

Health Care Technology in Sweden

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OVERVIEW OF SWEDEN

Sweden is the largest Scandinavian country, similar in size to California, with 8.7 million people concentrated mainly in the coastal regions and the south. Sweden is 1,500 miles long, and its northern part is above the Arctic Circle. Stockholm (the capital) is on the east coast roughly midway between north and south at the level of southern Greenland. Because of the Gulf Stream, the climate at this level of Sweden is relatively mild. The second-largest Swedish city, Goteborg, is situated further south on the west coast.

Winter snowfall in the southern part of the country is moderate, but the north has a severe winter climate dominated by snow and dark days. Northern summers have 24 hours of daylight and the famous midnight sun. Sweden's countryside is dotted with about 100,000 lakes, and forest covers about half the surface of the country. The north is dominated by a long mountain range, while southern Sweden is rather flat.

The Swedish population is relatively homogeneous; however, there are almost 1 million immigrants living in Sweden, of whom the great majority are Finns, Yugoslavs, and Greeks. Immigration accounted for 45 percent of the total population increase between 1944 and 1980. Every eighth child born in Sweden today is of foreign extraction, and foreign nationals constitute 5 percent of the workforce.

The Economy

Despite Sweden's size and geographic diversity, it is largely urban and highly industrialized. Agriculture provided employment for 80 percent of the population 100 years ago, but now accounts for only about 3 percent of the labor force. Eighty-three percent of



the population lives in urban areas, and the three largest cities have more than 30 percent of the population.

The country's economy combines capitalism and socialism. Private companies account for 80 to 90 percent of Swedish industry. In terms of employment, however, industry accounted for only 20 percent in 1990, as compared with 30 percent in 1962. Structural changes in industry in the last 20 years include decreased shipping and steel and textile manufacturing and increased engineering, chemical, and forestry products. Simultaneously, an expansion of the public sector has taken place, so that close to 40 percent of the workforce in 1992 found employment there.

A high percentage of the Swedish population (51 percent) is in the labor force (45). Eighty percent of women from ages 16 to 65 years old and 90 percent of those from 25 to 54 are gainfully employed. The female workforce, together with the aging of the population, imparts a great demand on health services (as working women are less able to be caregivers). Unemployment has been kept artificially low, but it rose to more than 4 percent in 1992 and is still increasing.

Sweden has one of the world's highest per capita incomes. The Swedish rate of gross national product (GNP) growth kept pace with that of Western European countries during the 1982 to 1990 period; however, Sweden's balance of payments has gradually worsened since 1984. Roughly 40 percent of Sweden's output is exported; 70 percent of its trade is with European countries. Recently Swedish companies have merged with both European and American firms.

Until 1991, the Swedish tax system was characterized by very high rates and a narrow tax base; in that year, a new system was introduced, under which national income tax is applied only to high incomes, and the marginal tax is reduced to a maximum of 50 percent. Local income tax is about 30 percent. Most goods and services are subject to value-added tax of 18 to 25 percent.

The high tax rate pays for extensive health and welfare benefits. All Swedes have compulsory health insurance that covers all health care, including outpatient and hospital services (except

for some co-payments for physician visits), home care, long-term and nursing care, and all equipment and aids for the disabled and handicapped. It also covers most of the costs of dental care and prescribed pharmaceuticals.

Government and Political System

Sweden's internal development has occurred in an atmosphere of tranquility unknown to most Western nations. The country has been neutral since the Napoleonic Wars. Although Sweden has not fought in a war since 1812, it maintains a modern army with compulsory military service. Its tranquility manifests itself in the stability of the political system, with almost 50 years of nearly continual rule of the Social Democratic Party during the twentieth century. (Since 1991, however, a coalition of nonsocialists has been in power.) The Swedish bureaucracy is noted for its stability and effectiveness. Governance in Sweden occurs largely by social consensus.

Sweden is a constitutional monarchy in which all federal political power rests in an elected parliament, whose 349 members are elected directly for three-year terms by proportional representation. The government consists of 13 ministries. Laws are administered by about 100 central agencies and 24 county administrations. Local units of government are the 24 counties (km) and the 289 municipalities.

Responsibility for health care has rested almost completely with the county councils for the last 100 years. Recently, however, the municipalities have begun to play an increasing role. Basic education and training of doctors and other health personnel is the responsibility of the central government.

For several hundred years before the current system was developed, health care was delivered by a combination of state, parish, and church hospitals and a system with district physicians employed by the central government. County councils were established and given increasing jurisdiction over acute care hospitals in 1864; eventually, their responsibility for health care grew so that by the 1960s, it included psychiatric

care and ambulatory services. The county councils have the right to **levy local taxes, most of which are income taxes** that cover health care. Members of the councils are publicly elected every third year, at the same time as national and municipal elections.

HEALTH STATUS OF THE POPULATION

Swedes have one of the highest life expectancies in the world, closely following Japan and Iceland (44). Sweden also has the oldest population among OECD countries and has experienced a rapid change in its citizenry's age structure. In 1970, persons over 74 years old constituted only 5 percent of the population; that share rose to more than 7 percent by 1985 and is expected to **exceed 11 percent by 2025** (21). The greatest increase is in the very elderly group, those over 85 years of age.

In many countries, health status is related to socioeconomic status. This problem is not as marked in Sweden (65); nonetheless, certain occupational categories, low-income groups, single people, immigrants, and the unemployed do have a lower health status than others (41). The fact that health status differences among different socioeconomic groups are small in Sweden may well be a consequence of persistent efforts to achieve equity through a general welfare system (41).

Infant mortality in 1989 was 6 per 1,000 live births, placing Sweden in third place globally (behind Japan and Finland) (33). An increasing number of extremely premature babies are being born, many of whom survive.

The main causes of overall mortality are (as in most countries) cardiovascular diseases and cancer. Ischemic heart disease and lung cancer are leading causes of premature deaths for men. Among women, premature deaths are mainly due to breast cancer and other nonspecified tumors and ischemic heart disease. The predominant cause of death among children and teenagers is accidents.

Figure 7-1 shows the relative burden of the most important disease groups in Sweden. The parameters used for measuring disease burden are as follows:

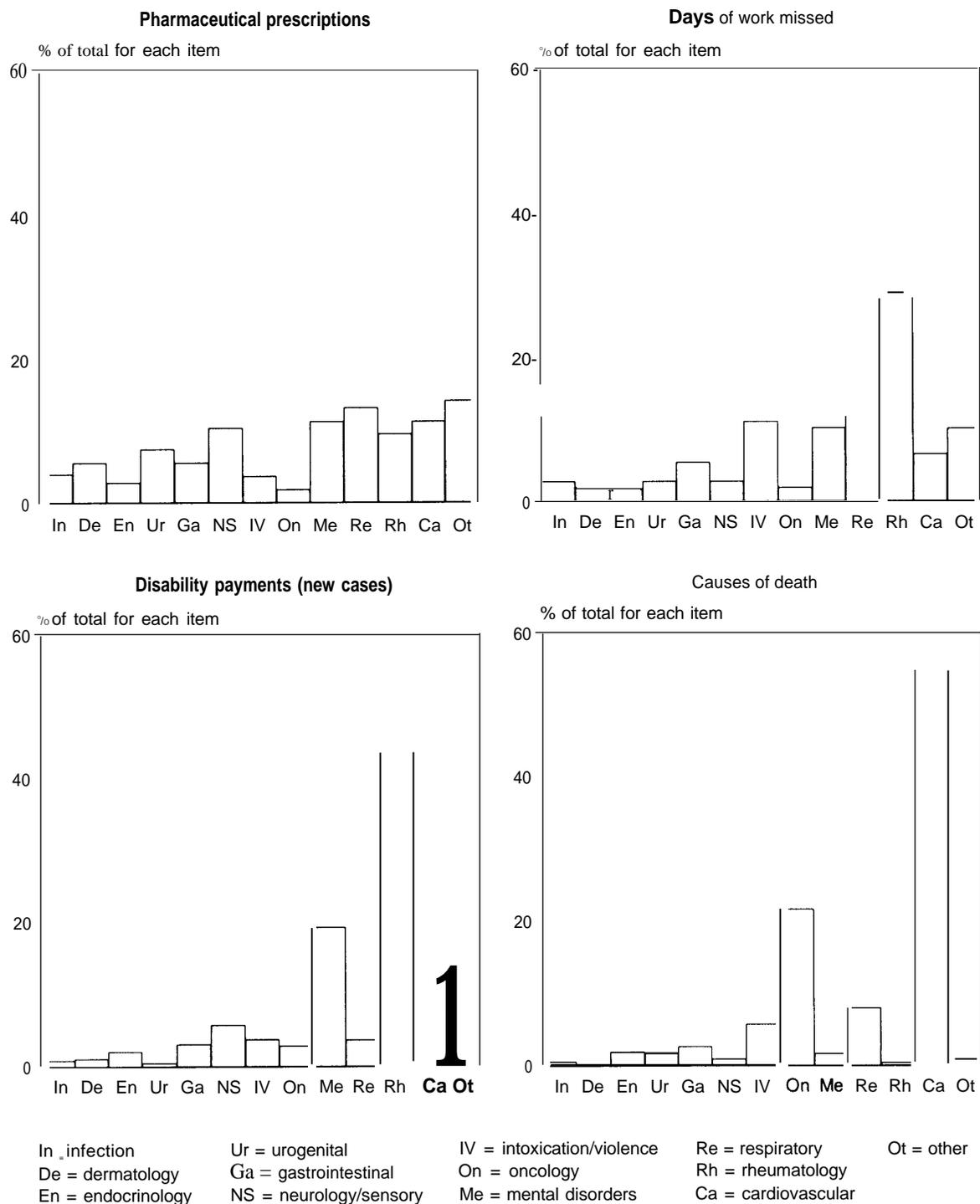
- prescriptions that indicate both drug consumption and physician contact (in or outside hospital) (1986);
- sick days (1983);
- individuals receiving (disability) pensions ("sick pensions") because of sickness per year (1986) (both sick days and new cases of sick pension indicate not only the disease burden but also the burden on professionally active age groups); and
- mortality (in 1986).

In only a few cases do disease burdens vary by gender. Sick pensions due to cardiovascular disease occur more than twice as frequently among men than women; the opposite is true for rheumatic diseases. Males dominate the "intoxication/violence" group by a ratio of 2 to 1.

