Duration of Hospitalization

Table 1.27: Length of Stay in CCU and Total Hospital Stay

	Total	Non ST elevation	ST elevation
n	1791	1079	712
No. of days in CCU (median [IQR])	3.00 [2.00, 5.00]	3.00 [2.00, 4.00]	3.00 [2.00, 5.00]
Total hospital days (median [IQR])	4.00 [3.00, 5.00]	4.00 [2.00, 6.00]	4.00 [3.00, 5.00]

1.13 Medical Treatment on Discharge

Aspirin, prasugrel, ACE-I, aldactone,, beta blockers, and colchicine were more often prescribed for patients with ST elevation. Clopidogrel, ticagrelor, ARB, CCB, nitrates, diuretics, insulin, and antihyperglycemics were prescribed more often for patients with non-ST elevation. All other recommended drugs were similarly given to both groups.

Table 1.28: Medical Treatment on Discharge among Hospital Survivors

	Total	Non ST elevation	ST elevation	p-value
n	1761	1071	690	
Anti-platelets				
Aspirin (%)	1673 (95.0)	1005 (93.8)	668 (96.8)	0.007
Clopidogrel (%)	551 (31.3)	441 (41.2)	110 (15.9)	<0.001
Prasugrel (%)	489 (27.8)	132 (12.3)	357 (51.7)	<0.001
Ticagrelor (%)	620 (35.2)	412 (38.5)	208 (30.1)	<0.001
P2Y12 (%)	1660 (94.3)	985 (92.0)	675 (97.8)	<0.001
Anticoagulants				
Warfarin (%)	40 (2.3)	20 (1.9)	20 (2.9)	0.210
Dabigatran (%)	16 (0.9)	11 (1.0)	5 (0.7)	0.692
Rivaroxaban (%)	19 (1.1)	16 (1.5)	3 (0.4)	0.062
Apixaban (%)	59 (3.4)	39 (3.6)	20 (2.9)	0.478
LMWH (%)	85 (4.8)	51 (4.8)	34 (4.9)	0.965
Other				
ACE-I (%)	1037 (58.9)	574 (53.6)	463 (67.1)	<0.001
ARB (%)	273 (15.5)	196 (18.3)	77 (11.2)	<0.001
ACE-I/ARB (%)	1305 (74.1)	767 (71.6)	538 (78.0)	0.004
Aldactone (%)	184 (10.4)	91 (8.5)	93 (13.5)	0.001
Beta Blockers (%)	1340 (76.1)	790 (73.8)	550 (79.7)	0.005
Digoxin (%)	19 (1.1)	12 (1.1)	7 (1.0)	1.000
CCB (%)	325 (18.5)	261 (24.4)	64 (9.3)	<0.001
Amiodarone (%)	55 (3.1)	31 (2.9)	24 (3.5)	0.584
Other Anti-Arrhythmic (%)	8 (0.5)	8 (0.7)	0 (0.0)	0.056
Nitrates (%)	77 (4.4)	68 (6.3)	9 (1.3)	<0.001
Diuretics (%)	326 (18.5)	229 (21.4)	97 (14.1)	<0.001
PPI (%)	933 (53.0)	570 (53.2)	363 (52.6)	0.840
H2 Blockers (%)	39 (2.2)	22 (2.1)	17 (2.5)	0.686
NSAIDS (%)	55 (3.1)	41 (3.8)	14 (2.0)	0.048
Colchicine (%)	17 (1.0)	6 (0.6)	11 (1.6)	0.055
Steroids (%)	34 (1.9)	24 (2.2)	10 (1.4)	0.317
Hormonal replacement therapy (%)	6 (0.3)	4 (0.4)	2 (0.3)	1.000
Insulin (%)	282 (16.0)	200 (18.7)	82 (11.9)	<0.001
Antihyperglycemic (%)	460 (26.1)	315 (29.4)	145 (21.0)	<0.001
Statins (%)	1643 (93.3)	991 (92.5)	652 (94.5)	0.131
Ezetimibe (%)	40 (6.4)	31 (8.2)	9 (3.6)	0.030

1.14 Re-Hospitalization within 30 Days of Admission

Re-hospitalization rates for patients with and without ST elevation were similar. Differences in reasons for re-hospitalization were not statistically significant.

Table 1.29: Re-Hospitalization within 30 Days of Admission

	Total	Non ST elevation	ST elevation	p-value
All patients[1]				
n	1761	1071	690	
Re-hospitalization (%)	238 (14.6)	140 (13.9)	98 (15.6)	0.408
Re-hospitalized patients only[2]				
n	238	140	98	
Scheduled (%)	67 (32.4)	38 (31.4)	29 (33.7)	0.841
Cardiac (%)	134 (65.4)	81 (66.9)	53 (63.1)	0.674

[1] Re-hospitalization among hospital survivors

[2] Patients who were re-hospitalized after more than 30 days of admission were excluded from re-hospitalized within 30 days of admission

1.15 Mortality and Major Adverse Coronary Event (MACE)

1.15.1 Rates of Mortality and MACE by ECG on Admission

Unadjusted rates of in-hospital mortality, 7-days mortality and 30-day mortality were higher in patients with ST elevation compared to those with non-ST elevation. However, MACE (Major Adverse Cardiac Events), which included recurrent MI or UAP, recurrent ischemia, stent thrombosis, ischemic stroke, urgent revascularization (follow-up) or death occurring within 30 days from hospitalization) was not significantly different for patients with and without ST elevation.

