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### Economics

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*Document Version*

Publisher's PDF, also known as Version of record

*Publication date:*

1999

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Wijk, P. V. D. (1999). *Economics: charon of medicine?*. s.n.

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## **Economics: Charon of Medicine?**



Rijksuniversiteit Groningen

## **Economics: Charon of medicine?**

Proefschrift

ter verkrijging van het doctoraat in de  
Medische Wetenschappen  
aan de Rijksuniversiteit Groningen  
op gezag van de  
Rector Magnificus, dr. D.F.J. Bosscher  
in het openbaar te verdedigen op  
woensdag 22 september 1999  
om 16.00 uur

door

Paul van der Wijk  
geboren op 1 februari 1966  
te Drachten

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*Economics: Charon of Care?* Paul van der Wijk  
Proefschrift, september 1999.

**Foto omslag:** Esther Haak  
**Druk:** Regenboog Drukkerij,  
Groningen

## Voorwoord

Dit proefschrift is gebaseerd op diverse onderzoeksprojecten die ik in de achterliggende jaren bij het Noordelijk Centrum voor Gezondheidsvraagstukken heb mogen verrichten. De belangrijkste ervan, in opdracht van de Ziekenfondsraad (tandheelkunde), het ministerie van Volksgezondheid, Welzijn en Sport (ouderenzorg en zorg voor mensen met een verstandelijke handicap) hebben geleid tot een visie op de rol die economisch onderzoek kan spelen bij besluitvorming in de care sector, en de tekortkomingen die economisch evaluatieonderzoek in die sector op dat moment had.

Wim van den Heuvel heeft een belangrijke rol gespeeld. Met name op momenten van opperste verwarring slaagde hij er veelal in de rode draad, en de inspiratie, te hervinden. Wim, ik dank je daarvoor en hoop dat in Maastricht nog velen van je bezielende begeleiding gebruik mogen maken.

Lense Koopmans had ruime aandacht voor de macro-economische kaders waarbinnen de gezondheidszorg zich afspeelt. Zijn deskundigheid op dat gebied en de vele anekdotes uit de landelijke politiek waren niet alleen voor dit boek leerzaam. Frans Rutten was vanaf het eerste uur in meer of mindere mate betrokken bij de meeste projecten. Zijn input betrof met name de micro-economische achtergrond van economisch evaluatieonderzoek. Beiden dank ik voor de prettige samenwerking. Jelte Bouma was als referent nauw betrokken bij de totstandkoming van dit boek. Je relativerend vermogen en lichte cynisme werkten op mij meestal zeer motiverend.

Zoals u zult zien is het uitvoeren van economische evaluaties een multi-disciplinaire tak van sport, waarbij velen hun inbreng hebben. Ik vind dat ik u de waslijst aan betrokkenen niet mag onthouden. Per project heeft een aantal mensen geprobeerd mij langs inhoudelijke afgronden en methodologische valkuilen te leiden. Voor het ontwikkelingsgeneeskunde-project: "Kosteneffectiviteit van

tandheekkundige implantaten" ben ik dank verschuldigd aan Rob van Oort, Rien van Waas, Martin van 't Hof en Berry Middel.

In het onderzoek in de ouderenzorg heb ik prettig samen gewerkt met Edwin Wolffensperger, Peter van Linschoten, Wybe Zijlstra en Robbert Huijsman. Met name Edwin was een uitdagende sparringpartner bij het vinden van een theoretisch kader voor de economische evaluatie in deze tak van zorg. Robbert had een belangrijke bijdrage bij het vervolmaken van dit uitgedachte kader, en het oplossen van de praktische problemen die de uitwerking met zich meebracht.

Tot slot is ook bij het project "Scheiden van wonen en zorg voor mensen met een verstandelijke handicap" een groot aantal mensen betrokken geweest. Johan Groothoff, Jos Boelema, Berthe te Velde, Mirjam Mulder en Doeke Post verdienen daarvoor een dankwoord.

Flip de Kam dank ik voor zijn kritische noten bij het manuscript en vooral voor zijn enthousiasmerende rol tijdens mijn studie. Jacqueline Wouda dank ik voor het feit dat ze de nodige correcties in het Engels heeft willen doorvoeren.

Een bijzondere vermelding verdienen voorts de leden van de P.I.S.P.O.T.

(Promovendi In Spé Proefschrift Ondersteunend Team): Jolanda Tuinstra, Geke Dijkstra, Mirjam Mulder en daarvoor zelfs nog Henoch Snuif. Toch geeft het feit dat ik pas de tweede van dit clubje ben dat de ons gestelde uitdaging tot een einde brengt, te denken over de door ons gehanteerde methoden van bespreking. Ria Molanus en Annemieke Brouwers wil ik danken voor het vele regelwerk dat zij, bijna altijd goedgemutst, tijdens het hele proces voor mij hebben verricht. Andere NCG-ers hebben hun bijdrage geleverd door de leuke sfeer en de grappen en grollen. Ook de GINO's verdienen een vermelding voor hun motiverende (?) opmerkingen. Jullie hoop ik nog af en toe te mogen ontmoeten in Dick's bar. Tot slot dank ik de collega's van het RZG voor hun belangstelling en hun hulp bij het ontdekken van de weerbarstige praktijk.

Last but not least is er nog een aantal types in de privé-sfeer dat in het zonnetje gezet dient te worden. Oeds Westerhof, William Klaassen en René Vloon die mij wegwijzen hebben gemaakt in het Groningse studentenleven. Inge Boonstra voor de mooie jaren die we in die tijd hebben gehad. Enkele volleybalteams die mij af en toe de weg hebben doen kwijt raken in datzelfde Groningse leven: Donitas heren Exces, Oranje Nassau 1, Stentor 1, maar natuurlijk vooral de gentlemen van Coendersborg. Een speciale vermelding verdienen de koekjes van Oranje Nassau 3, die mij enkele jaren als trainer en coach hebben gedoopt. Han Venema en Onno Roukens, vrienden van het eerste uur, dank ik voor de psychologische en humoristische (?) ondersteuning als paranimf. Van Judith hoop ik dat ze het droog houdt.

Piet en Lous Haak wil ik bedanken voor het beschikbaar stellen van hun hutje op de hei, op een camping met de toepasselijke naam “De aanhouder wint”. Niet onbelangrijk, het thuisfront: Pa en Ma, Tineke, Ruud, Jannie (ja, jij hoort er ook bij!). De vele politieke discussies zijn goed geweest om kritisch en systematisch te leren denken. Hoewel de contacten niet altijd even frequent zijn, is het goed te weten dat het warme nest er nog altijd is. Pa, ik ben blij dat je er in geslaagd bent de orthopeed ervan te overtuigen dat je op de dag van de promotie van je jongste zoon weer volledig mobiel moest zijn. Ma, ik ben blij dat je er bij kunt zijn.

En als allerlaatste: Esther, jij maakt m'n leven (on)draaglijk licht.

Paul van der Wijk

Juni, 1998



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## **Chapter 1 The increasing role of economics in health care sector**

### **1.1 Introduction**

Present welfare state arrangements in the Netherlands gradually came into being during the last two centuries. Around the middle of the nineteenth century the distress among the Dutch population was such that the pressure on the government to take measures for its relief increased markedly. The Dutch Medical Society, founded in 1849, played an important role here. The government played many different roles since then, leading to a large degree of legislation. The main characteristic of the developments following this legislation was that a system that was mainly based on charity (1880-1920) changed to one where access to a wide range of health care provisions is a legally right for every citizen.

The discipline of economics penetrated the medical field only fairly recently. The debate on high health care costs and the underlying reasons for the exploding costs started only about two decades ago. In the economic literature several explanations have been advanced for the ceaseless rise in health care expenditure, for instance the role of technology, ageing populations, the development of many halfway-technologies, the development of insurance systems, etc. (Mulder, 1996; Newhouse, 1993; Weisbrod, 1991). The rising collectivized health care costs led to economic concerns.

The economic interference in the health care sector started from a pure cost interest, not considering medical effectiveness or equity (Henke, 1992). However, during the last decade an interaction with other goals for government intervention can be observed. With regard to quality, equity and consumer sovereignty, one question has been frequently asked: at what costs? Therefore, the economic analysis of the health care sector was no longer restricted to cost containment policies or a debate on possible savings. The main goal of economic analysis shifted to improving of the value (quality) for money. Medical efficacy was no longer seen as the only criterion when it came to deciding on the introduction of a new intervention (Leaf, 1989; Committee on Choices in Health Care, 1992). Cost-effectiveness concerns became important, where effectiveness can be

defined as a rather broad concept that includes quality of care, equity and equal access, consumer sovereignty or a particular combination of these concepts. This chapter focuses on government intervention and the role of economics in the field of health care. It starts with the short history of government involvement with the Dutch health care sector, with regard to which different goals and themes can be identified during the centuries. As will be shown (in Section 1.2), government intervention became increasingly driven by efficiency motives. The role of economics becomes more and more important, principally because of the rising cost development (Section 1.3). Decreasing resources and increasing needs (and costs) have stressed the necessity of rationalizing and prioritization (Section 1.4). Economic evaluation studies could play an important role in this development. With that in mind, in Section 1.5 the key questions addressed in this thesis are identified. Section 1.6 outlines this book..

## **1.2 History of government intervention in the health care sector in the Netherlands**

From an economic and social point of view the health care system became a major societal concern only a limited number of decades ago. During the previous century government concern was chiefly restricted to the area of hygienic facilities, such as sewerage, the provision of drinking-water, refuse collection and later also immunization. There was no organized health care system. In the Middle Ages health care was a private concern. The only collective initiative in this field were the Guilds, organizations that supervised medical care. The Guilds of Surgeons had their own rules: aspiring members had to demonstrate a certain professional skill. At the end of the eighteenth century Napoleon abolished the Guilds.

In 1798, the Constitution first mentions a responsibility of the government for public health (art. 62 of the State Regulation Act). However, the first half of the nineteenth century can be seen as a period of unrestricted liberalism. The government did hardly intervene. As a result, the state of public health in the Netherlands was deplorable. Due to a sharp population increase and a wave of urbanization an impoverished city population developed, and many epidemic episodes occurred and were chronicled. The distress among people in the cities resulted in pressure on the government. According to Juffermans (1982) the bourgeoisie started to fear epidemic diseases, which usually did not stop on the boundaries of the

poorer neighborhoods. They saw a role for the government in the development of hygienic facilities in which the Enlightened medical doctors could play an important role (Mulder, 1996). Finally, this led to the Medical State Regulation Act (in 1818), which ordered cities to have their own Local Committee for Medical Research and Control. In 1851 each Local Authority had to promulgate its own Local Health Acts.

During the same period (1830-1860) a heterogeneous army of competent and incompetent doctors developed. The competition between these groups led to the formation of a medical class existing of a closed group of doctors that based their knowledge on natural sciences. As a result of that, in 1849 the Royal Dutch Society for Medicine was formed. During the following decades members tried to further professionalize their field of study and exclude quacks. All these developments resulted in increasing government intervention leading to the Medical Malpractice Act, the Medicines Act and the Act Governing the State Supervision of Health Care (1865), which resulted in central regulation of medical training. Furthermore, a central role of quality control was assigned to an advisory board of inspectors of national health. At this first stage of government regulation, quality was the main concern. During the next century this remained the most important aspect of central government intervention.

From 1900 on, the government became more interested in the access to health care. This was usually implemented by local governments through the building of local council hospitals. Equity concerns have also been relevant since 1900. The government supported organized medical care for the poor. In 1901 the Pierson cabinet enacted the Industrial Injuries Insurance Act. This law was especially targeted to the less educated workers in the factories who held high-risk jobs. Not only did the law guarantee a monetary payment in case of accident, it also offered insurance for medical help needed after occupational injury.

From 1904 on, several Dutch secretaries of state tried to establish a law which enclosed an insurance against costs of illness and against the loss of income as a result of this illness. It was not until 1941, when the Netherlands were occupied by the Germans during World War II, before a collective health insurance fund, the so-called Sickness Fund, was established. Employees with an income below a certain maximum (Dfl. 3,000,- in 1941 and Dfl. 62,200,- in 1998) were compulsorily insured in

this Fund, providing universal access to health care services. From that moment on, the overall goal of the health care system was increasingly aimed at improving the health status of the entire population, health care being a right for each individual, and government agencies guaranteeing access to all needed services for all individuals (equity concerns). The Health Act of 1956 defines the role of the government in a rather broad way: the government has a supervisory role.

After World War II, during the years of the 'Reconstruction', access again became a major topic. The aftermath of the war and the disrupted infrastructure of health care facilities necessitated to stimulate a vigorous rebuilding of the health care system. Also, there was strong demand for health care services due to diphtheria, typhoid, scabies and a high infant mortality rate (Knapen, 1992). The number of hospital days rose with 20% during the years right after the war, while the number of hospital beds increased with 11% (Juffermans, 1982). Until 1960 the number of hospital beds doubled in the Netherlands.

During the sixties, a new breeze of liberalism blew through the Netherlands. The central government parted with most regulation instruments such as price policy and capacity planning. In 1966, the Sickness Fund was regulated in a law, which described the principle of a compulsory insurance with free choice of a doctor and the supply of care in kind. In 1968, the Exceptional Medical Expenses Act (AWBZ) was enacted, which covered uninsurable risks, for instance long-term care for the elderly, the chronically ill, and the physically or mentally handicapped. As a result, and in part in reaction to many newly introduced technologies, health care costs increased dramatically.

During the seventies the economic situation deteriorated. As a consequence, cost containment (efficiency concerns) replaced unobstructed access as a major goal in health care policy. Many governments in Western Europe abandoned the opinion that the health care sector is part of the social safety net, and is therefore outside the realm of budgetary policy and economic analysis (Schieber, 1995). High health care expenditures were believed to unacceptably crowd out other important sectors, like education, infrastructure, etc. Furthermore, public health spending was considered to have a considerable upward effect on the tax to GDP-level, which in fact can be important for the competitive position of a country, and may cause

unemployment. This new way of thinking led to general blue-prints of how to organize the health care sector (for example: Health Care Structure Document Hendriks; Policy Document Dekker, Policy Document Simons) resulting in several laws.

In 1971, the Hospital Provisions Act was adopted, which laid down rules for the building of new intramural facilities, to prevent further growth in this sector. In 1980, the Health Care Charges Act was enacted. As a result of this law it was no longer possible to fix a charge that was not accepted by the Central Council for Health Care Charges. In 1983 hospitals were budgeted. Ever since, the macroeconomic budget for hospitals has been an important subject of discussion. In 1989 the budget system was reformed towards a function-based one. Costs of infrastructure were not included in that budget. The other components were: adherence, capacity, and production, which formed 25%, 35% and 40% of the budget respectively. These old parameters were not rewarding in a sense that they do not have an incentive to stimulate new forms of care and higher level of substitution. The eighties can be seen as a period of reform of the health care sector. In 1987 the Dekker-committee made proposals for change inspired by cost containment considerations. The committee proposed introducing a market orientation and competition between suppliers and between insurance companies to improve efficiency. The massive structure of separate regulations for each discipline hindered substitution and care innovation. To solve this problem the committee proposed the creation of a single insurance and finance regime for all care-providing institutions.

Recent developments in health care legislation include the implementation of the Medical Treatment Contracts Act in 1995. This law settles rights and duties of patients, and doctors and other health care professionals during the treatment process. A similar law was enacted for intramural institutions in 1996: the Care Institutions (Quality) Act. These acts explicitly take into account the role and position of the patient in the care delivery process (consumer sovereignty, quality).

Table 1 provides a survey of the development of government intervention in the health care sector. The different motives are shown, the goal within each motive, the approximate year of origin of each motive and examples of instruments. Without being complete, this table gives a good survey of the changing interests of the government regarding health care policy in the

Netherlands. As can be seen, the first interest of government intervention chiefly concerned quality goals. Of course this is still a dominant consideration. From 1900 on, other goals became important: availability first leading to subsidies or provision of health care services aiming at additional supply, and later to laws and regulations with the reduction of supply as a major goal. During the seventies, cost containment became important, leading to budget systems and laws on tariffs and prices. The promotion of consumer sovereignty is a fairly recent government aim. Finally, in the mid-eighties an all-comprehensive goal is aimed for: promoting efficient usage of health care resources while keeping other purposes (quality, availability, equity and consumer sovereignty) in mind.

Table 1: Goals of government intervention during the last century in the Netherlands, and the role of economics

<b>Motive</b>	<b>Goal</b>	<b>Year</b>	<b>Examples of instruments</b>
Quality	At first: guarantee the professional skills of medical and paramedical workers (shut out quacks). Later on: to monitor the efficacy of therapeutic and diagnostic interventions before supply is provided on a large scale.	1798	Constitution
		1804	Regulations Concerning Medical research and Supervision
		1806	Additional Articles to 1804
		1818	Medical State Regulation Act
		1865	Act Governing the State Supervision of Health Care
		1901	Health Act
		1928	Medical Malpractice Act
		1956	Medicines Act
		1958	Health Act
		1963	Paramedical Occupations Act
		1992	Occupations in Individual Health Care Act
Availability	Take care of a sufficient supply of health care services in relation to total demand including a fair	Since 1900:	Home Nursing Associations
		Since 1904:	School Medical Services
		1904	Subsidy Dutch Central Board for Tuberculosis Screening
		1967	General Invalidity Benefits Act
		1971	Hospital Provision Act
Equity	Removing physical and financial constraints that stand in the way in using existing facilities.	1901	Industrial Injuries Act
		1941	Health Insurance Act
		1966	Policy Document on Public Health
		1968	Exceptional Medical Expenses Act

<b>Motive</b>	<b>Goal</b>	<b>Year</b>	<b>Examples of instruments</b>	<b>Reports</b>
Efficiency	Cost containment	1974		Health Care Structure Document Hendriks
		1980	Health Care Charges Act	
		1981		Public health with limited means
		1983	Global Budgeting	
		1987		'Readiness to Change'
		1988		'Change Insured'
		1990		Policy Document Simons
		1994 1997	Budgetary Framework Care Copayments	
Consumer sovereignty	Promote and protect the position of the patient in the agency relationship of consumers with suppliers	1981		Patient Policy Document
			1992	Patient/client Policy Document
		1994		Committee 'Modernization of curative care'
		1995	Implementation of client-linked budget	
		1995	Medical Treatment Contracts Act	
Over-all goal	Promote efficient usage of scarce resources in the health care sector: <i>At what cost should high quality, equity and consumer sovereignty be provided?</i>	1986		Care Policy Document
		1987		Report 'Boundaries to Care'
		1991		'Choices in Health Care'
		1994		Policy Documents 'Safe and Sound'

### 1.3 Trends in health care spending in the Netherlands

In Section 1.2 it became clear that the role of economics in health care has become increasingly important. One of the causes of the change to a more cost oriented health care policy is the cost development in the health care sector since 1960. Not only did total expenditure on health per capita grow roughly twenty times and total expenditures on health care triple, the expenditures on health care as a share of the Gross National Product doubled. Similar trends are observed in most Western industrialized countries. Several causes are mentioned by different authors (Newhouse, 1993): an aging population, wasteful administrative costs, increased income of citizens, the spread of health insurance, a surplus of physicians which increased induced demand, more defensive medicine (Reynolds et al. 1987), expensive care for the terminally ill, the low productivity in this service-oriented industry (Baumol, 1967), the relationship between newly developed technology, the demand for health insurance, and research and development (Weisbrod, 1991), and so forth.

Table 2 shows the development of health care expenditures in the Netherlands since 1960. In the second column the total expenditures on health as a percentage as GDP are shown. The third and fourth column present the absolute amount of money spent on health care and the total expenditure per capita.

Table 2: Expenditure on health care in the Netherlands from 1960-1999

Year	Total exp. as a % of GDP	Total exp. in mln Dfl.	Total exp. per capita in Dfl.
1960	3.9	1731	151
1965	4.4	3154	257
1970	6.0	7255	556
1975	7.6	16677	1220
1980	8.0	27075	1913
1985	7.9	33506	2318
1990	8.3	43006	2777
1995	8.8	59700	3900
1996	9.0	61300	4040
1997	9.2	63900	4190
1998	9.2	66400	4310

Source : Program OECD Health data (CREDES (1960-1990)) and JOZ, 1999 (1995-1998)

The growth rate in the health care sector outpaced other sectors of the economy, leaving less resources for other valuable sectors like education, environmental policy and infrastructure. Because of the low rate of economic growth during the eighties the Dutch government was forced to cut back public expenditures in general and health care spending in particular. Cost containment became a famous concept. In most European countries a reform of the health care system was called for. Although the basic principles do not seem to have changed dramatically (Section 1.3), the call for a more efficiency-driven health care system can hardly be ignored.

#### **1.4 Prioritization**

As a result of cost containment policies the health care sectors' share of the gross national product (GNP) decreased and stabilized at approximately 8% in the eighties (see Table 3). In the nineties, the expenditures for the health care sector increased again, up to 8.7% in 1995. After that, this share stabilized again, mainly as a result of the numerator-effect<sup>1</sup>. In the government agreement of the cabinet Kok-II an annual growth rate of 2.3% (volume) was arranged (Koopmans et al., 1999). In general, however, there is a tendency towards decreasing resources (or at least a stabilization of means) with increasing needs, which has stressed the necessity of rationalizing and establishing priorities. Much discussion focuses on the design of this prioritization (Brock, 1995; Fleck, 1994; Hall, 1994; Hansson, 1994; De Jong and Rutten, 1983; Light, 1992; Mooney, 1992; White and Waithe, 1994). Rationing or prioritization is possible on an implicit or an explicit basis. The present system does make choices, but does so rather implicitly. Most authors favor the open and democratic but centralized way of ruling in which economic evaluation could play an important role (Fleck, 1992; Mooney, 1992). Some, on the other hand, argue that such a centralized system, like the Oregon-plan<sup>2</sup>, loses in

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<sup>1</sup> The GDP rose quickly.

<sup>2</sup> In 1988, the state of Oregon (USA) faced a budgetary shortfall for its Medicaid program (a program that provides financing for medical care to poorer people). The state decided to limit the number of services that its Medicaid program would cover. It developed a prioritization list of medical services. First medical conditions were linked to one or more courses of treatment. For each "condition-treatment" pair (CT-pairs) information on benefits and costs was gathered. Physicians were asked to determine what works medically, how well it works, and what benefits could be expected. Patients were asked to value these benefits using the Quality-of-Well-Being scale. This blend of medical fact and value to patients was used to establish outcome.

accuracy and individuality (Relman, 1991; Welch, 1991; White and Waithe, 1994) and is liable to interest group bias and additional corruption (Hall, 1994). However, most of these arguments focus on microeconomic problems with prioritization. Several systems can be used to implement prioritization, but all have their problems (Peyton Young), 1994). Rules are too imprecise to accurately reflect all the nuances of the individual circumstances, particularly concerning the widely varying personal values that different patients attach to medical risk and benefit.

Nevertheless, rule-based prioritization, in which economic evaluation could play an important role, can and will lead to more rational choices concerning different interventions and institutions on the meso- and macroeconomic level.

Reconsideration of the current resource allocation and a more selective manner of investing in new health care programs seem vital. Of course, other ways of solving problems with scarceness of resources are possible: raising the health care

budget to a larger amount of health care expenditures as a percentage of GNP, or increasing productivity and efficiency in the health care sector.

The first alternative, however, has important consequences for social insurance premiums and wages. The second is one which is very difficult to incite.

Economic evaluations can support the decision making process by providing systematic information on the costs and health consequences of investing in alternative health care programs. Until now, in the final decision political and ethical factors were decisive for adoption of new technologies (Van Rossum, 1991; Mooney, 1992). Van den Heuvel (1997) concludes that the outcome of MTA-studies did not substantially affect the decision making process. Political arguments and interest groups have a decisive influence on the outcome of the process. Van Rossum and Mooney explicitly recommend that cost-effectiveness figures should have a more official status.

## 1.5 Key questions

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By introducing cost considerations a cost-benefit ratio was derived, used for prioritization of CT-pairs. These cost-benefit calculations were used in the allocation of Medicaid funds (Blumstein, 1997).

The aim of this study is to investigate the possibilities and implications of economic evaluation within the health care sector, specializing on the care sector (care for the elderly and mentally retarded). Two key questions are to be answered:

- 1- what is the present role of economic evaluation in the care sector and to what extent can it be used for policy-making on the macro- and mesoeconomic level;
- 2- What methodological and practical problems do we face when we step out of the care sector and use existing methods for economic evaluation in the care sector? Special attention is given to data gathering for cost analysis.

In economic evaluation four levels of aggregation are possible: the aggregate societal (macroeconomic) level, the health care sector level, the mesoeconomic level (concerning a specific health care program or sector), and the microeconomic level (involving individuals or particular institutions)<sup>3</sup>. Of course it is very important to somehow evaluate health care on a macroeconomic level. It is necessary to provide an adequate and complete overview of costs and effects in the health care sector as a whole. However, the starting point for such a survey lies on a mesoeconomic level. Before decision rules can be formulated concerning choices for different treatment modalities, one has to know what the costs and consequences of the various health programs are. Even so, an analysis on a microeconomic level does not make much sense as long as there is no priority list of programs. Furthermore, a detailed analysis of every patient compared to the next best solution (based on opportunity costs) will be too time-consuming and too costly. However, this kind of clinical decision making can be very useful, especially when there are natural rationing principles (as in the case of organ transplants). This kind of analysis, however, lies beyond the scope of this thesis.

Economic evaluation on a mesoeconomic level can be seen as an input for macroeconomic decision making (with regard to policy across different sectors within the health care system), but is an equally relevant input for microeconomic decision making (only treatments which are cost-effective

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<sup>3</sup> This division in policy levels will be more elaborately explained in Chapter 8.

anyway will be implemented in a patient). Table 4 provides a rationale for the concentration for the mesoeconomic level.

Table 3: The importance of different kinds of economic evaluation

Societal level

Goal: *'The comparative analysis of alternative **societal programs** in terms of both costs and consequences'*

Health care sector level

Goal: *'The comparative analysis of alternative **health care programs** (or even alternative societal programs) in terms of both costs and consequences'* (Drummond, 1987)

↓

Input for rational decision making about health care on the national level

↓

Mesoeconomic level

Goal: *'The comparative analysis of alternative **courses of action** in terms of both costs and consequences of a health care program for a **certain disease program or different care modalities**'*

↓

Precondition for the implementation of certain health care programs

↓

Microeconomic level

Goal: *'The comparative analysis of alternative **courses of action** in terms of both costs and consequences of a health care program for a **certain disease, institution or individual**'*

This thesis pays specific attention to care. On a macroeconomic level, this factor (or the aging-problem behind it) can be considered an important cost-driver in health care (Newhouse, 1993; Weisbrod, 1991).

Furthermore, although structure and methodology of economic research in both sectors do correspond in broad outlines, there are large differences in design and practical implementation. Although at least 40% of our health care expenditure is used for care, economic research in this particular sector is still in its infancy.

## **1.6 Outline of the rest of the book**

This book has eight chapters. After the introductory chapter, Chapter 2 proceeds with an ideological framework explaining the actual vision on health care expenditure. This chapter gives a theoretical framework of the various distribution principles within economic theory. It considers the consequences they have with regard to cost containment policies and the role of economic evaluation in the health care sector. The distribution principles may lead to different health care systems and to different roles for economic evaluation.

Chapter 3 is a detailed cost analysis in dentistry and Chapter 4 considers the cost-effectiveness of a new technology, i.e. dental implants for edentulous people. These chapters are used to show what possible information can be gathered from an economic evaluation. Following these chapters, Chapter 5, 6 and 7 contain detailed research in the care for the elderly and the care of the mentally handicapped. These chapters partly relate to the same research question, but are also used to enlighten difficulties for conducting economic evaluations in the care sector. In Chapter 5 different options for residential home care are evaluated from a financial point of view. In Chapter 6 the same topic is discussed, but here it is merely restricted to people who need nursing home care. In Chapter 7 the results of a study of outplacement for people with a mental handicap are presented.

Finally, Chapter 8 gives an overview of the possibilities for policy-support of economic evaluations, and the methodological and practical problems faced during the several research projects. The results of the presented studies will be re-examined in the light of the two main questions of this thesis: (1) the possibilities for policymaking at different policy levels, and (2) difficulties of implementing an economic evaluation in the care sector. In the end a number of possible recommendations for future research will be discussed.

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## **Chapter 2 Motives for government intervention**

### **2.1 Introduction**

In 1998 health care expenditures in the Netherlands mounted up to approximately Dfl. 66,4 billion (Jaaroverzicht Zorg, 1998). Nearly four-fifth of this amount is paid publicly financed, notably from contributions to compulsory insurance under the Health Insurance Act and the Exceptional Medical Expenses Act. In addition, the government uses many other instruments to steer and contain the health care sector, including laws, regulation of supply and prices. The necessity of government intervention is an important issue. Some people maintain that government intervention is inevitable. Others claim that much of government intervention is not necessary and results in inefficiencies. To clarify this debate, in this chapter the traditional motives mentioned as a justification for government intervention in general will be discussed and applied to the health care sector. To better understand the background of the Dutch system, first major social theories are discussed (Section 2.2). Section 2.3 presents the consequences for the health care sector: why does the government regulate this particular sector? Section 2.4 surveys the methods of government intervention in the health care sector. Section 2.5 shows how the Dutch system fits into the framework of general theories on social justice and how economic evaluation can contribute to reaching a more utilitarian basis. Section 2.6 describes several methods of economic evaluations are described. Finally, Section 2.7 concludes.

### **2.2 Social theories on government intervention**

Medical and economic literature offer different motives that may justify government intervention in the health care sector. From an economic point of view, government intervention is motivated to an important degree by the allocation of scarce resources. The ultimate goal is to maximise welfare given certain constraints. These follow from a particular view on social justice. Roughly, three types of social theories can be distinguished in analysing government goals: the libertarian, the liberal and the socialist view.

