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Medical Technology in the Health Care System of the Netherlands

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THE NETHERLANDS: COUNTRY DESCRIPTION

The Netherlands is a small country divided into 11 Provinces, a district called the IJsselmeerpolders, and 850 municipalities. With about 400 inhabitants per square kilometer (1978), the Netherlands is one of the most densely populated areas of the world. In 1976, there were 13.9 million inhabitants. The percentage of the age group 65 and older was 11 percent, an increase of 5 percent since 1889 (2).

Form of Government

The Netherlands is a kingdom with a parliamentary democracy. The head of state is Queen Juliana of the House of Orange-Nassau. The Parliament (Staten Generaal) consists of two chambers. The Second Chamber (De Tweede Kamer), which is the more important one, has 150 members. As there are no electoral districts in the Netherlands, members of this chamber are chosen directly by the population under a system of proportional representation. This method of election leads to the presence in Parliament of a number of political parties. Since no one party has a majority, a coalition of several parties is necessary to form a government. In 1979, the government consisted of Ministers of the Christian Democratic and Liberal Parties. The major role of the Second Chamber of Parliament is to amend and approve drafts of laws put forward by the government. Only rarely does this chamber exercise its authority to develop laws on its own. The First Chamber (De Eerste Kamer), which is elected from and by Provincial councils, can only approve or reject laws that the Second Chamber has passed. Or-

dinarily, the First Chamber does approve these laws.

Provincial councils are elected in each of the 11 Provinces and manage the policies of individual Provinces. Each Province is headed by a Royal Commissioner (Commissaries der Koningin), who is appointed by the Queen after she is advised by the Cabinet. The main task of the Provinces is the supervision of the municipalities. Each municipality has an elected council and a mayor appointed by the Queen advised by the Cabinet (for larger cities) or by the Minister of Internal Affairs (for smaller towns).

Nature of the Economy

The Netherlands' location at the mouth of the great rivers Rijn and Maas has made the country a leader in international trade. Rotterdam has the largest harbor in the world. The Dutch economy is based on free enterprise, but the government's influence is growing in response to the weak economic situation and the imminent failure of a number of private enterprises.

Overall, the working population is divided into the following sectors (2):

Agriculture and mining	1.9%
Industry	38.0
Services (for-profit)	31.8
Government and nonprofit	28.3

Wage costs have risen tremendously in recent years, creating problems in selling the country's products internationally. Labor-intensive industries, in particular, have had a very difficult time. Because of the importance of the problem

of unemployment, the Government has sought to encourage the development of industries that make use of sophisticated techniques and know-how.

The production of medical technology is discussed in this context as a partial solution to the nation's economic problems. About 60 enterprises in the Netherlands are active in the manufacture and trading of medical instruments internationally. These include large companies, such as Philips, which have a broad range of articles, and many small companies, which are more specialized. The Dutch industry in medical technology takes care of 18 percent of the world market (i). Ninety percent of medical tech-

nology produced in the Netherlands is exported, which accounts for the importance of the medical technology industry to the national economy.

Overall, the Netherlands is a pluralistic country. With people of different backgrounds and different religions, tolerance is essential. Government is viewed not in a negative light, but as a solution to societal problems. Ordinarily, the public and the private sectors work hand-in-hand; but if the private sector is unable to deal with a problem, the Government will generally step in. The traditions of the Netherlands encourage the incorporation of the new, including the adoption of new models of social action.

THE HEALTH CARE SYSTEM

Fully describing the health care system of the Netherlands is a difficult task. Because the system has emerged with no systematic plan from the Netherlands' tradition of pluralism, in fact, some people call it a "nonsystem."

Immediately after World War II, the Government of the Netherlands sought to restore the country's social and economic life through various formal policies. As wartime regulations were abolished and freedom restored, specific laws regulating the health care system were passed. The two most important were the hospital tariffs law (*Wet Ziekenhuistarieven*) of 1965, which regulates price setting for all intramural institutions, and the Hospital Provisions Act (*Wet Ziekenhuisvoorziening*) of 1971, which regulates the building and renovation of intramural institutions. Notwithstanding this post-war government intervention, however, the health care system of the Netherlands remains largely private. Proposals to strengthen the government's regulatory powers have recently been sent to Parliament.

The government's role in health care is administered through the Ministry of Health and

¹Intramural institutions are institutions that receive patients as inpatients. This law applies to general hospitals, categorical hospitals (hospitals for specific diseases), psychiatric hospitals, nursing homes, homes for the mentally retarded, homes for handicapped children, etc.

