Chapter 4:
Temporal Trends in Characteristics, Management and Outcome of Patients with ACS in Israel: 2000-2008

4.1 Introduction

In this chapter, we present trends in the characteristics and management of patients with ACS hospitalized in Cardiology Departments and ICCU's in Israel since 2000, and evaluate the impact of these changes on clinical outcome and mortality. The data are derived from the biennial national surveys (ACSIS) which have been performed since 1992 in all 25 cardiac departments in Israel by the Working Group of Intensive Cardiac Care of the Israel Heart Society, the Israel Center for Disease Control and the Israel Society for the Prevention of Heart Attacks. In each survey, the study population included all patients with ACS hospitalized during a two-month period (generally February and March).

4.2 Patient Characteristics

The number of patients hospitalized with ACS in Cardiology and Intensive Care Units increased between the ACSIS surveys 2000-2006. In ACSIS 2008 there was a 15% decrease in the number of patients compared to 2006. The reason for this decrease is unknown. The gender and age distributions were similar until 2004; in 2006 a slight increase was noted in the proportion of male patients, and this trend continued in 2008. In addition, the survey population was slightly younger in 2006 and 2008 than in previous years.

Table 4.1: Patient Characteristics

Year	2000	2002	2004	2006	2008
No. of patients	1,795	2,049	2,094	2,077	1,763
Sex (%)					
Men	75.0	76.2	74.0	77.4	79.4
Women	25.0	23.8	26.0	22.6	20.6
Age (years) (%)					
<50	15.0	13.7	14.3	15.1	14.7
50-75	62.4	64.5	62.4	64.4	65.9
>75	22.6	21.8	23.3	20.5	19.4
Mean age ±SD	63.9 ± 13.2	64.1 ± 13.0	64.2 ± 13.3	63.4 ± 13.0	63.3±13.2

4.3 Cardiovascular History and Risk Factors

Between 2000-2008, an increase was observed in the proportion of patients with ACS who had undergone prior PCI. The proportion of patients with a prior history of MI and CRF increased, as did the prevalence of risk factors such as hypertension, diabetes, dyslipidemia, family history of CAD and smoking.

Table 4.2: Cardiovascular History and Risk Factors

	2000 N=1,795 %	2002 N=2,049 %	2004 N=2,094 %	2006 N=2,077 %	2008 N=1,763 %
CV history					
MI*	29.7	27.2	27.7	30.2	31.2
AP*	40.3	36.7	29.8	42.7	39.1
PCI*	18.7	19.2	21.0	28.1	34.1
CABG	8.8	10.1	11.1	11.3	9.9
CHF	8.1	7.1	7.4	8.7	8.4
CVA/TIA	7.2	8.6	8.1	8.8	6.9
CRF*	8.2	8.4	9.6	12.7	12.7
PVD*	10.3	9.7	7.0	10.4	8.2
Risk factors					
Hypertension*	48.0	50.5	56.6	59.9	59.2
Diabetes*	32.2	32.0	32.4	33.3	37.3
Dyslipidemia*	52.0	54.3	49.4	65.8	74.6
Current smokers*	35.3	33.2	34.2	38.1	38.9
Past smokers*	19.2	15.1	12.9	24.1	21.0
Family history of CAD*	21.1	18.4	18.6	27.0	26.8

*$p<0.05$

4.4 Admission Information

4.4.1 First Ward of Hospitalization

The proportion of patients who were admitted to Internal Medicine wards prior to being transferred to Cardiology wards was between 15-18% during the years 2000-2006. In 2008 this proportion had declined to 10%.

Table 4.3: First Ward of Hospitalization

Ward*	2000 N=1,795 %	2002 N=2,049 %	2004 N=2,094 %	2006 N=2,077 %	2008 N=1,763 %
Cardiology/CCU	83.4	80.6	81.3	80.0	89.2
Internal Medicine	15.5	17.2	16.4	18.4	10.2
Other	1.1	2.2	2.3	1.6	0.6

*p<0.05

4.4.2 ECG on Admission

Between 2000-2008, the percentage of patients with ST elevation on admission declined significantly, with a parallel increase in the percentage of patients with non-ST elevation.