The **libertarians** are direct disciples of the 'laissez-faire' in the eighteenth century. They favour a minimal state with no or very little government intervention. Individual freedom is the central theme. Within this school, two distinct sets of philosophical arguments should be mentioned: natural right libertarians and utilitarian libertarians. The former argue that state intervention is morally wrong (Nozick, 1974). The latter, represented by writers like Hayek (1976), advocate free markets and are opposed to government regulation out of a belief that this will reduce total welfare (Barr, 1993). The only task they see for the government is to protect individuals from outside enemies and eventually from their fellow-citizens. For both wings, the distribution of services in the health care sector should be the result of freely negotiated transactions in the market-place. The end result may be unfortunate for some people, but as long as the rules are applied properly they cannot be considered unfair.

**Liberal theories** contain a principle of distribution which could, in certain circumstances, have egalitarian outcomes, i.e. in some situations income redistribution is thought to be an appropriate state function. One of the mainstream philosophies in liberal theory is utilitarianism. The utilitarian aim is to distribute goods in order to maximise the total utility of all individuals in society. Therefore, goods and services should be distributed efficiently among existing firms and allocated efficiently among consumers. Furthermore, a simultaneous equilibrium of production and consumption is needed. This concept is called *Pareto-optimality*<sup>1</sup> (Koutsoyannis, 1987). Pareto-optimality is the benchmark for all mainstream microeconomics. It is a simple but powerful guide to test whether a re-allocation of resources might improve social welfare. A resource distribution is considered to be Pareto-optimal when any change in distribution would make someone worse off, even if others are better off. This implies that reallocation is not possible in order to improve one person's welfare without making anyone else worse off. A major drawback of this approach is that programmes that only make people better off and none worse off are very rare. Therefore, a less restrictive standard, the *Kaldor-Hicks criterion* has been

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<sup>1</sup> Although the concept is rather simple, the circumstances under which a situation is Pareto-optimal are rather complicated.

proposed. This compensation rule considers a programme an improvement in social welfare when those who gainers are willing to compensate the disadvantaged.

Various criticisms have been passed on the liberal approach, for instance whether the comparison of interpersonal utilities is possible (this requires cardinal utility) and whose utility should count in establishing the societal welfare function.

A special place, somewhere in between the liberal and socialist theories is taken by Rawls (1972). His beliefs are founded on the idea that the distribution of welfare in society should be based on social justice. All individuals come together as free agents to negotiate a social contract. To do this, they are placed behind '*a veil of ignorance*', which means they ignore all knowledge concerning themselves (their position in society, their cultural background, their historical background, etc.). Barr (1993) illustrates this concept by the example of an aircraft hijack. "*With distance from our personal interests, we may conclude that hijackers' demands should never be met in order to save more lives in the long run. The 'veil of ignorance' prevents giving in to threats, which is likely to happen if our personal loved ones would be in the plane.*" According to Rawls, under this "veil of ignorance", each rational individual will choose according to the 'maximin rule' which maximises the position of the least well-off individual.

Criticism on Rawls concentrates mainly on the concept of the 'veil of ignorance'. Removing all cultural and personal knowledge would immobilise negotiators resulting in no contract at all (Miller, 1976). Miller argues that social justice has three different components: rights, what one deserves and needs. Each component leads to a moral claim. It is just that an individual should have the right to keep his own income if he has earned it legally (*a right*), it is just that someone who works longer should receive more pay (*he deserves this amount of money*) and it is just that someone who is incapable to work should not be allowed to starve (*he is in need*). Miller concludes that a general theory of social justice is impossible. His view can be summarised as follows: the concept of social justice comprises of conflicting principles. How much value is attached to

these principles may vary tremendously between different individuals and societal value systems.

**Socialists** consider rights and needs as dominant elements of social justice. They agree on the importance of equality. This concept can only be put into practice through government intervention, because the market is perceived as being undemocratic and unjust. Socialists argue that the increased role of the government has greatly reduced the damage done by capitalism and the market system, leading to more equality, freedom and fraternity. Some disagree with their fellow-socialists on the question whether socialist goals could be achieved within a market system. Like the liberals, most socialists feel that the best system is some sort of mixed economy that accepts private property and the market mechanism but does not rule out government intervention to correct for undesirable outcomes. **Marxists** stress the exploitation of labour under a free market economy. The ruling elite will prosper, which leads to a class conflict and to economical and political inequality. In Miller's terms, need is the dominant element in their theory of justice.

It is evident that these different views of a just society lead to different policy implications for government intervention. Libertarians criticise the inclusion of needs in aims of government policy, because the resulting instruments (like taxation) impede on natural rights and reduce economic efficiency. Natural right libertarians regard the goal of equality as an unacceptable violation of individual liberty, so according to them even in the health care sector there is no role for government intervention. Utilitarian libertarians acknowledge that a free society based on private property and competitive markets is likely to foster inequality. Limited state action is acceptable to relieve poverty and to provide certain public goods.

The liberal/utilitarian concept includes a certain degree of economic security for all. Justice comprises needs, rights and deserts. The market, according to the libertarians a simple game with winners and losers, can be seen as a boxing tournament in which the participants are not divided into different weight classes (Barr, 1993). According to Mooney (1992) the

utilitarian approach is the guiding principle in health care. The main argument in favour of utilitarianism is that it makes efficient use of scarce resources.

The socialist concept regards this vision as too narrow. Equality and economic security are an integral part of freedom. The boxing tournament without weight classes (a strict application of utilitarianism) would yield several results that are not in keeping with the value system of most Western countries, and certainly not with that of the Netherlands (De Jong and Rutten, 1983). For instance, elderly patients and non-workers would be discriminated.

The goal to reduce social inequalities leads to the application of the maximin rule (maximising the utility of the least well-off individuals), egalitarianism (those most in need will be assigned the highest priority) or the equal-access principle (it does not really matter what level of wants is satisfied, as long as everyone has equal access). The latter principle avoids having to judge the effectiveness of services or the need of individuals. Even the most obdurate Marxist would not hold on to the principle of equal access if this would mean that nobody gets anything.

### **2.3 Consequences for the health care sector**

As Arrow (1963) pointed out, the market for health care is a very peculiar one. It follows that general views of the welfare state may not always apply to this sector. Arrow stresses the non-marketability of health care commodities (pp. 944-46) and the imperfect marketability of information, which leads to non-competitive behaviour of the health care market and to a general consensus that a laissez-faire approach of this market leads to intolerable outcomes. If we accept this theory, an important question will be how to allocate resources between sectors, treatment programmes, diseases, individuals, and so on.

In this paragraph, we analyse specific characteristics of the health care market and their implications for economic policy for societies in general and for the case of the Netherlands in particular. First, Arrow's statement is analysed and an answer is given to the question 'why is government

intervention in the health care sector necessary'. The second question is: 'On what basis should resources be allocated?'. Following this philosophical discussion, the Dutch system is briefly set out, followed by a first exploration of the role of economic evaluations in decision making, a subject which will be revisited in Chapter 8.

### **2.3.1 Efficiency motives for government intervention**

In the view of many, health care is a basic necessity and it should therefore be provided by the government. This conclusion does not unconditionally follow from the premise. For example, food can be seen as a basic necessity too, but the market system is, under normal circumstances, perfectly capable of providing this product. Therefore, there must be other reasons for intervention. According to Arrow, an answer to the question concerning government intervention in the health care sector depends on the differences of this sector with regard to the norm of welfare economics, a competitive market oriented model. The assumption of efficient market allocation only holds when the market equilibrium is based on perfect competition, which means there are (see Koutsoyannis 1987):

- 1- many suppliers and consumers without entry barriers;
- 2- homogeneous products;
- 3- perfect mobility of production factors;
- 4- transparent market; consumers and suppliers have insight in each others preferences.

Apart from perfect competition the standard assumptions of the Invisible Hand Theorem, which asserts that the market clearing set of outputs will be efficient, include the absence of market failures and perfect information. When these assumptions are satisfied, the government can have a legitimate role to intervene in a certain market by several motives, such as the existence of a monopoly, information asymmetry, external effects, public goods, or increasing returns to scale.

#### *Existence of a monopoly*

Take for example the pharmaceutical industry, where many drugs are produced in a monopolist market. This inevitably has a direct impact on both quantity and price of the products concerned. In a market with plenty of suppliers, the demand curve faced by the producers is completely elastic. Individual suppliers have no influence on the market price, they are price-takers. In contrast, a monopolist faces a demand curve with finite elasticity. By manipulating the produced quantity, he is able to influence

the market price. This will lead to a non-optimal quantity produced and a price that is too high.

Apart from the pharmaceutical industry, the health care sector knows monopolies in the supply of services by certain specialists, and regional monopolies of general hospitals.

### *Information asymmetry*

In a competitive market all subjects have access to the same information. There is a complete certainty about manufacture and production factors, technological developments, demand, consumer tastes, etc. In the health care sector this is not the case. According to Evans (1984) "Asymmetry of information between provider and user, and the resulting professional agency relation, are the most fundamental sources of "differentness" of health care as a commodity". In other words, the consumer does not have sufficient knowledge to make a correct medical diagnosis and assess his own needs for treatment. Furthermore, he lacks information about the quality of treatments, quality of suppliers and the fairness of the prices they charge. The information asymmetry can be divided into four different problems:

- a- insufficient knowledge of needs;
- b- insufficient knowledge of quality;
- c- insufficient knowledge of prices;
- d- insufficient knowledge of the future.

Ad a: The patient lacks sufficient knowledge of medical devices and treatments. He does not know which types of treatment are available and what outcomes can be expected of each of them. The decision is made by a medical doctor, who has studied for at least six years to decide which medical actions are necessary to treat the ailment in question. General practitioners and specialists in hospitals ought to consider the patient's needs. At the same moment, however, they are suppliers of medical services. As a consequence, there might be a financial incentive to supply as many services as possible, even when a patient does not really need them. A complete unregulated health care market could therefore lead to over-production and over-treatment.

- Ad b: The patient is not able to judge the quality of medical services. The risk of inferior products being supplied is considerable. This is one of the reasons why the government demands certain quality standards for the supply of medical services, as laid down in the Dutch Occupations in Individual Health Care Act (Wet op de Beroepen in de Individuele Gezondheidszorg) and those upheld by the Health Inspector (Inspectie van de Volksgezondheid).
- Ad c: The prices and charges in the health care sector not adequately reflect real cost. They are the result of negotiations. Furthermore, information about prices and charges is scant. A consumer makes his choice depending on his indifference curve and his budget constraint. If he has no insight in either of them, a rational choice is impossible. The price mechanism, therefore, is not working properly, leading to an imperfect balance between demand and supply.
- Ad d: Utility maximisation in the long run requires information about the future. Consumers in the health care market are unable to predict their usage of health care services. They might be involved in an accident, develop a fatal disease, and so on. For such cases the market solution is to offer private insurance as a protection against risk. However, there are several complications in the health care insurance market. One of them is the problem of asymmetric information. The purchaser of insurance may have a greater insight in his own state of health than the supplier. This is called the concept of 'lemons' (Akerlof, 1970): the purchaser may be a poor risk, leading to adverse selection. If the insurance company is not able to distinguish high-risk and low-risk individuals, it will set a comparatively high average premium for all individuals. Low-risk individuals might choose not to insure themselves and people with chronic diseases may be excluded from insurance coverage. This problem particularly surfaces in relation with medical insurance for the elderly.

Other complications with health care insurance are (among others) the problem of 'moral hazard'. If an individual's insurance covers all medical costs, health care is, at the margin, free to this

individual. On the supply side, however, a doctor knowing the insurance company will pay the bills of his patient is not constrained by the patient's ability to pay which might lead to excess supply. Thus a system of health insurance is likely to result in over-consumption, which is sometimes referred to as supplier-induced demand. As a result, an upward pressure on insurance premiums can be expected (further comments on conditions for an efficient private market for health care insurance are discussed by Arrow, 1963; Pauly, 1986).

All four aspects disrupt the market mechanism in the health care sector. If suppliers are able to manipulate demand, the demand curve will no longer be autonomous but becomes a function of the supply curve. The Invisible Hand is no longer working. This situation may lead to an inefficient allocation of resources, a serious argument for government intervention. Other departures from the Invisible Hand Theorem occur when there are market failures, like external effects, the presence of public goods or increasing returns to scale.

#### *External effects*

External effects exist when certain activities of consumers or producers have consequences for others, advantageous or disadvantageous, that are not reflected in prices. Dasgupta and Pearce (1972) describe them as follows: "An external effect will be said to exist whenever (a) an economic activity in the form of production or consumption affects the production or utility levels of other producers or consumers and (b) the effect is unpriced and uncompensated". In such a case, the societal costs do not match the private costs. As prices do not give adequate information about costs and benefits, resources are likely to be allocated inefficiently. Production quantities will be either too low (in case of positive external effects) or too high (in case of negative external effects). This way, external effects do not only influence the efficiency, but also the equity of the allocation of resources. Some individuals receive benefits as a consequence of an external effect for which they don't pay to the producer. Others are confronted with costs they will not be compensated for (for example: future generations).

The best solution to cope with this inefficiency, seems to be to internalise the external effect by correcting the price in such a way that it reveals actual societal costs and benefits. Another possibility is to change consumption and production patterns by means of laws and regulations (Coase, 1960).

Examples of external effects in the health care sector are vaccination programmes, providing clean drinking water, investment in sewerage, etc. As a consequence of one individual being vaccinated the probability of someone else being contaminated decreases. A recent study on the use of pesticide-treated bednets in Gambia for instance has shown that the incidence of malaria decreased among those who did not use bednets (Hammer, 1996).

According to Labelle and Hurley (1992) the option value can be seen as an external effect too. Individuals are willing to pay for the assurance that health care will be available in the future. The possibility of future consumption, whenever necessary, is seen as a benefit the price of which is not included in the current charge.

### *Public goods*

Under the regime of the Invisible Hand some goods and services will not be provided in adequate amounts. This is what Arrow called the "non-marketability" of such goods. Normally, market prices arise from a confrontation between demand and supply. On the market money is exchanged for goods. This exchange can only take place when the property rights of goods are clearly described and exclusive. It must be possible to exclude people who do not pay from consumption. Once a good is produced non-excludability makes it impossible to prevent people from using it, hence it is not possible to levy charges (the free-rider problem). In some cases exclusion from usage is not possible, because transaction costs are high or property rights are not enforceable (non-rejectability, e.g. air pollution). Another feature of public goods is non-rivalness. Non-rivalness implies that the marginal cost of an additional user is zero. In the health care sector the presence of pure public goods only plays a role with contamination and sewerage.

### *Increasing returns to scale*

Increasing returns to scale occur when doubling the input more than doubles the output. Average costs (AC) will exceed marginal costs (MC), while the price (P) is equal to the marginal costs ( $P=MC$ ). As a consequence firms probably cannot reach the most efficient level of outcome (where  $AC = MC$ ), and in that case will be driven out of business. The industry will either be monopolised or cease to exist at all. In both cases the government can decide to regulate or to take production into its own hands. For instance, this kind of regulation could be necessary in the case of high medical technology, which needs only to be available in one or two hospitals. Centralised production leads to lower costs for society in general, as a consequence of smaller overhead costs.

### *Special cost argument*

A further motive for financial support of the government in the health care sector is when a product's characteristic make this support indispensable. This is a special cost argument. Baumol (1967) concluded in 1967 that the art sector had a technological structure that increased real costs in comparison to other sectors of the economy. This 'disease of personal services' or 'Baumol's disease' also applies to the health care sector. According to Baumol there is a differential productivity development between different sectors of the economy. He suggests a division within activities in the production process. Firstly, activities with a progressive technology which stimulates labour productivity through innovations and capital accumulation. The output per man hour is rising in this sector. On the other hand, there are sectors where labour costs per unit of product will increase through the years because of an insufficient productivity increase. If there is a perfect mobility of production factors between sectors, wages in both sectors will increase correspondingly. As a consequence, in the second sector the wages rise, while the productivity stays on the same level. The labour costs per unit of product will then rise exponentially. The 'disease of personal services' includes activities like education, performing arts, and health care. It is said that these sector cannot exist without government support. Generally, this is only a secondary argument for government intervention: if the government decides to support the health care sector, the support tends to increase

over the years. Furthermore, there is debate about the potential productivity increase in the care sector (Baumol, 1993; Färe et al., 1997, especially for laboratory diagnostics and medication). In the care sector, however, the argument remains relevant.

### **2.3.2 Equity motives for government intervention**

Efficiency considerations are not the only possible motive for government intervention in the health care sector. Due to the special characteristics of health and health care as a commodity the government can have a paternalistic motivation to intervene.

#### *Merit goods*

In welfare economics consumer sovereignty is a central concept: an individual is thought to know best what is good for himself. A necessary precondition for this concept is that the information needed to come to a rational choice is available. The 'merit good' motive is built on the hypothesis that this precondition is not always satisfied. The government can decide to correct the preferences of individual actors in the economy because they cannot understand the importance of certain products (due to imperfect information or a misunderstanding of information). With a market mechanism this could lead to over- or underconsumption and an inefficient production pattern. The government may decide that a certain product is very important for its citizens, for example museums, monuments, safety belts and crash helmets. The government might assume that health is a useful product and that individuals will underestimate its value with total consumer sovereignty. One of the main reasons for this could be that health is not only a consumption good, but also an investment good: when a worker is healthy, he will be able to have a positive impact on the Gross National Product (GNP). The government can stimulate the consumption and production of certain goods by giving a subsidy or by regulation, as with safety belts and crash helmets. On the other hand, destimulation of 'demerit goods' can be accomplished by levying a tax (tobacco and alcohol) or a total ban (hard drugs). According to Margolis (1982) this argument is used too much, 'merit goods' are "any item of public expenditure that seems socially reasonable but cannot be accounted for within ordinary economic theory of demand.

It is a kind of escape clause." In the Netherlands the merit good argument was used to defend housing subsidies. This is no longer so, because people tend to understand the importance of good housing. As 60% of the people considers health as the most important aspect in life (SCP, 1997), the 'merit good' argument will not hold.

The health care sector has certain characteristics that can lead to a discrepancy between the choices an individual makes and the choices he should have made in order to increase his utility. Examples are the unpredictability of the incidence of disease, the unpredictability of the costs brought about by this disease, the uncertainty regarding the quality of the product, consequences of the disease for his position in society, etc. The government sees itself as interested party for individuals who are not able to make rational choices because of the limited information. In this view health is a good that people should have, regardless of their ability or their willingness to pay for it. This view has rather far-fetching consequences. If the poor would be willing to give up some health care in exchange for cash and the rich would gladly trade the equivalent amount of cash for additional health care, welfare economics would see this as a possibility for trade (according to the Pareto-criterium), because it would make poor and rich people better off in terms of their utility function (meaning that in their present situation health is less important than cash in the individual utility function of the poor). Extra-welfarists regard such trade as unacceptable, because health is a merit good and people are not able to judge its importance for their own lives.

#### *Equity considerations*

If we accept fostering social justice as one of the aims of the welfare state, equity considerations can be another reason for government intervention. Equity considerations may have a certain impact on the entry barriers that individuals encounter in health care consumption. Equity concerns the diffusion process of medical technology, the dispersion of health care in a fair way. Within this diffusion process a distinction can be drawn between horizontal equity and vertical equity.

**Horizontal equity** deals with aims like equal access, equal opportunity and minimum standards for certain goods and services. If one's house has inadequate sewage disposal, public health hazards may be an argument for minimum standards laid down in building codes. Furthermore, if individuals are not able to follow their preferences due to unequal power relations, as in an employer-employee relation, safety standards might be enforced by government agencies. Other horizontal equity considerations concern regional planning of services, know-how of entitlements under public insurance, etc.

Barr (1993) notes: "The horizontal equity argument should not be overstated. Where the standard assumptions hold, any problems of unacceptable standards or unequal access are generally *income distribution problems*".

**Vertical equity** concerns redistribution of income or consumption from rich to poor. Individuals from lower socioeconomic classes must be able to consume health care services needed<sup>2</sup>. This is one of the main points of departure for organising the health care system in Western European countries. To natural libertarians this is a devil in disguise, because the goal of equity is an unacceptable violation of individual freedom. Others, liberals, socialists and Marxists see a bigger role for the government in establishing and guarding vertical equity, be it in different graduations.

## 2.4 The Dutch system

According to Culyer et al. (1990) the foundations of the Dutch health care system are merely based on principles of equity. The Dutch Council of Health (1986) and Hutubessy and Ament (1994) regard the system to be based on egalitarian principles. This means that somebody who is ill and needs treatment, has a right to medical care. Not the ability to pay but the need for care determines the allocation of health care resources. These thoughts of solidarity have materialised in certain laws (AWBZ, Ziekenfondswet), which especially guarantee access to health care for lower income groups. However, as mentioned in Chapter 1, during the last

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<sup>2</sup>Need can be defined in several ways: need as initial health, need as a capacity to benefit, need as expenditures a person ought to have (see Culyer and Wagstaff, 1993). However, this does not change the essence of the discussion, even though the resulting government action depends largely on the definition of need.

decade efficiency, flexibility, and consumer sovereignty became important co-goals. Several solutions for cost containment were considered: more market elements (Plan Dekker, 1987), substitution (Goudriaan, 1990; IOO, 1995), stimulation of individual responsibility for health and self-care, introducing tight budgeting at all levels of health care decision making (for example functional hospital budgeting), prioritising based on cost-effectiveness studies (Postma, 1995) and reducing the level of service provision to which access is guaranteed (lowering the safety-net). In 1991 a special committee was established which investigated the possibilities of making more rational choices in the health care sector (Choices in Health Care Committee, 1992). The recommendations of this committee drew attention to the organisation of the Dutch health care system on a utilitarian basis.

## **2.5 Economic evaluations**

In a utilitarian system there is much room for economic evaluations, for which several methods are available. If alternative interventions all lead to the same outcome and one only seeks the treatment which has the lowest cost, this is called a *cost-minimisation analysis*. In this case, the benefits of the different treatment modalities are assumed to be the same.

Therefore, it is not necessary to distinguish between different outcomes. One merely searches for cost differences to find the most efficient way of service delivery.

If certain differences in outcome are likely to result from the treatment options under evaluation, both costs and consequences have to be considered. The literature distinguishes between three methods. If the outcome of the different treatment options can be measured by one single physical unit (such as life years saved), this is called *cost-effectiveness analysis* (CEA). If the differences in outcomes manifest themselves in different dimensions (for instance physical, psychological and social functioning), further analysis is needed. It is common practice to use preference ratings to aggregate these dimensions into one single index (like the time trade-off method or the Standard Gamble method, that both ultimately lead to an index called 'Quality Adjusted Life Years' (QALY)). This approach is called *cost utility analysis* (CUA). Finally, if the differences in outcome are measured in monetary terms (with willingness-

to-pay or willingness-to-accept procedures), this is called *cost-benefit analysis* (CBA). However, it is still highly controversial to apply a monetary value to a life year (Lee-Jones, 1979). Furthermore, there is strong disagreement on whether clinical outcomes as a result of medical interventions and converted into monetary equivalents can be compared with a money measure of costs (Sloan, 1995; Reinhardt, 1997). The problem becomes even more evident when the cost of treatment is not fully paid for by the patient, but by persons other than those who benefit from it (e.g. taxpayers).

Therefore, CEA and CUA are most often applied in economic evaluations. The central purpose of cost-effectiveness analysis is to compare the relative value of different interventions in creating better health and/or prolong life. The results of such evaluations are typically summarised in a cost-effectiveness ratio, where the denominator reflects the gain in health from a candidate intervention and the nominator reflects the costs of obtaining that health gain (Gold et al., 1996). Ideally, one would wish to be able to array a 'league table', in which a rank order of the cost-effectiveness of all different programmes for different diseases could be established, although the opinions about this approach are mixed given the present state-of-the-art (see Drummond et al., 1993; Birch and Gafni, 1994 and Drummond et al., 1995).

## 2.6 Summary

In a perfectly competitive market there is no reason for government intervention to improve the allocation of resources. However, the health care market fails to meet the traditional assumptions of the Invisible Hand, which are perfect competition, no market failures and perfect information. Consumer information in health care is highly imperfect due to the complex and very technical character of the goods and services traded. Moreover, technologies are rapidly changing. In addition, consumer information about prices and quality is limited. Knowledge about future demand is impossible, which give rise to practical problems in organising a private health insurance system. These information problems lead to inefficiencies. The result can either be under-consumption or over-consumption.

Summarising, due to several causes the health care market is not competitive and does generate considerable external effects (for instance: vaccination, sewerage). The question remains why the government has to intervene. Why do not producers and consumers act themselves? Several reasons could be mentioned:

- external effects are difficult to observe for consumers and even more importantly, very difficult to quantify;
- high transaction costs of negotiation in terms of time and money;
- external effects have the characteristics of a public good. Individuals who are not involved in the negotiations and as such do not contribute to the costs, can profit from the outcome.

When the government suspects that the individuals deciding on their health care consumption fail to take these aspects into consideration, this can be a reason to influence the demand or supply of health care services.

Furthermore, there is a general claim that the nature of the product health care makes support indispensable, because labour productivity in this sector lags behind that in other sectors of the economy. Baumol and Bowen (1976) conclude that between 1945 and 1965 the financial gaps in the performing art sector rose as a consequence of increasing labour costs. However, although this “disease of personal services” seems a fashionable argument in the health care sector, it is not a motive for government

intervention per se. It only means that if the government decides to intervene in the health care sector (on other grounds, efficiency or equity), the funds involved will increase over the years.

Nevertheless, there seem to be a lot of reasons for government intervention. Lack of competition and information failures may justify regulation. Externalities and insurance problems may justify public funding. What type of intervention is appropriate and how do we allocate resources if we accept the fact that public funding is necessary?

Strictly libertarian health policy would only favour those public health facilities for which no alternative exists. In practice these are practically none, except perhaps public goods like water supply and sewerage. The utilitarian approach is said to lead to a focus on prevention, cure and in certain circumstances rehabilitation. Care receives low priority because it contributes little to health status and is consequently valued less (De Jong and Rutten, 1983). In more socialist-inspired systems, like egalitarianism, this is fundamentally different. The worst-off are the first to receive help. This means that the chronically ill, the aged and the mentally handicapped receive ample attention. The equal access principle leads to a rather arbitrary level of health care production which is accepted as long as everyone has the same access. This principle is not workable for policy ends such as the allocation of scarce resources.

In the Netherlands the health care system is a hybrid of the utilitarian and the extremely egalitarian approach. This system is based on a historical development in which both efficiency and equity considerations have played an important role. If we accept equity as a strategic policy goal - regarding reduction of existing inequalities as a strategy to improve of public health by which (in addition) human capital is maintained- the underlying policy goal can be efficiency or: "How do policy makers allocate resources in such a way that they reach their strategic policy goal?" In this view, there is not necessarily a contradiction between the goal of equity and the goal of efficiency. In a way, maximising total health will benefit the least well-off and thus promote equity. As Vagero (1994) argues: "It should be possible to be in favour of both cost containment and

more efficient (in terms of health outcome) methods of cure and care without giving up the objective of equity in health." The belief that we should start with principles of equity, and then proceed to considerations of efficiency, is the foundation upon which most health care systems have been built (Rice, 1997).

Against that background, the maximisation of welfare is not likely to get much support as the single policy aim in the Netherlands, for this concept implies that the distribution of possible gains in health outcome does not matter to the general public. This view is contradicted by many publications in the field of health economics. For instance, Nord et al. (1995) show that treatment of younger people should have some priority over treatment of the elderly. This is possibly most efficient too. However, this does not necessarily lead to favouring treatment of people with a 'healthy' lifestyle over that of patients with an 'unhealthy' lifestyle (Charny et al., 1989), or to help people with a very low health status first (Nord et al., 1995). Equity considerations seem to play an important role in public views of health care and as a strategic goal for government policy. Taking equity considerations as a starting point for the organisation of the Dutch health care system does not imply that efficiency concerns should not play an important role any longer. For instance, the earmarked redistribution of income specifically for consumption in the health care sector, is not advisable from a welfare economic point of view (Feldstein 1984). The available evidence from a microeconomic point of view suggests that individuals with lower incomes may well prefer a higher income to more medical care, other things being equal, in which case the egalitarian approach does not serve them as well as other public policies that would require the same public expenditure on their behalf (Phelps, 1995). In such a case, it seems preferably to conduct a generic income policy, wherein unrestrained income transfers and levying of taxes take care of this redistribution.

In view of the recent developments described in Chapter 1, a greater impact of utilitarian procedures is defensible. This thesis is concerned with the role that economic evaluations can play at different levels of policymaking. In the following chapters 3-7, a number of examples of

economic evaluations are presented, with their possible contributions to policymaking.

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## **Chapter 3 Costs of implant-retained mandibular overdentures**

### **Summary**

The effectiveness of dental implants is studied widely. Most of these studies examine clinical outcomes. However, from the policy makers=point of view other variables than safety and efficacy are vital in decision making, such as the costs and effectiveness of dental implants as compared to other alternatives. This paper compares the costs of different treatment strategies in a randomised clinical trial in patients with resorbed mandibles and persistent problems with their conventional dentures: treatment with a mandibular overdenture on permucosal dental implants, an overdenture on a transmandibular implant, a new set of dentures after preprosthetic surgery and a new set of dentures only

Cost data were gathered on an individual patient level to gain insight in specific cost episodes. Direct costs are identified, subdivided into the costs of labour, material, technique and overhead. Data about these components were gathered during the consecutive treatment phases in the first year. The results show that the resources used to treat a patient with an overdenture on a transmandibular implant are seven times as expensive as a complete new set of dentures. Comparison of the cost ratio of an implant-retained overdenture on permucosal implants and a regular new prosthesis proves less unfavourable: 1:3. A new set of dentures after preprosthetic surgery is almost as expensive as treatment with permucosal implants.