A comparison of the two most important disease groups, rheumatologic and cardiovascular diseases, illustrates how the chosen parameters reflect different aspects of the disease burdens. A high mortality rate in a disease group (e.g., cardiovascular diseases) is connected with a heavy load on hospital care. Sick days and cases of sick pensions reflect the fact that the age group involved is professionally active and that the disease causes morbidity rather than mortality. They also denote a system with favorable conditions for economic compensation. During the 1980s, Sweden experienced an increase from an average of 18 days to a total average of 25 days of absence from work annually per insured person (41). Women, especially in the age group over 50 years, account for most of this increase.

During the 1980s, mortality among adults from 25 to 64 years old decreased (44). Most prominent was the decrease in mortality from accidents and from cardiovascular diseases; however, the male mortality rate in this group still is twice the female rate. In this age group, cardiovascular problems account for 45 percent of male and 25 percent of female deaths, whereas cancer accounts for 25 percent of male and 51 percent of female deaths. Alcohol-related diseases rose during the 1970s but remained constant during the 1980s. Mortality in the age group over 65 years of age also de-

FIGURE 7-1: Relative Disease Burden in Sweden, 1980s
Selected Disease Groups



SOURCE SCB, Health in Sweden (Stockholm Statistics Sweden, 1989)

creased during the last century, mainly because of decreases in coronary heart disease and stroke.

Generally, Swedes are very concerned about their health and about illness prevention. In certain indicators of life style, Sweden (in comparison with the other Nordic countries of Denmark, Norway, Finland, and Iceland) rates lowest in smoking, low on alcohol consumption, and is in the middle on fat consumption (42).

Prevention in the Swedish context includes not only medical care but also media information and various restrictions imposed on the population. (One effect of active information campaigns is a load on the health care system, especially primary health care.) Preventive measures have been taken against such factors as poor eating habits, physical inactivity, tobacco smoking, alcohol and drug consumption, sexually transmitted diseases (including AIDS), poor work environments, and pollution. Maternal and child health care—including several programs for prevention of disease during pregnancy, childbirth, and early childhood—have been strong features of the Swedish health care system since the 1940s. Several screening programs for both children and adults have long been in use; some, such as screening for congenital diseases, dental health for children, and breast and cervical cancer screening for women, are almost compulsory.

The government established and funded several institutions years ago with the mandate to combat certain public health problems—in particular occupational diseases. In 1992 a Public Health Institute was founded and funded generously to promote healthy life styles. This new institute is establishing professorial chairs for new public health research institutions throughout the country and is also running large-scale media programs to promote healthy life styles and prevent diseases, particularly from smoking and alcohol abuse. Sweden has tried for years to limit alcohol abuse by restricting sales to special state-owned shops with limited hours. However, this measure has not prevented alcohol abuse from being a serious problem in Sweden. Rules against smoking indoors in public places (including hospitals) are becoming increasingly common.

THE SWEDISH HEALTH CARE SYSTEM

Constitutional Basis and Legislative Background

All Swedish citizens are entitled to health and medical care, regardless of where they live or their economic circumstances. Health care is considered a public sector responsibility.

The Swedish health care system is decentralized. Before the 1970s, with the exception of the creation of medical regions in 1958, few major structural changes had been made in the system since the transfer of health care administration to the county councils in 1864. In the twentieth century, Sweden concentrated on developing universal financial coverage and providing personnel for its costly, complex system of state-operated hospitals.

Private health care plays a minor role in Sweden. Although practitioners increased substantially in numbers during the last decade, most physicians (about 90 percent) are still employed in the publicly run hospitals and within the primary health services (13). Although hospitals were public and the population was largely covered for hospital care through sick funds, out-of-hospital care was often not covered until 1947. In that year the National Health Insurance Act, covering physician services, outpatient services, and drugs, was passed by the Parliament. The national health insurance program was implemented in 1954 after a period of careful planning. In 1958, Swedish counties were organized into seven medical regions, creating intercounty cooperative clusters envisioned as necessary for efficient delivery of specialized services. (Box 7-1 shows some important milestones in Swedish health care.)

In 1961 a comprehensive plan was introduced to increase medical manpower by expanding medical education. New hospital positions were created for medical school graduates. By 1970 the center of gravity of the medical profession had shifted sufficiently toward salaried service that a reform making virtually all doctors employees of the state, unthinkable in 1948, was effected with little resistance.

BOX 7-1: Important Milestones in Swedish Health Care

1862	County councils formed
1928	County councils given statutory responsibility for acute care
1960	Private beds retired from public health services and county councils become formally responsible for outpatient care at hospitals
1963	County councils take over district medical service
1967	County councils take over mental hospitals
1970	Public health services established a uniform patient fee; employed physicians receive fixed salary
1975	Private physicians given opportunity to join insurance plan; reimbursement regulated
1980	County councils given responsibility for vaccination programs
1982/83	County councils take over two remaining state teaching hospitals
1983	County councils given full statutory responsibility for planning all forms of health care
1985	County councils given control over reimbursement and practice rights of private physicians
1991	Opportunity for pilot projects that place primary care under municipal control
1992	Municipal responsibility for health care of elderly (ADEL reform)
1993	Opportunity for pilot projects to coordinate financing between social insurance and health care

SOURCE Committee on Funding and Organization of Health Services and Medical Care, Three Models for Health Care Reform in Sweden (Stockholm Ministry of Health and Social Affairs, 1993)

Medical and social services were combined into the National Board of Health and Welfare in 1968. Even before this time, however, the central government had begun to transfer services to the counties. In 1961 responsibility for district doctors was transferred to the counties; in 1963 responsibility for mental hospitals was transferred (19). Subsequently, responsibility for university hospitals, public dental services, and services for the mentally handicapped was also given over to the counties.

The Health and Medical Services Act of 1983 finalized formal decentralization, giving the 24 county councils and three large municipalities further responsibility for the health of their inhabitants (including preventive care and rehabilitation). The money transferred from the central budget to the councils became a lump sum.

Each county has a politically elected council, but in negotiations with the central government as well as with employees' organizations, they tire

organized in the Federation of County Councils (FCC). The FCC has a (politically elected) board and a well-staffed central office. During the development of the current system for health care administration the central government has been responsible for research and development as well as for the education of physicians. For historical reasons, most of the education of other health care personnel rests with local authorities, counties, or communities.

Under the Health and Medical Services Act the councils are required to promote the health of residents in their areas and to offer them equal access to good medical care and to transportation in case of disease. The councils plan the development and organization of all needed health care. The legislation provides for the protection of each patient's integrity, including the right to be informed about his or her state of health and about available investigative procedures and treatment. Special regulations cover the protection of patients' identities in

file handling and in various registers. Somatic patients are free to discontinue medical treatment. (The rules for psychiatric patients are dealt with in separate legislation.) The National Board of Health and Welfare supervises all health care personnel, and any misconduct is investigated by the National Medical Disciplinary Board.

Administration

The administration of Sweden's health care system has several levels and branches. The state is responsible for ensuring that the system develops efficiently and according to overall objectives, in the context of the goals and constraints of social welfare policy. The Ministry of Health and Social Affairs (*Socialdepartementet*) is at the first level below the government, and parliament and is concerned mainly with outlining guidelines for health care, social welfare services, and health insurance.

At the second level are a number of relatively independent administrative agencies. The National Board of Health and Welfare (*Socialstyrelsen*) is the central supervising authority for health and social services. In addition to a central office, it has about 10 county units, all with the following three well-defined tasks:

1. supervising, following up on, and evaluating developments in all areas of health and social policy;
2. acting as a center of knowledge in the realm of social policy; and
3. acting as an expert body for the government.

The Federation of County Councils plays a key role in health policy and structural and manpower issues. Other central supervising authorities (mainly for health protection) include the National Environmental Protection Board, the National Board of Occupational Safety and Health, the National Food Administration, the National Institute of Radiation Protection, the Chemical Inspection, the National Drug Institution, and the Institute of Forensic Medicine.

The Swedish Council of Technology Assessment in Health Care (SBU), funded by the central government, reviews and evaluates information

TABLE 7-1: Public and Private Health Care in Sweden: Hospital Beds, Bed-Days, and Physician Visits, 1980 and 1992

	1980	1992
Hospital beds		
Public	117,500	93,700
Private	8,400	7,800
Bed-days		
Public	35,600,000	29,000,000
Private	2,800,000	2,500,000
Physician visits		
Public	18,900,000	20,200,000
Private	2,900,000	4,600,000

SOURCE Federation of County Councils, *Statistical Yearbook for County Councils 1994* (Stockholm, 1994)

on the medical, economic, and ethical impacts of new and existing health care technologies. The Swedish Planning and Rationalization Institute of the Health and Social Services (SPRI), owned in common by the central government and the county councils, works on planning and efficiency measures and special investigative tasks. It also supports research and development in health care administration. Other agencies include the National Corporation of Swedish Pharmacies (*Apo-teksbolaget*), which purchases and distributes drugs; the Medical Products Agency (*Lakemedelsverket*), which is responsible for drug control and registration; and the National Social Insurance Board (*Riksforsakringsverket*), which is responsible for the central administration and regulation of the national health insurance system. (Table 7-1 illustrates some recent structural changes in the health care system with respect to hospital beds, bed-days, and physician visits.)

Financing

The national health insurance system is a state-controlled and supervised financing instrument designed to create equity in health care. Financed by the state and by employer contributions, the system is administered by regional social insurance offices (*Allmänna försäkrings skassor*). Payments for medical care, dental care, and hospital

TABLE 7-2: Public Financing of Health Care in Selected OECD Countries, 1970 and 1992

	0/0 in 1970	o/o in 1992
United Kingdom	87	83
Sweden	86	88
The Netherlands	84	73
France	75	74
Germany	70	72
Canada	70	72
United States	37	44

SOURCE Organisation for Economic Cooperation and Development, OECD Health Data a Software Package for the International Comparison of Health Care Systems (Pam, France Organisation for Economic Cooperation and Development, 1993)

treatment are made directly from the social insurance office to the concerned health care administration or individual practitioner.