Table 4.4: ECG on Admission

Admission ECG*	2000 N=1,795 %	2002 N=2,049 %	2004 N=2,094 %	2006 N=2,077 %	2008 N=1,763 %
ST elevation	56.1	49.4	48.9	43.2	43.4
Non ST elevation	40.7	47.4	47.9	51.7	53.0
Undetermined ECG finding	3.2	3.2	3.2	5.1	3.6

*p<0.05

4.4.3 Killip Class on Admission

The Killip class distribution remained relatively unchanged between 2000-2004. In 2006 a slightly larger proportion of patients presented with Killip Class 1, and this trend continued in 2008.

Table 4.5: Killip Class on Admission

Killip class*	2000 N=1,795 %	2002 N=2,049 %	2004 N=2,094 %	2006 N=2,077 %	2008 N=1,763 %
1	81.6	79.1	77.9	82.4	87.4
2	10.4	11.9	13.8	10.4	7.6
3	5.5	7.2	7.1	5.7	3.9
4	2.5	1.8	1.2	1.5	1.1

*p<0.05

4.5 Primary Reperfusion Therapy in Patients with ST Elevation

Between 2000-2008, a 12.6% increase was observed in rates of primary reperfusion among patients with ST elevation. The use of thrombolysis declined markedly in favor of primary PCI.

Figure 4.1: Primary Reperfusion among Patients with ST Elevation

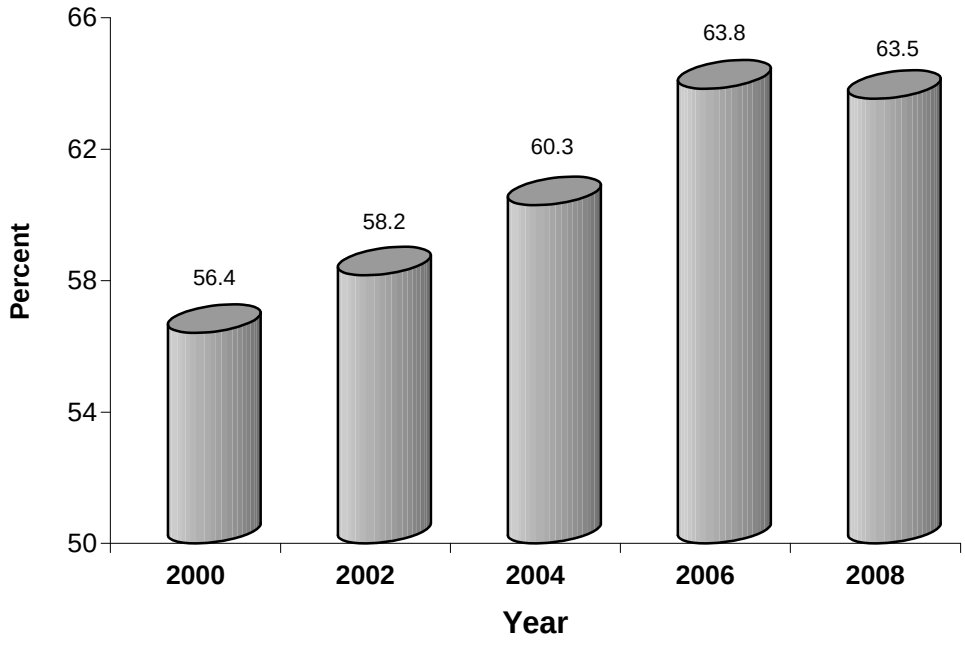
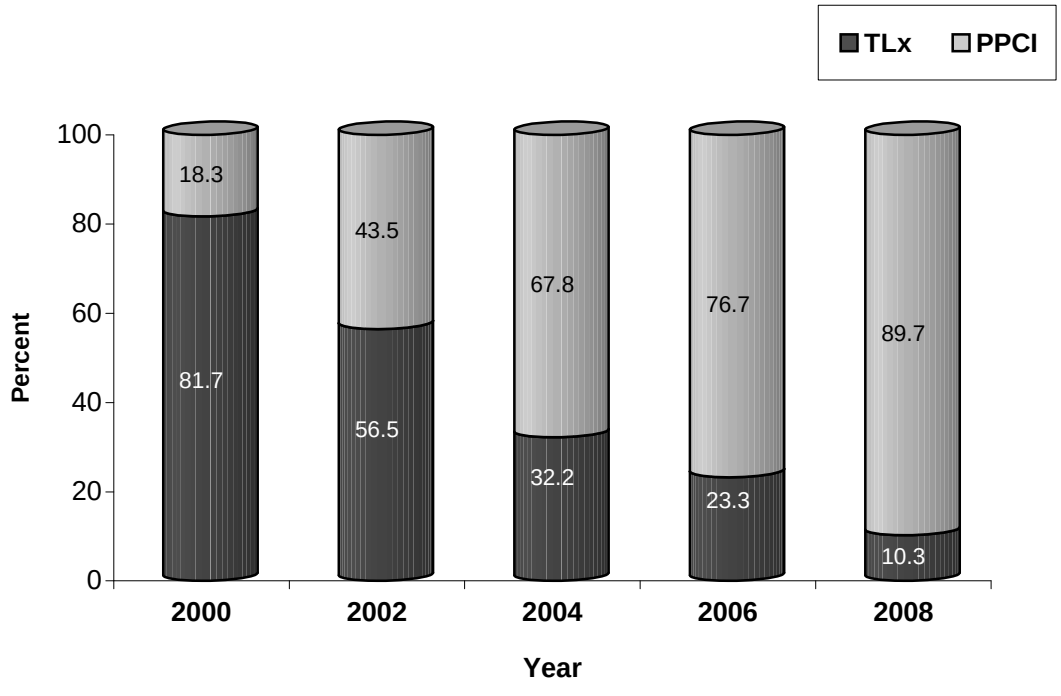


