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**The disease impact, health care management,
and costs of stroke in the Netherlands**

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Abstract

Stroke is a major chronic disease with a high morbidity and mortality. In the Netherlands about 30,000 people a year suffer a stroke for the first time. One third of these stroke patients dies within the first year after stroke, and 41% of the survivors experience limitations in their daily activities.

The aim of this report is to give an overview of the disease impact, health care management, and costs of stroke in the Netherlands. First, we present the epidemiological trends of stroke in recent years, by describing the incidence, prevalence and mortality of stroke, and the relationship with its major risk factors.

Then, we describe the Dutch health care system, its recent developments, and its bottlenecks and limitations of the Dutch health care system. Finally, an overview is presented of the use of health care resources due to stroke in the Netherlands, the supply of physicians, stroke units, and the total drug expenditure and consumption by defined daily dosage. Special attention is given to the costs of stroke in 1993, the lifetime costs, and the future costs of stroke.

This report is part of the OECD-Ageing-Related Disease Project entitled “Cross-national difference in the treatment, costs and outcomes of stroke”.

Preface

This main purpose of this report is to provide information for the OECD-Ageing-Related Disease project entitled “Cross-national difference in the treatment, costs and outcomes of stroke”. The objectives of this project are to examine how treatment variations for stroke may be influenced by institutional factors, and economic incentives, and to quantify the consequences either in terms of costs or of health outcomes. This project investigates whether differences in health care spending and resource allocation may affect health outcomes. For this project data are collected up to year 2000. The information gauged in this report is based on the templates provided by the OECD, and is therefore a selection of the information available in the Netherlands. This study is a cooperation between the Department for Health Service Research of the National Institute of Public Health and the Department of Health Organisation, Policy and Economics of the Maastricht University. The report successively analyses epidemiological stroke trends, major stroke risk factors, bottlenecks in stroke care, Dutch policy and the health care system in relation to stroke, and the costs of stroke.

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The authors

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Samenvatting

Een beroerte is zowel in medisch als in sociaal-economisch opzicht een belangrijke aandoening. Per jaar worden in Nederland ongeveer 30.000 personen voor de eerste keer getroffen door een beroerte. Van alle patiënten met een beroerte overlijdt eenderde binnen het eerste jaar na de beroerte. Van alle overlevenden ondervindt 41% als gevolg van de beroerte beperkingen bij het uitvoeren van activiteiten in het dagelijks leven. Het doel van dit rapport is om informatie te verschaffen voor het OECD-Ageing-Related Disease project getiteld “Cross-national difference in the treatment, costs and outcomes of stroke”.

Het project beoogt na te gaan in hoeverre mogelijke behandelingen van patiënten met een beroerte worden beïnvloed door bijvoorbeeld institutionele factoren of economische prikkels. Daarnaast worden de gevolgen van een beroerte gekwantificeerd in termen van zowel kosten, als gezondheidsuitkomstmaten. Voorts wordt onderzocht in hoeverre verschillen in gezondheidsuitgaven en middelentoewijzing van invloed zijn op de gezondheidsuitkomsten.

Hoofdstuk 1 geeft een beschouwing van de epidemiologische trends van een beroerte. Om te beginnen, worden de incidentie en de mortaliteit ten gevolge van een beroerte gedurende de afgelopen jaren weergegeven. Vervolgens worden enkele belangrijke risicofactoren (cholesterol, hypertensie, body mass index, tabaksconsumptie) voor een beroerte beschreven. Het doel van hoofdstuk 2 is om inzicht te verschaffen in het Nederlandse gezondheidszorgbeleid en de economische karakteristieken van het Nederlandse gezondheidszorgsysteem, in relatie tot de zorg voor patiënten met een beroerte. In deze beleidsanalyse wordt de relatie tussen private en publieke zorgverzekeringen besproken. Daarnaast worden andere belangrijke aspecten van het Nederlandse gezondheidszorgsysteem besproken, zoals eigen bijdrage, wetgeving en financiering van de gezondheidszorg.

Hoofdstuk 3 geeft een gedetailleerde samenvatting van belangrijke knelpunten in de zorg voor patiënten met een beroerte in Nederland. Voorts wordt weergegeven hoe recent beleid poogt om deze belemmeringen weg te werken. Nieuwe ontwikkelingen in de zorg aan patiënten met een beroerte worden in dit hoofdstuk beschreven, waaronder stroke units, stroke services, TIA-poli's en consensus richtlijnen voor behandeling van patiënten met een beroerte.

Hoofdstuk 4 gaat verder in op het gezondheidszorgaanbod in Nederland, door de OECD aangemerkt als een belangrijke indicator voor kwaliteit van zorg voor patiënten met een

beroerte. Het hoofdstuk geeft informatie over het aanbod aan specialisten, stroke units, en de consumptie en uitgaven geneesmiddelen in daily defined dosage.

In hoofdstuk 5 wordt het gebruik van voorzieningen ten gevolge van beroerte in Nederland gepresenteerd. Speciale aandacht gaat uit naar de ziekenhuisopnamen ten gevolge van een beroerte. Tot slot worden de kosten van beroerte in 1993, de levenslange kosten van een beroerte en de toekomstige kosten van een beroerte weergegeven.

Summary

Stroke is a major disease both in medical and in socio-economic terms. In the Netherlands about 30,000 people a year suffer a stroke for the first time. Of these stroke patients one third dies within the first year after the stroke and 41% of the survivors experience limitations in their daily activities. The aim of this report is provide information for the OECD-Ageing-Related Disease project entitled “Cross-national difference in the treatment, costs and outcomes of stroke”. The objectives of this project are to examine how treatment variations for stroke may be influenced by institutional factors, economic incentives. In addition the consequences of a stroke are quantified both in terms of costs and health outcomes. This project investigates furthermore, whether differences in health care spending and resource allocation may affect health outcomes.

Chapter 1 outlines the epidemiological trends of stroke. Initially, stroke incidence and stroke mortality in recent years are presented. Then, the developments in some major of stroke risk factors (cholesterol, hypertension, body mass index, tobacco consumption) are described. The purpose of Chapter 2 is to provide insight into Dutch health care policy and the economic characteristics of the Dutch health care system, particularly how it affects the health care services for stroke. In this policy analysis the relationship between private and public health insurance is described. Other crucial aspects of the Dutch health care system are described such as cost sharing, regulations, and financing of the health care services. Chapter 3 presents a detailed summary of the bottlenecks in stroke care in the Netherlands. Further emphasis is placed on how recent policy developments try to meet these limitations. New developments in stroke treatment described in this chapter encompass stroke units, stroke services, TIA-outpatients' clinics and stroke consensus guidelines. Chapter 4 reports data on health care supply in the Netherlands, which is regarded as a relevant indicator for the quality of stroke care. Information is provided on the supply of physicians, stroke units, and the total drug expenditures and consumption by defined daily dosage. Chapter 5 presents the use of resources due to stroke in the Netherlands. Special attention is given to hospital admission due to stroke. Finally calculations will be given on the cost of stroke in 1993, the lifetime costs and the future cost of stroke.

1. Epidemiology

1.1 Incidences ischaemic and haemorrhagic stroke

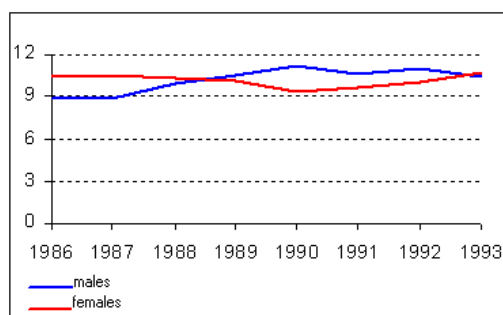


Figure 1: Prevalence of stroke (per 1,000)
Source: VTV 97 (1)

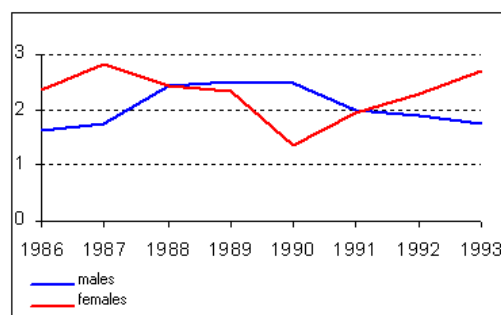


Figure 2: Incidence of stroke (per 1,000)
Source: VTV 97 (1)

In the Netherlands there is no recent population-based registration that allows for insight into the prevalence and incidence of stroke. The most recent population-based source is the Tilburg Stroke Study (2), which estimates the annual incidence at 1.7 per 1,000, 1.5 of which are first ever strokes. In the Netherlands the incidence and prevalence figures for stroke are often based on GP-registrations. The average incidence in 1994 based on these registrations is estimated to be 1.7 per 1,000 for men and 2.0 per 1,000 for women; the average prevalence in 1994 ranges from 5.6 per 1,000 for men and 5.4 per 1,000 for women (1). Stroke is a disease of the old age. The prevalence rate above 55 years is estimated to be 25.2 per 1,000 for men and 27.7 per 1,000 for women. As the figures 1 and 2 show, the incidence and prevalence rates have been rather stable during recent years (1).

1.2 Mortality for both ischaemic and haemorrhagic stroke

Stroke is the leading cause of death for women and the third cause of death for men (3). In the Netherlands the annual age-adjusted stroke mortality dropped between 1972 and 1986 (4), afterwards the decline in mortality levelled off. Overall in 1999 9% of the deaths were caused by stroke (3).

Figure 3 shows the mortality by cause of death, age and gender per 1,000,000 of the average population in 1995. It clearly shows that mortality due to stroke occurs predominantly in the old-age groups.