Patients pay fees for each contact with the health care system. The fee, set by each county council, varies from SEK50 to SEK130 (\$US5 to 15) per physician visit in outpatient care up to a maximum of SEK 1,600 (\$ US200) within 1 year, after which any health care service (except dental care) is free of charge during the subsequent year. This co-payment, which is the same for everyone, is kept by the county council. Consultation with private practitioners is reimbursed, and the patient pays between SEK120 and SEK200 (\$US15 to 25) depending mainly on the specialty of the physician. Similarly, pharmaceuticals are reimbursed. The patient pays a maximum of SEK120 (\$ US15) for the most expensive medicine and SEK 10 (\$US 1.20) for every additional medicine on the same prescription.

About 88 percent of health services in Sweden is publicly financed. Over the last 20 years, only minor changes have occurred in the proportion of public financing of health care in Sweden (which also is the case in other Organisation for Economic Cooperation and Development (OECD) countries). (See table 7-2.)

Health care costs in Sweden have increased rapidly in recent decades. The annual rate of increase was limited to about 1 to 2 percent during the 1980s. Since 1990, however, the volume of health services has decreased, and the costs in real

terms have decreased by about 1 to 2 percent annually. Costs are expected to decrease further in 1994 by about 3 percent (13).

In 1960 the costs of health care amounted to about 3 percent of gross domestic product (GDP), as compared with 8.5 percent in 1989 (18,34). In 1991 the total costs of health care amounted to SEK120,582 million (\$US 16,750 million), corresponding to per-capita spending of almost **\$US2,000**. (See table 7-3 for distribution of costs.)

The costs are financed approximately as follows: county councils, 60 percent; state subsidies, 16 percent; state funds, 12 percent; national health insurance reimbursement, 8 percent; and patients' fees, 4 percent. The general state subsidies are intended to level out differences in income between the county councils and include funds for education, research, and psychiatry (18).

Organization of the System

The health care system has several levels, the uppermost being the Federation of County Councils. The system has regional, county, and local levels, each of which is described briefly below.

Regional Level

Sweden is divided into seven medical care regions, each with a population of 11.5 million and comprising about three counties. These counties share one or more regional hospitals that are affiliated with a medical school and function as research and teaching hospitals. Among the specialized services that these institutions provide are neurology, radiation therapy, thoracic surgery, neurosurgery, pediatric surgery, and certain types of cardiac care. Some specialized services are provided on an interregional basis. (Thoracic surgery departments, for example, are located only at the four largest regional hospitals.)

County Level

Counties have an average population of 300,000, usually sharing one highly specialized central hospital with 15 to 20 specialties, and one or more district hospitals with at least four specialties

TABLE 7-3: Cost Distributions Within the Swedish Health Care System

Service	% of total
Inpatient Care	
Somatic short-term care	33
Long-term care	14
Psychiatric care	8
Total	55
Outpatient Care	
Primary care	14
Hospital outpatient care	7
Psychiatric care	2
Total	23
Drugs	10
Self-pay	12
Total	100

SOURCE LKELP 92 Report No 3, The Federation of County Councils, 1992 (In Swedish)

(e.g., internal medicine, surgery, radiology, and anesthesiology).

Local Level

At this level are the primary care districts with at least one local health care center for outpatient care and at least one nursing home for long-term care. At the health centers, care is provided by district physicians, district nurses, and midwives (if necessary as ambulatory care in the patient's home). The primary care districts also offer clinics for child and maternity care, and they operate screening and vaccination programs. Other branches of primary care include school health and industrial health services.

Because most medical care in Sweden is delivered by the hospitals, which are operated by the county councils, it is the counties that actually invest in new medical technology and decide whether to adopt a new technology. In addition, the budgetary authority of the counties constrains the services offered by the hospitals. Thus, physicians have less freedom in Sweden than they do in other Western countries to adopt services and to purchase equipment.

In theory, the four hospital tiers provide a clear hierarchy for acquisition of sophisticated new technologies. The regional hospitals come first, followed by the lower tiers. At each tier a service is provided only if there is a sufficient population base for it. (The case of computed tomography (CT) scanning, described later, will clarify how such decisions are made.) Rarely needed procedures are concentrated, and more experience with such procedures on the part of medical practitioners brings better results.

Each county's autonomy is somewhat limited by financial negotiations with the central government. Their freedom of choice also is constrained by cooperative agreements with other counties to provide specialized services on a regional basis. The objective of the regional system of medical services has been to ensure that specific types of services are delivered at the level (local, county, or regional) at which they can be provided most efficiently. In six of the regions, the university hospital, partly staffed by the medical faculty of the university, is the hospital responsible for highly specialized care in the region. The seventh region (Orebro) has no university, but its regional hospital is almost as well equipped for high technology as the university hospitals. Up to now, counties have had agreements with the regional hospitals and the other counties within the region concerning economic and administrative details of the delivery of highly specialized care.

Public Policy Concerns

In the early 1980s the Swedish economy slowed, which raised concerns about the high costs of health care. National caps have been put on county council taxes several times, constraining the rise of health care costs and also slowing medical technology diffusion.

Apart from economic pressures, the main weaknesses of health services in Sweden are considered to be (18):

- lack of integration of health and social services and health insurance (especially sickness benefits, early retirement pensions, and occupation-

- al injury insurance) and, within the health sector, of primary and hospital care;
- failure of general practitioners to act as “gate-keepers” for primary care, which results in a high proportion of direct referrals to hospitals; emphasis on institutional care, which may not always be effective and efficient;
- limited choices for patients; and
- insufficient incentives for health personnel to improve the productivity and efficiency of the health sector.

Although the level of public confidence in the health care system still is high, the system is generally considered to be somewhat rigid, and the level of patient orientation is viewed as being too low. With the growing concern regarding health care priorities, the focus is increasingly on protecting the most vulnerable groups, such as the elderly.

The demand on health care services is steadily increasing not only because of the growing numbers of elderly persons, but also as a result of medico-technical advances that allow treatment of conditions that were once untreatable. These factors, together with demands for restraints on public spending, encourage reforms.

Reform Proposals and Implementation

Sweden’s entire system of well-defined responsibilities for health care, with agreements on how money should flow and how patients are to be taken care of, is now under debate. To some extent this debate is due an imbalance between costs and resources, and to some extent it is due to decreased confidence in the system. Many new ideas are being tested, most of them originating in the United States or the United Kingdom. A political consensus now exists on reforming health services during the 1990s. Changes are certainly going to be introduced, probably of different types and with different goals in different counties (67). Common themes, however, are increased patient choice, reallocation of responsibilities and freer market mechanisms, competition, improved levels of service, and less bureaucracy.

A parliamentary committee was appointed in 1993 to review options for health care financing and organization. This committee was asked to consider three alternative models for the Swedish health system: 1) a continuation of the current system of financing, 2) a system in which primary health care providers become the budget allocation mechanism by buying services for their patients, and 3) a private insurance system.

The committee has responded with three models for health care reform (11). The first is based on the idea that within all county councils, there should be a separation of purchaser and provider roles, with a greater emphasis on reimbursement based on performance. The second model, described as the primary care model, involves transferring responsibility for health services from county councils to municipal councils. The assumption is that bringing services and political accountability closer to the citizens would mean that primary care would receive a higher priority. Under the new system, patients are allowed free choice of primary care center or doctor and of hospital, even across the county borders. The idea is to introduce an “internal market” with a “purchase and sale” situation in order to generate competition, based on the theory of incentives for improving productivity and efficiency (18). The third model is described as compulsory health insurance, which requires the replacement of tax financing with a system of social insurance. This would lead to a separation of insurers and providers (25).

The committee’s report compares the strengths and weaknesses of these three reform models based on criteria focusing on equity and on continued public revenues as the main source of financing of health care, along with increased freedom of choice and democratic influence. Although the introduction of business concepts into health care might sound attractive in theory, reality may produce substantial challenges, such as caring for elderly people with a mix of somatic and social problems.

It is assumed that reform will entail greater needs for central follow-up and evaluation, with

an emphasis on cost-effectiveness. Any new approach will also have to include monitoring and evaluating goal achievements; comparing inputs, expenditures, and results in different places and for different activities; and observing and evaluating the content and quality of various activities. Quality assessment and quality assurance are likely to become important tasks for, say, the National Board of Health and Welfare. At present, quality assurance activities are very “soft” and hardly affect professional functioning—a situation that seems certain to change in the future.

The Role of the Public

Politically speaking, if a new technology is cost effective at the central hospital level, the county council and taxpayers both have a role in deciding whether to acquire it. This does not always lead to cost-effective decisions, however. Swedish citizens (like those of other countries) resist the closure of local hospitals and often promote new technology for reasons of local pride. Still, the close link between citizens and resource decisions helps ensure that the public feels committed to the health care system. Although Sweden has one of the highest levels of per capita expenditures on health care in the world, these amounts have been clearly promoted by popular political choice.

As patients, Swedish citizens pay little for their health care services, and price is therefore not a mechanism for limiting the demand for such services. A major constraint on demand is the fact that patients often are forced to wait for services simply because the supply is insufficient. Physical queues are often necessary for preliminary consultation. Once a referral to a specialist is made, there is another wait before a consultation. If a nonemergency procedure (e.g., a surgical procedure) is recommended, there is a further wait.

Waiting time has fallen dramatically since 1991, when the government explicitly guaranteed services in another hospital or a private hospital for patients with certain conditions who had been waiting longer than three months. Services covered by this guarantee include coronary artery disease surgery, hip joint and knee joint replacement,

cataract surgery, gallstone surgery, hernia surgery, surgery on prolapsed uterus, treatment for incontinence, and hearing aid tests. A national fund was created to finance these procedures. As a result, there has been a rapid increase in the number of these surgical operations and there are now essentially no waiting times for them. Their increase certainly points to an expansion of indications, and concern is growing about the possibility of inappropriate procedures.

Constraints on the supply of services are successful because Swedish patients are collectivism in their orientation. The deference that Swedes display to government decisions reflects their confidence in the civil service and respect for government policies. Planners’ efforts to control the dissemination of health care technology are greatly assisted by this tendency of Swedish citizens to cooperate with their government (19).