Figure 4.2: Type of Primary Reperfusion among Patients with ST Elevation



4.6 Time Intervals

The median time interval elapsing between symptom onset and help-seeking did not change significantly between 2000 and 2008. The median time interval between arrival and primary PCI decreased, and a decrease was also observed in the time elapsing between arrival and thrombolytic treatment, most notably between 2006-2008.

Table 4.6: Time Intervals

Time interval	2000 N=1,795 Median (25%-75%)	2002 N=2,049 Median (25%-75%)	2004 N=2,094 Median (25%-75%)	2006 N=2,077 Median (25%-75%)	2008 N=1,763 Median (25%-75%)
From symptom onset to ER arrival	160 (80-460)	176 (87-480)	165 (90-392)	181 (88-492)	170 (87-486)
From arrival to TLx	59 (36-85)	53 (37-75)	51 (34-75)	53 (34-75)	35 (21-50)
From arrival to primary PCI	81 (45-131)	92 (54-155)	76 (42-137)	70 (83-115)	69 (39-112)

4.7 Procedures during Hospitalization in CCU

The use of coronary angiography, PCI, stents and echocardiography increased steadily between 2000-2006, while the use of CABG declined between 2000-2008.

Table 4.7: In-Hospital Procedures

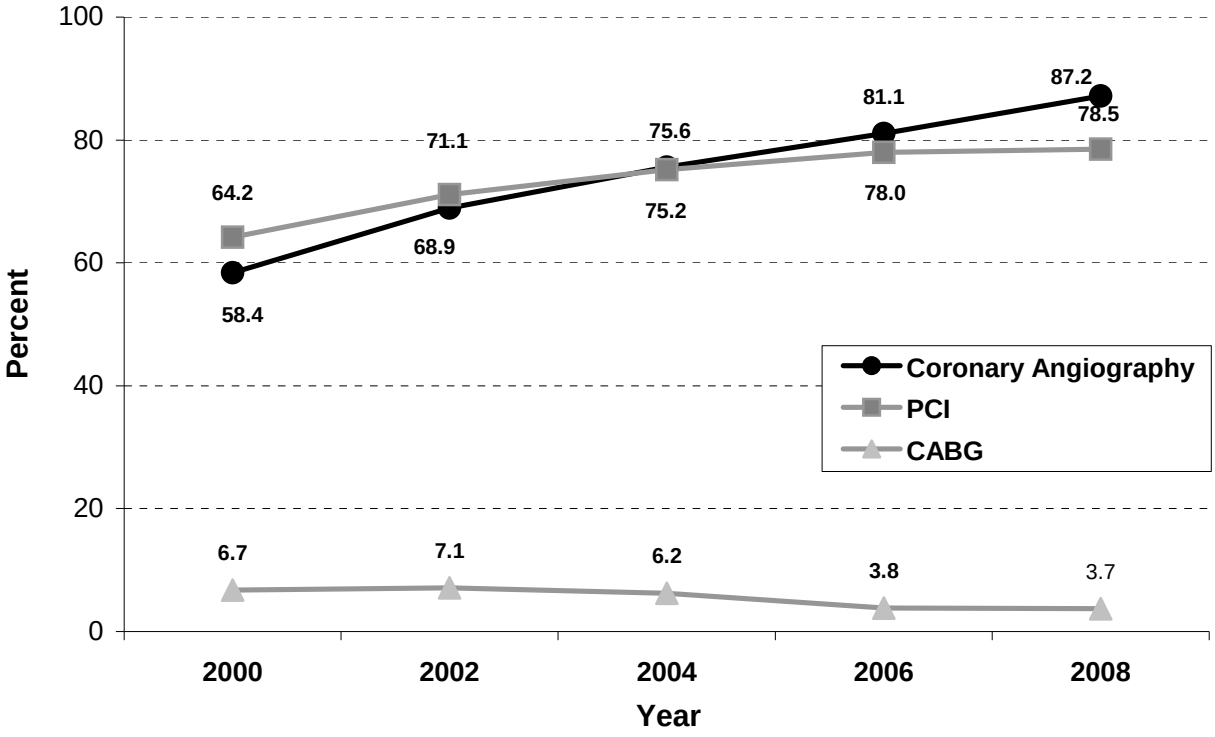
Procedure	2000 N=1,795 %	2002 N=2,049 %	2004 N=2,094 %	2006 N=2,077 %	2008 N=1,763 %
Coronary Angiography*	58.4	68.9	75.6	81.1	87.2
Any PCI(1)*	64.2	71.1	75.2	78.0	78.5
