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VAKGROEP PUBLIEKE ECONOMIE

THE COSTS OF CORONARY  
HEART DISEASES  
- The Case of Belgium -

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## A B S T R A C T

In the cost analysis for different cardiovascular diseases, we have selected Acute Myocardial Infarction (AMI), Stable Angina Pectoris (SAP) and Unstable Angina Pectoris (UAP). An average treatment pattern for these diseases was established in agreement with two GPs and six cardiologists. We distinguished between GP care, Hospital care and follow up care. In addition, the costs for coronarography, Percutaneous Transluminal Coronary Angioplasty (PTCA) and Coronary Artery Bypass Grafting (CABG) are calculated. Costs for AMI, SAP and UAP amount to 233,769 BEF, 157,981 BEF and 424,951 BEF, respectively.

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## I N T R O D U C T I O N

Cardiovascular diseases are a major cause of mortality and morbidity in Belgium. The costs for treating them are considerable. Therefore, we have analyzed the treatment patterns for the various cardiovascular diseases and the associated costs thoroughly. In our analysis, we take a societal point of view : costs for the health insurance as well as for the patients are accounted for.

We distinguish three cardiovascular diseases : Acute Myocardial Infarction (AMI), Stable Angina Pectoris (SAP) and Unstable Angina Pectoris (UAP). The treatment pattern (hospital care, home care, etc.) and the components of the various treatments (number of visits, drug intake, etc.) are analyzed.

In each subsection, we first present the history of a patient from the time of the event until referral to the cardiologist and/or the hospital. We make use of the information given by two GPs, whose practices are located in urban Antwerp and in a rural area, respectively. We assume them to have rather accurate knowledge of the initial treatment given to the various patients. In the case of AMI, we also make use of data from epidemiologic studies.

Next we discuss GP-care and calculate the costs for the specified treatment pattern. We base our calculations on the information resulting from the interviews with the two above

mentioned GPs.

If patients need hospital care, we include the costs for transportation to the hospital. We have assumed that the average distance from the hospital to the patient's location and back is about 40 km. By applying the relevant fees for the use of either a standard ambulance or a 'Medical Urgency Group'-ambulance (MUG) we obtain the transportation costs.

In order to estimate the cost for hospital care, we sent a questionnaire to six cardiologists from various Belgian hospitals (two university hospitals, two large training hospitals and two peripheral hospitals). We also convened a panel of these cardiologists ( the "Delphi Panel") aiming at agreement on typical patterns of care, including utilization rates for inpatient and outpatient services, diagnostic procedures, surgical procedures and pharmacologic therapy. For a certain number of items, the panel could reach a consensus. However, several times differences in opinion were observed. In those cases, we used an average of the estimates given by the cardiologists.

When patients are discharged from the hospital, they mostly need follow-up care and drug therapy. Estimates for these items were also obtained from the questionnaire and the Delphi Panel.

Once all cost components have been analyzed in detail, we

connect them to the probability that each component is performed. Consequently, we obtain the expected treatment costs for a patient with AMI, SAP and UAP.



## 1. ACUTE MYOCARDIAL INFARCTION

### 1.1 Overview

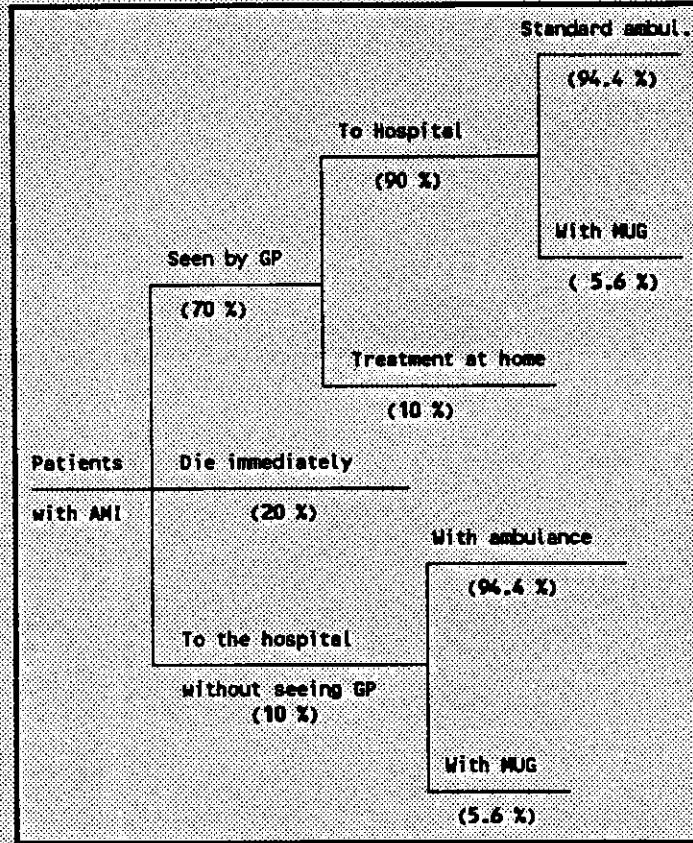
In order to define the history of a patient with AMI, information was obtained from two GPs and from the IHE (<sup>1</sup>) data bank. This Institute collects data about the incidence and treatment of major diseases, including AMI. The data are obtained from about 150 participating GPs. In 1987, the latter registered 386 AMIs. We also need the mortality data due to AMI. These data are obtained from the Monica Study (<sup>2</sup>). For 1986, the Monica study reports 684 AMIs in a population of 240,162.

In Figure 1 we present the history of an AMI-patient. Both GPs estimate that a considerable part of the patients (up to 70 %) first consult a GP before being admitted to the hospital. One GP judges that about 20 % of the patients die immediately. This number is confirmed by the IHE data from 1988 (19 % of the patients die immediately) and the data from the MONICA study (19,7 % of the patients die within one hour). The patients who are first seen by a GP are referred to the hospital or receive further treatment at home by the GP. One GP treats about 10 % of the AMI patients at home while the other prefers to refer every patient to the hospital. IHE data rather confirm the estimate of the first GP by revealing that about 15 % of AMI-patients are treated at home.

After a coronary event, a patient can be transported to the

Figure 1

History of patients with an acute myocardial infarct



hospital with a standard ambulance or with a MUG. Note that the MUG-ambulance is equipped such that oxygen can be administered and that various other medical services, such as monitoring, can be performed. A medical doctor and a nurse are part of the MUG-team. The use of the MUG enables the doctor to administer the first 'hospital' care at the spot where the patient experienced his coronary event. The latter usually results in an increase in the probability of survival.

## 1.2 GP care

We have interviewed one GP who treats some of his AMI patients at home. It concerns especially older people for whom hospitalization is a rather dramatic event. The treatment consists of several visits during the first days after the outbreak of the event. During the three days after the AMI, morphine is administered, an ECG is taken and several blood examinations are ordered. The patient is regularly seen by the GP until about the fifth year after the acute phase of the AMI, on average.

Concerning the medication, the patient gets 10 mg morphine during the first three days after the AMI. From the first day on, 50 % of the patients get a  $\beta$ -blocker, 50 % Digitalis and Diuretics, 20 % Calciumantagonists. These drugs are given, on average, during a period of 5 years. 20 % of the patients receive a prescription for long acting nitrates. Due to the side effects the dose is lowered after a month. After 4 months the therapy is stopped. The estimated annual mortality rate after the AMI amounts to 7 %. This assumption influences the costing of the follow up care and the drug therapy.

The costs for the above described treatment amount to 67,942 BEF. Note that we took into account a 7 % mortality rate after the infarct and an annual discount rate of 5 % for future costs. In the appendix the unit costs for the different items are listed as well as the detailed cost calcula-

tion for the treatment of AMI at home.

### **1.3 Transportation**

We assume that a patient can be transported to the hospital by means of a standard ambulance or 'Medical Urgency Group'-ambulance

The fee for transportation with a standard ambulance consists of a lump sum of 720 BEF plus 70 BEF per km for the kilometers between the 11th and 20th kilometer plus 55 BEF per km above 20 kilometers.

