

Chapter 3: Acute Coronary Syndrome by Sex

3.1 Sex Distribution and Mean Age

Of the 1,763 patients in the ACSIS 2008 study population, 79.4% (1,399) were men and 20.6% (364) were women. Male patients with ACS were, on average, 9.2 years younger than female patients (mean ages: 61.4 and 70.6, respectively).

Table 3.1: Sex Distribution and Mean Age

Sex	N	%	Mean age \pm SD
Men	1,399	79.4	61.4 \pm 12.7
Women	364	20.6	70.6 \pm 12.8
Total	1,763	100.0	63.3 \pm 13.2

3.2 Age Distribution in Men and Women

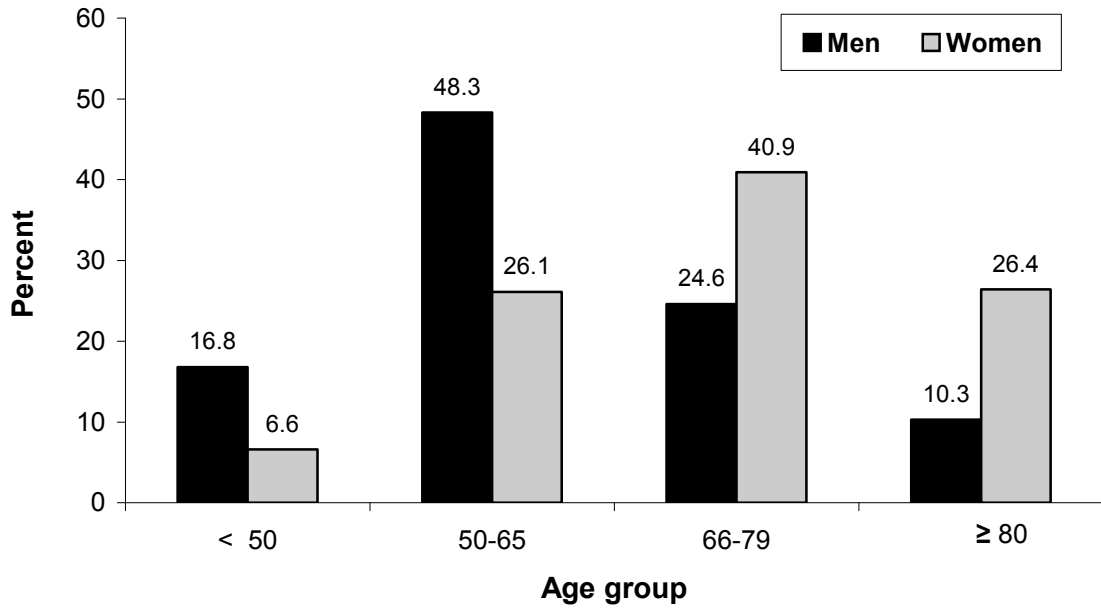
The age distribution of male patients was significantly different from that of female patients. The majority of men (65.1%) were in the younger age groups (≤ 65) and only 10.3% were aged 80 or above. 16.8% of men were less than 50 years old. By contrast, the majority of women (67.3%) were in the older age groups (>65), and 26.4% were aged 80 or above. Only 6.6% of women were under age 50.

Table 3.2: Age Distribution

Age group* (years)	Men		Women		Total	
	n	%	n	%	N	%
< 50	235	16.8	24	6.6	259	14.7
50-65	676	48.3	95	26.1	771	43.7
66-79	344	24.6	149	40.9	493	28.0
≥ 80	144	10.3	96	26.4	240	13.6
Total	1,399	100.0	364	100.0	1763	100.0

* $p < 0.05$

Figure 3.1: Age Distribution



3.3 Cardiovascular History and Risk Factors

3.3.1 Cardiovascular History

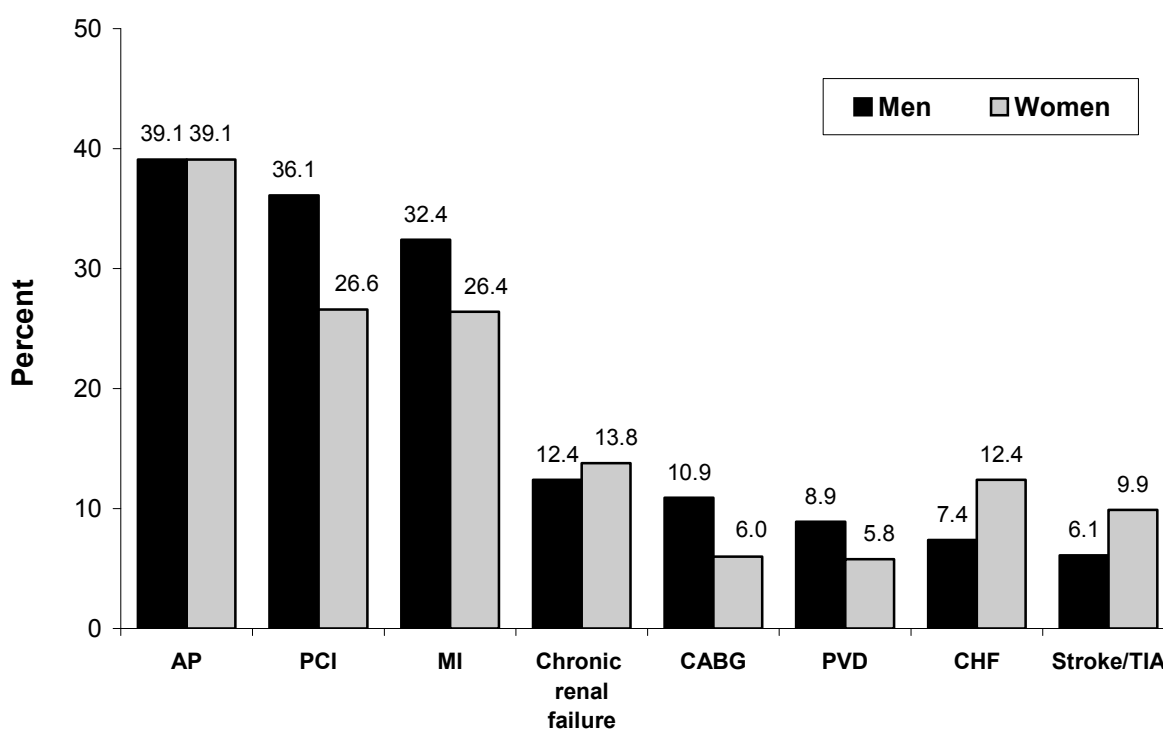
Almost one-third of male patients (32.4%) and over one quarter of female patients (26.4%) had a history of prior MI, and 39.1% of both male and female patients had a history of angina pectoris. Men were more likely than women to have undergone PCI or CABG. Women were more likely than men to have a history of stroke or TIA, and a history of heart failure than men.

Table 3.3: Cardiovascular History

CV history	Men (N=1,399) %	Women (N=364) %
MI*	32.4	26.4
AP	39.1	39.1
Stroke/TIA*	6.1	9.9
CHF*	7.4	12.4
PCI*	36.1	26.6
CABG*	10.9	6.0
Chronic renal failure (CRF)	12.4	13.8
PVD	8.9	5.8

*p<0.05

Figure 3.2: Cardiovascular History



3.3.2. Risk Factors

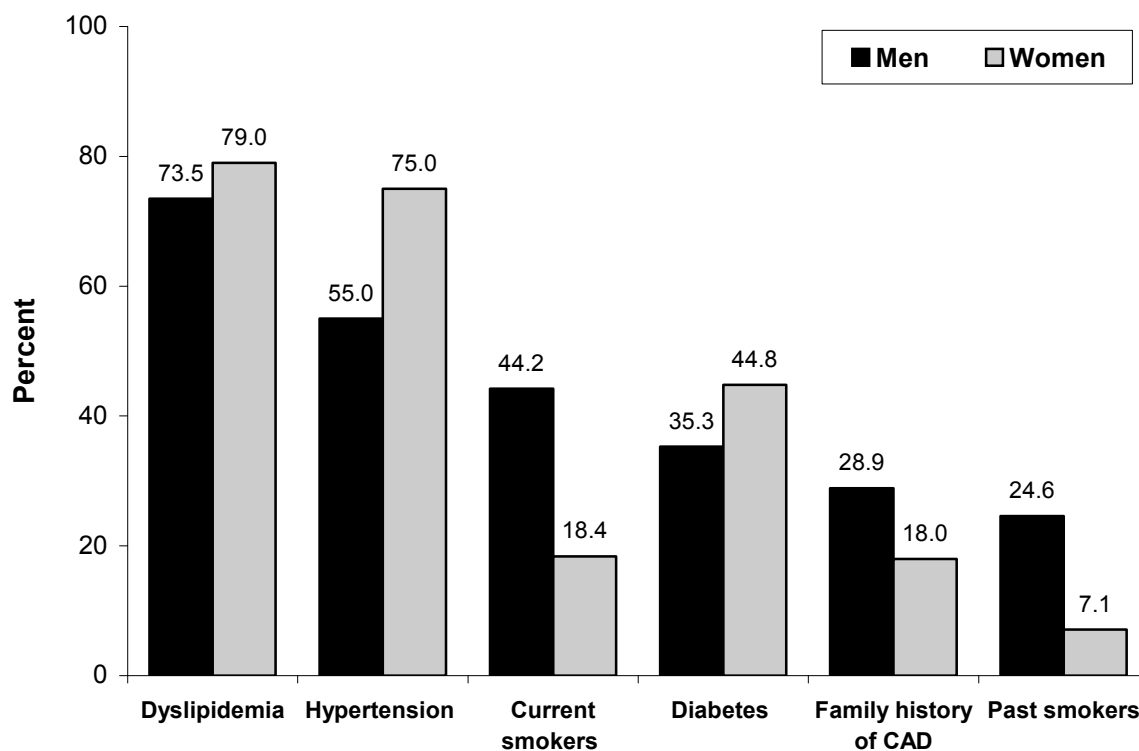
Dyslipidemia was the most prevalent risk factor in both men and women (73.5% of men and 79% of women). Hypertension and diabetes were found to be more prevalent in women, while family history of CAD, past and current smoking were more prevalent among men (Figure 3.3). The proportions of newly diagnosed dyslipidemia, hypertension and diabetes were higher in men with these risk factors than in women (Figure 3.4).

