10.
Controlling Medical Technology in Sweden

Erik H. L. Gaensler
Lewin and Associates, Inc.
Washington, D.C.

Egon Jonsson
Swedish Planning and Rationalization Institute
Stockholm, Sweden

Duncan vB. Neuhauser
Case Western Reserve University
Cleveland, Ohio

Contents

LIST OF TABLES

LIST OF FIGURES

10. Controlling Medical Technology in Sweden

Erik H. L. Gaensler
Lewin and Associates Inc.
Washington, D.C.

Egon Jonsson
Swedish Planning and Rationalization Institute
Stockholm, Sweden

Duncan vB. Neuhauser
Case Western Reserve University
Cleveland, Ohio

SWEDEN: COUNTRY DESCRIPTION

Sweden is a Scandinavian country of 8 million people. It is 1,500 miles in length and its northern part is above the Arctic Circle. Largely urban and highly industrialized, Sweden has one of the world's highest per capita incomes. The country's economy is mixed capitalist and socialist. Basic demographic data for Sweden and the United States are presented in table 1.

Sweden's internal development has occurred in an atmosphere of tranquility unknown to most Western nations. Except for an ultimately unsuccessful expansionary period during the 17th and 18th centuries, Sweden's history has largely been one of relative isolation, distinguished by neutrality since the Napoleonic Wars. The stability of this country is reflected in the continuity of Swedish politics. During this century, one party, the Social Democrats, ruled for 44 years with only a 3-month hiatus prior to their defeat in 1976 (65).

Like England, Sweden is a constitutional monarchy in which all Federal political power rests in an elected Parliament. Local units of government are the lans (counties), of which there are 25. Although Sweden has not fought in a war since 1812, it maintains a modern army with compulsory military service.

Sweden provides extensive health and welfare benefits for its citizens. Demographic data and information on health and medical care in Sweden and the United States are presented in tables 2 and 3, respectively. All 8,236,179 Swedes[1] are covered by compulsory health insurance. This pays for all physician care and hospital services, except for a modest copayment fee of about $4.50. Care for the chronically ill is provided in nursing homes or at the patient's residence at no extra charge. Drugs are free except for a modest

[1]By census as of Dec. 31, 1976 (56).

Table 1.—Demographic Characteristics of the United States and Sweden

	United States	Sweden
Population		
1960	180.68 million	7.48 million
1971	207.05 million	8.10 million
Population density (1971)	22 per km²	18 per km²
Percent of population in urban areas (1970)	74.1%	79.6%
Average annual compound growth rate (1960-71)	1.2%	0.7%
GNP per capita (1972)	$5,590	$4,480
Percent of labor force unemployed (1971)	5.4%	2.7%

SOURCE: R. Maxwell, *Health Care: The Growing Dilemma* (New York, N.Y.: McKinsey and Co., 1975) (37).

Table 2.—Data on Health in the United States and Sweden

	United States	Sweden
Life expectancy at age 1		
Male		
1958	67.8	71.9
1971	67.9	72.0
Percent change	+ 0.1	+ 0.1
Female		
1958	73.8	74.9
1971	75.2	77.3
Percent change	+ 1.9	+ 3.2
Infant mortality per 1,000 live births (1969)	20.7	11.7
Maternal mortality per 100,000 live births (1969)	24.5	10.2
Elderly (+ 65) as a percent of total population (1968)	9.6	13.5
Deaths from motor vehicle accidents per million population (1969)	275	169
Deaths from accidents, poisoning, and violence per million population (1969)	777	682
Annual number of cigarettes smoked per adult (1970)	3,670	1,620
Liters of alcohol consumed per person (1972)	5.9	5.7

SOURCE: R. Maxwell, *Health Care: The Growing Dilemma* (New York, N.Y.: McKinsey and Co., 1975) (37).

Table 3.—Dataon Medical Care Providers and Facilities in the United States and Sweden

	United States	Sweden
Health expenditures		
Percent of GNP spent on health services(1969)	*6.7%.*	6.4%
Annual health expenditures per person (U.S. dollars)(1969)	*$298*	$234
Physicians and nurses		
Dentists per l0,000 population (1970)	5.0	8.4
Doctors per l0,000 population (1970)	15.8	13.6
Nurses per 10,000 population(1969)	33.5	38.2
Percent of general medical practitioners in group practice(1971)	12.O%	20.0%
Hospitals		
All hospital beds per 1,000 population (1969)	81.0	164.0
Average number of beds in general hospitals(1969)	155.0	540.0
Average number of beds in psychiatric hospitals(1969)	1,174.0	146.0
Psychiatric beds per 1,000 population (1969)	30.3	62.8
Admissions to general hospitals per l,000 population(1969)	144.6	147.0
Average length of stay(days)	9.3	12.6

SOURCE: R. Maxwell, *Health Care: The Growing Dilemma* (New York, N.Y.: McKinsey and Co., 1975) (37).

basic charge, and prescriptions for such long-term conditions as diabetes or epilepsy require no copayment. Also provided in Sweden are maternity benefits, compensation for 90 percent of lost income during illness, and various types of pensions. All of these benefits, which maintain the citizen's health indirectly by providing for economic well-being, are part of the Swedish matrix that blends health and social welfare functions.[2]

Largely because of the cost of Sweden'scomprehensive health and social welfare benefits, which absorb almost three times as much of the budget as defense, Swedes pay among the highest taxes in the world (44). The magnitude of these taxes is a commentary on the Swedes' high priority for good health. In fact, in a 1975 survey, a representative sample of the population ages 18 to 70 years listed medical and dental care first among 29 potential uses of an increase in the nation's total revenues (11).

As a country that not only is actively trying to control the use of medical technology but has

[2]For a complete discussion of benefits, see pp. 27-64 in *Var Tryghet* (17). A similar discussion in English appears in *Information for Immigrants: Social Insurance in Sweden* (18).

had some success in doing so, Sweden is a fascinating case. The efforts of Swedish planners are aided by the Swedish bureaucracy's favorable relationship with the citizenry. They are greatly facilitated, as well, by the regionalized hierarchical structure of Sweden's health care system.

To understand the regionalized structure of Sweden's present health care system, it is necessary to gain some appreciation of the major forces in Swedish history that have affected its development. These are discussed in the next section of this chapter. In the following section, the general mechanisms that Swedish planners use to control the diffusion of medical technologies—the rationing of medical care, the education and employment of doctors by the state, and the evaluation of specific technologies and issuing of voluntary guidelines by the Swedish Planning and Rationalization Institute of the Health Services (SPRI)—are described. The section after that contains case studies of specific technologies to illustrate how Sweden's system operates in practice.

HISTORICAL ORIGINS AND DEVELOPMENT OF THE MEDICAL SYSTEM

Two aspects of the Swedish health care system, regionalization and socialization, are critical in understanding the manner in which Sweden controls medical technology. The origins of these features of this country's medical care structure are rooted in Sweden's political, economic, and cultural history.

The fiscal "socialization" of Swedish medicine did not occur until national health insurance was implemented in 1955, the regional system of medical services was not established until 1958, and the employment of doctors by the Swedish Government did not come about until the establishment of a national health service in 1969. As described below, however, events as early as the 16th century predisposed Sweden to develop the regionally organized and tractable medical system that facilitates controlling the diffusion of modern medical technologies.