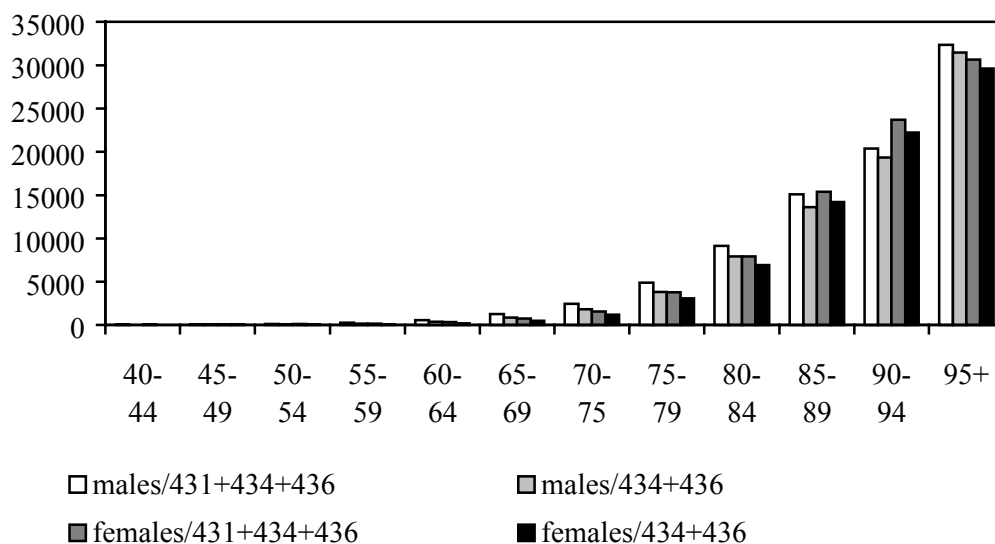


Figure 3: Death by cause, age and gender per 1,000,000 of the average population in 1995

Source: CBS (3, 5)

1.2.1 Place of death

The majority of the stroke patients in the Netherlands are admitted to the hospital. Stroke patients of 80 years and over and patients who had a stroke before are less likely to be admitted to a hospital (6). Table 1, based on hospital registrations and the causes of death statistics (5, 7), gives an overview of the number of stroke patients who died inside and outside the hospital in the period 1980 to 1993. The ratio clearly shows that for ischaemic stroke the number of deaths is higher outside the hospital, while death due to haemorrhagic stroke is more often occurs inside the hospital.

Table 1: Absolute numbers of deaths inside and outside the hospital

year	ischaemic (431)			haemorrhagic (434+436)			all stroke		
	inside	outside	ratio inside/ outside	inside	outside	ratio inside/ outside	inside	outside	ratio inside/ outside
1980	2744	4723	0.58	724	586	1.24	3468	5309	0.65
1981	2784	4623	0.60	820	586	1.40	3604	5209	0.69
1982	3015	4437	0.68	857	564	1.52	3872	5001	0.77
1983	2894	4219	0.69	862	517	1.67	3756	4736	0.79
1984	3067	4453	0.69	926	550	1.68	3993	5003	0.80
1985	3063	4587	0.67	990	468	2.12	4053	5055	0.80
1986	3049	4554	0.67	1031	329	3.13	4080	4883	0.84
1987	2866	4535	0.63	1020	310	3.29	3886	4845	0.80
1988	3086	4723	0.65	1023	323	3.17	4109	5046	0.81
1989	3022	4631	0.65	1132	226	5.01	4154	4857	0.86
1990	3067	4732	0.65	1172	269	4.36	4239	5001	0.85
1991	2932	5089	0.58	1268	273	4.64	4200	5362	0.78
1992	3000	4862	0.62	1357	339	4.00	4357	5201	0.84
1993	2985	5442	0.55	1438	315	4.57	4423	5757	0.77

Source: CBS (5, 7) and SIG/PRISMANT (7).

1.2.2 Hospital case fatality

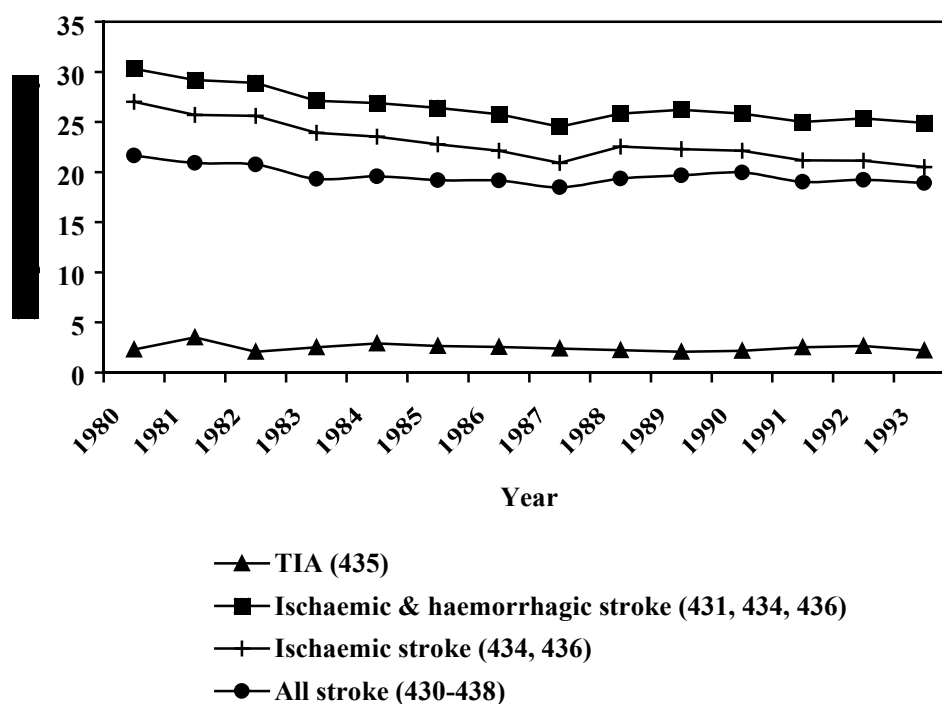


Figure 4: Hospital case fatality for stroke

Figure 4 gives an overview of the in-hospital case fatality rate for stroke per year. For all strokes the case fatality rate has dropped since 1980. In general the case fatality rate is the highest for haemorrhagic stroke (ICD-431), i.e. 56 % in 1980 to 45% in 1993. For ischaemic

stroke (ICD 434 and 436) the rate decreased from 27% in 1980 to 21% in 1993. For TIA the rate is, of course, the lowest and varies between 2% and 3% during the whole period. In the Netherlands there are no national figures to calculate the 30 days, 6 months and 1-year inhospital case fatality. In this report the figures of the ROSA (Research On Stroke Amsterdam) study are used to calculate the 7 days, 30 days, 6 months and 1-year case fatality, for both in- and outside the hospital (i.e. no hospital case fatality, but overall case fatality). For the 7 days, 30 days, 6 months and the 1-year case fatality we were able to calculate the inhospital fatality rates as these time intervals correspond with the ROSA measurement points. The population in the ROSA study consisted of 760 patients consecutively admitted because of stroke (within one week after onset) to 23 hospitals in the Netherlands. Stroke in this study was defined according to the WHO-definition as the sudden onset of focal neurological dysfunction or loss of consciousness lasting more than 24 hours or leading to death presumably due to cerebral vascular disease (8). Table 2 gives the case fatality figures, both inhospital and overall.

Table 2: Inhospital case fatality and overall case fatality based on the ROSA study (n=760)

	inhospital case fatality	overall case fatality
7 days	13.9%	14.1%
30 days	21.8%	22.4%
6 months	26,3%	33.8%
1 year	26.3%	36.6%

Source: ROSA Data modified by J. Struijs

1.3 Risk factors

In this paragraph attention is paid to the major risk factors for stroke, i.e.:

- Cholesterol
- Hypertension
- Body Mass Index
- Tobacco consumption.

1.3.1 Cholesterol

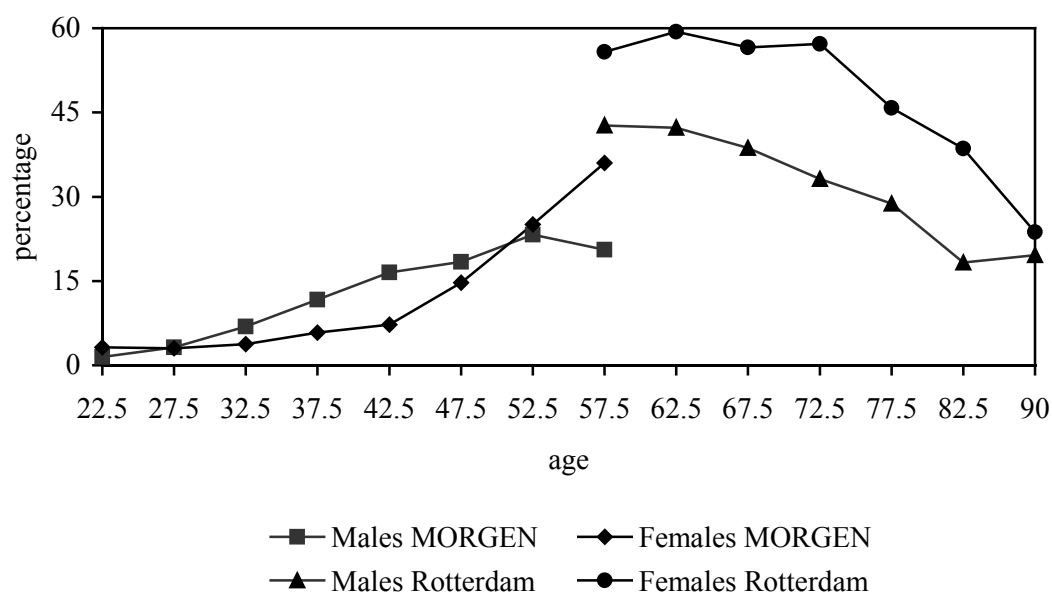


Figure 5: Prevalence (%) of hypercholesterolaemia by age and gender

Population studies have repeatedly demonstrated a strong association between high serum and high LDL cholesterol concentration and cardiovascular diseases (9).

Figure 5 gives an overview of the prevalence of hypercholesterolaemia by age for both men and women in the Netherlands. Hypercholesterolaemia is defined in this figure as serum cholesterol levels of 6.5 and higher mmol/l. Separate data sources were used to compose this figure, i.e. the MORGEN study and the Rotterdam study. The Monitoring Project on Risk factors for Chronic Diseases or MORGEN study provided data on a probability sample of the general population aged 20-59 years in the Netherlands. In this cross-sectional study males and females were examined regarding their body weight, height, total cholesterol, high-density lipoprotein (HDL) cholesterol, blood pressure, (including questions concerning demographic variables). In the Rotterdam study (or ERGO study) the prevalence and determinants of chronic diseases, including stroke, in the elderly (age ≥ 55 years) were investigated in inhabitants of Ommoord, a suburb of Rotterdam. The number of participants was 7983 (3105 men, 4878 women). Differences in outcomes between the two studies can be explained by regional difference, difference in period of measurement (MORGEN 1993-1995; Rotterdam 1990-1993), and differences in the measurement methods.