Table 3.4: Risk Factors

Risk factors	Men (N=1,399) %	Women (N=364) %
Dyslipidemia	73.5	79.0
Hypertension*	55.0	75.0
Diabetes*	35.3	44.8
Current smokers*	44.2	18.4
Past smokers*	24.6	7.1
Family history of CAD*	28.9	18.0

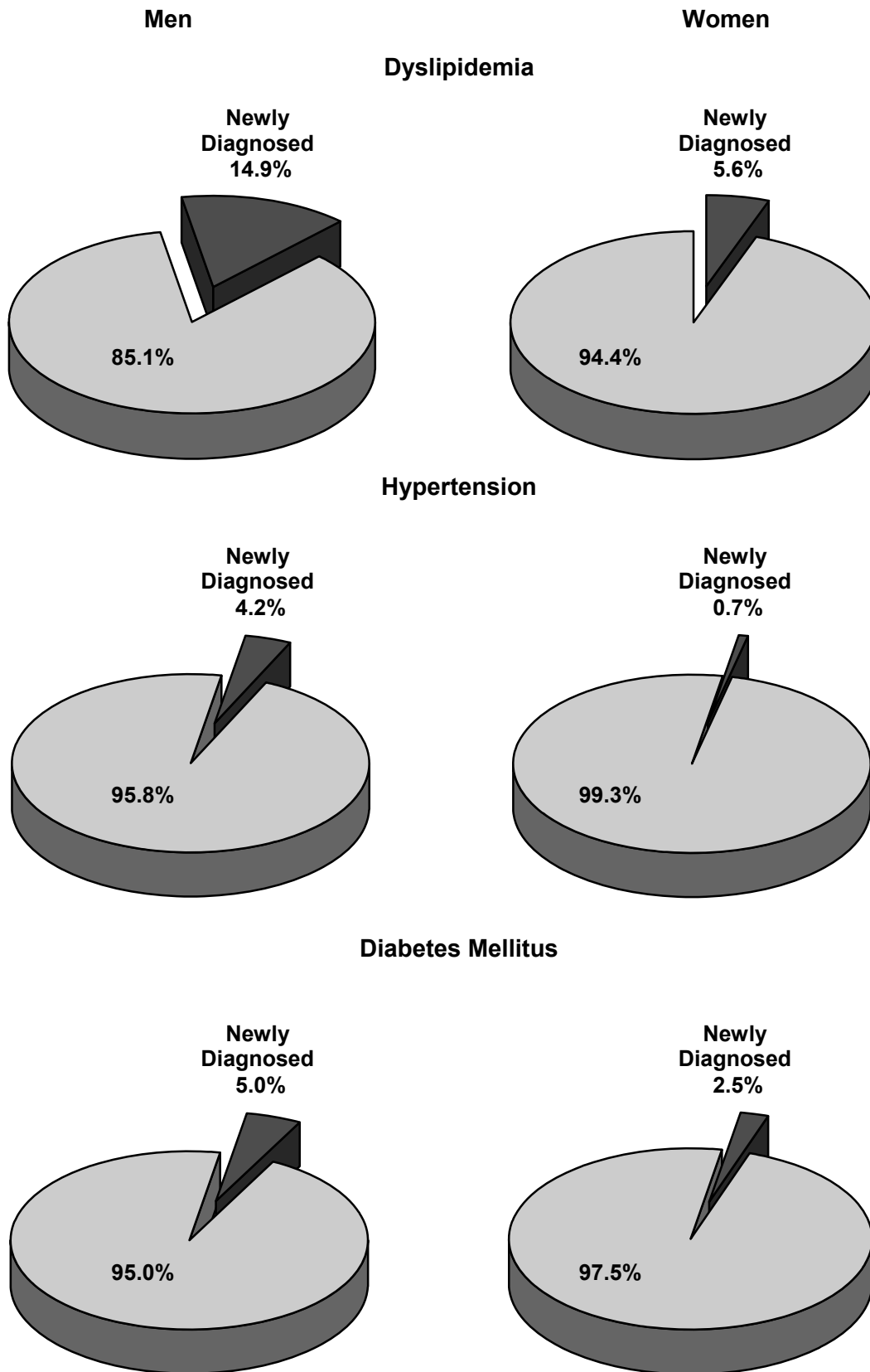
*p<0.05

Figure 3.3: Risk Factors



3.3.2.1 Newly Diagnosed Risk Factors

Figure 3.4: Newly Diagnosed Risk Factors*

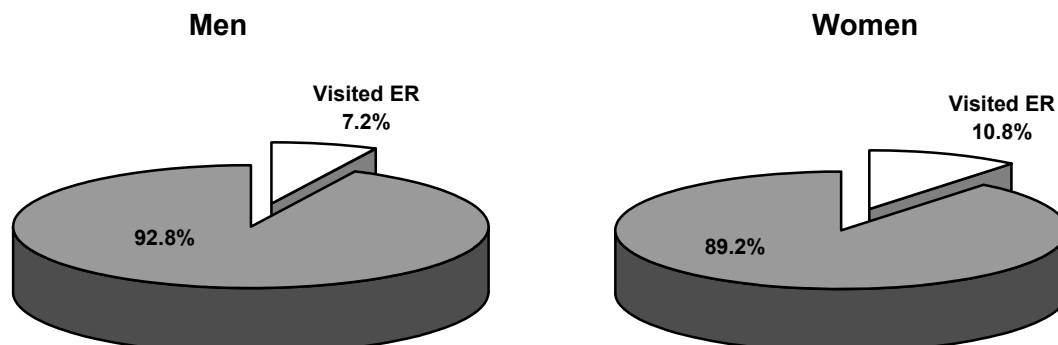


*as percentage of patients with risk factor

3.3.3 Visit to ER during the Month Preceding Hospitalization

7.2% of male patients and 10.8% of female patients had visited the ER during the month preceding hospitalization.

Figure 3.5: Visit to ER during Preceding Month



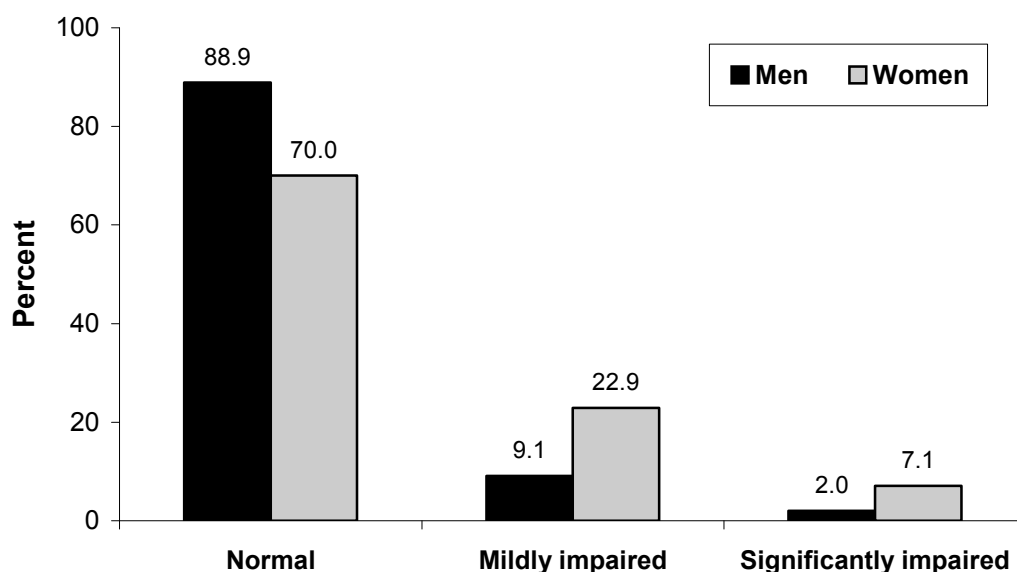
3.3.4 Patient's General Functional Level

The functional level of male patients was significantly higher than that of female patients. Over 30% of women had some functional impairment, as compared with 11.1% of men.