The Swedish Bureaucracy

The effectiveness of the Swedish bureaucracy is partially rooted in the bureaucracy's historically favorable relations with the citizenry. The origins of the Swedish civil service date to medieval times. Unlike many other countries, Sweden failed to develop a feudal system, so rather than becoming feudal lords, Swedish nobles entered into the service of the king. The consequences of the nobles' playing the role of civil servants rather than feudal lords were twofold. First, friction between nobles and serfs in Sweden was inarguably less than it was on the continent, and Sweden's aristocratic civil servants did not have to bear the burden of citizen antagonism. Second, comprising an elite, selected from the well educated and capable, the Swedish civil service usually acquitted itself in a style worthy of the respect accorded it.

The result has been described by British historian Roland Huntford (24):

> The identification of aristocracy and civil service has conferred on the Swedish bureaucrat a unique supremacy and esteem. For centuries, he has been honored with deference and respect. He has never had to bear the scorn, dislike, and suspicion poured on the state functionary in so many other countries. He is considered greater than the politician, the lawyer, and the industrialist, The senior official remains, true to the figure of a mandarin, at the top of Swedish society . . . . The chief civil servant has more prestige than his minister.

State office was monopolized by the Swedish nobility until the late 19th century; at that time, highly competitive examinations were introduced to determine entrance to the "executive" guild, so the Swedish bureaucracy has remained a recognized elite (20).

Good bureaucrat-citizen relations are guarded in Sweden by special officials called "ombudsmen, " who have been active since

68-035 O - 80 - 12

1809. It is their duty to investigate complaints against the government and its agencies on behalf of the electorate. The diffusion of the Swedish word "ombudsman" into other languages is testimony to the longstanding responsiveness of the Swedish civil service, a responsiveness that is only beginning to be duplicated elsewhere.[3]

The effectiveness of the Swedish bureaucracy also stems from the bureaucracy's insulation from political tides. Even when governments turn over, as happened in 1976, the medical administration remains intact. This is because the chief health officer, the Director-General of the National Board of Health and Welfare (Socialstyrelsen), is not a Cabinet Minister, but a civil servant who works on a theoretically apolitical plane above the elective government. The continuity of the Swedish medical civil service has enormously facilitated health planning, because in some cases, as many as *20* years have elapsed between the issuing of a report and its implementation.

The Parish System of Decentralized Administration

The subjugation of the nobles to the state was not the only important source of qualified administrators for Swedish development. The Reformation, embraced by King Gustav Vasa in the 1530's, resulted in the establishment of a Lutheran State Church which exists to this day (45). Following the union of state and church, the clergy continued its task of keeping parish records of births, deaths, and population movements, but now this activity amounted to census taking on behalf of the state. This source of demographic information has proved to be invaluable to medical planners on many occasions.

The parish system also provided a geographic blueprint for administrative regions. This framework was exploited by the government as a basis for decentralized medical care responsibility when it ordered the church to provide rudimentary care for its parishioners in the 17th century.

State Secular Hospitals

Before the Reformation, the Catholic Church had established helgeandshuser (lit: holy ghost houses) for the care of the sick and the poor. When King Gustav Vasa de facto nationalized the church in 1527, he took pains to see that these salutary functions were continued. In a series of letters[4] to priests and taxmasters, King Gustav ordered that parish services to the indigent and ill be maintained, and authorized taxmasters to finance them (64). This royal initiative marks the beginning of the government takeover, or socialization, of medicine in Sweden.

The development of state hospitals was further spurred by the needs of the 17th century. Swedish troops, particularly during the Napoleonic Wars, were devasted by syphillis *(50).* For treating the soldiers, venereal disease hospitals called kurhus (lit: cure-house) were established, and government district doctors were appointed to staff them (22). These secular hospitals established a second channel for medical services, alongside the parish system, that eventually came to dominate.

When the last soldiers returned from the Napoleonic Wars to henceforth neutral Sweden, a third course of medical development, a civil one, was already being pursued. Military spending was being reduced, so to preserve the kurhus system, a head tax was levied. A number of hospitals independent of the original "holy ghost houses" had already been established in the major cities. These were more reassuringly named lasaretts,[5] after the biblical figure Lazarus who was raised from the dead. In the century preceding 1864, the landmark year when the lans

[3] Today, a special medical ombudsman plays a crucial role in arbitrating consumer complaints against the health care system. This ombudsman and the Medical Responsibility Board of the National Board of Health and Welfare usually settle what would be malpractice claims in the United States with far less litigation and lower awards *(70).* A frequent complaint in the United States is that the defensive medicine produced by malpractice claims leads to overuse of diagnostic procedures. It is interesting to note, therefore, that the volume of laboratory and X-ray tests ordered in Swedish hospitals is only one-half of that performed in American hospitals on similar patients (12,30).

[4] These letters were assembled and analyzed by Reformation historian Thyselius in 1841 (64).

[5] The first and most famous of these is the Serafimer lasarett in Stockholm, established in 1752 (67).

(counties) and landstinget (county councils) took over the hospitals, nearly 50 lasaretts were built, and the number of beds went from 200 to nearly 3,000 (67).

Counties and County Councils

Sweden was not politically organized in a highly centralized fashion until quite recently. In the 19th century Sweden's economy was based on loosely connected and geographically disparate clusters of industry, mining, and agriculture called bruks *(46).* The parishes and bruks were too small to deal directly with the Swedish Government, so for their dealings with the state, they had formed small clusters called lans, or counties. These lans eventually came to be used as the new administrative base for medical care delivery.

In the reforms of 1862, 25 counties (mostly rural areas with a central market town) and four self-standing cities were officially designated lans (40). A mere *2* years later, in 1864, the responsibility for health of citizens in each of these lans was invested in the landstinget (lit: county council) which had been formed to administer the Ian (58). At first exclusively devoted to providing for the hospitals, the county councils subsequently took on other responsibilities. Nevertheless, they continued to devote over two-thirds of their budget to medical care (33).

The state retained both fiscal and administrative control of the medical schools, and in 1878, it created a body to supervise them as well as the county councils. This organization was known as Medicinalstyrelsen (lit: Medical Steering) (59), and was a descendant of the Collegium Medicum, a principally academic and professional organization that had been founded in 1663.

The remaining events in the history of Swedish health care involved resolving the problems of financing and providing personnel for the costly and complex enterprise of state-operated hospitals. With the exception of the development of medical regions in 1958, few major structural changes have been made in Sweden's health system since the transfer of the administration of health care to the county councils in 1864.

National Health Insurance, Employment of Doctors by the State, and Medical Regions

The Social Democrats came to power in 1932, and it was during their 44-year tenure (1932-76) that Sweden's health care system evolved most of the features that facilitate its control of technology: 1) national health insurance, 2) the employment of doctors by the state, and 3) a regionalized, hierarchical system for the provision of medical services.