Table 1.30: Unadjusted Rates of 7-Day, 30-Day mortality, 30-Day MACE[1] and 1 year mortality

	Total	Non ST elevation	ST elevation	p-value
n	1791	1079	712	
In-hospital mortality (%)	30 (1.7)	8 (0.7)	22 (3.1)	<0.001
7-days mortality (%)	28 (1.6)	5 (0.5)	23 (3.3)	<0.001
30-days mortality (%)	54 (3.0)	18 (1.7)	36 (5.1)	<0.001
MACE[1] (%)	221 (12.4)	119 (11.1)	102 (14.5)	0.041
1 year mortality (%)	137 (7.8)	81 (7.6)	56 (8.0)	0.812

[1] Definition of MACE includes: recurrent MI, recurrent ischemia, stent thrombosis, ischemic stroke, urgent revascularization (follow-up) or death occurring within 30 days from hospitalization

Figure 1.22: Unadjusted Rates of In–Hospital, 7–Days & 30–Days Mortality, 30–Days MACE and 1 year mortality
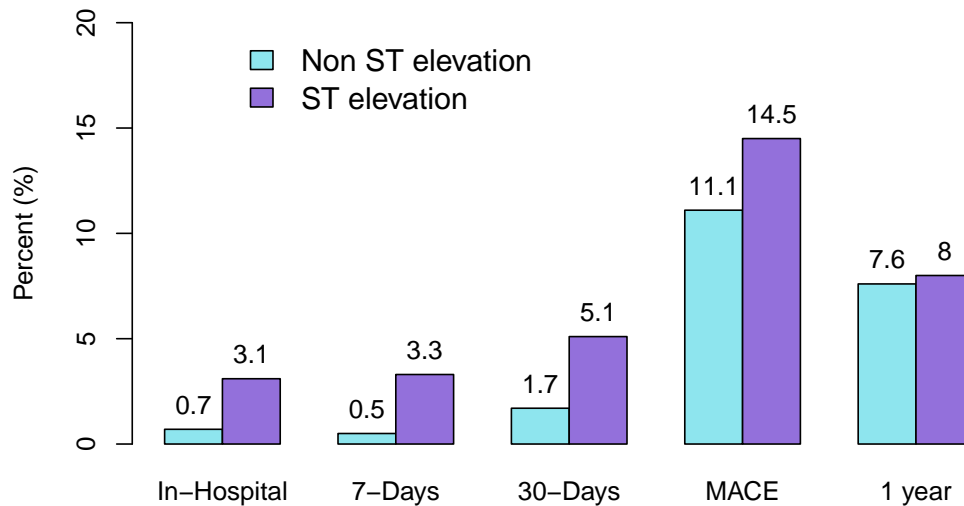
After adjustment for age and other risk factors, in-hospital, 7-day, and 30-day mortality rates were significantly higher for patients with ST elevation compared to those with non-ST elevation. Rates of MACE were 26% higher for patients with ST elevation than those with non-ST elevation, however this did not reach statistical significance.

Table 1.31: Mortality Rates by ECG on Admission Adjusted for Age and Other Risk Factors

	OR[1] (95% CI)	OR[2] (95% CI)
In-Hospital	5.3 (2.42,12.84)	4.76 (1.96,12.6)
7-Days	9.08 (3.69,27.31)	7.86 (2.88,25.86)
30-Days	3.99 (2.25,7.31)	3.88 (2.03,7.71)
MACE[3]	1.47 (1.1,1.96)	1.42 (1.05,1.93)
1 year mortality	1.35 (0.93,1.97)	1.4 (0.91,2.14)

[1] Age adjusted

[2] Adjusted for age, gender, past ACS, diabetes, hypertension, killip class $\geq$ 2, any angiography

[3] Definition includes: recurrent MI, recurrent ischemia, stent thrombosis, ischemic stroke, urgent revascularization (follow-up) or death occurring within 30 days from hospitalization

1.15.2 Rates of Mortality and MACE by Gender

Table 1.32: Unadjusted Rates of In-Hospital Mortality, 7-Day Mortality, 30-Day Mortality, 30-Days MACE and 1 year mortality, by Gender

	Total	Women	Men	p-value
n	1791	377	1414	
In-hospital mortality (%)	30 (1.7)	12 (3.2)	18 (1.3)	0.019
7-days mortality (%)	28 (1.6)	11 (2.9)	17 (1.2)	0.032
30-days mortality (%)	54 (3.0)	23 (6.1)	31 (2.2)	<0.001
MACE[1] (%)	221 (12.4)	56 (14.9)	165 (11.8)	0.122
1 year mortality (%)	137 (7.8)	43 (11.6)	94 (6.8)	0.003

[1] Definition includes: recurrent MI, recurrent ischemia, stent thrombosis, ischemic stroke, urgent revascularization (follow-up) or death occurring within 30 days from hospitalization

Table 1.33: Odds Ratios for Mortality and MACE by Gender Adjusted for Age and Other Risk Factors

	OR (Women vs. Men) with 95% CI	
	Age Adjusted	Risk factors Adjusted[1]
In-Hospital mortality	1.61 (0.72,3.45)	1.54 (0.63,3.66)
7-Days mortality	1.49 (0.65,3.29)	1.36 (0.54,3.31)
30-Days mortality	1.85 (1.03,3.29)	1.78 (0.92,3.4)
MACE[2]	1.15 (0.81,1.6)	1.11 (0.77,1.57)
1 year mortality	1 (0.66,1.5)	1.03 (0.65,1.62)

[1] Adjusted for age, past ACS, diabetes, hypertension, killip class $\geq$ 2, any angiography

[2] Definition includes: recurrent MI, recurrent ischemia, stent thrombosis, ischemic stroke, urgent revascularization (follow-up) or death occurring within 30 days from hospitalization.