Table 3.5: General Functional Level

Functional level	Men (N=1,399) %	Women (N=364) %
Normal	88.9	70.0
Mildly impaired	9.1	22.9
Significantly impaired	2.0	7.1

Figure 3.6: General Functional Level



3.4 Prior Chronic Treatment

Approximately 50% of both men and women were being treated with aspirin at the time of the event. Other drugs in common use were ACE inhibitors and ARB, beta blockers, lipid lowering drugs and oral hypoglycemic drugs. Women were more likely than men to be treated with anticoagulants, ACE-I/ARB, beta blockers, diuretics, insulin, hypoglycemic drugs, nitrates and calcium antagonists (Table 3.6).

Table 3.6: Prior Medical Treatment

Treatment	Men (N=1,399) %	Women (N=364) %
Aspirin	49.4	53.7
Anticoagulants*	3.7	6.1
Clopidogrel	12.6	9.1
ACE-I	29.6	42.7
ARB	7.0	11.6
ACE-I/ARB*	35.9	53.4
Aldosterone receptor antagonist	1.2	1.4
Beta Blockers*	34.8	49.0
Digoxin	0.7	1.7
Diuretics*	16.4	27.5
Insulin*	6.3	12.1
Hypoglycemic drugs (Oral)*	20.9	28.8
Statins*	46.8	59.9
Fibrate	4.3	4.1
Ezetimibe	1.3	0.6
All lipid lowering drugs*	48.0	61.3
Calcium antagonists*	19.4	32.5
Nitrates*	8.9	12.7
Other drugs*	35.6	55.8

*p<0.05

3.5 Transportation, Pre-admission and Admission Information

3.5.1 Mode of Transportation

Close to half of all male patients (48.4%) and 35.1% of women patients reached the hospital by private transportation. Approximately 40% of patients, both men and women, arrived by means of mobile CCU units. Women were more likely than men to arrive by regular ambulance.

Table 3.7: Mode of Transportation

Mode of transportation to hospital	Men (N=1,399) %	Women (N=364) %
Mobile CCU	39.1	40.9
Regular ambulance	9.1	15.5
Private car/independently	48.4	35.1
Not relevant (in-patient)	3.5	8.6

3.5.2 First Arrival

No differences were found between men and women with respect to the first ward of arrival (Emergency Room for 87.7% of both men and women).

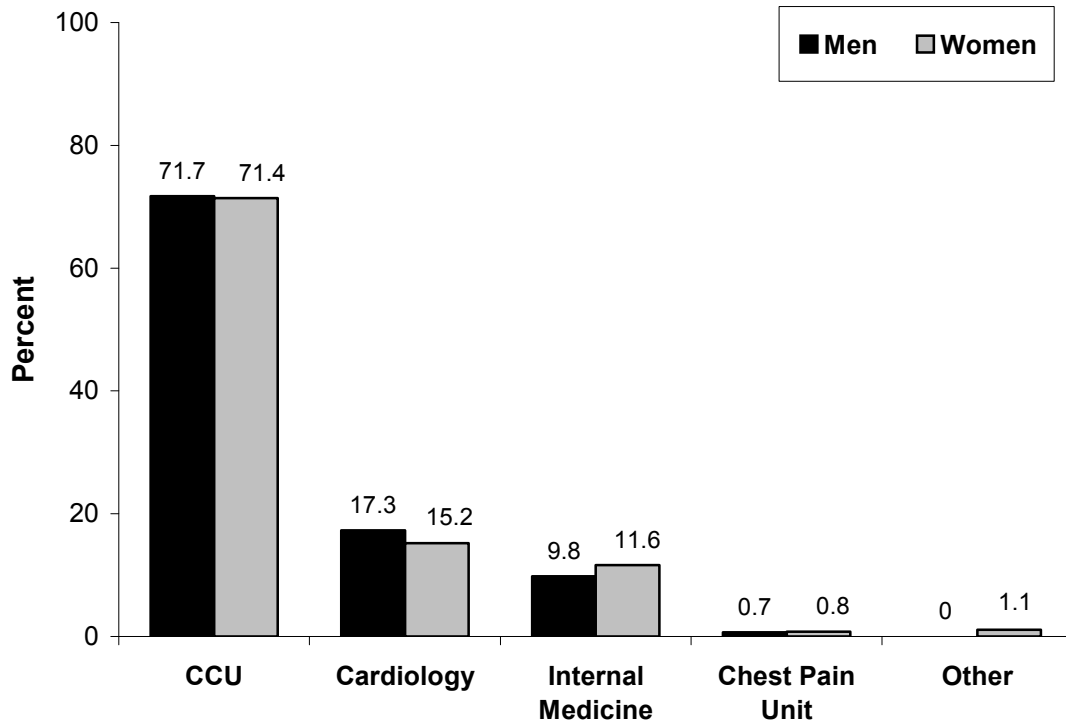
Table 3.8: First Arrival

Ward of First Arrival	Men (N=1,399) %	Women (N=364) %
Emergency Room (ER)	87.7	87.7
Direct to CCU	8.5	10.0
Catheterization Laboratory	3.9	2.2

3.5.3 First Ward of Hospitalization

For the majority of patients, the first ward of hospitalization was the Coronary Care Unit. No differences were found between men and women with regard to first ward of hospitalization.

Figure 3.7: First Ward of Hospitalization



3.5.4. Length of Time from Symptom Onset to Admission

The median time interval elapsing between symptom onset and help-seeking was longer for women with ACS (132 minutes) than for men (108 minutes); however this difference was not statistically significant. Transportation time to hospital was rather similar for men and women. The median time elapsing between arrival at the emergency room and admission to the ward was similar for women and men. For 25% of both men and women, this time delay was greater than 3 hours.

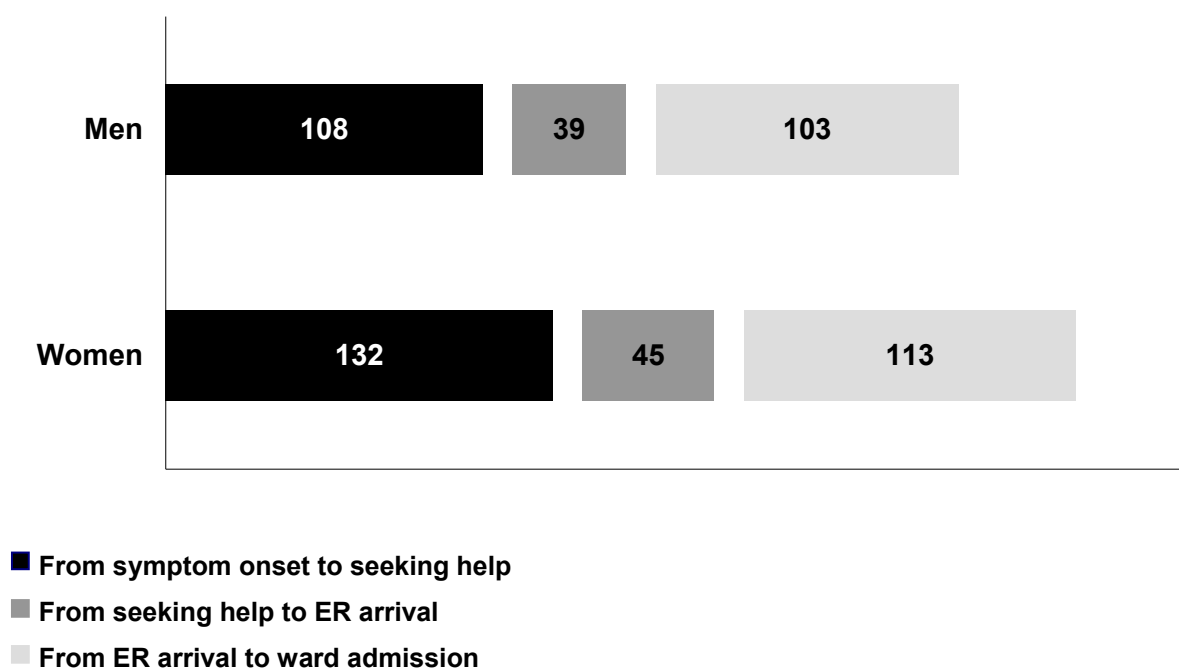
Table 3.9: Length of Time from Symptom Onset to Admission

	Length of time (minutes)					
	Men (N=1,399)			Women (N=364)		
	n*	Median	25%-75%	n*	Median	25%-75%
Symptom onset to seeking help	1,038	108	45-383	252	132	48-426
Seeking help to ER arrival**	1,161	39	0-65	297	45	15-79
ER arrival to first ward of admission	1,349	103	42-191	345	113	50-201

* number of patients for whom data was available

**p<0.05

Figure 3.8: Median Length of Time from Symptom Onset to Admission (minutes)



3.5.5 First Medical Contact

Men were somewhat more likely than women to experience their first medical contact in the emergency room, and women were more likely than men to experience their first medical contact at home.