During the period 1862-1955, numerous voluntary insurance plans had evolved to replace patients' income, but the financing of outpatient care remained largely in private hands. Inpatient care was financed through a system of employer-financed sickness funds (sjukkassor) (35). In 1910, only 10.7 percent of Swedes were active members of the over 2,000 sickness funds; by 1930, this figure had grown only to 16.6 percent (57).

National health insurance covering outpatient care was not seriously debated until the 1920's (60). The National Health Insurance Act (Allman Sjukforsakring), covering physicians, outpatient services, and drugs, was finally passed by Parliament in 1947. Laws in Sweden, however, are implemented at the government's discretion, so a grace period is left during which the administrative framework can be ironed out to ensure their smooth implementation. In the case of the health insurance law, the major issue complicating implementation was whether physicians would remain independent under the new insurance scheme or instead would become civil servants (32).

In a 1948 report, Dr. Alex Hojer, a prominent socialist who served as Director-General of the National Board of Health from 1935 to 1952, recommended a reform of primary health care, based on salaried positions for all physicians (51). Hojer also suggested that Sweden should aim to improve its health system by coupling the development of decentralized ambulatory and preventive care services with that of more

centralized specialized services (51). The county appeared to be too small a unit to benefit from full efficiencies of scale in providing specialized services that required major investments of capital and training of personnel, Hojer said, so intercounty cooperation would be essential (51). To facilitate such cooperation, he suggested, large regional hospitals should be developed. Primary care services, however, should be decentralized to bring them as close to the people as possible. Small health centers, Hojer believed, were the ideal unit for blending both social welfare and medical services into "totalvard, " or total care on an ambulatory basis (51).

In 1955, 8 years after the National Insurance Act was passed, national health insurance was implemented. The history of the Swedish health system since then, with some minor exceptions, can be described as the development and systematic implementation of Director-General Hojer's principles by his successors Arthur Engel and Bror Rexed. Their systematic implementation of Hojer's ideas during the three decades following the publication of his 1948 report is compelling evidence of the importance of the continuity and power of the civil service as a factor in the development of Sweden's medical structure.

With the publication of the Engel report of 1958, the basis of Sweden's hierarchical hospital plan was laid (52). Under this plan, Swedish counties were organized into seven medical regions, creating the intercounty cooperative clusters that Hojer had envisioned as necessary for efficient delivery of specialized services. In 1961, a comprehensive plan was introduced to increase medical manpower by expanding medical education (53). Vast numbers of new hospital positions were created for medical school graduates, and 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 fairly little ado (69).

The unification of medical and social welfare services became a reality when the two were combined into the Nation-al Board of Health and Welfare (Socialstyrelsen) in 1968. The decentralization of ambulatory health services, intended to foster small facilities for "total care, " was prompted when the government transferred responsibility for the district doctors and mental hospitals to the counties in 1961 and 1963, respectively.

MECHANISMS FOR CONTROLLING MEDICAL TECHNOLOGY

Swedish planners, have at their disposal three organizational levers for controlling medical technologies—patients, hospitals, and medical personnel. These levers and how Swedish health planners manipulate them in order to control the influx of medical technologies are described below.

Swedish Patients and Constraints on Consumer Demand

Sweden has a government-owned and operated medical care system. Except for a nominal charge for ambulatory care, the patient pays nothing for medical services. Price, therefore, is not a mechanism used to limit demand. As Swedish health economist Ingemar Stahl has pointed out (49):

> From the patient's viewpoint, there is hardly any reason to stop the individual demand at a point at which further costs for treatment will not be outweighed by benefits. Probably the patients will demand treatments up to a point where further treatment will be rather a nuisance and completely disregard the costs involved
>
> . . . . With zero user charges, rationing of health care becomes a necessity. Clinical freedom in its usual sense can no longer be accepted and different types of cost control and economic surveillance have to be introduced . . . . One and the same illness can often be treated in different ways and there will be no incentives for patients to select or prefer the most cost-effective treatment . . . . It is not at all clear that the basic incentives of the medical profession will act as a countervailing power.

Restraining consumer demand, therefore, is one method that—deliberately or otherwise—Swedish planners have used to limit the use of medical services and restrain the influx of medical technologies. What makes these restraints on supply of services successful in Sweden is not the brilliance of its planners but the compliance of Swedish consumers. This compliance appears to be rooted in the collectivist orientation of Swedish society.

The Swedish medical care system depends to an extent on consumers who not only place a high enough value on medical services to willingly pay the price, but who also have a "collectivism" rather than "individualistic" attitude toward the use of resources. Without Swedes' collectivism orientation, which in large measure accounts for their acceptance of the rationing of medical care, the efforts of Swedish planners could not succeed.

Before investigating collectivism further, certain constraints on consumer demand in Sweden must be described to show why they might be objectionable to those with individualistic values. An intentional mechanism for limiting demand for medical services in Sweden are modest copayments for consultations and prescriptions. These copayments, set at 7 Swedish crowns in 1970, rose to 20 crowns ($4.50 U. S.) by 1977. The copayments are loosely indexed to inflation, by being kept roughly equal to "the cost of a first run movie at a commercial theatre" *(68).* The parallel is deliberate. Not a significant source of revenue, these copayments are meant to discourage frivolous waste without inhibiting reasonable use of medical services.

A second, though unintended, constraint on the demand for medical services in Sweden is that patients are often forced to wait for services simply because the supply of services is insufficient. Since there are no appointments for preliminary consultations, patients have to form physical queues in reception areas. Patients also have to be put on waiting lists for specialist services after referrals have been made. The Swedish Medical Association has acknowledged that patients have average waits of over 60 days to see an internist, 82 days for a gynecologist, 146 days for an ophthalmologist, and 16 days for a routine X-ray (43). Although they are not pleased by the long waits, Swedish patients are surprisingly phlegmatic about them.

The difference between the values of Americans and Swedes was noted by American political scientist Steven Kelman in his comparison of worker safety regulation (31):

> In Sweden, deferent values were dominant, which encourage people to accept the wishes of the state. In America, dominant self-assertive values encouraged people to have it their way.

The deferent values that Swedes hold are reflected in their confidence in the civil service and respect for government policies. For example, Sweden has been able to pass and successfully enforce legislation mandating the use of vehicle seatbelts, a law that has proved unacceptable or unworkable in other countries. While it is difficult to argue against the benefits of seatbelt use, Swedish citizens have also complied with rules requiring daytime use of special headlights, which are at times expensive to install, a slight nuisance, and are only of debatable value. Other examples of how Kelman's so-called "deferent values" have facilitated social policy decisions abound. Extraordinarily high taxes on cigarettes and alcohol have not spawned widespread contempt of government monopolies and rampant smuggling as in other countries. In the medical sphere, studies requiring mass screening of mass populations—even entire counties—for asymptomatic disease have been successful largely because of citizen compliance. Planners' efforts to control the dissemination of medical technology are greatly assisted by this tendency of Swedish citizens to cooperate with their government.