CONTROLLING HEALTH CARE TECHNOLOGY

Research Policies

Although the central government is explicitly responsible for all research, some counties (especially those connected with regional hospitals or with a stronger economy) also support research activities, particularly those aimed at improving the content and quality of health services (67). The central state budget includes resources for university-based research and education, and medical faculties have been relatively well funded. The preclinical departments have especially large and well-educated staffs, and laboratory research activities in Sweden are generally considered to be excellent. The clinical institutions are not as well supported by the state budget, partly because of the dual responsibility for operating the university hospitals, which have small academic staffs responsible for research and education of both medical students and some paramedical personnel, and large, nonacademic staffs employed by the county for patient care. For along time all academic activity was concentrated in the university hospital, with its specialized beds and large outpatient de-

partments. During the last decade all universities have created special departments of primary care (sometimes called general medicine) headed by a professor and other staff. All academics must take part in research; the unwritten rule is that such activities should constitute about 20 to 25 percent of academics' time (the rest being divided between teaching and medical service).

The main source of research support is the Medical Research Council (MRC). Most of the MRC'S research funding goes to university pre-clinical departments, but some also is directed to clinical departments, primary care, or social medicine. During the last decade, the MRC has appointed special committees for health services research and technology assessment. It was partly through the initiative of the MRC and its technology assessment committee that the Swedish Council on Technology Assessment in Health Care (SBU) was created (see below). Other governmental research bodies—such as the Social Research Council (SFR) and the Council of Research (FRN)—also play a role in formulating government policy toward biomedical research. In addition, clinical research is supported by several large private foundations.

Sweden invests heavily in health-related research, primarily basic biomedical research. According to a study sponsored by the U.S. National Institutes of Health in 1980, Sweden invested the highest amount of public funds per capita in biomedical research and development in the world, with the United States a close second. Sweden also has an active pharmaceutical industry with relatively heavy investments. In 1993, approximately 50 percent of health-related research was financed by government and the other 50 percent by industry.

Sweden also has explicit policies, as already noted, to encourage certain types of research that can improve Swedish health services. The development of health care technology assessment is one example. However, there is increasing concern that clinically oriented research, which is supported through clinical activities, is losing financial support under health care reforms. This

problem has been noted by the Parliament, which is investigating the situation.

Medical Education and Employment Policies

The central government plans carefully to match physician training programs with current and anticipated needs. In recent years the policy has been to increase the number of Swedish physicians specializing in long-term care and psychiatry. Positions for specialists trained in the use of technology-intensive techniques has been relatively constrained. Most recently, however, the government has taken measures to further restrict admissions to medical schools and has initiated a thorough evaluation of medical education.

Once physicians are educated, the National Board of Health and Welfare can decide to a large extent where they will work, through its allocation of medical posts. Until recently, the Board determined the number of positions in different specialties throughout the system. This not only had an affected the control of health care technology but also helped ensure geographic access for the entire population. Recently, however, this policy was changed; determining the number of positions for doctors is now the responsibility of the county councils. Because the total number of physicians is still decided by the central government, county councils are limited in this respect. A similar system is applied to nurses, who represent a greater proportion of hospital personnel in Sweden than in most countries. (Nurses are trained to a high level and perform a variety of tasks ordinarily reserved for physicians in other countries.)

As with other functions, the central government has announced that it wishes to decentralize the administration of universities and schools for higher education. It is anticipated that the local governing board of universities will decide most of its activities by itself, adhering to certain standards of quality (67). One possibility is to create local foundations to run the universities. Many would welcome such a decentralization of policy-making, but others are concerned about loss of

uality in both education and research. In any event, it seems likely that the future will see marked alterations in the administration of education and research in Sweden.

Regulation and Control of Pharmaceuticals

Sweden has a well-organized central agency for the control of pharmaceuticals, the National Pharmaceutical Board, which became an independent institution in 1990. The agency has a reputation for high scientific competence and integrity, similar to that of the U.S. Food and Drug Administration (FDA) or similar bodies in the United Kingdom or Australia. When new medicines are registered—after thorough scrutiny of efficacy and safety—their price is agreed upon by the Pharmaceutical Board and the manufacturer or distributor. The drugs are then sold through the state monopoly (*Apoteksbolaget*), mostly on the basis of physicians' prescriptions (68).

Swedish patients have enjoyed an unusually favorable subsidy with regard to prescription medicine. The patient pays only a nominal amount, slowly increasing from SEK15 to SEK120 (\$ US2.50 to \$US 15), for all prescriptions written at the same time by the same physician. This situation has led to patients' requesting their doctors to write many prescriptions at the same time, in order to increase the amount paid by the government. During recent years, some restrictions have been introduced both regarding the amount that can be prescribed (only a three month supply) and the type of pharmaceuticals affected (e.g., vitamins and cough medicines are no longer part of the scheme).

A new bill is being discussed to decrease subsidies for medicines. The government has suggested both that the patient will have to pay a certain sum for each prescribed drug and that only the cheapest drug of the same kind will be subsidized. This would increase the amount that the patients must pay while decreasing government costs for drugs, now more than SEK10 billion. This bill is being resisted by both patients' organizations and the pharmaceutical industry.

There are only a few pharmaceutical enterprises in Sweden. Most medicines used are imported through subsidiaries of large international companies. The few Swedish companies are, however, quite successful and have considerable presence in the international pharmaceutical market. Part of this success is due to unusually good cooperation between university and industry research. (Highly qualified industrial researchers are appointed as adjunct professors, and this cooperation has stimulated research in both industry and the universities.)

International pharmaceutical companies frequently conduct early clinical trials in Sweden. Since the early 1980s, a clear agreement between the pharmaceutical industry and the FCC has established rules for clinical studies with new drugs. This agreement has been important for the trials' financial support as well as for patient safety and an improved image for the pharmaceutical industry.

Regulation of Medical Devices

In contrast to pharmaceuticals, medical devices have been much less regulated. Except for legislation on the control of sterilized disposable, the electrical safety of certain devices, and radiation safety, Sweden has had few legal rules to control the diffusion and use of medical devices. The main responsibility for this task has rested with health personnel. Since 1976, however, the National Board of Health and Welfare (NBHW) has had an advisory committee composed of representatives of the county councils, research institutes, and industry to monitor issues of the safety of the medical devices. All accidents and most major problems related to medical devices must be reported to this committee, which has in turn issued regulations and recommendations on safety.

In effect since 1993, new legislation has placed on industry the main responsibility "safe and appropriate" medical devices. The NBHW supervised the implementation of this legislation, which is part of a general harmonization of Sweden's rules with the policies of the European Union. The new legislation requires that produc-

ers of medical devices report malfunctioning equipment and enables the NBHW to request technical changes in the equipment or to stop the use of such devices.

Payment for Primary Health Care

In 1993 the central government introduced a radically new policy for paying for primary health care services. The new model features several characteristics of the United Kingdom's system of general practice—mainly a voluntary listing of the population with preferred providers (called “house doctors”) at outpatient settings, and a per capita allocation of the primary health care budget according to each provider's population size (a minimum of 3,000 people). This model is expected to increase patients' choices of providers and to encourage competitive behavior within the publicly operated health system. A potential problem with this change is that there are essentially no incentives for cost-effective medical procedures or for the provision of preventive measures in the new model. On the contrary, the model may encourage overtreatment.

Quality Assurance

The National Board of Health and Welfare introduced a special program for quality assurance in 1991. Several organizations, including SPRI, have begun concentrating on research in this area. A committee on collaboration and coordination among national health care organizations, colleges for the medical professions, and nursing colleges has been established to promote quality-related activities. In late 1991 this council asked the medical colleges to develop specific quality indicators for each specialty, which began to be available in 1992. Their purpose is to encourage departments to monitor their own performance continuously. Indeed, quality committees are becoming common in hospitals. (All hospitals have questionnaires to assess patient satisfaction; however, quality audits are still being developed.) The effects of all these activities related to quality of care is not yet known.

HEALTH CARE TECHNOLOGY ASSESSMENT

Sweden was one of the first countries to become involved in the assessment of health care technology. A study of CT scanning was carried out in the early 1970s (see below); even before this study, the National Board of Health and Welfare asked some prominent physicians to evaluate particular technologies to determine if they were “consistent with proven scientific knowledge and good experience” (68). Over the last 15 years, formal assessments have been increasingly accepted in Sweden and are carried out in many institutions.

Swedish Council on Technology Assessment in Health Care (SBU)

Through the combined efforts of the MRC, politicians in the government and Parliament, assisted by the Board of Health and Welfare and SPRI, SBU was created in 1987. Its basic purpose was intended to update the Swedish government and the county councils with respect to scientific information on the overall value of medical technologies, especially new technologies (16). Cost containment was never the main aim, as it has been in other countries; the government did not wish to slow the introduction of new medical advancements. SBU was envisioned as an organization that would both assess important technologies and serve as a coordinating body for activities in Sweden. The idea was to give the SBU three years to see if creating a more permanent organization would be sensible. The desired outcome was the reorienting of policy and practice in constructive directions (67).

The board of the SBU was made up of representatives of important organizations in health care. It was envisaged that the board would have enough competence to select suitable fields for assessment as well as suitable methodologies. At the end of the trial period, SBU was producing high-quality reports from an international perspective and had already had important effects on clinical decisionmaking. Independent reviewers proposed that the SBU be set up as an independent authority fi-

nanced by the state. The government accepted this proposal and presented a bill to Parliament for approval; thus, the permanent Council began to function in 1992 with a budget of SEK12 million (\$US1.5 million).

The SBU depends on specialists working in the health services, mostly those outside university centers, to ensure contact with problems encountered in the daily routine of medical services (67). The SBU's studies are not merely technology assessments but also analyses of the nature of particular problems in Swedish society and evaluations of context and technology from diverse standpoints (including social and economic). Several SBU reports discuss the problems of assessment and propose methods for solving them (22,53,54,62). The SBU has also published a report recommending priorities for assessment (54).

The first SBU technology assessment concerned preoperative investigations in elective surgery (55). The study team reviewed the literature and concluded that there was little justification for routine use of preoperative x-rays, electrocardiograms, or laboratory tests. A survey of practice revealed considerable variations in the use of such tests and an economic analysis showed that the cost for complete preoperative investigations in Sweden totaled SEK726 million.