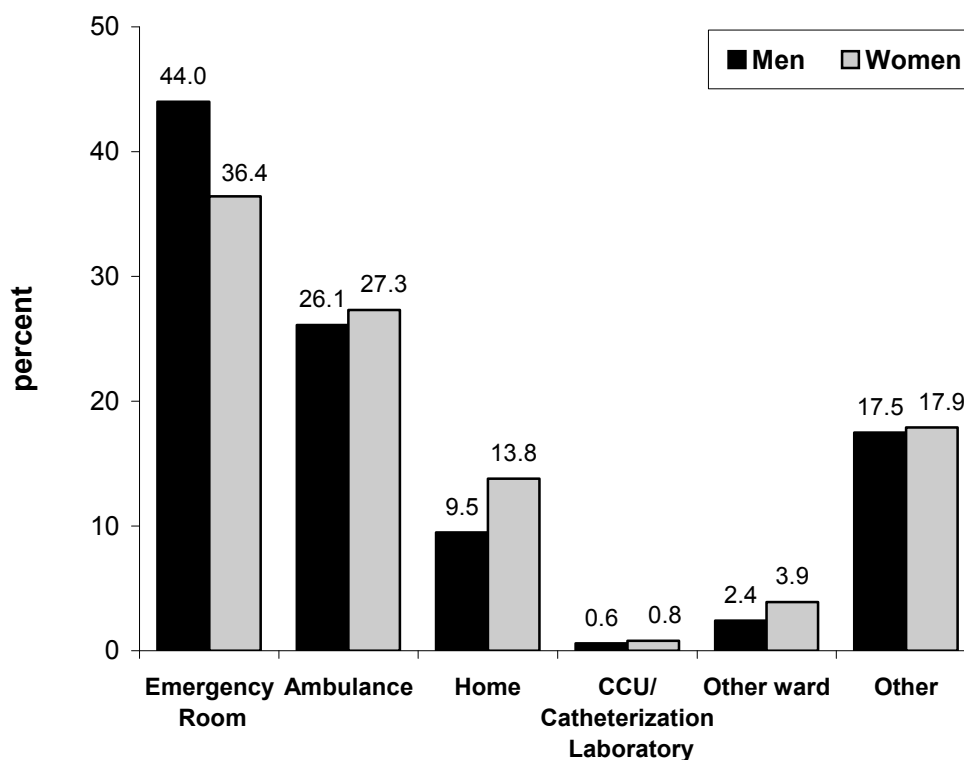
Table 3.10: First Medical Contact

First medical contact*	Men (N=1,399) %	Women (N=364) %
Home	9.5	13.8
Ambulance	26.1	27.3
Emergency Room	44.0	36.4
CCU/Catheterization Laboratory	0.6	0.8
Other ward	2.4	3.9
Other**	17.5	17.9

*p<0.05 for M/F difference

** refers largely to patients whose first medical contact was in a primary care setting

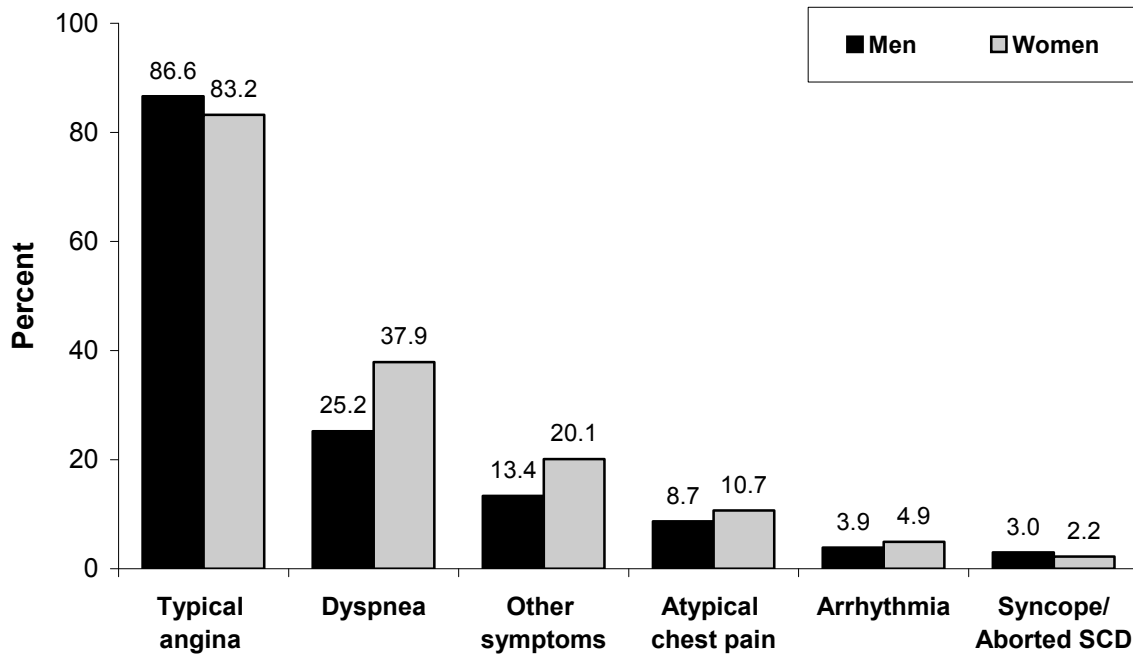
Figure 3.9: First Medical Contact



3.5.6 Presenting Symptoms and Killip Class

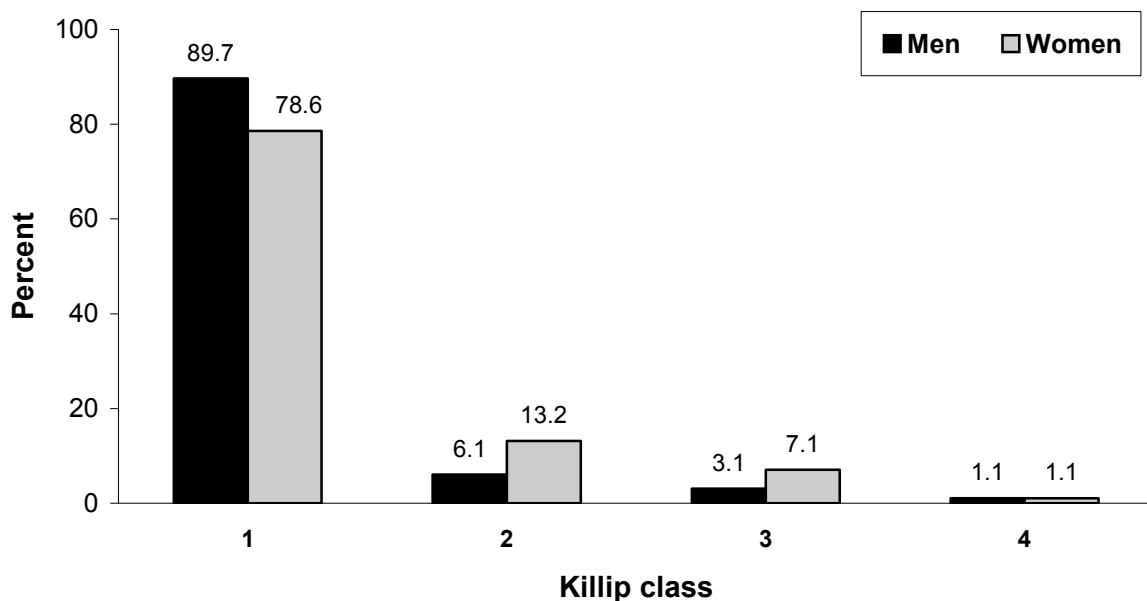
Over 80% of patients arriving at the emergency room presented with typical angina (86.6% of men and 83.2% of women). Women were more likely to present with dyspnea than men; with respect to other symptoms, no significant gender differences were observed.

Figure 3.10: Presenting Symptoms



Male patients generally presented with a lower Killip class than women. Killip class >2 was almost twice as frequent among women (8.2%) as among men (4.2%)

Figure 3.11: Killip Class on Admission



3.5.7 Treatment at First Medical Contact

Almost three-quarters of men and almost two-thirds of women received aspirin at their first medical contact. In addition, close to half of the men and more than one third of the women received regular or unfractionated heparin, and 14.7% of men and 14% of women received clopidogrel. Nitrates were administered to 38.4% of men and 36.3% of women.

Table 3.11: Treatment at First Medical Contact

Treatment	Men (N=1,399) %	Women (N=364) %
Aspirin*	73.1	65.7
Clopidogrel	14.7	14.0
Heparin (unfractionated/regular)*	44.7	37.6
LMW heparin (fractionated)	8.9	10.4
IIb/IIIa antagonists	1.0	1.4
Beta Blockers	5.7	6.3
Diuretics*	6.4	12.4
ACE-I*	2.7	4.9
ARB	0.4	0.3
ACE-I/ARB*	3.1	5.2
Narcotics	20.7	19.5
Nitrates	38.4	36.3
Antiarrhythmics	2.4	3.0

*p<0.05

3.6 First recorded ECG

3.6.1 Location of First ECG

For the majority of both men and women, the first ECG was performed in the emergency room (for 57.7% of men and 53.9% of women). For 28.7% of men and 27.8% of women, the first ECG was performed in the ambulance.

Table 3.12: Location of First ECG

Location of first ECG	Men (N=1,399) (%)	Women (N=364) (%)
Home	10.0	12.2
Ambulance	28.7	27.8
Emergency Room	57.7	53.9
Hospital Ward	3.6	6.1

3.6.2 ECG on Admission

A slightly higher proportion of male patients (45%) were admitted with ST elevation than female patients (40%)

Table 3.13: ECG on Admission

ECG on admission	Men		Women	
	n	%	n	%
ST elevation	621	44.5	144	39.6
Non-ST elevation	778	55.5	220	60.4
Total	1,399	100.0	364	100.0

3.6.3 First ECG Rhythm

Over 90% of men and 88.7% of women presented with normal sinus rhythm. Atrial fibrillation was more frequent in women than in men.