From the figures of the MORGEN-study and the GP-registration (Peilstations) (see figure 6), it appears that the prevalence of hypercholesterolaemia significantly decreased in the period 1987 to 1997, i.e. 6.7 and 8.7 percent, for males and females respectively.

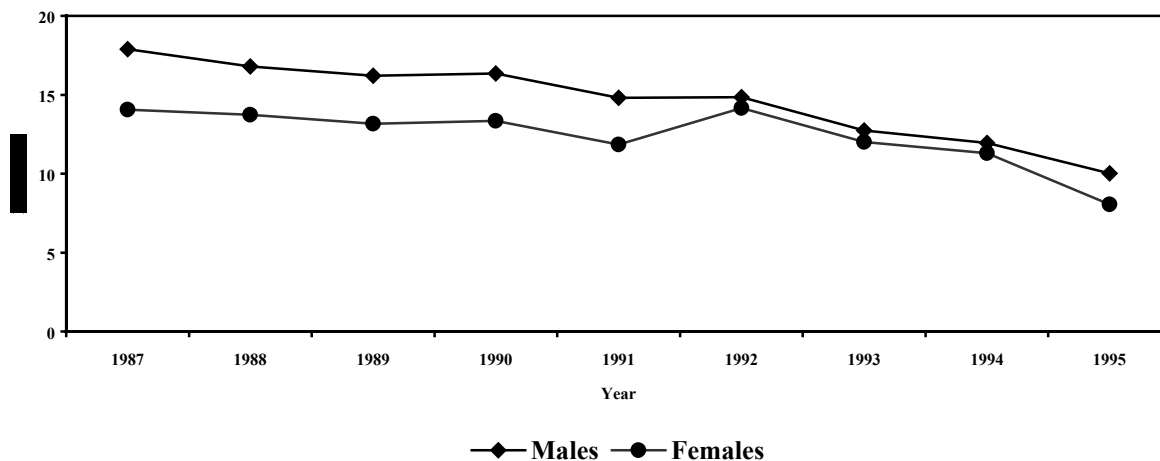


Figure 6: Prevalence (%) of hypercholesterolaemia in the period 1987-1995

1.3.2 Hypertension

The continuous relationship between the level of blood pressure and the risk of cardiovascular events, and the arbitrary nature of the definition of hypertension have contributed to the variation in the definitions issued by various national and international authorities (10). Accordingly, in order to reduce confusion and provide more consistent advice to clinicians around the world, the WHO-ISH Guidelines Committee has agreed to adopt in principle one definition. Hypertension is defined as a systolic blood pressure of 140 mmHg and higher and/or a diastolic blood pressure of 95 mmHg and higher in subjects who are not taking antihypertensive medication. Based on the same sources as used for the measurement of cholesterol, figure 7 gives insight in the prevalence of hypertension by age and sex in the period of 1990 to 1995.

This definition is also used in the Netherlands (1) and is also applied in this report. Yet, in the new consensus guidelines for the Netherlands another definition was put forward (11). In these guidelines hypertension is defined as a systolic blood pressure of 140 mmHg and higher and/or a diastolic blood pressure of 90 mmHg for persons younger than 65 years. For persons over 65 years the hypertension limit for systolic blood pressure is 160 mmHg (11).

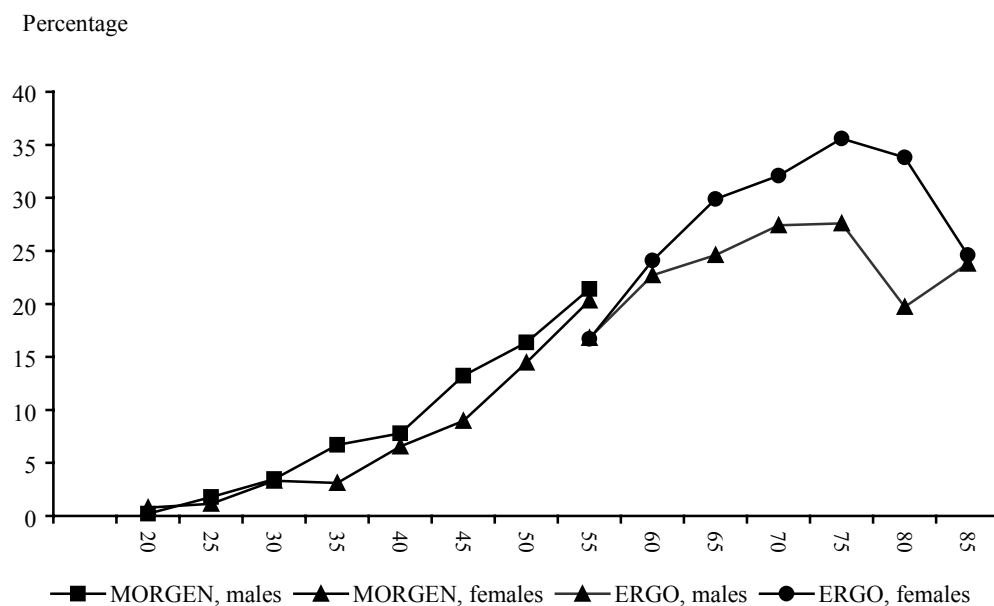


Figure 7: Prevalence (%) of hypertension by age and gender in the period 1990 -1995

Based on the weighted average, it is estimated that the prevalence of hypertension in the age group 20 and over is 10% for males and 13% for females. Generally the prevalence of hypertension increases with age. However, in the old-old age group the prevalence of hypertension decreases, due to selection bias and stiffness of the vascular wall (1).

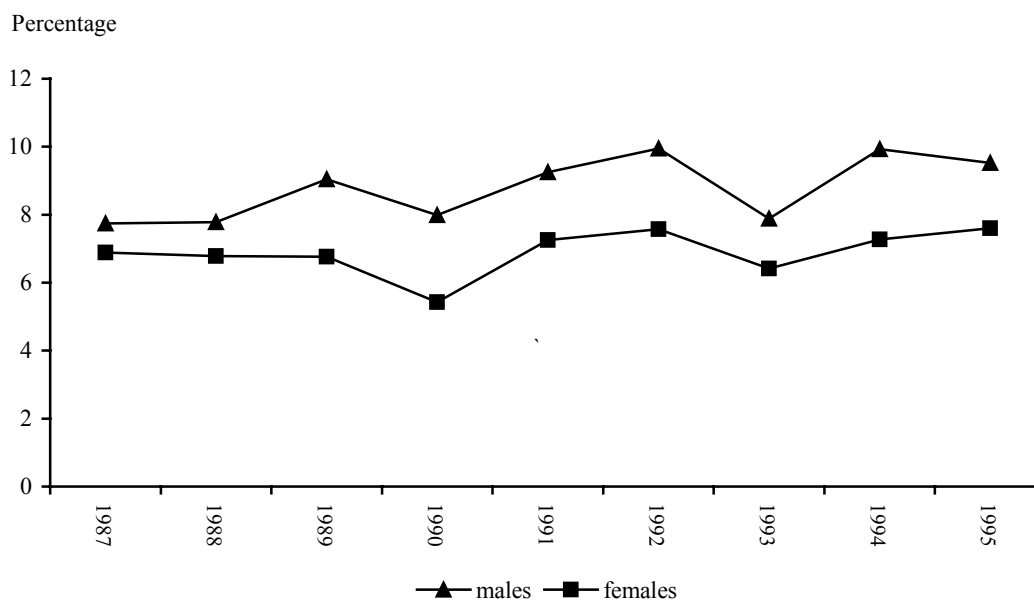


Figure 8: Prevalence (%) of hypertension by gender in the period 1987 - 1995

In the period 1987 to 1995 the prevalence of hypertension slightly increased (see figure 8). For the age-group of 20-59 years this increase was 1.7 and 1.8 percent for males and females respectively.

Table 3 gives an overview of the stroke incidence and mortality risks due to an 10 mmHg increase in the systolic bloodpressure by sex and age (12).

Table 3: Stroke incidence and mortality risks for increase of systolic blood pressure with 10 mmHg

Age	Incidence	Mortality
0-34	1.2	1.3
35-59	1.1	1.3
60-69	1.1	1.2
70-79	1.1	1.1
80+	1.1	1.1

Table 3 shows that an increase of 10 mmHg in the systolic bloodpressure results in an increase in both the stroke incidences and the stroke mortality. The differences between the various age groups are shown to be small.

1.3.3 Body Mass Index

Obesity can be classified by using the Body Mass Index or BMI. The BMI is computed by using the following formula $BMI = \text{weight (kg)} / (\text{height in meters})^2$. A person is classified as obese, if his/her BMI is higher or equal to 30.