The SBU recommended that preoperative routines not be used in the absence of specific indications. An extensive "marketing" effort was used to convince surgeons and anesthesiologists of the wisdom of these recommendations. Follow-up surveys of practice were done in 1990 and 1991 to evaluate the impact of the report. The evaluation in 1990 showed a significant decrease in routine preoperative testing that continued in the 1991 measurement. The actual savings, apart from the increase in quality of care, were SEK50 million per year, or five times the SBU'S yearly budget at that time.

Another full-scale assessment concerned the problem of back pain (56). Most commonly used treatments were found, through a literature review, to be either ineffective or unproven; however, early movement and rehabilitation were found to have a positive impact on recovery. Moreover,

the SBU report found that back problems were related to both physical and psychosocial working conditions. The report recommended a cautious approach to diagnosis and treatment, and more research on the efficacy of proposed treatments. It also recommended systematic approaches to changing individuals' working conditions so as to reduce the problem of back pain. Extensively publicized, this report led to a renewed discussion of the disorder throughout Sweden. Its impact is presently being assessed. Other SBU reports have dealt with stroke (59), percutaneous transluminal coronary angioplasty (58), magnetic resonance imaging (57), and early detection of diabetic retinopathy (60).

Several large projects are currently under way at the SBU. One is a thorough evaluation of the treatment of mild to moderate hypertension. Although many expert committees have made recommendations concerning this condition, the literature has never been examined to evaluate results in relation to resources needed for different types of patients. The study has already raised serious questions about the efficacy of treating mild to moderate hypertension.

Another large project concerns the rationale for radiation treatment of cancer. A Swedish working group of oncologists, economists, and experts in critical assessment is working to evaluate the voluminous literature on efficacy and cost-effectiveness. In addition, an extensive survey is being carried out to document the radiotherapy situation. Because this is a sensitive field, an international expert group has also been appointed to assist in preparing the final report. In addition, the SBU is studying the appropriateness of coronary artery bypass surgery (CABG) in Sweden, using methods developed by the RAND Corp. (10,69).

Once an SBU report is completed, it is distributed to decisionmakers, clinicians, nurses, and administrators within the health care system. The SBU has also begun publishing a newsletter that covers not only SBU studies but also national and international assessment activities. Furthermore, each year the SBU arranges at least one major conference introducing or concluding an SBU proj-

ect. It also organizes courses, seminars, and lectures by foreign experts.

During 1992 and 1993, when questions arose in Sweden concerning the benefits of psychiatric care, the SBU reviewed psychiatric procedures in Sweden and estimated the total costs for medical care for mental illness. The Parliament showed considerable interest in this area and gave the SBU additional funding to investigate mental health technology. In 1993 the SBU began to organize a large study of the use of psychotropic drugs to treat psychosis.

The growing visibility of the problems of health care evaluation, along with the SBU'S work, has given the field of technology assessment in health care a high profile in Sweden. In 1993 the Parliament discussed the possibility of setting aside 1 percent of national health expenditures for health services research, including technology assessment.

The main problem for health care technology assessment in Sweden is the large number of technologies needing assessment and rationalization. In response to an SBU survey of practitioners, administrators, politicians, and patient organizations on new and existing technologies needing assessment, 1,800 responses were received. Relatively few technologies can be scrutinized as carefully as CABG or CT scanning, and relatively few can be controlled directly by the system. Hundreds if not thousands of technologies remain unevaluated and uncontrolled.

Consensus Conferences

Consensus conferences have been organized in Sweden since 1982, following the model developed at the National Institutes of Health (NIH) in the United States (7). A conference on total hip replacement was held a few months after an NIH conference on the same subject. As of 1993, about 15 conferences had been held. Consensus conferences are organized and supported by the MRC and SPRI; the subjects they address are of importance to the county councils and are selected by a special MRC subcommittee.

Although the Swedish conferences follow the NIH format closely, they also have a different scope. In the United States conferences focus on the safety and efficacy of a technology. In Sweden this focus is retained, but the conferences also try to address questions of health care organization, cost-effectiveness, and social and ethical considerations.

An evaluation of the Swedish program of consensus conferences was undertaken in 1985 and 1986. Separate reports described how the consensus statements were reached and were received by physicians (29) and by politicians and administrators (6). More than half of the latter indicated that they had found the statements of one or more conferences to be of practical value; in some cases, the statements had a direct effect on political decisions. The physicians' evaluation studied the effects of conferences on hospital-based physicians in supervisory positions within relevant clinics. Awareness of particular consensus conferences was high. According to about 10 percent of the respondents, a consensus statement had changed clinical practice. Most physicians said that there was no change because the consensus statement reflected clinical practice prior to the conference (29). With the further development of health care technology assessment in Sweden, the MRC is reducing its support for consensus conferences. Although consensus conferences played an important role in demonstrating the need for technology assessment in health care, the MRC feels that this activity has become less important—particularly because of the establishment of SBU.

Swedish Planning and Rationalization Institute (SPRI)

SPRI has a very broad mandate to study issues of health care, including such issues as resource use, the diagnosis-related group (DRG) system, health economics, the use of computers in medical decisionmaking and administrative purposes, planning of health services, and quality of care. SPRI was involved in technology assessment very ear-

ly, particularly through studies on CT scanning (described below); and gradually developed a more comprehensive program for technology assessment. Nonetheless, technology assessment was considered insufficient, and this situation led to discussions about a new agency—which in turn resulted in the creation of the SBU. SPRI subsequently refocused its attention on quality assurance; however, it continues to undertake ad hoc studies of technology, mostly in collaboration with the Nordic Evaluation of Medical Technology (NEMT).

Nordic Evaluation of Medical Technology (NEMT)

NEMT consists of staff from four Nordic institutes: SPRI, the Danish Hospital Institute, the Finnish Hospital League, and the Norwegian Hospital Institute; there is also Icelandic representation. NEMT generally produces one report every other year. These reports are usually surveys of ex-

isting practice in the countries in a particular area of medicine and diffusion of technologies in that area. Recent reports have dealt with magnetic resonance imaging, prostate cancer, and coronary artery bypass surgery. NEMT is currently conducting a study of the diffusion, use, and effective monitoring of treatments with anticoagulants.

Center for Technology Assessment

This center, which is located at Linköping University, was established with the financial support of the local county council in the mid-1980s. It has been particularly active in studying the cost-effectiveness of pharmaceuticals (8,30) and has also participated in primary data collection, as in a randomized study of renal lithotripsy (9). The Center has developed into an independent research institute; currently, its main areas of research are economic assessments, technology diffusion, and the use of technology by the disabled.

Case studies

TREATMENTS FOR CORONARY ARTERY DISEASE

Beginning with Lindgren's stellate ganglion resection experiments in the late 1940s (31), Sweden was at the forefront of experimental surgical techniques to relieve angina pectoris. Four fully equipped thoracic surgery clinics were established in Sweden in the 1950s. Activities were dominated initially by lung surgery for tuberculosis and carcinoma of the lung and subsequently by operations for congenital heart disease and heart valve problems.

Nonetheless, when coronary artery bypass grafting (CABG) was introduced in various Western countries, Sweden approached the new procedure with considerable caution, although experts on an advisory body of the National Board of Health and Welfare agreed that the bypass procedure was con-

sistent with proven scientific knowledge and good practice. It was instituted on a small and experimental scale in 1973 and 1974 (66).

The central question for Swedish planners concerned how to implement the technology. Specifically, the issue became choosing the appropriate tier of the hospital hierarchy for introduction of CABG (19). CABG requires enormous ancillary support, including intensive care units, heart-lung machines, and blood gas monitoring. The sites for CABG were thus predetermined, as the location of the thoracic surgery departments had already been established.

Introduction of CABG was slow. (See table 7-4.) In 1977 only about 220 CABG operations (about 27 per million Swedes) were performed; by 1979 that number had increased to 404 (50 operations per million inhabitants). At the same time

TABLE 7-4: CABGs and PTCAs in Sweden, 1977–1992

Year	CABGs	PTCAS
1977	220	—
1979	404	—
1980	503	—
1981	727	—
1982	836	3
1983	1,236	46
1984	1,574	74
1985	1,970	165
1986	2,313	282
1987	2,774	465
1988	3,518	654
1989	3,946	858
1990	4,329	1,098
1991	4,642	1,774
1992	6,286	2,760

SOURCE T Aberg, *The Development of Thoracic Surgery During the Last 40 Years* (Stockholm SBU (in press), 1993 in Swedish).

the World Health Organization (WHO) had stated that the theoretical need for CABG was about 150 per million people (70). One limiting factor was the number of intensive care beds available to the thoracic surgery clinics. Another was a change in the heads of the cardiothoracic centers (all the chief surgeons retired within a period of 5 years).

When the U.S. Veterans Administration (VA) trial was published in 1977 (36) showing the clear benefits of CABG, Swedish thoracic surgeons and cardiologists attempted to treat only the most promising candidates with CABG and to treat the remainder with drugs. The Swedish level was seen as being too low, and plans were made to increase the numbers incrementally, in order to approach the WHO recommended level of 150 per million. The expansion was too slow, however, and long waiting lists developed. Private centers were established to meet some of the need; the public sector also responded, and the number of centers was gradually increased to the current number of eight.

Percutaneous transluminal coronary angioplasty (PTCA) was introduced in Sweden in 1982 and has gradually diffused into practice. However, it was adopted later and at a slower rate in Sweden than in other industrialized countries (58). At present there are about 25 PTCAS per 100,000

population in Sweden, as compared to about 70 CABGS per 100,000. The total direct costs of all CABGS is about six times that of PTCAs. Both CABG and PTCA procedures continue to increase in frequency because of their diffusion to counties where the demand still is not satisfied, expanding indications for revascularization, and the availability of resources from the Guarantee Fund, which applies to both procedures. Because surgical backup for PTCA is necessary, its diffusion has been limited to the eight centers performing CABG. There are no specific policies concerning PTCA; however, the regional structure, the limited number of surgical centers, and financial constraints have certainly slowed its diffusion. Other factors are medical concern for the high rate of restenosis, insufficient assessment of both PTCA and CABG, and cost concerns (58), along with a struggle between radiologists and cardiologists over control of PTCA (2).

Despite the slow implementation of CABG, there were no active protests from either patients or physicians until the mid- 1980s. By 1985, waiting lists were more than one year in Stockholm, Uppsala, and other sites. An evaluation sponsored by the MRC showed that patients were dying while on the waiting list (2); indeed, the mortality rate could be 10 percent per waiting year. Patients began to complain, and a 1987 report from an expert group highlighted the issue of waiting lists (15).