Stent(2)*	73.7	81.4	86.3	91.5	90.8
CABG*	6.7	7.1	6.2	3.8	3.7
IABP	4.8	4.4	3.5	4.8	4.8
Echocardiography*	69.7	68.5	79.0	84.4	79.4

(1) Percent of all patients undergoing angiography

(2) Percent of all patients undergoing PCI

*p<0.05

Figure 4.3: Trends In-Hospital Procedures



4.8 In-Hospital Complications

Between 2000-2008, there has been a decline in the frequency of most in-hospital complications, such as re-infarction, post-MI angina, heart failure, AVB, right- and left- BBB, primary VF, asystole and acute renal failure.

Table 4.8: In-Hospital Complications

	2000 N=1,795 %	2002 N=2,049 %	2004 N=2,094 %	2006 N=2,077 %	2008 N=1,763 %
Re-MI*	2.5	1.9	1.0	1.8	1.5
Post MI angina / Re-ischemia*	13.8	6.7	5.5	6.2	3.6
CHF mild-moderate (Killip 2)*	18.5	10.4	6.8	12.5	7.7
Pulmonary edema (Killip 3)*	10.7	8.9	7.3	9.2	6.6
Cardiogenic shock (Killip 4)*	5.3	3.8	3.2	4.2	2.8
Free wall rupture	0.8	0.4	0.6	0.2	0.6
Tamponade	0.6	0.1	0.3	0.2	0.5
Moderate-severe MR*	3.8	2.3	0.7	3.2	1.6
RBBB*	6.8	4.0	0.5	1.9	1.3
LBBB*	3.6	2.0	0.3	0.9	0.7
Sustained VT	2.5	1.6	1.7	2.4	1.5
High degree (2-30) AVB*	4.2	3.0	2.1	2.5	2.2
Primary VF*	3.6	2.6	1.5	2.5	1.5
Secondary VF*	1.2	0.5	0.6	1.1	1.4
Asystole*	4.0	2.0	1.7	2.6	2.0
TIA	0.3	0.1	0.1	0.4	0.2
Stroke	0.9	0.8	0.7	0.6	0.6
Acute renal failure*	7.9	8.6	6.8	5.4	4.5