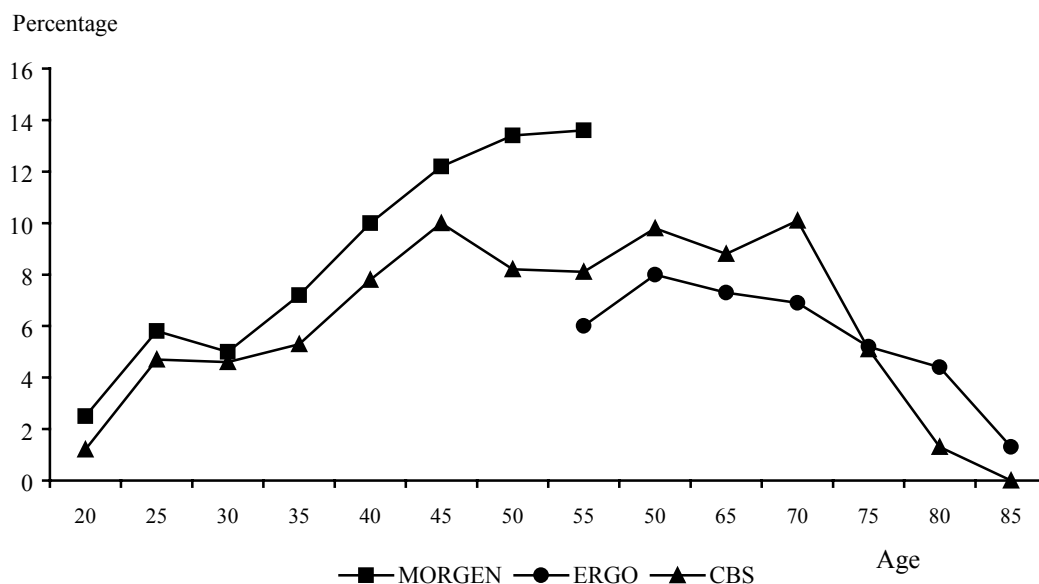


Figure 9: Prevalence (%) of male obesity (BMI ≥ 30) by age

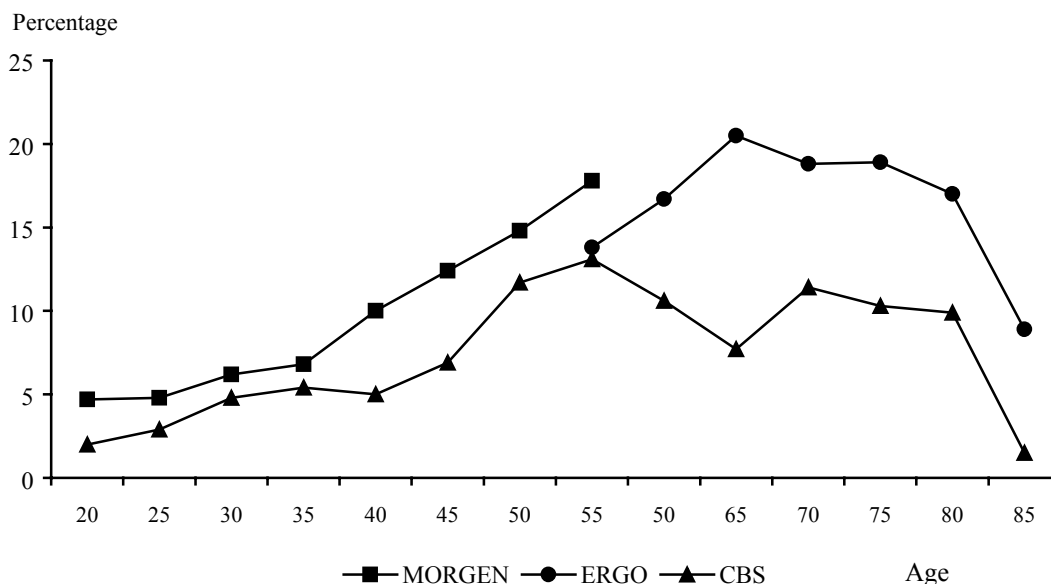


Figure 10: Prevalence (%) of female obesity (BMI ≥ 30) by age

Figures 9 and 10 present the prevalence of obesity by gender and age based on three sources; Statistics Netherlands, the MORGEN study, and the Rotterdam study. For persons of 20 and over the prevalence of obesity in males is 7% and for females 11%. The prevalence increases

with age till the age of 60 to 70 years, then to decrease again. For the differences between the MORGEN study and the Rotterdam study no explanation can be given. The lower obesity rate of Statistics Netherlands might be due to the fact that weight is underestimated in the self-assessed health interview survey, which is used to compute this rate.

1.3.4 Tobacco consumption

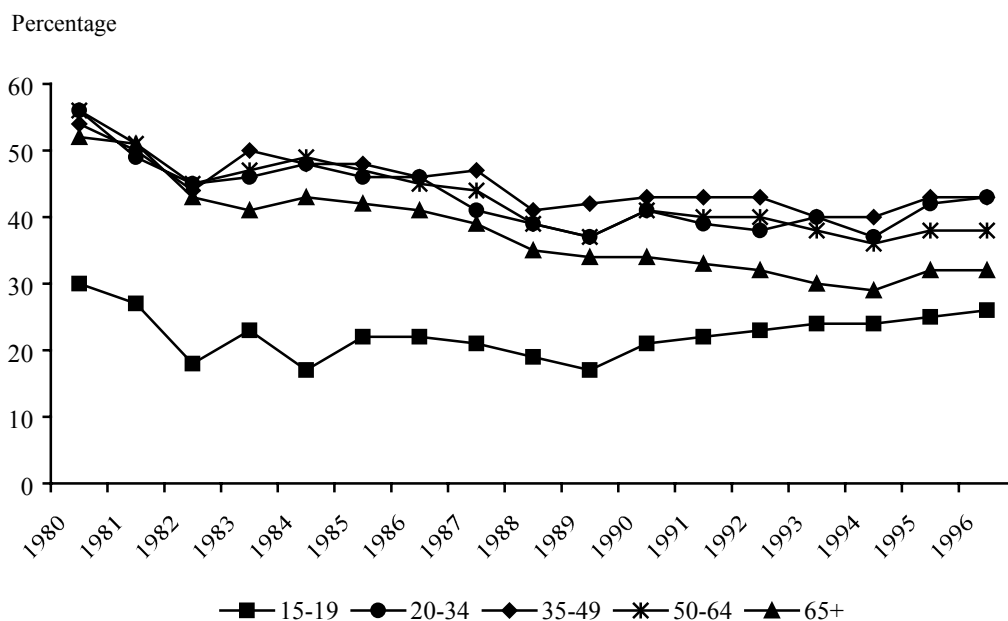


Figure 11: Percentage male smokers by age (15+) and gender in the period 1980 - 1996

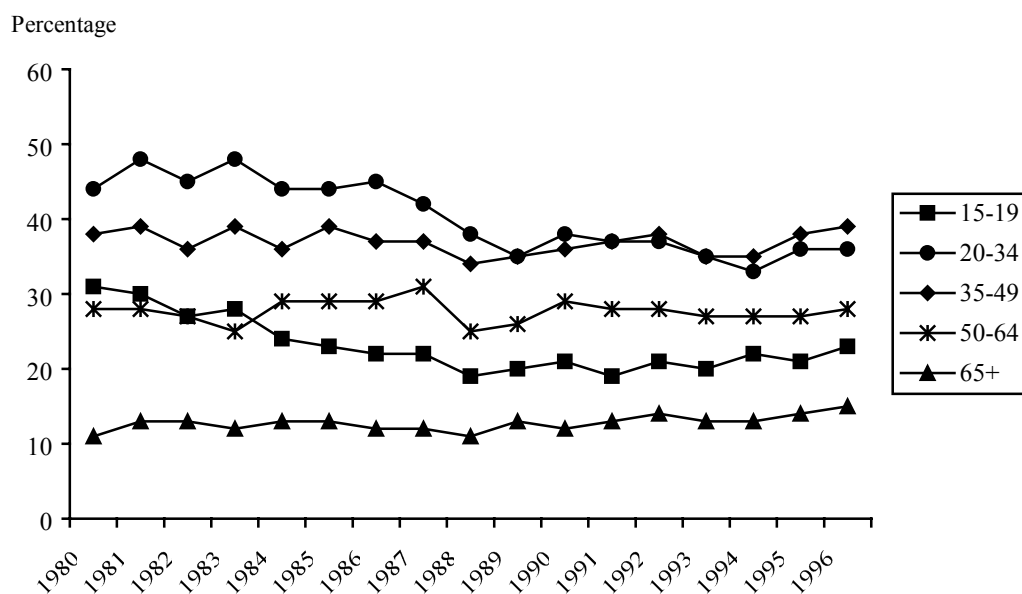


Figure 12: Percentage female smokers by age (15+) and sex in the period 1980 - 1996.

During recent years the percentage of smokers is rather stable (figure 11 and 12). These figures are based upon data from the Foundation for Public Health and Smoking (STIVORO). The Foundation for Public Health and Smoking (STIVORO) bases their figures on a nationwide sample of 20,000 persons aged 15 and over. Data from this organisation show that in the period 1958 to 1990 the percentage of male smokers (do you ever smoke?) decreased. The percentage of female smokers increased between 1958 and 1970, to decrease slightly after 1970. Since the beginning of the Nineties the percentages of male and female smokers are more or less stable.

Table 4 gives the relative risks of tobacco consumption for stroke specified by age and gender (12).

Table 4: Stroke mortality risks for current smokers

Age	Male	Female
0-34	1	1
35-59	3.6	6.3
60-69	2.5	2.6
70-79	1.8	2.2
80+	1.1	1

The relative risks of tobacco consumption increase with age till the age of 60 then to decrease again.

2. Policy Tables

2.1 Introduction

Table 5: Health insurance of the Dutch inhabitants in 1999

Insurance	1999	Percentage of population
Health Insurance Fund	9,938,000	62.8
Private Insurance Fund	4,798,000	30.3
Public Law Scheme	786,000	5.0
Non-insured	291,000	1.8
Total Netherlands	15,813,000	100.0

Source: Statistics Netherlands (13)

One of the main characteristics of the Dutch health care system is the mix between public and private financing (14). The largest parts of the health care facilities are financed by the Health Insurance Act (36,8%) and the Exceptional Medical Expenses Act (36,8%), smaller parts are financed by the Privately Insured (14%) and directly by the government (5%). Among OECD countries the Netherlands is second only to the United States in the share of private health insurance (14). About 63% of the population are members of a health insurance fund, about 30% have taken out private health insurance voluntary, and about 5% have a medical insurance under a public law scheme (i.e. public servants). A very small percentage of people are not insured at all, some of them on the grounds of their beliefs or convictions.

2.2 Health Insurance Act

The majority of the Dutch population is insured under the Health Insurance Act (*Ziekenfondswet*). Insurance under the Health Insurance Act is statutory: every person who meets the criteria spelled out in the act is automatically insured and consequently obliged to pay the statutory contribution irrespective of whether that person intends to make use of the benefits provided by the act (14). People insured under the Health Insurance Act are mainly employees (70% of the insured) with an income below a certain maximum (NLG 64,600.00 (EUR 29,314.20) in 2000). Besides people who live on social security, senior citizens (aged 65 and over and income below NLG 41,100.00 (EUR 18,650.37) in 2000), and self-employed

persons (income below NLG 41,200.00 (EUR 18,695.74)) can be insured under the Health Insurance Act. The Health Insurance Act provides health care insurance in kind and covers the basic medical health care facilities including general practitioner (gp) and paramedic care, pharmaceutical care, specialist medical care, medical devices, inpatient hospital care and rehabilitation. For inpatient hospital care and rehabilitation the Health Insurance Act covers only the first 365 days. After this period the Exceptional Medical Expenses Act (AWBZ) will come into effect.