Why Swedish citizens are so accommodating is difficult to determine. In addition to the supply of medical services, the Swedish Government controls the supply of housing, capital on both the reserve and retail levels, education, and many other citizens' services. In a country where one must wait in line for an apartment, a loan, or a position in a university, waiting in line for health services is not so strange an experience. Swedish internist Lars Werko remarked on the phlegmatic nature of the Swedish

patient shortly after the "Seven Crowns reform" (69):

> The relative indifference demonstrated by most people toward the recent changes in medical practice, as judged from what is written in the newspapers or discussed on television, has always astonished me. The explanation I have arrived at is that the people rely upon the government and are confident that all is going to function as well tomorrow as it did yesterday.

Copayments and queues apparently do reduce the demand for services. In 1963, the average number of physician visits per person per year in Sweden was 2.5 (7). By 1974, 4 years after the "Seven Crowns Reform" significantly reduced costs to the patient, annual visits had risen only to 2.7 per capita (33). More visits per capita would have led to increased referrals and to greater demand for specialists and their technologies.

The Regionalized Hierarchy of Hospitals

In terms of expenditures, 87 percent of medical care in Sweden is delivered at hospitals, 88 percent of which are operated by the 26 county councils in the decentralized fashion set out by the reforms of 1864 (33). Thus, it is the counties who are the actual purchasers of medical equipment, and in a sense, it is the counties who decide whether a new technology is adopted.

The policymaking of the counties, however, is constrained by the" state, as is discussed below. The counties' freedom of choice is also limited by cooperative agreements with other counties to provide specialized services on a regional basis. The objective of the regional system of medical services introduced by Director-General Arthur Engel in 1958 (52) **was** to ensure that specific types of services were delivered at the level—local, county, or regional—on which they could be provided most efficiently.

This regionalized system of Swedish medical services is mirrored by Sweden's hospital system. There are four levels or categories in the hospital hierarchy: 1) health centers, 2) district hospitals, 3) central general hospitals, and 4) regional hospitals.

Outpatient services within each county are organized by primary care districts containing 10,000 to 20,000 inhabitants, and each of these districts usually has one or more health centers. Health centers in primary care districts, which form the lowest tier of the hierarchy, are usually staffed by general practitioners in charge of ambulatory and preventive practice. District nurses are active in home care and sometimes specialize as midwives or child care nurses.

At the second tier of the hospital hierarchy, above the health center, are district hospitals. These hospitals, which usually serve several primary care districts with a total population of 60,000 to 90,000, ordinarily provide four specialized services—medicine, surgery, radiology, and anesthesiology.

At the third tier of the hospital hierarchy are the central general hospitals. There is usually at least one such hospital per county, and each hospital serves a population of 250,000 to 300,000, Each central general hospital offers 15 to 20 specialized services.

At the fourth and top tier of the Swedish hospital hierarchy are the regional hospitals. There are seven regional hospitals throughout the country, each of which has an average population base of slightly over a million. All but one of these institutions are affiliated with medical schools and serve as centers for research and teaching. Among the specialized services that these institutions provide are neurology, radiation therapy, thoracic surgery, neurosurgery, pediatric surgery, and certain types of cardiac care. [b]

Sweden's four hospital tiers provide a clear "pecking order" for who receives sophisticated new technologies. The regional hospitals are the first in line, and the central general hospitals, district hospitals, and health centers follow. At each tier, a service is provided only if there is a sufficient population base for it to be as cost effective at that level as at a higher one.[7]

'Some of these services are actually provided on an interregional basis. Thoracic surgery departments, for example, are located only at the four largest regional hospitals.

'As an aside, it might be said that such a system is not only more economical but also tends to provide better care. The very rarely needed procedures are concentrated, and more experience with such procedures by medical practitioners brings better results.

County council members need not feel responsible for bringing a sophisticated new technology to their own county's central general hospital, because county residents may be referred from that hospital to the regional hospital that they subsidize. If a new technology is cost effective on the central hospital level, however, the county's council and taxpayers both have a role in deciding whether or not to acquire it. As Egon Jonsson, the SPRI planner responsible for the CT rationalization report, put it, "There is a clear link between the politician a Swedish citizen elects, the size of his taxes, and the medical services he has access to" (28). Because of the policy that, except under special circumstances, Swedish patients cannot use hospitals outside the county or region in which they reside, citizens as well as planners have a direct interest in seeing that necessary—but not excessive—equipment outlays are made in the central hospitals.

It should not be inferred, however, that cost-effective choices are always made. County pride occasionally dominates over pragmatism. Several central hospitals, for example, have begun to insert pacemakers, even though ideally this procedure should be performed at the regional level (68). Similarly, when technology-intensive advances in obstetrics and a decline in the birth rate recently mandated closing the lying-in ward of the Enkoping central hospital in favor of the regional department in Uppsala, local citizens filed a petition to block the closing. A senior planning official of the National Board of Health and Welfare, attributed the uproar solely to local fear that the city was becoming a backwater (68).[8]

This regionalized hierarchy of hospitals provides Swedish health planners with two separate strategies for optimizing the use of medical technologies. Highly sophisticated equipment and technology-intensive specialties can be concentrated at the regional hospitals and simpler inventions can be dispersed to the health centers. Often, the most cost-effective level for the provision of a service is that of the health center, because care at health centers is less expensive per patient than care at outpatient clinics at major hospitals (14). As Director-General Arthur Engel explained (14):

> For financial and manpower reasons, we have formulated the guiding principle that care should be provided on the lowest acceptable level of the organizational system.

Swedish planners foresee the health center as being the new basic unit for the decentralized provision of total care (totalvard), the combination of sick care (sjukvard) and preventive care (halsovard), and also the counseling and financial services of the social welfare system (34). Referrals to specialists at the central and regional hospitals will be made from the health centers, so that economies of scale for complex and unusual care will be preserved.

The American political scientist Arnold Heidenheimer concluded that the hierarchical structure of Swedish hospitals is deliberately being polarized (21):

> Centripetal forces here respond mainly to the location of highly specialized equipment and skills, while centrifugal forces are strengthened by political demands for care which is proximate both in terms of physical distance and in terms of its concerns with primary care.

This process of polarization leaves the district hospitals caught in the middle between the poles of specialization and decentralization. Swedish planners doubt that district hospitals are large enough to benefit fully from efficiencies of scale for many services, and aim to convert them to chronic care and old-age homes (15). The four specialties that these hospitals now house will then move up to the level of the central general hospitals. Currently, too much geriatric care is being delivered on an inappropriate technology-intensive level at the central and regional hospitals. The conversion of the district hospitals to long-term care facilities, therefore, should reduce the influx of technology not only at the district level, but at the county and regional levels as well.

[8] 'Citizens' opposition to the closing of the central hospital ward was certainly not based on medical grounds because the quality of care to be received by the mothers at the regional hospital was to improve significantly. Less than 10 percent of the Enkoping petitioners were women of childbearing age. When polled separately, the women who were potential mothers and likely to be the most affected by the change, were in favor of the move.

State Education and Employment of Medical Personnel

The external organization of Swedish hospitals provides only a partial picture of the mechanisms at the disposal of Swedish planners to restrain the influx of technologies. In addition, the internal mix of medical personnel and facilities must be analyzed. For the sake of brevity, the discussion of medical manpower here is limited to physicians and nurses.