Chapter 2: Temporal Trends 2000-2016

Temporal Trends in Characteristics,

Management, and Outcome of Patients with ACS

in Cardiology: 2000-2016

2.1 Patients' Characteristics

Table 2.1: Patients' Characteristics

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
n	1793	2048	2094	2075	1746	1779	1885	1791	
Gender (Male) (%)	75.1	76.2	74.0	77.4	79.4	77.5	77.1	79.0	<0.001
Age (%)									<0.001
≤ 50	17.5	16.2	16.6	17.4	17.0	15.3	15.8	13.7	
50-75	60.1	62.0	60.2	62.1	63.6	65.1	63.4	64.9	
> 75	22.5	21.8	23.3	20.5	19.4	19.6	20.8	21.3	
Age (mean (sd))	13.18	13.03	13.33	13.05	13.18	12.67	12.91	12.82	0.264

2.2 Cardiovascular History and Risk Factors

Table 2.2: Cardiovascular History and Risk Factors

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
n	1793	2048	2094	2075	1746	1779	1885	1791	
CV history									
MI (%)	29.6	27.2	27.7	30.2	30.9	32.0	30.4	37.2	<0.001
AP (%)	40.3	36.6	29.8	42.7	39.0	34.4	28.9	28.1	<0.001
Prior PCI (%)	18.7	19.1	21.0	28.0	34.0	33.8	34.2	33.4	<0.001
CABG (%)	8.8	10.1	11.1	11.3	9.8	10.0	9.1	8.8	0.251
CHF (%)	8.1	7.1	7.4	8.7	8.4	8.5	7.9	6.7	0.771
CVA/TIA (%)	7.2	8.6	8.1	8.8	6.9	8.2	8.4	8.2	0.712
Chronic renal failure (%)	8.2	8.4	9.6	12.8	12.4	12.0	12.6	11.4	<0.001
PVD (%)	10.3	9.7	7.0	10.4	8.2	8.2	7.1	6.0	<0.001
Risk factors									
Hypertension (%)	48.0	50.4	56.6	60.0	59.2	66.0	66.1	64.7	<0.001
Diabetes (%)	32.2	31.9	32.4	33.4	37.1	38.0	39.1	41.5	<0.001
Dyslipidemia (%)	52.0	54.3	49.4	65.8	74.5	75.3	75.9	72.7	<0.001
Current smoker (%)	35.3	33.3	34.2	38.1	38.9	38.4	39.3	38.5	<0.001
Past smoker (%)	19.3	15.1	12.9	24.1	20.9	24.7	20.6	21.1	<0.001
Family Hx of CAD (%)	21.2	18.5	18.6	26.9	27.0	31.2	28.8	33.4	<0.001

2.3 Admission Information

2.3.1 First Ward of Hospitalization

Table 2.3: First Ward of Hospitalization

	2000	2002	2004	2006	2008	2010	2013	2016
n	1793	2048	2094	2075	1746	1779	1885	1791
Ward (%)								
Cardiology/CCU	83.4	80.6	81.3	80.0	89.2	89.0	84.8	86.8
Internal Medicine	15.5	17.2	16.4	18.4	10.2	9.4	13.5	12.3
Other	1.1	2.2	2.3	1.6	0.6	1.5	1.8	0.9

p for trend <0.001

2.3.2 ECG on Admission

Table 2.4: ECG on Admission

	2000	2002	2004	2006	2008	2010	2013	2016
n	1793	2048	2094	2075	1746	1779	1885	1791
ST elevation	56.1	49.4	48.9	43.2	43.6	43.6	39.7	39.8
Non ST elevation	43.9	50.6	51.1	56.8	56.4	56.4	60.3	60.2

p for trend <0.001

2.3.3 Killip Class on Admission

Table 2.5: Killip Class on Admission

	2000	2002	2004	2006	2008	2010	2013	2016
n	1793	2048	2094	2075	1746	1779	1885	1791
Killip class (%)								
1	81.6	79.0	77.9	82.4	87.6	87.2	87.6	90.5
2	10.4	11.9	13.8	10.5	7.5	6.7	7.1	5.6
3	5.5	7.3	7.0	5.7	3.9	4.3	3.3	2.5
4	2.5	1.8	1.2	1.5	1.0	1.8	1.9	1.4