People not covered by the Health Insurance Act, i.e. public servants, self-employed, or people above an income with a certain maximum are privately insured, although the options are limited as the different private insurances look alike.

Table 6: Coverage of Public Health Insurance and Availability and Use of Private Health Insurance

Public: Health Insurance Act		Residual Insurance: Private Insurance, Public Law Scheme		
Universal	Services excluded from coverage related to stroke	Availability	Use	% of population covered
Yes	Yes, covered by the Exceptional Medical Expenses Act (AWBZ) ¹	Yes	People not covered by the Health Insurance Act, self-employed or people above an income with a certain maximum	30.3

¹ The public Exceptional Medical Expenses Act (AWBZ) is concerned with very severe financial burdens as a result of serious long-term illnesses or disorders. Facilities not covered by this Act are in general covered by the normal health insurance (that can either be statutory under the Health Insurance Act or private health insurance). In general all Dutch residents are covered for all services relevant to stroke.

2.3 Exceptional Medical Expenses Act

In addition to the above health insurance there is a public health insurance scheme, which covers the whole population against major medical risks, independent of income. The Exceptional Medical Expenses Act (AWBZ) is concerned with very severe financial burdens as a result of serious long-term illnesses or disorders. For all Dutch residents the insurance scheme under the Exceptional Medical Expenses Act is statutory, and insured persons are obliged to pay contribution laid down by law. Insured people who object to an insurance

scheme on the grounds of their beliefs or convictions pay additional income tax instead of contribution (14).

Coverage includes admission and stay in general hospitals, psychiatric hospitals, and rehabilitation centres after the first 365 days, and nursing home care, home care, and outpatient psychiatric care.

2.4 Cost-sharing

2.4.1 Introduction

In the Netherlands the question of co-payments by patients (whether or not patient charges for medical care are desirable), has been a frequently recurring health policy issue. Patient charges comprise a specific combination of different characteristics, which finally determines the amount of money an insured person has to pay out-of-pocket for using a service (15). In this report, only patient charges (out-of-pocket expenses) paid by patients who are insured under the Health Insurance Act and the Exceptional Medical Expenses Act are dealt with. An important and frequently used restriction is that charges should have no in adverse effects. Therefore, there should be a maximum to the total out-of-pocket expenditures per insured person or family per year, especially for those with the lowest income or health levels. This is one of the reasons why the cost-sharing contribution in the Netherlands is relatively low (15).

2.4.2 Cost-Sharing for Non-Drug Related Care

For inpatient care covered by the Health Insurance Act in general no cost sharing is requested. For inpatient care (mostly after 365 days) covered by the Exceptional Medical Expenses Act there is an income-related patient charge. If patients are admitted to a facility for a limited time or for a day or night only, they have to pay a low rate, which varies between NLG 220 (EUR 99.83) and NLG 1,155 (EUR 524.12) per year (rates with effect from 1 July 2000), depending on their income (16), e.g.:

- NLG 220 (EUR 99.83) if their income is below NLG 29,386 (EUR 13,334.79) per year;
- NLG 365 (EUR 165.63) if their income is between NLG 29,386 (EUR 13,334.79) and NLG 43,721 (EUR 19,839.72) per year;

- NLG 550 (EUR 249.58) if their income is between NLG 43,721 (EUR 19,839.72) and NLG 72,871 (EUR 33,067.42) per year;
- NLG 920 (EUR 417.48) if their income is between NLG 72,871 (EUR 33,067.42) and NLG 91,496 (EUR 41,519.07) per year;
- NLG 1,155 (EUR 524.12) if their income is above NLG 91,496 (EUR 41,519.07) per year.

Persons who are staying permanently in an inpatient facility and are covered by the Exceptional Medical Expenses Act, have to pay a higher rate depending on their income with a maximum of NLG 3,670 (EUR 1,665.37) per month in a home for the elderly, and a maximum of NLG 3,350 (EUR 1,520.16) in other facilities (16). Although in table 7 the co-payment figures for inpatient care are classified as modest, they might be high for those people who have a salary just above the income limit. High co-payments are especially likely to appear for those patient in these group who have cumulative costs due to comorbidities.

Table 7: Cost-Sharing for Non-Drug Related Stroke Care

Inpatient Care	Ambulatory Care			Co-payment		Detailed descriptions
	Specialist care	Diagnostic procedures	Rehabilitation	Exemptions	Reinsurance	
Yes, modest	None	None	None	Yes	None	See paragraph 2.4.2, exemptions to co-payment are possible depending on income; reinsurance is not possible

For ambulatory care there is no patient charge. However there are some restrictions to the care covered by the Health Insurance Act, such as a maximum of nine treatments of paramedic care. For chronic patients, such as stroke patients, additional treatments are covered if prescribed by the general practitioner and after consulting the health insurance company. If patients want to continue paramedic care beyond the limits set by the Health Insurance Act, they have to pay for it themselves.

2.4.3 Cost-Sharing for Drug Related Care

The Dutch government takes the control of the rise in drug expenditures seriously. Safe and affordable pharmaceutical care for all is the principle upon which the Dutch government's medicine policy is based (17). One of the main measures was the introduction of the drug reimbursement system (GVS) in 1991, which is relevant for outpatient drug care (18). Within the framework of this system therapeutically mutually interchangeable drugs are clustered by the Ministry of Health, Welfare and Sports. The therapeutic value of a product is determined by the full spectrum of both beneficial and adverse effects (19).

Table 8: Co-payments and Patient Cost-Sharing Policies for Drugs

Differentiation	Method	Exemptions to co-payments	Reinsurance of second-tier co-payment allowed?	Does reinsurance offset co-payment?
For outpatient care drug reimbursement system (GVS)	Therapeutically mutually interchangeable drugs are clustered with a reimbursement limit per cluster. If a patient needs a drug, the price of which exceeds its reimbursement limit, the difference must be paid by the patient him/ herself.	No	Not relevant, drug reimbursement system only applies (GVS) to outpatient care	No

The ministry sets a reimbursement limit per cluster. The maximum reimbursement for each product is set at the price level of the product immediately below the average price per cluster (19). If the patient is taking a drug, the price of which exceeds its reimbursement limit, the difference must be paid by the patient himself. For medicines newly brought onto the market the ministry decides whether they will be included in the basic package covered by the Health Insurance Act. The Minister has the authority to exclude out-of-date and/or obsolete medicines from the package (17).

2.5 Regulation for high technologies

Table 9: Impact of regulation on access to high technologies, waiting lists for diagnostic services

Capacity constraints on diagnostic technology		Intensity of wait for elective services		Waiting times for emergency		Queue jumping	Comment
Explicit	Targeted funding	MRI	CT Scan	MRI	CT Scan		
No	No	Some months	Some weeks	Insignificant waiting time		N.r.	Use of MRI as a diagnostic technology is still limited

N.r. = not relevant

According to the Dutch guidelines for Stroke of the Dutch Institute for Healthcare Improvement (CBO) (20-22) CT-scan is indicated within 24 hours after stroke. In the Netherlands the waiting times for a CT-scan are generally short (23). The same is true for MRI. However, it should be noted that the use of MRI as a diagnostic service is still limited. The use of MRI is expected to increase in the future, as MRI give; more information regarding the stroke, its causes and complications that CT -scan. and 6 hours after the stroke it is more sensitive than CT-scan (24). The insignificant waiting time refers to the emergency services. For elective service the waiting time is longer, and can increase to some weeks for CT-scans and even some months for MRIs.

There is no regulation for the access to above high technologies such as CT-scans and MRIs. The supply of top-clinical care facilities, such as neurosurgery, are however limited by the Special Medical Services Act (Wet op bijzondere medische verrichtingen).

2.6 Financing of hospitals

Table 10: Financing of Hospitals

Global budgets	Mixed - Case-Mix (DRG) and global budgets	Case-Mix (DRG)	Fee for service	Within budget constraint
Yes, based on 3 budget components	Not yet	Not yet	None	Not relevant

Hospital cost containment has been an important political issue. During the last decade, Dutch hospitals have been subject to extensive, and frequently changing government regulations on reimbursement. Currently, the Netherlands has a fixed functional budgeting system consisting of three budget components: availability (size of the clinical catchment area), capacity (number of beds, medical specialists), and production (number of hospital admissions, inpatient days, first outpatient visits, and day-care visits) (25).

As a consequence of changes in the reimbursement system the financial responsibility of hospitals increased. This increasing responsibility, together with a growing inter-hospital competition and negotiations with insurers, makes greater demands on cost information systems. These systems have to be far more elaborate than the regular hospital cost accounting systems that sufficed in the past (26).

2.7 Guidelines for carotid endarterectomy and thrombolytics

Table 11: Guidelines for Carotid Endarterectomy and thrombolytics

Carotid Endarterectomy				Thrombolytics
Degree of stenosis	Stroke facility ¹	Patient health	A-symptomatic patients	
Floor	Other than 70-99			
< 50	No	Combined operative morbidity and mortality of less than 5-7%	No limits	Degree of stenosis < 50, and combined operative morbidity and mortality of less than 2%
				rt-PA is recommended for a select group of patients following the NINDS trial

¹ This concerns specification of the performance of stroke facilities (e.g. maximum risk of death that is acceptable).

The Dutch Stroke guidelines of the Dutch Institute for Healthcare Improvement (CBO) (20-22) for endarterectomy of carotid stenosis are as follows: “Patients with a recent (< 6 months) amaurosis fugax or a (transitory) non-disabling ischaemic event and a symptomatic carotid stenosis of 70-99% at the symptomatic side are indicated for carotid endarterectomy in a centre with a combined operative morbidity and mortality of less than 5-7%. Carotid endarterectomy with a symptomatic carotid stenosis of 50-69% is recommended only if patients have no or little risk factors and in a centre with a low (2%) morbidity and mortality .. (guideline 14)”, and “It is plausible that carotid endarterectomy in patients with a-symptomatic carotid stenosis of > 50% will reduce the risk of getting a stroke. This risk-reduction is however limited and can only be reached in a centre with a low operative morbidity and mortality (2%). (guideline 15)”.

For trombolitics r-tPA may be used for a select group of patients, within 3 hours after the symptoms occurred and under very strict conditions (21). The guidelines are based on the guidelines of the National Institute of Neurological Disorders and Stroke (27).