Environmental Protection (*Ministerie van Volksgezondheid en Milieuhygiëne*) Ultimate responsibility for the entire Ministry rests with the Minister, but health care, specifically, is under the direction of a State Secretary. Both these officials are politicians.

A number of important advisory councils and boards at the national level seek to ensure the full cooperation of doctors, hospitals, sick funds, private insurance organizations, and others affected by national health care policies. These advisory boards include: 1) the Health Council (*Gezondheidsraad*), which advises the government about the state of the art in applied medical sciences and plays a central role in the application of new technologies; 2) the Central Council for Public Health (*Centrale Raad voor de Volksgezondheid*), which fosters cooperation between the government and private organizations and institutions working in the health care system and advises the government on all issues in curative and preventive health (16); 3) the Central Board for Hospital Tariffs (*Centraal Orgaan Ziekenhuistarieven*), which plays an important role in the pricing of services of intramural institutions on the basis of the 1965 hospital tariffs law; and 4) the Central Board for Hospital Provisions (*College voor Ziekenhuisvoorzieningen*), which advises the government on the building of intramural institutions

in accordance with the 1971 Hospital Provisions Act.

The government's most important role in the health care system is in the area of preventive medicine. Preventive services, which amounted to 3 percent of total costs of health care in 1977, are financed out of general revenues. Some preventive services are provided by the organizations for home care (Kruisorganisaties), private organizations that receive government subsidies. In addition, municipal health services provide preventive care and ambulance services. Industry provides some preventive services as required by law.

In general, the government's role in curative health care is very modest, involving only a few government institutions. Basically, it is to guide the curative system to help ensure the availability and accessibility of high-quality care at reasonable costs. The government has a special responsibility for the quality of care, which is entrusted to National Inspectorates (Staatstoezicht op de Volksgezondheid) and their Provincial offices (16).

Hospitals

A number of hospitals in the Netherlands were founded and administered by Catholic or Protestant religious orders, but most of these institutions have now been turned over to private foundations administered by lay people. Though most of the hospitals in the Netherlands are private, there are also public institutions. Some large cities, for example, have their own municipal hospitals. Originally, these facilities were established to treat poor patients, as required by the national poor laws. In addition to municipal hospitals, some psychiatric hospitals are public. With the exception of the Province of North Holland, however, most Provinces meet their legal obligation to provide psychiatric services by making arrangements with private hospitals.

There are seven university teaching hospitals in the Netherlands, which are under the control of the Ministry of Education and Sciences (Ministerie van Onderwijs en Wetenschappen). These hospitals, which have traditionally had

an important role in conducting medical research, are gradually being transferred to the health care system and are increasingly emphasizing patient care.

A breakdown of hospitals in the Netherlands by type is presented in table 1.

Table 1.—Intramural Health Care Institutions in the Netherlands (1976)^a

Types of institutions	Number of institutions	Number of beds	Beds per 1,000 inhabitants
General hospitals	185	61,038	4.4
Categorical hospitals ^b	54	7,012	0.5
University teaching hospitals	7	6,776	0.5
Psychiatric hospitals	73	25,940	1.9
Institutions for mentally retarded	127	26,947	2.0
Institutions for sensory handicapped	13	1,795	0.1
Nursing homes	304	42,034	3.0
Total	763	171,542	12.4

^aIntramural institutions are institutions that receive patients as inpatients.

^bCategorical hospitals are hospitals for specific diseases.

SOURCE: Nationaal Ziekenhuisinstituut (National Hospital Institute). *Financiële Statistiek 1976 in de Instellingen van Intramurale Gezondheidszorg* (Utrecht, 1977) (11).

Health Care Providers

Medical specialists and pharmacists in the Netherlands work mostly on a fee-for-service basis. They work either in private practice in the community or under an arrangement with hospitals to provide services. Generally, physicians work independently. Only in psychiatric hospitals, university teaching hospitals, and large municipal hospitals are doctors on salary.

Data on the numbers and types of personnel in the Dutch system are presented in tables 2 and 3. Table 4 shows the increases in specific types of hospital staff that occurred between 1973 and 1978.

Levels of Care

The health care system of the Netherlands is generally considered to have three levels of care. The first level, public health, includes the provision of preventive services. Some preventive services are offered to the entire population, and

Table 2.—Number of Personnel Employed by Intramural Health Care Institutions in the Netherlands (1978)

Types of institutions	Number of personnel
General hospitals.....	94,293
Categorical hospitals (including university teaching hospitals).....	31,434
Psychiatric hospitals.....	23,254
Homes for mentally retarded.....	24,099
Institutions for sensory handicapped.....	1,133
Nursing homes.....	43,191
Total.....	217,404

SOURCE: National Ziekenhuisinstituut (National Hospital Institute), *Statistiek Personeelssterkte 1978 in de Instellingen van Intramurale Gezondheidszorg*, 79, 165 (Utrecht, 1979) (14).