p for trend <0.001

2.4 Primary Reperfusion Therapy in Patients with ST Elevation

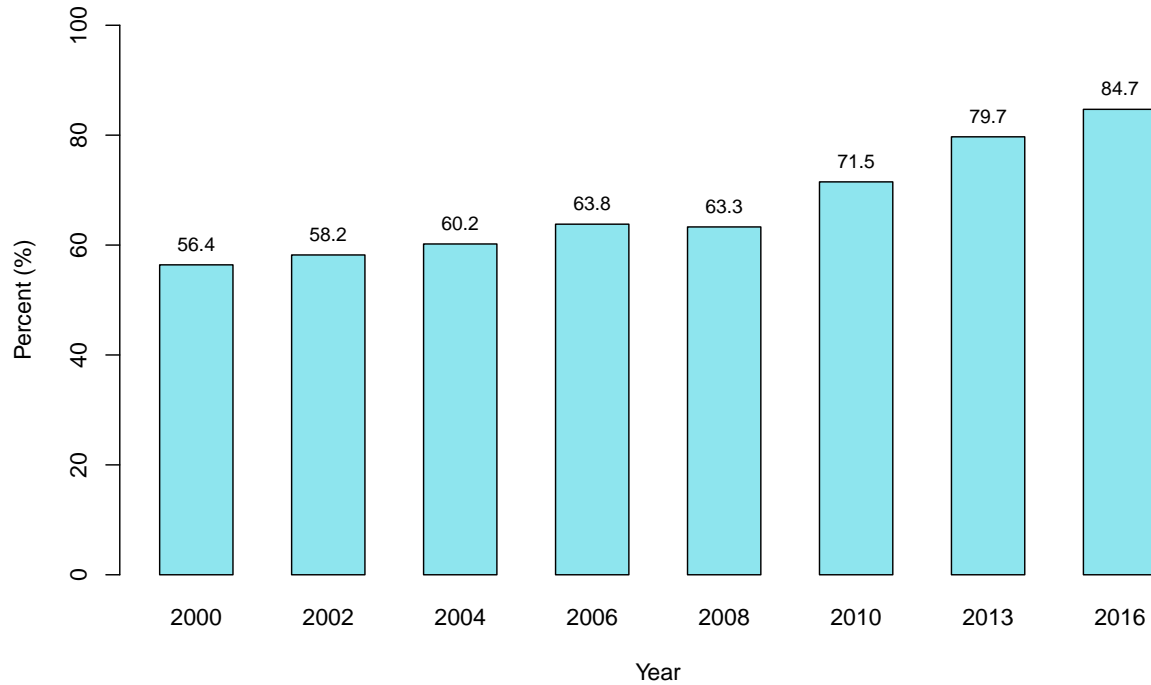Figure 2.1: Primary Reperfusion among Patients with ST Elevation

Figure 2.2: Type or Primary Reperfusion among Patients with ST Elevation
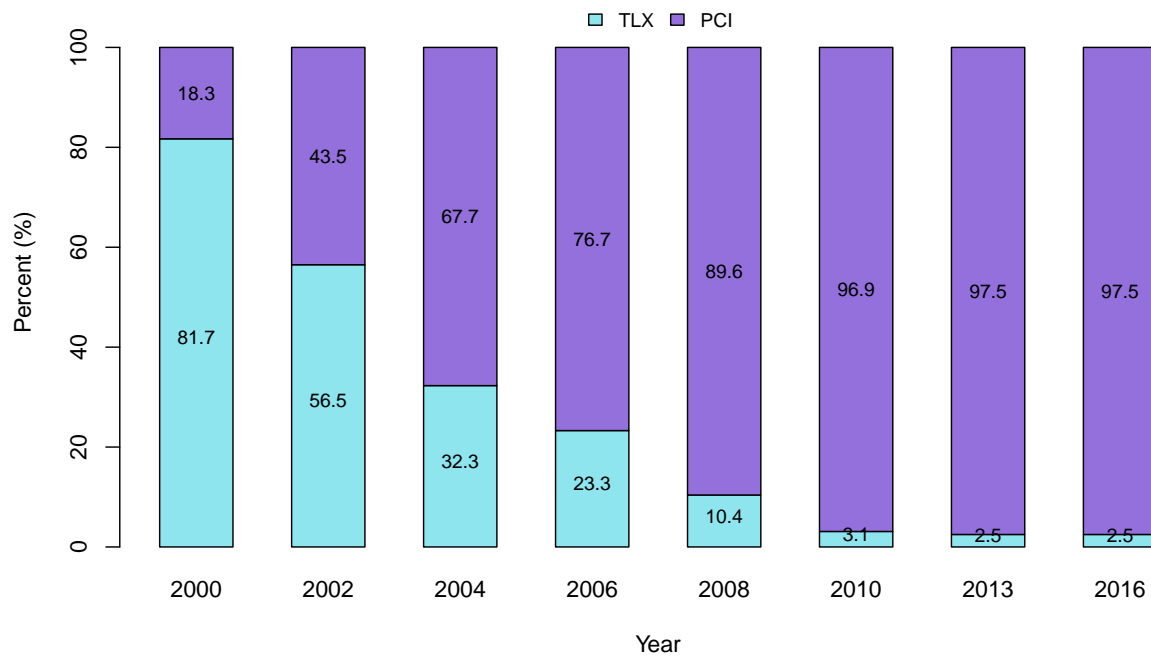
2.5 Time Intervals

Table 2.6: Time Intervals in reperfused patients (minutes)

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
n	567	588	617	571	482	555	596	603	
Symptom onset to ER arrival (median [IQR])	105.00 [60.00, 191.00]	107.00 [65.00, 190.50]	118.50 [74.00, 210.00]	118.00 [71.00, 230.25]	114.00 [70.00, 210.00]	115.00 [70.00, 211.50]	129.50 [74.00, 250.25]	116.00 [70.00, 194.00]	0.139
ER arrival to primary PCI (door to balloon) (median [IQR])	75.00 [37.75, 120.00]	86.00 [50.75, 146.75]	70.00 [40.00, 112.25]	70.00 [40.75, 109.00]	67.00 [39.00, 108.00]	65.00 [38.00, 110.00]	67.00 [35.00, 105.00]	50.00 [26.00, 85.00]	<0.001
ER arrival to TLx (median [IQR])	59.00 [36.00, 84.75]	52.50 [35.00, 72.00]	51.00 [34.00, 75.00]	51.00 [32.50, 74.00]	35.00 [21.00, 50.00]	50.00 [32.00, 68.50]	31.50 [20.00, 50.50]	34.50 [27.25, 66.00]	0.001
Onset to balloon (median [IQR])	165.00 [120.00, 240.00]	180.00 [120.00, 295.00]	180.00 [135.00, 300.00]	190.00 [130.00, 330.00]	194.50 [127.50, 310.00]	195.00 [131.00, 330.00]	200.00 [137.50, 350.00]	169.00 [120.00, 284.25]	0.001
Door to balloon ≤ 90 min. (%)	46 (62.2)	106 (52.0)	241 (65.1)	261 (65.9)	272 (67.3)	334 (66.7)	352 (69.7)	413 (77.9)	<0.001