The fee for transportation with a MUG-ambulance amounts to a lump sum of 900 BEF plus 90 BEF per km for the 11th to the 20th kilometer, plus 70 BEF per km for the kilometers above 20 km. Patients transported in the MUG-ambulance also need to pay the services provided by a specialist (equal to the fee for a visit plus the fees for any other medical services).

We assume further that the average distance from the hospital to the spot where the patient fell ill and back is about 40 km (<sup>3</sup>).

### **1.4 Hospital care**

#### **1.4.1 History of hospitalized patients with AMI**

The history of a hospitalized patient with an AMI is depicted in Figure 2 and Figure 3. Note that the Delphi-panel reached a consensus on this particular treatment pattern. 60 % of the

patients who are admitted at the hospital get a thrombolytic treatment, the other 40 % a conventional treatment with pharmaceuticals. About 15 % of the admitted patients die in the hospital. Forty percent of the patients who are discharged alive, suffer from post-infarction angina pectoris.

We further know that some patients with AMI receive a coronarography. The probability of undertaking this procedure depends mainly on whether post-infarction angina pectoris occurs or not. After the coronarography the cardiologist can decide to continue the drug treatment, to perform a Percutaneous Transluminal Coronary Angioplasty (PTCA) or to perform a Coronary Artery Bypass Graft (CABG). The probabilities associated with each of these decisions are shown in Figure 3.

Figure 2

History of hospitalized patients with an acute myocardial infarction

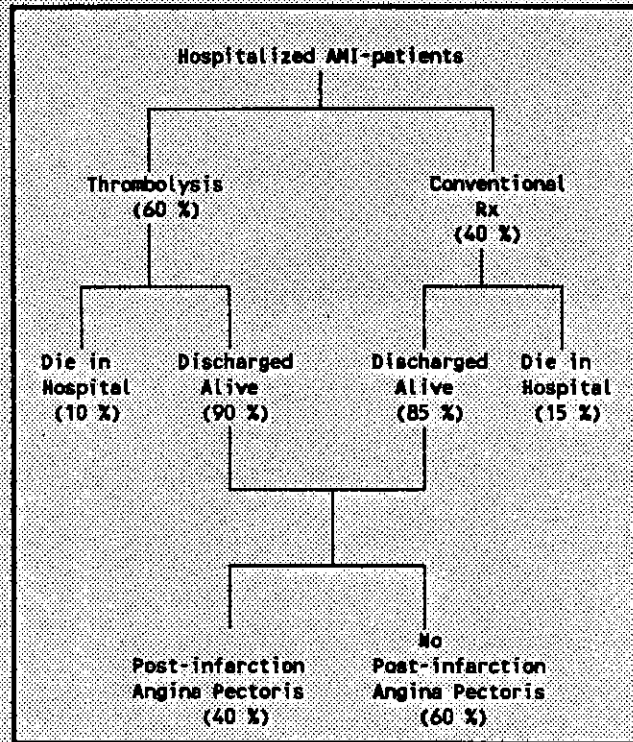
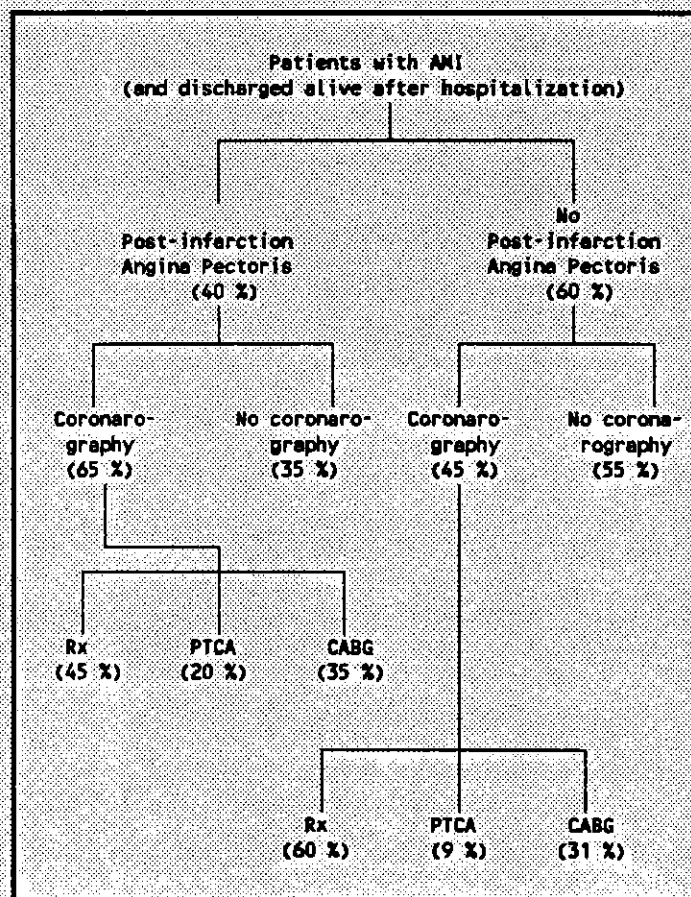


Figure 3

Coronarography for patients with an AMI



1.4.2 Treatment of and costs for AMI-patients, during hospital stay

In this section we discuss the procedures which are performed on hospitalized patients with AMI. We make a distinction between the stay in the coronary care unit (CCU), and that in the regular ward.

It is not that simple to calculate the unit costs, since

'hotel' costs and the costs for lab test vary between hospitals. Therefore, a weighed average of these charges will be computed. Recently, the financing of clinical biology in Belgium has changed rather dramatically. Henceforth, we must distinguish between three components. Firstly, there is a specific payment per lab test performed. Secondly, the hospital receives a lump sum per patient-day. This particular payment may again differ between hospitals. Thirdly, a lump sum is paid per hospitalization. This component varies between the hospitals as well. Note that for all components that vary between hospitals an weighed average cost is computed.

We refer to the Appendix C for a detailed presentation of all cost components. We only highlight the main items here.

A patient with a AMI stays in the CCU for four days. He receives oxygen and is monitored continuously. A rather extended package of lab-tests is performed quite regularly. Within the Delphi Panel differences were noted about the probability of administering an echocardiography to an AMI-patient. In our analysis we use an average probability of 51 %. The costs for an AMI-patient staying in the CCU, are calculated to be 80,795 BEF.

Within the panel the average stay in the regular care ward varied from 6 to 10 days. In our base run calculation, we assume a stay to last 8 days. During that period 4 ECGs and 1 echocardiography are taken. Treatment concerned cardiac rehabilitation, dietary counseling, exercise testing, holter



monitoring, etc. varied. The costs resulting from the treatment in the regular ward amount to 74,886 BEF.

As one can learn from Figure 2, quite a number of patients get a thrombolytic treatment upon arrival at the hospital. This treatment costs 30,744 BEF of which about 27,000 BEF is due to the thrombolytic drug Eminase<sup>R</sup>.

The costs associated with coronarography, PTCA, CABG are included in the cost analysis for patients with AMI. For simplicity's sake, we discuss the unit costs of these particular procedures separately. We need to multiply those unit costs (4) by the estimated probabilities of coronarography, PTCA and CABG for patients with AMI.

We now combine the probabilities of death, thrombolysis, post infarction angina pectoris etc. (Figures 2 and 3) with the costs for the different items mentioned above. So we calculate the expected costs for the hospitalization of AMI-patients. We assume that the deaths among hospitalized patients occur during their stay in the CCU. In addition we assume, the costs for an AMI-patient who died in the hospital are half of the CCU-costs of a patient who survived the hospital stay. Those calculations result in an expected hospital cost of 267,457 BEF.

### 1.5 Follow-up care and drug therapy for AMI-patients, discharged from hospital

Concerning the drug therapy and follow up care for discharged AMI-patients, we made the assumption that 7 % of the patients decease annually. Futur costs are discounted at a 5 % discount rate. We presume further that there is no follow up care or drug treatment after the fifth year.

About 80 % of the patients with an AMI are regularly followed by the cardiologist during the first year. Thereafter this number reduces to 70 %. During the first year, 4 visits are paid to the cardiologist and 10 to the GP. For the following years, these numbers reduce to 2 and 6, respectively. When the patients visit the cardiologist, some lab-tests and other medical services are performed.