The Ministry of Health took the initiative of developing a “guarantee” that a patient on the waiting list for three months could go anywhere in the country as a priority case. Up to that time, patients were largely confined to their own catchment area, and counties were reluctant to send patients to another county. Waiting time is now seldom more than six weeks, and death of patients on the waiting list is rare. (The evolution of the waiting list is shown in table 7-5.)

The Ministry of Health also appointed a group of experts to develop national indications for CABG (probably setting an international precedent). An expert group appointed by the National Board of Health and Welfare reviewed the need for

TABLE 7-5: Patients with Coronary Artery Disease Awaiting Diagnostic Workup and Treatment in Sweden, 1987–1993

Year	Waiting for	
	Diagnostic workup	Operation
1987	2,000	750
1988	NA	1,150
1989	2,566	1,529
1990	2,903	NA
1991	1,756	1,243
1992	1,521	915
1993	1,346	827

KEY NA = not available

SOURCE T Aberg, *The Development of Thoracic Surgery During The Last 40 Years* (Stockholm SBU (in press), 1993 (in Swedish))

CABG and PTCA in 1987 (39). The group concluded that the combined need would be 6,500 procedures in 1992, at a time when the total was about 4,000. Because of these reports, additional resources were made available, leading to a rapid increase in the number of procedures, particularly PTCA. These increases are still continuing. (See table 7-4.)

Despite these reports, the costs of CABG were of little interest until the development of private sector clinics paid from public funds. The public sector then stimulated studies of the procedure's costs in public hospitals and sought ways to improve its effectiveness while reducing costs. Today, the average cost of a CABG procedure in Sweden is about SEK125,000 (\$ US15,000).

In 1992 SBU published a comprehensive report on PTCA that also considered alternatives, including newer technologies. One of the main conclusions of the report was that:

The paucity of methodologically strong comparisons, particularly the virtual absence of RCTS comparing PTCA, CABG, and medical treatment, severely limits informed clinical practice and policymaking concerning the management of coronary artery disease (58).

In 1993 SBU reviewed the appropriateness of CABG in Sweden using the RAND method (10), with support from the MRC, the county councils, and the National Board of Health and Welfare and

the full cooperation of thoracic surgeons and cardiologists. Because of the failures of PTCA (primarily the problem of restenosis), there has been considerable interest in the newer technologies for opening coronary arteries, including laser technologies, stents, and rotational atherectomy. These devices all are considered experimental (58) and are used in only one of the centers for thoracic surgery.

Although Sweden's "wait-and-see" approach to new technology avoids costly mistakes, slow implementation of a new and beneficial technology means that many deserving candidates cannot receive the procedure. This case illustrates once more the collectivism orientation of Swedish patients and their willingness to trust their government's decisions. Despite CABG'S SLOW implementation, there were no active protests from either patients or physicians until the 1980s. Patient and provider protests and political actions are now more frequent than they were in the past.

MEDICAL IMAGING (CT AND MRI)

Computed Tomography (CT)

In general, the field of diagnostic imaging has not been the subject of specific policymaking in Sweden, with the exception of assessments of CT scanning and MRI. Hospitals have been free (within their restricted budgets) to purchase diagnostic imaging equipment as they deemed appropriate.

The CT scanner was introduced in Sweden in 1973, the same year that the United States acquired its first scanner. By May 1978, however, Sweden had 1.6 scanners per million people, whereas the United States had 4.8 per million (19). This is surprising, considering that Sweden had originated the specialty of neuroradiology and was a leader in radiology and radiotherapy. (The diffusion of CT scanning is shown in table 7-6.)

Planners in Sweden did not view the introduction of CT scanning as a simple case of adding another machine. They viewed CT as a technology that would partially replace the functions of other diagnostic modalities, which could there-

TABLE 7-6: Diffusion of CT Scanning and MRI in Sweden, 1973-1994

Year	CT scanning	MRI
1973		
1974	1	
1975	3	
1976	6	
1977	11	
1978	12	
1979	15	
1980	16	
1981	18	
1982	22	
1983	33	
1984	36	2
1985	41	2
1986	48	5
1987	56	5
1988	77	7
1989	85	9
1990	91	11
1991	97	18
1992	104	22
1993	115	34
1994	120a	42*

*Estimated.

NOTE. Figures represent the accumulated number of units installed
SOURCE Swedish Council on Technology Assessment in Health Care (SBU), *MRI--Magnetic Resonance Imaging* (English language summary). Stockholm, 1992

fore be allocated fewer resources. The problem was thus ensuring that CT scanners were not installed beyond the point of diminishing returns in terms of the diagnostic examinations they replaced. Therefore, when the first head scanner was installed by the Karolinska Hospital in Stockholm, an evaluation was immediately mounted to rationalize further purchases.

The evaluation team weighed the costs of the head scanner against those of cerebral angiography and pneumoencephalography at various levels of examination. The basic question was this: How many angiographic and pneumoencephalographic examinations would have to be replaced at a given hospital by CT scanning for the costs of the scanner to be justified economically? Only

equipment, hospital, and personnel costs were included in the analysis, although other costs and benefits (including medical and psychological value of the innovation) were listed.

The cost-effective level of installation of CT scanners was determined to lie somewhere between the levels of the regional and central general hospitals (27,28). Some of the large central hospitals did almost as many brain examinations as the smallest regional hospital did; thus, the evaluation did not recommend which institutions should acquire CT scanners. Rather, it published charts that county councils could use to graph specific levels of usage of angiography and pneumoencephalography at a given hospital in order to determine whether replacement of these modalities with a CT scanner would be appropriate.

The success of the Swedish evaluation was probably due in large part to its timeliness. The county councils needed information to help their decisionmaking, and the information arrived on time and was credible. Most Swedish hospitals waited for the report and followed its recommendations. Only two scanners had been installed in Sweden at the time the report was released; by December 1978, Sweden had eight head scanners (all but one at regional hospitals) and six total body scanners (two of which were located at the largest central hospital). The county councils expected the CT scanners to pay for themselves; thus, the hospitals received only a small additional budget when they purchased a scanner.

In 1985, a consensus conference on stroke was held in Sweden (35). Based on the economic consequences of missing a diagnosis of stroke, the consensus panel suggested that all hospitals should have CT scanners. This report led to an increased diffusion of CT scanners in the late 1980s. The importance of CT scanning for this indication was further emphasized in an SBU report in 1992 (57).

Magnetic Resonance Imaging (MRI)

MRI was introduced to the world market in 1978, and the first MRI scanner was introduced in Sweden in 1984 and installed in the Academic Hospi-

tal in Uppsala (23,52). Diffusion in Sweden was slower than in some other countries. By mid- 1992 nearly 20 hospitals had installed MRI scanners. Future plans indicate that between 30 and 40 hospitals hope to have access to this technology within a few years.

The first technology assessment of MRI in Sweden was performed by SPRI in 1984 (49). Although it essentially described only the state of the art, this report immediately led to an unusual policy measure adopted by the Federation of County Councils, which stated that a moratorium should be placed on MRI until a thorough assessment of the first installed machine had been performed. This initiative did not stop some hospitals from acquiring MRI, but it certainly slowed diffusion during the following years. By 1990, however, the number of MRI units per population had caught up with the diffusion rate in most other European countries, in part as a result of the assessment of the first installment. (See table 7-6.)

In 1990 the NEMT program, representing the five Nordic countries, carried out a comprehensive evaluation of radiology in those countries. SPRI also studied the numbers and utilization of MRI in the Nordic countries in 1990 (50). These reports did not specifically affect policy or practice but focused attention once again on diagnostic imaging.

In 1992 SBU published an assessment of MRI in the context of diagnostic imaging, especially CT scanning (57). It included, in addition to a description of clinical aspects of MRI and a comparative analysis of the sensitivity and specificity of competing modalities for diagnostic imaging, a thorough literature review, studies of diffusion from an international perspective, surveys of perceived need and current examination practices, cost calculations, a cost-effectiveness analysis, and description of technical aspects of MRI. The report showed that:

- diffusion of MRI in Sweden was relatively slow,
- there was little evidence to support a speedier diffusion,

- many hospitals had plans to acquire MRI within the next few years, and
- although MRI could replace many conventional diagnostic procedures, the cost would be much higher with no clear evidence of superiority in diagnostic accuracy except in a limited number of cases and indications.

The future potential of MRI, both in research and clinical practice, was clearly acknowledged in this analysis, but the report concluded that CT scanning will remain the most important diagnostic measure for diseases of the brain for the foreseeable future. Recognizing the potential of MRI, SBU stated that its role and limitations would not be completely determined during this decade in part because of a lack of "rigorous scientific studies which compare the results of MRI examinations with other imaging techniques. Likewise, no published study verifies the cost effectiveness of MRI in relation to other techniques," (57). In addition, the report stated that the possible long-term risks of placing the body in strong magnetic fields are unknown. Although MRI can reduce the need for some other examinations, such as CT scanning, angiography, arthroscopy, and ultrasound, the report demonstrated that total net costs following the introduction of MRI would increase considerably.

This report was cautious in its attitude toward further MRI installations, pointing out the financial costs and the need to consider the existing capacity of diagnostic imaging (primarily CT) before purchasing an MRI scanner. Many hospitals are still adopting a wait-and-see attitude.

LAPAROSCOPIC SURGERY

The laparoscope has been used in Sweden since the mid- 1960s, mainly in diagnostic gynecology (20). The performance of laparoscopic cholecystectomy in France in 1987 and 1988, and the reports of Dubois and coworkers (12) were of considerable interest in Sweden. Several surgeons from Gothenberg visited France in 1990 to learn about this procedure, which they then introduced in Sweden. It spread rapidly, fueled by media re-

ports and patient demand, as in other countries. By 1991, 68 percent of surgery departments either were providing laparoscopic cholecystectomy or intended to begin (26). Other applications of laparoscopic surgery have spread more slowly.