2.8 Remuneration systems for specialists

Table 12: Remuneration systems for specialists

Ambulatory care specialists		Hospital-based specialists		Comment
Mode of remuneration	Mixed hospital and ambulatory practice	Mode of remuneration (salary, fee-for-service or mixed)	Salaried/public physicians with a private practice within public hospitals	
Fee- for- service	Yes	Fee for service in general hospitals	Not allowed	Most specialists work in general hospitals with a fee- for- service system; these specialists have a higher income than specialists in university hospitals

The remuneration is different for specialists who work in general hospitals or in university hospitals. Specialists in university hospitals receive more or less a fixed salary. Specialists in general hospitals work mostly on a fee-for-service basis with a maximum level.

2.9 Continuum of care

Table 13: Providing a continuum of care: Impact of regulation on availability of stroke units, access constraints for rehabilitation services

Stroke units		Rehabilitation			Comment
Guidelines	Planning	Acute care rehabilitation	Outpatient and/or ambulatory rehabilitation	Option for private rehabilitation	
Yes	Yes	Yes	Yes	Possible	In the Netherlands next to hospital stroke units within the hospital much emphasize is put on regional stroke services in which several health care professionals work together

Recent attempts aiming at continuity of care in the Netherlands encompass the development and introduction of integrated health care arrangements. Since these arrangements are directly tailored to the demand, it is generally expected that integrated health care will enhance efficiency. Examples of integrated stroke care are numerous. It is believed that the care in a stroke unit reduces the risk of mortality, life-long disability, and dependence on permanent care with about 20%. The care within a stroke unit is in most instances provided by a multi-disciplinary stroke team. Next to that most regions are setting up a regional stroke services, in which continuity and efficiency of care can be guaranteed. Essential to regional cooperation of stroke services is the harmonization and cooperation, both in organisational and financial terms, between the different health care professionals in one region (28). The Dutch stroke guidelines focus on both aspects (20-22).

With regard to rehabilitation the aim is to start intensive rehabilitation as early as possible in order to increase the chance of recovery (21, 22). After hospital discharge waiting for an inpatient rehabilitation services is an important issue (29).

2.10 Limitations and constraints in accessing long-term care services

Table 14: Limitations and constraints on access to long-term care services

Limitations to length of stay in acute care facilities	Constraints and access to long-term care services (availability)		Comments
	Institutional care	Home care	
Yes, lower reimbursement in case of blocked beds	Yes, nursing homes and rehabilitation centres	Yes, home care and home care facilities	Blocked beds are a major issue in the Netherlands, especially for stroke patients

Blocked beds are a major issue in the Netherlands. The average waiting time for a home for the elderly is 35.5 weeks, for a nursing home somatic department 8 weeks, for a nursing home psychogeriatric department 18.5 weeks, and for home care 10 weeks (30).

In general, stroke patients stay relatively long in Dutch hospitals, e.g. average length of stay for stroke patients in 1998 was 22.5 days and for the average patient 9.1 days (31). Several studies have shown that this relatively long length of stay of stroke patients is mostly due to blocked beds (29, 32-34). A study in the period of 1992 to 1994 showed that for stroke patients about 10 of these blocked beds days are due to non-medical reasons, such as having to wait for a place in a nursing home (28%), or a rehabilitation centre (5%), or waiting for home care facilities (3%) (29). An additional problem for hospitals is that the reimbursement rate for patients who stay in the hospital without a medical indication is lower. Thus health insurance companies sometimes cut the reimbursement rate for stroke patients during the period they stay in the hospital without a medical indication. Taking into account that only a 15 days stay is indicated, it could be argued that the length of hospital stay in the Netherlands can be reduced considerably without compromising the quality of care. Consequently in recent years many hospitals have guaranteed the continuity of care after stroke by using stroke units and regional stroke collaboration centers which leads to a reduction of the length of stay.

2.11 Supply and financing of long-term care at home

In general long-term home care is reimbursed under the Exceptional Medical Expenses Act (see 1.3), and therefore accessible for all patients. Patients who are either insured under the Health Insurance Act or privately insured are automatically covered by reimbursement under the Exceptional Medical Expenses Act. Other patients have to go to a health insurance company for reimbursement. The health insurance companies are responsible for the execution of the Exceptional Medical Expenses Act.

Table 15: Supply and financing of long-term home care

Publicly organised home services		Financing long-term care services after stroke					
Nursing	Help with ADL	Nursing care		Home care			
		Universally covered / means-tested public benefit	Role of insurance / private payments	Nursing		Help with ADL	
				Universally covered / means-tested public benefit	Role of insurance / private payments	Universally covered / means-tested public benefit	Role of insurance / private payments
Available, but waiting lists	Available, but waiting lists	Yes, Exceptional Medical Expenses Act	Execution of reimbursement	Yes, Exceptional Medical Expenses Act	Execution of reimbursement	Yes, Exceptional Medical Expenses Act	Execution of reimbursement

3. Recent health care policy developments

3.1 Bottlenecks and limitations in stroke care

In 1995 the Netherlands Heart Foundation published a report (6), which gives an overview of the main bottlenecks in the treatment and care for stroke patients. They are presented below :

- 1 When a patient gets a stroke it is not clear which care is the best for him/her at the moment: home care, hospital care, or nursing home care. Primary care in the home situation is often provided only by a GP, and a neurologist or a nursing home physician is rarely consulted;
- 2 One third of the patients in the acute phase is treated at home. Home care is difficult to get especially for the night and weekends, and during public holidays;
- 3 Due to the limited capacity it is difficult to get stroke patients admitted to a nursing home;
- 4 If stroke patients stay at home during the acute phase, diagnostic examinations (CT-scan) are often insufficient;
- 5 Stroke patients in a hospital often receive too many diagnostic examinations (such as a routine EEG);
- 6 Blocked beds in hospitals are a major problem, due to the fact that stroke patients in hospitals can not be discharged home (shortage of home care) or to a nursing home (insufficient capacity);
- 7 Most stroke patients are discharged home. Both formal and informal caregivers are not sufficiently prepared for their return. As a consequence aids and home adaptation are often not on time;
- 8 Stroke patients and their informal caregivers have insufficient knowledge about the course and the prognosis of stroke;
- 9 Care activities of the several disciplines and health care echelons are not geared to one another;
- 10 Rehabilitation for stroke patients at home encompasses only physiotherapy and speech therapy. Speech therapy is not tailored to the needs of the stroke patients. Occupational therapy is only limitedly available and often not reimbursed;
- 11 It is unknown whether stroke patients use day-care and other facilities which aim at rehabilitation and relieving the home-situation;

- 12 There is little knowledge about the care for stroke patients in nursing homes and in homes for the elderly;
- 13 There is little knowledge about the number of and care of foreign stroke patients;
- 14 Not all stroke patients visit a rehabilitation specialist;
- 15 At the end of their recovery many stroke patients and their informal caregivers feel lost; The frequency of GP visits decreases and some patients and their caregivers are reluctant to ask for help;
- 16 At the end of their recovery many stroke patients have cognitive and emotional problems, and their behavior has often changed. This is not understood by their informal caregivers, nor recognized by their formal caregivers;
- 17 There is limited knowledge about the extent of limitations and handicaps, and of cognitive, emotional and behavioral problems after stroke;
- 18 Innovational care facilities are hard to track, as a central registry is missing;
- 19 There is little knowledge about the quality of stroke care;
- 20 Assessment and testing of professional stroke care is limited;
- 21 Young children of stroke patients get too little attention;
- 22 More attention should be paid for the rehabilitation of young stroke patients;
- 23 There is little knowledge about the differences in perception of and dealing with stroke between stroke patients and their informal caregivers;
- 24 Many patients and their caregivers complain that there is little attention for their sexual problems;
- 25 Especially in the chronic phase there is little attention for the diminishing of social contacts.

Next to these stroke related issues, there are a number of other issues which limit the care for chronic patients. Such issues include problems in access to insurance, and financial barriers due to different acts and regulations for financing and planning.

3.2 Changes in the health care policy in the Netherlands

The list above presents a gloomy picture of the health care system in the Netherlands. However, recent publications of the OECD and the WHO show that the health care situation in the Netherlands is not any worse than that of comparable countries. Next to that paragraph 2.1

describes the situation has changed considerably since the mid- nineties. In this paragraph some of the recent policy developments are described.

3.2.1 General changes in health policy in the Netherlands

“To care for people in a healthy environment” is the slogan of the Dutch Ministry of Health, Welfare and Sport (35). The present economic prosperity allows for, additional funding is of capacity in the cure and the care sector in order to improve quality of care and to reduce waiting lists. Additional funding is also reserved for prevention, higher salaries and better fringe benefits, and for actions reducing the workload. The problem however remains that the supply of labour in the public health sector is limited resulting in short-staffed organisations. Besides, the Ministry is aiming at some fundamental changes in the public health care administration and in the health care insurance system. One major change involves to organize a more tailor-made and need-based care by introducing client-linked budgets and setting upregional centers for the coordination of care. They will play a key role in the regional distribution of financial means. Health insurance companies will get a greater responsibility for a better match between supply and demand on a regional level, for contracting regional care, and for reducing waiting lists within the region. To this purpose regional offices will be set up. A central office will be responsible for the allocation of patients and thereby for the waiting lists.

Another major change involves simplifying the financial reimbursement system by a better tuning of the Health Insurance Act and the Exceptional Medical Expenses Act. Some key persons are even in favour of merging both reimbursement systems. Another point of discussion is merging the private and public health insurance schemes into one public health insurance scheme with one basic package.

Finally, in recent years it has become clear that the current fixed functional budgeting system does not meet present-day needs. The main problems are the lack of transparency of this budgeting system, and the unsuitability of the fixed functional budgeting system in the provision of integrated and dynamic care (36). Therefore, the Dutch government is now considering the implementation of outputpricing based on hospital case-mix measures (Diagnose Behandelcombinaties ((DBC's)), i.e. reimbursement based on market prices calculated on the basis of a combination of diagnoses and treatments (36, 37). Hence financial incentives in the near future will be based on case-mix features. The intention of

these DBCs is that it will lead to more market forces within the hospital sector, as hospitals have to compete on the prices of their services.