To calculate the costs of the drug therapy, we collected data about the drug prescription by the cardiologists (dose and exact name of the drugs can be found in the appendix B). The following drugs taken during a period of 2,5 years : digitalis, diuretics, calcium antagonists. For anti-arrhytmics and anti-coagulants, a therapy of 6 months seems the rule. Finally, AMI-patients are assumed to take B-blockers and ACE inhibitors during 5 years.

By multiplying the unit costs of each item of the follow up care and drug therapy by the probability that they are per-

formed, we obtain the expected total costs for follow-up care and drug therapy : 45,329 BEF.

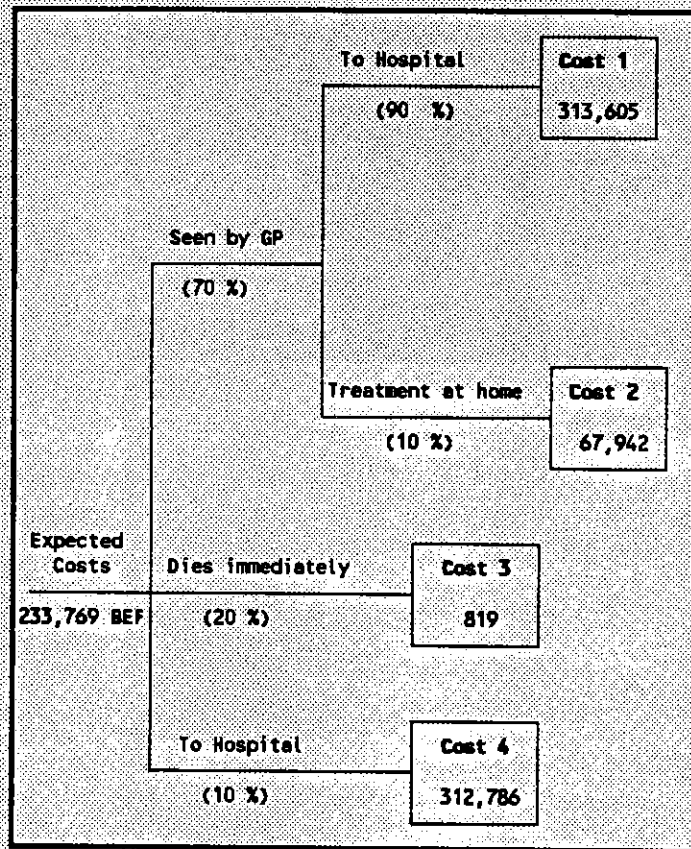
#### **1.6 The expected costs for an AMI-patient**

Until now we have analyzed the costs of the different types of care for AMI-patients (GP care, transportation, hospital care, follow up care and drug therapy).

In this section we combine the results obtained so far. We refer the reader to the tree of Figure 4, that depicts the overall history of AMI-patients. At the end of each branch we put the appropriate costs. Then we multiply each of these costs by the appropriate probability. These calculations result in the expected costs for patients with AMI, i.e. 233,769 BEF.

Figure 4

The expected total costs for AMI-Patients



Note : Explanation of the costs :

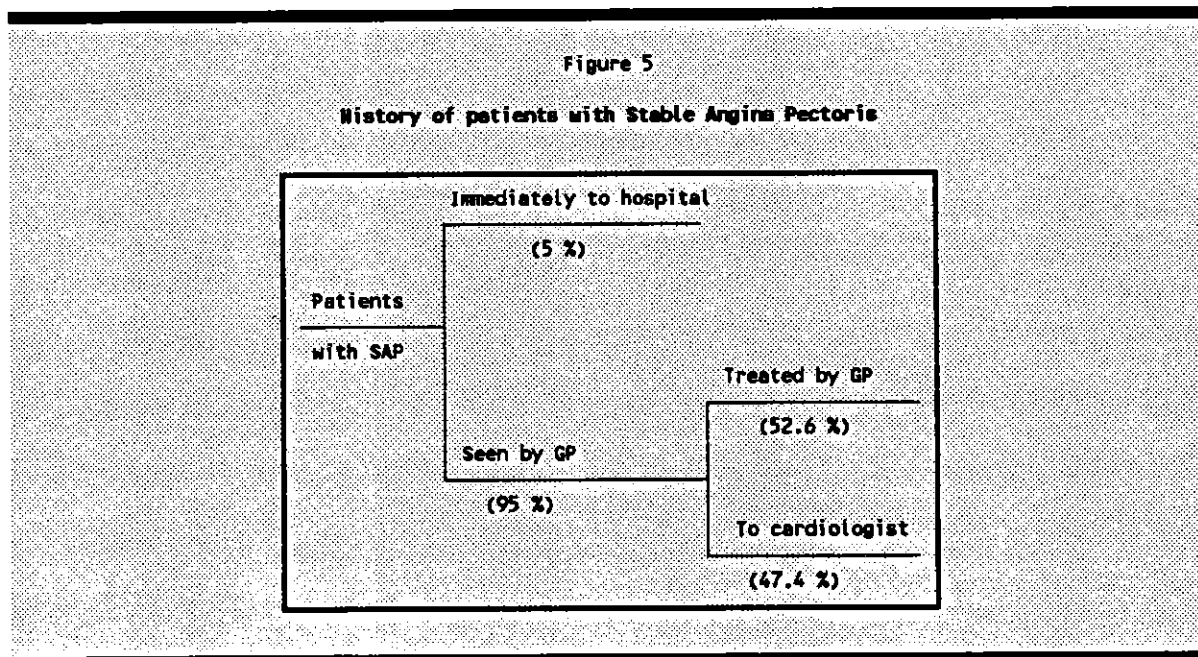
- 1) Cost 1 : 819 (Visit GP)  
267,457 (Expected Hospital costs)  
45,329 (Expected follow-up and drug costs)
- 2) Cost 2 : 67,942 (Cost for treatment AMI-patient at home)
- 3) Cost 3 : 819 (Visit GP)
- 4) Cost 4 : 267,457 (Expected Hospital costs)  
45,329 (Expected follow-up and drug costs)

## 2. STABLE ANGINA PECTORIS

### 2.1 Overview

Stable angina pectoris in patients is (in most cases) not immediately diagnosed as such by the GP. In many cases the physician is likely to have diagnosed initial complaints as rheumatism or a cold.

The interviewed GPs estimate that 5 % of the patients go immediately to the hospital in order to consult a specialist. The other 95 % first consult the GP : 50 % are treated by the GP himself and 45 % are referred to the hospital. These events are presented in Figure 5. Note that patients with SAP are assumed to have the same mortality rate as the average population between 35 and 74, i.e 1,3 %.



## 2.2 GP care

The patients who are treated by the GP, consult him 4 times during the first year whereas one blood examination is ordered. The number of consultations decreases to two during following years. Each year a blood examination is performed. After the fifth year, the symptoms subside and patients no longer consult the GP.

The following drugs are prescribed :  $\beta$ -blockers (in 60 % of the cases), long acting nitrates (50 %), calciumantagonists (50 %), digitalis (60 %), diuretics (50 %) and anti-arrhythmics (20 %). Except for long acting nitrates, the therapy is continued on average until the fifth year after diagnosis. The dose of long acting nitrates is lowered after the first month and the therapy is stopped at the fourth month after diagnosis. Patients who are referred to the cardiologist are seen once a year by the GP for follow-up.

Taking into account the probabilities of death and discounting the future costs at a 5 % discount rate, we obtain an expected cost of 80,899 BEF.