Table 2.7: Time Intervals (minutes) in reperfused patient, by gender

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
Men									
n	454	476	487	472	401	455	499	493	
Symptom onset to ER arrival (median [IQR])	100.00 [60.00, 187.00]	105.00 [64.00, 184.00]	118.00 [70.00, 210.00]	114.50 [69.25, 213.75]	111.00 [69.50, 205.50]	110.00 [67.00, 210.00]	126.00 [71.00, 240.00]	110.00 [65.25, 191.00]	0.234
ER arrival to primary PCI (door to balloon) (median [IQR])	85.00 [51.00, 120.00]	82.00 [49.00, 137.00]	70.50 [40.00, 110.00]	69.00 [42.50, 105.00]	65.50 [38.25, 102.50]	64.00 [36.25, 103.00]	67.00 [37.00, 105.25]	50.00 [25.00, 85.00]	<0.001
ER arrival to TLx (median [IQR])	59.00 [36.00, 80.00]	52.00 [35.00, 71.00]	49.00 [32.00, 70.50]	49.50 [32.00, 72.25]	37.00 [20.75, 50.50]	55.00 [40.00, 72.00]	30.00 [20.00, 46.00]	34.50 [27.25, 66.00]	0.009
Onset to balloon (median [IQR])	160.00 [115.00, 220.00]	180.00 [120.00, 285.00]	180.00 [130.00, 295.00]	188.50 [130.00, 300.00]	182.50 [125.75, 300.00]	188.00 [125.00, 324.50]	195.00 [132.75, 345.00]	165.00 [116.00, 270.00]	0.006
Women									
n	113	112	130	99	81	100	97	110	
Symptom onset to ER arrival (median [IQR])	127.50 [82.00, 205.00]	117.00 [86.25, 215.50]	120.00 [80.00, 230.00]	141.00 [79.25, 291.00]	121.00 [75.00, 265.00]	130.00 [86.50, 233.50]	147.00 [85.00, 330.00]	124.00 [93.25, 227.75]	0.189
ER arrival to primary PCI (door to balloon) (median [IQR])	54.00 [28.00, 82.00]	113.50 [69.25, 159.25]	69.00 [40.00, 116.25]	78.00 [40.00, 128.00]	72.00 [40.25, 130.00]	78.00 [40.00, 132.00]	63.00 [33.00, 103.00]	58.50 [30.00, 94.00]	0.029
ER arrival to TLx (median [IQR])	61.00 [37.00, 91.00]	53.00 [39.00, 80.00]	64.00 [40.00, 88.00]	61.00 [36.25, 103.50]	30.00 [25.00, 41.00]	23.00 [19.00, 27.00]	70.00 [70.00, 70.00]	NA [NA, NA]	0.137
Onset to balloon (median [IQR])	180.00 [145.00, 252.50]	210.00 [130.00, 311.50]	190.50 [151.25, 307.50]	255.00 [137.50, 442.50]	210.00 [133.75, 385.00]	249.50 [155.00, 356.75]	212.00 [150.00, 397.00]	188.00 [144.00, 385.00]	0.008

2.6 Procedures during Hospitalization in CCU

Table 2.8 Procedures during Hospitalization in CCU

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
n	1793	2048	2094	2075	1746	1779	1885	1791	
Coronary Angiography (%)	58.4	68.8	75.5	81.2	87.3	89.7	88.9	93.3	<0.001
Any PCI [1] (%)	64.3	71.1	75.2	77.0	78.5	79.5	77.9	77.2	<0.001
Stent (%)	73.7	81.4	86.4	92.5	90.9	90.8	91.9	94.0	<0.001
CABG (%)	6.7	7.1	6.2	3.8	3.9	1.7	4.7	3.5	<0.001
IABP (%)	4.8	4.4	3.5	4.8	4.8	4.6	2.3	2.2	<0.001
Echocardiography (%)	75.8	79.8	88.0	87.2	86.5	85.9	85.2	85.7	<0.001