Table 3.14: First ECG Rhythm

ECG rhythm*	Men (N=1,399) %	Women (N=364) %
NSR	92.7	88.7
AF	3.6	6.3
SVT	0.1	0.8
VT/VF	0.4	0.3
Other	3.2	3.9

*p<0.05 for M/F difference

3.7 Primary Reperfusion Therapy in Patients with ST Elevation

3.7.1 Primary Reperfusion

Forty-five percent of men and 40% of women presented with ST elevation (see Figures 3.12A,3.12B). Of men who presented with ST elevation on admission, 64.9% underwent primary reperfusion; of women presenting with ST elevation, 57.6% underwent primary reperfusion. Rates of primary PCI and thrombolysis were similar for men and women, as were rates of stents and the distribution of bare metal and drug-eluting stents. Stents were used for almost 90% of both men and women undergoing primary PCI.

Figure 3.12A: Reperfusion in Men with ST Elevation

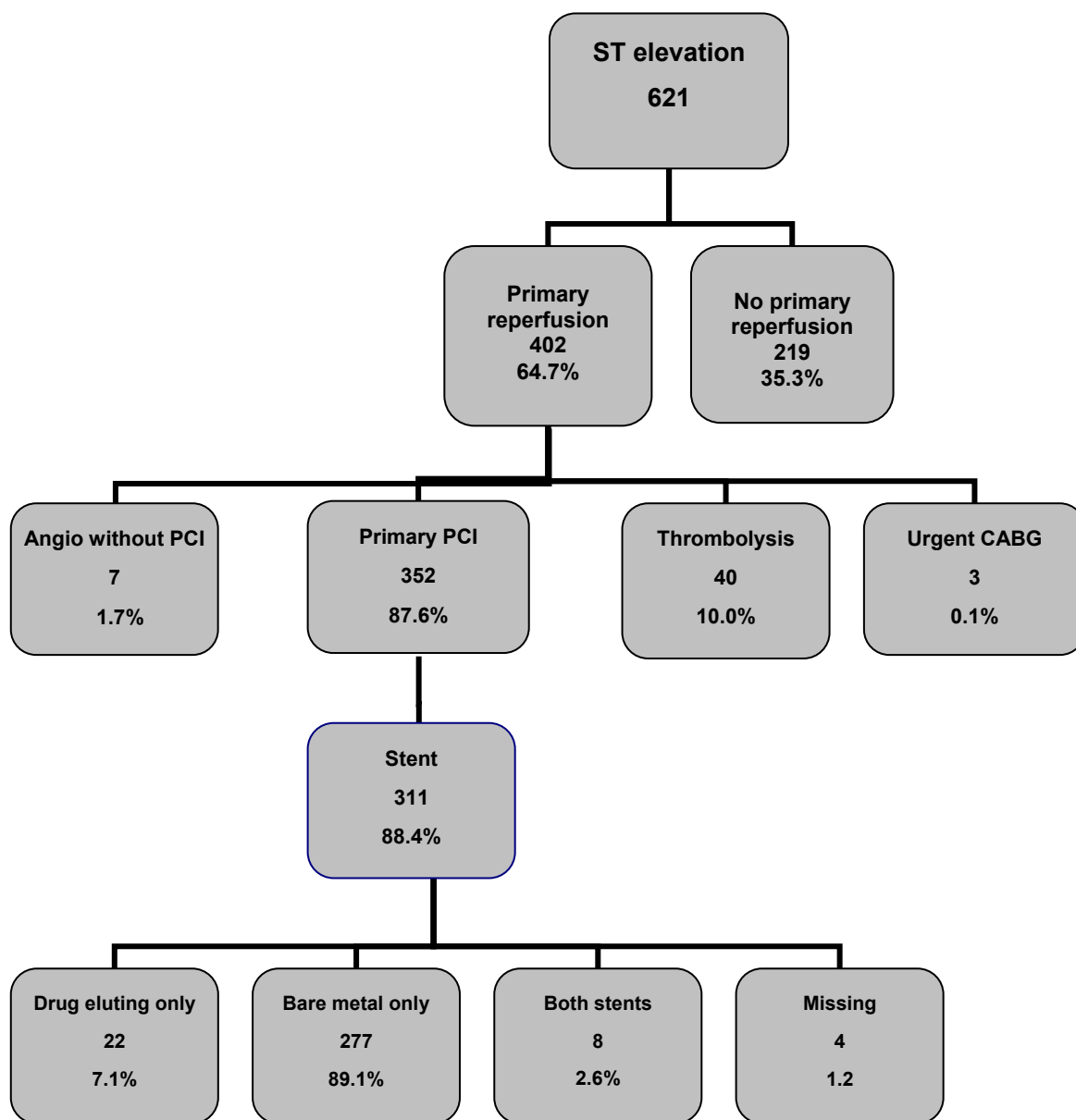
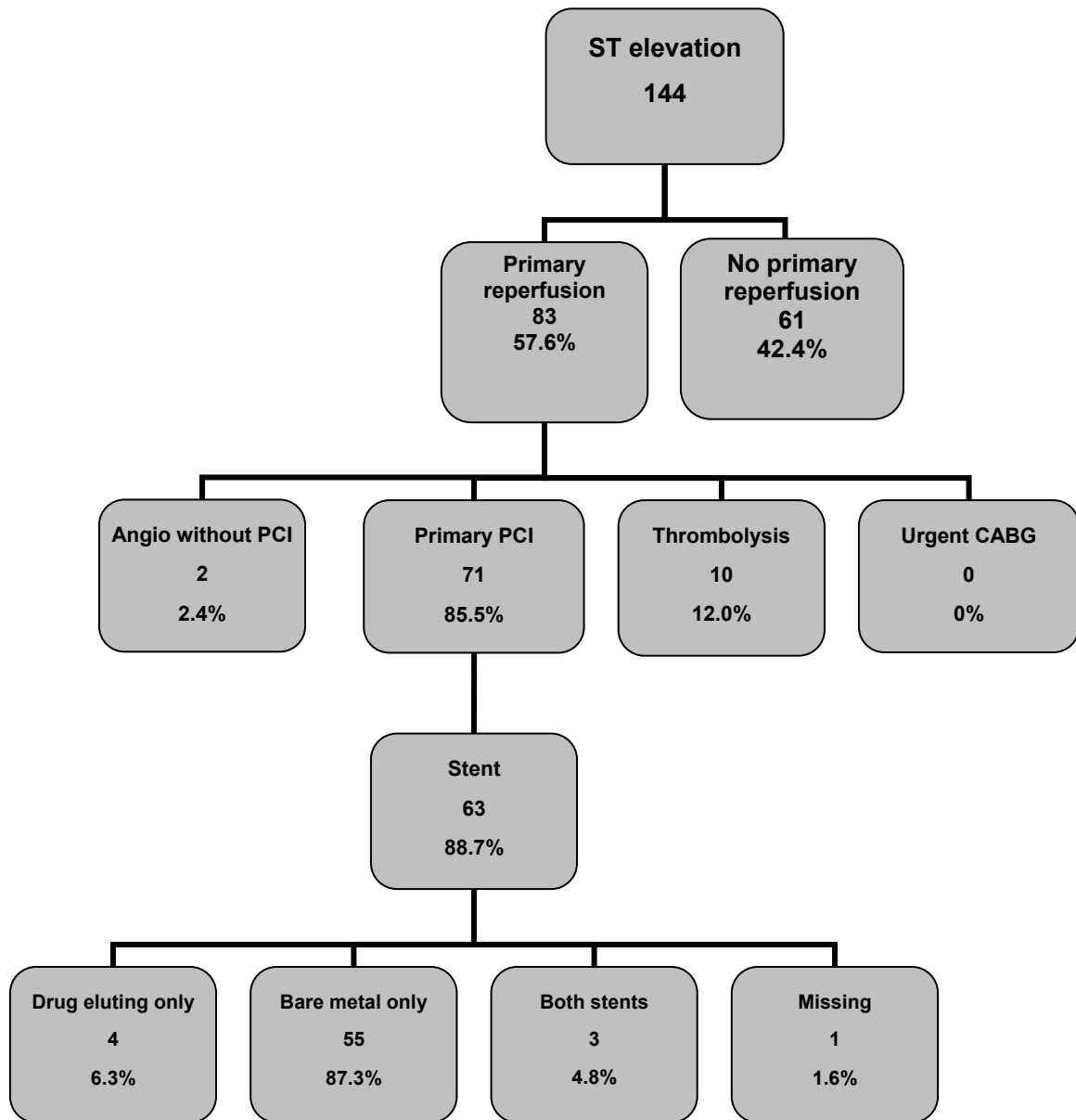