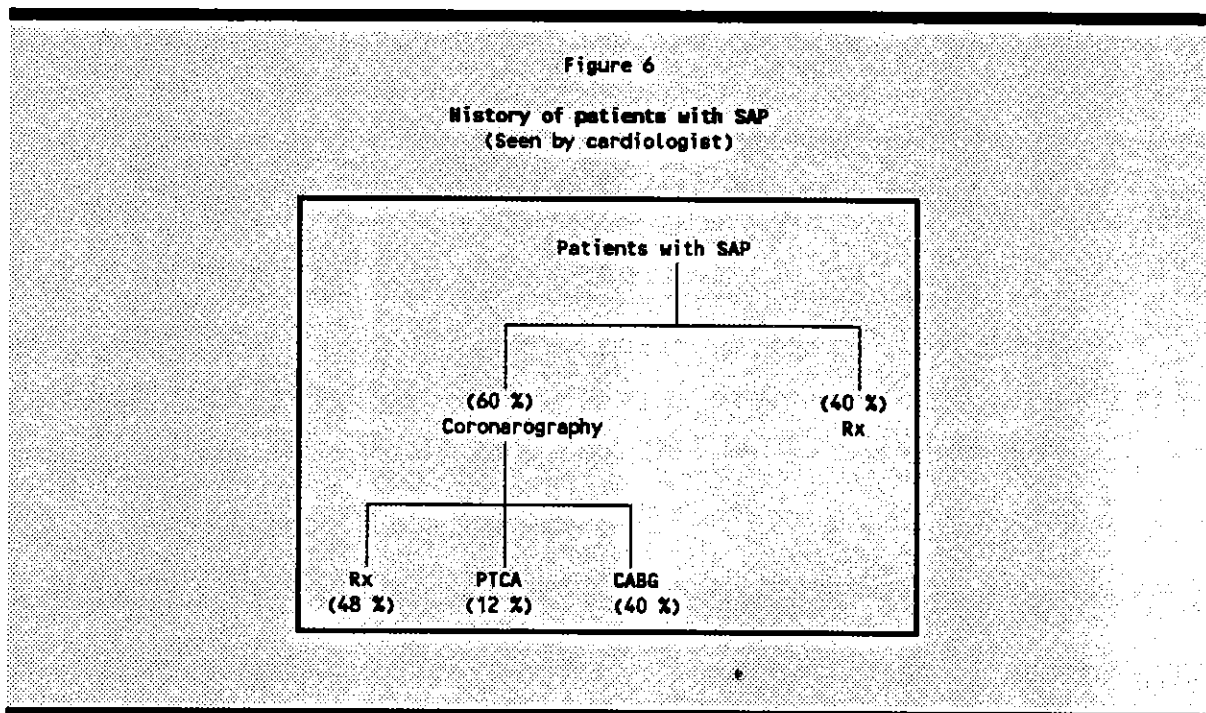
## 2.3 Care by Cardiologist

### 2.3.1 History of SAP-patients

Stable Angina Pectoris is the least dangerous disease among

the three Coronary Heart Diseases considered. Consequently no hospital admission is required if no coronarography, PTCA or CABG are to be performed. The history of patients with SAP is relatively simple. From section 2.1 we know that a large number of these patients are not seen by the cardiologist, but are treated by the GP instead.

The history of those who visit the cardiologist is shown in Figure 6. A distinction is made between the patients who are receiving a drug therapy only (40 %) and the patients receiving a coronarography (60 %). This coronarography informs the cardiologist about the need for further drug therapy or about the utility of a PTCA or a CABG.



### 2.3.2 Treatment of and costs for patients with SAP

Only a fraction of the patients with SAP needs to be hospitalized. Two visits to the cardiologist and a number of lab-tests are required for the work-up, which costs 15,276 BEF.

For those who get a drug therapy after work-up, only the costs for the pharmaceuticals and for the follow-up care have to be taken into account. We assume that follow-up care and drug therapy continue for five years and cost 102,268 BEF.

If coronarography, PTCA or CABG are necessary the treatment becomes more expensive. The costs of these procedures are calculated in section 4.

Taking into account the probability with which each strategy is followed (see Figure 4) and the unit costs of each strategy, we calculate the total expected treatment costs for patients who are referred to the cardiologist. They amount to 234,198 BEF. This rather important cost level is due to the fact that many patients have to undergo PTCA or CABG.

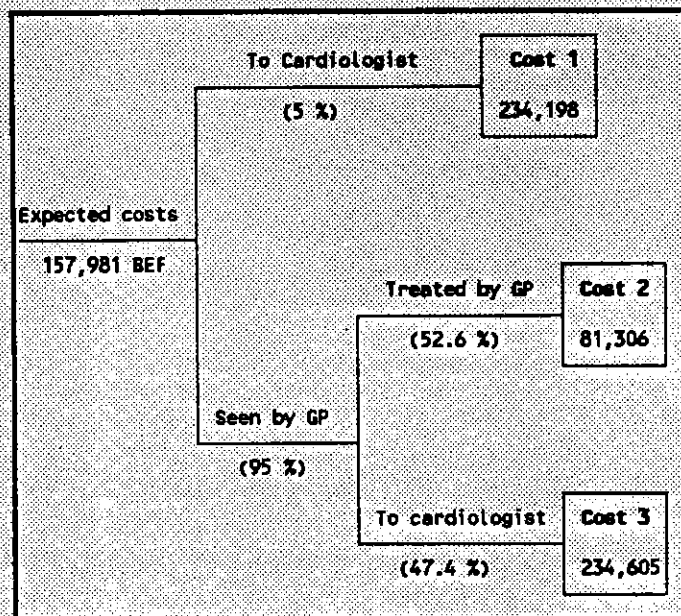
### 2.4 The expected costs for a SAP-patient

By combining the results of our calculations for GP-care and care by the cardiologist, we obtain the global expected costs for patients with SAP. We use Figure 7, which depicts the overall history of SAP-patients. Applying the same methodology as in section 1.6, results in global expected costs for SAP of 157,981 BEF



Figure 7

The expected total costs for SAP patients

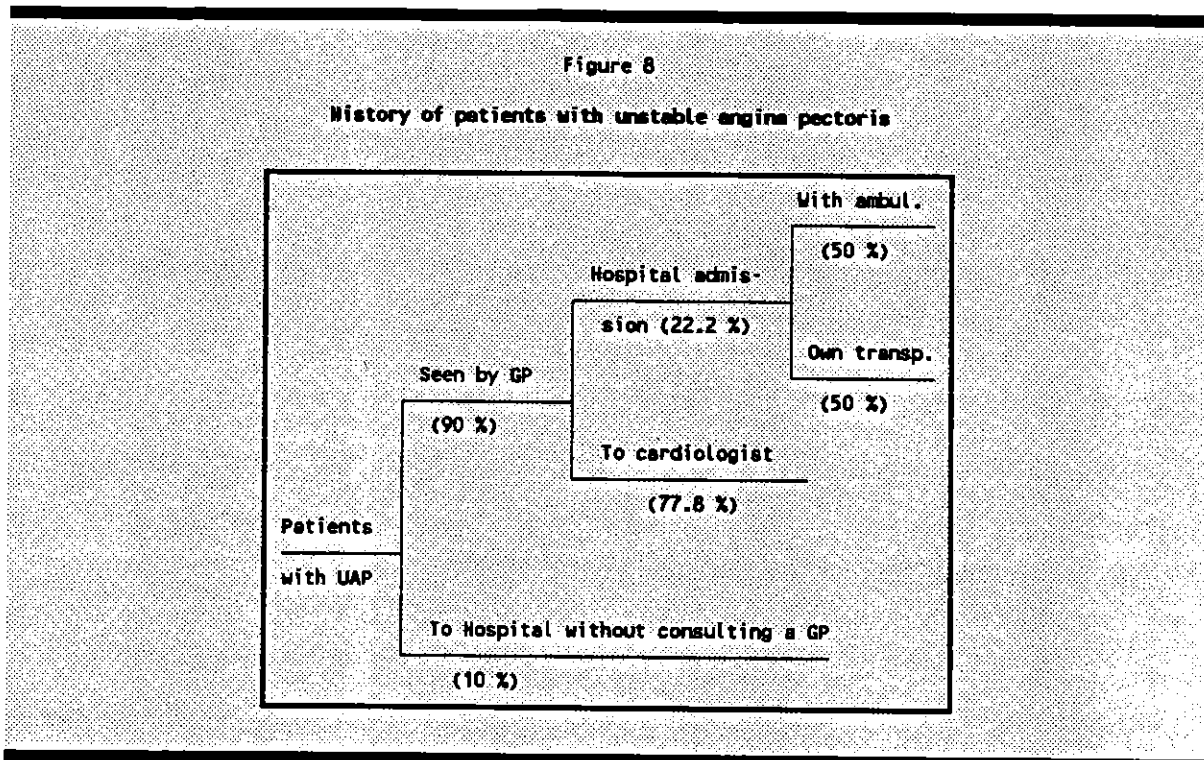


Note : Explanation of the costs :  
 1) Cost 1 : 234,198 (Care by cardiologist)  
 2) Cost 2 : 407 (Consultation GP)  
 80,899 (Treatment by GP)  
 3) Cost 3 : 234,198 (Care by cardiologist)  
 407 (Consultation GP)

### 3. UNSTABLE ANGINA PECTORIS

#### 3.1 Overview

10 % of the patients with unstable angina pectoris go immediately to the cardiologist without seeing a GP first. 20 % are seen by the GP who refers them to the hospital for admission (50 % with own transportation, 50 % with an ambulance). The other 70 % are referred to the cardiologist, who hospitalizes every patient with UAP. Figure 8 represents the history of a patient with UAP.