[1] Percent of all patients undergoing angiography

Figure 2.3: Trends In–Hospital Procedures
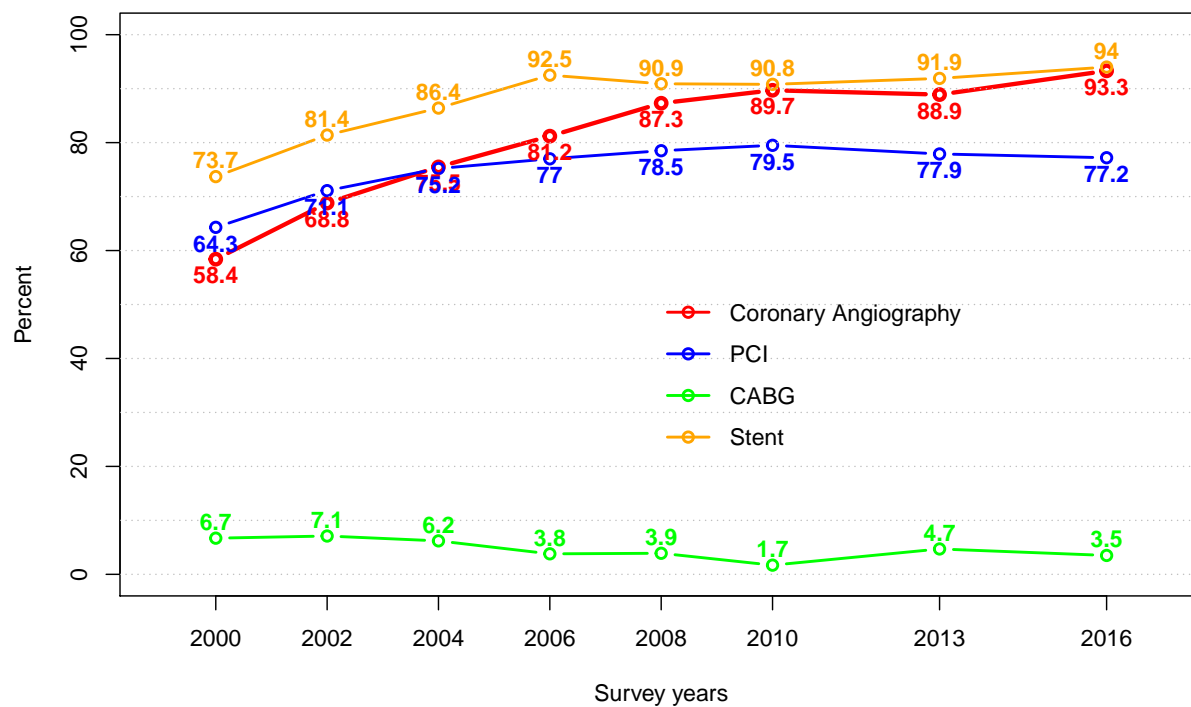
2.7 In-Hospital Complications

Table 2.9: In-Hospital Complications

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
n	1793	2048	2094	2075	1746	1779	1885	1791	
Re-MI (%)	2.5	1.9	1.0	1.8	1.5	1.1	1.0	0.5	<0.001
Post MI angina/Re-ischemia (%)	13.7	6.7	5.5	6.2	3.6	2.0	2.0	1.3	<0.001
Sub-Acute Stent Thrombosis (%)	NaN	NaN	NaN	0.7	1.3	0.6	0.8	0.7	0.588
Mild-moderate CHF (Killip 2) (%)	18.4	10.4	6.8	12.5	7.5	7.8	6.1	5.9	<0.001
Pulmonary edema (Killip 3) (%)	10.7	8.9	7.3	9.2	6.6	4.9	4.4	3.1	<0.001
Cardiogenic shock (Killip 4) (%)	5.3	3.8	3.2	4.2	2.7	3.1	3.3	2.0	<0.001
Free wall rupture (%)	0.8	0.4	0.6	0.2	0.6	0.1	0.1	0.2	<0.001
Tamponade (%)	0.6	0.1	0.3	0.2	0.5	0.3	0.0	0.2	0.027
Moderate-severe MR (%)	3.7	2.3	0.7	3.2	1.6	1.7	2.1	1.1	<0.001
Sustained VT (%)	2.5	1.1	1.4	2.4	1.0	1.3	1.3	1.1	0.005
High degree AVB (2-3) (%)	4.2	3.0	2.1	2.5	2.2	2.1	1.5	1.4	<0.001
Primary VF (%)	3.6	2.4	1.2	2.5	1.2	1.9	1.2	1.3	<0.001
Secondary VF (%)	1.2	0.4	0.5	1.1	1.3	0.6	0.5	0.6	0.315
Asystole (%)	4.0	2.0	1.7	2.6	2.1	1.9	1.9	1.3	<0.001
TIA (%)	0.3	0.1	0.1	0.4	0.2	0.1	0.2	0.1	0.486
Stroke (%)	0.9	0.8	0.7	0.6	0.6	0.5	0.6	0.5	0.109
Acute renal failure (%)	7.9	8.6	6.8	5.4	4.4	6.1	4.6	5.1	<0.001
Bleeding (%)	1.2	1.0	0.5	1.1	1.5	2.4	0.9	1.8	0.003

2.8 In-Hospital Treatment

Table 2.10: In-Hospital Treatment

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
n	1793	2048	2094	2075	1746	1779	1885	1791	
Aspirin (%)	96.9	96.3	96.8	97.7	97.9	98.2	97.8	97.3	0.002
Heparin (%)	76.5	45.2	41.1	42.9	36.8	43.2	53.3	44.7	<0.001
LMWH (%)	26.1	47.6	61.6	58.5	50.0	45.9	41.9	33.5	0.002
P2Y12 inhibitors (%)	17.5	48.9	76.0	83.3	88.8	94.7	95.4	94.1	<0.001
IIb/IIIa antagonists (%)	19.1	12.6	20.4	30.9	31.2	24.6	13.6	9.1	<0.001
Beta Blockers (%)	77.7	80.5	84.6	85.5	85.3	86.1	82.3	79.7	0.023
ACE-I/ARB (%)	62.2	72.3	75.7	79.8	78.6	83.2	80.2	76.7	<0.001
Statins (%)	37.2	58.8	75.4	92.9	93.6	97.0	93.0	95.0	<0.001
LLDs (%)	39.1	59.3	76.0	93.5	94.7	97.1	93.1	100.0	<0.001
Digoxin (%)	3.3	2.3	3.4	2.7	2.2	1.4	1.1	1.3	<0.001
Diuretic (%)	28.2	24.9	30.2	29.9	29.0	27.3	24.8	22.6	0.001
Nitrates (%)	76.7	60.0	25.4	NaN	27.6	23.7	16.6	13.9	<0.001