3.2.2 Changes in the field of stroke care

3.2.2.1 Stroke consensus guidelines

New developments in stroke treatment induced both changes in the care of stroke patients and a necessity to revise the stroke consensus guidelines. The Netherlands Heart Foundation and representatives from 25 professions and institutions participated in the revision of these consensus guidelines in 2000. With methodological assistance of the Dutch Institute for Healthcare Improvement (CBO), separate working groups (diagnosis, treatment, organization of care, rehabilitation/education, implementation and cost-effectiveness) studied the literature and translated the results into recommendations with explanatory text. The strength of scientific evidence was classified. The guidelines focus on the establishment of stroke services and stroke units, on early thrombolysis, secondary prevention (lifestyle measures, acetylsalicylic acid, treatment of hypertension and hypercholesterolaemia, and surgery of the carotids), and early intensive cognitive rehabilitation. The guidelines thus cover the broad spectrum of stroke care (20-22).

3.2.2.2 Changes in stroke care organizations

In recent years there have been some fundamental changes in the stroke care organizations. The number of stroke services, stroke units and TIA-outpatients' clinics is rapidly increasing. In this the Netherlands Heart Foundation has taken the lead in formulating guidelines and acting as an expert center on stroke care (38). The Netherlands Heart Foundation has developed step by step guidelines for setting up regional stroke services and guidelines for developing stroke units and TIA-outpatients' clinics (28, 38-40). A stroke service is defined by the Netherlands Heart Foundation as a regional chain of care providers, joint in a network, that guarantees integrated and professional stroke care in all stages of the disease. The members of the network have a joint responsibility for an adequate transfer of patients between the health care facilities and for the quality of the care chain as a whole. Coaching informal caregivers is an important feature of the medical treatment in each link of the chain. A stroke unit is part of a stroke service (28). At present a large number of Dutch hospitals has a stroke unit (39). Some rehabilitation centers and nursing homes have a rehabilitation stroke unit. A hospital stroke unit aims at the acute diagnostics, treatment and care of patients with

an acute stroke (39). According to the advice of the Netherlands Heart Foundation, every hospital should have a stroke unit as part of a stroke service. The teams should incorporate the following stroke experts: neurologist, specialized nurse(s), rehabilitation specialist, physiotherapist, speech therapist, occupational therapist, social worker, and a transfer nurse. Ideally, a nursing home physician, neuropsychologist, geriatrician, activity counselor, and psychiatrist should also be members of the multi-disciplinary team. The team should be allowed to consult a cardiologist, an internist, and a dietician within due time. The hospital stroke unit should be a separate unit within the hospital of at least four beds and provide care in accordance with a protocol (39). A relatively new phenomenon in stroke care is the TIA-outpatients' clinic aiming at early diagnosis (within one day by a neurologist) and prevention of stroke (changing lifestyles and if necessary medication) (40).

4. Data on health care supply

In this chapter data on health care supply are presented, as the OECD regards these data as a relevant indicator of quality stroke care.

4.1 Supply of physicians

The Medical Specialist Registration Commission provides information on the number of neurologists, neurosurgeons and radiologists. On the 1st of January 1999, in total 632 physicians were registered as neurologists. Of this group, 31 neurologists were also specialized in clinical neurology, 9 neurologists were also specialized in clinical neurophysiology, and 392 neurologists were also registered as a clinical neurophysiologist in the Netherlands. In addition there are 110 registered neurosurgeons and 867 radiologists (41). The true figures are assumed to be somewhat higher.

4.2 Diagnostic imaging machines

In the Netherlands no recent information is available regarding the number of diagnostic imaging machines. The Dutch Society of Radiologists assumed that each of the 140 Dutch hospitals has at least one CT-Scan, one Doppler Ultrasound, one MRI, and facilities to make a contrast arteriography (42).

4.3 Stroke units

In the Netherlands the numbers of stroke units and stroke services are rapidly increasing. The stroke guidelines, which are discussed in chapter 3, aim to make these care facilities available for every stroke patient.

4.3.1 Qualitative information

As stated before a stroke service is defined by the Netherlands Heart Foundation as a regional chain of care providers, joint in a network, that guarantees integrated and professional stroke care in all stages of the disease. The members of the network have a joint responsibility for an

adequate transfer of patients between the health care facilities and have a joint responsibility for the quality of the care chain. Coaching of the informal caregivers is a main feature of the medical treatment in each link of the chain. A stroke unit is part of a stroke service (28). According to the definition of the Netherlands Heart Foundation a stroke service is a hospital department that aims at adequate diagnostics, care and treatment of stroke patients in the acute phase. A stroke unit should:

- have a multi-disciplinary team of care-providers; the team is equipped for expert and skilled treatment of stroke patients;
- have a specific medical, paramedical, nursing, and psycho-social policy for stroke patients, which is elaborated in protocols/guidelines, plans and procedures;
- have the technical and infrastructure facilities for the early diagnosis, treatment, secondary prevention, prevention of complications and early rehabilitation of stroke;
- be embedded in a stroke service so that stroke patients, for the sake of their treatment, can be transferred as soon as possible to the next facility in the care chain(39).

4.3.2 Quantitative information

Because no national data are available, it is assumed that every Dutch hospital (140) has or will have a stroke unit in due time. In the guidelines of the Netherlands Heart Foundation it is advised that each stroke unit should at least have a capacity of 4 beds (39).

In May 1999 the Netherlands Heart Foundation send a questionnaire to all health care facilities in the Netherlands inquiring after the availability of stroke services. At that time there were 59 stroke services and another 80 health care facilities were considering starting a stroke service in their region (43). 56 of the existing stroke services cooperate with (one or more) hospitals, nursing homes, homes for the elderly, rehabilitation centres, home care and general practitioners. Because of blocked beds most stroke services are an initiative of the hospital(s) in the region (43). One of the main problems for stroke services are the flow rate throughout the several health care facilities, the financial possibilities, personnel shortage, and shortage of time (43).

4.3.3 Performance of stroke services

Co-ordinated care on stroke units has shown a reduction of mortality rates and improved independence in activities of daily living. It has been hypothesized that benefits are due to an integrated approach linking acute treatment with early mobilization and rehabilitation and prevention of post-stroke complications. It is expected that co-ordination of care throughout the acute, rehabilitative and chronic phase after stroke – a stroke service – results in a decrease of, for example, hospital discharge delay, and improved health effects of rehabilitative interventions as patients are treated on the best time at the best place.

However additional research on this point is needed. In the Netherlands, currently three regions are provided with funds to develop regional stroke service programs. These stroke services are currently evaluated by the study “Evaluation of Dutch Integrated Stroke Service Experiments (EDISSE). In a semi-experimental design patients receiving care from a stroke service are compared to patients receiving no stroke service care at all (historical cohort, no stroke service (year 1991/1992)) and patients receiving regular care as provided (= control regions’ rising initiatives to organize stroke care). The objective of the EDISSE study is to evaluate the effect of three various types of stroke services on the quality of the process of care, patients’ and informal caregivers’ health outcomes and the cost-effectiveness. Data collection is currently completed; results are expected in the second half of 2001.

4.4 Consumption of drugs

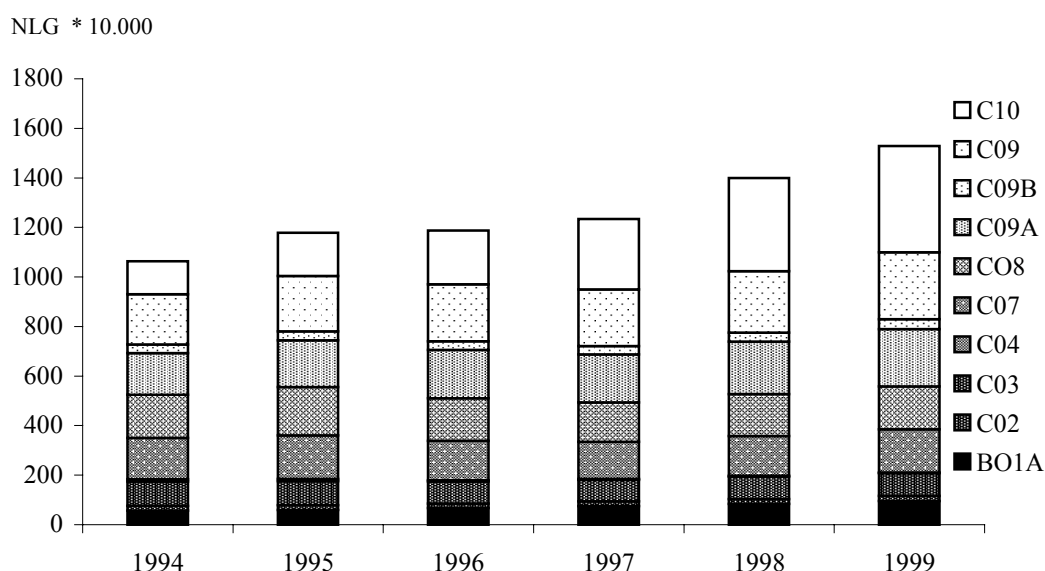
The Foundation for Pharmaceutical Statistics (SFK) collects exhaustive data on the use of pharmaceuticals in the Netherlands (18). The SFK gets its information directly from a panel of pharmacies. About 63% of all pharmacies are represented in this panel, which accounts for 90% of drug consumption in the Netherlands. Table 16 gives an overview of the consumption in DDDs of the drugs which are regarded as relevant for the OECD-stroke project.

Table 16: Consumption in DDDs (in 1 millions) of stroke related drugs

Drugs	1994	1995	1996	1997	1998	1999
B01A Antithrombotic agents, vitamin K	161	187	204	219	237	265
C02 Antihypertensives	0	0	0	0	0	0
C03 Diuretics	212	217	219	226	232	247
C04 Peripheral Vasodilators	9	8	5	4	3	3
C07 Beta Blocking Agents	133	143	149	156	163	176
C08 Calcium Channel Blockers	103	119	127	132	138	148
C09A ACE inhibitors, plain	122	142	158	172	182	201
C09B ACE inhibitors, combination	16	17	20	21	22	25
C10 Cholesterol/triglyceride reducers	138	160	177	193	204	226

Source: SFK (18)

In the period 1994-1998 the government managed to limit the average annual growth of drug expenditures to 5.25 percent (18). This happens by means of forced price measures and by thinning out the drug package. Without these measures, the growth would have been end up at the structural level of 10 to 12 percent per year (18). Figure 13 shows that there is also an increase in the costs of drugs which are taken by stroke patients. The total costs of all relevant categories increased from NLG 1,064,760,983 (EUR 483,167,469) in 1994 to NLG 1,530,149,425 (EUR 694,351,537) in 1999.