*p<0.05

4.9 In-Hospital Treatment

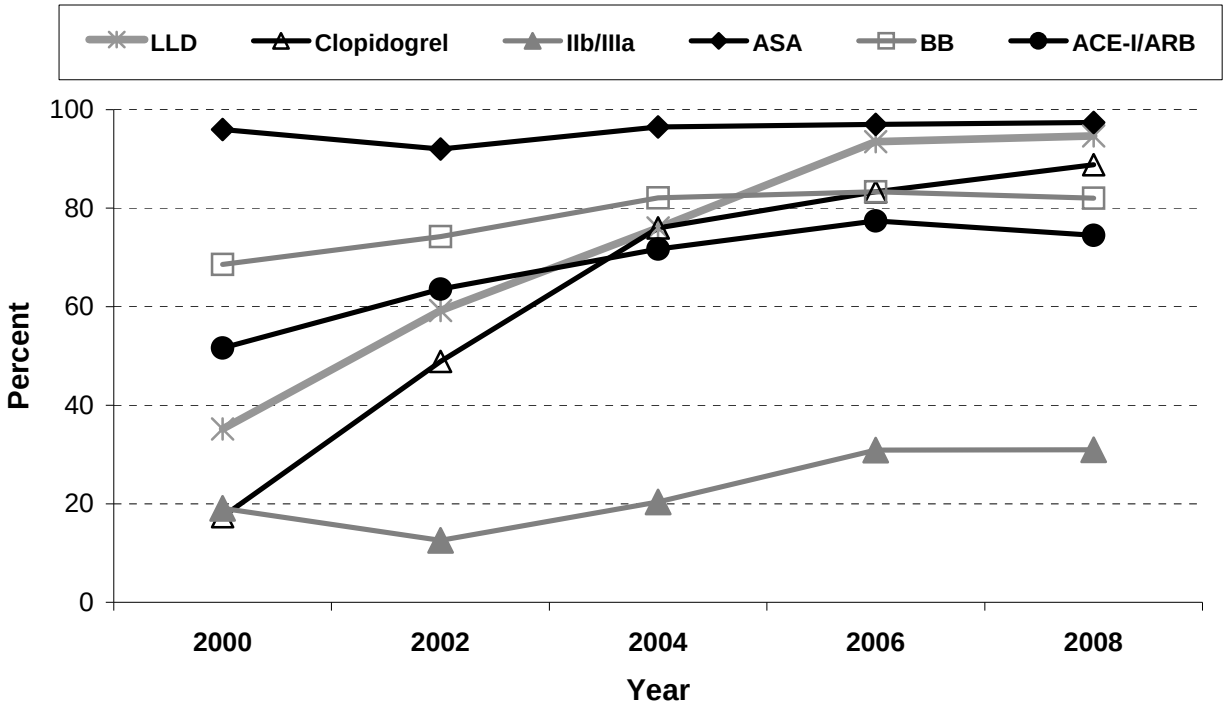
There has been a dramatic increase over the years in the use of Clopidogrel and lipid-lowering drugs. In addition, there has been an increase in the use of fractionated heparin, IIb/IIIa antagonists, beta blockers and ACE inhibitors.

Table 4.9: In-Hospital Treatment

Trearment	2000 N=1,795 %	2002 N=2,049 %	2004 N=2,094 %	2006 N=2,077 %	2008 N=1,763 %
Aspirin*	96.0	92.0	96.5	97.0	97.4
Heparin (unfractionated/regular)*	75.3	53.5	50.1	59.8	58.9
LMW heparin (fractionated)*	25.3	48.2	61.8	58.1	53.9
Clopidogrel*	17.4	48.9	76.0	83.3	88.8
IIb/IIIa antagonists*	19.1	12.6	20.4	30.9	31.0
Beta Blockers*	68.6	74.2	82.1	83.3	82.0
ACE-I/ARB*	51.6	63.6	71.7	77.4	74.5
LLD*	35.2	59.2	76.0	93.5	94.7
Digoxin	3.3	2.3	3.4	2.7	2.2
Diuretic*	28.3	24.8	30.2	29.9	29.3