Table 3.—Number of Physicians and Other Health Care Personnel in the Netherlands (1976)

Types of personnel	Number	Number per 100,000 inhabitants
Physicians		
General practitioners.....	4,937a	36
Specialists.....	7,223	53
Doctors in public health ¹	1,158	8.4
Other doctors.....	8,574	62
Total.....	21,892	159.4
Nonphysicians		
Dentists.....	4,462	32
Pharmacists.....	1,197	9
Midwives.....	850	6.2
Home nurses.....	3,721	27
Maternity aides.....	2,718	20
Total.....	12,948	94.2

^aGeneral practitioners with own pharmacy: 1,298.

SOURCE: Centraal Bureau voor de Statistiek (Central Bureau of Statistics), *Vademecum Gezondheidsstatistiek Nederland 1977* (The Hague, 1977) (3).

Table 4.—Increase in Hospital Staffing in the Netherlands (1973-78)

Type of staff	Number in 1973	Number in 1978	Average yearly increase
Nursing staff.....	53,390	55,852	+ 0.9%
Medical and paramedical staff.....	18,190	24,385	+ 6.0
General staff.....	36,620	42,173	+ 2.9
Other.....	4,430	3,316	- 5.6
Total.....	112,630	125,726	+ 2.2%

SOURCE: Ministerie van Volksgezondheid en Milieuhygiëne (Ministry of Health and Environmental Protection), *Financieel Overzicht van de Gezondheidszorg. Waarin Opgenomen een Raming van de Kosten tot 1984* (The Hague, September 1979) (7).

others are offered to specific groups (e. g., children, diabetics, employees, and elderly people).

The second level of care, so-called "first-line care," is immediately accessible to the patient. This includes home care provided by nurses, as well as care provided by general practitioners working in solo practice, in group practice with other general practitioners, or in health centers with other professionals such as nurses, physiotherapists, and social workers. Both the government and sick funds want to encourage the development of health centers.

"Second-line care," the third level in the system, is generally, except for emergencies, provided on referral by the first-line practitioners. Second-line care includes outpatient care by specialists (provided mostly through outpatient departments of general hospitals) and inpatient care in acute care hospitals. It also includes care in nursing homes and homes for the mentally retarded.

Administration of the System

The Netherlands' health system depends very heavily on private institutions and independent practitioners. Individual patients are free to choose their own physician, whether generalist or specialist. Professionals are free to select treatment for their patients. Physicians are also free to settle and practice where they like, although in order to practice in a particular hospital, they are required to obtain a license from the hospital board.

With the government taking the steps to be described below, the openness of the health system in the Netherlands is generally decreasing. The possibility of restraining cost rises by restricting the number of health care personnel is now much discussed.

Financing

As mentioned previously, preventive care is financed by the government out of general revenue. Curative health care is financed by insurance and out-of-pocket payments; only a small part of it is subsidized by the government.

The following sections describe how the insurance system is divided.

National Sick Fund Insurance

A **compulsory insurance** scheme dating to 1941 was legalized in the Sick Fund Act (*De Ziekenfondswet*), social security legislation passed in 1966. Sick fund insurance (*Zeikenfondsverzekering*) covers about 70 percent of the population. Members of the scheme include employees whose income falls below a certain level (36,200 florins in 1978—\$19,053),² self-employed persons whose income falls below this same level, and those over the age of 65 with incomes below a certain level (20,600 florins in 1978—\$10,842). Each group is subsidized by the government in a slightly different way.

National sick fund insurance finances all acute health care, including that provided by general practitioners, specialists, and hospitals. Generally, all costs, including drug costs, are covered, and the patient pays only for incidentals such as appliances and transportation.

The national sick fund insurance scheme is executed by 65 independent sick funds. All of these funds are members of the Society of Dutch Sick Funds (*Vereniging Nederlandse Ziekenfondsen*, VNZ), which plays an important role in shaping health care policy in the Netherlands. The sick funds are supervised by the Sick Fund Council (*Ziekenfondsraad*), representing government, employers, employees, sick funds, institutions, and professionals working in the health system. The Sick Fund Council approves arrangements between sick funds and providers of medical care. It also advises the Ministers of Social Affairs and Health Care concerning the premiums of the insurance schemes, which the Ministers have to fix.

Private Insurance

Approximately 30 percent of the population is not insured under the national sick fund insurance scheme described above. Individuals in this group finance their own health care, usually by buying private insurance. Private insurance premiums and health care expenses are tax deductible by the patient.