Figure 3.12B: Reperfusion in Women with ST Elevation



3.7.2 Reasons for Not Performing Primary Reperfusion

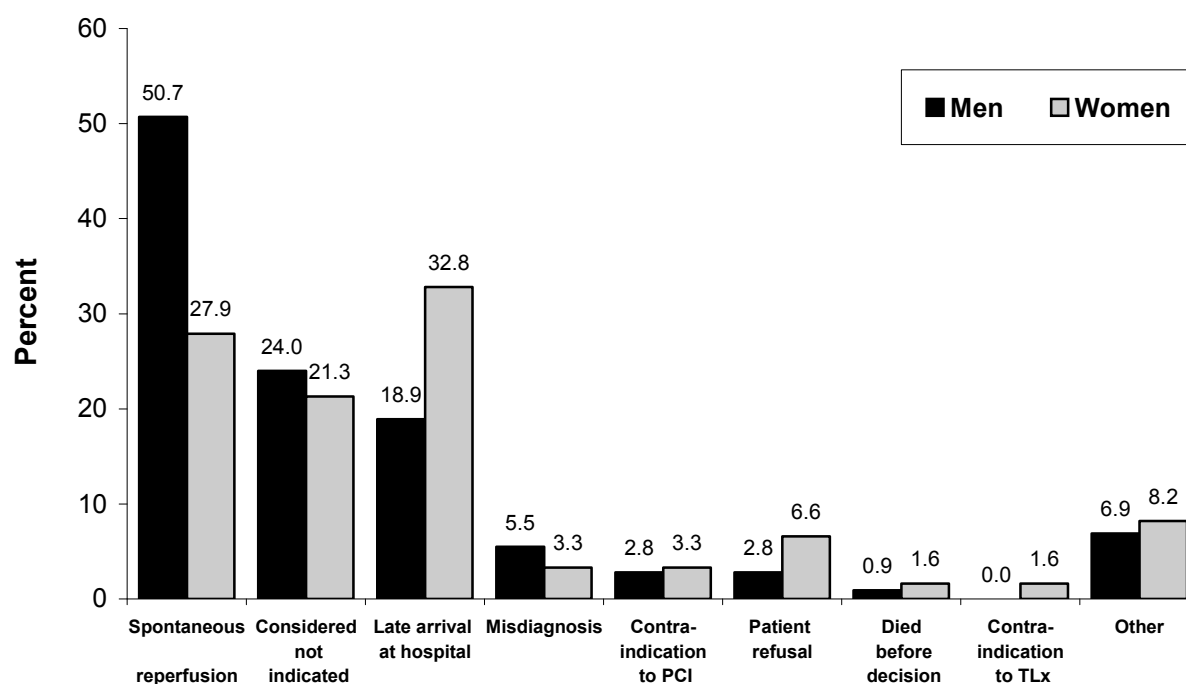
Among patients with ST elevation, the main reasons for not undergoing primary reperfusion were "spontaneous" reperfusion and late arrival at the hospital. Spontaneous reperfusion was almost twice as frequent among men (50.7%) as among women (27.9%). Late arrival at the hospital was more frequently cited as the reason for not performing primary reperfusion among women (32.8%) as compared with men (18.9%).

Table 3.15: Reasons for No Primary Reperfusion among Patients with ST Elevation

Reason	Men (n=219) %	Women (n=61) %
Spontaneous reperfusion*	50.7	27.9
Late arrival at hospital*	18.9	32.8
Misdiagnosis	5.5	3.3
Contraindication to TLx	0.0	1.6
Contraindication to PCI	2.8	3.3
Considered not indicated	24.0	21.3
Died before decision	0.9	1.6
Patient refusal	2.8	6.6
Other	6.9	8.2

*p<0.05

Figure 3.13: Reasons for No Primary Reperfusion among Patients with ST Elevation



3.7.3 Use of Medications and Protective Devices during Primary PCI

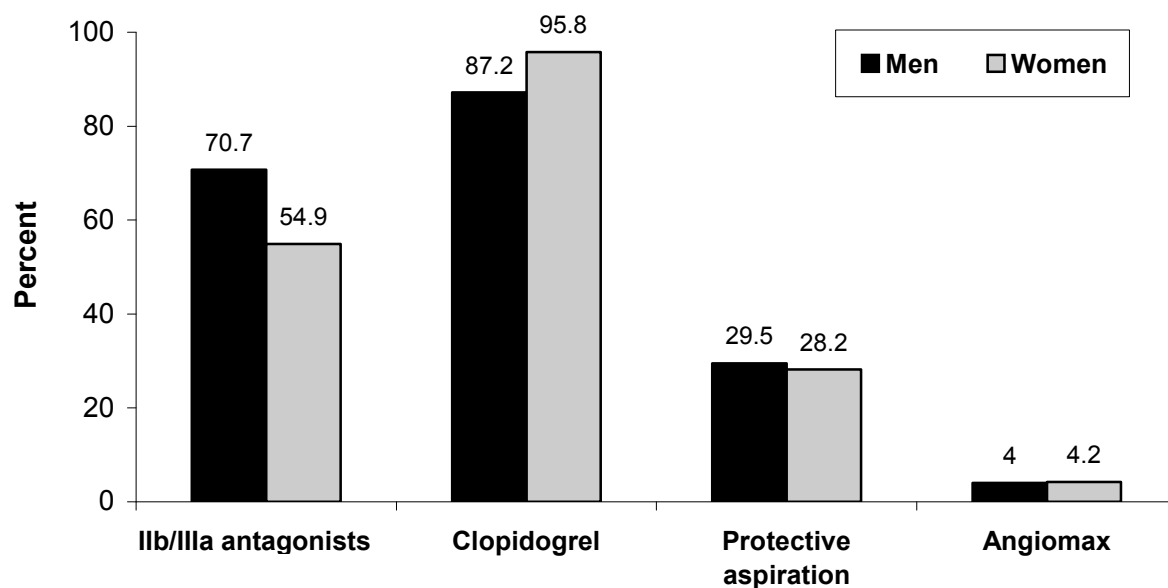
Men were more likely than women to be treated with IIb/IIIa antagonists during PCI, and women had somewhat higher rates of treatment with Clopidogrel (although for both men and women rates were high). Angiomax and protective aspiration were employed equally for men and women.

Table 3.16: Other Medications and Protective Devices Used during Primary PCI

Medication/protective device	Men (N=352) %	Women (N=71) %
IIb/IIIa antagonists*	70.7	54.9
Clopidogrel*	87.2	95.8
Angiomax	4.0	4.2
Protective aspiration	29.5	28.2

*p<0.05

Figure 3.14: Other Medications and Protective Devices Used during Primary PCI



3.7.4 TIMI Grade Flow

Following primary PCI, for approximately 88% of both men and women a maximum TIMI grade flow of 3 was achieved.

Table 3.17: TIMI Grade Flow before Primary PCI

TIMI before primary PCI	Men (N=352) (%)	Women (N=71) (%)
0	55.9	62.9
1	16.2	5.7
2	12.5	15.7
3	15.4	15.7

Table 3.18: TIMI Grade Flow after Primary PCI

TIMI after primary PCI	Men (N=352) (%)	Women (N=71) (%)
0	2.9	7.4
1	0.6	1.5
2	9.3	2.9
3	87.2	88.2

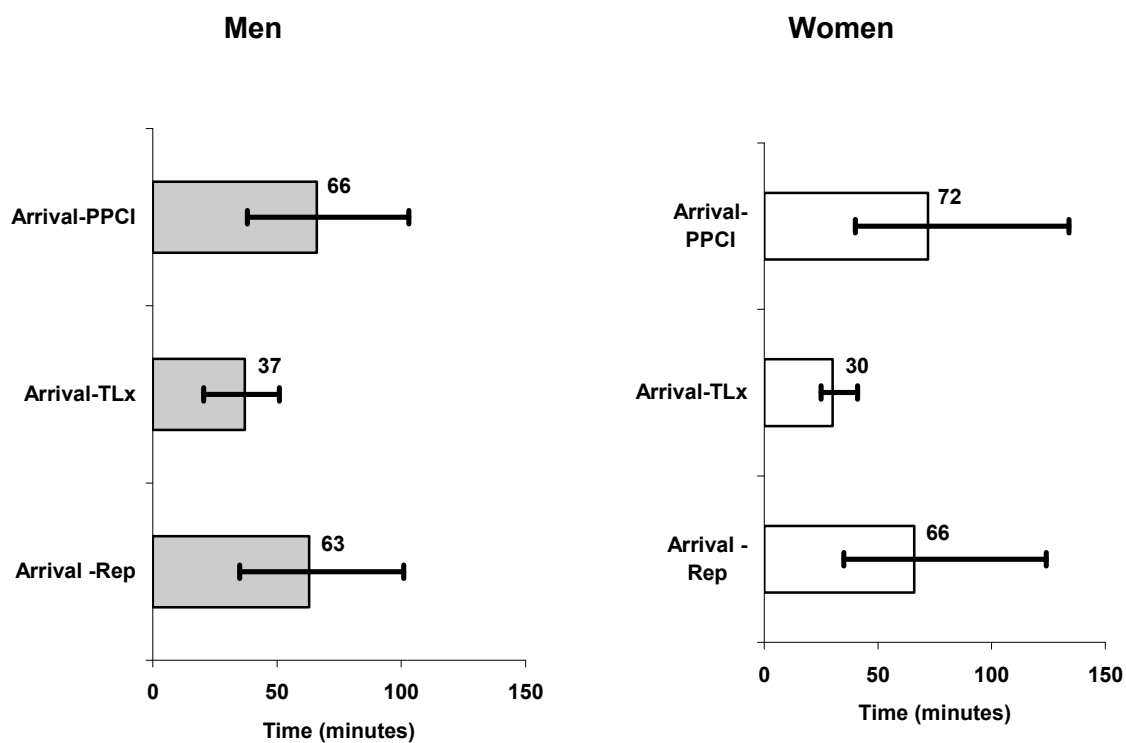
3.7.5 Length of Time from Arrival to Primary Reperfusion

No significant differences were found between men and women with respect to the time delay between arrival and primary reperfusion.