*The presented chapter is partly based on the following paper:*

Wijk, P. van der; Bouma, J.; Waas, M.A.J. van; Oort, R.P. van; Rutten, F.F.H. The cost of Dental Implants as Compared to That of Conventional Strategies. *International Journal of Oral and Maxillofacial Implants*, 13: 4, 546-553.

### 3.1 Introduction

The costs of the health care sector grew explosively in many Western societies during the eighties. Cost containment was, and still is, a dominant theme within the health care sector. Reliable information about the costs of alternative treatment strategies is therefore vital and will be presented here regarding the various options for treating edentulousness.

Dental implants were developed as an alternative to conventional dentures and their efficacy and effectiveness have been established during the last decade. The growing evidence of the effectiveness calls for research into costs and effects of this treatment. Many articles have been published about clinical aspects. The main criterium for clinical success seems survival<sup>1-7</sup> although other objective criteria such as the gingival index, the plaque index, pocket depth and the mobility of the implant are frequently described<sup>1,8-11</sup>. In a number of other publications the psychosocial effects of dental implants are mentioned<sup>12-16</sup>. Over all, these studies show considerable improvement in the psychological well-being of patients treated with dental implants. Only one article is known to assess costs<sup>17</sup>.

The purpose of this study is to compare real costs of treatment with overdentures on dental implants with the costs of conventional strategies during the first year after treatment. Four possible treatment alternatives are included. Surgery for permucosal implants (**PI**) was performed under local anaesthesia. Two different, two phase implant systems were applied: the Brånemark system, a titanium screw-type cylinder, and the IMZ system, a titanium cylinder with titanium-plasma-spray coating. During the first step, the fixture installation, two fixtures were interforaminally inserted under local anaesthesia. The mean length of the fixture operation was 73 minutes. After this operation, the patient was seen twice for check-ups of 15 minutes. Patients were not allowed to wear the mandibular denture during the first two weeks. After initial woundhealing the denture was adjusted with a soft-liner and a soft diet was prescribed. The abutment connection took place after a healing period of three to six months. At that moment the titanium abutments were connected to the implants. The mean operating time of this second operation was 41 minutes, followed by one routine check of 15 minutes. For both systems an implant-tissue supported overdenture was used with a single-bar attachment.

Transmandibular implants (**TMI**) were placed under general anaesthesia. The implant was inserted extraorally<sup>3</sup>. Mean operating time, including the

impression for the superstructure, was 2 hours and 11 minutes. The superstructure was placed, consisting of a triple-bar construction with cantilever extensions. The patient was checked three times before the superstructure was placed (taking 60 minutes, in total). Preprosthetic surgery (PPS) took place under general anaesthesia. Thirty patients were treated surgically by interforaminal vestibuloplasty and deepening of the floor of the mouth. The operation itself lasted 1 hour and 30 minutes, two hours more were needed for diagnostics, checks and relining of the prosthesis. The group of patients who received a new set of dentures did not have any surgery. In all groups the dentures were manufactured with an optimal fit and according to the balanced occlusion principle.

### **3.2 Material and methods**

#### *Patient selection*

A randomised clinical trial was conducted at the Department of Oral and Maxillofacial Surgery and Maxillofacial Prosthodontics (University Hospital of Groningen) and the Department of Oral and Maxillofacial Surgery (University Hospital of Nijmegen). Treatment with implant-retained mandibular overdentures on two permucosal implants (Brånemark or IMZ) was compared with treatment with a mandibular overdenture on a transmandibular implant and with two conventional treatments with a new mandibular denture, one after preprosthetic surgery and one without. All patients received a new maxillary denture. In total 240 patients were randomly assigned to one of the above groups. For the economic evaluation two separate trials were put together in the ADIOS-group (Academic Dutch Overdenture Study). In Nijmegen three groups of 30 patients were treated with mandibular overdentures, overdentures on permucosal implants or with regular new dentures. All these patients had a maximum mandibular bone height of 14 mm. In Groningen a selection was made based on the mandibular bone height. For the group of patients with a mandibular bone height above 15 mm three treatment options were available: overdentures on permucosal implants, new dentures after preprosthetic surgery or regular new dentures. For the patients with a lower bone height (8-14 mm) preprosthetic surgery as in this group the obtainable increase of the denture bearing area would be insignificant<sup>18</sup>, so for the group with lower jaws only two treatment options were available: overdentures on permucosal implants or regular new dentures. The whole concept, ordered by the National Health Insurance Council of the Netherlands, resulted in an uneven distribution of patients. Nevertheless, it had several advantages: similar treatment procedures were used and evaluated and a larger

research population was established.

Patients included in this study all had severely resorbed mandibles and persistent problems with their conventional set of dentures. They were referred to a University clinic by general practitioners. The criteria for inclusion were edentulousness in both jaws for at least twelve months, a mandibular bone height of 8 to 25 mm and no general contra-indications for implants or surgical procedures. All subjects were informed about different treatment options, possible risks and the method of treatment assignment. Written informed consent was required for participation in the trial. Treatment was assigned by means of a balancing procedure aiming for an equal distribution of patients over the treatment groups with regard to variables that may interfere with the outcome of the study<sup>16,19</sup>. This pre-treatment comparability was ensured by balancing all groups for age, gender, period of edentulousness in the mandible, age of the present mandibular denture and mandibular bone height. No significant differences were found on either one of these aspects. Table 1 shows the structure of the treatment groups and their most relevant characteristics.

**Table 1: Patient characteristics at baseline**

Treatment	Transmandibular implants	Per mucosal surgery	Preprosthetic dentures	New set of dentures
	N = 30	N = 89	N = 28	N = 89
Age	53	55	53	57
Gender M (%)	28	23	37	29
F (%)	72	77	63	71
Number of years edentulous in lower jaw	21	22	20	23
Number of mandibular dentures	3,5	2,8	2,3	2,8
Mean age mandibular denture	6,4 7,2	8,2	6,9	

Only the number of dentures in the lower jaw proved different in the various treatment groups (2-way-ANOVA).

### *Study design*

In association with this clinical trial, we performed a cost analysis of all different treatment modalities. One important consideration should be kept in mind. It was possible for patients to refuse the allocated treatment. In nine cases this happened. For these patients the 'Intention to treat' principle was applied, implying that patients are evaluated in the originally allocated treatment group regardless of their actual treatment. However, for the cost

analysis this is of no importance, because people who are not treated do not generate any costs. The same principle holds for attriters: as long as they did not show up at the dental clinic, no treatment costs were made. If effects would have been taken into account exclusion of attriters would have been a probable source of bias.

The integral cost analysis is based on data about actual costs, and not data about fees. Fees are just a revenue for the provider and do in most cases not reveal actual costs. As we were interested in actual costs, and not in fees, the patients were followed through the treatment process during the first post-treatment year. Detailed hospital data were collected for each patient. Costs were subdivided into the costs of labour, equipment, technique and overhead during the different treatment phases: examination, fixture operation, abutment operation, prosthodontic treatment, controls and complications until one year after treatment. A procedure was used that compares with the Resource Based Relative Value Scale<sup>20,21</sup>. Cost components were divided in the total work of physicians' labour and practice expenses. A Conversion Factor was not used, because for all components actual costs were assessed completely, and not relatively to other medical procedures.

The cost of labour was based on a registration of treatment time at the individual patient level. Actual costs were then determined using gross salary of the dental staff. Costs of labour can be divided into surgical costs and prosthodontic costs. The estimation of labour costs included the duration of the treatment, but not the intensity.

Practice expenses were subdivided in cost of material, hospital costs and overhead costs. Costs of material includes the costs of the dental implants, the new set of dentures, the abutments, etc. All those different cost components were gathered on an individual patient level too. Further costs were accumulated on the hospital level, as a variety of diagnostic tests (blood tests, X-rays) was conducted on patients undergoing general anaesthesia: the TMI-group and the group of patients who received preprosthetic surgery (PPS). Information on whether or not the test was performed on individual patients was not always recorded. The costs of diagnostic tests were estimated from the treatment protocol. Other hospital costs were generated because patients who received a transmandibular implant or preprosthetic surgery had to stay in hospital for three days. Last, there are the cost of overheads. Each treatment makes use of the normal hospital facilities. These costs include: costs of reusable equipment, capital costs of the building and the inventory,

consumables, laundry services, cleaning, maintenance, electricity, administration, etc. An estimate of the cost of floor space was made by calculating the size of the dental department and multiplying it by the historical value of office and clinical space. All other costs (laundry, cleaning, maintenance) were approximated by using hospital expenditure for the different components within the total budget.

#### *Statistical analyses*

To make the results more comprehensive mean values are used in the tables. Differences in patient characteristics were tested by means of a two-way ANOVA with a significance-level of  $\alpha = 0,05$ . For all cost data a 95%-confidence-interval was calculated based on the standard error of the mean of all groups. No differences in costs were found relating to bone height.

### **3.3 Results**

#### *Costs of surgical procedures*

Table 2 shows the total time of each different profession within treatment and the resulting costs.

Table 2: Total treatment time and costs (in dollars) per treatment group

	Transmandibular implants		Permucosal implants		Preprosthetic surgery		Complete dentures	
	Hours	Costs	Hours	Costs	Hours	Costs	Hours	Costs
Dental surgeon	4 h 06	250	3 h 34	217	3 h 30	213	-	-
Nurses	6 h 22	174	6 h 07	136	3 h 00	82	-	-
Anaesthetist	2 h 41	163	-	-	0 h 30	30	-	-
Assistant anaesth.	-	-	-	-	1 h 30	64	-	-
Administrative	0 h 30	12	0 h 40	15	0 h 15	9	-	-
<i>Prosthodontic procedure</i>								
Prosthodontist	4 h 38	197	4 h 40	200	3 h 58	168	4 h 06	175
Assistent	4 h 38	100	4 h 40	102	3 h 58	84	4 h 06	87
<b>Total</b>		<b>896</b>		<b>670</b>		<b>650</b>		<b>272</b>
95%-confidence interval		[875-917]		[648-692]		[616-684]		[248-296]

Time invested by prosthodontist and assistant do not differ very much. In the implant groups more time is needed to construct to the superstructure and of course the operation time is higher. Especially for the transmandibular implant this leads to pronounced additional costs.

#### *Costs of prosthodontic procedure*

All groups had the prosthodontic treatment performed according to a standard procedure. The permucosal implant group started the prosthodontic treatment about three weeks after the second operation. The group of patients with a transmandibular implant had the superstructure placed within 24 hours of surgery and the new set of dentures were made two months later. The PPS-group was transferred to the prosthodontist one month after the vestibuloplasty. Patients who received a new set of dentures started their treatment at the prosthodontists. Mean treatment time for the production of a new set of dentures was calculated on individual patient level. Table 2 presents the results, including all check-ups until 6 weeks after treatment.

*Other costs*

All patient groups undergoing surgery had the costs of the usage of an operating room included. Table 3 shows the practice expenses for all treatment groups.

Table 3: Practice expenses per treatment group, in dollars

	Transmandibular implant	Per mucosal implants	Preprosthetic surgery	Complete Dentures
<i>Hospital costs</i>				
Laboratory tests	75	-	75	-
X-ray	63	63	63	-
ECG	18	-	18	-
Hospital days	1,500 <sup>a</sup>	-	1,500 <sup>a</sup>	-
Operating room, min.	469 <sup>b</sup>			
max.	1,594	434	469	-
Medication	12	12	12	-
<i>Material costs</i>				
Equipment	345	175	-	-
Implants	2,130	455	-	-
Prosthesis	1,475	1,220	570	575
<i>Overhead</i>	400	412	392	211
<b>Total</b>	<b>6,487-7,612</b>	<b>2,771</b>	<b>3,099</b>	<b>786</b>
95%-confidence interval	[6,387-7,712]	[2,669-2,873]	[3,038-,160]	[752-820]

<sup>a</sup> Average length of stay was three days in a university hospital

<sup>b</sup> Due to the insurance system in the Netherlands, part of the costs of the transmandibular implant are accounted for in the bill of the operating room. Nobody knows exactly what part. The minimum estimation reveals a situation in which the implant is paid largely out of this fee, the maximum estimation shows the cost of a very heavy operation and almost no payment for the implant itself.

For the operational procedures a standard package of diagnostic tests (including an ECG) was done. Patients under general anaesthesia (TMI and PPS) stayed in hospital for three days, costing \$ 1,500,-. Medication consisted of antibiotics and analgesics. Material costs were divided into costs of equipment, implants and prosthesis. Different equipment and instruments are used for each treatment during the surgical and the prosthodontic procedure. The instrument case of the transmandibular implant was averagely used for the operation of 30 patients. The total costs of an instrument case with tray including an adjustable drill guide, the superstructure drill guide, several screw

drivers, drill sleeves, tap sleeves, fasteners and lock screws are about \$ 6000, or \$ 200 per patient. This does not include drills and taps (\$ 145 if converted per patient). The usage of disposables for the permucosal implants is somewhat different for the Brånemark- and the IMZ-system. The Brånemark-system uses special disposables for implant patients. IMZ uses the regular machinery of a surgeon. However, the resulting differences in costs per patient were not dramatical (ca. \$ 50 pp), so the average cost of both systems was used. Total costs of disposables were \$ 175 per patient (drills, screw taps, screws and the capital costs of a control unit).

Other material costs represent mainly the costs of the implants itself, the costs of the abutments and the superstructure, and the costs of the dental prosthesis. Costs of overhead were accounted to the treatment groups on the basis of total treatment time. Table 3 provides an overview of the material and overhead costs per treatment group.

#### *Costs during follow-up (until one year)*

In some cases complications occurred which had great influence on the total cost per individual patient. The costs of follow-up in this study were calculated according to the number of visits to the dentist and to the average treatment time of those visits. Furthermore, costs of material and overhead were accounted for as described earlier. In table 4 the labour time of follow-up treatment is shown per treatment group. Both implant groups are significantly more expensive than the conventional treatments with respect to follow-up, due to visits to the dental surgeon and the dental hygienist. In total these costs mount up to more than \$ 300,- for the first year, while people with a new denture cost less than \$ 100,-.

During the first year the average time needed by the dentist for the implant groups was between 48 minutes (PI) and 67 (TMI) and between 50 (PI) and 35 (TMI) minutes with the dental hygienist. This time was needed for aftercare and maintenance of a proper oral condition.

Table 4: Time and costs of follow-up per treatment group in hours and dollars

	Transmandibular implant		Per mucosal implants		Preprosthetic surgery		Complete dentures	
	Hours	Costs	Hours	Costs	Hours	Costs	Hours	Costs
Dental surgeon	0 h 50	55	0 h 40	33	0 h 10	11	-	-
Dentist	0 h 67	52	0 h 48	37	0 h 20	16	0 h 40	30
Dentist-assistent	0 h 67	30	0 h 48	22	0 h 20	9	0 h 40	17
Dental hygienist	0 h 35	19	0 h 50	29	-	-	-	-
<b>Total labour</b>	-	<b>156</b>	-	<b>121</b>	-	<b>36</b>	-	<b>47</b>
Material		68		119		13		19
Overhead		118		77		10		28
<b>Total costs of follow-up</b>		<b>342</b>		<b>317</b>		<b>59</b>		<b>94</b>

*Total costs in the first year*

The costs of each treatment strategy can be broken up into their components (table 5): labour, material and overhead.

Table 5: Total cost of treatment during the first year in dollars

	Transmandibular implant	Per mucosal implants	Preprosthetic surgery	Complete dentures
<i>Labour</i>				
-Surgery	599	368	398	-
-Prosthodontics	297	302	252	262
-Check-ups	156	121	36	47
<i>Practice expenses</i>				
<i>Materials</i>				
-Implants	2,975	370	-	-
-Instruments	199	99	-	-
-Disposables	145	114	-	-
-Prosthesis	631	1,220	570	575
-Aftertreatment	68	119	13	19
<i>Overhead</i>				
-Treatment	400	412	392	211
-Aftertreatment	118	77	10	28
<i>Hospital costs</i>				
-Hospital stay	1,500	-	1,500	-
-Operating room	469-1,594	434	469	-
-Diagnostic tests	168	75	168	63
<b>Total costs</b>	<b>7,605-8,830</b>	<b>3,711</b>	<b>3,808</b>	<b>1,205</b>
95%-confidence Index	7,494-8,951 631-733	3,644-3,858 308	3,712-3,894 316	1,170-1,240 100

Table 5 gives an aggregate of table 2,3, and 4. It shows that the total costs in the first year of treatment mount up to between \$ 7.600 and \$ 8.800 for an overdenture on a transmandibular implant. The total cost is 7 times as much as the costs of treatment with a new set of dentures. Treatment with an overdenture on permucosal implants or new dentures after vestibulum surgery are similar with respect to treatment costs. They cost almost 3.2 times as much as regular new dentures. The high costs of the transmandibular implant and the preprosthetic surgery result from an operation under general anaesthesia (hospital stay, diagnostic tests, operating room costs). Costs of aftercare were included for the first year. In these costs failures of new dentures were concluded.

#### *Sensitivity analysis*

The purpose of a sensitivity analysis is to test the validity of conclusions made over a range of reasonable values for the assumptions made in the base line analysis. In this sensitivity analysis we calculated the threshold-values at which the conclusions about the total costs would change. A summary of the sensitivity analysis and its relation to the main analysis is shown in table 6.

Table 6 Summary of the main analysis (average costs) and the sensitivity analysis (additional costs under various assumptions), all in dollars

	Transmandibular implant	Permucosal implants	Preprosthetic surgery	Complete dentures
Main analysis	8,216	3,748	3,776	1,179
Survival implants - 10%	822	375	0	0
Aftercare + 25%	86	79	15	24
Operating time + 25%	150	92	97	0
Material costs + 25%	1,006	482	145	148
Overhead costs + 25%	156	129	104	78
Hospital costs + 25%	665	158	534	16

The model is based on the costs for the first year. One of the most important assumptions for generalisation is the survival rate. If 100% of the implants in patients in the transmandibular and the permucosal treatment group would survive, the treatment costs would have been \$ 7.394 and \$ 3.363 respectively (\$822 and \$375 cheaper). The other costs components do not have a very important differentiating impact on total costs between groups, except material costs. If the costs of the dental equipment necessary to use dental implants

would decrease with 25%, total costs of the implant groups would decrease with \$ 1.006 and \$ 482. The annual figures do not change dramatically if one of the other estimates is varied.

### **3.4 Discussion**

This paper has described in some detail the total treatment costs of a specific new technology: dental implants and overdenture treatment. Although not many articles on this particular subject have been published in the dental literature, information about this aspect will be crucial in the future with resources running dry for the health care sector. As regards to labour, material and hospital costs the information collected was very detailed and enabled costing to be conducted on an individual basis. The resources used to treat a patient with an overdenture on a transmandibular implant can almost provide seven patients with a complete new set of dentures. If we compare a regular new prosthesis with an implant-retained overdenture on permucosal implants the proportion of costs becomes more favourable, namely 1:3. New dentures requiring preprosthetic surgery are almost as expensive as treatment with an overdenture on permucosal implants. These figures compare to those of Jönsson and Karlsson<sup>17</sup>, except for the permucosal implant group. In their study this treatment alternative is much more expensive, but this is only logical because they evaluate implants with a fixed bridge.

The results of the study seem rather robust as the sensitivity analysis shows that threshold values for various cost estimates, for which conclusions alter, are unrealistic. Furthermore, the confidence intervals are rather small, which suggests that collecting individual data is an accurate method to estimate cost prices. The relatively small standard deviations confirm the relative homogeneity of the research group. Only in very few cases enormous costs had to be made to improve the oral health status. The presented data seem useful for other purposes, because the outcomes look comparable to the literature<sup>1,3,7,10</sup>. In the first year a survival of the implants of 92% was measured. The abovementioned authors all claim survival rates between 89% and 96%.

The method used for cost analysis resembles closely the Resource Based Relative Value Scale adopted by the Congress in 1989. Such a system provides information that better reflects the resource cost required to deliver a service. Although in the Netherlands it was not used for determination of reimbursement levels, the system gives better understanding of true costs than tariffs do. The relative comparison of different types of maxillofacial

procedures becomes well-founded. The cost figures cannot only be used for societal comparisons, but also give insight in financial flows in institutions and for individual dentists. A discussion about inadequate reimbursement levels may be the result.

Although the present data support general conclusions, this study has several shortcomings. In the study patients were treated in a clinical setting in an academic hospital. This can create certain biases. First, dentists connected to a hospital may be more experienced than general practitioners. Therefore, the survival rates could become somewhat overstated. Second, the overhead costs in an academic hospital are probably much larger than in a general practice. In addition, only people with a marginal bone height between 8 and 25 millimetre were selected. All patients had a very long experience with dentures and they still had complaints. The population could be described as "dental cripples". Therefore, it is possible that the reported costs are somewhat higher than the costs of implants placed in routine practice settings would have been. However, the ratio between the treatment costs of the different treatment options to other settings can be generalised.

One of the most important shortcomings of such a comparison is the lack of data about long term costs. In the short run dental implants are more expensive. Probably, parts of these additional short-term costs will lead to savings in the future due to for example fewer rebasings and relinings. As this study has shown that considerable additional investment is necessary for dental implants as compared to traditional treatment. Costs of aftercare are considerably high in the implant groups, so initial differences in costs during the treatment phase will most probably not be compensated for in the long run. Of course part of the conventional prostheses as well as overdentures on implants will fail. For both treatment options all complications during the first year were included. In all circumstances the patients finished that first year in their own treatment group. Therefore, it was not possible to say something about the costs of failure in the long run. However, in our study between 25% and 33% of the patients in the CD-group opted for implants after one year<sup>22</sup>. Furthermore, in 17% of the patients adjustments to their prosthesis had to be made. The ratio seen in this study may actually decrease in the long run, thereby making implant supported prostheses less economically undesirable relative to conventional prostheses.

In the end the questions remains whether the reported benefits of dental implants<sup>1-17</sup> justify the additional investment mentioned here. This is the cost-

effectiveness issue, about which we will report elsewhere.

**Acknowledgements**

This study was financially supported by the National Health Insurance Council of the Netherlands.

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## **Chapter 4 Cost-effectiveness of implant-retained mandibular overdentures**

### **Summary**

The medical and the dental care sector continue to expand. Total expenditure is rising although resources are limited. Oral implantology in particular has gained a lot of ground over the last decades. Research concerning the clinical and psychosocial outcomes of treatment with dental implants has been done frequently. Dental implants tend to give better results if the clinical and psychosocial aspects are considered. However, these studies are seldom based on a randomised clinical trial. Therefore, they cannot be comparative. Furthermore, a relationship between these effects and the costs necessary to establish them has never been determined. For a more rational choice in allocating the health care budget, research into the relationship between cost and effect for this particular treatment is necessary. In this article a cost-effectiveness analysis is presented regarding overdentures on permucosal dental implants as compared with conventional treatment modalities such as preprosthetic surgery or a regular set of dentures.

Costs that treatment with dental implants result in were identified, measured and valued using the perspective of societal cost as the point of departure. Information was gathered on an individual patient level. Furthermore, the clinical and psychosocial aspects of treatment outcome were studied. As an indicator for the overall effectiveness a ratio scale for oral health was used.

The results show that the cost-effectiveness of overdentures on permucosal dental implants is definitively higher than that of the preprosthetic surgery. The choice between overdentures on permucosal implants and regular new dentures depends on assumptions for the long run. A great deal of information is lacking. Further research is needed with regard to the life expectancy of the implants, the life span of dentures, the cost of aftercare and the development of oral health for all treatment groups in the long term.

*The present chapter is partly based on the following paper:*

Wijk, P. van der; Bouma, J.; Oort, R.P. van; Waas, M.A.J. van; Rutten, F.F.H. (submitted). Cost-effectiveness of Implant-Retained Mandibular Overdentures.

## **4.1 Introduction**

To date, cost-effectiveness literature in dentistry remains fairly limited. There are some studies concerning the cost-effectiveness of certain diagnostic procedures and prophylaxis<sup>1-3</sup>. Little is known about the cost-effectiveness of dental implants. All kinds of research has been done to establish the clinical efficacy and safety of this new dental technology. During the eighties, evidence about the efficacy of dental implants was established. However, a randomized clinical trial to compare dental implants with other conventional technologies was never reported. Moreover, an explicit investigation into the cost-effectiveness of this new technology to support the decision making process concerning admission into insurance coverage was never made. Such a comparison of different restorative technologies can be of interest for patients, clinicians, hospitals, insurance companies and the government. All of them have different reasons for gathering information about the cost and effect of these treatment modalities.

Many edentulous people are dissatisfied with their dentures. For a large group of these patients a new set of dentures will solve their problems. Sometimes surgical corrections in the form of buccal vestibuloplasty and deepening of the mouth floor can improve satisfaction. Use of dental implants may reduce problems with retention and stability and thus improve the satisfaction of patients.

The purpose of this study is to compare the cost-effectiveness of overdentures on dental implants with the cost-effectiveness of conventional strategies for people with a resorbed mandible. The conventional strategies include a new set of dentures after preprosthetic surgery or just a new set of dentures. Longitudinal data on cost and effect were gathered during one year in a randomized clinical trial. To give information on long-term cost-effectiveness, several assumptions were added based on the literature or on our own research population.

## **4.2 Material and methods**

### *Patient selection*

The present study was conducted at the Department of Oral and Maxillofacial Surgery and Maxillofacial Prosthodontics (University Hospital of Groningen). This randomized clinical trial included patients with serious problems with their lower dentures and a resorbed mandible, referred to the

hospital by dentists or general practitioners. Inclusion criteria were: (1) a mandibular bone height of 8-25 mm, (2) no history of dental surgery and (3) no general contra-indications. All patients were informed about different treatment modalities, possible risks and the method of treatment assignment. Written informed consent was obtained from all participating subjects. Furthermore, approval was acquired from the hospital ethical committee. Comparability between groups was ensured by balancing all groups as regards age, gender, period of edentulousness in the mandible, age of the present mandibular denture, and mandibular bone height. This method aimed at an equal distribution of patients over the treatment groups with regard to variables that may interfere with the outcome of the study<sup>4</sup>. Except for the number of dentures in the lower jaw no significant differences between different treatment groups were found (2-way-ANOVA; see table 1).

Table 1 Patient characteristics at baseline

Treatment	permucosal implants	preprosthetic surgery	new set of dentures
participants	(n=59)	(n=30)	(n=59)
non-participants	(n=12)	(n = 7)	(n = 3)
age	55	53	57
gender m (%)	23	37	29
v (%)	77	63	71
edentulous in lower jaw (in yrs)	22	20	23
number of mandibular dentures	2,8	2,3	2,8
mean age mandibular denture	7,2	8,2	6,9

### *Study design*

This study is part of the ADIOS multicenter trial<sup>5-9</sup>. In this part of the trial, treatment with implant-retained mandibular overdentures on two permucosal implants (Brånemark or IMZ) was compared to treatment with two conventional options, one after preprosthetic surgery and one without. In the end 170 patients were randomly assigned to one of the above groups. Two groups of patients were subdivided: people with a mandibular bone height of between 16 and 25 mm and people with a mandibular bone height of 8-15 mm. The first group was assigned to anyone of the three treatment options. The latter received either permucosal dental implants or new dentures. No preprosthetic surgery was implemented in the group with low mandibular bone height because the results of surgical procedures are frequently

disappointing in cases where the mandibular bone height is less than 15 mm<sup>7</sup>. No significant differences were found between the higher and the lower jaw group regarding initial variables presented in table 1. For all patients the 'Intention to treat' principle was applied. Patients who refused the allocated treatment were evaluated in the group they were originally allocated to ('Intention to Treat' principle<sup>10</sup>). This removes the selection bias from initial differences in motivation between treatment groups, but has as a consequence that the outcome does not reflect the treatment results fully, because these results are weakened by patients lost due to attrition (n=22). Most of the attriters were found in the invasive treatment groups (permucosal implants and preprosthetic surgery; (n=12 and n=7 respectively)).

#### *Costs*

Alongside this clinical trial, cost analyses of all the different treatment modes were performed. These cost analyses can be divided into two parts. In the first part a description is given of the actual cost, until six weeks after treatment. It also provides an estimation of societal costs during the first year. These costs are accounted for using individual cost data. Four different cost categories were used: costs of labor, equipment, technique, and overheads. Data about these cost categories was gathered during the different treatment phases: examination, fixture operation, abutment operation, prosthodontic treatment, controls, and complications until one year after treatment<sup>11</sup>.

Non-medical individual costs -like travel costs and waiting time costs- and indirect costs (loss of labor productivity) were gathered using a questionnaire distributed among patients. All costs were converted into dollars, according to the exchange rate in 1995 (1 US\$ - 1,6 DFL).

#### *Effects*

On the effect side several clinical and psychosocial criteria were used as outcome criteria. In most studies on the subject survival percentages are presented as one of the clinical end-points in the study design. These outcome measures fall short in this study. Because (a) they do not allow a comparison between implants and other technologies and (b) they do not tell us anything about the cost-effectiveness ratio of the different treatment options. The main outcome of treatment with dental implants is an improvement in oral health status. Therefore, it is important to focus on this outcome.

The subjective evaluation of the patient concerning his oral health is a major indicator for the success of treatment. Because there is no standard by which to judge in dentistry, we measured denture satisfaction using a validated self-administered 'dental complaint' questionnaire, consisting of items such as functioning, retention and aesthetics<sup>9, 12</sup>. These data give insight into the development of different dimensions of oral health. They cannot be used to explain cost-effectiveness in one index. Therefore, the patient's overall denture satisfaction was depicted on a ten-point rating scale (0: lowest score, 10 highest score). This outcome was taken as the end-point of this cost-effectiveness analysis.

#### *Statistical analyses*

All of the different cost components are based on individual data. A 95%-confidence interval was calculated based on the standard error of the mean. Although the costs were not normally divided, no transformation of cost functions was conducted because the skewness of the population data (caused by a few patients with high costs who wanted dental implants after their conventional treatment) was seen as a regular phenomenon.