Interest also has been increasing in laparoscopic treatment in gynecology. Beginning with sterilization via laparoscope in the early 1980s, the use of treatment laparoscopy has gradually spread. Puncture of ovarian cysts is diffusing currently. Since the late 1980s laparoscope have been used in gynecology to remove ectopic pregnancies and blocked tubes or ovaries. During the early 1990s innovative procedures spread widely through gynecology in Sweden. Although these procedures have been found to take up to 100 percent more time than traditional procedures, they are considered cost effective because of the patients' rapid return to normal functioning. Normal recuperation time in gynecology with these procedures is a few days compared to 2 to 4 weeks with traditional procedures (12).

To encourage less invasive surgery, a special fund was set up by the health insurance funds in 1991 to encourage services associated with shorter periods of sickness. Most of the 65 hospitals in Sweden that provide laparoscopic surgery received funds for acquiring the equipment, the total cost of which was SEK40 million (\$US4 million).

SBU recognized the potential of less invasive surgery in 1990 and commissioned a review of the literature on all specialties of medicine and surgery. Although this review was not published, support was obtained from the European Commission to study the cost-effectiveness and the diffusion of 10 types of minimally invasive therapy (MIT) in five European countries, not including Sweden (4). Information collected on the diffusion of these procedures demonstrated that Sweden was one of the earliest innovators in this field in Europe.

Since 1990, SBU has continued to monitor developments in MIT in general and laparoscopic procedures specifically. In 1992 SBU carried out a survey of laparoscopic surgery in Sweden, focusing on five conventional surgical procedures that could be replaced partially by laparoscopic proce-

dures. (See table 7-6.) SBU estimated that about 25,000 conventional operations could be replaced by laparoscopic technique each year, which would reduce the number of bed-days by about 32,000 and the number of days of sick leave by about 210,000; the cost savings per year thus could be about SEK200 million per year if such replacements were actually to occur (61).

The laparoscopic technique for cholecystectomy is now well established and seems to be the first option for this condition in Sweden. A recent survey showed that 70 to 75 percent of all cholecystectomies are performed by laparoscopic technique (24). Early enthusiasm for laparoscopic surgery led to the belief that within a relatively short time, about 70 percent of all conventional surgical techniques would be replaced by the laparoscopic technique. (See table 7-7.) However, applications of laparoscopic surgery in fields other than cholecystectomy (e.g., appendectomy and inguinal hernia), have been slow because of concern about complications. The general feeling in Sweden is that estimates of the efficacy of other procedures seem to have been too optimistic (24). The use of laparoscopic technique for several indications is thus viewed as appropriate only within the frame of a randomized controlled trial.

Laparoscopic surgery is not subject to other specific policy measures in Sweden. Because of budget constraints and the regionalized system, therapeutic laparoscopy is found primarily in larger hospitals, but it also has spread to smaller hospitals. The main concern with these procedures is the expansion of indications and the growing number of surgical procedures. Concern is also growing about potential future needs for reoperations because of increased risks of complications that may result when surgeons have a less complete overview of the operating field than they do with conventional operations. Several randomized controlled trials are underway in Sweden to establish whether these and other concerns are valid. In addition, a National Register of Laparoscopic Surgery established in 1993 is monitoring the volume, complications, and certain technical aspects of the procedures.

TABLE 7-7: Estimated Number of Conventional Surgical Procedures Replaceable by Laparoscopic Surgery in Sweden

Procedure	Po en a rep a emen	
	Numbe o procedures	N mbe o bed-days
Gallstone	5,000	10,000
Gallbladder	1,000	7,000
Appendicitis	8,600	8,600
Hernia	10,000	0
Other	1,400	5,600

SOURCE Swedish Council on Technology Assessment in Health Care (SBU), "Medical Science and Practice" (Newsletter), No 1-2, 1993, (in Swedish)

TREATMENTS FOR END-STAGE RENAL DISEASE (ESRD)

Renal dialysis was introduced to Sweden in the early 1960s; by the end of 1965, six of the approximately 40 centers in Europe treating patients with ESRD were in Sweden (5). Both dialysis and transplants were performed in Sweden quite early in their development. The Swedish program has emphasized transplants; in 1980, Sweden was one of only six countries in which more ESRD patients had had transplants than were on dialysis.

Treatment of ESRD became a policy issue by 1965 because of a shortage of hemodialysis services in the Stockholm region. In 1966 an ad hoc committee investigated the issues and presented a proposal with estimates of the need for hemodialysis and the organization of renal medicine. (Transplant services were also dealt with, but more superficially.) In 1967 the National Board of Health issued national ESRD policy recommendations stating that hemodialysis should be provided at the regional level only and that transplant surgery should be concentrated in two or three regional hospitals (37). This report was followed by a 1970 policy document stating that renal medicine and hemodialysis services should be regarded as regional services (i.e., each regional hospital should provide treatment for the entire population with chronic renal failure in its region). This policy document also recommended that renal transplant be a "multiregional specialty"

(i.e., four regional hospitals should serve the population of specific catchment areas made up of two or three regions) (48).

These reports led to a strong debate within the community of nephrologists in Sweden. Regional medical services committees, which had authority for planning ESRD services, did not uniformly endorse the centralization of hemodialysis services. Several hospitals already had started decentralized units and refused to close them. By 1975 most health care regions had two or more decentralized units; after that year, the Board made no efforts to stop this development (5). Transplants, however, did become a multiregional service.

The cost-effectiveness of ESRD services has always been an issue. The 1970 policy recommendations presented cost estimates and predictions; since then, although many studies have been carried out and conferences held, the government has not pursued the issue of the economic consequences of the ESRD program (5)—perhaps because ESRD was introduced during a period of economic expansion. Care for a dialysis patient in Sweden costs about 2 million SEK per year (US\$250,000).

By 1970, Sweden had the highest rate of patients receiving ESRD treatment in the world, (5) and has continued to have one of the highest treatment rates. It is estimated that a 70 percent increase in the ESRD population will occur between 1990 and 1995 (from 1,500 to 2,400) because of the aging of the population (40) and improving survival rates (32).

Despite the high overall provision of ESRD treatment and high proportion of transplanted patients, several national goals have not been met. Large and persistent variations in the provision of ESRD treatment are still seen. The high reliance on hospital hemodialysis and the limited use of home dialysis are also considered unsatisfactory (5). There are currently about 400 beds for dialysis at 40 different hospitals. About 75 patients are on hemodialysis at home, and 325 are treated with peritoneal dialysis. Dialysis is also quite common in the elderly; more than 30 percent of dialysis patients were 70 years or older in 1990 (40).

Erythropoietin (EPO)

EPO was marketed in Sweden beginning in 1989. It was subject to evaluation for efficacy and safety (like any other drug), was approved for the specific indication of anemia in renal insufficiency, and was then paid for exactly like any other pharmaceutical product. Any physician may prescribe EPO, the diffusion of which has been extraordinarily rapid; the number of doses rose by 50 percent during the 1991 to 1993 period. EPO'S **cost to the health services** was SEK78 million in 1992 (more than \$US1 million per million people). All other Scandinavian countries have lower volumes and lower average costs for EPO (although this high volume and high **cost has not been an issue** in Sweden to date).

A 1990 doctoral dissertation stated that people were dying because of lack of dialysis in Sweden, especially among the elderly population. Publicity on this issue led the National Board of Health and Welfare to issue a quick "alarm report" on this issue. The Board was unable to confirm that people were dying; however, it recommended that the county councils improve their planning processes for ESRD treatment, especially dialysis.

NEONATAL INTENSIVE CARE

Specialized clinics, fully equipped for neonatal intensive care, appeared in Sweden during the 1960s **and gradually** spread. Neonates are cared for in all of the 43 departments of pediatrics in Sweden, which include some degree of intensive care. Many high-risk pregnant women are referred to regional hospitals before delivery. Modern respiratory care, including ventilator therapy for newborns, has spread into the seven regional hospitals and to eight of the central county hospitals. There are currently 15 hospitals throughout the country with close to 100 beds for specialized neonatal intensive care for about 130,000 newborns per year. An estimated 500 to 600 babies per year are ventilated in these neonatal intensive care units (NICUS). The technology of neonatal intensive care has dramatically improved survival for the pre-term newborn; also, the technology has paved the way for increased clinical understand-

ing of several essential physiological and pathogenic phenomena.

The organization of neonatal intensive care has developed along similar lines in most hospitals. NICUS are run by pediatric specialists, with one exception (in Gothenberg) where the clinic is under the supervision of specialists in anesthesiology. The Swedish system developed without national concern for its role and place in the overall structure of Swedish health care; nevertheless, NICUS have mainly been concentrated in the large regional and central district hospitals. They have developed with the close collaboration of obstetrics and pediatrics departments.

Improved care for very pre-term infants at extremely low birth weights has gradually become a subject for professional as well as public concern. The discussion has centered around ethical dilemmas, the limits of neonatal intensive care, the costs and benefits of this service in general, and issues of staff competence and experience and questions about the geographical distribution of the resources—particularly of new and improved medical technologies.

In the 1980s the National Board of Health and Welfare established an advisory committee of experts in perinatology to monitor developments in this field. This committee arranged a conference in 1989 at which it reviewed recent evidence on neonatal mortality and morbidity, with particular reference to prognostic factors and potential development of handicaps in premature infants. Other available epidemiological evidence in this area was also reviewed, as were legal, ethical, and economic issues (38).

Among the facts presented were the following:

- the evidence of a significant increase in survival because of NICUS is overwhelming;
- parallel to this development, with many more healthy newborns surviving, the incidence of neurological diseases (and particularly of multihandicapped individuals) among newborns could be seen as increasing;
- establishing a firm prognosis at an early stage in the neonatal period is difficult;

- cesarean sections for very pre-term deliveries bring significant increased risks for both post-operative complications and pregnancies at a later stage; and
- the relationship of costs and benefits seems reasonable in comparison with other expensive medical procedures.

The conference concluded that although it is not possible to predict prognoses in individual cases, there is a practical need to establish a limit of at least 25 weeks of pregnancy, after which (in principal) obstetric interventions should be considered. Regarding the newborn infant, a more individualized approach was recommended. The majority of the neonatologists thought it correct to take an initially open but wait-and-see attitude toward ventilator therapy in some instances; a minority thought that initially very active treatment is always justified. All agreed that it is ethically defensible to discontinue treatment of very severely injured newborns. Furthermore, a national study was recommended to investigate the incidence, mortality, short-term and long-term morbidity, and prognostic factors for neonates below 1,000 grams. (This study is in progress.) Finally, it was recommended that a national register be established for all pre-term newborns under 1,000 grams to monitor and define prognostic factors in the neonatal period.