Figure 2.4: Trends in Hospital Treatment
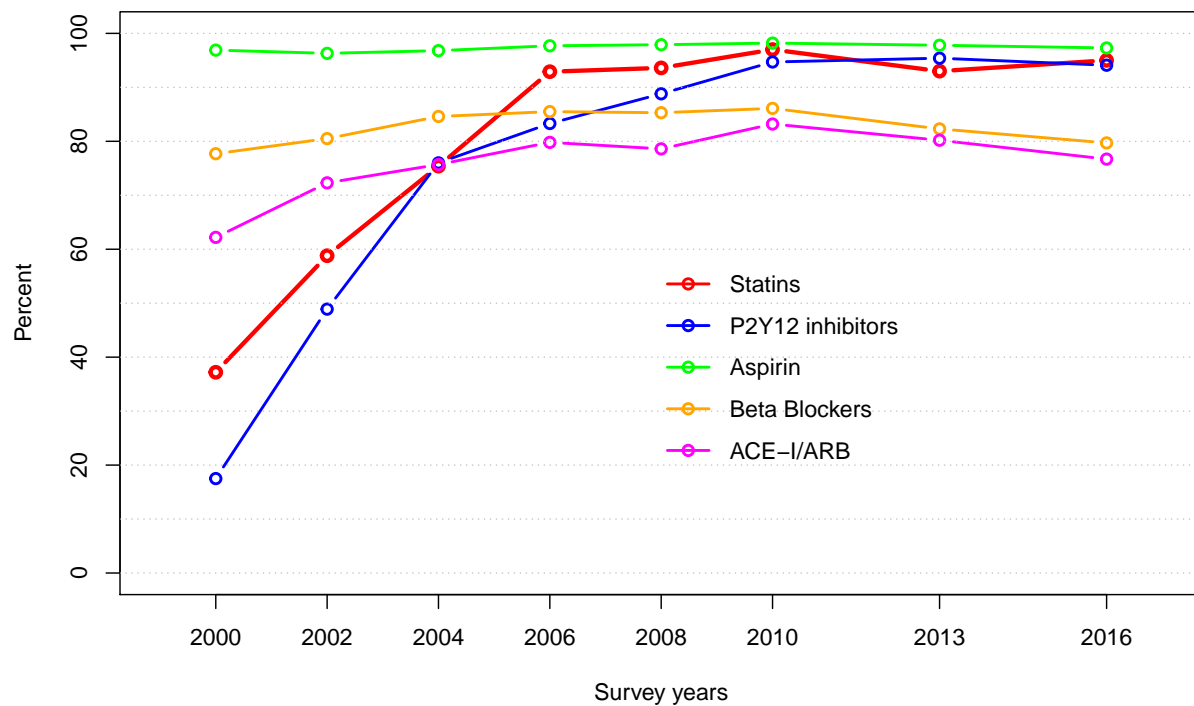
2.9 Medical Treatment on Discharge

Table 2.11: Medical Treatment on Discharge among Hospital Survivors

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
n	1698	1976	2025	2016	1702	1741	1848	1761	
Aspirin (%)	94.3	92.7	94.3	96.9	96.2	96.9	95.8	95.7	<0.001
Beta Blockers (%)	75.0	76.9	81.6	83.1	82.0	82.2	78.7	82.7	<0.001
P2Y12 inhibitors (%)	32.6	53.0	64.2	76.3	79.8	86.4	85.7	94.3	<0.001
ACE-I/ARB (%)	58.5	69.2	73.0	76.5	75.0	80.5	76.8	74.1	<0.001
Statins (%)	54.0	68.4	81.2	93.9	92.6	96.2	93.6	97.9	<0.001
LLDs (%)	55.9	69.0	81.7	94.5	93.7	96.4	93.8	100.0	<0.001
Digoxin (%)	3.5	2.3	2.5	2.1	1.5	1.0	0.9	1.3	<0.001
Diuretic (%)	23.0	21.3	23.2	23.0	23.9	22.5	19.6	22.4	0.264
Nitrates (%)	45.8	31.2	19.6	NaN	8.6	6.7	7.6	5.4	<0.001