Pretreatment comparability of the groups regarding general satisfaction with oral health was checked by analysis of variance (Tukey test). There were no significant differences. The outcome after one year was checked using this same test. A significance level of 0.05 was chosen. The 'denture complaint' questionnaire revealed six scales after using principal component factor analysis with varimax rotation<sup>7,9</sup>. These scales are: *functional complaints lower denture*, *functional complaints upper denture*, *functional complaints in general*, *physiognomy*, *'neutral space'*, and *aesthetics*. Mean scores prior to treatment did not reveal any significant deviations between the treatment groups (2-way-ANOVA).

#### *Assumptions for main analysis of cost-effectiveness in the long run*

The period of follow-up of this clinical trial was one year. To draw conclusions about cost-effectiveness in the long run, several assumptions about our research population have to be made. The assumptions in the main analysis are based on the literature and on our research population.

- 1- The average life span of dental implants is fifteen years for this relative old patient population. Mean life expectancy for this groups is 75 years in the Netherlands. Currently, they are on average 55 years old. The maximum life span would then be 20 years.

However, to give a conservative estimate of the cost-effectiveness ratio in the main analysis a life span of fifteen years is taken as a starting point;

- 2- The survival rate is 90% in the long run. During the first year after treatment in 6% of the cases a failure of treatment was inevitable. the literature shows that loss of implants mainly happens during the first year. Survival rates reported in the literature fluctuate between 91% and 98% for a period between 0 and 9 years (table 5).
- 3- The life span of the set of dentures is seven years. The patients in the population were on average edentulous for 22 years. In this period they had three different prostheses. Their last set of dentures was also approximately seven years old.
- 4- In this population 25% of the patients with a regular set of dentures wants implants during the first year. In the group of patients who received preprosthetic surgery this percentage is 8%. For the period of fourteen years these amounts are extrapolated to 33% and 10% respectively. The additional costs that these groups generate are corrected for in the costs of aftercare.
- 5- The oral health status, defined as the satisfaction of patients with their dentures expressed in a rating scale between 0 and 10, will be unaltered during this fourteen years for all different treatment groups. This assumption is the most reserved one to this extent that the expectations are that patients with a new set of dentures might face a decrease in oral health during the next years. However, this cannot be confirmed by any information from the literature.
- 6- Costs and effects are discounted at a 5% rate. The discount rate reflects the decision-maker's time preference for present over future outcomes. If a decision maker is indifferent between incurring \$ 1 of cost today versus \$ 1.10 a year from now, this implies an annual discount rate of 10%.

In the sensitivity analysis all these assumption will be loosened. Several other possibilities will be calculated. As a result of the many assumptions that had to be made to come to a conclusion about cost-effectiveness in the long run, a sensitivity analysis was performed to test the validity of conclusions made over a range of reasonable values for the assumptions made in the base line analysis. In this sensitivity analysis we calculated the threshold-values at which the conclusions about the costs-effectiveness would change.

### 4.3 Results

#### *Direct medical costs*

Table 2 shows the results of the cost-accounting procedure during the first year after treatment in all groups.

Table 2 Total cost of treatment, in U.S. dollars, during the first year (in 1995 dollars: 1\$ = NGL 1,6)

	permucosal implants	preprosthetic surgery	complete dentures
<i>labor</i>	670	650	262
<i>materials</i>	1,803	570	575
<i>overhead</i>	412	392	211
<i>hospital costs</i>	509	2,137	63
<b>total costs first year</b>	<b>3,394</b>	<b>3,749</b>	<b>1,111</b>
Aftercare first year	317	59	94
non-medical and indirect costs	305	188	147
<b>Societal costs</b>	<b>4,016</b>	<b>3,996</b>	<b>1,352</b>
95% CI <sup>a</sup> total costs	3,872-4,160	3,860-4,126	1,297-1,407

<sup>a</sup>) Confidence Interval

The total cost of an overdenture on two permucosal implants is approximately \$ 3,400. The cost of preprosthetic surgery mounts up to even more than \$ 3,750<sup>11</sup>. Differences are due to the operation under general anesthesia and three-day admission into hospital. Although the costs of labor are somewhat less expensive than for permucosal implants, the additional hospital costs cause a major difference between these treatment modalities. Regular new dentures cost \$ 1,200.

The cost of follow-up is much higher for dentures on permucosal implants (\$ 317 in the first year). The cost of failures in the implant groups is included in this amount. In the conventional treatment groups, the cost of follow-up is somewhat lower: \$ 59 for patients with preprosthetic surgery and \$ 94 for patients with a new set of dentures. The latter is, however, only the cost of regular check-ups.

#### *Non-medical and indirect costs*

Further, we calculated non-medical (travel costs, waiting time) and indirect costs (absence from work) due to treatment. These costs are of importance when a policy decision has to be made regarding the collective financing of one of the chosen treatments. At the bottom of table 2 a survey of the non-

medical costs of all treatment options is given. Indirect costs played a minor role for this treatment and within this population.

### *Effects*

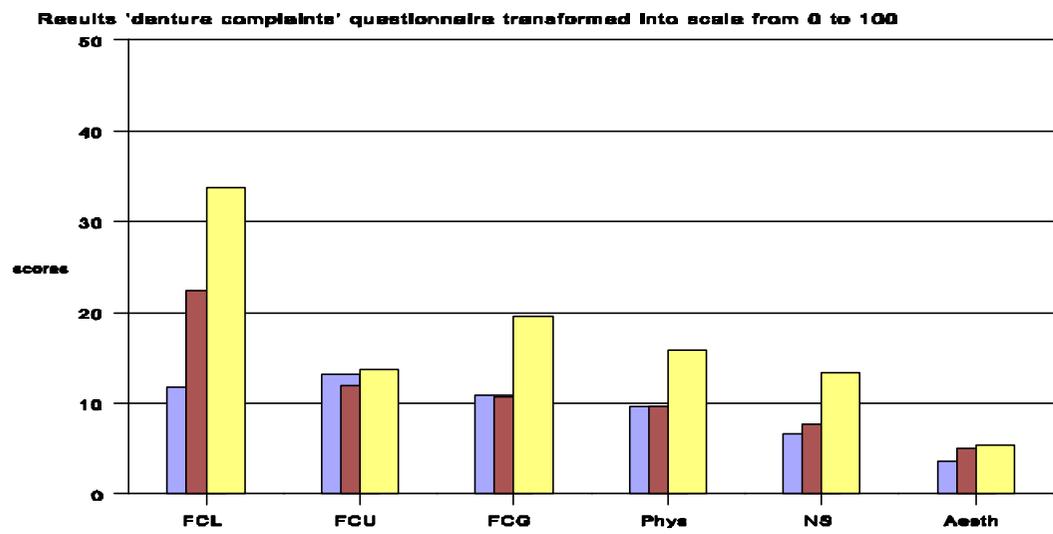
Effects were measured on a clinical and a psychosocial basis. Clinical outcomes will not be shown, except for the survival rates of permucosal implants (table 3), because these outcome measures are not comparative between treatment with permucosal implants and the conventional treatment strategies.

Table 3 Survival percentage in the literature and in our own population

Study	year	system	survival percentage	period of follow-up
Adell et al.	1981	Brånemark	91,0%	5- 9 years
Kirsch et al.	1986	IMZ	97,2%	0- 8 years
Van Steenberghe et al.	1987	Brånemark	95,6%	0- 4 years
Bosker et al.	1989	TMI	97,8%	5-12 years
Naert et al.	1991	Brånemark	98,8%	0- 2 years
		IMZ	98,0%	0- 2 years
<b>ADIOS<sup>a)</sup></b>	<b>1994</b>	<b>all</b>	<b>95,0%</b>	<b>1 year</b>

<sup>a)</sup> Academic Dutch Implant Overdenture Study

Survival percentages are comparable to those in the literature<sup>13-17</sup>. For 3.5% no osseointegration was reached. During the first year, in 2.5% of the patients had severe complications that led to removal of one or both implants. For the psychosocial outcomes, in this article we pay attention to the 'denture complaint' questionnaire and the subjective evaluation of the patients' oral health status and quality of life. As explained in the materials and method section, the 'dental complaints' questionnaire consisted of six constructed subscales: *functional complaints lower denture*, *functional complaints upper denture*, *functional complaints in general*, *physiognomy*, *'neutral space'* and *aesthetics*. All subscales were transformed into a score of between 0 and 100, where 0 means no complaints at all and 100 is the maximum score. Figure 1 provides the results for the different treatment strategies at T1 (one year after treatment). At T0 there were no significant differences between the groups.



**Figure 1**

■ **Permucoasal Implants**    
 ■ **Preprosthetic**    
 ■ **New dentures**

scale	explanation	multiple comparison <sup>a)</sup> <sup>a)</sup> Tukey-test (p < 0.05)
FCL	functional complaints lower denture	new dentures > preprosthetic surgery, permucosal implants preprosthetic surgery > permucosal implants
FUL	functional complaints upper denture	not significant
FCG	functional complaints in general	new dentures > preprosthetic surgery
Phys	physiognomy	not significant
NS	neutral space	new dentures > permucosal implants
Aesth	aesthetics	not significant

The permucosal implant group scored significantly fewer complaints than the conventional groups on the factor 'functional complaints lower denture'. Permucosal implants performed better on the subscales 'functional complaints in general' and 'neutral space' as compared to new dentures. Subjective ratings about the new denture were asked for both before and one year after treatment. Table 4 shows the scores on the rating scale after treatment and the average score in all treatment groups. The increment serves as a measure of the improvement in oral health as a result of treatment.

Table 4 Subjective judgment of patients concerning their oral health on a rating scale (0-10)

overall rating	permucosal implants (n=59)	preprosthetic surgery (n=30)	new dentures (n=59)
10	15.0%	3.5%	-
9	27.0%	18.0%	7.0%
8	43.0%	39.0%	23.0%
7	13.0%	18.0%	30.0%
6	2.0%	14.0%	14.0%
5	3.5%	15.5%	
4	3.5%	7.0%	
3	2.5%		
mean before	4.7 (1.5)	4.4 (1.5)	4.5 (1.6)
mean after	8.4 (1.0)	7.5 (1.4)	6.6 (1.5)
increment	3.7	3.1	2.1

There are significant differences between the implant group and the group of patients with new dentures ( $\alpha=0,05$ , Tukey test). All groups show considerable improvement in oral health.

#### *Short-term cost-effectiveness*

In table 6, under point 1, an overview is given of costs and effects during the first year, using the oral health status as a point estimate for effectiveness. As can be seen the cost per point of oral health improvement is much lower for regular new dentures than for the other alternatives.

1. For the group treated with permucosal implants costs per point of oral health are \$ 1, 085 for the first year. For the group of patients treated with preprosthetic surgery this is even higher (\$ 1,289 per point), while for the denture group a ratio of \$ 644 per point of improvement in oral health can be found.

However, a comparison on such a short notice is not fair. The costs of the treatment with a dental implant are all centered in the first year, while returns are to be expected on the long run. For treatment with regular new dentures expectations are different: costs are to be expected in the longer run, while effects probably will decrease during the years. The main (dynamic) analysis shows that cost-effectiveness, defined as total costs in dollars per point of oral health (aggregated over 15 years) for permucosal implants is higher in the long run, based on the assumptions mentioned on page 7.

- 2 For the permucosal implant costs per point of oral health mounts up to \$ 180. For the other alternatives this ratios are \$ 223 and \$ 225 respectively. Below this main case scenario, other results are given for less restricted assumptions.

To examine the robustness of our results over a range of alternative values for uncertain parameters, we performed a sensitivity analysis. In this analysis five of the six assumptions are varied one at a time (see table 5).

Table 5 Cost-effectiveness ratio's, costs per point of oral health in US Dollars. Main results and sensitivity analyses.

	permucosal implants (PI) (n=59)	preprosthetic surgery (PPS) (n=30)	complete dentures (n=59)
1. Cost-effectiveness ratio after one year	1,085	1,289	644
2. Main result	180	223	225
3a.Life span of implants 10 years	210	226	230
3b.Life span of implants 20 years	168	216	223
4a.Total disappearance of original improvement in oral health in all groups	299	365	352
4b.Decline of 0.1 point per year in all groups	225	289	373
4c.Oral health declines more quickly in group with new dentures (0.1 point per year in PI-group, 0.15 in PPS-group and 0,2 in CD-group)	225	330	549
5a.Discount rate 0%	168	194	195
5b.Discount rate 10%	207	237	243
6a.Survival percentage of implants is 80%	201	223	225
6b.Survival percentage of implants is 70%	235	223	225
7a.Percentage of people who want new implants after conventional treatment is 5% for PPS-group and 10% for CD-group	180	203	171
7b.Percentage of people who want new implants after conventional treatment is 20% for PPS-group and 50% for CD-group	180	250280	

Only assumption three concerning the life span of the dentures (7 years) is expected to be stable. This was seen as a sort of optimum term for adjustment of the prosthesis. In addition a threshold analysis was performed to show under which circumstances the outcome concerning the costs of the study would change (table 6).

Table 6 Threshold analysis concerning cost-effectiveness

Event	break-even point
Life span of implants	7.5 years
Life span of dentures	three times longer for denture-group*
Decline in oral health	two times stronger in implant-group*
Discount rate	negative*
Survival percentage of implants	< 72%
People of CD-group who want implants	< 12%

- 3 When the life span of implants is even longer (for example 20 years) the ratio of costs per point of oral health drops to \$ 166. For preprosthetic surgery and new dentures the ratio drops slightly, because a percentage of these groups gets implants, which will survive longer. When the life span of implants is much shorter (10 years), the costs per point of oral health increases to \$ 210. However, implants will still be cheaper;
- 4 Three different scenario's are given for assumptions on the development of oral health. In the first, the original improvement in oral health is totally disappeared in all groups, which means a much stronger decline in the implant group than in the other treatment groups. In the second, a proportional decline of 0,1 point per year for all groups is proposed. The third assumption shows the result when oral health declines more quickly in patients with new dentures. In this case the cost-effectiveness ratio of new dentures rises enormously.
- 5 Two different discount rates are shown. When the discount rate is 0%, decision makers are indifferent between expenditures now or in the future. In general this is not an option, because this would always lead to postponement of the project. However, this option is frequently shown in cost-effectiveness analyses, because it shows clearly what the influence of the discount rate on the final results are. Under both assumptions, implants stay the most cost-effective option. The lower the discount rate, the lower the difference between all ratio's;
- 6 Under (5) the results are shown when the survival percentage of the implants tends to be lower than expected. When this decreases to 70%,

regular new dentures or preprosthetic surgery will be more cost-effective;

- 7 Assumption six shows what happens when less people from the traditional treatment groups want implants in a later stage of their life. When 10% of the people in the denture group want implants, the cost-effectiveness ratio drops to approximately \$ 175 per point of oral health;

As can be seen in the main scenario the cost-effectiveness of dental implants is the highest. When implants live longer these results even improve. This yields also for the other treatment options, because costs are postponed and oral health is supposed to be constant in the main scenario. If we vary the level of decline in oral health the position of the complete denture deteriorates. If the discount rate is kept zero, the position of the dental prosthesis is better. This is because the bulk of the costs of treatment with dental implants are made in the first year. If the survival rate of dental implants declines to 80% the costs per point of improvement in oral health rises quickly. However, at 80% the cost-effectiveness of treatment with permucosal implants is still higher than that of the other treatment options. Even so, the percentage of people who were treated with a new set of dentures but still want implants has to decline dramatically (to approximately 12%) to end up beneath the break-even point.

Treatment with dental implants will always be more expensive. However, table 6 shows the threshold analysis for the cost-effectiveness ratio: “for what changes in assumptions will the cost-effectiveness ratio shift in favor of treatment with new dentures?”. The assumptions highlighted with an asterisk, are almost impossible. Even the others are rather unlikely, although future research is necessary to shine a light on these aspects.

#### *Cost-effectiveness*

For a final judgment about the various treatment modalities three different approaches are possible. One could treat all patients with an overdenture on permucosal implants and so *maximize results* at the highest cost. One could also treat all patients with a regular set of dentures, the least expensive treatment even in the long run with inclusion of all aftercare and so obtain a *minimization of costs*. And one could approach treatment by using a method of *cost-effectiveness*, the costs per annum put out against the points of improvement in oral health measured by the ratio-scale. In the long run, the cost-effectiveness of the implants seems higher under most circumstances. If

the government has a fixed budget, the question remains: "Should we treat fewer people with better results or more people with an inferior treatment modality?"

#### **4.4 Discussion**

In the ADIOS-study the total societal costs of a specific new technology, dental implants and overdenture treatment, were estimated. In this article only the final results are shown. The resources used to treat a patient with an overdenture on a transmandibular implant can be used to treat almost seven patients with a complete new set of dentures. If we compare a regular new prosthesis with an implant-retained overdenture on permucosal implants the proportion of costs becomes more favorable, viz. 1:3. These results are comparable with a study of Jönsson and Karlsson in 1990<sup>18</sup>. The high costs of dental implants result not only from the treatment per se, but also from the high costs of aftercare, which is in contradiction with findings of Naert<sup>17</sup>. Although treatment time of aftercare is comparable for the PPS- and the CD-group, costs of material are considerably higher. Furthermore, the need for assistance by a dental hygienist to maintain a proper oral condition in the implant group accounts for additional costs. This is in accordance with the literature<sup>19</sup>. Oral hygiene has proved to be a prerequisite for maintaining osseointegration in implant-supported dentures<sup>19-20</sup>. So, two factors are related with higher aftercare costs of the dental implant group: material costs and assistance of an oral hygienist. If the treatment with new dentures requires preprosthetic surgery, this treatment is as expensive as treatment with an overdenture on permucosal implants. Costs of treatment with implants will always be higher than the other treatment options, even if the implant lasts 20 years. However, if we take into consideration the effects of treatment, measured as subjective evaluation of oral health on a ratio-scale, the cost-effectiveness of dental implants is supposedly higher than that of the other treatment modalities. In many articles on the subject the positive effects of treatment with dental implants is shown<sup>7,21-23</sup>. There is no gold standard for measuring these effects in one index. Therefore we used a subjective evaluation of patients themselves as a measure for outcome, based on a 'denture complaints' questionnaire. The permucosal implant group scored significantly better than the conventional treatment groups with respect to 'functional complaints lower denture'. In addition, permucosal implants did better on the factors 'functional complaints in general' and 'neutral space'. Furthermore, a subjective rating scale was filled in before and after treatment in all treatment groups. The increment served

as a measure for the improvement in oral health as a result of treatment. All groups showed considerable improvement, but the dental implant group had significantly better results than the new denture group. In short, implants are dominant to preprosthetic surgery in all different scenarios.

A statement about the comparison between new dentures and an implant-supported overdenture is more difficult to give. There is a tendency towards the implant-retained mandibular overdenture being more cost-effective. Assumptions about the life expectancy of the implants, the life span of dentures, the costs of aftercare of all treatment groups and the development of oral health, however, will determine the cost-effectiveness in the long run.

There are some shortcomings in this study that hamper generalization of the results. First, patients were treated in a clinical setting and only people with a marginal bone height between 8 and 25 millimeter were selected. Second, all patients had a very long experience with dentures and they still had complaints. The population could be described as "dental cripples". It is therefore possible that the reported costs are somewhat higher than what might have been expected from implants placed in routine practice settings. The conclusion of this study can be that treatment with dentures on two permucosal implants or treatment with a new set of dentures is more cost-effective than preprosthetic surgery. This treatment option cannot be defended from an economic point of view. Treatment with permucosal implants will almost certainly be more cost-effective than treatment with a new set of dentures, despite the fact that permucosal implants are more expensive. Further research is needed to show whether the necessary assumptions in this study have been accurate.

### **Acknowledgments**

This study was supported by the National Health Insurance Council of the Netherlands.

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## **Chapter 5 Economic evaluation of alternatives for care in residential homes**

### **Summary**

In the Netherlands a trend can be seen in the development of services for the elderly, towards the provision of community care. Patterns of change are designed to produce downward substitution in the provision of care, moving away from institutional care, towards enhanced home care and developing improved coordination at client level by means of case management. The shift away from institutional care is motivated by both social and economic considerations.

In this article alternatives for residential care are compared to care in other settings (at home or in a service center). The societal cost comparison is based on individual data of all clients, concerning professional care, informal care, costs of other care auxiliaries, and costs of housing, food and transport. The method used is a static matched group comparison. Groups are matched with regard to the Activities in Daily Life (ADL) and Instrumental Activities of Daily Life (IADL) and with regard to mental functioning.

The results clearly suggest that home care is a cheaper option than is institutional care for all groups, no matter how severe their physical or mental disorders are. However, people with mental disorders using home care facilities appeared to be rare and confidence intervals were rather broad. Therefore, further research is necessary to establish the real cost savings of home care on a macroeconomic level. The amount of savings depends on the valuation method for informal care.

Cost comparison between the service center and a residential home showed no significant differences.

*The present chapter is partly based on the following paper:*  
Wijk, P. van der; Wolffensperger, E.W.; Heuvel, W.J.A.; Huijsman, R. (submitted).  
Economic evaluation of alternatives for care in residential homes.

## 5.1 Introduction

In the Netherlands multidisciplinary home care is considered an alternative for institutionalization of dependent elderly in need of support. Traditionally, home care was administered to elderly people in their own homes and only intended for people with minor health problems. When it was no longer possible to maintain an independent life style at home, not even with the help provided by home care organizations, the only remaining option was admission into an institution (a residential home or a nursing home). Several developments in Dutch society have changed this practice. Firstly, the increasing number of elderly people in our society leads to a growing number of dependent elderly people, which puts a strain on the health care budget. Home care is considered to be a cheap alternative for institutional care. Secondly, a large number of elderly people express a preference for receiving care at home. By that means they are able to lead an independent life, which is considered to have a positive impact on their well-being. In addition to this preference reversal, possibilities to provide care at home have grown due to technological innovations. These developments have led to an increase in the demand and use of home care alternatives.

However, effectiveness and efficiency seem to have been disregarded. Also, little attention has been given to the influence of the extent of need on costs and quality. Only for specific diseases or problems, like diabetes or hip replacements, evaluations of costs and consequences in comparison to hospital care have been made. Since the eighties the Dutch government has contrived the concept of substitution, replacing more expensive care methods with less expensive ones and stimulating extramural care at the expense of institutional care. Cost reductions were expected as a result of this policy shift, since extramural (home) care was expected to be much cheaper. Several pilot projects were started that were to reveal the problems and possibilities of delivery of home care to a group of elderly people with more complex health problems. Many of them included an economic analysis. The bulk of these studies concluded that provision of home care was cheaper (Ruissen, 1991; Hoeksma, 1991, Van der Giessen and Otten, 1992). However, this was assumed only to apply to elderly people with few problems in physical functioning and Instrumental Activities of Daily Life (IADL; the ability to take care of one's own personal and household care). People in need of more support were believed to be taken care of more efficiently in an institutional setting. However, most of these studies failed to take into account the fact that

different care modes are used to serve dissimilar target groups. This study contains an analysis of the costs of a group of elderly people cared for in different care alternatives that meets on two of the most factors concerning for the demand of care, physical functioning and cognitive impairment.

The aim of this cost analysis of care alternatives for a selected group of elderly people from a societal perspective. An analysis like this can contribute to a more efficient allocation of resources between different care arrangements on a national level. Instruments for such a reallocation include regulation of the supply of facilities, a selection of elderly people for certain care arrangements indicated on medical grounds, etc. In analyzing the information of this study one basic comparison is proposed: the comparison of costs by looking at characteristics of persons in various services in order to determine the relative cost structure of various service approaches, including compensating variations in demographic characteristics or support needs.

Three different care categories could be distinguished:

- 1- assistance was provided to elderly people in their own homes. A wide array of services is possible: home nursing care, domiciliary care, meals-on-wheels, alarm schemes, etc.;
- 2- senior citizens moved to a central housing complex, of a kind service center, where they can live in their own apartment with domiciliary care services. The advantage of this care mode can be that the overhead costs of travelling etc. are much lower because many elderly people are concentrated in the same neighborhood;
- 3- senior citizens in need of help were admitted into residential homes.

All of these facilities were provided in the same area, the Northern part of the city of Leiden in the Netherlands. The central research question was: What are the costs of different care modes for elderly people with a comparable need of support, corrected for different individual characteristics of persons in services?

## **5.2 Material and methods**

### *Population and scales*

A total of 163 clients were included in this study: 74 clients received home care services, 30 people moved to the service center and 59 were admitted to a

residential home. This sample consisted of all the people living in the service center and a random survey from a larger population of care-seeking elderly in the city of Leiden for the other alternatives. The sample proved to be a good reflection of the total population of elderly people in the city of Leiden (Van der Wijk and Wolffensperger, 1995).

#### *Costs estimates*

The objective of this study is to draw up an inventory of societal costs. This means all financial have been included, regardless by whom they were made. In other words: the question, whether it is the government, the insurance company, the nursing home or the elderly themselves pay, is not relevant in this context. For all clients a time registration procedure was conducted through interviewing staff members and through an observational study. The amount of time needed for particular care activities, like taking a bath, using the bathroom, making meals, etc., was scored in minutes per day (the care intensity). The following resources in hours and days were measured: use of individual help in a residential home, home help services by district nurses and assistant nurses and time spent on care by relatives (informal care). These care costs are denoted by a figure derived from a multiplication of the measured amount of care by the cost per item (for instance the costs of staff per hour based on the annual salary for the particular staff category concerned). Informal care is valued at the same salary level as the domiciliary care, as the activities are very similar.

Assessment of informal care is complex due to problems with valuing unpriced resources. Basically, two methods can be used to value informal care (Smith and Wright, 1995; Busschbach, 1998). The opportunity cost method establishes the value of informal care by assessing the best alternative to use that time. When time spent on informal care would otherwise have been spent working on a paid job, that time should be valued as being equal to the wage rate of the population involved (Gold, 1996) For this particular population this is a problem, because most informal caregivers are retired elderly people and they are primarily engaged in leisure time or voluntary work. No adequate method has been found yet to correct the wages of these individuals.

Another possibility to value informal care time is to assess the shadow price for the services delivered by the informal caregiver. The cost of informal care is valued according to the costs that would have been made as a professional caregiver had provided the service. A problem is that the time spent by informal

caregivers may be much higher than that of professionals. This means that activities should not be valued according to total time spent by informal caregivers, but according to the time professionals would have spent on that same activity (Busschbach et al., 1998). We used this method, asking professionals in institutional care explicitly how much time they spent on performing a certain care task. Thereafter, an hourly rate was assigned to each activity. This wage rate depends on the specific expertise needed to perform the service. For example, cooking is valued lower than nursing. The weighted average cost of informal care activities was valued at Dfl. 32,- per hour (based on the expertise that was necessary for each activity, for instance a home help for cooking and a district nurse for medical activities) (Groenenboom and Huijsman, 1995).

Other costs to be taken into account are : hotel costs, which are included in a residential home setting, while excluded in the other alternatives. Housing costs were based on individual data from clients. Costs of food are estimated based on information from the Dutch National Bureau of Statistics (CBS, 1994). Costs of other care services, like meals-on-wheels and daycare, are included based on a survey among elderly people. Overhead costs based on the care intensity of the individual.

### *Index of physical and mental functioning*

The clients were statically assessed by two instruments. Firstly, an IADL-scale was used to register physical functioning in Activities in Daily Life and Instrumental Activities of Daily Life. This scale runs from 0 to 28 and can be seen as an interval scale (Zijlstra, 1991; Kempen et al., 1995). The scale can be regarded as an adequate measure of the individuals ability to cope with activities that are necessary for living independently. The IADL-scale contains of 14 activities which are hierarchically arranged so that the ability to cope with a more difficult activity presupposes the ability to perform an easier one. The most basic activity is eating, followed by sitting/getting up, moving around in the house from one place to another, using the bathroom, etc., and the most difficult activity is: doing household chores. The degree of psychological functioning was established using the Cognitive Impairment Score (CIS), which measures problems with orientation of time and locality, memory and spatial capacity. This scale also has interval characteristics and the score can vary between 0 and 15 (Zijlstra, 1991). Baseline data for the different populations are shown in Table 1.

Table 1: Baseline data of the study populations (including standard deviation).

	Home care N = 74	Central housing N = 30	Residential home N = 59
Age (in years)	80,8	82,2	83,1
% single living	71,6 %	74,0 %	71,4 %
IADL-score	8,8 (6,2)	12,3 (5,0)	14,5 ( 9,2)
CIS-score	1,0 (2,3)	1,2 (1,9)	2,7 ( 5,0)
Income (in Dfl.)	1500	1550	1460

As can be seen, clients characteristics significantly vary between different populations (Scheffé,  $\alpha = 0,05$ ). These data make clear that a simple comparison of cost data will not suffice for an adequate cost comparison between settings. Therefore, four different subgroups were created using the IADL- and CIS-figures (according to Zijlstra et al., 1991):

- 1- clients with light IADL-problems (score 0, N=13);
- 2- clients with mild or moderate IADL problems (score 1 to 7, N=60);
- 3- clients with severe IADL-problems (score 8 to 14, N=45);
- 4- clients with very severe IADL-problems (score 15 to 28, N=44);
- 5- clients with very severe IADL-problems and severe CIS-problems (score

15 to 28 and CIS-score > 7, N=14).

People with high cognitive impairment were only found in the group of people with severe IADL-problems. Table 2 shows the results of this classification.