*p<0.05

Fig 4.4: Trends in Hospital Treatment



4.10 Medical Treatment on Discharge

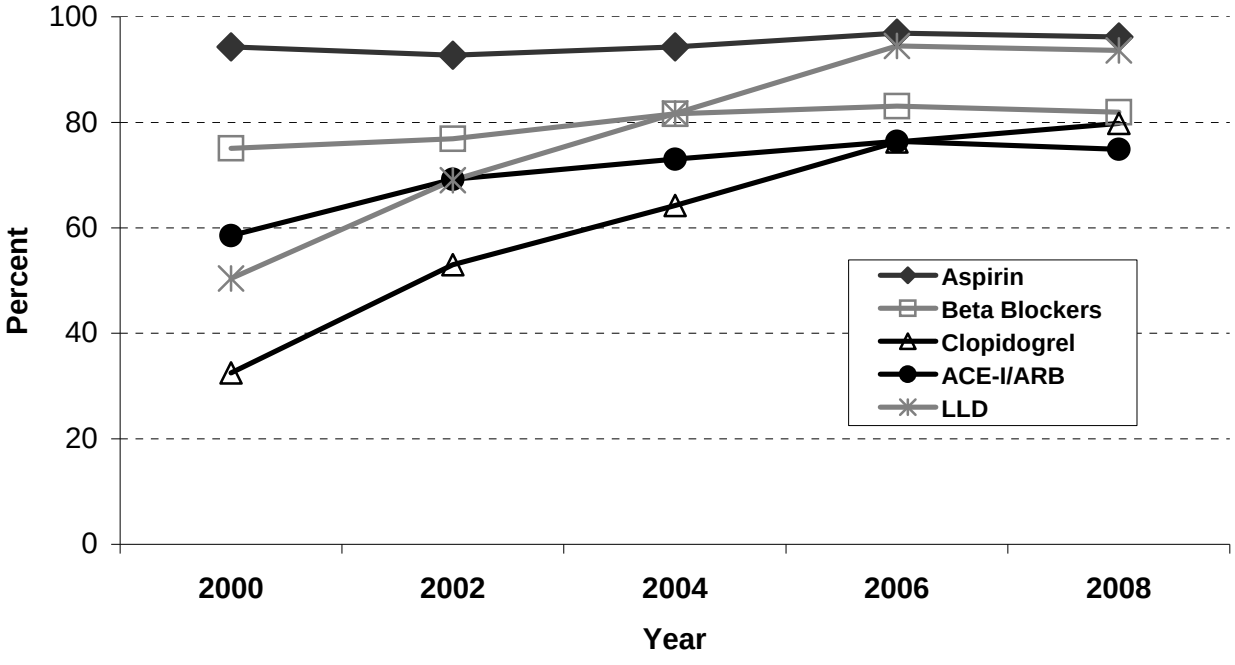
The recommended use of aspirin on discharge has reached 97% in recent years. There has been a marked increase in the recommended use of medications such as beta blockers and ACE inhibitors, while the most dramatic increases have occurred in the use of LLD and clopidogrel.

Table 4.10: Medical Treatment on Discharge among Hospital Survivors

	2000 N=1,795 %	2002 N=2,049 %	2004 N=2,094 %	2006 N=2,077 %	2008 N=1,763 %
Survivors (%)	94.8	96.5	96.8	97.2	97.5
Medical Treatment					
Aspirin*	94.3	92.7	94.3	96.9	96.2
Beta Blockers*	75.1	76.9	81.6	83.1	81.9
Clopidogrel*	32.5	53.0	64.2	76.3	79.8
ACE-I/ARB*	58.5	69.2	73.0	76.4	74.9
LLD*	50.4	69.0	81.7	94.5	93.6
Diuretic	23.0	21.2	23.2	23.0	23.9
Digoxin*	3.5	2.3	2.5	2.1	1.5