As of 1977, Sweden had roughly 15,000 doctors, or a ratio of 1 physician per 515 population, quite similar to the ratio of 1 per 571 population in the United States (25,61). Most Swedish physicians are employed by the state. In 1977, only 6 percent of Swedish physicians were in private practice, and the average age of these physicians was considerably over the mean for their profession. The gradual disappearance of the private sector in Sweden has facilitated planning. In other countries, noninstitutional settings have been used to circumvent constraints on technology purchases (47).

The state not only employs but also educates virtually all medical personnel in Sweden. Thus, it is able to match training programs to anticipated and present needs. As Director-General Rexed succinctly put it, "Training policy (is) the most important contribution to future planning" (44). By 1985, the numbers of Swedish doctors specializing in long-term care and psychiatry are projected to increase by 130 percent and 60 percent, respectively. **The ranks** of physicians who use technology-intensive techniques, however, will be increased by only 28 percent (44). (Swedish policy toward the training of the latter is discussed in conjunction with specific technologies in the next major section of this chapter.)

Once doctors are educated in a predetermined fashion, the National Board of Health and Welfare also can decide to a large extent where these physicians will work, through its allocation of medical posts. This power facilitates planned assignment of doctors at various levels within the hospital hierarchy (from the regional hospital to the health center) and is also the basis for ensuring their proper geographical distribution. It should not be inferred, however, that Sweden has solved the nearly universal problem of supplying rural areas with physicians (13). An overall physician shortage in Sweden still allows for mobility.

Doctors are not the only human resource that is "rationalized" in Sweden. The same official goal of "giving the best care without undue demands on scarce resources" (44) applies to the use of nurses. Nurses comprise a much greater proportion of total hospital personnel in Sweden than in the United States. Nurses in Sweden perform a variety of tasks that in the United States are ordinarily reserved for doctors—delivering babies as midwives, and giving anesthesia and administering public health services as district nurses.

How does the "rationalization" of human resources through training and of capital resources by regionalization affect the overall plant-personnel mix at the Swedish hospitals? Cross-national comparisons show that Sweden has the highest per capita number of beds in the world, with 17 per 1,000 population, as compared to 10 per 1,000 in the United States (62).[9] Sweden has only one-half the personnel-to-bed ratio of the United States (29), though, and a higher proportion of Swedish workers are nurses. Sweden also has a longer mean length of stay than the United States, 30.9 days as opposed to 18 days. Much has been made over these differences as a manifestation of planning. The differences, however, can be largely explained by the older age of the Swedish hospital population. This population tends to be admitted to hospitals for chronic problems that require longer stays but less intensive care.[10]

Governmental Evaluation and Control of Medical Technology

The three governmental bodies that exercise control over the medical care system in Sweden are the Executive and Parliament, the National

[9]Figures from R. Maxwell, *Health Care: The Growing Dilemma* (37) that are cited in table 3 differ somewhat.

[10]The significance to planners of care for the elderly must not be underestimated: The life expectancy of Swedes is the highest in the world, and the proportion of the population over 65 years of age is 14 percent, compared to 11 percent in the United States (29).

Board of Health and Welfare, and the county councils.

The relationship of the state to the counties is like that of a rider to a horse—the rider can apply persuasive tactics, but in the final analysis, it is up to the animal to decide on its movements *(48)*. The steering role of the rider is played by the National Board of Health and Welfare, which sets standards for quality, conducts inspections, and allocates physicians (44). In addition, the Swedish Government uses its fiscal leverage by subsidizing hospital construction. Since *1884*, however, counties have had constitutional power to tax their citizens and to decide whether or not to build hospitals, so they control the amount of care available. In summary, the state tries to compel the counties to follow the desired path through regulation and subsidy.

The question persists, however, of how the state decides which course to adopt when a new technology becomes available. To answer this, it is useful to examine the information on which the "rider" depends. The National Board has three principal sources of information for evaluating new methods and instrumentation: 1) the National Bureau of Statistics (Statistiska Centralbyran), 2) physicians who serve as consultants to the National Board of Health and Welfare, and 3) the Swedish Planning and Rationalization Institution (SPRI).

The National Bureau of Statistics assembles data concerning all Swedish patients using their "social security" numbers. Since social security numbers are used for medical record identification, all medical services rendered to a given individual can be accounted for and used in tabulating national health statistics.

Once health needs and budgetary constraints are known, the strictly medical likelihood of **a** new technology's satisfying unmet needs must be evaluated. This general evaluation of biomedical innovations in Sweden is performed by selected physicians, prominent in their specialties, who serve as consultants to the National Board. Their task is to assess whether the technology "is consistent with proven scientific knowledge and good experience."[11] Unlike SPRI, these physicians do not appraise equipment on a brand-by-brand basis. Instead, they evaluate experimental techniques (such as transplantations) or diagnostic and therapeutic interventions without precedent in a general way.

If the likelihood of a new technology's fulfilling unmet medical needs is deemed adequate, planning to determine whether implementation is affordable and on what scale it should be undertaken can proceed. The panel of experts' opinion on the potential of the innovation from a medical standpoint is used by the National Board through SPRI (63). This administratively independent body is financed jointly by the National Board and the county councils. Combining the scientific evaluations of the panel of experts with the statistics for need and costs, SPRI attempts to formulate a coherent plan for implementing the new technology in the most "efficient" way.[12]

Summary of Mechanisms for Controlling Medical Technology

It is worth summarizing the mechanisms Swedish planners might have at their disposal to control the influx of innovations by matching them with the five basic strategies for restraining medical technologies. The first strategy, to oversee R&D so as to abort innovations that could consume inordinate amounts of resources, does not play a significant role in Swedish efforts to control technology. The Swedish Government does invest heavily in health R&D, but funds for R&D are not systematically identified in government budgets. Different parts of the government invest in R&D according to their general mandate and interests. Most of the funding is from the Ministry of Social Affairs and goes directly to university hospitals. Another major route is from the Ministry of Education to the Medical Research Council, which may fund research and has also

[11]Little useful literature has been published on the subject of expert evaluation panels. The discussion in this paper was based entirely on an interview with Gunnar Wennström (68).

[12]When SPRI was organized in the 1960's, the evaluation of medical technology was not one of its tasks. It was concerned with architectural design, staffing analysis, engineering, and research on medical care delivery problems.

funded research chairs in important areas. There are no special procedures for planning this R&D investment. Not only is it considered counterproductive to supervise basic science in Sweden, but it also would be impossible to extend control abroad, where innovations such as CT scanners and coronary artery bypass operations originated.

A second strategy Swedish planners could employ, adjusting manpower policy so as to reduce the number of technology-intensive specialists, is used. Favored by Sweden's manpower policy at present are doctors and nurses trained for chronic, geriatric, and primary care.

The third mechanism that could play a role in Sweden's socialized system is funding incentives. Financial pressure might be used to indirectly punish counties that acquired technologies that were uncalled for in the eyes of SPRI and the National Board. Swedish planning director Dr. Gunnar Wennstrom, however, although fully cognizant of this channel for technology control, insists that it is rarely used (68).

The fourth strategy, regulating technologies as rigidly as pharmaceuticals, is not appropriate for use in Sweden, because it goes against the "rider and horse" mentality of the Swedish medical structure. As previously noted, the counties in this context are free to make their own decisions concerning the purchase of medical technologies.