²For conversion of Dutch florins and guilders to U.S. dollars, the exchange rate used throughout this chapter was 1.90 florins or guilders = \$1.00 (U.S.).

Although private insurance policies vary, generally the costs of more expensive items, such as hospital and specialist care, are completely covered. The costs of general practitioner care and drugs, however, are usually not covered. Deductibles and coinsurance are common.

In Government councils that play an important role in the system, private insurance companies are represented by their own society, the National Society of Private Insurers for Health Care Costs (*Kontaktcommissie Landelijke Organisaties van Ziekttekostenverzekeraars*, KLOZ).

National Catastrophic Illness Insurance

In 1968, Parliament passed a general law on costs of catastrophic illness (*Algemene Wet Bijzondere Ziekttekosten*), establishing a new catastrophic insurance scheme under social security. This scheme is known as "insurance for the population" (*Volksverzekering*), because all citizens are required to be members. The scheme is financed out of premiums, which are levied by fiscal authorities. There is no income limit for membership, but the premium (2.86 percent) is levied on those whose incomes exceed a specified maximum (41,750 florins in 1978—\$21,974; 43,950 florins in 1979—\$23,131).

This insurance finances the most expensive forms of care, including long-term care in general hospitals, nursing homes, homes for the mentally retarded, and ambulatory care for mental health. Beginning in 1980, the catastrophic scheme will also finance home care, previously financed through general revenues and patient contributions. This change is intended to reinforce first-line health care.

Reimbursement

Payment to Hospitals and Other Institutions

Tariffs for hospitals and other institutions are set by the Central Board for Hospital Tariffs, the national advisory board mentioned earlier. This body is made up of representatives of hospitals, sick funds, private insurance systems, and independent members. The Central Board for Hospital Tariffs evaluates costs prospective-

ly and sets rates following guidelines that it has developed and that the Sick Fund Council and the Minister concerned have approved. The guidelines are very clearly defined and applied with individual circumstances taken into consideration.

Payment to Physicians

General practitioners are paid on a cavitation basis for sick fund patients and on a fee-for-service basis by private patients. Specialists are paid exclusively on a fee-for-service basis for all patients. Fees from the sick funds are set in negotiations between the organization of physicians, the Royal Netherlands Medical Association (De Koninklijke Maatschappij ter Bevordering der Geneeskunst), and the sick funds. General practitioners' fees for private patients are comparable to their fees for sick fund patients. Specialists' fees for private patients, however, are much higher. On the average, a specialist can earn 50 percent of his/her income from private patients, who make up only 30 percent of the population. Technical specialties such as radiology are the best paid.

Fees for all physicians can be changed only with the approval of the Minister of Economic Affairs, who is attempting to implement a general incomes policy for social and political rea-

sons. Recently, the government has set up a Commission on the Structure of Medical Specialists' Fees (Commissie Structuur Honorering Medische) to revise fees. The government is also developing an incomes policy to bring the incomes of specialists and other professionals into line with incomes of comparable government officials.

Cost Containment

Because the curative health care system is largely private and financed by insurance, the government's influence on the system can only be indirect. Many items of the health care system are open ended. More services generate more money for the providers. Furthermore, since the health care costs are not part of the government budget, health care expenditures do not compete with other social needs such as education.

Figures demonstrating the rise in the costs of care during the period from 1973 to 1977 are shown in table 5. As can be seen from these figures, overall cost rises have been in the range of between 11.2 and 18 percent each year for the past several years. There does, however, seem to be a decreasing trend in the rise of costs. The percentage of gross national product consumed

Table 5.—Overview of Health Care Costs in the Netherlands (1973-77)

Category of expenditures	Cost per year (in millions of florins/dollars) ^a					Percent increase in relation to past year			
	1971	1974	1975	1976	1977	1974	1975	1976	1977
Intramural care	6,663	8,060	9,749	11,222	12,519	21.0%	21.0%	15.1%	11.6%
	\$3,506	\$4,242	\$5,131	\$5,906	\$6,589				
Specialists	970	1,110	1,261	1,346	1,484	14.4	13.6	6.8	10.2
	\$510	\$584	\$664	\$708	\$781				
Drugs	1,500	1,640	1,855	2,025	2,174	9.3	13.1	9.2	7.4
	\$789	\$863	\$976	\$1,066	\$1,144				
Extramural care	1,961	2,293	2,668	3,076	3,486	17.0	16.4	15.2	13.3
	\$1,032	\$1,206	\$1,404	\$1,619	\$1,835				
Preventive care	323	372	431	530	581	15.2	15.9	23.0	9.6
	\$170	\$195	\$227	\$279	\$306				
Administration and other	778	912	1,028	1,149	1,273	17.2	12.7	11.8	10.8
	\$409	\$480	\$541	\$605	\$670				
Total	12,195	14,387	16,992	19,348	21,517	18.0%	18.1%	13.9%	11.2%
	\$6,418	\$7,572	\$8,943	\$10,183	\$11,325				
Percent of GNP	7.2	6.5	8.2	8.2	8.2				

^aFor conversion of florins to U.S. dollars in this table, the exchange rate used was 1.90 florins = \$1.00 (U.S.). The actual exchange rate, however, has fluctuated over the years.