Figure 2.5: Medical Treatment in Discharge among Hospital Survivors
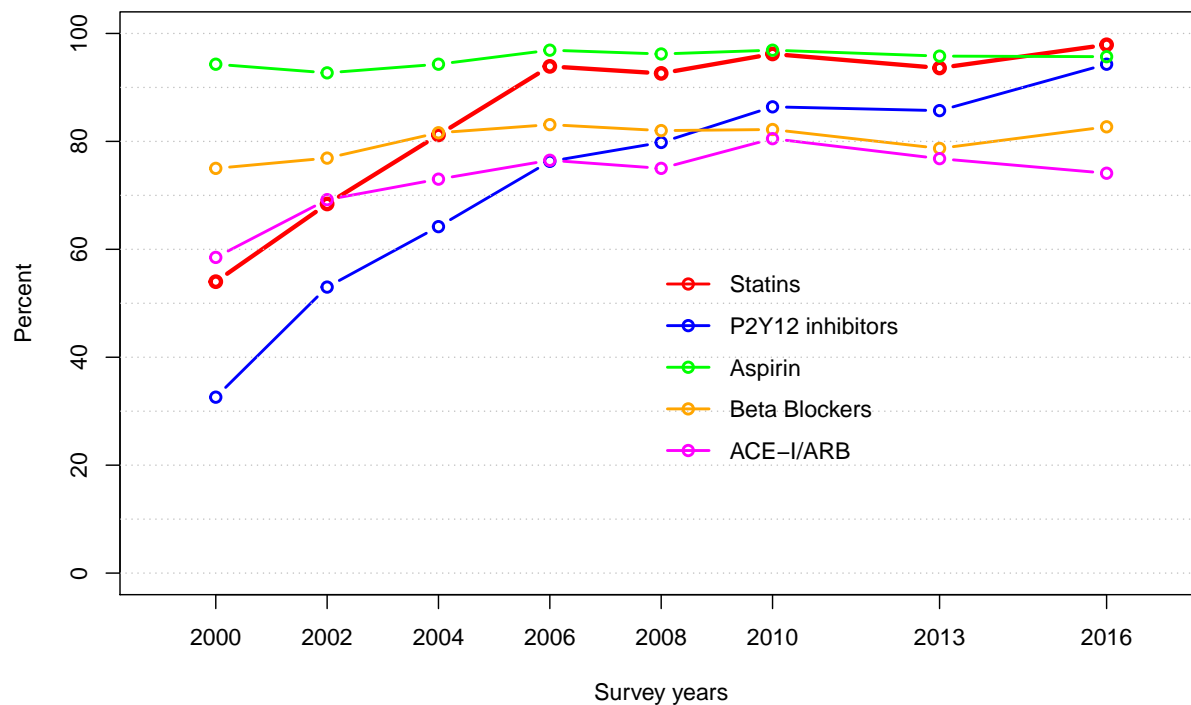
2.10 Short and long Term Outcomes

Table 2.12: Rates of Mortality and MACE[1]

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
n	1793	2048	2094	2075	1746	1779	1885	1791	
Mortality									
On discharge (%)	5.2	3.5	3.2	2.8	2.5	2.1	2.0	1.7	<0.001
7-day	5.2	3.3	3.1	2.9	2.6	2.2	1.8	1.6	<0.001
30-day	8.6	5.5	5.5	4.6	4.4	4.2	3.7	3.0	<0.001
1 year	13.5	11.0	11.2	9.8	8.1	8.1	8.3	7.8	<0.001
MACE[1]									
30-day	26.5	18.6	14.6	16.4	12.5	10.3	10.4	8.9	<0.001

[1] 30 day MACE: Death/UAP/MI-isch/CVA/St.thromb/Follow-up urg. revasc

Table 2.13: Rates of Mortality and MACE[1] by Gender

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
Men									
n	1346	1560	1549	1606	1387	1378	1453	1414	
Mortality									
On discharge (%)	3.9	2.6	2.8	2.6	1.9	2.0	1.5	1.3	<0.001
7-day	3.9	2.6	2.7	2.4	2.1	1.9	1.3	1.2	<0.001
30-day	7.1	4.6	4.6	4.0	3.5	3.6	2.7	2.2	<0.001
1 year	11.8	9.5	9.3	8.4	7.4	6.9	6.9	6.8	<0.001
MACE[1]									
30-day	23.8	17.8	12.8	14.9	10.7	9.2	9.3	7.9	<0.001
Women									
n	447	488	545	469	359	401	432	377	
Mortality									
On discharge (%)	9.4	6.4	4.6	3.6	5.0	2.5	3.5	3.2	<0.001
7-day	9.2	5.3	4.2	4.5	4.5	3.2	3.3	2.9	<0.001
30-day	13.0	8.2	7.9	6.9	7.8	6.2	7.0	6.1	0.001
1 year	18.6	15.6	16.6	14.6	10.9	12.3	12.9	11.6	<0.001
MACE[1]									
30-day	34.7	21.1	19.4	21.7	19.5	14.2	14.1	12.7	<0.001

[1] 30 day MACE: Death/UAP/MI-isch/CVA/St.thromb/Follow-up urg. revasc

Table 2.14: Rates of Mortality and MACE[1] by ECG on Admission

	2000	2002	2004	2006	2008	2010	2013	2016	p for trend
ST elevation									
n	1006	1011	1025	895	761	776	748	712	
Mortality									
On discharge (%)	7.4	4.8	4.3	4.1	3.7	2.7	2.9	3.1	<0.001
7-day	7.3	4.6	4.3	4.0	4.1	2.7	3.1	3.3	<0.001
30-day	11.1	7.0	6.7	5.8	6.0	4.8	4.6	5.1	<0.001
1 year	15.7	10.9	10.7	10.2	8.1	8.3	8.8	8.0	<0.001
MACE[1]									
30-day	28.0	19.5	14.2	17.0	13.7	10.4	11.2	10.5	<0.001
Non ST elevation									
n	786	1034	1069	1179	985	1003	1137	1079	
Mortality									
On discharge (%)	2.5	2.2	2.2	1.9	1.6	1.7	1.3	0.7	<0.001
7-day	2.5	2.0	2.0	2.0	1.4	1.8	0.9	0.5	<0.001
30-day	5.4	4.0	4.2	3.7	3.2	3.8	3.1	1.7	<0.001
1 year	10.7	11.0	11.8	9.6	8.1	7.9	8.0	7.6	<0.001
MACE[1]									
30-day	24.7	17.7	14.9	16.0	11.7	10.3	9.9	7.8	<0.001

[1] 30 day MACE: Death/UAP/MI-isch/CVA/St.thromb/Follow-up urg. revasc