### **3.2 GP care**

From the previous section we know that all patients are seen by the cardiologist and hospitalized, whether they consult a GP first or go immediately to the hospital. Consequently, the GP has no active role in the treatment of UAP-patients. After the treatment by the cardiologist, most patients consult a GP for follow-up care. The costs of the latter care are discussed in section 3.5.

### **3.3 Transportation**

Figure 3.6 shows us that about 50 % of the patients are transported to the hospital in a standard ambulance. Applying the various fees for ambulance services (see section 1.3) to the average fare of 40 km, we obtain a transportation cost of 2,520 BEF per patient. Taking into account that only half of the patients with UAP are transported to the hospital by an ambulance, we calculate that the expected costs for transportation amount to 1,260 BEF.

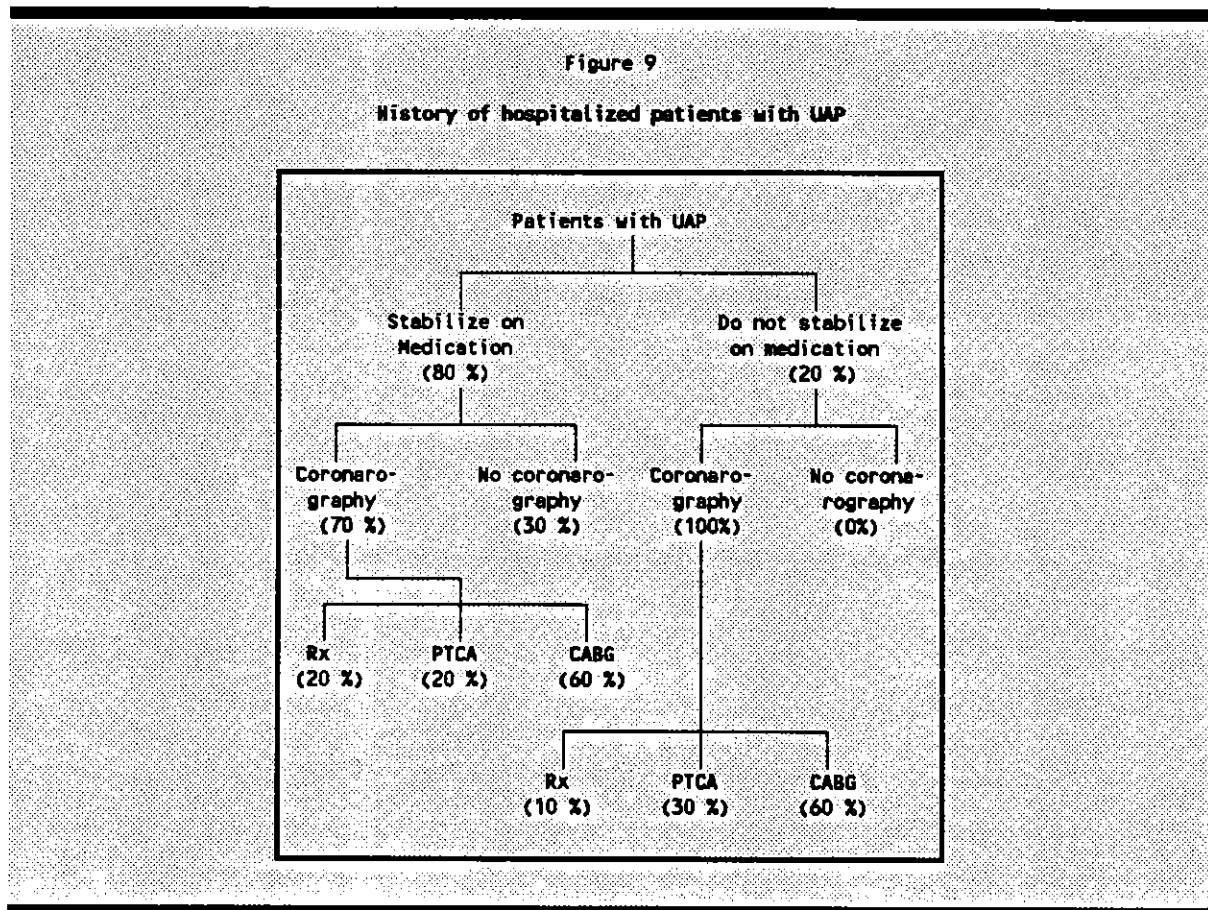
### **3.4 Hospital care**

#### **3.4.1 History of UAP-patients**

We assume that all patients with UAP are hospitalized. About 80 % of them stabilize on medication, the other 20 % do not. The panel gave various estimates of the probability of pa-

tients to receive a coronarography after stabilization on medication. Therefore, in our analysis we used the average probability of 70 %. 20 % of these patients continue drug therapy, 20 % are getting a PTCA and the remaining 60 % undergo CABG.

From Figure 9 we see that every patient who does not stabilize on medication, gets a coronarography. We repeat that this procedure informs the cardiologist about the need for continued drug therapy (only 10 %), for a PTCA (30 %) or a CABG (60 %).



### 3.4.2 Treatment of and costs for hospitalized UAP-patients

We know that all patients with UAP are admitted to the hospital. They first stay in the CCU and are then moved to the regular care ward. Some have to undergo a coronarography and, afterwards, a PTCA or a CABG. Appendix E presents the cost components in a more detailed way.

Every patient with UAP stays for five days in the CCU. The treatment of these patients is very similar to the treatment of patients with AMI in the CCU. They are continuously monitored. The total costs for the stay in the CCU amount to 78,806 BEF.

The stay in the regular care ward varied from 6 to 10 days. During this period four ECGs are taken. Some patients undergo an exercise, thallium and technetium test. Taking into account the probabilities by which these tests are performed, the expected costs for the stay in the regular care ward are 56,489 BEF.

From Figure 3.7 we know that some patients with UAP undergo coronarography and eventually PTCA or CABG. To allocate the costs for these procedures to the treatment of patients with UAP, we multiply the unit costs of the procedures by the probability of getting them when suffering from UAP. For expository's sake, we discuss those particular costs separately in section 4.

Taking into account the probabilities from Figure 7, we obtain the expected hospital costs for UAP-patients : 402,281 BEF.

We can conclude that treatment of UAP-patients is more expensive than that of AMI-patients. This is due to both the lower mortality rate and the fact that a considerable percentage of these patients have to undergo the rather expensive CABG.

### **3.5 Follow-up care and drug therapy for UAP-patients, stabilized on medication**

The Delphi panel estimates that 75 % of the patients are followed during the five years after their event. The annual mortality rate among these patients is assumed to be 4 %. Four visits are paid to the cardiologist and 10 to the GP on a yearly basis.

When the patient consults the cardiologist, often an ECG is taken. Further health services may include an echocardiography, lab-testing, chest X rays, etc. Considering the mortality rate after discharge from the hospital and of receiving the different procedures, we obtain the 'unit' costs for follow-up : 28,811 BEF

We make the same assumption as in section 1.5 concerning the duration of drug therapy and the dose administered. Only the probability that a particular drug is prescribed will be different between AMI and UAP-patients. The calculations to obtain a 'unit cost' for drug therapy are presented in the Appendix E. The unit cost amounts to 25,704 BEF.