SOURCE: Ministerie van Volksgezondheid en Milieuhygiëne (Ministry of Health and Environmental Protection), *Financieel Overzicht van de Gezondheidszorg, Waarin Opgenomen een Raming van de Kosten tot 1984* (The Hague, September 1979) (7).

by health care expenditures was 7.2 percent in 1973 and 8.2 percent in 1977 (6).

Since 1976, the government has tried to bring down collective spending, that is, spending on items financed by taxation and social security premiums. Since these items are financed out of wages, increased expenditures contribute to unemployment. The government expects that implementation of its cost-containment policy will save 2 billion florins (\$1.052 billion) in 1981 (15). It has already submitted two important proposals to Parliament. One is the law on tariffs in health care (*Wet Tarieven Gezondheidszorg*), which would give the government full authority to regulate all tariffs and fees. The second proposal is the law on health care provisions (*Wet Gezondheidszorgvoorzieningen*), which would allow regulation of the development of all health care facilities, including doc-

tors' practices. These proposals would broaden and replace existing laws.

Although these proposed laws could be enacted within 2 years, past experience with the Hospital Provisions Act of 1971 suggests that the types of policies which they embody are difficult to implement. Under the Hospital Provisions Act of 1971 (which the pending legislation would strengthen), the government's policy is to decrease the number of general hospital beds to four beds per 1,080 inhabitants. Implementation of this policy has been difficult, because the general population, patients, and hospital employees resist the closing of their hospitals. Furthermore, because of its policy of full employment, the government approved an increase in guidelines for nursing personnel in intramural institutions this year, despite the predicted negative impact on costs.

POLICIES TOWARD MEDICAL TECHNOLOGY

The general impression in the Netherlands is that medical technology is a significant contributor to rising health care costs, but little specific information is available. Econometric analyses by the author give indirect indications that technological innovation is an important contributor to costs (10,12). In an analysis of price rises in institutional health care, Van Montfort reported that costs for medical and nursing materials rose from 323 million florins (\$170 million) in 1972 to 497 million florins (\$262 million) in 1975, an increase of 53.9 percent (17). Of the 53.9-percent increase, 16.9 percent was due to price increases and 37 percent to real changes in services. Technical innovation also increases costs by increasing staff size in hospitals (5). Further, technology requires space. About 20 percent of total space in hospitals is taken up by selected departments with technology, such as X-ray equipment, laboratories, and operating rooms (9).

From the standpoint of outputs, technical innovation appears to be a stronger influence in the diagnostic area than in the therapeutic. Between 1960 and 1974, the number of diagnostic procedures performed rose from 9.84 per 1,000

insured patients to 45.75 per 1,000 (13). The number of therapeutic procedures performed rose during the same period from 50.5 per 1,000 in 1960 to 94.09 per 1,000 in 1974 (13). Increases within the area of diagnosis can also be documented. For example, laboratory production per 100 admissions increased about 11 percent per year from 1973 to 1975 (13). The incidence of X-ray use also rose slightly, from 401.8 per 1,000 admissions in 1973 to 413.7 in 1975, an increase of 3 percent (13). Therapies increased 31 percent over the same interval (13).

Research and Development Efforts

Research related to medical technology is conducted by industry, by research organizations, and by universities. University research is generally funded by government.

The two important government organizations that fund research are: 1) the Dutch Organization for Fundamental Scientific Research (*Nederlandse Organisatie Zuiver Wetenschappelijk Onderzoek*, ZWO), and 2) the Dutch Organization of Applied Scientific Research (*Nederlandse Organisatie voor Toegepaste Natuur-*

wetenschappelijk Onderzoek, TNO). The research of ZWO is basic research that has little to do directly with medical technology. TNO, however, has a special department for health care, the Health Organization TNO (Gezondheidsorganisatie TNO), which spends about 50 million florins (\$26.3 million) a year on research related to patient care. Some of this research is conducted in a few prominent general hospitals, but most of it is conducted in university teaching hospitals.