Table 2: Baseline data of the subgroups (including standard deviation)

	Home care	Central housing	Residential home
<b>Group 1</b>	N = 2	N = 0	N = 11
IADL-score	0 (0,0)	0 (0,0)	0 (0,0)
CIS-score	0 (0,0)	0 (0,0)	0 (0,0)
<b>Group 2</b>	N = 34	N = 9	N = 16
IADL-score	4,5 (2,3)	5,0 (3,0)	5,0 ( 1,9)
CIS-score	0,1 (0,3)	0,1 (0,5)	0,1 ( 0,5)
<b>Group 3</b>	N = 21	N = 10	N = 13
IADL-score	12,1 (1,8)	12,4 (2,2)	12,6 ( 1,5)
CIS-score	0,6 (1,2)	0,7 (1,0)	0,8 ( 0,9)
<b>Group 4</b>	N = 11	N = 11	N = 17
IADL-score	22,0 (4,1)	19,7 (2,7)	21,7 ( 3,6)
CIS-score	0,9 (2,1)	1,2 (1,9)	1,0 ( 2,3)
<b>Group 5</b>	N = 3	Na	N = 12
IADL-score	16,8 (6,2)	-	17,2 ( 9,2)
CIS-score	12,3 (2,3)	-	12,6 ( 2,4)

The demographic data were analyzed per group using a Scheffé-test, comparing multiple independent means. Cost figures are plotted with 95% confidence intervals. The level of costs dates from 1994 and the costs are represented as Dfl. (Dutch guilders; 1.6 Dfl = US\$1).

### 5.3 Result

#### *Population*

As can be seen in table 1 and 2, people with severe cognitive impairment are rarely found in the home care alternatives. Cognitive impairment seems a strong predictor for admission in a residential or nursing home. People without IADL-problems are scarcely found in our research group, only two in home care. There are no significant differences within groups from different settings. Therefore, a cost comparison for the groups 2, 3 and 4 seems valid.

#### *Care intensity*

In Table 3 the care intensity is shown for all different patient groups for distinct care givers within settings. According to our analysis the amount of time of individual care increases with higher IADL- and CIS-scores. This is true for all types of care, although the effect is less pronounced for informal and private care.

Table 3 Average care intensity per client group in each setting, in minutes per day (including standard deviation)

	Group 1 N = 13	Group 2 N = 59	Group 3 N = 44	Group 4 N = 39	Group 5 N = 15
<b>Home care</b>					
Domiciliary care	19 (8,1)	24 (15,2)	26 (17,3)	19 (12,7)	18 (12,2)
District nurse	0 (0)	2 ( 2,4)	5 ( 3,3)	11 (13,6)	61 (29,8)
Informal care	1 (1,4)	3 ( 2,9)	7 ( 6,6)	12 (13,9)	18 (23,9)
<b>Total</b>	<b>20 (6,8)</b>	<b>29 ( 9,8)</b>	<b>38 (16,3)</b>	<b>42 (13,4)</b>	<b>97 (24,3)</b>
<b>Service centre</b>					
Domiciliary care	-	25 (20,9)	52 (45,5)	96 (54,5)	-
District nurse	-	4 (5,5)	9 (7,6)	11 ( 5,2)	-
Informal care <sup>1</sup>	-	4 (3,3)	11 (9,8)	15 (11,7)	-
<b>Total</b>	-	<b>33 (20,7)</b>	<b>72 (34,4)</b>		<b>122 (45,8)</b>
<b>Residential home</b>	-	18 (12,7)	43 (29,4)	125 (76,1)	207 (102,1)

<sup>1</sup> Time of informal care activities are is measured

The clients at home with more complex complaints receive more attention from the district nurse. Furthermore, they use a greater range of services, as can be seen in Table 4. The people in a residential home receive an all-comprehensive care arrangement. This includes day care arrangements, meals, an alarm system, etc. These components are all included in the cost comparison with the home care alternatives. Cost of informal care mounted up between Dfl. 2,- to Dfl. 8,- per day for people in the service complex, when the activities are valued according to the shadow price method.

Table 4: Use of other services per client group in each setting

	Group 1 N = 13	Group 2 N = 59	Group 3 N = 44	Group 4 N = 39	Group 5 N = 15
<b>Home care</b>					
Private care (minutes per week)	2	9	17	11	7
Meals-on-wheels *	1,4	0,7	4,1	3,2	3,0
Alarm system (%)	0	6	16	37	53
Daycare in nursing home *	0	0,1	0,15	1	2
<b>Service centre</b>					
Private care	-	0	8	8	8
Meals-on-Wheels *	-	1,3	4,0	4,8	-
Alarm system (%)	-	90	95	100	-
Daycare in nursing home *	-	0,1	0,4	0,7	-

\* frequency per week

%: total percentage of people with alarm system.

### *Cost comparison*

Table 5 shows the cost comparison for all client groups in different settings. For all groups providing home care services seems more efficient than institutional care. Only the left side of the care continuum, i.e. people with many IADL- and CIS-problems, were rarely found in the home care settings. For these groups admission in an institution seems necessary, although there are indications that from a cost perspective this is not necessarily the most efficient form of care.

Table 5 Societal costs divided into 6 cost categories (in Dutch florins per day) for five client-groups.

Group	Home care					Service centre			Residential home				
	1 n=2	2 n=34	3 n=21	4 n=11	4G n=3	2 n=9	3 n=10	4 n=11	1 n=11	2 n=16	3 n=13	4 n=17	4G n=12
Care staff	11	20	24	29	70	22	44	75	11	10	22	58	109
Private care	1	4	7	5	5	0	5	5	0	0	0	0	0
Informal care	0	2	4	7	11	1	2	8	0	0	0	0	0
Housing	18	18	19	19	20	16	17	17	32	32	32	32	32
Food	10	10	10	10	10	8	8	8	13	13	13	13	13
Overhead	1	2	2	9	17	14	14	14	18	18	18	18	18
<b>TOTAL</b>	41	56	66	79	133	61	90	127	74	73	85	121	172
95% c.i.	28-54	40-69	37-95	50-108	104-162	47-77	61-117	64-179	59-89	63-83	73-97	77-120	136-208
Mean	<b>62</b>					<b>110</b>			<b>111</b>				
Informal care <sup>1</sup>	5	10	17	32	43	8	21	32	0	0	0	0	0
Total	46	64	79	104	165	68	109	156	74	73	85	121	172

Although people at home make more use of all kinds of additional services, this does not outweigh the facility and overhead costs in residential homes. Tailor-made care arrangements at home or in the service center lead to lower costs. Savings add up to at least Dfl. 17 to Dfl. 42, when informal care is valued at the shadow price.

#### **5.4 Discussion**

In this study the costs of two different kinds of home care arrangements have been compared to the costs of care in a residential home. Clients were divided into client groups, comparable with respect to some important individual characteristics (IADL, CIS, age, living arrangement). As the aim of this study was to compare total costs in different care settings, this relationships between these characteristics have not been examined. In several studies the characteristics mentioned above were seen as important factors to determine care intensity (Zijlstra, 1991, Kemper, 1992; Coughlin et al., 1992). These indicators are the best to be found so far. However, more research is necessary to establish the relationship between client characteristics, care intensity and costs.

Direct care costs for similar groups of clients are lower in home care facilities. This conclusion is in contradiction with findings of O'Shea and Blackwell (1993), who argue that community care is not a cheap option, once informal care is quantified and valued and day hospital and in-patient stays in acute hospitals are taken into consideration. Svensson et al. (1996) also conclude that group living is an expensive option. However, they analysed costs for a group of elderly patients with dementia, a group that is functionally and mentally more restrained than the elderly in our group. Furthermore, Svensson et al. (1996) argue that cost differences might be due to differences in the mental and physical conditions of the elderly included in their study. That is one of the major problems we tried to rule out in our cost analysis. On the other hand Greene et al. (1993) argue that 41% of the elderly in the United States would have a potential for net long-term cost reduction. However, this study was based on a simulation model.

The cost reductions of community care are partly owing to care by relatives, as Fuchs also found in 1995. However, due to the matched group comparison, there were no differences between groups in household status. Therefore, the way the mechanism works is not clear: were the partners of the individuals living in a residential home no longer able to assist in caring or were all care

tasks taken over by professionals? If the latter is the case, there is likely to be a considerable amount of supplier-induced demand in the all-comprehensive institutional care arrangement. Costs of residential care and costs of the service centre show no significant differences. The service center seems to generate more staff costs, probably due to the existence of a case manager. Furthermore, the service center has its own building for social activities at the expense of the total project. However, the present population is not at its maximum yet. If more people move into the service center, the cost per person will decrease.

The feasibility of substitution depends on the assumption that there are elderly people who require lower levels of care than provided in their present situation. In many studies this line of argument is based on a straightforward comparison of average costs (Challis, 1992). The comparisons that are made may not be between similar clients or between similar groups. In fact, if individual patient costs are calculated, it may be so that discharging people from institutional care to home care will raise average costs in both settings.

For a closer look at the developments that take place in the different care facilities, and their cost consequences, a large-scale longitudinal study seems useful instead of the current methodology that analyses three different care modes at one moment in time. Wimo (1995) employed such an approach and compared the use of care of demented patients six months before they went into group living with the elderly's consumption six months after their movement. In his view, the elderly people that moved into a group living arrangement generated lower care costs than they would have been in their old institution. However, Wimo points out that this sort of longitudinal study should go on for a number of years, because the group living arrangement will probably be changed after a couple of years, as the condition of the elderly becomes worse and the structure and the costs of the care delivery process will be changed.

The scope of this analysis was clearly cost-driven. For a good understanding of the working of different care delivery systems more evidence about effectiveness is needed. However, from a cost perspective some interesting points can be mentioned:

Many problems concerning an adequate allocation of care to clients have been reported (Lagergren, 1994). As demonstrated in this article the usage of different client characteristics to establish some kind of client mix can be an important step on the way to a better internal financial management and perhaps

to a better system of charging insurance companies. Substitution will create a demand for a range of other social services, in this study for instance: meals-on-wheels, daycare, private domestic care, etc.

Informal care plays an important role in assessing the possibilities of utilization of home care facilities. Although the percentage of single people was the same in all groups, individuals at home received more care from relatives. Generally, the effort of informal caregivers rises, when the care intensity of the elderly individual increases. Because the government does not pay directly for any informal care, from a public finance point of view home care seems a cheap alternative. This makes it even more difficult to understand why the Dutch government keeps such a tight budget for home care.

Cost saving of home care add up from 17% to 45% in comparison to residential care, when informal care is valued at the shadow price. When informal care is considered at the real cost, then savings are much lower, from 4% to 38%. Savings seem much higher when the less severe handicapped are cared for at home. Threshold values between different modes of care hardly exist, as cost calculation is based on individual data. In this study no general threshold was found. Only in one case a situation came up where a very acute problem came into being, as a result of which the costs surpassed those of a matched client in a residential home. This client, however, broke a hip and needed assistance twenty-four hours a day.

A tailor-made package of services at home will be cheaper for practically each situation, even if informal care is included in the analysis and valued against professional fees. Although a service center seems to be an appealing concept in which productivity gains can be established, the scale of such an operation is decisive. A large investment is needed to overcome the considerable take-off costs.

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## **Chapter 6 Economic evaluation of alternative ways for delivering nursing home care**

### **Summary**

In Europe and in the Netherlands the number of elderly people is rapidly increasing. This has considerable consequences for health care costs: enormous increases in costs can be expected. As a result of the call for cost containment the question of proper resource allocation in the care for the elderly people has gained importance, that is: the question whether the dependent or disabled person is cared for at the appropriate level and receives an appropriate amount of services. This study assesses the financial consequences of different kinds of nursing home care. Using a static group comparison with matched groups, costs of different care delivery patterns are analysed, including providing a tailor-made package of home care services, additional individual or group care in a residential home, and conventional nursing home care. Depending on the group of clients, government savings of 38% to 53% were found for home care alternatives, even for this considerably disabled population. Even if informal care was included and valued against professional prices, the costs of deinstitutionalised modes of care were at least 17% lower than those of institutionalised ones.

*The present chapter is partly based on the following paper:*  
Wijk, P. van der; Wolffensperger, E.W.; Heuvel, W.J.A.(submitted).  
Economic evaluation of alternative ways for delivering nursing home.

## 6.1 Introduction

Between 1980 and 1994 the percentage of elderly in the Dutch population increased from 11.5% to 13.1%. The total number of elderly people in the Netherlands is 2.1 million on a total population of 15.4 million (CBS 1995). In 1994 the expenditure on health care was nearly 58 billion guilders, which is 8.4% of the Gross Domestic Product (GDP), a high percentage compared to that of other European countries. In Europe only France (9.1%), Sweden (8.8%) and Germany (8.5%) spend a higher proportion of their GDP on health care. Worldwide, the United States heads the list, with health care expenditures of 13.4% as a percentage of its GDP (Thorslund and Parker 1995). In all Western countries the percentage of elderly inhabitants will continue to grow during the next decades. As a result of a rising life expectancy and a decreasing natural growth of the population the percentage of elderly people in the Netherlands will have doubled over the next fifty years (Ministry of Health 1992). In the rest of Europe similar developments are expected. In the United States this development will be somewhat less pronounced. Nevertheless, in 2030 almost 1 out of 5 people will be 65 years or older (Baker and Bice 1995). There will be a strong increase of the elder elderly. These demographic developments will have crucial consequences for the need for medical care and health care costs. If one assumes that health status and care utilisation remain constant for all age groups and no major innovation in the field will occur, rises in health care costs of 8% to 22% can be expected in the Netherlands (Thorslund and Parker 1995). However, the needs of the elderly can be met with various strategies to make more effective and more efficient use of resources. In the Netherlands, several strategies have been proposed to combat the increase of health care costs: limiting the basic package of insured health services, budgeting the medical specialists, imposing a stringent policy on medications, promoting competition between insurers, and expanding the options for replacing expensive care by cheaper care modes. Regarding care for the elderly, during the last decade these measures have led the government to shift resources from institutional care to domiciliary care and home care services. The goal of this substitution process was to shift flows of patients from intramural to extramural facilities and as such make more efficient use of resources. The evidence of the financial consequences of substitution is equivocal. According to Greene et al. (1995) a significant reduction in nursing home use can be achieved without

increasing total community expenditures by more effective use of these community services. Wimo et al. (1993) concluded that day care could play an important role in reducing expenditure by preventing institutional care. However, other studies do not yield positive results. Weinberger et al. (1993), for example, claim higher costs for elderly people living at home. O'Shea and Blackwell (1993) find that community services are only cheaper as long as the costs of informal care are not quantified and valued. Kane (1995) concludes that a series of controlled demonstration projects has shown that, under current pricing strategies and service models, home care is more expensive than nursing home care for people with substantial disabilities unless they receive the bulk of the care from unpaid relatives.

In the Netherlands approximately 52,000 people live in nursing homes. Another 128,000 live in residential homes (Ministry of Wealth 1994). The combined costs of these institutions are 10,000,000,000 billion guilders in 1994, almost one-fifth of the total health care budget. The above mentioned demographic changes stress the need for the development of alternatives of nursing home care. There is some evidence that approximately 40% of the elderly in intramural institutions could be helped in other (deinstitutionalised) ways (Coolen and Duipmans 1988; Te Velde et al. 1992; Committee on the modernisation of the care for the elderly 1994). On a macroeconomic level this substitution could reduce the growth of costs of care for the elderly that can be expected as a consequence of demographic developments. For society as a whole cost savings are to be expected. For certain groups (as in a study of Weinberger: people with progressive dementia) home care facilities will probably be more expensive. In this article a study is made of the financial consequences for two alternatives of care delivery to Dutch elderly people living in nursing homes. All clients included in the study had an indication for a nursing home. Although this made the population between the different settings appear to be comparable, further research on this aspect was done, because different client characteristics may lead to a diverging professional care dependency (and as a result of that in varying costs). Therefore, it was necessary to compare costs for people in different settings but with similar needs.

All people who had an indication for a nursing home admission in the region of south-east Groningen (in the Northern part of the Netherlands)

were included in this study. A broad package of services was supplied to assist elderly living at home or in a residential home. As a consequence of this tailor-made service, people were able to continue living in their own homes or in the residential home and did not have to move to a nursing home, which would have been the case without the programme. Four groups of clients were identified:

- 1- People who lived on their own and received additional home care to be able to continue living in their own house.  
Care was assigned after consultation of home care organisations, the general practitioner and the nursing home. The nursing home had the leading role in the care administration process and served as an advisory board for home care organisations. Home care was delivered by district nurses and domiciliary care.
- 2a- People who lived in residential homes and received individual care.  
Elderly people in residential homes often need additional care for a short period of time. Usually, they have severe medical problems as decubitus, incontinence, etc., that make it necessary that extra attention is paid to these clients. Part of this care does not belong to the regular activities of residential homes. In the programme nursing homes delivered this short term care on an individual basis within the residential home, in order to prevent that moving the client to a nursing home could be prevented.
- 2b- People in residential homes who received group care.  
For one group of elderly clients, their present home was a residential home. To prevent their moving to a nursing home, group care was provided to a group of cognitively impaired elderly. Due to all kinds of additional group activities during the day they were able to stay in the residential home.
- 3- A control group for comparing the above-mentioned care settings; regular nursing home residents.

The hypothesis underlying this project was: more efficient use of health care resources can be stimulated through the use of alternative ways of delivering nursing home care. Research questions of the economic evaluation were:

- A- Is it possible to establish cost savings from a societal perspective when supplying different modes of nursing home care in other

settings?

- B. How do costs differ between different settings for clients who are similar in terms of care intensity?

## **6.2 Material and methods**

### *Population and scales*

All clients in this study were assessed for admission to a nursing home. These people, who were assessed independently and were sufficiently disabled to be admitted into nursing homes, were cared for in other settings. They received services that offered a full range of personal care, nursing services, housekeeping, etc., in their own homes or in a residential home. A total of 165 clients was included in the study. Of these clients 16 were institutionalised in nursing homes, 14 lived in a residential home and received additional individual care, 15 clients lived in a residential home and received additional group care and 120 were living at home and had access to home care facilities. All kinds of data concerning personal characteristics of clients were registered using a registration form that contained information about IADL-functioning, cognitive impairment, relational and psychosocial problems. The IADL-scale measures problems with activities in daily life and instrumental activities in daily life and the Cognitive Impairment Scale measures orientation to time and locality, memory and spatial capacity (Cognitive Impairment Scale). A combined score for the Activities of Daily Life and the Instrumental Activities of Daily Life gives an index for the care dependency in daily life. This IADL-scale runs from 0-28 and can be categorised as an interval scale (as proved by using a Mokken procedure (Zijlstra et al. 1991; Kempen et al. 1995). The degree of dementia was measured by the CIS-score. The scale runs from 0-15 and also has interval characteristics (Zijlstra et al. 1991).

### *Costs*

The cost analysis focuses on the costs directly linked to care (personnel, medicaments, etc.). Costs within institutions were all-in, so hotel costs (housing, maintenance, energy, etc.) and overhead were included. All cost components in institutional care were accounted for based on annual reports of the institutions. A standard spread sheet was composed and all costs were included in one of five different categories in the same way. These categories were: housing, care personnel, medical costs, food and other costs. The costs of care personnel were accounted to the individual based on a time registration procedure (see Section *care intensity* below).

For people living at home a comparable set of data was created using a questionnaire in which nature, frequency, intensity and duration about costs of housing, food (for example meals-on-wheels), energy and medical consumption of the individuals living at home were gathered. In the sensitivity analysis alternative calculations of valuing this individual costs are presented.

Informal costs are measured and assessed using the shadow price method (Gold 1996; Busschbach et al. 1998). This means informal care time is measured using the time a professional carer needs for a specific activity. This time period is valued against the fee that this professional carer gets when delivering the service himself.

The level of costs is from the year 1994 and the costs are expressed as Dutch guilders (US \$ = 2.0 Dfl). Costs related to production losses were not included, because production losses in this elderly population will be negligible (none of them was working anymore).

#### *Care intensity*

To adjust for possible differences in patient characteristics between settings, similar patient groups were created within each setting using individual data on IADL-functions and degree of cognitive impairment (CIS). Patients in residential homes receiving individual somatic care and people in nursing homes do have significantly more IADL-problems ( $\alpha = 0,05$ ). The other groups do not differ statistically (see table 1).

Table 1 Average IADL-score and CIS-score per client group per setting (including standard deviation).

	Severely physically handicapped				Severely physically and severely mentally handicapped			
	IADL		CIS		IADL		CIS	
	$\mu$	$\sigma$	$\mu$	$\sigma$	$\mu$	$\sigma$	$\mu$	$\sigma$
Home care (n=112)	21,5	2,7	1,0	1,6				
RH individual somatic care (n=14)	23,3	3,2	1,0	1,4				
Scheffé-test	N.S.		N.S.					
Home care (n=8)					22,4	2,8	10,4	1,6
RH psychogeriatric group care (n=15)					21,8	4,4	9,3	3,1
Nursing home (n=20)					23,2	4,2	11,1	1,3
Scheffé-test					N.S.		N.S.	

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Furthermore, it follows from the table that only a very small group of people who have cognitive problems stays at home. All of these clients had a partner who played an important role in the care giving process. From these data it follows, that two groups of patients can be compared in this research group: people with severe IADL-complaints (living at home or having individual somatic care at a residential home; group 1 and group 2a) and people with severe IADL-complaints and severe cognitive problems (living in a nursing home or in a residential home getting psychogeriatric group care; a small part of group 1, group 2b and group 3).

The care intensity of the individual is quantified by a time registration procedure. For every client care intensity was established by interviews with care givers. Validity was enhanced through an observational study in which care givers were followed for several days. For the home care alternatives the amount of care was given in hours per week. This was divided by seven and used as a proxy for care intensity per day. The rationale behind this was that patients who get home care twice a week will be able to function independently during the whole week. Informal care was measured on that same basis. The amount of time used was identified by asking about the personal efforts in certain activities, liking cooking, cleaning or other physically household chores. Social visits were not included. The valuation of this informal mode of care is a special problem Smith and Wright, 1994. In this study the shadow price method is used. The rationale behind this is the premise that if informal care was not available, another professional would be needed to provide the necessary input. Most of these activities are on the lowest speciality level, this means: no specific nursing skills are needed, and thus they are valued against the hourly fee of a home help at the lowest expert level (Dfl. 27 per hour). However, specific nursing skills are valued much higher (Dfl. 38,- per hour. In an institutional setting very little active support is given by informal carers.

#### *Data analysis*

The statistical package SPSS was used for analyses of the results. To make the results more comprehensive mean values are used in the tables. Differences in IADL- and CIS-scores were tested by means of the Scheffé-test with a significance level of 0,05. This test makes it possible to

make a multiple comparison between different settings. For all cost data a 95%-confidence-interval was calculated based on the standard error of the mean.

### 6.3 Results

#### *Care intensity*

Table 2 shows the results of the time registration procedure for the clients in all settings. Most people at home get help from the home care organisation as well as from the district nursing home service. The total amount of hours is multiplied by the gross salary of care personnel.

Table 2 Care intensity of the different population groups in individual care minutes per day

Type of care	client group	Mean time	Standarddev.	N
Home care	severe IADL	60	59	112
	severe IADL and CIS	62	46	8
Home nursing service	severe IADL	7	31	112
	severe IADL and CIS	11	14	8
Informal care	severe IADL	55	52	112
	severe IADL and CIS	72	55	8
Residential home Individual somatic	severe IADL	155	34	14
	severe IADL and CIS	-	-	-
Psychogeriatric	severe IADL	-	-	-
	severe IADL and CIS	174	39	15
Nursing home	severe IADL	-	-	-
	severe IADL and CIS	152	41	16

People in nursing homes tend to get less care minutes than people in residential homes with additional care. However, the costs will not be lower, because of the higher level of expertise of personnel in the nursing homes. Apart from the individual care intensity for each client care personnel in institutional settings is involved in all kinds care of activities on a group-level. These activities are divided equally across clients.

In table 3 the total amount of informal care per activity group is shown for all patient groups. Total time of care givers is given in the first column, in

the second column an estimation is given of the time professional care givers would have needed for provision of these activities. These last figures are used to find the costs of informal care in the next section.

Table 3 Mean time of informal care per activity, and total time necessary by professionals to provide those same activities (standard deviation between brackets).

Type of care	client group	Mean time		N
		informal caregivers	professional	
ADL-activities	severe IADL	99 (48)	32 (18)	112
	severe IADL and CIS	109 (32)	38 (27)	8
HDL-activities service	severe IADL	31 (20)	10 (10)	101
	severe IADL and CIS	36 (12)	12 ( 6)	6
Nursing activities	severe IADL	13 ( 4)	4 (2)	110
	severe IADL and CIS	15 ( 6)	4 (3)	7
Social activities	severe IADL	21 (15)	9 ( 7)	99
	severe IADL and CIS	38 (30)	14 (11)	8
<b>Total</b>	<b>severe IADL</b>	<b>148</b>	<b>55</b>	<b>112</b>
	<b>severe IADL and CIS</b>		<b>198 72</b>	<b>8</b>

*Costs per setting for comparative client groups*

With all the information accumulated so far, the cost per unit of production, the individual medical and non-medical costs, patient characteristics and accompanying care intensity, a calculation of costs per individual for each treatment modality is possible. These final cost estimates are presented in table 4 and table 5. Table 4 gives a comparison for people with severe IADL-problems. In this group considerable efficiency gains can be established by supplying home care to a group of elderly, even if they have severe IADL-problems. Gains mount up to more than fifty guilders a day if we look at government expenditure (when informal care is excluded), which is a 38% saving. However, if informal care is taken into account according to, savings in the main analysis decrease to 17%.

Table 4 Costs of nursing home care for people with severe IADL-problems, Dutch guilders per day.

IADL-index	Home care incl.	Residential home
	district nursing severe N=112	with individual care severe N=14
Care personnel		82
-Home care	38	
-Home nursing	13	
-Informal care	30	
(Para)medic personnel	1	2
Housing	13	28
Food	10	12
Other	18	25
Total	123	149
95%-confidence interval	111-135	128-170

Table 5 shows the results for people with severe IADL-problems and severe cognitive problems. Note that this group is very rare in home care situations. However, it is possible to help them at home at a lower price than in the other institutions. Residential homes where special attention is given to those kinds of elderly seem a cheap substitute too. Savings for the government mount up from 36% (when informal care is included) to 53% (informal care excluded). Societal cost decreases with 27%, considering residential group help compared to nursing home care respectively.

Table 5 Costs of nursing home care for people with severe IADL-problems and severe cognitive problems (CIS), Dutch guilders per day

IADL-index	Home care incl. district nursing severe + CIS N=8	Residential home with group care severe + CIS N=15	Nursing home severe + CIS N=20
Care personnel		92	77
-Home care	40		
-Home nursing	20		
-Informal care	38		
(Para)medic personnel	1	2	21
Housing	13	28	43
Food	10	12	16
Other	18	25	60
Total	140	159	217
95%-confidence interval	101-169	135-183	192-242

### *Sensitivity analysis*

In this sensitivity analysis the critical components in the calculation are changed by 25% to show what the impact will be on costs and for the comparison between the different care settings. If the maximum amount of all individual costs together is taken into consideration, this will show the absolute minimum of cost savings for extramural care. On the other hand gives the minimum amount of individual costs the maximum saving rate. In table 5 these scenarios are shown, together with a univariate sensitivity analysis for the variables housing and care. Although care has an important impact on total costs, an increase of 25% of all cost factors will not change conclusions about the cheapest options, if nursing home care is considered. The differences between residential care and home care are diminished. Care intensity has to be doubled in the home care situation before other alternatives will become cheaper.

In the main analysis care intensity of informal carers mirrors the time necessary for that same activity by professionals. When an informal carer takes 30 minutes to make a bed, while a professional carer uses only 10 minutes, this last figure is used in the cost calculations. If however, the full 30 minutes are included in the analysis the price per day of the home care alternative approximately raises with Dfl 50,- to Dfl. 95,- per day for elderly people with severe IADL-problems and elderly people with severe IADL-problems and severe CIS-problems respectively.

Table 6: Sensitivity analyses for both client groups in all settings, in guilders per day

	Home care incl. district nursing	Individual care in residential home		
<b>Severe IADL</b>				
Main analysis	93	149		
Costs of housing + 25%	98			
Care intensity +25%	106			
Informal care valued as regular home help	127			
All of the above	149			
	Home care incl. district nursing	Residential home with somatic care	Nursing home	
<b>Severe IADL + CIS</b>				
Main analysis	102	159	217	
Costs of housing + 25%	106			
Care intensity +25%	117			
Informal care valued as regular home help	161			
All of the above	190			

## 6.4 Discussion

The purpose of this study was to perform an economic evaluation of care for a group of elderly with severe impairments, either cognitive or functional. The results on sub-group-level show that home care is cheaper for people with many problems in activities of daily living. For people with a severe degree of dementia, additional care in a residential facility is much cheaper than admission in a nursing home. For this group home care cannot necessarily be seen as a more cost-effective method of care arrangement, because the assistance of informal carers is a necessary condition for organising the care delivery process. If, and only if, there are informal carers, then home care can be seen as more cost-effective alternative.

This presented method for economic evaluation has several advantages above the traditional cost comparisons. Cost analyses in this study were conducted on an individual level. This means that a large range of cost components was included, consisting of housing costs, adaptations to accommodations, food, personal care, medical care, etc. Even in the institutional settings costs of care was calculated based on an individual time registration procedure. The comparison between institutional settings and home care is, therefore, not based on average costs like in most studies so far. That (traditional) approach does not pay any attention to differences in client characteristics, that do have a major influence on costs. People who are severely demented and who have a lot of physical problems will need more professional attention, no matter which setting they are in. Summarised: individual costing is necessary to find out if there are any threshold values at which home care will be more expensive than institutional care. The type of methodology used in this article is promising for economic evaluation in the care sector. Based on this method it will be possible to construct cost functions for an institution as a whole based on individual data. Based on client characteristics it will even be possible to predict future costs of a new admitted person.

Nevertheless, there are some shortcomings. First, the study does not have a longitudinal character. The economic evaluation started as a piggy-back study, long after the project had started. It was not possible to assess costs and effects prospectively. Secondly, there is no random design. This is compensated through a matched control group. However, the questions remains whether the client characteristics used in this study (IADL and CIS) to predict care intensity the only significant ones. Several other

factors may have to be included. Thirdly, the costs of informal are crucial. These can be a significant cost factor in home care facilities. There is, however, much discussion how to value this type of care (Smith and Wright 1994; Gold et al. 1996; Busschbach et al. 1998). The most common assessment was conducted in this study. Last, in this study quality of care and quality of life assessments were not included. This was not the focus of the research study. Furthermore, measurement of quality of life in dementia patients will be very difficult (Wimo et al. 1993).