*p<0.05

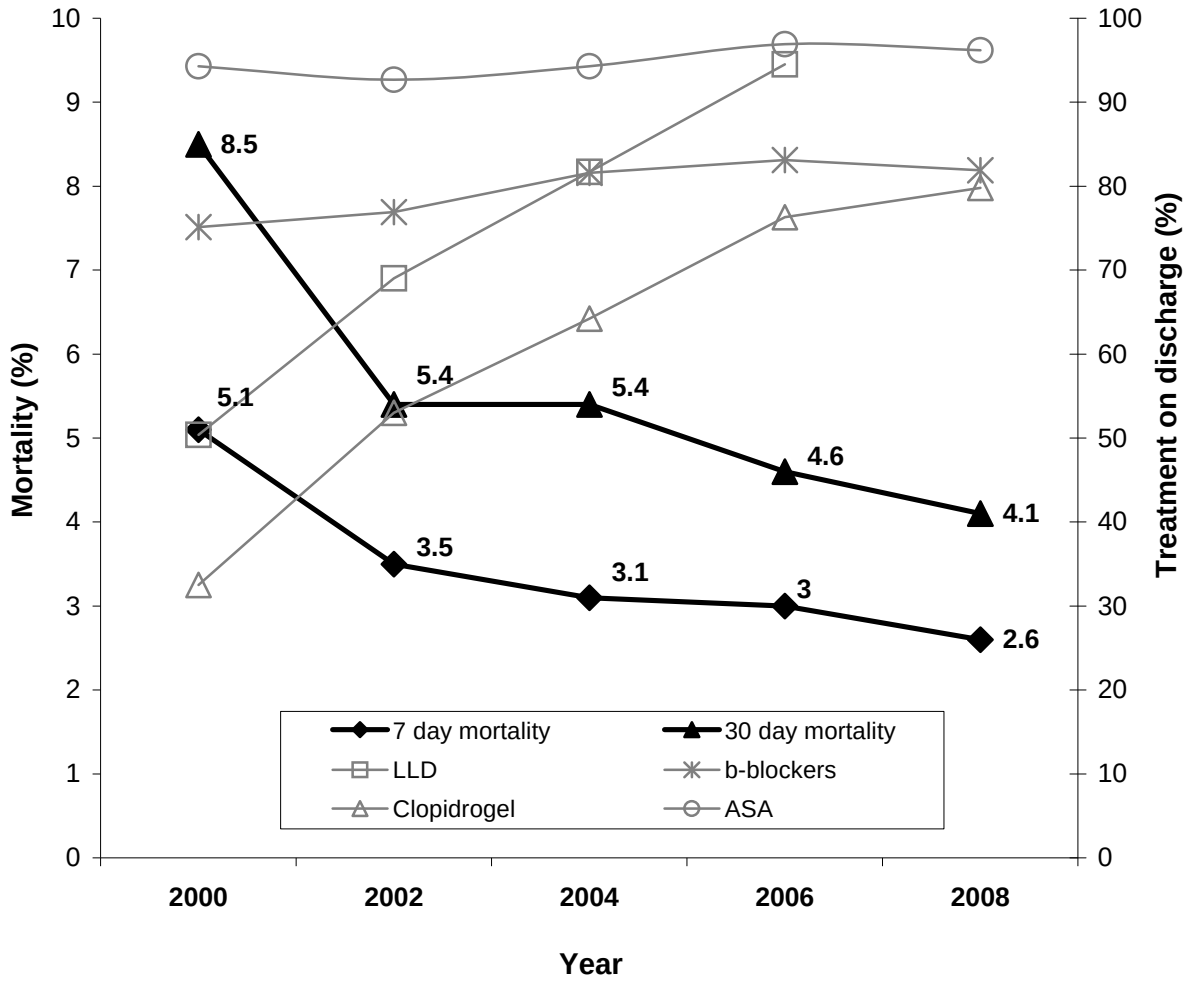
Figure 4.5: Medical Treatment on Discharge among Hospital Survivors



4.11 Medical Treatment and Mortality

The increase in the use of aspirin, clopidogrel, beta-blockers and lipid-lowering drugs has been accompanied by a dramatic decrease in 7-day and 30-day mortality. This decrease was most marked between 2000-2002; however, mortality rates continued to decrease in subsequent years.

Figure 4.6: Recommended Medications and Mortality



4.12 Short and Long Term Outcomes

All outcome measures indicate a marked improvement, with the trends observed between 2000 and 2006 continuing in 2008. Between 2000-2008, a 50% decline was observed in both 7-day and 30-day mortality rates and in rates of MACE. Rates of one-year mortality declined by 27% between 2000 and 2006, and it is hoped that follow-up mortality data will indicate a continuation of this trend.

Table 4.11: Rates of Mortality and MACE

Outcome	2000 N=1,795 %	2002 N=2,049 %	2004 N=2,094 %	2006 N=2,077 %	2008 N=1,763 %
Mortality*					
7-day	5.1	3.5	3.1	3.0	2.6
30-day	8.5	5.4	5.4	4.6	4.1
1 year	13.5	10.9	11.1	9.8	NA
MACE*	26.6	18.6	14.6	15.8	12.5

*p for trend <0.001