From Figure 7 we know that only a small part of the patients with UAP will stabilize on medication. Therefore the expected

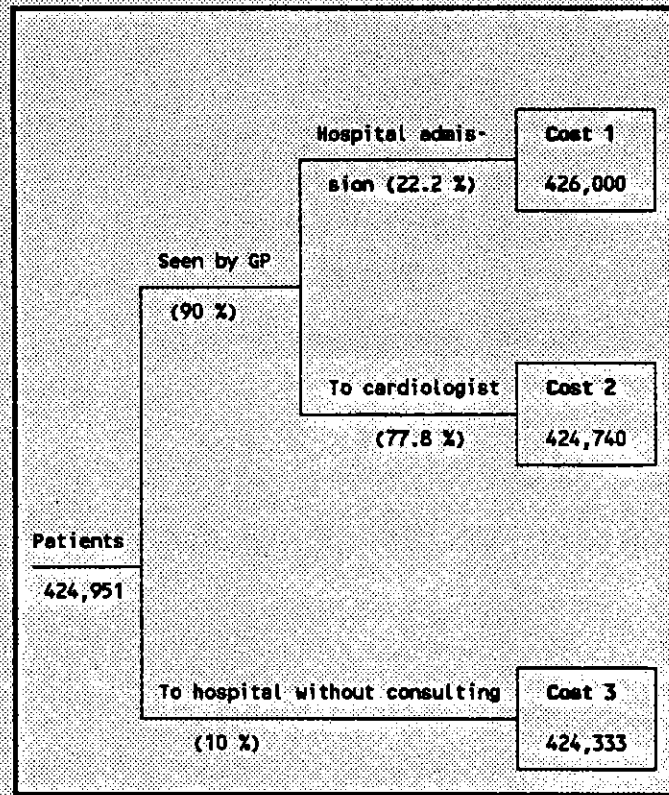
costs of follow-up care and drug therapy for a patient with UAP will be smaller than the sum of the two unit costs, namely 22,052 BEF.

### **3.6 Expected costs for UAP-patients**

The previous analysis of the different costs enables us to calculate the 'total expected costs' for patients with Unstable Angina Pectoris. To do so, we use Figure 10. At the end of each branch we put the appropriate cost. By multiplying these costs with the probabilities, we obtain the expected costs for UAP patients : 424,951 BEF.

Figure 10

The expected total costs for UAP patients



Note : Explanation of the costs :

- 1) Cost 3 : 402,281 (Hospital Care)  
22,052 (Follow up + Drugs)
- 2) Cost 2 : Cost 3 + 407 (GP-consultation)
- 3) Cost 1 : Cost 2 + 1,260 (Transportation)



#### 4. COSTS OF CORONAROGRAPHY, PTCA AND CABG

While describing the treatment pattern for AMI, SAP and UAP, we mentioned that some patients get a coronarography, a PTCA or a CABG. Cost data concerning these procedures were derived from 60 patient records. The latter were obtained from three hospitals.

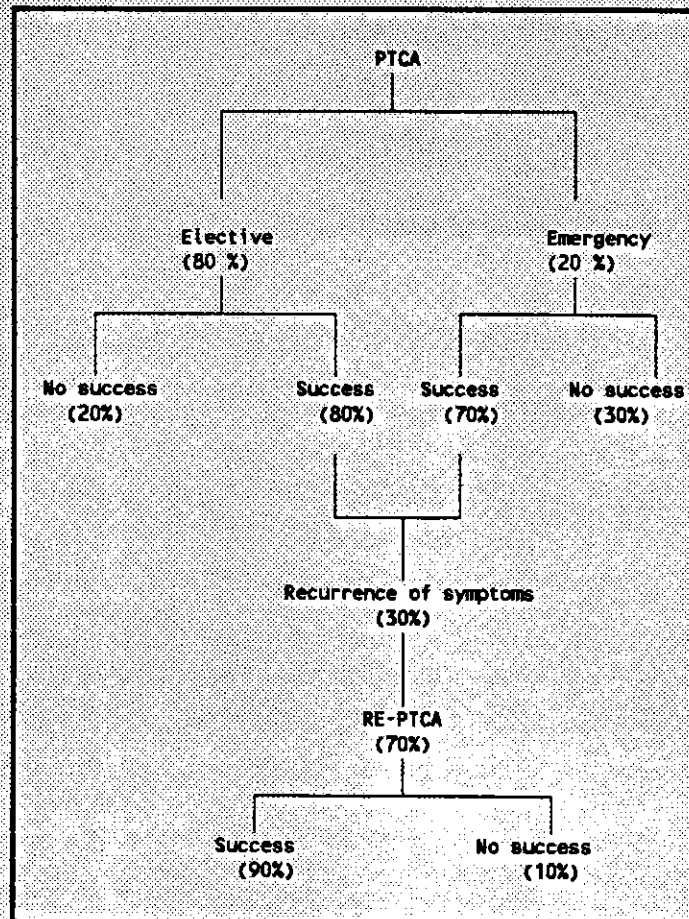
The average stay in the hospital for a coronarography is 2.4 days, which results in 13,093 BEF hotel costs. The services administered by the X-ray department and the cardiology department account for 29,940 BEF. The laboratory testing costs about 10,000 BEF (including lump sum and payment for each test). The total cost of a coronarography amounts to 56,180 BEF.

The average hospital stay of patients undergoing PTCA is 4.25 days. The drugs used are rather expensive (7,409 BEF) and the services from the X-ray and cardiology department cost about 50,000 BEF. Further a catheter and other materials are required. These calculations result in a total cost of 145,296 BEF. The latter amount assumes absence of complications. Of course, the costs of possible complications have to be taken into account (emergency bypass surgery and myocardial infarction). We also add the costs for repeat PTCA and CABG after unsuccessful PTCA. In Figure 11, we model the history of patients after PTCA. The expected costs of the tree designed below represent the 'unit' costs of PTCA. They amount to

214,515 BEF. These unit costs have to be incorporated in the trees for AMI, UAP and SAP.

Figure 11

History of patients after PTCA



Note : After an unsuccessful PTCA, 80 % of the patient get a CABG.

The average stay in the hospital of patients undergoing a Coronary Artery Bypass Grafting (CABG) is 12 days. Drugs and materials used cost about 7,300 BEF. 76,400 BEF have to be paid for the surgery and 65,000 BEF for the anesthesia. Total hospital costs are 339,212 BEF. We assume that these patients

receive follow-up care during five years and that 7 % of them die annually. Details concerning the follow-up care can be found in Appendix F. If no complications occur, CABG costs 395,067 BEF. Taking into account complications such as peri-operative mortality, repeated surgery after CABG and Acute Myocardial Infarction during surgery, the expected costs increase to 418,920 BEF.

## 5. CONCLUSION

In the cost analysis for different cardiovascular diseases, we have selected Acute Myocardial Infarction, Stable Angina Pectoris and Unstable Angina Pectoris. In agreement with two GPs and six cardiologists, we described an average treatment pattern for these diseases. We distinguished between GP care, Hospital care and follow-up care. In addition, the costs for coronarography, Percutaneous Transluminal Coronary Angioplasty (PTCA) and Coronary Artery Bypass Grafting (CABG). Costs for AMI, SAP and UAP amount to 233,769 BEF, 157,981 BEF and 424,951 BEF, respectively.

The results of the present study are used further in a cost-effectiveness analysis of cholesterol lowering therapy with simvastatin vs. the treatment with cholestyramine. We report on this analysis in Tormans et Al. (Seso-paper).