R&D in the health area is primarily the task of the university teaching hospitals, which are reimbursed by the social security system and patients on the basis of a uniform tariff. This tariff is based on the output of the average university teaching hospital, with the guidelines applied to the bigger general hospitals taken into consideration. Reimbursement is not sufficient to cover university teaching hospitals' costs, however, and the government covers their deficits. The deficits amount to about 30 percent of the hospitals' budgets, and some of the deficits are attributable to research and teaching. According to the Ministry of Education and Sciences, the total deficit in 1977 was 496 million florins (\$261 million).

At this time, there is a special commission on the tariffs for these university teaching hospitals which is to solve the problem of reimbursement. As a method of furnishing the resources needed for new developments in patient care, the policy will be to fund new techniques at the marginal cost of the technique. The guidelines for reimbursement, however, do not contain space for research. Research is to be directly funded by special funds.

Evaluation of Medical Technology

Few evaluation studies of medical technology have been conducted in the Netherlands. New technologies in health care, including new diagnostic and therapeutic devices, however, are evaluated by the Health Council, before they are accepted into medical care. The advice of this group guides the decisions of other bodies, such as the Sick Fund Council and the Central Board for Hospital Provisions, which are responsible for planning health services.

The Health Council's evaluations are mostly of a technical nature. Only recently has the council considered costs and benefits in making its recommendations. Before it made its recent recommendation about the number of kidney transplants, for example, it considered the economic benefits of transplantation versus dialysis (4). Similarly, it considered some cost issues prior to advising on renal dialysis.

A working party on the evaluation of medical instruments with regard to safety and efficacy has been founded in cooperation with the Health Organization TNO and the National Hospital Institute (Nationaal Ziekenhuisinstituut), a research institute founded by the National Hospital Council (Nationale Ziekenhuisraad). So far, the working party has published eight papers on items including heart monitoring systems, EKG apparatus, defibrillators, electrical thermometers, electrical beds, external pacemakers, and blood pressure monitors. Reports in preparation concern EEG instruments, fetal monitoring instruments, and heart monitoring instruments.

Regulation of Medical Technology

The only medical technology that is directly regulated in the Netherlands, based on legislation of 1958, is drugs. Drugs can be prepared only by pharmacists, general practitioners with their own pharmacy, or assistants working under the supervision of pharmacists or general practitioners with their own pharmacy.

Industrial production and distribution of drugs by drug companies must be approved by the government. The Commission on Drugs (Geneesmiddelencommissie) advises the Minister of Health on drugs, and only those drugs which have been registered can be distributed to the public. Prior to registration, a special board evaluates the drug's composition, efficacy, and side effects. This board critically examines the producer's claim regarding the drug's efficacy.

Planning of Medical Technology

The Hospital Provisions Act of 1971, which regulates the building and renovation of institutions such as hospitals, is the only law that can

contain the expansion of technology in the Netherlands. Under this law, a hospital that wants to make a capital investment for renovation exceeding a certain amount of money must apply for a license with the Central Board for Hospital Provisions. The Board can also limit the size of, for example, the hospital's X-ray department. Recently introduced legislation would give the government the authority to close down hospitals or part of them.

Article 18 of the Hospital Provisions Act of 1971 gives the government the authority to regulate very "advanced" technologies on the basis of a national plan. This national plan contains an inventory of existing facilities and gives indications as to where these facilities should be changed. The planning process has not been fully applied to all facilities, because there is some fear that a national plan may favor the expansion of existing facilities and thereby increase costs.

So far, regulations have been issued for both renal dialysis for chronic kidney failure and megavolt therapy. Preparations are currently under way to issue regulations to cover cytogenetic laboratories, nuclear medicine (both diagnostic and therapeutic), and diagnostic facilities for angiocardigraphy and heart catheterization. Guidelines for open-heart surgery and computed tomography (CT) scanners are in operation, also.

Many technologies, however, do not need building arrangements and can be expanded without government regulation. In some instances, the government has asked hospitals not to invest in new instruments without the approval of the Ministry of Health. It has done this, for example, in the case of diagnostic devices that use radioactive isotopes, such as gamma cameras. (The automation of laboratory equipment is a special case described in the next major section of this chapter.)

The Central Board for Hospital Tariffs is considering the development of special guidelines with respect to investments in medical instruments and the number of paramedical personnel. General hospitals following the guidelines would be able to expand these investments and

personnel by a limited amount each year. It is hoped that a policy of restricting this infrastructure will make doctors more critical with respect to their utilization of facilities.

There are technological innovations that the government has not dealt with and over which it has no authority. The government is considering a system of restraining expansions by a new law to limit tariffs in the health care sector. This law, the law on tariffs in health care, may avoid a proliferation of bureaucracy and allow for a flexible policy. Recently, the government has stressed the importance of negotiations between hospitals and reimbursers of care. These regional contacts could provide an important forum for discussion, out of which a sensible policy toward the deployment of medical technology may evolve.