In light of Sweden's medical structure, issuing voluntary guidelines through a national information agency, the fifth strategy, is clearly preferred. It is therefore not surprising that SPRI has undertaken to fill this advisory role. The success of this purely advisory institute in planning technology in Sweden goes hand in hand with the regional organization of Sweden's hospital system, because planning the rational diffusion of a technology requires a clear hierarchy in order to prevent duplication.

In theory, therefore, Sweden is predisposed towards the second and fifth of the aforementioned containment strategies, i.e., the manpower and informational approaches. Only empirical evidence about the influx of specific technologies, however, can demonstrate whether these methods work. Presented in the next section of this chapter, therefore, is an analysis of the Swedish experience with CT scanners, coronary artery bypass operations, and other innovations.

SPECIFIC TECHNOLOGIES

CT Scanners

The first CT scanners became available in England in 1972 and were introduced in Sweden and the United States in 1973. As of May 1978, the United States had 4.8 scanners per million inhabitants (8). Sweden, however, had only 1.6 scanners per million population (54).

How did Sweden manage to stem CT's influx? In the case of CT scanners, manpower strategies did not play a role for two reasons. First, in the short period between the introduction of CT scanners in 1972 and 1978, no significant adjustment in the numbers of radiologists could have been made. Second, although the concentration of physicians per capita is about the same in Sweden as in the United States, 5.23 percent of Swedish doctors (compared to 2.81 percent of American physicians) are specialists in radiology (23).[13] Thus, Sweden has sufficient radiologists to equal if not exceed the U.S. level of CT use per capita.

It appears that what was responsible for restraining the influx of scanners in Sweden were timely coordinated planning and the regional hierarchy of services. SPRI began with the groundwork for plans to rationalize CT scanners in 1973, when the first head scanner

[13] Actually, for many years Sweden has been a leading country in radiology and radiotherapy. This preeminence is often attributed to the centralization of the hospital system, because centralization provides concentrated experience and permits greater specialization in the subsections of radiology. Indeed, the specialty of neuroradiology originated in Sweden (41,42).

was purchased by the Karolinska Hospital in Stockholm. The introduction of CT scanning to Swedish hospitals was not viewed by planners as a simple case of adding another machine. CT was viewed as partially replacing the functions of other diagnostic modalities, which therefore could be allocated fewer resources. The problem facing Swedish planners, therefore, was to ensure that the CT scanners were not installed beyond the point of diminishing returns from the standpoint of the diagnostic examinations they replaced.

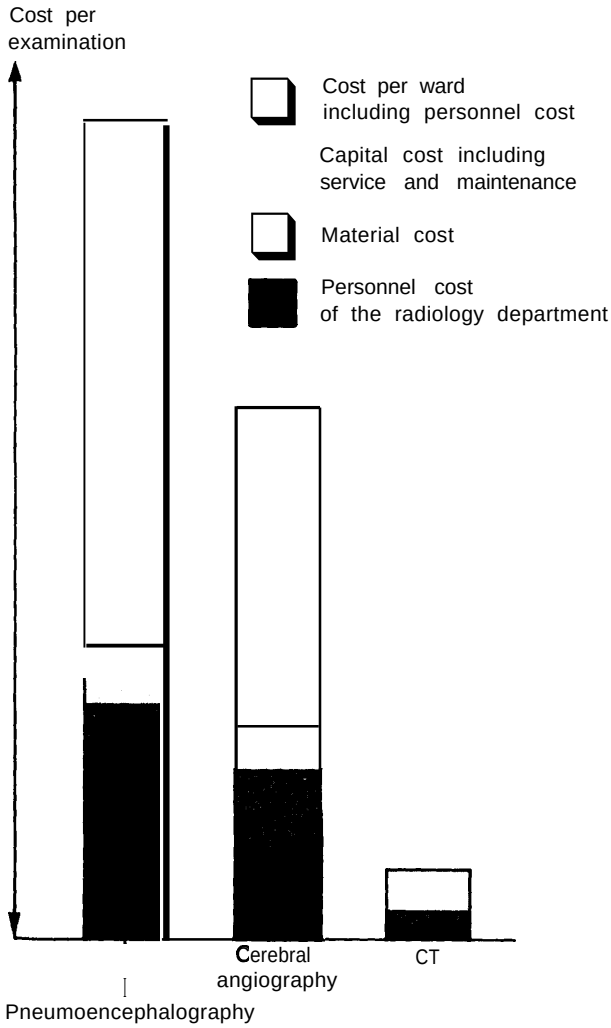
The basic question SPRI asked was: How many pneumoencephalographic and/or angiographic examinations have to be replaced at a given hospital by CT in order for the costs of the scanner to be justified? The costs of the CT head scanner were weighed against those of pneumoencephalography and cerebral angiography at various levels of examination.[14] The medical and psychological value of replacing an invasive procedure with a noninvasive one were deemed impossible to gauge, so only equipment, hospital, and manpower expenses were considered. (See figure 1.)

The cost-effective level for installation of CT scanners was determined to lie somewhere in between the regional and central hospitals, since some of the large central hospitals did almost as many brain examinations as the smallest regional hospital. SPRI did not specifically recommend, therefore, which institutions should acquire CT technology. Rather, it published charts that county councils could use to grid specific levels of usage of angiography and pneumoencephalography at any given hospital in order to determine if replacement of these modalities with a CT scanner would be cost effective. (See figure 2.)

Why was this seemingly unspectacular information probably responsible for restraining CT? The answer lies partly in the timeliness of SPRI'S report. As the experience with the Enkoping hospital obstetrics unit showed, it is easier not to add a service than to eliminate it later on. Swedish health economist Edgar Borgenhammer stated (11):

> My experience is that it means a lot for the possibilities of cost containment that the admin-

Figure 1.—Relative Proportions of Different Cost Items in the Total Costs of Pneumoencephalographic, Cerebral Angiographic, and CT Examinations