Table 3.19: Length of Time from Arrival to Primary Reperfusion

	Length of time (minutes)			
	Men N=389		Women N=78	
	Median	(25%-75%)	Median	(25%-75%)
From arrival to reperfusion	63	(35-101)	66	(35-124)
From arrival to thrombolysis	37	(20.5-51)	30	(25-41)
From arrival to primary PCI	66	(38-103)	72	(40-134)

Figure 3.15: Length of Time from Arrival to Primary Reperfusion

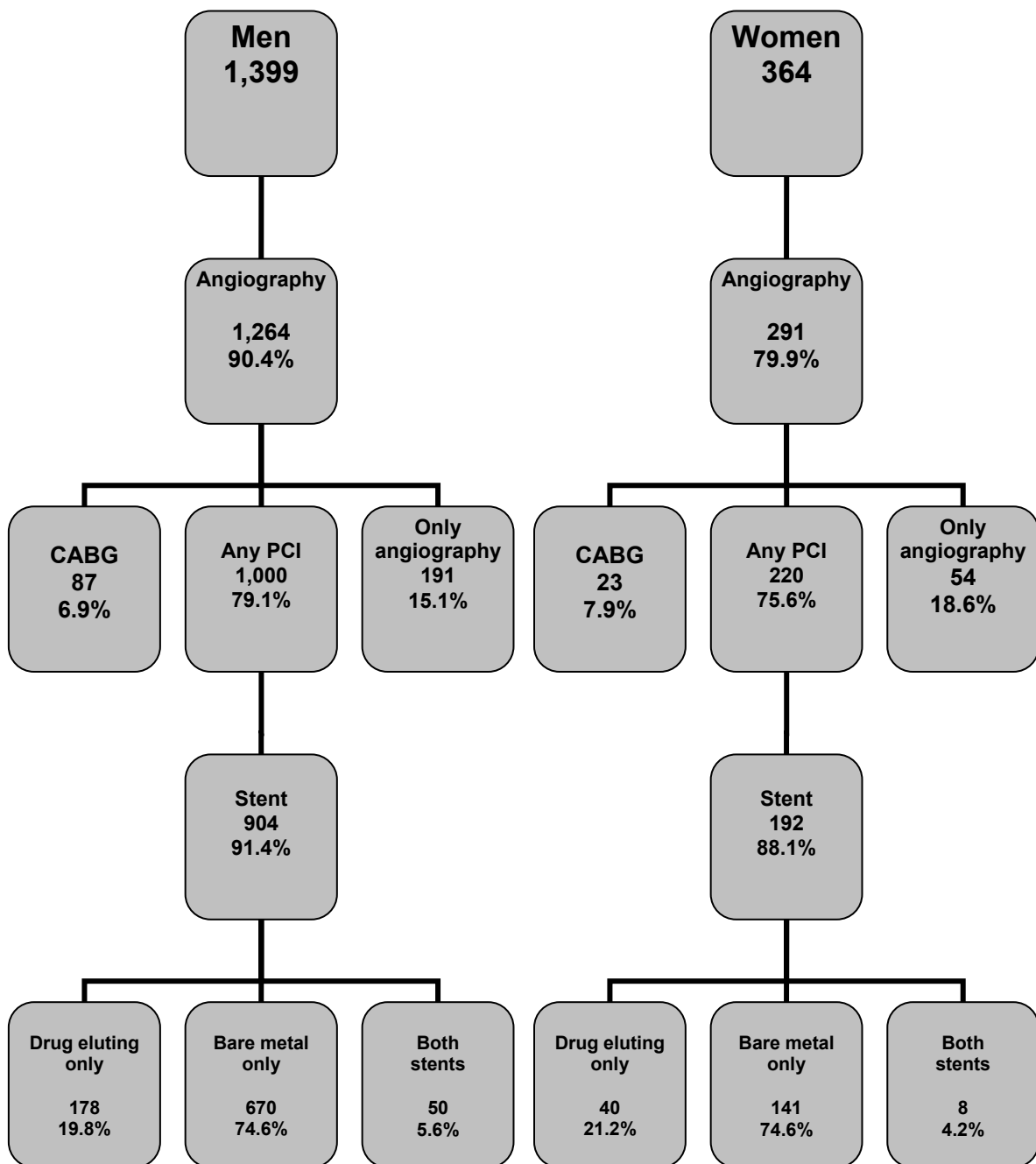


3.8 Coronary Interventions and Procedures during Hospitalization

3.8.1 Cardiac Interventions and Procedures during Hospitalization

A slightly higher percentage of men (90%) than women (80%) underwent angiography during hospitalization. Rates of other cardiac interventions and procedures were similar for men and women.

Figure 3.16: Cardiac Interventions and Procedures during hospitalization



3.8.2 Other Procedures

Women were more likely than men to require CPR and ventilation. Rates of other procedures were similar for men and women.

Table 3.20: Other Procedures

Procedure	Men (n=1,399) %	Women (n=364) %
DC Shock	2.7	4.1
Resuscitation (CPR)*	2.4	4.4
Ventilation*	4.0	6.6
IA Balloon	4.5	6.1
ECHO	78.8	81.8
EPS	0.4	0.3
Stress test / SPECT	2.0	1.7
Permanent pacemaker	0.4	0.8
Temporary pacemaker	2.4	3.0
Hypothermia for anoxic brain damage	0.1	0.0

*p<0.05

3.9 Ejection Fraction

Ejection fraction was determined in 81% of both men and women. The distribution of EF was rather similar in men and women. However, for 26.6% of women vs. 21.4% of men, the EF was <40%.

Table 3.21: Ejection Fraction

Ejection fraction	Men (N=1,399) %	Women (N=364) %
EF determined (%)	80.6	80.7
Normal (≥50%)	48.9	46.4
Mild (40-49%)	29.7	27.0
Moderate (30-39%)	14.5	19.0
Severe (<30%)	6.9	7.6

3.10 In-Hospital Complications

In-hospital complications occurred, on the whole, more frequently among women. For example: CFH and pulmonary edema; re-infarction; sub-acute stent thrombosis, free wall rupture, tamponade, moderate to severe MR, high degree AVB, atrial fibrillation, acute renal failure, major bleeding and infection.

Table 3.22: In-Hospital Complications

Complication	Men	Women
	(N=1,399) %	(N=364) %
CHF mild-moderate (Killip 2)*	6.6	11.8
Pulmonary edema (Killip 3)*	5.4	11.5
Cardiogenic shock (Killip 4)	2.4	4.1
Hemodynamically significant RVI	1.3	1.4
Re-MI*	1.4	1.7
Post MI angina /re-ischemia	3.3	4.7
Sub-acute stent thrombosis*	0.6	2.5
Free wall rupture*	0.2	2.2
Pericarditis	0.4	0.8
Tamponade*	0.3	1.4
VSD	0.2	0.8
Moderate-severe MR*	1.1	3.6
RBBB (new onset)	1.4	1.1
LBBB (new onset)	0.6	1.1
High degree AVB*	1.9	3.6
Sustained VT	1.5	1.6
Primary VF	1.4	2.2
Secondary VF	1.4	1.1
AF*	4.6	8.5
Asystole	2.1	1.9
TIA	0.2	0.0
Stroke	0.5	1.1
CVA/Stroke in hospital	0.7	1.1
Acute renal failure*	3.9	6.9
Major bleeding*	1.3	2.7
Infection*	3.7	6.6

*p<0.05

3.11 In-Hospital Medical Treatment

Close to 100% of men and 96% of women received aspirin, and over 90% received lipid-lowering drugs. In-hospital medications were, on the whole, similar for men and for women. Men were more likely than women to receive clopidogrel and IIb/IIIa antagonists, and women were more likely to receive ARB, diuretics and insulin.

Table 3.23: In-Hospital Medical Treatment

Treatment	Men (N=1,399) %	Women (N=364) %
Aspirin*	98.1	95.9
Warfarin or other anticoagulants	4.1	4.4
Heparin (unfractionated/regular)	37.7	32.9
LMW heparin (fractionated)	50.7	47.4
Clopidogrel*	90.1	84.0
ACE-I	68.3	67.4
ARB*	6.9	11.9
ACE-I/ARB	74.1	77.3
IIb/IIIa antagonists*	33.1	23.1
Aldosterone receptor antagonist	4.4	6.4
Beta Blockers	82.0	82.4
IV inotropic agent	3.2	3.6
Digoxin*	1.8	3.6
Diuretics*	25.8	42.9
Insulin*	13.2	20.4
Hypoglycemic drugs (Oral)	14.7	16.5
Statins*	84.3	90.7
Fibrate	5.3	6.9
Ezetimibe	1.3	1.1
All lipid lowering drugs*	95.4	92.0
Calcium antagonists	18.7	22.9
Nitrates	27.2	29.1
Other drugs	69.5	73.6

*p<0.05

3.12 Duration of Hospitalization

The median length of stay in the intensive coronary care unit was similar for men and women (4 days). Median length of overall hospital stay was also similar for men and for women (5 days).