Clearly, there will be a break-even point below which the costs of home care will be more than the costs of nursing home care. Obviously, that break-even point is more likely to be reached if the client has a high level of disability, low cognitive functioning and little family help. The feasibility of substitution depends on the assumption that there are some individuals who require lesser levels of care (in care time or professional expertise) than is provided in the setting they are located in presently. According to this study the financial consequences of substitution will be highly positive and the break-even point will not be met unless there is no informal care available. These results seem highly important for policy makers.

### **Acknowledgements**

This study was part of a larger research programme 'The development of alternatives for nursing home care in south-east Groningen' funded by the Ministry of Public Health, Welfare and Sports of the Netherlands.

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## **Chapter 7 Economic evaluation of alternative ways of delivering care to people with a mental handicap**

### **Summary**

The traditional care for people with a mental handicap in the Netherlands consisted of an 'all-in' package of services: people with a mental handicap were almost without exception admitted into a residential home. Large institutions accommodated several dozens of people with a mental handicap.

Institutionalization was considered to have large advantages. However, there was growing documentation that institutional care had negative aspects. Ever since, a variety of innovative services has emerged in the care for people with a mental handicap. During the eighties, there has been a desire to deliver effective treatment in the least restrictive environment possible. Many non-economic reasons have been mentioned for this deinstitutionalisation. However, the cost side adds an important dimension to policy considerations regarding deinstitutionalisation.

In this pilot-study, a cost analysis was conducted, based on a longitudinal pretest-posttest design, to gain insight in the cost consequences of moving individuals from institutions to a small-scale setting. For this purpose, a model was constructed based on data from annual reports and a survey amongst parents and caregivers, including data about the costs before the transition (costs of intermediate care facilities) and after the transition (costs in small-scale settings).

The results show that there were no significant cost differences between clients in community-based small-scale facilities and residential care facilities. However, when costs of informal care are included, these results change dramatically. Depending on the assessment procedure used to value informal care, small-scale settings become 10%-25% more expensive.

*The present chapter is partly based on the following paper:  
Wijk, P. van der; Groothoff, J.W.; Post, D.; Koopmans, L. (submitted).  
Economic evaluation of alternatives for care in residential homes: Is deinstitutionalisation more expensive?*

## 7.1 Introduction

In the fifties large institutions were built to protect persons with mental retardation from society and to allow them to live in a safe, protective environment far from population centers. In these institutions hundreds of mentally handicapped people were admitted and received care for 24 hours a day. Moreover, they received a complete range of services including housing, food, paramedical services, etc. The Declaration on the Rights of Mentally Retarded Persons in 1971 can be seen as a turning point in the delivery of care for people with a mental handicap people. This Declaration states that *"whenever possible, the mentally retarded person should live with his own family or with foster parents and participate in different forms of community life. The family with which he lives should receive assistance. If care in an institution becomes necessary, it should be provided in surroundings and other circumstances as close as possible to those of normal life"* (General Assembly of the United Nations, 1971). Since then the terms normalization, integration and deinstitutionalisation have frequently been heard in the mental health care sector. Attitudes in the mental health care sector have changed, mainly as a result of several experiments which demonstrated that people with a mental handicap can live successfully in local communities provided that they are given appropriate support. Several non-economic reasons have been mentioned for deinstitutionalisation, for example adaptive behavior improvement, quality improvement and normalization. Although, the driving forces behind normalization and deinstitutionalisation are not economic, financial aspects play an important role in the diffusion of such experiments to a more national level. When community-based service models were implicitly mandated to provide the mechanism that would enable retarded people to experience independence, autonomy, freedom of choice, and respect - dimensions that are considered to be important items of an individuals quality of life (Emerson, 1985)- the government explicitly asked for more details about cost consequences.

One of the most important economic incentives to deinstitutionalisation in the Netherlands was the fact that more and more innovative forms of care were included in the Exceptional Medical Expenses Act (AWBZ). This strong tendency towards independent living arrangements for people with a mental handicap (and elderly people), led to a big increase in expenditure for housing within the AWBZ. The question rose whether the costs of housing should remain part of the budget of the health care sector, and in particular of that of the Exceptional Medical Expenses Act. A distinction between the costs of

housing and care was proposed. The most important motivation underlying this concept was that other people in society must pay their own rent too (normalization).

The financial consequences will play a major role in the decision making on the continuation of small-scale settings. In this light, it seems strange that so little information is available to support policy decisions on care for people with a mental handicap. This is not only the case with regard to care for people with a mental handicap, but also with regard to other care activities. In the Netherlands, economic research in this sector is still in its infancy. In the international literature, the attention paid to this aspect is fairly recent (Dockrell, 1995; Hatton et al., 1995; Knobbe et al., 1995; Beecham et al., 1997).

The aim of this paper is to explore the economic impact of deinstitutionalisation of care for people with a mental handicap in a broad sense: What will be the financial implications of introducing this policy of transitioning retarded people to small-scale settings on a societal base.

## 7.2 Material and methods

### *Subjects*

32 subjects were included in this pilot-study, all of whom were enjoying intermediate care facilities. Participation of staff was necessary for selecting patients suitable for care arrangements outside the institution. Therefore, a random design did not reflect the daily decision making situation. Because the government wanted to be informed about the cost consequences for a large range of clients, participants were taken from different classes of people with a mental handicap, but all of them were expected to succeed in the small-scale environment. The characteristics of residents are presented in table 1.

Table 1: Client characteristics of all participants

	Age	Sex	Level of mental retardation	no.	Physical handicaps	Visual handicaps	Challenging behavior
Intermediate care facility (N=32)	23	44% M 56% F	Light:	9	22 %	11%	11%
			Moderate:	11	18 %	18 %	18%
			Severe:	7	43%	43%	29%
			Very severe:	5	80%	60%	20%

The assessment of impairments and level of mental retardation were derived from the judgment of clinical, educational and care staff in each facility. As can

be seen, the majority of participants were judged to suffer from moderate mental retardation, as well as some sort of visual, hearing and physical impairments more mixed. The ratio of male to female participants was almost equal. The average age was 23 years. Additional problems of a physical nature (for instance dependence on a wheelchair), visual problems and major challenging behavior (aggression, self-injury) were scored extensively, but only the general figures are shown here. Despite the high percentage of subjects with additional problems, all subjects were expected to be fit to live in a small-scale institution.

### *Settings*

The costs of two different service modes were compared: a traditional (an intermediate care facility) and the new concept of delivering more tailor-made care in small-scale settings. Both services basically provide 24-hour staff support for residents.

People in the intermediate care facility live in small units, with usually no more than 24 residents. Generally, these facilities have a central kitchen and cleaning staff. The day program is carried out at a special educational or habilitative center in the neighborhood.

Small-scale settings differ in nature and size. Facilities with two to six people were included in this research project. In these houses, domestic and cooking tasks are performed out by care staff and residents.

### *Costs*

The examination of community-based small-scale settings and institutional costs was based on principles widely applied in health economics, described by Knapp (1995) and Gold et al., (1996). Costs were measured integrally, and from a societal perspective, in order to include all cost components.

Furthermore, cost comparisons were made on a like-with-like basis, comparing individuals that move from one setting to another.

As information about the costs of small-scale settings was scarce, the costs calculation was based on a survey amongst parents and personnel. Nature, frequency, and duration of all health and welfare services provided to participants during the 3 months prior to their relocation to a small-scale setting were included. Direct care costs were measured in the month before the patient's relocation to a small-scale setting. During one week all staff activities were registered. Included were: all direct contacts with clients, indirect client-related activities, and not assignable time of caregivers (like time spent on

group care, staff meetings and supervision). These data were gathered on a day-to-day basis by interviews with members of staff. Care time was registered on several care items: time for support in instrumental activities (cleaning, doing the dishes, etc.); care time necessary for daily life activities (washing, getting dressed, eating, etc.); nursing care (providing medication, tending to patients with an epileptic attack, etc.); and time for support with respect to psychological functioning and challenging behavior. The one-year outcome of the evaluation of the two groups was analyzed by applying the Wilcoxon Matched-Pairs Signed Rank Test. In all statistical tests a significance level of .05 was chosen. Furthermore, 95%- confidence intervals were computed for all groups of care activities.

Further direct costs include: time costs of primary caregivers, medical consumption in complementary facilities (hospital admission, visits to general practitioner, visits to paramedics), care appliances, transportation, housing (rent, depreciation, equipment, maintenance) and food provision (e.g. Meals-on-Wheels). Such a detailed analysis was necessary because the budgetary system in the Netherlands includes part of them in the institution's budget, while in small-scale settings they are excluded and therefore at the cost of the individual. A cost analysis at the societal level should include all these cost components.

Another important reason for individual costing is the fact that in small-scale settings the support from informal caregivers is in general much higher. To identify these costs additional questionnaires were used to obtain details about informal care (*direct non-medical costs*), and to try and find out if lost wages and productivity losses (*indirect costs*) by relatives play a role. Measurement of these informal care hours was simply done in minutes per day. The interpretation of these figures and the valuation of them are very difficult. We used two methods to assess informal care. First, the opportunity-cost method, which proposes to value time spent on informal care as the cost of the best alternative use of resources for that time. When the time spent on informal care would otherwise have been spent on working for a wage, that time should be valued as being equal to that wage (Busschbach et al., 1998). Second, the shadow-price method, which simply uses the cost that would have occurred when the informal care was performed by professional caregivers. To value the activities performed by informal caregivers, the same list of activities was used to establish the care intensity of individuals. For instance, helping to take a bath took professional caregivers 15 minutes. The assistance with bathing, which took informal caregivers one hour, was valued at 15 minutes.

Three-months cost estimations of individuals were compared to the situation before the transition using the Wilcoxon Matched-Pairs Signed Rank Test. Overhead costs were divided over clients on an average basis, because these types of costs can hardly be assigned to individual clients.

### 7.3 Results

#### *Direct care-related costs*

Table 2 provides data about the individual care intensity of all clients in the different settings.

Table 2 Care intensity for individual activities of caregivers and costs in different setting for all groups of people with a mental handicap ( in minutes per client per week)

	Intermediate care	Small-scale
<i>Individually assignable tasks</i>	<i>N=32</i>	<i>N=32</i>
Instrumental activities	105	85
Activities of daily life	24	12
Nursing care	7	7
Psychological functioning	112	114
<b>Total</b>	<b>248</b>	<b>218</b>
95%-confidence interval	225-271	201-235
Wilcoxon Matched-Pairs Signed Rank Test:		*
<i>Not face to face, but individually assignable</i>	180	172
95%-confidence interval	174-187	164-181
Wilcoxon Matched-Pairs Signed Rank Test		NS
Other (including sickness, etc)	725	610
95%-confidence interval	600-850	540-680 <sup>1</sup>
Informal care – opportunity time	160	200
95%-confidence interval	90-230	110-290
Wilcoxon Matched-Pairs Signed Rank Test		NS
Informal care – shadow time	70	90
95%-confidence interval	30-110	45-135
Wilcoxon Matched-Pairs Signed Rank Test		NS

\* p < 0,05

<sup>1</sup> Not individually assignable, so no difference tests possible

The resident-staff ratio in the intermediate care facilities was 1:0.53. Therefore, an average of 19.1 hours per week per resident was available<sup>1</sup>. More

<sup>1</sup> 0,53 \* 36 hours, which is the average amount of hours a professional worker is available in the Dutch care sector.

than 4 hours were directly assignable to individual clients. Another 3 hours of care were used for indirect client-related activities (such as administrative work, group consultation for certain clients, etc.). Approximately 12 hours could be attributed to group-related activities, group care activities, or at least to helping different individuals at the same time.

On average, per resident in small-scale settings, 0,43 full-time equivalent per week is available for professional caring in small-scale facilities, i.e. means 16.6<sup>2</sup> hours. Only 22% (3.5 hours) of these care hours can be attributed to individual care of residents. 2.5 hours are indirect client-related activities. A little over 10 hours is left for group activities, etc.

As can be deduced from the table, in small-scale settings less care is needed for instrumental and daily life activities. This development can be partly accounted for by the fact that the inhabitants perform more tasks themselves, especially when it comes to cooking, doing the dishes, cleaning, etc. Savings on personnel in these small-scale settings may very well be possible. However, there will always be need for a supervisor.

In Table 3 the averages of individual costs for direct care are presented, based on three different levels of specialized personnel. Overall, no significant differences in costs as a result of differences in care intensity could be detected, not even when informal care minutes were added. Indirect costs (productivity gains or losses) were not taken into account. None of the participants said to have started or quit their job during the research period.

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<sup>2</sup>0,43 \* 36 hours.

Table 3 Individual costs of care time in Dutch guilders

	Intermediate care facility N = 32	Small-scale setting N = 32
Wage of caregivers per hour (gross) <sup>1</sup>		
-Nurse	36.-	36.-
-Coach/caregivers	33.-	33.-
-Household	27.-	27.-
-Informal caregivers	20,-	20,-
Total weighted individually assignable time per client per day <sup>3</sup>	21.3	18.7
Not face to face	14.6	13.8
Not individually assignable	57.0	47.9
<i>Total</i>	92.9	80.4
95%-Confidence interval	71.5-114.3	73.8-97
<i>Informal care</i>		
Opportunity cost method	7.5	9.6
Shadow-price method	5	6.5

<sup>1</sup> Including costs for the employer and income taxes.

<sup>2</sup> Many of the informal caregivers do not have a paid job. That is why the average wage rate of informal caregivers is below that of the professional caregivers, although the care sector is not famous for its high salaries.

<sup>3</sup> Based on the division of activities: housekeeping activities were mostly provided by a less specialized worker than the other activities. Nursing care was only done by qualified nurses.

#### *Total costs*

In Table 4 the averages of individual costs for the different care facilities are presented. Average societal costs for an intermediate care facility are Dfl. 175.5, and for a small-scale setting Dfl. 171. In all settings, costs of personnel account for more than 50% of total costs. There seem to be considerable differences between various settings in the staff time not spent on performing primary tasks. Especially in the small-scale settings administrative activities are often performed by the executive staff during their working hours. Average costs for day care activities are added for both settings, because they are not included in the all-comprehensive package of services provided in these facilities. This amount of Dfl. 37.- is the weighted average cost for people attending special schools, working in a sheltered workshop or spending time in a day care facility, two days a week. Although the pattern of activities does not change, people in small-scale settings tend to attend more activities outside their own home. This volume effect causes an increase in the costs of day care activities, as shown in Table 4. Additionally, the cost of transportation rises and

client bounded expenses increase. In general, the average societal costs of care delivery do not change significantly, not even when we take the amount of informal care into consideration.

Table 4: Average of individual costs (in guilders) per day, divided in eight cost categories

	Intermediate care facility		Small-scale setting	
	Absolute	in %	Absolute	in %
Personnel not executing primary tasks	7.-	4.0%	4.0	2.3%
Personnel executing primary tasks	93.0	53.0%	81.0	47.4%
Food	7.5	4.3%	9.0	5.3%
Cleaning, etc.	1.0	0.6%	n.a. <sup>1</sup>	
Client bounded	1.0	0.6%	4.0	2.3%
Transport	1.0	0.6%	4.0	2.3%
Overhead	8.5	4.8%	3.5	2.0%
Housing	19.5	11.1%	20.0	11.7%
Daycare	37.- <sup>2</sup>	21.1%	45.5- <sup>2</sup>	26.6%
Total	175.5	100 %	171.-	100 %
95%-confidence interval	160-191		144-206	
one-way ANOVA			NS <sup>3</sup>	
Informal care	5-7.5		6.5-9.6	

<sup>1</sup> Mostly included in the personnel executing primary tasks.

<sup>2</sup> The average costs for day care activities, two days a week.

<sup>3</sup> No significant differences were found in cost patterns between facilities.

## 7.4 Discussion

At present, literature on costs of deinstitutionalisation which particularly focuses on people with a mental handicap is still scarce, although there are some studies from the UK and the USA. The results are diverse. The correlation between size of the facility and cost is not clear. Heal (1987) concludes that larger facilities are more expensive. However, this conclusion is confounded by the fact that the larger facilities are owned by the state. Public facilities are found to be more costly than private facilities (Heal, 1987). On the other hand, the results of Nerney et al. (1990) contradict this outcome. They concluded that smaller facilities with fewer than six residents appeared to be more expensive. Campbell and Heal (1995) suggested a U-shape relation with facility size, with intermediate-sized facilities being the least costly. Knobbe et al. (1995) found some public savings for community-based alternatives when compared to state institutions. Hatton et al. (1995) compared four different

service models at a single point in time. Comparing specialized institution-based units, a specialized campus-style education service, specialized community-based group homes, and ordinary community-based group homes (which probably reflects best the small-scale settings included in this study), they found that the specialized group-home model was to be preferred, since this model was not associated with considerable high costs. This conclusion seems to be supported by the results of our study. Dockrell et al. (1995) describe how closure of long-stay mental handicap hospitals leads to a range of new resettlement initiatives for clients with learning disabilities, which were on average 25% more expensive, while improving the quality of life of individuals on attributes like personal privacy, choice/autonomy, participation in domestic activities, access to the neighborhood and the use of community facilities. Beecham et al. (1997) conclude that, at mean, community care was less expensive than long-stay in-patient care. Ashbaugh and Nerney (1990) find that variety in costs between community care settings and larger scale facilities mainly depend on staff-to-resident ratios. The results of our study seem to support these findings. Furthermore, our analysis suggests that from a societal perspective, small-scale settings are not significantly more expensive intermediate care facilities, while participation in domestic activities and use of community facilities seemed to increase. A subgroup analysis, considering the relation between the severity of the mental handicap and individual costs, could not yet be performed, due to the small number of clients in each class of mental handicap.

The most important potential shortcoming of most cost comparative studies on the care for people with a mental handicap is the selection bias resulting from the confounding of resident characteristics between different settings. Type and level of disabilities vary systematically between different care arrangements. This points directly to the necessity for an individualistic costing procedure, which can only be researched in a matched group comparison or a longitudinal design. In this pilot-study we used a longitudinal design, following people who first lived in an institution or in an intermediate care facility and then moved into a small-scale setting. These people, as such, serve as their own controls.

Due to the intensive method of observations, the number of individuals included in the study was small, thereby reducing the degree to which findings can be generalized to other settings.

In this study a first trend can be seen that individuals in small-scale settings tend to make more use of public facilities, like public transport and day care

facilities. In general, no significant cost increase could be found from the transition of people with a mental handicap from intermediate care facilities to small-scale settings.

A special problem in economic evaluations in the care sector is the identification, measurement and valuation of non-care-related and indirect costs. In this study we measured total informal care time using interview data. Although the concept of informal may be clear, the measurement and valuation of care minutes remains problematic. What items have to be included (which activities are regular and which are specifically related to the mental handicap), how much time do we account for them (is 24-hours surveillance counted for 24-hours or just for a fraction of that, because it is possible to do something else during that time), and what is the monetary value of an hour invested in caregiving. For the valuation of this informal care time we used two different methods: the opportunity-cost method and the shadow-price method. Both seem to have their pros and cons (Busschbach, 1998). In this study, the amount of informal care and the value of it did not dramatically change the results. When, however, a pure home-care alternative is evaluated, informal care is likely to have a large influence on total costs. A discussion about measurement and valuation of these costs in economic evaluation, especially in the care sector, seems necessary.

### **Acknowledgement**

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This study was supported by the Dutch Ministry of Welfare, Health and Sports

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## **Chapter 8 The role and problems of economic evaluations in care**

### **8.1 Introduction**

Since 1976, the consequences of an ageing society for health care spending have become a major political concern (Blommestijn, 1991). The main instrument to reduce supply constraints in this area has long been substitution (Goudriaan, 1992, Gerritsen, 1993). Patterns of change were designed moving away from institutional care towards enhanced home care and the development of improved co-ordination at client level through case management.

While the provision and the development of such new care facilities has generated considerable political attention, economic efficiency of the drive for such downward substitution has received little systematic thought. Throughout this thesis, several factors have been mentioned that may explain this neglect for economic evaluation in the care sector.

- 1 Care facilities and care activities may attract less attention due to their target group: the elderly, chronically ill and disabled. This target group is not part of the labour force and has limited political power. Treatment of these people will in most cases lead to less cost-effective outcomes when a strictly utilitarian approach is followed (Nord, 1994).
- 2 Since medical technology is generally regarded to be the most important contributor to the rise in health care costs, policy makers tend to focus on containing higher spending through lashing out at technological innovations.
- 3 The results yielded by care activities are less spectacular. As in the medical world itself, where the latest medical technologies are important competitive instruments between hospitals and doctors, an economic study directed at major technological advance (like liver or lung transplantation), concerning treatments which involve life and death, is likely to attract more attention than a study of care facilities which deliver activities in a new fashion (Reisman, 1993).
- 4 There are several problems inherent to analysing the consequences of care policy alternatives, which make economic evaluations in the care sector more complicated.

Section 8.2 gives an overview of the difficulties faced in economic evaluations in the care sector. Next, in Section 8.3 the research reported in this thesis is used to identify different possibilities of how the results of economic evaluations may be used on different policy levels. On headlines, this does not differ much from the possible use of economic evaluations in general, but there are some minor deviations. In a final section 8.4, the main results of this thesis, its implications and suggestions for further research are discussed.

## **8.2 Economic evaluations in the care sector**

This thesis reports results from economic studies in the care sector based on common rules for economic evaluation. When performing these studies some specific problems emerged, which complicated the interpretation of results. Traditional instruments for economic evaluation prove not always applicable in the care sector. For instance, there is no standardised outcome measurement scale, organising a randomised trial is complicated, and the relevance of non-medical costs is a special concern. So, conducting economic studies in the care sector reveals several problems in methodology and implementation. In this section these problems will be summarised and possible solutions will be discussed.

### *1- Research questions*

Most policy research focuses on questions such as: what treatment should be provided; which intervention or what treatment option is most cost-effective for certain patient groups. Such questions are closely linked to questions like: To whom should treatment be provided: should dental implants be provided to anyone with a dental prosthesis; or: should a breast cancer screening programme be available to all women or only to specific categories of women?

There certainly is a case to be made for specifying individual patient characteristics that are associated with better health outcomes and/or lower costs. In the care sector this imposes an additional problem, because many of the manifest health problems are irreversible. An incontinent patient clearly requires more labour intensive treatment and therefore is a more expensive case compared to someone with the same functional abilities without being incontinent, while the outcome of care in terms of quality of

life or patient satisfaction is not very likely to differ. The care sector offers a safety net to all people who cannot care for themselves anymore, regardless of the reason. The question whom to treat is not appropriate here.

Other complexities exist, because the mode of treatment is mostly linked to locality, or: Where should treatment be provided? The high costs of inpatient services have stimulated searches for community-based care options. These extramural alternatives by definition take place in another setting. The questions what treatment should be provided and where treatment should be provided are difficult to separate out in the care sector.

Serious problems of research in the care sector arise because of the lack of specificity of the treatment (Krupnick, 1992). Problems include to define the what, how and where. In most research in the care sector, these questions are interrelated. It is important to keep this in mind, when formulating a sharp and detailed research question. Furthermore, the demand for care is determined by many complex factors. In many cases, it is not related to a particular disease. This has important repercussions for the gathering of data, especially those of indirect costs.

#### *Perspective*

Another choice that has to be made regards the perspective of the study. In general, three different perspectives can be discussed: (1) microeconomic (individual treatment programme participant), (2) mesoeconomic (health care suppliers, insurers, programme sponsors, local government agencies), and (3) societal. There is no fundamental difference between cure and care with respect to the perspective of the study. As in the cure sector, the societal perspective is considered the most comprehensive in the care sector. In practice, however, it is extremely difficult to apply, since a large part of the costs are typically indirect and do not have a market value. Special attention concerning identification, measurement and valuation of these indirect costs is called for (see point 4).

In Chapter 2, the conflict between distributional and allocational policy goals for government interventions was described. In the Netherlands, the system tends to give high priority to distributional issues. In this light, it

seems strange that this aspect gets so little attention in economic evaluations. This applies especially to the care sector, where many co-payment procedures exist. Paying more attention to the distribution of costs among actors, that is maintaining a multidimensional scope, is worthwhile.

### *3- Study design*

In general, a randomised clinical trial (RCT) is regarded to be the best control over a study situation, although such a design generally says more about cost-efficacy than about cost-effectiveness. Nevertheless, a RCT is seen as the best way to isolate the investigated effect (Leaf, 1989; Mulder, 1996; Gold et al., 1996). There are, however, some serious problems that hamper the use of RCTs in the care sector.

In most cases the key of community care projects is participation of staff in selecting patients suitable for care arrangements outside the institutions (Wimo et al., 1995). A random design would therefore not adequately reflect the daily decisionmaking situation. Furthermore, a practical problem may arise in the care sector. In some circumstances, it may not be possible to randomly assign people to different care arrangements, because people simply may not want to move into a nursing home. In that case, the ethical problems are prohibitive (Holland, 1983).

A second aspect of design regards the blinding of carers and patients (double-blind). The best way to examine results and outcomes of intervention is thought to exist when the actors are kept in ignorance of which treatment they have given/undergone. This approach is rarely feasible in the care sector when the study is beyond the scope of simple drug or vaccination trials. A third aspect which should be mentioned as problematic is the time period of follow-up. One year is mostly seen as a minimal study period. This leads to a considerable amount of attrition, especially in the care for the elderly (nursing homes, where people on average live for about a year), and to financially expensive research programmes (due to extensive follow-up).

Last but not least, there are a thousand different ways to provide care. In the care sector, treatments are more and more following protocols. Every institution has its own view on care, its own organisation, co-operation with third parties, etc. Even when a RCT would be feasible, the results of such a study could not easily be generalised, due to all these differences in

the implementation of providing care, in each individual situation under review.

RCTs are not very often found in the care sector. It is not an useful instrument when evaluating projects which involve transition, because it is seen as unethical to change people's living environment against their will and because the success of a transition depends on certain patient characteristics. Although these research may particularly be considered to be only differences of degree, researchers should not underestimate the resistance of care providers and care suppliers to the implementation of randomised trials. Other study designs may be needed.

In Chapters 6 and 7, in which experiments are introduced into the natural environment of the research population, controls are difficult to find (Frank and Manning, 1992) or it has to be in another institution, which creates considerable bias (in the view on care, infrastructure, etc.).

With respects to costs, it is important to understand that, due to differences with regard to those aspects, type and level of disabilities vary systematically across facility alternatives. For instance, the population of elderly patients in an institution comprises those with severe problems in living independently. The outcome of economic evaluations will thus be questionable: to what extent can differences be attributed to the type of facility and to what extent to the type of clients served?

Generally, four options for research design can be found in the care sector:

- 1- Static group comparisons across multiple intact groups (Hill and Bruinincks, 1984; Hoeksema et al., 1991; Felce and Perry, 1997);
- 2- Static group comparisons with matched groups (Otten, 1991; Hatton, 1995). Groups can be matched by sex, level of retardation, years of institutionalisation, self-care skills, age and IQ. As described in Chapter 5, this method was used for the evaluation of care for the elderly. In that study only three matching criteria were identified: problems with (Instrumental) Activities in Daily Life, cognitive problems, and personal status (living alone or living together). Most probably there are other criteria that have an influence on intensity of the care required. Although this seems a good method to get around the problems concerning the influence of client characteristics on costs in a

- post-test only design, it is critical that all variables associated with costs be identified and employed. Case-control studies: individuals with and without the intervention under consideration are compared retrospectively with respect to their exposure to the study programme.
- 3- Case-control studies have the advantage that they avoid the prolonged follow-up, required in cohort-studies or RCTs. However, selection, observer and recall biases may seriously affect the validity of the results of these studies.
  - 4- Cohort studies: individuals exposed and not exposed to a given type of intervention are compared prospectively with respect to care consumption and level of outcome under consideration (Van der Giessen en Otten, 1992; Knobbe, 1995). However, in this type of study design, the factor that affects the choice of the intervention is a strong determinant of outcome. This pre-test/post-test comparison is especially valuable for studies that analyse transition of situations like the case study described in Chapter 7. In that study, however, there was no control group (as in Dockrell et al., 1995). With this method pre-tests are performed to account for selection bias. A comparison of costs before and after a transition gives an insight into the development for all individuals. The addition of preplacement assessments enhances plausibility of attributing observed variation to setting differences. However, because the population studied is not randomised, results cannot be generalised to all people with a mental handicap (which in care is called confounding by indication (Holland, 1983)). Developments in care intensity, costs or outcome can be related to patient characteristics. For instance, for the mentally retarded, costs of small-scale settings tend to be lower for people with a light mental handicap, while for people with a severe mental handicap costs tend to be much higher. Furthermore, it could be possible that on account of exogenous developments, results in the old facility would have changed too.

In this thesis, methods 2 and 4 were used, partly due to the fact that the real experiments had already started before the economic evaluation was set up. However, in all cases a randomised clinical trial was seen as not appropriate by care providers.

#### *4- Cost accounting*

Another question is: what costs must be included and how do we value them? Costing procedures have varied greatly between various studies in the literature. At one extreme, one could report state-wide averages of domiciliary costs per cost item, without specifying the composition of these cost averages. At the other extreme, a representation of exhaustive breakdowns of personnel, programme, professional support, and administrative costs is possible.

Cost accounting is a three-step process. First, the relevant resources used by clients have to be identified adequately (identification). Second, apart from the occurrence of an event, some measure of its duration and the amount of resources consumed must be obtained (measurement). Third, the cost-per-unit must be determined using a consistent method (valuation).