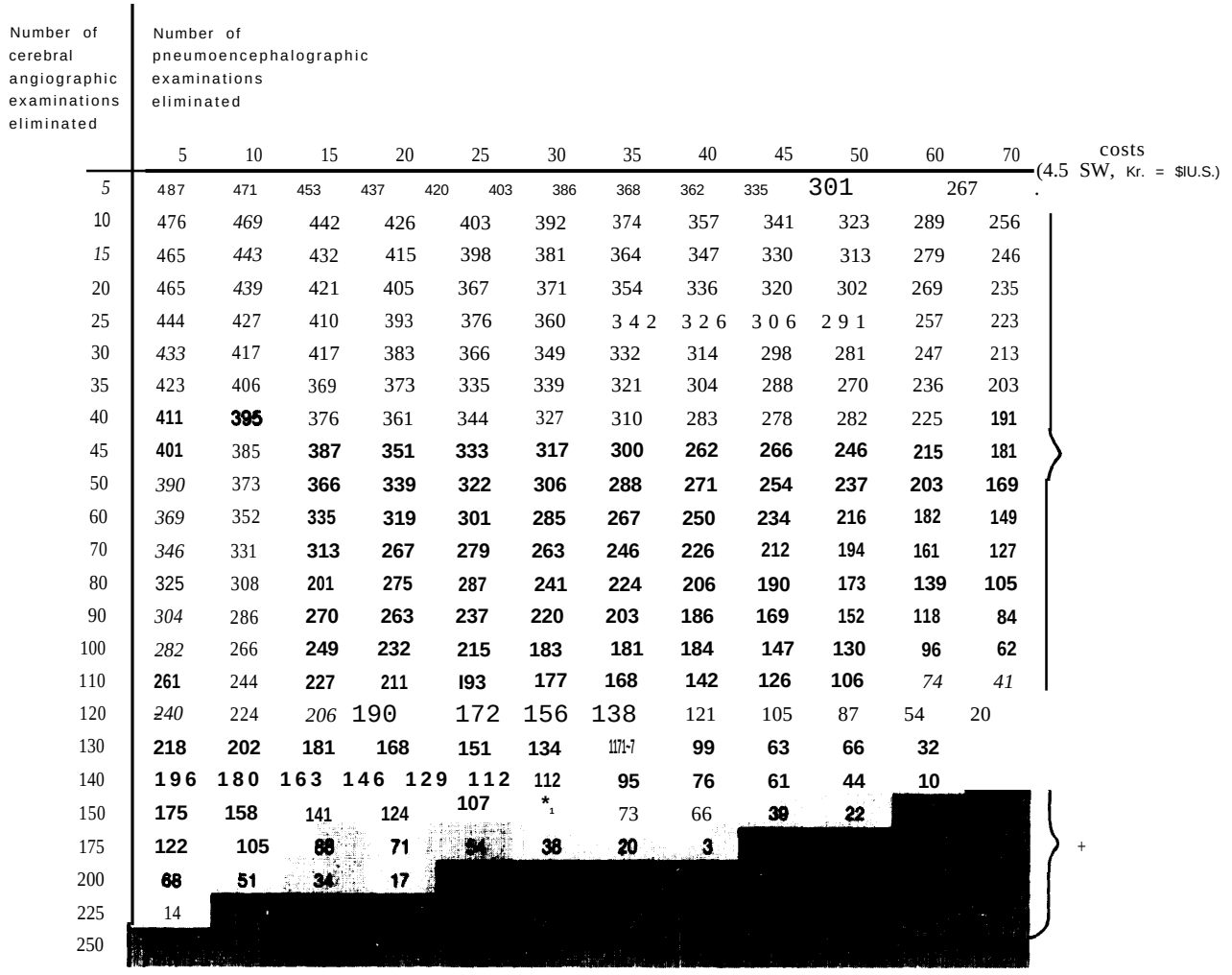


As is evident from this figure, cerebral angiographic and pneumoencephalographic examinations are much more personnel demanding than CT examinations.

SOURCE: E. Jonsson and L. Å. Markē, "CAT Scanners: The Swedish Experience," *Health Care Mgt. Review* 2:37, 1977 (28).

[14]Two other methods used to detect cerebral lesions in Sweden, gamma- and echo-encephalography, did not figure prominently in CT planning for two reasons (28). First, their cost per investigation is only one-fifteenth the cost of angiography or pneumoencephalography. Thus, potential savings from replacing them with CT were not significant. Second, both gamma- and echo-encephalography give somewhat different types of information from the types of information given by pneumoencephalography, angiography, and CT.

Figure 2.—Projected Annual Cost Increase or Decrease Resulting From the Introduction of a CT Scanner (in thousands of Swedish kroners)



SOURCE: E. Jonsson and L. Å. Marké, "CAT Scanners: The Swedish Experience," *Health Care Mgt. Review* 2:37, 1977 (28)

> istrator can catch problems before they grow big. . . , Once resources have been allocated to an area it is very difficult to diminish or remove them,

The Swedish experience with CT is a case where planning was done before the situation grew too big. Most Swedish hospitals waited for the report and seemed to follow its recommendations. Only two scanners had been installed in Sweden at the time the SPRI report was released. By that date, *320* scanners were already in operation in the United States (8).

Although it is far from perfect in practice, Sweden's hierarchical hospital system did serve to arrest the diffusion of scanners. As of February 1979, 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 (54). As of late 1979, Sweden had 17 scanners (27). They were installed on the following dates: October 1973 (1), November 1975 (1), November 1976 (l), January 1977 (l), February 1977 (l), March 1977 (I), July 1977 (1), September 1977 (l), November 1977 (1),

December 1977 (l), January 1978 (l), February 1978 (l), May 1978 (l), February 1979 (l), June 1979 (2), August 1979 (1).

How successful was the SPRI model in predicting the effect of the introduction of CT? The assumption that the usage of alternate modalities would drop off proved correct. A subsequent turn that has altered the results of CT implementation, however, is that scanners are used more frequently than was projected on the basis of the assumption that scans would replace angiographs and pneumoencephalographs (4). As a consequence, the introduction of CT may have lowered costs for given numbers of cerebral examinations, but raised total costs. The structure of the Swedish hospital, however, keeps these marginal costs at a minimum, an advantage Swedish planners Jonsson and Marke pointed out (28):

> It is conceivable that in the United States, 50 angiographs per year could be replaced by 800 CAT exams. This would result in a major net increase in third party expenses. The Swedish counties have less of a problem in this area. Once they decide on equipment purchase and staffing changes, that decision defines most of the difference in total costs. A much higher than expected volume of CAT scans will not create a financial crisis, perhaps until another budget year when a second CAT scanner is asked for.

In September 1979, SPRI organized an international conference to alert other countries to the need for evaluations similar to its evaluation of CT. The following features of SPRI'S approach are especially deserving of note:

- SPRI developed good working relationships with a number of senior physicians who provided medical expertise.
- The report SRRI issued was timely, Produced when the decisions were being made, the report synthesized existing knowledge and original information SPRI collected in areas such as costs and staffing. It was not the definitive study that might have consisted of **a** randomized trial with long-term followup. Such a study, however useful, would not have provided information until many years after the critical decisions had already been made.
- The report addressed the concerns of the decisionmakers. The lay county council members needed to understand the central issues. They needed this kind of information to respond to the perhaps overenthusiastic requests for scanners from their medical staff.
- The report did not give a simple yes or no answer with regard to CT scanners, but defined a set of tradeoffs related to the avoidance of other more risky procedures, volume of tests, and costs. It allowed play for local preferences in coming to a decision.
- SPRI performed a new analysis for body scanners when the matter of their possible purchase arose.
- SPRI organized a national conference on this topic drawing together physicians and administrators and lay county council members to present its analysis and allow for discussion. Swedish authorities presented their views on CT, and an American expert, Barbara McNeil, came to explain that the benefits of CT scanners were not yet at all well defined.
- SPRI staff continued contacts with medical decisionmakers to offer advice.
- To improve future medical technology assessments, SPRI is now conducting a followup interview study to see how, if at all, Swedish decisionmakers were influenced by the SPRI analysis.

The approach that SPRI used in its evaluation of CT scanners might well be used as a model for other countries.