Table 3.24: Length of Hospital Stay

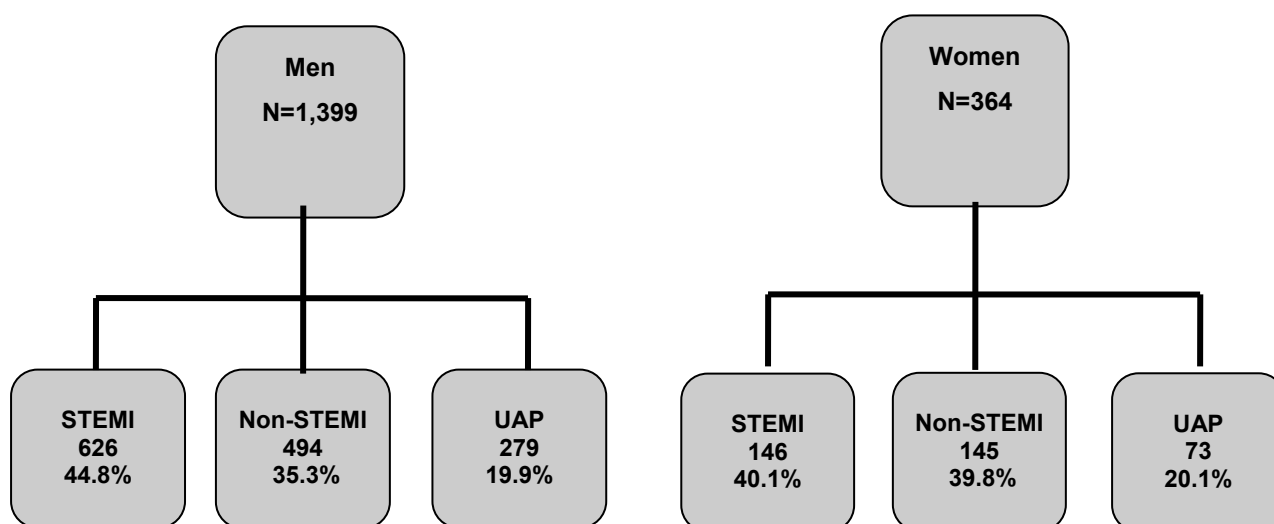
Length of stay (days)	Men N=1,399		Women N=364	
	Median	25%-75%	Median	25%-75%
No. of days in CCU	4.0	3.0-5.0	4.0	3.0-6.0
Total days in hospital	5.0	3.0-6.0	5.0	3.0-7.0

3.13 Discharge Diagnosis

3.13.1 Discharge Diagnosis

Approximately 80% of both men and women patients were discharged with a diagnosis of AMI, and approximately 20% of both men and women with UAP. A slightly larger proportion of men were diagnosed with STEMI, and a slightly larger proportion of women with Non-STEMI.

Figure 3.17: Discharge Diagnosis



3.13.2 Type of MI

Approximately 90% of both men and women were diagnosed with Type 1 MI. Slightly more women than men were diagnosed with Type 2 MI. (See **Chapter 1.13.2: A New Universal Definition of MI**)

Table 3.25: Type of MI

Type of MI	Men (N=1,120) %	Women (N=291) %
1	90.8	88.4
2	4.8	7.0
3	0.2	0.0
4A	2.5	1.4
4B	1.7	2.1
5	0.0	1.1

3.14 Medical Treatment on Discharge

On discharge, male patients were somewhat more likely to be treated with Clopidogrel and lipid-lowering drugs than women patients, and women patients were more likely to be treated with diuretics and insulin; otherwise, recommended medical treatment on discharge was similar for men and women.

Table 3.26: Medical Treatment on Discharge among Hospital Survivors

Recommended treatment	Men (n=1,373) %	Women (n=346) %
Aspirin*	96.6	94.2
Warfarin or other anticoagulants	4.8	6.4
LMW heparin (fractionated)	8.5	7.8
Clopidogrel*	81.4	73.6
ACE-I*	68.7	62.3
ARB*	7.3	11.9
ACE-I/ARB	75.7	74.1
Aldosterone receptor antagonist	5.0	6.7
Beta Blockers	81.9	81.5
IV inotropic agent	0.1	0.6
Digoxin	1.4	1.7
Diuretics*	21.1	35.0
Insulin*	7.8	11.6
Hypoglycemic drugs (oral)	17.3	21.7
Statins*	93.9	87.6
Fibrate	6.0	6.1
Ezetimibe	1.5	1.7
All lipid lowering drugs*	94.8	89.0
Calcium antagonists*	18.6	24.3
Nitrates	8.5	9.2
Other drugs*	58.7	67.9

*p<0.05

3.15 Re-hospitalization within 30 Days of Admission

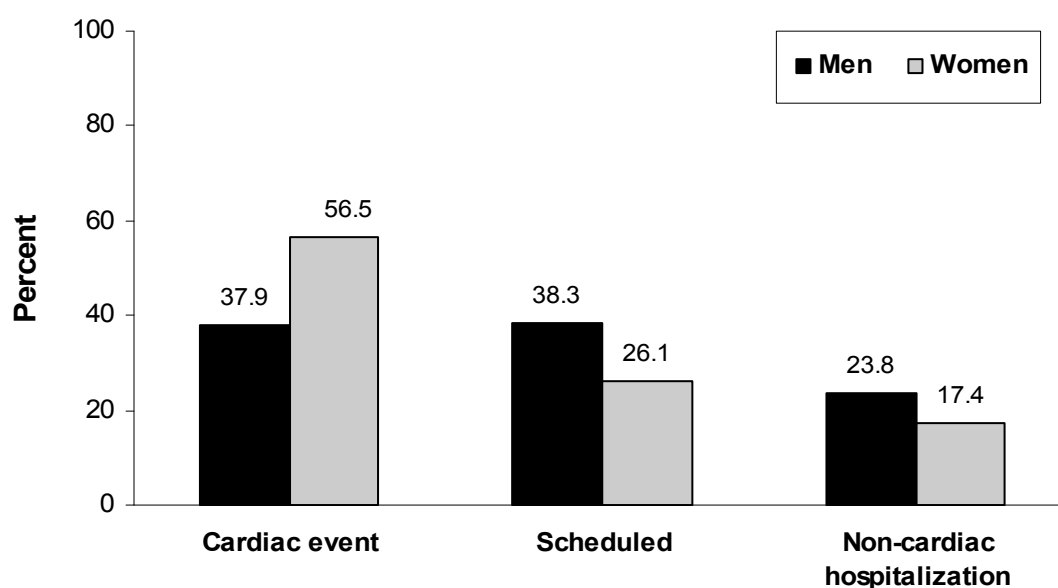
Rehospitalization rates were slightly higher for women (21.4%) than for men (17.3%). A greater proportion of women were hospitalized following urgent cardiac events, and a greater proportion of men were rehospitalized for scheduled procedures and for non-cardiac reasons.

Table 3.27: Rehospitalization within 30 Days of Admission: Reasons

	Men (n=1373) %	Women (n=346) %
Rehospitalized (%)	17.3	21.4
Reason for rehospitalization*		
Scheduled	38.3	26.1
Urgent Cardiac event	37.9	56.5
Non-cardiac hospitalization	23.8	17.4

* $p < 0.05$ for M/F difference

Figure 3.18: Reasons for Rehospitalization within 30 Days of Admission



3.16 Mortality and Major Adverse Coronary Event (MACE)

Unadjusted 7-day and 30-day mortality rates were almost twice as high in women as in men, as were unadjusted rates of Major Adverse Coronary Events (MACE), which include recurrent MI, recurrent ischemia, stent thrombosis, ischemic stroke, urgent revascularization (follow-up) or death occurring within 30 days from discharge. After adjustment for age and additional risk factors associated with poor outcome, no gender differences in 7-day mortality, 30-day mortality or MACE were observed.

Table 3.28: Unadjusted Rates of 7-Day Mortality, 30-Day Mortality and MACE

Mortality	Men (n=1,399) %	Women (n=364) %
7-day*	2.0	4.7
30-day*	3.2	7.7
MACE*	10.8	19.2

* p<0.05

Table 3.29: Rates of Mortality and MACE by Sex, Adjusted for Age and Other Risk Factors

	Men* (n=1,143) %	Women* (n=389) %	Age-Adjusted OR (95% CI) (Women vs Men)	Risk factor Adjusted OR** (95% CI)
7-day	2.3	3.3	1.31 (0.69-2.50)	0.92 (0.45-1.88)
30-day	3.6	5.4	1.34 (0.80-2.25)	1.01 (0.57-1.80)
MACE***	11.5	14.9	1.38 (0.99-1.92)	1.24 (0.88-1.74)

* age adjusted

** adjusted for age, gender, past MI, diabetes, hypertension, Killip class \geq 2, any angiography

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