**Appendix A : Unit costs for various services**

<b>Hospital Care</b>	<b>Unit costs</b>
Hospital stay (per day)	5,429
Lump sum payments	
Lab-testing per day	448
Other	6,311
Dynamic monitoring	
First day	4,081
2th-5th day	3,571
EKG Monitoring	
First day	1,701
2th-5th day	1,275
Oxygen	
First day	4,081
2th-21st day	3,571
Cardiac output	1,956
Resuscitation	5,748
Echocardiography	1,734
Temporary pacemaker	2,551
EKG	574
Chest X ray	718
Lab tests	
Cardiac enzymes	88
Creatinine	16
Liver	132
Bloodsugar	12
Lipids	80
Urine analysis	36
Blood count	138
Electrolytes	51
Cardiac rehabilitation	287
Dietary counseling	300
Exercise testing	850
Thallium Test	11,136
Technetium test	4,118
Holter monitoring	3,569
Telemetry	3,569
Lung function	2,040

<b>AMBULATORY</b>	<b>Unit Costs</b>
GP consultation	407
Cardiol. consultation	713
Lab tests	
Cardiac enzymes	350
Creatinine	63
Liver	532
Bloodsugar	47
Lipids	318
Urine analysis	144
Blood count	400
Electrolytes	207
Lump Sum	270

Unit costs for ambulatory lab-testing

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	BEF
<b>CARDIAC ENZYMES</b>	
LDH	100
LDH-isoenzymes	250
<b>BLOOD COUNT</b>	
Sedimentation rate	38
Hemoglobin	48
Erythr.	33
Leukocytes	26
Formula	63
Hematocret	133
Thrombocytes	59
<b>CREATININE</b>	
Creatinine	63
<b>LIVER</b>	
Alc. Fosfatase	63
Gamma-GT	105
GPT	73
GOT	73
GIDH	105
LAP	113
<b>BLOOD SUGAR</b>	
Glucose	47
<b>LIPIDS</b>	
Triglyceriden	141
Cholesterol	78
NDL-Cholesterol	99
<b>URINE ANALYSIS</b>	
Microscop.	53
Albumine	44
Glucose	47
<b>ELEKTROLYTES</b>	
Sodium	69
Potassium	69
Chloride	69

Unit costs for hospital lab-testing

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	BEF
<b>CARDIAC ENZYMES</b>	
LDH	25
LDH-isoenzymen	63
<b>BLOOD COUNT</b>	
Sedimentation rate	26
Hemoglobin	33
Erythr.	8
Leukocytes	7
Formula	33
Hematocret	33
Thrombocytes	15
<b>CREATININE</b>	
Creatinine	16
<b>LIVER</b>	
Alc. Fosfatase	16
Gamma-GT	26
GPT	18
GOT	18
GIDH	26
LAP	28
<b>BLOOD SUGAR</b>	
Glucose	12
<b>LIPIDS</b>	
Triglycerides	35
Cholesterol	20
HDL-Cholesterol	25
<b>URINE ANALYSIS</b>	
Microscop.	13
Albumine	11
Glucose	12
<b>ELECTROLYTES</b>	
Sodium	17
Potassium	17
Chloride	17

Appendix B : Unit costs for drugs

**B-Blockers : atenolol [Tenormin<sup>R</sup>]**  
49 x 100 mg : 1,184 BEF

**Digitalis : digoxine [Lanoxin<sup>R</sup>]**  
120 x 0,25 mg : 192 BEF

**Diuretics : furosemide [Lasix<sup>R</sup>] + triamtereen [Dytac<sup>R</sup>]**  
50 x 40 mg : 340 BEF + 28 x 50 mg : 299 BEF

**Calcium Antagonists : nifedipine [Adalat<sup>R</sup>]**  
100 x 10 mg : 714 BEF

**Long Acting Nitrates : nitroglycerine [Nysconitrine<sup>R</sup>]**  
100 x 2,5 mg : 422 BEF

**Anti-Arithmics : amiodaronhydrochloride [Cordarone<sup>R</sup>]**  
60 x 200 mg : 781 BEF

**Anti-coagulants : acenocoumarol [Sintron<sup>R</sup>]**  
100 x 1 mg : 123 BEF

**ACE inhibitors : captopril [Capoten<sup>R</sup>]**  
45 x 25 mg : 846 BEF



**Appendix C : Costs for AMI-patients**

**Treatment costs for a patient with an AMI by GP (in BEF)**

	EXPECTED COSTS
<b>FIRST DAY</b>	
- Visit	819
- Visit	544
- ECG	1,360
- Blood (cardiac enzyme)	557
<b>SECOND DAY</b>	
- Visit	544
<b>THIRD DAY</b>	
- Visit	544
- ECG	1,360
<b>AFTER A WEEK</b>	
- Visit	544
- Extended blood	3,222
<b>AFTER TWO WEEKS</b>	
- Visit	544
<b>AFTER A MONTH</b>	
- Visit	544
- ECG	1,360
<b>DURING FIRST YEAR (*)</b>	
- Consultation	379
- ECG	1,265
- Extended Blood	2,996
<b>DURING YEAR 2 (*)</b>	
- Consultation (2x)	670
- ECG (2x)	2,240
- Extended Blood (2x)	5,308
<b>DURING YEAR 3, 4, 5 (*)</b> (each year)	
- Consultation (1x)	793
- ECG (1x)	2,694
- Extended Blood (1x)	6,277
<b>TOTAL</b>	<b>34,519</b>

Note : \* The expected costs are calculated, taking into account :

- The probability that a particular drug is prescribed
- The mortality rate after AMI (7 %)
- The discount rate (5 %)

**Medication costs for treatment of AMI by GP**

	% of patients for which the drug is prescribed	Expected Costs
B-Blocker	50 %	16,327
Digitalis	50 %	761
Diuretics	50 %	4,594
Nitrates	20 %	127
Calcium-antag.	20 %	11,350
Analgesics	100 %	264
<b>TOTAL</b>	--	<b>33,423</b>

Note: The expected cost is calculated, taking into account:

- The probability that a particular drug is prescribed
- The mortality rate after AMI (7 %)
- The discount rate (5 %)

**Stay in CCU (AMI-Patients)**

	Number	% of patients	Expected costs
Days	4	100	21,716
Dynamic monitoring			
First day	1	100	4,081
2th-5th day	3	100	10,713
ECG Monitoring			
First day	1	100	1,701
2th-5th day	3	100	3,825
Oxygen			
First day	1	100	4,081
2th-21st day	3	100	10,713
Cardiac output	8	100	15,648
Resuscitation	1	10	575
Echocardiography	1	51	884
Temporary pacemaker	1	7,5	191
ECG	6	100	3,444
Chest X ray	2	100	1,436
Lab tests			
Cardiac enzymes	7	100	868
Creatinine	2	100	32
Liver	1	100	132
Bloodsugar	3	100	36
Lipids	1	100	80
Urine analysis	2	100	72
Blood count	3	100	414
Electrolytes	3	100	153
<b>TOTAL</b>			<b>80,796</b>

Stay in regular care ward (for AMI patients)

	Number	% of patients	Expected costs
Days	8	100	43,432
ECG	4	100	2,296
Cardiac rehabilitation	8	75	1,722
Dietary counseling	1	75	225
Exercise testing	1	70	595
Thallium Test	1	47	5,234
Technetium test	1	30	1,235
Holter monitoring	1	55	1,963
Echocardiography	1	100	1,734
Telemetry	1	40	1,428
Resuscitation (+ CCU)	1	3,5	3,029
Lung function	1	15	306
Lump sum payments			
Lab-testing per day	12	100	5,376
Other	1	100	6,311
TOTAL	7	100	74,886

**Follow-up care (AMI-Patients)**

	Number	% of patients	Expected Costs
<b>First year</b>			
Number of visits			
GP	10	100	3,790
Cardiologist	4	100	2,652
ECG	4	90	1,922
Chest X ray	4	100	359
Lab-tests			
Blood count	1	100	372
Lipids	1	100	396
Sugar	1	100	44
Urine analysis	1	100	134
Lump Sum	1	100	251
Exercise Testing	1	45	356
Technetium test	1	35	1,441
Echocardiography	1	45	726
Holter monitoring	1	50	1,660
<b>TOTAL (80 % of hospitalized AMI patients are followed)</b>			<b>12,202</b>
-----			
<b>Following years</b>			
Number of visits			
GP	6	100	6,768
Cardiologist	2	100	3,952
ECG	2	100	3,182
Lab-tests			
Blood count	1	70	776
Lipids	1	70	617
Sugar	1	70	91
Urine analysis	1	70	279
Lump sum	1	70	748
Exercise testing	1	65	1,531
Echocardiography	1	30	1,442
<b>TOTAL (70 % of hospitalized AMI patients are followed)</b>			<b>13,571</b>