##### *4.1 Identification of costs*

The identification process is particularly difficult because the spectrum of societal costs is so broad that identifying all resources consumed requires considerable knowledge of the actual working procedures. Information of care providers and patients will be necessary to identify all possible resources. Several cost components are normally included:

- Direct costs for care services (e.g. laboratory tests, physicians' time) should include all costs that are a direct consequence of the actions of individuals and/or institutions within the professional care sector, aimed at care providers (Luce and Elixhauser al., 1991).
- Direct costs outside the care sector include all resources invested by family and friends acting as informal care providers, and patients' travel time and out-of-pocket costs that are not based on official prescriptions.
- Indirect costs within the care sector are all medical costs originating in gained life-years and costs of diseases in the future (Busschbach et al., 1998). Weinstein et al. (1996) propose to only include intervention-related diseases for the years a patient would have been alive anyway, and to incorporate all medical costs during gained life-years. These guidelines are not applicable to the care for the elderly or people with a mental handicap. Nothing is known about added life-years as a result of living at home in stead of in a nursing home. Furthermore, almost every disease is related to age. In theory all have to be included in the

research design, because it is almost impossible to relate them causally to the living situation (at home or in a nursing home). In practice, only complications like hip fractures, broken arms, etc. due to living independently at home are included.

- Indirect non-medical costs are costs that occur as a result of production losses arising from illness or disablement. In the care for the elderly it is very unlikely that patients are still in paid employment. Thus these productivity costs (Koopmanschap et al., 1993) do not play a role in the care sector. However, the loss of unpaid work by elderly people may be of particular importance here. In the care for people with a mental handicap or psychiatric patients it might be possible that some persons get work after a transition, or lose their job. These costs and revenues should be included.



### *Solutions*

A checklist for identifying all possible costs is given table 8.1 (Based on Van der Wijk, 1995; IOO, 1995; Chisholm, 1997).

Methods for measurement and valuation techniques for all these cost components are described in the next section. Different perspectives to uncover counterproductive incentives of budget proposals will be shown

### *4.3 Valuation of costs*

Valuation of costs requires the assessment of identified and measured resources used for caring. It is the last process in cost accounting. In general, marginal cost is considered the appropriate cost valuation procedure for economic evaluation studies (Drummond, 1987; Sloan, 1995; Gold, 1996).

#### *Problems with the valuation of direct costs in the health care sector*

Direct costs in the care sector should be examined carefully in quantity of units and associated costs. The costs of a nursing home day, for instance, include various costs, such as the cost of the building and staff. These average costs cannot be used to compare different settings, unless the patient characteristics of all populations are the same. Basically, all units that are included in the nursing home day care should be included and valued separately by the opportunity cost. The extent to which the prices normally attached to the cost units are believed to adequately reflect real cost for society has to be further investigated.

#### *Problems with the valuation of direct costs outside the care sector*

Allocation of direct costs outside the care sector is complex due to problems with valuing unpriced time resources. How should time spent on informal care be assessed? Several methods can be used to value informal care time (Smith and Wright, 1995; Gold et al., 1996; Busschbach et al., 1998).

- First, opportunity costs can be established. Time spent on informal care should ideally be valued as being equal to the most normal alternative use of that time. When time spent on informal care would otherwise have been spent working in a paid job, that time should be valued as being equal to the average wage rate of the target population (Gold et al., 1996). In general, age- and gender-specific wage estimates will provide adequate specific estimates. If time spent on informal care would otherwise have been spent on leisure time, the value is more complicated to assess. Most informal care for the elderly is provided by other elderly people. They are primarily engaged in leisure time or voluntary work. No adequate method has been found yet to correct the wages of these individuals for the involvement in leisure time activities.
- Another method to value time spent on informal care would include the use of shadow prices for services delivered to the patient by the informal caregiver. The cost of informal care is valued according to the costs that would have been made if a professional care provider had provided the service (Rutten et al., 1993). A problem is that the amount of time spent by informal care providers may be much larger than the time it would have taken a professional to do the same job. This means that the activities should not be valued according to total time spent by informal care providers, but according to the time a professional carer would have spent on the same activity. This method explicitly requires a list of activities and a quantification of the time professionals have spent on them. This method was used in Chapters 5 and 6. The list of activities concerned is added in appendix B (in Dutch).

In this line of research the next step is to assign an hourly rate to each particular activity. This wage rate depends on the specific expertise needed to perform a given activity. Some activities (like cooking) are valued lower than others (e.g. nursing). This method is the most practical in mapping the costs of informal care. Nevertheless, Busschbach et al. (1998) recommend dividing time spent into time given up from paid work, from unpaid work, and from leisure time. This makes it possible to add more opportunity based cost valuations in the sensitivity analysis. For example, in the Netherlands Groenenboom and Huijsman (1995) report an

unweighted average of Dfl. 34 per hour for informal care. Boelema et al. (1995) use an average of Dfl. 32 in their report on normalisation for people with a mental handicap.

A problem of both approaches may be that informal care can have some effect on the quality of life of patients, and of volunteers (family and friends). This could lead to overrating costs. Most people provide help because they want to. This preference is part of their utility function and probably in their own QALY (positive or negative). The definition of benefits should be broadened to include all kinds of intangible benefits derived by individuals from the care process (Wiseman, 1997).

#### *Problems with the valuation of indirect medical costs*

Indirect medical costs in the care sector are very difficult to assess.

According to Weinstein et al. (1996) this would mean including costs of treatment-related diseases incurred during added life-years and the time the patient would have been alive anyway, and the costs of unrelated diseases in gained life-years. Non-health care costs in added years of life are not included. In this thesis, no specific diseases were taken into account. The demand for care, in general, is a result of several complex needs, possibly a consequence of various diseases. This means that all possible future costs should be included. However, since such figures would be based on average cost patterns among age groups, there would be no difference between treatment groups. It does not seem necessary nor feasible to include all these indirect future medical costs.

*Problems with the valuation of indirect non-medical costs*

Indirect non-medical costs or production losses are probably of limited size in the care sector, where clients are mostly elderly individuals, people with a mental handicap or psychiatric patients who did not have a job, or who have already retired. The best method to estimate these costs is the friction-cost method (Koopmanschap et al., 1995), which uses the average vacancy period of the lost job as a basis for cost calculations. However, how big is the chance that people with chronic mental illness had paid employment earlier, given the current high rates of unemployment? If this chance was not very big, should we include productivity losses for individuals with more acute conditions, who have short-term spells of absence? And how to proceed when in the near future excess labour demand is expected (Smith and Wright, 1996)? If lost productivity is included in the cost estimates for employed people, should we include lost productivity due to unwaged activities? Lost unpaid work may be especially important in the care sector. Brouwer et al. (1997) recommend to value these hours according to the wage rate of a professional housekeeper. Lost leisure time is expected to be fully captured in the outcome-measurement, the QALY-concept, and should therefore not be counted again (Gold et al., 1996). As will be shown in the next section, the QALY-concept does not suffice in the care sector, which means that costs of lost leisure time should be identified, measured and valued separately and taken into consideration at the cost side. If economic evaluations are used to decide on priority setting in resource allocation, care activities will not receive their proper weight.

*Measurement of societal costs*

A patient taken care of at home, does not go to a nursing home. For the individual himself the first option will be cheaper. However, for society as a whole that may be not the case. The bed in the nursing home is filled anyway, because there are waiting lists. When both people are helped, the costs for society as a whole are higher. When the first person is admitted into the nursing home, the other may have to wait for several months. Although this may have its impact on costs (a partner not being able to work, because he or she has to assist in caring), it is mostly not taken into consideration in economic evaluations. For inclusion of all costs of a care programme, the impact on waiting lists (and the costs to society of these waiting lists) should be included.

#### *5- Outcomes*

In general, outcome measurement instruments can be subdivided into technical and allocative efficiency measurement instruments. Measures of technical efficiency as a rule are intermediate variables like hospital occupancy rate, length of stay, number of clients treated, number of complications, and so on. However, many of these measures hardly show any causal relationship to the quality of care provided. These measures are important for (I) internal management information, for instance about production efficiency and utilisation review, and (II) external management information like market share or financial status (within budgets). They are, therefore, especially important on the micro- and mesoeconomic level.

As stated, such measures of production and efficiency do not show whether the health status of patients is improved. In a manner of speaking, they only give information on the amount of cars built and the way they were build (with which resources), and not about quality aspects or consumer satisfaction. For information on those aspects, other measures on allocative efficiency are needed. Measures of allocative efficiency can also be subdivided into internal measures like process and service quality, and external measures like customer satisfaction or effects on health status. Donabedian (1980) suggests three dimensions of quality: structure, production process and outcome. Structure refers to the physical and organisational setting. Process quality involves appropriate equipment, timely treatment, an adequate amount of services, following protocols, etc. The focus of a process approach is in fact on proper practising (Li and

Benton, 1996) and particularly important on the mesoeconomic level. Outcome for economic evaluations on the health sector level is defined as the change in a patients' health status following treatment, including physical, social, and psychological functions. Economists typically want to compare changes in quality of life among different health care programmes. Therefore, they have a strong preference for more general measures of quality of life. As an over-all measure, the QALY-concept was developed (Quality-Adjusted Life-Years). In this single index, mortality and morbidity are integrated. The result is a number between 0 and 1 (the utility factor) that corrects the number of life-years gained for quality of life. The potential use of cost-utility analysis lies in its ability to allow comparisons across health care programmes by referring to a league table of results (Gerard, 1992). A large disadvantage of this method is that by generalising the effects of health care programmes into one single index, sensitivity for small health change in certain dimensions is lost.

The use of a QALY appears to be difficult in the care sector for the following reasons:

- As considered above, the question of differentiating survival rates is a first complication. Actual changes in health status are very difficult to demonstrate in the care sector. Research on the influence on morbidity or mortality requires a huge database. Danermark et al. (1996) find no significant relationship between relocation and mortality in 22,579 elderly persons. Wimo et al. (1995) use a model based on average survival after the diagnosis of dementia. Differences in survival between certain care facilities were calculated using a Markov model of transition probabilities based on the development on the Global Deterioration Scale in the first year. They calculate that there is no significant difference in survival rate between the groups. However, progress of dementia symptoms seems to be slower for the group living under alternative programmes than for the individuals who live at home or in a geriatric psychiatric ward or a nursing home. In another study, no long-term difference was found in cognitive and physical functions for people who receive day care (as compared to people who live at home without day care) (Wimo et al., 1993).
- The product care has an intrinsic value which cannot be measured by output measurements. The goal of care is not so much to improve

health status, but to stop a deteriorating in health status. It is impossible to catch this in a QALY;

- The QALY is too insensitive on multiple health dimensions.
- In many cases, it is not easy to interview older people or mentally retarded people about their perceptions of the quality of their lives (Jenssen, 1995). Unless it can be ascertained that possible cognitive disturbances are small, the data must be obtained from a proxy. This proxy usually is a caregiver or a family member. There is considerable debate whether or not these proxies can be seen as accurate (Busschbach, 1998). An alternative would be using an indirect method of valuation of health status by the general public, as with EuroQOL (Brooks, 1996). However, this would aggravate the next problem;
- The QALY is discriminative (Gudex, 1996). A person aged 60 will in general have fewer years of benefit, than a twenty-year old. More in general, the question remains if a comparison of care for the elderly with other medical interventions is opportune. The nature of caring is to stop the functional decrease on several dimensions of the quality of life. Health gains hardly can be expected.

Other outcome measures are necessary. Economic evaluation could use utilisation reviews to answer questions like: what capacity level should each facility in the sector of the care for the elderly have; what is the optimal staff mix; what are the advantages of substitution, etc. The budget of nursing staff, for instance, mounts up to approximately 60-70% of total care costs (Groenenboom and Huijsman, 1995). For internal information, therefore, a detailed time registration procedure can find significant cost factors and thereby help in meeting the internal cost-containment policy. These are typically technical efficiency-motives. To allocate resources, a number of different output measurement instruments can be used.

*I- Internal performance measures (technical efficiency measures)*

Productive efficiency is used as a measure for performance. These measures include length of stay, case mix, patient cost per day, and total cost per case (Li and Benton, 1996). In most cases Data Envelopment Analysis is used to define these concepts (e.g. cost efficiency in nursing homes, Kooreman, 1994; Fazel and Nunnikhoven, 1992). In a more simple fashion, utilisation reviews measure the degree to which work force,

facilities, and equipment are employed. The average utilisation rate can be expressed as the average output rate divided by capacity, for instance occupancy ratio and nursing staff task assignments. Wimo et al. (1994) provide nine internal performance measures of psychogeriatric day care: the participation quotient, the registration quotient, capacity quotient, turnover quotient, average number of visits of patients per week, the degree of institutionalisation, mortality, a misjudgement quotient, and discharge analysis. However, the trouble with these measures is that, although occupancy rates, for instance, are a key variable in decisionmaking with regards to facility planning, real occupancy rates can easily be influenced by doctors and institutions.

#### *II- External performance measures (technical efficiency measures)*

Financial performance analysis is usually carried out by insurance companies. They are interested in the production parameters for financial reasons. In the Netherlands this is the case, because the budget for hospitals depends for a large part on the production parameters (together with availability and capacity). Availability counts for 25% of the budget, based on the adherence of the population. Capacity (35%) is based on the number of beds and specialist places (with a weighing factor for special functions). The budget for production (40%) is based on the number of admissions, the number of hospital days, the amount of day care services and the number of people that make a first visit to the outpatient department. Data on the utilisation of these parameters can be used to establish technical efficiency.

#### *III- Internal quality measures (allocative efficiency measures)*

Internal quality measures refer to process quality and service quality. Process measures, for example, may include prescription procedures for physicians or procedures for referring a patient to a specialist. These can objectively be recorded based on patient files. To establish the service quality remains a problem. The quality of the prescriptions in terms of their necessity and adequacy require explicit criteria. These could be provided by guidelines and protocols. In both cases the quality of health care is only measured using process qualifications. No judgement is given on the satisfaction of patients (subjective measures) or health status (objective measures). In the literature, however, these aspects are

generally seen as the most important outcome of medical intervention.

#### *IV- External outcome measures (allocative efficiency measures)*

Health status is most commonly measured by means of disease-specific (for instance the Older Americans Resources and Services (OARS) Multidimensional Functional Assessment Questionnaire, the Groningen Activity Restriction Scale (GARS) (Suurmeijer et al., 1994), or the Nursing-Care Dependency Scale (NCD) (Dijkstra, 1998)) or generic (Sickness Impact Profile, Nottingham Health Profile or Rand 36) health outcome measures (Essink-Bot and Rutten-van Mólken, 1991; Van der Zee and Sanderman, 1994). In cost-effectiveness analyses, both instruments are very common. In each case a disease-specific instrument should be used to find out in which fields patients do better or worse. This can yield important information for improving the process of care. Recently, there is a trend to the usage of utility-based measures (time trade-off, standard gamble) which lead to an index for improvement of health status (for instance the QALY or the DALY (Murray, 1994)). As was mentioned at the beginning of this section, QALY's are difficult to use in the care sector (Chisholm, 1997). The QALY, as it is known now, cannot be used as an outcome measurement instrument for practical reasons (only use of proxies possible, it is too insensitive, and the product care cannot be evaluated by such outcome measurement instruments). Other instruments have to be used. The Dutch Advisory Council on Government Policy (Wetenschappelijke Raad voor de Regering (WRR)) suggests cost-quality analyses (WRR, 1997) in which a standardised concept of different dimensions of quality is used to evaluate care alternatives. This quality-concept could be based on the outcome measures mentioned above and can contribute to the use of economic evaluations on the mesoeconomic and the care sector level.

#### *Solutions*

In practice, a combination of several external measurement instruments seems best. In the CEA in dentistry (Chapter 4) several instruments were used:

- a- Clinical Implant Performance Scale (CIP-scale); in order to afford comparison of the clinical results of the different implant systems;
- b- Chewing ability; in order to be able to compare all treatment

- methods;
- c- Denture complaints; an assessment technique which uses a validated self-administered questionnaire, consisting of items focusing on problems with dentures, asking questions about functional complaints, physiognomy and aesthetics;
  - d- overall denture satisfaction; as an end point for cost-effectiveness analysis. A general measure of quality of life did not (significantly) differentiate between treatment groups.

In both studies in care for the elderly, quality was measured on a mix of qualitative and quantitative data, based on the judgement of clients and their informal care providers and professionals (Van Linschoten and Wolffensperger, 1994; Wolffensperger et al., 1994). Quality was defined with regard of the following aspects: availability, interpersonal manner (attitude), technical quality, efficiency, continuity, safety, and co-operation with informal carers and other professionals, for example physicians. This approach leads to a kind of process analysis. The results reflected bottlenecks in the implementation of the care delivery process (Van Linschoten and Wolffensperger, 1995). A comparison between different care options based on these concepts is difficult, a quantification of the outcomes even more so. Furthermore, data on external performance measures were used, number of clients treated, average number of visits per client, number of complications, etc. A patient satisfaction list was used to discover how different alternatives were valued.

In the care for the mentally retarded, other aspects are considered to be important in the measurement of quality of care. Vreeke et al. (1993) proposed four aspects: (a) objective quality of life, (b) physical and social functioning, (c) integration, and (d) satisfaction of clients and parents. Gardner et al. (1997) use concepts of personal goals, choice, social inclusion, relationships, rights, dignity and respect, health, environment, security and satisfaction. Van der Wijk et al. (1996) summarise possible instruments that can be used in this area. However, even within the field, there is no general agreement on methods to measure these concepts.

Since the QALY in its current form is not useful in the care sector, other methods for outcome measurement have to be chosen. An indirect method

for valuation of health status, like EuroQOL, would help to assess the position of, for instance, a demented elder person on the health status continuum. However, the ethical consequences remain problematic. Care activities are not aimed at health gains, but more at stopping the decline of health status. This hardly can be measured as an output. Cost-quality analyses, as proposed by the WRR seem a good alternative. In a study like that, a combination of output measures, like the ones described above, can be used to evaluate performance, quality and the development in health status.

### **8.3 Concluding remarks**

This section offers some concluding remarks on the usefulness of economic evaluation of health care options in general, specifically applied to studies included in this thesis. Furthermore, special attention will be drawn to the things we learned during the implementation of studies in the care sector. Finally, some recommendations are presented for the nature and direction of future research possibilities,

#### **8.3.1 Possibilities to support public policy**

Knapp (1997) mentions several developments that trigger the demand for economic information in the health care sector: the growing prevalence of diseases very expensive to treat such as anxiety disorders, wider economic pressures and government cut-backs, other socio-economic changes which trigger equity considerations (an ageing population, increased tax burdens or higher insurance premiums for the working population), family expectations (higher standards of care and treatment expected), market forces (competition between insurers on health insurance premiums and budgeting of insurance companies that want to cut providers' reimbursement rates). In general, an expanding role for economic evaluation is to be expected in the health care sector. In the following a short review is given of possible uses; more specifically the use of results of this thesis will be demonstrated. After that, an overview of specific problems for economic evaluation in the care sector is given and a checklist to get around them. Finally, some recommendations for further research are presented.

This paragraph starts with a survey of the possible options to support policy makers that may follow from the studies in Chapter 3-7 in this thesis. In general, the possibilities for economic evaluations on different policy levels can be described using the framework of Frenk (1994), in which the main objectives and their most important issues are worked out (see figure 1).

Figure 1: Policy levels, objectives and issues in economic evaluations in health care

<b>Policy level</b>	<b>Main objective</b>	<b>Issues</b>
1 Societal	Availability Equity	Choices between for example: education, defence, infrastructure; Other sectors with effects on health
2 Health care sector	Equity Allocational efficiency Appropriateness Availability	Choices in health care and institutional arrangements: - Public agencies involved in health care; - Levels of government; - Public/private mix; - Resource generators;
3 Meso-economic	Allocational efficiency Technical efficiency Quality/effectiveness Acceptability	- Priority setting; - Cost-effectiveness issues; - Productivity; - Quality of care;
4 Instrumental	Performance enhancement on the institutional level	- Individual decisions; - Man Power Planning; - Human resource development;

Source: Based on Frenk, 1994;

### *Societal level*

The studies in this thesis have no effect on decision-making on the societal level. On this level, choices have to be made between for instance education, the defence budget, environmental policy and health care. Although it is not common practice yet, economic evaluations could play an important role here (Drummond and Stoddart, 1995). Graham and Vaupel (1987) conducted a study in which they compared the consequences on health status, measured by the number of life-years saved, from policies in different sectors in the economy. The health care sector is not necessarily the most efficient field to produce an improvement in health status of the general population (for example, safety belts or crash helmets, or food programmes may be much more efficient for specific purposes). However, decision-support for these questions seems to be light-years ahead of us.

### *Health care sector level*

At the health sector level, the monitoring of the health status of the total population, together with total costs and accessibility of health care, is important. Based on this information, health targets can be established. Furthermore, the health care sector level addresses the organisation and the management in the health care sector. For instance by posing questions like: who provides the resources for the health care sector, how are those resources collected and distributed over providers? Rutten (1996) describes the planning of specialist facilities as another possibility, for instance as an assessment for licensing of specialist facilities. He concludes that surprisingly little work has been done to support this kind of decisionmaking.

As Van den Heuvel et al. (1997) and Terpstra (1996) have shown, in the Netherlands the use of economic evaluation in important decision-making processes in health care is still at a very low profile. The most ambitious use of economic information has been the attempt in Oregon (Blumstein, 1997), USA. A state commission considered cost-effectiveness data and public valuations of health status. It proposed a priority list of services the state should cover. It estimated the total costs to provide each service until it reached the point at which the budget ran out. Services with a cost-effectiveness ratio beneath that point were not funded at all. The results showed a kind of 'Rule of Rescue', a high preference for life prolonging

treatments (Hadorn, 1991). Therefore, care services in particular were moved up and down the list, and cost-effectiveness ratios only became important in an ad hoc way. The procedure showed that it is very difficult to use costs and effectiveness data for prioritising cure and care.

From the studies in this thesis it becomes clear that at this level several possibilities exist to support decisions for policy purposes. Examples are:

- Excluding technologies from public reimbursement (for example the transmandibular implant mentioned in Chapter 4);
- Deciding about the suitability of new services for public funding (for example the permucosal implant in chapter 4 and the small-scale settings in Chapter 7, but also the encouragement of new modes of care in care for the elderly (Chapters 5 and 6);
- Setting the 'right' indication for medical technologies and treatment (Chapter 4);
- Reforming payment schemes for hospitals and other institutions (Chapters 5, 6, and 7);
- Changing payment schemes for health care professionals (as was suggested in Chapter 3);
- Changing reimbursement levels or coverage level (Chapters 3 and 7);
- The consequences of co-payment schemes and the shift in costs after the introduction of new facilities (chapter 5, 6, and 7);

In practice, however, the influence of results of these and other studies in the sector seems limited, or at least still far away. In dentistry, for instance, the dental prosthesis was removed from the insurance package, although it was seen as a rather cost-effective way of treating edentulous people. This rule has been abandoned recently. Nevertheless, the cumulation of studies that showed that payment schemes for hospitals and other institutions were counterproductive, led to some experiments with other means of financing (lump-sum, output-pricing). Furthermore, reimbursement levels are changed once in a while by the Central Council for Health Care Charges (Centraal Orgaan Tarieven Gezondheidszorg), although, according to professional critics, they are years behind.

#### *Mesoeconomic level*

On one hand the mesoeconomic level addresses allocational efficiency:

what do health care actors do; what types of technology do they provide; and how can priorities be set so that for any fixed budget in health care the allocation to different treatments and patients is such that we generate the greatest possible health for all? Economic research can support decisions on how to provide health care, concerning questions like the optimal staffing rate, the best mix of expertise, the provision of facilities, the use of equipment? On the other hand, the mesoeconomic level focuses on the technical efficiency (given program A, the costs of care should be minimised) of the production process in institutions and as such, forms an important input for internal management. Furthermore, this could be seen as a categorisation of medical efficiency, eliminating all unnecessary care. The mesoeconomic level is the level at which the traditional cost-effectiveness analyses take place, for instance as a piggyback to a randomised clinical trial in which three treatment options for edentulousness are compared (Chapters 3 and 4). On a programmatic level, possible subjects for studies are:

- resource allocation across programmes (based on utilitarian principles set out in Chapter 2);
- comparison of productivity between institutions (Van der Wijk et al., 1995, based on the data in Chapter 5);
- utilisation review;
- external budgeting;
- resource allocation in the region and investigating the possibilities for specialisation;
- disease management (protocols, guidelines);

On the mesoeconomic level (from the insurers' perspective) more information about care utilisation, costs and outcomes is used, for instance, in developing programmes for disease management. Information on cost-effectiveness of medical programmes can be helpful in determining standards and clinical guidelines for good medical practice or appropriate care (Elsinga and Rutten, 1997). The changes in the health care field described in Chapters 1 and 2 have led to the introduction of legislative changes like budgetary controls, separation of purchasing and providing, and a system of integrated care. This system improves the ability of different actors in the health care system to work together and to provide care in the neighbourhood. For instance, it promotes a more important role

for the general practitioner as a gatekeeper, a more important role for ambulatory care (transmuralisation) and better monitoring of individual patient treatment. These developments enhance the role of economic evaluation, because research is not only needed on the national policy level, but also on a more regional level and within institutions, insurance companies, etc. It can, for example, be used in the contracting process between insurers and providers (Gerard, 1993). The information can have potential in promoting a greater level of responsiveness of providers to new incentives and thereby encourage the market mechanisms which are proposed in many reforms. The decisionmaking on this echelon is likely to be sensitive to factors like local prevalence and incidence, local medical practice, and local capacity. The economic information provided should be made relevant to these local circumstances.

For insurers, the information will be needed to specify and monitor the delivery of health care within contracts. Here, the information gathered will focus on the costs and the process and service quality of care. At the provider level, information is needed to manage the use of resources and the delivery of quality services. The methods described in Chapters 3, 5 and 6 could be useful here. Standards for good medical or care practice and guidelines can be provided.

For providers, a Resource Management System which captures health activities and costs based on the case mix of services delivered, enabling care services to be managed within budgets or contracts, becomes increasingly necessary (managed care). Institutions (suppliers) and health care insurers are expected to become more and more responsible for their own exploitation within the budget.

#### *Microeconomic level*

The microeconomic level refers to the direction and administration of the process of cure and care, asking questions regarding management accounting. Other uses could be: the choice of patients that should receive access to a certain treatment, or the decision on the amount of money to be spent on individual patients (Ham, 1997).

At the microeconomic level, all kinds of organisational problems can be analysed. These take the form of management and financial accounting problems. In this category, questions about management information systems, cost consequences of client characteristics, the optimum staffing

ratio, the necessary expertise of staff, etc., can be answered. Within this level, economic evaluation focuses on technical efficiency questions.

- Developing medical audit and utilisation review schemes (Chapter 3);
- Establishing the optimal staff-level in quantity (number), and quality (what level of expertise) (Chapters 6 and 7);
- Internal budgeting;
- Human resource development;

At the institutional level, economic evaluations are only used in an ad hoc way. Management accounting, in principle, is an internal affair. At the patient level, economic evaluation can be used to make informed decisions. Application on this microeconomic level has several practical and ethical drawbacks (Williams, 1988; Hansson et al., 1994; Brock, 1993; Phelps, 1995; Lazaro, 1996), and it is therefore rarely put into practise.

### **8.3.2 Problems in care studies**

The care sector is underrepresented in economic studies in health care. In most surveys of the subject, studies comparing care-interventions are not even mentioned (Elixhauser et al., 1993; Gerard, 1992). Most of the work concentrates on medical or educational prevention, diagnosis (for symptoms or screening procedures), and treatment (cure, rehabilitation, maintenance). Surprisingly, little research is being done in the care sector. The majority of studies focus on care for the mentally ill (Chisholm et al., 1997(a); Chisholm et al., 1997 (b); Knapp et al., 1994) and the mentally retarded (Beecham et al., 1997; Hatton et al., 1995). Non-acute care for the elderly is rarely evaluated. Several reasons were mentioned: first, the target group, which makes such an evaluation almost per definition less cost-effective; second, practical problems; and finally, the lack of prestige. Most studies in this field are assessed based on the standard toolkit for economic evaluations. For many reasons these tools do not fit automatically in the care sector. Many of the necessary adjustments are described in this thesis. The most important ones are surveyed below. Hopefully, they can serve in a more explicit discussion about the roles and methods of economic evaluation on different policy levels in the care sector. What have we learned so far?:

- Purely utilitarian principles cannot be used in the care sector. Care can

be seen as an ultimate safety net for all people who are no longer able to take care of themselves. The question whom to treat does not fit in this picture. Economic evaluations in this sector will always be more efficiency-driven;

- The research question should be formulated carefully. In most cases in the care sector locality and treatment modality are linked. Results should always be compared considering these possible differences;
- The perspective of the study could be more diverse. Not only the societal perspective should be used, but also the perspective of different other actors. Cost shifts from public agencies to individuals are fairly common and can lead to counterproductive incentives, which in turn may lead to less access for the least well-off;
- The study design in care evaluation is different from that in research of cure interventions. Randomised clinical trials are rarely done in the care sector, although they are fundamentally possible. Several options have been mentioned to get around this problem: static group comparisons, static group comparisons with matched groups, pretest-posttest without randomisation.
- Cost estimations should be made on an individual basis. This can be done, but it adds important restrictions to the gathering of data;
- Particularly the direct non-medical costs play an important role. A checklist was developed to include all possible related informal care costs. There will be less measurement problems if multiple data sets are used. The shadow price method is recommended for the current state of affairs;
- Indirect medical costs do not have to be included. In general, future care-related costs would have to be included in an economic evaluation. However, since it is extremely difficult in most cases to prove life-prolonging treatment, future costs can be excluded. Current costs should be included only when differences in all-comprehensive care packages exist;
- The effects of a certain programme on waiting lists and the costs that arise from these waiting lists should be included when a societal perspective on costs is taken;
- Outcome measurement in the care sector cannot be done with QALY's or DALY's yet. Outcome measurement will also be efficiency-driven, based on internal and external performance measures. For a description

of process qualifications, internal quality measures can be used.