The conference's recommendation limiting most intervention to pregnancies of at least 25 weeks has had an impact on medical practice in Sweden. This recommendation has been subsequently supported by evidence from clinical studies (17).

Extracorporeal Membrane Oxygenation (ECMO)

In 1991 a state-of-the-art conference on NICUS was organized by the Sweden Medical Research Council. The proceedings, published as a supplement to the *International Journal of Technology Assessment in Health Care* (46), pointed to many research questions, including the need for controlled studies of continuous positive airway pressure (CPAP) and ECMO. A comprehensive

policy-oriented assessment of NICUS in Sweden is now underway, sponsored by the National Board of Health and Welfare. Preliminary results point to an uneven distribution of resources, over-capacity in the number of beds, and a potential relationship between volume of services and health outcomes for newborns (17). Of special concern are various aspects of quality of care, which may well be related to professional competence and experience.

Introduced in Sweden in 1991, ECMO is available in two hospitals. There is no randomized controlled trial for ECMO and its potential alternatives, such as the new generation of respirators, including the high-frequency oscillation ventilation (HFOV) system.

The demand for treatment with ECMO is generally considered to be satisfied by the existing two centers. Because there are very few cases per year with indications for care using this technology, treatment with ECMO is a marginal issue.

Neonatal intensive care has not been a visible policy issue in Sweden, nor have NICUS been assessed comprehensively. However, as noted earlier, improved care for very pre-term infants has gradually become an issue—as has its costs.

SCREENING FOR BREAST CANCER

Clinical examination, using mammography for specified indications, was introduced in Sweden in 1964. About 10 years later, it was available all over the country. Clinical trials of screening for breast cancer began as early as 1966, using physical examination and thermography as the screening methods. Mammography screening in Sweden began in one region of Sweden in 1974; by the end of the 1980s, it had covered almost the entire country.

The target population for screening varies from county to county, with some counties supporting screening beginning at age 40 and others proposing that screening begin at age 50. The total target population is 1.5 million women; probably more than 50 percent are actually screened.

The first randomized, controlled trial (RCT) of screening mammography (in women over 40) in Sweden began in 1977. The results, reported in

1985 (64), confirmed the findings in the Health Insurance Program (HIP) study in the United States of a reduction in mortality from breast cancer of 30 percent, but later analysis revealed that the benefit was restricted to women between age 50 and 70 at the start of the trial. (63). The results of this RCT were based on a small absolute number of deaths. Of the 135,000 women in the age group from 40 to 74, there were, after screening every second year, 86 deaths in the screened group as compared with an expected 118. This has raised a concern about the relationship of the costs to the benefits of mammography screening.

A second RCT in Sweden was completed in Malmo in 1988 in women aged 45 to 69. This study, however, could not confirm a statistically significant reduction in mortality from breast cancer in the screened group. After 9 years of screening 20,000 women every second year, there were 63 deaths from breast cancer in the screened group compared with 66 in the nonscreened group (3).

Two more RCTS of mammography screening are ongoing in Sweden (in Stockholm and Goteberg). As a result of the first study, the National Board of Health and Welfare recommended in 1985 that all county councils in Sweden introduce mammography screening for all women aged 40 to 74. Since then, most county councils have gradually expanded mammography screening.

Two technology assessments of screening have been carried out in Sweden. The first, performed by a parliamentary committee in 1984, examined

screening programs for cancer for both effects and financial costs, finding that there was a benefit from mammography screening (47). The second assessment, performed by SPRI in 1990 (51), reviewed the incidence, prevalence, and other epidemiological data on breast cancer in the country, analyzed the results from mammography screening programs in different countries, and included cost analyses of different options for screening as well as a cost-effectiveness analysis of the first trial in Sweden (showing a cost per year of life saved of about SEK75,000 or \$US10,000 in 1993 dollars, and a total cost of about SEK500 million, or about \$US8 million per million people, to screen the total target population). The report concluded that ongoing monitoring of mammography screening is crucial.

There are several current concerns. First, as screening has been gradually introduced, radiologists and technicians have shifted to breast cancer screening, which has led to waiting lists and delays for other radiology services. Second, the specificity and sensitivity of mammography achieved in the RCTS are difficult to achieve in routine practice. Finally, and perhaps most significantly, various important aspects of screening for breast cancer by mammography have been neglected, such as the large number of false positive findings, the need for an effective and efficient follow up, and delays from suspicion of malignancy to final diagnosis.

CHAPTER SUMMARY

From a macroeconomic perspective, it can be said that the health sector in Sweden is consuming a considerable share of society's resources; employs a relatively high proportion (10 percent) of the workforce; maintains the health of Sweden's productive capacity; constitutes the basis for the industrial development of pharmaceuticals, medical equipment, and devices; and has the potential to grow exponentially. The health sector consumes about 8 percent of Sweden's GDP, deter-

mines a substantial portion of sick leave and early retirement, plays an important role in the export and import of medical goods, and greatly influences social policy making.

Regulation and planning have played a significant role in the Swedish health care system, but less direct controls, such as planning for personnel needs, have perhaps been more important. The regionalized system that has evolved precludes many of the problems of duplicated and under-used technology that have troubled other coun-

tries. The system also encourages geographically and financially based access to services, even though limited resources do result in waiting lists and other restrictions.

Despite the generally high level of public satisfaction with the Swedish health care system, change is under way. With decentralization, the public is increasingly involved in decisionmaking. One result, already discernible, is growing pressure for choice-of physician, of institution, and of treatment procedure. Increasing patient choice must, however, be coupled with increasing responsibility. The public must have a sound basis for making reasonable choices in health care. Up to now, relatively little has been done to ensure that this is the case.

During the past decade or so, Sweden gradually developed a greater commitment to health care technology assessment. At the time of an earlier review sponsored by the U.S. Office of Technology Assessment (19), there was no organization in Sweden dedicated to such assessment. A number of such institutions now exist (including SBU at the national level) and are engaged in this vital activity. In addition, the importance of health services and clinical research is being recognized as crucial for improving the system's quality. Technology assessment is increasingly visible to policy makers, and its proposed extension to psychiatric care and social services is an indication of its growing acceptance.

The government currently is considering a proposal for a comprehensive assessment of the need to strengthen applied clinical research and possibly to earmark a percentage of the health budget for this purpose. (A figure of 1.5 percent of the total health budget has been discussed.) The pressure to do so came first from the technology assessment community, with increasing support from clinicians experiencing difficulties in financing clinical research as a result of the many ongoing experiments with a "free market" in Swedish health care. Substantial support for the proposal and for technology assessment in health care comes from a parliamentary committee that is developing guidelines for priority setting in health

care and that sees the need for assessments of clinical practices.

The main achievements of Sweden's system for health care technology assessment are the development of a well-organized, respected government body for assessment and the spread of the idea of technology assessment throughout the medical profession. Sweden has been successful in institutionalizing health care technology assessment in its health services not only because such activity comports with the national character but also because technology assessment has never been viewed as threatening by Swedish health care professionals. Cost containment depends on budgets; hence, technology assessment has had a more positive slant: to ensure that beneficial and cost-effective technologies are diffused rapidly into the system.

Technology assessment in health care was introduced as an activity with two objectives: on the one hand, to speed the diffusion and use of medical technologies with proven safety, efficacy, and effectiveness to ensure broad and equitable access to the technology; and on the other hand, to monitor technologies that have not yet been scientifically assessed whose policy implications are not yet fully understood so that potentially harmful, useless, or less effective technologies can be phased out and replaced. Thus, technology assessment in Sweden has by no means aimed solely at cost savings. This is a particularly sensitive issue in Swedish health care, both for the general public and for the medical profession, which have experienced more than a decade of reductions in the volume of health services as well as seemingly endless experiments with measures to control increasing costs.

Technology assessment in health care was also introduced with strong support from the clinical scientific community. When SBU was established, the government intentionally selected individuals who represented respected research-based institutions to constitute its board and expert group (about 20 people). SBU is not seen as a separate institution that criticizes professionals; in fact, prestigious specialists carry out the SBU

studies. Swedish specialists are highly motivated to improve the quality of their care, and SBU is seen as a positive source of help. Thus, although SBU is active in advising policymakers, it is seen as a constructive addition by health care professionals.

For its part, SBU has concluded that successful assessments must meet certain requirements, including the following:

- assessments must result from a strong interest among policy makers and/or clinicians;
- data on the technology in question must be available, preferably from methodologically rigorous studies, and especially from randomized trials;
- to ensure integrity, all related studies, including clinical and economic studies, must be identified and thoroughly reviewed, with the committed involvement of expert professionals;
- assessments must be scientifically and clinically credible and presented in a logical manner;
- assessments must be presented so that they are accessible to the medical profession, policymakers, and the general public;
- results must be accompanied by clearcut policy options or straightforward recommendations; and
- a strategy for strong, long-lasting marketing efforts on different fronts should accompany the results.

Perhaps the greatest single problem with health care technology assessments in Sweden is the large number of unassessed technologies—including, according to one SBU survey, about 400 new technologies. Even if more money were available, there is a limit to the number of research sites and well-trained researchers that Sweden can develop in a relatively short period of time. The only solution is international collaboration.

Swedish experts participate in a variety of international activities and are attempting to contribute to the development of permanent international structures for sharing information and coordinating activities. Increasingly, too, experts from other countries actively participate in

technology assessment projects in Sweden. Although practical problems need to be overcome for such international structures and cooperative networks to be effective, this is considered a high priority in Sweden.

The experience of health care technology assessment in Sweden shows that it is possible to identify technologies needing assessment and to assess them in ways that affect their adoption and use. These lessons will surely be applied more intensively as the health care system evolves.

Finally, as SBU has come to realize, dissemination is time consuming. Assessment results need to be marketed both to professionals and to the public. The results do not necessarily affect everyday clinical practice. Although the best clinical departments are responsive to assessment results, ordinary practitioners may not follow SBU recommendations. (This problem is heightened by Sweden's size and areas of sparsely populated territory.) Better methods of dissemination are needed in conjunction with methods of quality assurance.

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