Reimbursement and Medical Technology

The reimbursement system, as described previously, favors the expansion of medical technology. The structure of tariffs varies between hospitals, and such services as drugs and laboratory tests can be included or not in the charge per day. Pharmacists and clinical chemists, who are responsible for the chemical analyses done in the hospital, are on the hospital's payroll, and their salaries are included in the hospital tariff. A few physicians also perform these tests, however, and they can be paid on a fee-for-service basis. Most specialists work on the basis of fee for service, which encourages giving service. The surgeon and the anesthetist bill the patient for their services, for example. The radiologist bills for a fee.

The hospital bills separately for its services and is reimbursed at cost. Costs for the use of an operating room (including the cost of personnel, instruments, and appliances), for example, are not included in the hospital tariff. X-rays are not included either. These services are billed for separately and are reimbursed at cost. The tariffs for medical ancillary services such as laboratory and X-ray are set uniformly for the whole country by the Central Board for Hospital Tariffs. These tariffs, which are based on costs for per-

sonnel, materials, and costs of other investments and include a small addition for overhead costs, are revised every 3 years.

Under this hospital reimbursement system, the more services that are performed, the more money that is generated. In technical departments, the costs are more or less constant, so an increase of services above the budgeted level generates surpluses of revenue above costs. These surpluses allow expansion. They also lead to lower rates for patient days when the Central Board for Hospital Tariffs has to revise the hospital budget. Hospital budget revisions are made whenever the hospital applies for a tariff increase, otherwise at the end of 4 years.

The direct relation of services and income for physicians is criticized by government, the sick funds, and patients. Because of these criticisms, radiologists recently made a new agreement with the sick funds, under which radiologists' fees for tests in excess of 15,000 are lowered by a percentage. The government is also urging hospitals to include more items in the day rate to mitigate expansion in certain services.

Several health economists are studying the possibilities of stricter budgeting in hospitals, or perhaps replacing hospital rates by a system of budget financing under which there would be a more direct relationship between output and costs (10, 12).

Utilization Review

There has not been much utilization review in the Netherlands. In Utrecht, however, the Foun-

ation of Medical Registration (Stichting Medische Registratie) assembles data about patients admitted to hospitals, diagnoses, average length of stay, operations performed, and so forth. This foundation covers almost 90 percent of hospital beds in the Netherlands and is financed by member hospitals, i.e., voluntary members. The data the foundation generates are very important, because they are used by medical staff to evaluate their work and are also used for hospital planning.

A separate data bank has been established by the sick fund organizations to collect data on their patients admitted to hospitals. The data collected concern such things as the referral policies of general practitioners and acts performed by specialists, they also include data on hospitalizations (e.g., average length of hospital stay). Some individual private insurance companies have also begun to collect important data about their patients admitted to hospitals.

Recently, a new foundation called the National Organization for Quality Assurance in Hospitals (Centraal Begeleidingsorgaan voor Intercollegiate Toetsing in Ziekenhuizen) was established. This new organization is financed by hospitals, which are licensed by the Central Board for Hospital Tariffs to include their contribution as part of their reimbursement costs. The new organization is expected to foster medical audit and utilization review in hospitals, particularly in cooperation with the medical societies.

SPECIFIC TECHNOLOGIES

As noted previously, article 18 of the hospital provisions law allows the government to issue guidelines and regulate advanced medical technologies on the basis of a national plan. Only some medical technologies have been brought under this article to date.

CT Scanners

At the present time, there are 32 CT scanners installed in the Netherlands. There is no defin-

itive regulation of CT scanners by article 18, but the Secretary of State and the hospitals have agreed not to install additional facilities without allowances from the government.

In existing CT scanner guidelines, a distinction is made between brain scanners and total body scanners. For brain scanners, the guideline is one scanner per 500,000 inhabitants. Brain scanners are to be installed in hospitals that have teaching facilities in neurology and a

department of neurosurgery, and hospitals with scanners are to work in regional cooperation with other hospitals. On the basis of the existing guideline and population, about 30 brain scanners can be installed. These scanners will be placed in the near future.

Total body scanners are to be placed in those university teaching hospitals which have a center for cancer patients, teaching facilities for X-ray diagnostic and therapeutic procedures, expertise in radiation physics, a radiation therapy simulator and treatment planning system, and the capacity for evaluating the results of CT body scanning with those of other radiological diagnostic methods, nuclear medicine, echography, and clinical neurophysiology. Since a preponderant motivation is research, spreading CT body scanners throughout the country is not deemed necessary. About eight total body scanners are to be installed.