- In the near future, cost-quality analyses are more opportune for the care sector;
- Economic evaluations are more useful on the mesoeconomic level (for organisational and programmatic purposes) than they are presently useful on the macroeconomic level. For the health care sector, several problems regarding the comparability of care activities remain.

### **8.3.3 Further research**

- 1- Further research could focus on the use of cost functions in which service variables, resident characteristics, and other relevant variables are included to predict costs in a (linear) regression method. Such information could typically be relevant for individual organisations (SCP, 1989). In Alberta, Canada, a Resident Classification System was developed using resident characteristics to measure nursing care requirements and to provide case-mix information for a new funding system (Charles and Schalm, 1992). The information in Chapters 5,6 and 7 could be used to develop a system like that. More information about the factors that cause a demand for assistance is then necessary. From the literature Activities of Daily Living and Instrumental Activities of Daily Living seem to have an impact on the intensity of care. In Chapter 5, a regression analysis showed the influence of Cognitive Impairment. Many other factors have to be identified and their influence on care intensity has to be quantified.
- 2- When economic evaluations in the care sector tend to shift to cost-quality analyses, the next step involves production-function analysis. When the proposed quality measures can be quantified in a certain way, it becomes possible to relate inputs (costs) to outcomes in a mathematical equation. This procedure, however, will mainly be applicable for answering technical efficiency questions. But it will create a great forum for mirror information for institutions and a way to compare performances of hospitals and specialists;

- 3- Before this is possible, a standardised set of quality measures should be developed which measure the performance of service delivery in the care sector adequately. Such a set of quality measures should include measures for performance (technical efficiency), process outcomes (regarding quality of care activities), patient satisfaction scales, and an instrument to assess general health status.
- 4- More attention should be focused on the measurement and valuation of informal care time. Questions like the following should be answered: how do we count 24-hour surveillance, what time standard do we use for care activities delivered by informal care providers, and what are costs of time given up from unpaid work or leisure time. If the last question is answered, it will be possible to make an opportunity-based cost valuation procedure, which values input rather than output (as with the shadow price method)
- 5- Further efforts should be aimed at assessing productivity losses due to informal care activities of family and friends. How should lost productivity of unwaged activities be valued? And how can double-counting be prevented? For many informal care providers, helping their partners influences the quality of their life in a positive or negative sense. Maybe this effect should be included in outcome measurement rather than on the cost side;
- 6- Finally, the possibilities and consequences of usage of QALY-like instrument should be analysed. These issues have to be addressed before an adequate, health level wide comparison between cure and care activities is possible.

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## Summary in Dutch

### *Economie: Charon van de geneeskunde?*

De laatste decennia valt een toenemende spanning tussen de vraag naar zorg en de beschikbare middelen voor de gezondheidszorg waar te nemen. De schaarste aan middelen vraagt om een voortdurende afweging omtrent kosten en baten van nieuwe behandelvormen. Economisch evaluatieonderzoek kan dit proces ondersteunen door informatie te verstrekken over de kosten en gezondheidseffecten van gezondheidszorgvoorzieningen.

De rol van de economie in de geneeskunde wordt door velen impliciet vergelijkbaar geacht aan de functie van de veerman Charon, die in de Griekse mythologie de overtocht over de rivier de Styx naar de onderwereld regelde. Charon nam echter alleen passagiers mee als zij een muntje onder hun tong gelegd hadden gekregen door de nabestaanden. Charon bepaalde zo wie wel en niet in de onderwereld terechtkwam.

In hoofdstuk 1 wordt ingegaan op het toenemende belang van de economie in de Nederlandse gezondheidszorg. Een beperkte historische schets vanaf circa 1800 laat zien dat financiële afwegingen steeds belangrijker worden bij het bepalen van het landelijke overheidsbeleid in de gezondheidszorg. Dit valt natuurlijk grotendeels te verklaren uit de expansieve kostenstijging in deze sector. Het groeipercentage in de gezondheidszorg was vele malen hoger dan in andere sectoren van de economie. Onderwijs, milieu en infrastructuur dreigden daarvan de dupe te worden. Omdat het merendeel van de zorguitgaven ook nog eens bekostigd wordt uit premiegefinancierde middelen kan een hoog groeipercentage nadelige consequenties hebben voor de concurrentiepositie van het Nederlandse bedrijfsleven. Deze aspecten, gevoegd bij de geringe economische groei in de jaren tachtig, hebben de aandacht voor kostenbeheersing in de gezondheidszorg fors doen toenemen. De voortdurend stijgende vraag naar zorg bij beperkte middelen doet de noodzaak van het rationeel inzetten van middelen en het stellen van prioriteiten extra voelen.

Met name in de care sector (het eerste compartiment: ouderenzorg, zorg voor mensen met een verstandelijke handicap, geestelijke gezondheidszorg) werd tot voor kort maar weinig onderzoek gedaan naar een efficiënte allocatie van middelen. Dit proefschrift gaat aan de hand van een aantal praktische toepassingen in op de rol die economisch evaluatieonderzoek ook in de care sector kan spelen. Verder wordt aandacht besteed aan de

problemen die optreden bij het uitvoeren van economisch evaluatieonderzoek in de care sector. Het huidige instrumentarium van economisch evaluatieonderzoek is teveel gericht op activiteiten in de cure sector. Daarom is een aantal aanpassingen nodig in methodiek en uitvoering.

In hoofdstuk 2 wordt uiteengezet waarom de overheid zich überhaupt met de gezondheidszorg bemoeit. Efficiencymotieven zijn daarbij van groot belang. Door specifieke kenmerken van de gezondheidszorg ontstaat geen markt van volledige mededinging, waardoor efficiencyverliezen kunnen optreden. Sterke kartelvorming (farmaceutische industrie), regionale monopolies (ziekenhuizen) en asymmetrische informatie zijn voorbeelden van deze specifieke kenmerken. Verder kunnen externe effecten de overheid nopen tot ingrijpen en vormt in Nederland het verdelingsmotief een belangrijke beweegreden voor overheidsinterventie.

De achterliggende visie op de theorie van de verdeling van rechtvaardigheid is mede bepalend voor de visie op de rol van de overheid: hoe kan een maatschappij zijn schaarse middelen alloceren over mensen met strijdige behoeften. De ideeën van liberalen, socialisten en marxisten over de te prefereren verdeling van middelen in de maatschappij passeren de revue, met name toegespitst op de gezondheidszorg. Van oudsher zijn in Nederland de egalitaire beginselen een belangrijke input. Wel valt de laatste jaren een trend waar te nemen naar een meer utilitaire verdeling van middelen. Daarbinnen past nadrukkelijk een grotere rol voor economische evaluatieonderzoek.

De hoofdstukken 3 tot en met 7 zijn toepassingen van economisch evaluatieonderzoek. In hoofdstuk 3 en 4 wordt begonnen met het beschrijven van een traditionele kosteneffectiviteitanalyse in de cure sector. Hoofdstuk 3 is een uitgebreide studie naar de kosten van tandheelkundige implantaten in vergelijking met de traditionele behandelmethoden. De kosten van behandeling met permucosale implantaten, inclusief de kosten van nazorg in het eerste jaar, blijken circa zeven keer hoger dan voor een reguliere gebitsprothese. De gebruikte methodiek, een integrale kostprijsmethode, biedt vele aanknopingspunten. Het integraal toerekenen van alle kostensoorten aan één product (behandelmethode) geeft alle actoren belangrijke informatie over de verdeling van middelen over kostenplaatsen. Deze methode heeft voordelen boven de gebruikelijke marginale kostentoe rekening, waarbij alleen de meerkosten van een nieuwe therapie worden berekend.

In hoofdstuk 4 komt het vraagstuk omtrent de kosteneffectiviteit van tandheelkundige implantaten aan de orde. Hoewel de uitkomsten op lange termijn met veel onzekerheden zijn omgeven, kan worden geconcludeerd dat tandheelkundige implantaten voor bepaalde groepen cliënten met persisterende problemen, een kosteneffectieve behandeling vormen. Een vergelijking met behandelmethoden voor andere ziektes (de zogenaamde league-tables) strandt op problemen rond de vergelijkbaarheid van de effectmeting.

In de hoofdstukken 5, 6 en 7 worden zorgvernieuwendende initiatieven uit de care sector geëvalueerd. Hierbij moet worden aangetekend dat met de care sector expliciet het eerste compartiment binnen ons verzekeringsstelsel wordt bedoeld (in grote lijnen: de AWBZ-zorg)<sup>1</sup>. In hoofdstuk 5 komt een evaluatie van alternatieven voor het verzorgingstehuis aan de orde. Hieruit komt in eerste instantie naar voren dat de thuiszorg voor vergelijkbare cliënten een goedkoop alternatief is. Wel wordt het al dan niet gebruik maken van thuiszorg ingegeven door het feit of er mantelzorg aanwezig is. Ook als deze mantelzorg als kosten worden meegenomen, blijft thuiszorg over het algemeen goedkoper. Naast thuiszorg, is een andere manier om de zorg voor ouderen te organiseren de opzet die in Leiden-Noord is gekozen: een dienstencentrum in de wijk. Ouderen wonen of in het dienstencentrum zelf, of in de aangrenzende wijk. Deze vorm van transmuralisering biedt ouderen de mogelijkheid langer thuis te blijven wonen. De Zorgvoorziening Zijloever blijkt een duur alternatief, maar dit wordt voor een groot deel verklaard door de opzet van het experiment (groot gebouw dat volledig ten laste komt van de exploitatie van het project). Duidelijk blijkt uit dit onderzoek dat er voor verschillende actoren verschillende prijsprikkels kunnen worden waargenomen. Dit draagt niet altijd bij aan een efficiënte inzet van middelen. Een voorbeeld hiervan is de inzet van mantelzorg. Vanuit het perspectief van het ministerie van VWS is dit een goedkoop alternatief, omdat het ministerie op geen enkele wijze meebetaalt aan de geleverde informele zorg. Voor de maatschappij als geheel zijn de kostenbesparingen op zijn minst veel geringer, omdat het produceren van de informele zorg ten koste kan gaan van betaalde arbeid of andere productieve activiteiten van de informele verzorgers.

Hoofdstuk 6 evalueert alternatieven voor verpleeghuiszorg. Een zelfde soort conclusie als hierboven mag worden getrokken: zolang het mogelijk blijft

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<sup>1</sup> In de Angelsaksische landen omvat het begrip care de gehele gezondheidszorg.

ouderen thuis te verzorgen is dit voor de samenleving als geheel vaak goedkoper. In het onderzoek doen zich problemen voor met de effectmeting. In kwalitatieve zin zijn alle groepen behoorlijk tevreden. Het kwantificeren van deze uitkomsten stuit op grote problemen (dit wordt nader toegelicht op bladzijde 153).

Tot slot komt in hoofdstuk 7 de evaluatie van het de-institutionaliseren van mensen met een verstandelijke handicap aan de orde. Hieruit wordt duidelijk dat deze normalisatie-gedachte niet per definitie duurder hoeft te zijn voor de maatschappij. Bovendien zijn in veel gevallen positieve effecten waar te nemen die zich uiteten in een toenemend activiteitenpatroon van participanten.

In hoofdstuk 8 passeren al deze studies nogmaals de revue tegen de achtergrond van de vraag welke problemen er zijn bij het opzetten en uitvoeren van economische evaluatiestudies in de care sector. Het uitvoeren van economische analyses kwam in de care sector pas in het begin van de jaren negentig op gang. Als redenen daarvoor kunnen onder andere worden genoemd:

1. Het uitgangspunt van beleidsmakers dat de technologische ontwikkelingen in veel grotere mate bepalend zijn voor de kostenstijging in de gezondheidszorg;
2. De doelgroep van zorginstellingen is minder interessant voor beleidsmakers en onderzoekers. Het gaat hier om ouderen, chronisch zieken en mensen met een verstandelijke handicap. Deze groepen maken slechts in beperkte mate deel uit van de beroepsbevolking. Het zorgen voor deze mensen leidt tot minder kosteneffectieve uitkomsten als strikte utilitaire uitgangspunten worden gehanteerd;
3. De theoretische, maar bovenal praktische, problemen die zich voordoen bij de implementatie van dergelijk onderzoek.

Een vijftal hoofdcategorieën van problemen wordt onderscheiden: het formuleren van de onderzoeksvraag, het perspectief van de studie, de opzet van de studie, de kostenberekening en de effectmeting. De aard van deze problemen en de mogelijke oplossingen komen in paragraaf 8.2 uitgebreid aan de orde.

- Allereerst wordt expliciet aandacht gevraagd voor het formuleren van de onderzoeksvraag. In de zorgsector zijn behandelvorm, plaats van behandeling en uitvoerder van de behandeling vrijwel automatisch aan elkaar gekoppeld, hetgeen grote consequenties kan hebben voor de uitkomsten van de zorg. De resultaten van de behandeling worden niet

zozeer grotendeels bepaald door de effectiviteit van de behandeling, maar veeleer door het directe contact met de cliënt, bepaald door de attitude en de deskundigheid van de medewerker, de omgeving, etc.;

- Het perspectief van de studie behoeft in de care sector extra nadruk. Kostenverschuivingen van overheidsinstanties naar individuen komen veelvuldig voor en kunnen leiden tot contraproductieve prikkels voor zorgvernieuwing. De vele financiële schotten in de Nederlandse gezondheidszorg hebben een zelfde werking;
- Randomised clinical trials worden nog slechts weinig uitgevoerd in de care sector. Hoewel in beginsel mogelijk, stuit de uitvoering op problemen. In veel gevallen spelen de verzorgers bijvoorbeeld een belangrijke rol bij het selecteren van mensen die geschikt lijken om deel te nemen aan een project van uithuisplaatsing. Een random toewijzing van cliënten zou geen recht doen aan de dagelijkse praktijk. Andere problemen doen zich voor bij het toepassen van het double-blind concept, het toepassen van informed consent, etc.
- Kostenberekeningen moeten expliciet worden gebaseerd op individuele gegevens. Cliëntkenmerken kunnen een cruciale rol spelen bij een vergelijking van kosten tussen alternatieven van zorg. In het verleden is teveel gewerkt met een vergelijking van gemiddelde kostprijzen tussen zorgvoorzieningen;  
Met name de directe niet-medische kosten zijn van groot belang bij een economische evaluatie in de “care sector”. Het gebruik van meerdere datasets wordt aangeraden (interviews met verzorgers, dossiers, observaties, schriftelijke vragenlijsten). Het vaststellen van de individuele zorgintensiteit, en de rol van de mantelzorg daarin, is van cruciaal belang;
- Voor het meten van uitkomsten kan in de “care sector” geen gebruik worden gemaakt van de QALY. Kosten-kwaliteitsanalyses liggen voorlopig meer voor de hand, hierbij gebruik makend van interne en externe performance indicatoren en meer kwalitatieve procesindicatoren;

Verder wordt in hoofdstuk 8 aandacht besteed aan de tweede vraag van dit proefschrift: in hoeverre, en voor wie, zijn economische evaluatiestudies bruikbaar ter ondersteuning van de besluitvorming.

Op macro-economisch niveau zou de kosteneffectiviteit van maatregelen betrekking hebbend op de gezondheidsstatus van Nederlanders kunnen worden vergeleken. De gezondheidszorg is niet per definitie de meest

effectieve sector om een verbetering van de gezondheidsstatus te bewerkstelligen (denk aan: veiligheidsriemen, valhelmen, voedselprogramma's).

Op het niveau van de gezondheidszorg gaat het daarbij vooral om de samenstelling van het verzekeringspakket (exclusie van vergoeding voor nieuwe medische technologieën, vaststellen van de 'juiste' indicatie voor een bepaalde behandelvorm) of het veranderen van kostentoedeling (nieuwe budgetteringssystematiek, invoeren van de diagnose-behandel-codes). Op meso-economisch niveau kunnen de uitkomsten van economische evaluatiestudies worden gebruikt voor de toedeling van middelen aan verschillende ziekteprogramma's, het benchmarken tussen zorgvoorzieningen mogelijk (op basis van kosten en kwaliteitsaspecten), het verantwoorden van externe budgetten, of het evalueren van disease management programma's. Dit maakt de discipline interessant voor overheden, zorgverzekeraars, zorgaanbieders en patiënten of consumenten. De uitkomsten zijn met name voor patiënten en consumenten te gebruiken voor het wegwerken van de informatieasymmetrie (micro-economisch niveau).

Tot slot wordt een aantal aanbevelingen gedaan voor verder onderzoek, om de in dit proefschrift beschreven problemen te verhelderen en de bruikbaarheid van de resultaten van economisch evaluatieonderzoek in de care sector verder te vergroten:

- 1- Het ontwikkelen van kostenfuncties op basis van service- en individuele patiëntkenmerken;
- 2- Het vaststellen van technische efficiency door inputs te relateren aan de kwaliteits-indicatoren met behulp van productiefuncties;
- 3- Het ontwikkelen van een door heel Nederland te gebruiken set van kwaliteitsmaatstaven, speciaal geschikt voor gebruik in de care sector;
- 4- Additionele aandacht voor het identificeren, meten en waarderen van informele zorg en de daarbij behorende productiewinsten of -verliezen;
- 5- Het bepalen van de mogelijkheden om ook in de care sector te komen tot het gebruik van de QALY, en daarna eventueel de ontwikkeling en toepassing van een dergelijk instrument.

Deze onderwerpen dienen nader te worden uitgewerkt voordat een adequate vergelijking tussen activiteiten in de curatieve en de care sector mogelijk is.

## **Northern Centre of Healthcare Research (NCH) and previous dissertations**

The Northern Centre for Healthcare Research (NCH) was founded in 1986 as a research institute of the University of Groningen (RUG), The Netherlands. Researchers from both the Medical and Social Faculty, with various professional backgrounds, are members of the NCH. These include medical sociologists, medical doctors, psychologists and human movement scientists. Research of the NCH is aimed at optimising quality of life of patients and quality of healthcare, and focuses on (a) determinants of health and illness, (b) consequences of illness, (c) the effects of medical treatment and decision making, and (d) the evaluation of health services and various types of interventions. At the time that this thesis is published, the NCH comprises five research programmes.

Until 1998, the NCH covered two research programmes, i.e. Determinants of Health and Medical Decision Making and Evaluation of Healthcare. The first programme was reformulated in 1996 and was continued as *Disorder, Disability and Quality of Life (DDQ)*. Hence, previous dissertations in this area are listed as part of the present DDQ-programme. The second programme was subdivided in 1998 into two new programmes, i.e. *Public Health and Public Health Services Research* and *Rational Drug Use*. Dissertations published earlier within the second programme are listed retrospectively under these new headings. In 1998, two new programmes, *The Outcome and Evaluation of Interventions in Patients with Motor Problems* and *Process and Effects of Movement Programs*, were formulated and officially integrated in the NCH in January 1999. The accomplished dissertations since the start of the programmes in 1998 are included in the list.

More information regarding the institute and its research can be obtained from our internet site: <http://www.med.rug.nl/nch>

## Disorder, Disability and Quality of Life

- Sanderman R (1988) *Life events, mediating variables and psychological distress: a longitudinal study.*  
PROMOTORES: prof dr WJA van den Heuvel, prof dr PE Boeke, prof dr PMG Emmelkamp.  
REFERENT: dr J Ormel
- Kempen GIJM (1990) *Thuiszorg voor ouderen; een onderzoek naar de individuele determinanten van het gebruik van wijkverpleging en/of gezinsverzorging op verzorgend en huishoudelijk gebied.*  
PROMOTORES: prof dr WJA van den Heuvel, prof dr W Molenaar.  
REFERENT: dr ThPBM Suurmeijer
- Sonderen FLP van (1991) *Het meten van sociale steun.*  
PROMOTORES: prof dr WJA van den Heuvel, prof dr FN Stokman.  
REFERENT: dr J Ormel
- Heyink JW (1992) *Levertransplantatie: psycho-sociale aspecten.*  
PROMOTORES: prof dr WJA van den Heuvel, prof dr MJH Slooff
- Gerritsen JC (1993) *Onafhankelijkheid van ouderen: mogelijkheden en voorwaarden.*  
PROMOTOR: prof dr WJA van den Heuvel.
- Reitsma B (1994) *The end of the line? Evaluation of a multidisciplinary team approach to chronic pain.*  
PROMOTORES: prof dr EC Klip, prof dr JWF Beks, prof dr JP Hennis
- Ranchor AV (1994) *Social class, psychosocial factors and disease: from description towards explanation.*  
PROMOTORES: prof dr WJA van den Heuvel, prof dr AP Buunk.  
REFERENTEN: dr R Sanderman, dr J Bouma
- Oosterhuis A (1994) *De gedragstherapeutische behandeling van slaapklasten.*  
PROMOTOR: prof dr EC Klip
- Linschoten CP van (1994) *Gezondheidsbeleving van ouderen; een Longitudinale studie.*  
PROMOTOR: prof dr WJA van den Heuvel. CO-PROMOTOR: dr J Ormel
- Linden-van den Heuvel GFEC van (1994) *Voorbereiding op medische ingrepen.*  
PROMOTOR: prof dr EC Klip
- Uitenbroek DG (1995) *Exercise behavior.*  
PROMOTOR: prof dr WJA van den Heuvel
- Steuerink N (1995) *Zo lang mogelijk zelfstandig; naar een verklaring van verschillen ten aanzien van opname in een verzorgingstehuis onder fysiek kwetsbare ouderen.*  
PROMOTORES: prof dr WJA van den Heuvel, prof dr TAB Snijders,  
prof dr J Ormel
- Ruiter JH de (1995) *Sociale ondersteuning en kwaliteit van leven bij patiënten met kanker.*  
PROMOTORES: prof dr WJA van den Heuvel, prof dr H Schraffordt Koops.  
REFERENTEN: dr FLP van Sonderen, dr R Sanderman
- Krol B (1996) *Quality of life in rheumatoid arthritis patients: the relation between personality, social support and depression.*  
PROMOTOR: prof dr WJA van den Heuvel.  
REFERENTEN: dr R Sanderman, dr ThPBM Suurmeijer
- Kooiker SE (1996) *Illness in everyday life: a health diary study of common symptoms and their consequences.*  
PROMOTORES: prof dr WJA van den Heuvel, prof dr J van der Zee
- Zwanikken CP (1997) *Multiple sclerosis: epidemiologie en kwaliteit van leven.*  
PROMOTOR: prof dr J Minderhoud.  
CO-PROMOTORES: dr JW Groothoff, dr ThPBM Suurmeijer

- Scaf-Klomp W (1997) *Screening for breast cancer; attendance and psychological consequences.*  
 PROMOTOR: prof dr WJA van den Heuvel.  
 REFERENT: dr R Sanderman
- Nieboer AP (1997) *Life-events and well-being; a prospective study on changes in well-being of elderly people due to a serious illness event or death of the spouse.*  
 PROMOTORES: prof dr SM Lindenberg, prof dr J Ormel
- Eijk LM van (1997) *Activity and well-being in the elderly.*  
 PROMOTORES: prof dr WJA van den Heuvel, prof dr SM Lindenberg
- Alberts JF (1998) *The professionalized patient: sociocultural determinants of health services utilization.*  
 PROMOTOR: prof dr WJA van den Heuvel.  
 REFERENT: dr R Sanderman
- Jong GM de (1999) *Stress, stress management and issues regarding implementation.*  
 PROMOTORES: prof dr PMG Emmelkamp, prof dr JL Peschar.  
 REFERENT: dr R Sanderman

### **Public Health and Public Health Services Research**

- Lucht F van der (1992) *Sociale ongelijkheid en gezondheid bij kinderen.*  
 PROMOTOR: prof dr WJA van den Heuvel.  
 REFERENT: dr JW Groothoff.
- Engelsman C & Geertsma A (1994) *De kwaliteit van verwijzingen.*  
 PROMOTORES: prof dr WJA van den Heuvel, prof dr FM Haaijer-Ruskamp,  
 prof dr B Meyboom-de Jong.
- Puttiger PHJ (1994) *De medische keuring bij gebruik van persluchtmaskers.*  
 PROMOTORES: prof dr D Post, prof dr WJA Goedhard.  
 CO-PROMOTOR: dr JW Groothoff.
- Dekker GF (1995) *Rugklachten-management-programma bij de Nederlandse Aardolie Maatschappij B.V.: ontwerp, uitvoering en evaluatie.*  
 PROMOTORES: prof dr D Post, prof WH Eisma.  
 CO-PROMOTOR: dr JW Groothoff
- Mulder HC (1996) *Het medisch kunnen; technieken, keuze en zeggenschap in de moderne geneeskunde.*  
 PROMOTOR: prof dr WJA van den Heuvel
- Mink van der Molen AB (1997) *Carpale letsels: Onderzoek naar de verzuimaspecten ten gevolge van carpale letsels in Nederland 1990-1993.*  
 PROMOTORES: prof dr PH Robinson, prof WH Eisma  
 CO-PROMOTOR: dr JW Groothoff.  
 REFERENT: dr GJP Visser
- Tuinstra J (1998) *Health in adolescence: an empirical study of social inequality in health, health risk behaviour and decision making styles.*  
 PROMOTORES: prof dr D Post, prof dr WJA van den Heuvel,  
 CO-PROMOTOR: dr JW Groothoff
- Dijkstra A (1998) *Care dependency, an assessment instrument for use in long-term care facilities.*  
 PROMOTORES: prof dr WJA van den Heuvel, prof dr ThWN Dassen.

## **Rational Drug Use**

- Zijlstra IF (1991) *De regionaal klinisch farmacoloog*.  
PROMOTORES: prof dr H Wesseling, prof dr FWJ Gribnau, prof dr C van Weel.  
REFERENTEN: dr FM Haaijer-Ruskamp, dr H Wollersheim
- Jong-van den Berg LTW de (1992) *Drug utilization studies in pregnancy: what can they contribute to safety assessment?*  
PROMOTORES: prof dr MNG Dukes, prof dr H Wesseling.  
REFERENT: dr FM Haaijer-Ruskamp
- Denig P (1994) *Drug choice in medical practice; rationals, routines, and remedies*.  
PROMOTORES: prof dr FM Haaijer-Ruskamp; prof dr H Wesseling
- Boerkamp E (1995) *Assessing professional services quality; an application in health care*.  
PROMOTORES: prof dr JC Reuijl, prof dr FM Haaijer-Ruskamp
- Trigt AM van (1995) *Making news about medicines*.  
PROMOTORES: prof dr TFJ Tromp, prof dr FM Haaijer-Ruskamp
- Dijkers FW (1997) *Repeat prescriptions. A study in general practice in the Netherlands*.  
PROMOTORES: prof dr B Meyboom-de Jong, prof dr FM Haaijer-Ruskamp,  
prof dr AF Casparie
- Bosch JL (1997) *Outcome assessment of the percutaneous treatment of iliac artery occlusive disease*.  
PROMOTORES: prof dr MGM Hunink, prof dr WPTHM Mall,  
prof dr L Koopmans
- Vries SO de (1998) *Management strategies for intermittent claudication*.  
PROMOTOR: prof dr MGM Hunink.  
REFERENT: dr JB Wong

## **The Outcome and Evaluation of Interventions in Patients with Motor Problems (from 1998 onwards)**

- Sluis CK van der (1998) *Outcomes of major trauma*.  
PROMOTORES: prof dr HJ ten Duis, prof WH Eisma.
- Geertzen JHB (1998) *Reflex sympathetic dystrophy: a study in the perspective of rehabilitation medicine*.  
PROMOTORES: prof WH Eisma, prof dr HJ ten Duis.  
CO-PROMOTOR: dr JW Groothoff.  
REFERENT: dr PU Dijkstra

## **Process and Effects of Movement Programs (from 1998 onwards)**

- Berkuysen MA (1999) *Toward tailor-made cardiac rehabilitation; getting at the heart of the matters*.  
PROMOTORES: prof dr AP Buunk, prof dr P Rispens.  
REFERENT: dr R Sanderman

# Stellingen

behorende bij het proefschrift “Economics, Charon of medicine?” van Paul van der Wijk

1. Het geven van een kunstgebit als huwelijkscadeau, zoals dat vroeger op het Groningse platteland gebruikelijk was, getuigde van een zelfde visie als die van het tandheelkundig beleid van de Ziekenfondsraad in de jaren negentig;
2. Hoewel tandheelkundige implantaten ook op lange termijn duurder zijn dan reguliere gebitsprotheses, kunnen zij voor mensen met persisterende gebitsklachten toch worden gezien als een kosteneffectieve behandeling;
3. Voor het vormen van een oordeel over kosteneffectiviteit en efficiency van zorgvormen in de ouderenzorg is het identificeren, meten en waarderen van cliëntspecifieke factoren een noodzakelijke voorwaarde;
4. De-institutionalisatie van mensen met een verstandelijke handicap is niet per definitie duurder voor de samenleving als geheel;
5. De-institutionalisatie leidt op termijn tot grote problemen in de intramuraal instellingen;
6. Het wegwerken van wachtlijsten in de gezondheidszorg geeft niet de meest kosteneffectieve inzet van middelen;
7. That any sane nation, having observed that you could provide for the supply of bread by giving bakers a pecuniary interest in baking for you, should go on to give a surgeon a pecuniary interest in cutting of your leg, is enough to make one despair of political humanity (GB Shaw, 1911);
8. Het toepassen van utilitaire beginselen binnen de gezondheidszorg zal leiden tot een verdere verschuiving van gelden richting de cure sector;
9. Ook de kosteneffectiviteitanalyse moet aan een kosteneffectiviteitanalyse worden onderworpen;

10. De vrije artsenkeuze vraagt om een sollicitatiegesprek tussen cliënt en dokter;
11. De wet van Murphy is in tegenspraak met zichzelf;
12. Pessimisten hebben meer plezier in het leven dan optimisten. Voor een optimist is het onmogelijk plezierig verrast te worden;
13. In het volleybal is de aanval niet de beste verdediging;
14. Wie het laatst lacht is meestal niet zo snel van begrip;