**Drug therapy (AMI-Patients)**

	%	Expected
	of	Costs
	patients	
<b>First year</b>		
Anticoagulants	26	54
B-Blocking agents	65	5,331
Long-acting nitrates	60	848
Ca antagonists	45	3,272
Digitalis	25	97
Diuretics	40	1,044
Anti-arrhythmics	15	331
ACE inhibitors	20	638
<b>TOTAL (80 % followed)</b>		<b>9,293</b>
=====		
<b>Following years</b>		
B-Blocking agents	55	13,446
Long-acting nitrates	45	812
Ca antagonists	35	3,252
Digitalis	14	70
Diuretics	25	834
ACE inhibitors	13	1,236
<b>TOTAL (70 % followed)</b>		<b>13,755</b>

**Appendix D : Costs for SAP-patients**

**Costs for the treatment of a patient with SAP by GP (in BEF)**

	EXPECTED COST
<b>I. TREATED BY GP (medication excluded)</b>	
<b>FIRST YEAR</b>	
- Consultation (4x)	1,628
- Extended blood	2,577
<b>DURING YEAR 2 to 5</b>	
- Consultation (2x)	2,760
- Extended Blood (1x)	8,736
<b>SUBTOTAL</b>	<b>15,701</b>
<b>II. DRUG PRESCRIPTIONS BY GP</b>	
B-Blocker (60 %)	23,167
Digitalis (60 %)	1,080
Diuretics (50 %)	5,968
Nitrates (50 %)	318
Calcium antag. (50 %)	34,223
Anti-arhythmics (20 %)	442
<b>SUBTOTAL 2</b>	<b>65,198</b>
<b>III. TOTAL</b>	<b>80,899</b>

Note : The expected costs are calculated, taking into account :

- Probability that each drug is prescribed
- A 5 % discount rate
- A mortality rate of 1,3 %

Work-up for SAP-Patients

	Number	% of patients	Expected Costs
<b>Number of visits</b>			
GP	4	100	1,628
Cardiologist	2	100	1,426
ECG	1	100	574
Chest X ray	1	100	964
Exercise Testing	1	100	850
Thallium test	1	50	5,568
Technetium test	1	50	2,059
<b>Lab-testing</b>			
Blood count	1	100	400
Electrolytes	1	100	207
Creatinine	1	100	63
Cardiac Enzymes	1	100	496
Liver	1	100	532
Blood sugar	1	100	47
Lipids	1	100	318
Urine Analysis	1	100	144
Lump Sum	1	100	270
<b>TOTAL</b>			<b>15,276</b>

**Drug treatment (For SAP-Patients)**

	X of patients	Expected Costs
<b>First year</b>		
Anticoagulants	20	44
B-Blocking agents	55	21,178
Long-acting nitrates	50	1,786
Ca antagonists	50	9,190
Digitalis	16	157
Diuretics + anti-ar- rhythmics	15	1,318
<b>TOTAL</b>		<b>33,673</b>

**Follow-up care for SAP-patients**

	Number	% of patients	Expected Costs
<b>Number of visits</b>			
GP	10	100	17,820
Cardiologist	3	100	11,163
ECG	3	100	7,539
Exercise testing	1	100	3,721
Thallium Test	1	50	24,373
<b>Lab-tests</b>			
Blood count	1	100	1,751
Lipids	1	100	1,392
Sugar	1	100	206
Urine analysis	1	100	630
Lump Sum	1	100	1,182
<b>TOTAL</b>			<b>68,595</b>



**Appendix E : Costs for UAP-patients**

**Stay in CCU (For UAP-patients)**

	Number	% of patients	Expected Costs
Days	5	100	27,145
Dynamic monitoring			
First day	1	100	4,081
2th-5th day	4	100	14,284
ECG Monitoring			
First day	1	100	1,701
2th-5th day	4	100	5,100
Oxygen			
First day	1	100	4,081
2th-21st day	4	100	10,284
Cardiac output	8	100	15,648
Echocardiography	1	50	867
Thallium Test	1	25	2,784
ECG	7	100	4,081
Chest X ray	1	100	718
Lab tests			
Cardiac enzymes	7	100	868
Creatinine	2	100	32
Liver	1	100	132
Bloodsugar	3	100	36
Lipids	1	100	80
Urine analysis	2	100	72
Blood count	3	100	414
Electrolytes	3	100	153
<b>TOTAL</b>			<b>78,806</b>

**Stay in regular care ward (for UAP patients)**

	Number	% of patients	Expected Costs
Days	8	100	43,432
ECG	4	100	2,296
Exercise testing	1	70	595
Thallium Test	1	47	5,234
Technetium test	1	30	1,235
Holter monitoring	1	55	1,963
Echocardiography	1	100	1,734
Lump sum payments			
Lab-testing per day	13	100	5,824
Other	1	100	6,311
<b>TOTAL</b>	<b>7</b>	<b>100</b>	<b>82,193</b>

**Follow-up care (UAP-Patients)**

	Number	% of patients	Expected Costs
<b>Number of visits</b>			
GP	10	100	16,460
Cardiologist	4	100	8,796
ECG	2	90	4,644
Chest X ray	4	100	1,547
<b>Lab-tests</b>			
Blood count	1	100	1,617
Lipids	1	100	1,286
Sugar	1	100	190
Urine analysis	1	100	582
Lump Sum	1	100	1,092
Exercise Testing	1	45	1,547
Echocardiography	1	45	2,407
<b>TOTAL (75 % followed)</b>			<b>29,630</b>

**Drug treatment (For UAP-Patients)**

	% of patients	Expected Costs
<b>First year</b>		
Anticoagulants	50	44
B-Blocking agents	80	21,178
Long-acting nitrates	50	1,786
Ca antagonists	20	9,190
Diuretics	5	157
Anti-arrhythmics	5	1,318
<b>TOTAL</b>		<b>33,673</b>

Appendix F : Costs for Coronarography, PTCA and CABG

	CABG	Coronaro- graphy	PTCA
Number of days	12	2.4	4.25
Hotel costs	65,148	13,093	23,253
Lump sum payments			
Drugs	37,787	2,355	7,409
Anesthesia	65,505	0	0
Surgery	76,408	0	0
Cardiology + Radiology	28,987	29,940	48,806
Physiotherapy	11,608	0	0
Lab-testing	6,268	3,339	2,284
Other	35,392	0	55,307
<b>TOTAL</b>	<b>339,212</b>	<b>56,180</b>	<b>145,296</b>

Appendix G : Sources for cost data about CHD

	IHE	Moni- ca	GPs	Cardio- logist	Del- phi	Re- cords
<b>AMI</b>						
Overview	X	X	X			
GP-treatment			X			
Hospital treatment				X	X	
Follow-up + drug therapy				X	X	
Mortality after hospit.				X		
<b>SAP</b>						
Overview			X			
GP-Treatment			X			
Treatment by Cardiologist					X	
Mortality after event				X		
<b>UAP</b>						
Overview			X			
GP-Treatment			X			
Hospital Treatment					X	
Follow-up + drug therapy					X	
Mortality after event				X		
<b>Coronarography</b>						X
<b>CABG</b>					X	X
<b>PTCA</b>						X

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1. IHE is the acronym for 'Instituut voor Hygiëne en Epidemiologie' of the Ministry of Public Health. This institute collects data about major diseases which are treated by a large number of general practitioners in Belgium. There is also asked for the incidence of Acute Myocardial Infarction and for the mortality within two hours, one day, one month and one year as a consequence of AMI. Following publications have been used :
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  - 2) VAN CASTEREN, V., VAN DER VEKEN, J. and LION, J. De morbiditeit in België in 1987; Registratie door de huisartsenpeilpraktijken. Instituut voor hygiene en epidemiologie. Maart 1989.
2. WHO-MONICA-GHENT-CHARLERLOI. Verslag over de activiteiten van de registers van acute coronaire aanvallen in Gent en Charlerloi tijdens het kalenderjaar 1986.
3. Personal communication from Dr. Verhoeven, Ministry of Health.
4. In some cases the 'unit cost' of a procedure is itself equal to the weighted sum of the cost components. For instance, to calculate the 'unit cost' of CABG, we have taken into account the probability and the costs of peri-operative mortality, of complications, etc.

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