Renal Dialysis and Kidney Transplants

There has been a "gliding standard" of an absolute limit of a minimum of 71 and a maximum of 111 dialysis units per 1 million inhabitants. This gliding standard was made dependent on the number of kidney transplants performed. The guideline for kidney transplants has been 32 transplants per 1 million inhabitants, and the Health Council urged the government to aim at 400 kidney transplants per year. This goal has not been reached, however, because there have not been enough kidneys available.

The existing renal dialysis guideline applies for patients older than 15 years. As dialysis is being used for people over 60 years old, and more people are applying for treatment, however, the need for dialysis equipment is growing. The government has recently increased the guideline to 100 dialysis units per 1 million inhabitants. This would bring the number of dialysis units, not including home dialysis units, to 1,407 in 1980.

Cardiac Surgery

Cardiac surgery is a very hot political issue in the Netherlands. The supply of existing facilities is not sufficient to meet the ever growing de-

mand for coronary bypass surgery. Notably, the Society of Heart Patients (Nederlandse Hart-patientenvereniging) deployed lobbying activities in government and Parliament to increase the facilities and get permission for patients to have operations in other countries such as the United States, Switzerland, and England (8). As a result, patients may now be reimbursed by sick funds and other private insurance for bypass operations performed in foreign countries.

According to the Sick Fund Council, in 1978 there were 1,079 operations for open cardiac surgery performed abroad as follows (18):

Houston, Tex., United States.	268
Genolier Swiss, Switzerland.	501
London-St. Anthony's Hospital, England.	218
London Middlesex Princess Grace Hospital, England	92
Total	1,079

In 1977, the total number of operations performed abroad was 965.

Planning for cardiac surgery is based on the following guidelines: 300 operations for open coronary surgery per 1 million inhabitants (i.e., 4,200 operations per year), 50 operations for closed cardiac surgery (i. e., 720 operations per year). The total capacity in 1976 was 2,095 open- and 388 closed-heart surgery operations. The target at the moment is set at 6,000 operations a year. The specified guidelines are to be realized after 1980.

The government has designated six teaching university hospitals and three general hospitals as cardiac centers where these cardiac surgery operations can be performed. Each center is to aim towards a production of 400 operations a year. Currently, the Antonius Hospital at Utrecht is performing 700 operations a year. In addition, very recently, the government designated a sanatorium for tuberculosis to function, in cooperation with a nearby general hospital, as a center for 1,000 operations per year.

Megavolt Radiation Therapy

For planning these facilities on the basis of article 18, the concept of a "radiation unit" is used. A radiation unit is a megavolt apparatus, with supplementary provisions, which has suffi-

cient capacity to treat 250 new patients a year. The capacity of telecobalt apparatus with a range of 2,000 to 3,000 curies is one radiation unit. The capacity of telecobalt apparatus with 6,000 to 9,000 curies is two radiation units. A linear accelerator can be counted as two radiation units.

Currently, there are 49 radiation units in 20 general, university teaching, and categorical (special purpose) hospitals in the Netherlands. The number of cancer patients in the Netherlands is estimated at 3,250 patients per 1 million inhabitants, about 1,450 of whom need radi-

ation therapy. Given its population of 13.9 million inhabitants, the country needs radiation capacity for 20,155 new patients, i.e., 80 units. The existing 49 units, therefore, may have to be enlarged in the near future. Since 20 of the 1,450 patients are treated by orthovolt units, however, the need for megavolt apparatus may be less. For this reason, the government intends to follow a prudent policy in enlarging the existing facilities. Very recently, there have been indications that the need for radiation therapy may increase. The government will ask the Health Council to advise on this matter. The guidelines may have to be revised.

CONCLUDING REMARKS

The proliferation of medical technology is of great concern to the government of the Netherlands, which is confronted with ever increasing costs of medical care. In an effort to restrain costs, the government is seeking to control specific elements of the health care system, especially hospital beds. There are many conflicting interests to be considered. Patients and doctors want the most modern technology. The medical technology industry, with its importance in R&D and the general economy, is another important force. Although a full employment policy favors the expansion of health care personnel, the rising costs of the health care system may jeopardize the general economic system.

In light of these conflicting interests, the evaluation of medical technology could play an important role in the effort to find solutions to the difficult and delicate problems which surround the diffusion of medical technology. In the area of technology assessment, the Netherlands has as yet made very few contributions. The need for technology assessment, however, is likely to be increasingly felt in the future. The problems are international, so perhaps technology assessments could be performed on a European basis. I would hope that the European community will be able to make a contribution in this area.

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