*Figure 13: Total costs of drugs*

5 Use of resources

5.1 Macroeconomic estimates

Similar to other countries, stroke in the Netherlands accounts for about 3% of the health care costs (44, 45). A large share of these costs are due to home nursing services (16%), hospital care (20%), and nursing home care (37%) (44). Looking at the lifetime costs, it appears that long-term care facilities exceed the acute care facilities (44, 46). Unfortunately no national data are available on cost for services like stroke prevention, mental health care, and caregivers (44, 47, 48).

5.2 Hospital stay

The majority (approximately 70%) of stroke patients are admitted to a hospital immediately after the stroke (49-51). In recent years stroke patients account for approximately 2% of the admitted hospital patients and for 4% of the inpatient hospital days (7, 44). The length of hospital stay has decreased for stroke patients from 28 days in 1980 to 23 days in 1998 (7). In the same period the average length of stay also decreased from 14 days to 9 days (7). As a result, stroke patients in Dutch hospitals still stay relatively long (31). In the period 1980 to 1993 the average length of stay for both ischaemic and haemorrhagic stroke (ICD-9 code 431, 434, 436) decreased from 32 days in 1980 to 29 days in 1993. For ischaemic stroke alone (ICD-9 code 434, 436) the number of hospital days decreased from 34 days in 1980 to 30 days in 1993. In the same period the average number of hospital days for TIAs (ICD-9 code 435) declined from 20 days in 1980 to 13 days in 1993.

Several studies have shown that the relatively long length of stay for stroke patients is mostly due to blocked beds (29, 32, 34). The study showed that in the period of 1992 to 1994 about 10 of these blocked beds days are due to non-medical reasons, such as hospital waiting for a place in a nursing home (28%) or rehabilitation centers (5%), or for home care facilities (3%) (29). Taking into account that only 15 days are due to medical reasons, it might be argued that the length of hospital stay in the Netherlands can be reduced considerably without compromising the quality of care (29). Because of that, stroke guidelines in the Netherlands encompass the development and introduction of integrated health care arrangements, such as

stroke services and stroke units (20-22, 28, 38, 39). Since these arrangements are directly tailored to care demand, it is generally expected that integrated health care will enhance efficiency, especially in the long run (20, 52, 53). However in the short run, investments have to be made. For different actors on the health care market, this is important to realise as too optimistic expectations regarding the short term efficiency effects of integrated care may lead to disappointment (53). For the long run integrated health care will enhance efficiency as supply structures are directly tailored to care demand, and therefore the formation of integrated health care can be categorised as a potential Pareto-improvement (53). For stroke for instance, it is believed (20, 52) that the treatment of unselected acute stroke patients on a stroke care unit saves lives, reduces the length of hospital stay, reduces the frequency of discharge to a nursing home, and reduces cost.

5.3 Costs for stroke care

The services involved in stroke management are multi-disciplinary, and may include GPs, hospitals, rehabilitation centres, nursing homes, and community services. For the year 1993 a Cost-Of-Illness (COI) study was performed based on prevalence data (44). The purpose of this study was to identify and estimate the costs of stroke in the Netherlands, both direct (medical consumption) and indirect (productivity loss). All data in this COI-study refer to persons suffering from cerebrovascular disorder (ICD 430-438) or who died because of it. The underlying rationale is that direct costs and productivity losses are assigned to the year in which they occur (in this case, 1993). Expected future incomes lost as a result of premature mortality are assigned to the year of death.

The direct costs are in general based on figures provided by the Financial Statement of Care. The Financial Statement of Care is a government document that is presented to Dutch Parliament together with the budget. It gives an integrated overview of the financial developments in the healthcare sector over the past years as well as predictions for the next year. Figures from the National Hospital Institute are used to calculate the costs of hospital care. The costs of drugs are calculated using information from the Health Insurance Executive Board. To quantify the indirect costs, the human capital approach is used. This approach attempts to estimate the value of lost production due to temporary or permanent absence from work, disablement, or premature death. Productivity losses are estimated using

the average salary per employee. Finally, to test the likelihood of the assumptions made when measuring and evaluating the direct and indirect costs, a sensitivity analysis is performed. The total cost of stroke for the Dutch society in the year 1993 was about NLG 2,532.00 million (EUR 1,148.97 million). The total direct costs amounted to NLG 1,966.00 million (EUR 892.13 million), which is about 3% of the healthcare budget of NLG 57,781.00 million (EUR 26,219.87 million) for 1993.

5.3.1 Inpatient costs

This COI study reflects the course that patients with stroke follow when they become ill. Stroke patients generally contact their GP or the emergency department of a hospital. Most of those who visit their GP are also referred to the hospital. In 1993 the total costs for GP care amounted to NLG 18 million (EUR 8.17 million). This is only 0.7% of the total costs for stroke. The costs for stroke hospital care can be calculated on the basis of either the number of discharged patients (e.g. stroke accounts for 2% of all discharged patients) or the number of inpatient days (e.g. stroke accounts for 4% of inpatient days). Taking the overall costs for all hospitals, the costs due to stroke would be NLG 295.40 million (EUR 134.05 million) based on admission figures, and NLG 706.00 million (EUR 320.37 million) based on inpatient days. In the COI study it is assumed that the first calculation is an underestimation, since the average length of stay for stroke patients is relatively long (e.g., 24 days for stroke compared to 10 days for all diagnoses). Because the first days in the hospital are the most expensive we assume that the figure based on the number of days in hospital is an overestimation. Thus, an average of NLG 500.70 million (EUR 227.21 million) was reached, which corresponds to 20% of all stroke costs. In the figure of NLG 500.70 million (EUR 227.21 million), the total costs for rehabilitation centres are included, which amount NLG 121.20 million (EUR 55.00 million) in 1993.

After discharge from the hospital, patients will visit various types of care providers, such as nursing homes and paramedical care. In the Netherlands nursing home costs are very high, e.g. about NLG 925.00 (EUR 419.75) about 37% of all stroke costs. Compared to the inpatients stroke costs the costs for outpatient paramedical care are negligible. Furthermore, some patients will be cared for at home by professionals or their own families. Home care services account for 16.3 % of all stroke costs, namely NLG 413.00 million (EUR 187.41 million).

All costs in table 17 are calculated pro rata, i.e., we assume that if a certain percentage of patients in a service have stroke, they will incur proportionally the same percentage of care and the same percentage of costs. However, it may be the case that stroke patients do not require the same level of care as patients with other diagnoses. In general, the figures in table 17 are based on national statistics. This applies to hospitals, nursing homes, absenteeism, work disability and mortality. Table 17 also presents the costs of each particular service discussed above as a percentage of the total (direct and indirect) costs. These give an indication of the sensitivity values of the various items. Regarding the direct costs, the conclusion will be most responsive to variation in nursing homes, hospitals and nursing home care. For some of these healthcare facilities (general practices and hospitals) indeed several assumptions were made.

Table 17: Estimates of the direct and indirect costs of stroke in 1993

Category of expenditures or losses	Effect due to stroke (rate used)	Estimate to the nearest million	% of total costs	Sensitivity analysis*
Direct costs				
General practitioner	0.8%	18	.7	15-22
Hospitals (including rehabilitation centers)	1.8%			
- inpatient discharges	4.4%	501 ¹	19.8	295-706
- inpatient hospital days				
Outpatient use of drugs	-	95	3.8	-
Nursing homes	17.6%	925	36.5	-
Home nursing services	12%	413	16.3	241-585
Physiotherapy	0.5%	6	.2	-
Speech therapy	11.2%	8	.3	-
Subtotal direct costs		1,966	77.6	
Indirect costs				
Absenteeism	0.2%	71	2.8	-
Disability	0.9%	383	15.1	-
Subtotal morbidity costs		454	17.9	
Mortality costs of life years lost before the age of 65 years	5,493	112	4.4	71-206
TOTAL COSTS		2,532	100.0	

* minimum- maximum

1 Average costs of inpatient admission and inpatient care, including rehabilitation (see note I).

2 The total costs for rehabilitation centres were about 121,2 million NLG.

Source: (44)

With regard to hospital stay, it makes a difference whether one calculates the cost on the basis of number of days in hospital or on the basis of number of discharged patients (e.g., the costs would vary between NLG 295.00 million (EUR 133.87 million) and

NLG 706.00 million (EUR 320.37 million). The costs of home nursing care were based on the information provided by one Home Nursing Organization, and differ from the results reported by Koopmanschap et al (54). A range of \pm 5% is chosen to test the likelihood of these figures. Based on this range, the total costs for home nursing care would vary from NLG 241.00 million (EUR 109.36 million) to NLG 585.00 million (EUR 265.46 million). Finally, if the prevalence of GP consultation ranged from 7 per 1,000 (min.) (55) to 10 per 1,000 (max.) (56), the corresponding GP costs would vary from NLG 15.00 million (EUR 6.81 million) to NLG 22.00 million (EUR 9.98). The cumulative effect of these changes in medical consumption on the total costs, using the minimal and maximum plausible values, would result in a \pm 15% change.

5.4 Lifetime costs and future costs of stroke

The lifetime direct costs of medical care were calculated for all first-ever-in-lifetime stroke patients and separately for patients with a cerebral infarction (CI) or a primary intracerebral haemorrhage (PICH) in the Netherlands in 1991 by Bergman et al (46). The lifetime direct costs of care were based on data from national and international studies. In addition, we examined the effect of an aging population on future healthcare costs. Data on survival after stroke and places of residence were obtained on population-based follow-up studies. Hospital costs were based on the ROSA study in which 760 consecutively hospitalised stroke patients from 26 hospitals were followed up to 5 years after stroke. The average daily costs for a nursing home were based on a national report on resource utilization. Information on the type and consumption of professional healthcare services during the first year after stroke for patients living at home were obtained from two Dutch studies. The lifetime costs for 24,007 first-ever stroke patients are estimated to be NLG 1,870 million in 1991. Per-person costs are higher for women (NLG 83,000) than for men (NLG 71,000). The major cost component of first-year costs is hospital costs (45%), while nursing home costs dominate lifetime costs (50%). An increase in the population older than 65 years of 27% between 1991 and 2010 might lead to a parallel increase of total costs of 30%, or 1.5% per year. A recent study confirmed that the future costs of stroke will become an increasingly important issue (57). It is expected that mainly due to the ageing of the population the number of stroke patients and the costs will increase substantially till 2015 (57-59). Depending on the scenario applied the increase in these costs will vary between 33% and 48% (57).

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