Coronary Bypass Surgery

Although there were precedents for the treatment of coronary artery disease by surgery in Sweden, no procedure had been very successful or was in wide use when coronary bypass surgery was introduced. Beginning with Lindgren's stellate ganglion resection experiments in the late 1940's, Sweden had been on the forefront of experimental surgical techniques to relieve angina pectoris (36). Various techniques were developed and tested, but although in some cases the techniques did yield some relief from

pain, they did not appreciably change mortality statistics. As a result, there developed in Sweden skepticism toward each new "miracle" operation that emerged in that country or elsewhere.

According to Uppsala thoracic surgeon Torkel Åberg, skepticism toward innovations in heart surgery influenced Swedish decisionmaking on the bypass operation (1). Lending credence to Åberg's argument is Sweden's decision not to use heart transplantation. Subsequent to its introduction in South Africa in 1967, heart transplantation was attempted in almost every developed nation except Sweden. The consensus in Sweden, despite some heated dissent, was that heart transplantation was too experimental in nature to justify its use (9,10). In the case of coronary bypass surgery, Sweden exercised considerable restraint, but did not decide to avoid the procedure altogether. The experts on the medical evaluation board agreed that, unlike heart transplantation, the bypass procedure was consistent with proven scientific knowledge and good practice. Since the bypass surgery was felt to be potentially valuable, in 1973-74, it was instituted in Sweden on a small and experimental scale (68).

The Swedish experience with coronary bypass surgery differed from that with CT scanners because of the doubts concerning not only the economics of the surgery, but also its strictly medical worth. Once the decision to implement bypass surgery was made, however, its diffusion process paralleled that of CT. Once again the central question for Swedish planners was: How can this technology be implemented in the most cost-effective fashion? In other words, which tier of the hospital hierarchy is appropriate for coronary bypass surgery? In the case of CT, there was some dispute, since a scanner can be placed virtually anywhere, even in a doctor's office. Bypass surgery is fundamentally different from CT, however, in that it requires enormous ancillary support.

In order to perform this surgery, all the prerequisites for major cardiac surgery—intensive care units, heart-lung machines, blood gas monitoring—are necessary. Given these prerequisites, the sites at which coronary bypass surgery could be performed in Sweden were predetermined—by the location of departments of thoracic surgery, which had already assembled all these resources and equipment for other types of heart operations. These departments, as a result of a consolidation that took place in 1963, were located only at Sweden's four largest regional hospitals.

In designing the framework for the Swedish regional hospital network, Director-General Arthur Engel saw thoracic surgery departments as a special case, noting in his 1958 report that these departments required a "block" of supporting departments: pulmonary medicine, specially equipped cardiology and radiology clinics, and a physiology laboratory for respiratory and circulatory testing (52). At the time of that report, eight hospitals and two sanitoria were equipped for thoracic surgery. Referrals to these institutions from smaller hospitals were erratic. Furthermore, two of the departments had far greater operating loads than the others, some of which had only 10 beds. Engel felt that these inefficient units were best closed, as the minimum effective size for a thoracic surgery department was 25 beds, and the ideal unit was 50 beds (52). This judgment implied that a fifth, interregional tier of the hospital hierarchy would be necessary for thoracic surgery; otherwise if all seven regions were to outfit effective size units, there would be overcapacity. No immediate modifications were made to the newly created regional system, however, so as to ease the passage of the 1958 report.

As explained by Engel, the interregional system for advanced cardiac surgery departments was developed in 1963 (14):

> One amendment to the original plan was made in 1963. It was found inadvisable to carry out advanced cardiac surgery needing extracorporeal circulation and respiration by means of a heart-lung machine at all regional hospitals. This activity is therefore now located in the four largest regions only.

As a result of the 1963 consolidation of thoracic surgery departments, Swedish planners had only four possible sites to choose from for cor-

onary bypass surgery.[15] Thus, in the case of coronary artery surgery, an earlier consolidation of services played a dividend in restraining the diffusion of a then unforeseen innovation—the maxim being "past planning begets the success of future planning."

The decision that coronary bypass surgery was worthwhile and would be done only at select hospitals did not answer the question of how many operations should be performed. For the year 1977, only about 220 coronary bypass operations, or about 27 per million Swedes, were performed. (See table 4.) What limited

Table 4.—Estimated Number of Coronary Artery Bypass Operations Performed in Sweden (1977-79)

Year	Number of operations	Number of operations per million population
1977	**220**	**27**
1978	**300**	**37**
1979	400	50

SOURCE. T. Aberg, Professor of Thoraclc Surgery, The Academ!c Hospital, Uppsala, Sweden, personal communication, December 1979 (2)

Sweden to the relatively low figure of 27 operations per million citizens? Surgical candidates were plentiful. According to the World Health Organization (WHO), the theoretical need for bypass surgery is estimated to be *150* patients per million population (71). Medical manpower was not a limiting factor in Sweden, either. Swedish thoracic surgeons were doing far fewer coronary bypass procedures than the *50* procedures that WHO stated "are required per year per surgeon for adequate professional skill to be maintained" (71).

The immediate limiting factor was the number of intensive care beds available to the thoracic surgery clinics. A certain number of bed-days are allotted to each clinic, which can use them as it sees fit. This allowance was expanded to accommodate what planners saw as suitable numbers of bypass operations. Additional operations would have had to cut into resources for other types of thoracic surgery (l). Swedish thoracic surgeons' response to the Veterans Administration (VA) trial (38), given the limited resources they had, was to try to treat only the most promising candidates with coronary bypass surgery and handle the remainder of angina patients with drugs (26). Surgeons at Uppsala Academic Hospital, who handled roughly one-third of the bypass referrals in 1977, allotted resources for 72 operations. In deciding who received the operation, surgeons considered patients' medical conditions and ages (1).

The level of 27 coronary bypass operations per million population per year, achieved by 1977, was found to be insufficient to treat all the patients that had been selected for surgery. Plans were proposed to incrementally raise the number of bypass operations in Sweden closer to the optimal level of *150* per million per year suggested by WHO, if not beyond (3). At the same time, there was a call in the United States to reduce the amount of bypass surgery.

Viewing the discrepancy in coronary bypass surgery levels in the United States and Europe, Swedish internist Ed Varnauskas arrived at the following conclusion (66):

> With the given indications, the number of operations now performed is probably too high in the USA and too low in Europe. The truth lies somewhere in between.

There are two separate routes for reaching the "golden mean" between underutilization and overutilization of technology. The pattern in the United States seems to be overexpansion followed by contraction. The disadvantage of this path is that resources are wasted. Furthermore, reducing the share of resources allocated to an entrenched medical technology is more difficult than increasing the share allocated to an underutilized one.

Rather than following the pattern in United States, Sweden tends to adopt a "wait and see" approach.[16] In the case of coronary bypass surgery, Sweden's "wait and see" approach was

[15] Although no reliable figure for the number of centers for coronary bypass surgery in the entire United States is available, in 1975, in the State of California alone, 91 hospitals performed cardiac operations (16). California's population, five times that of Sweden's, does not account for the over 20 times greater diffusion of coronary bypass surgery in terms of operation centers.

[16] "The phrase used to describe this policy is "avvaktande hallning" *(54)*, which translates idiomatically as "wait and see."

cost effective but had one major drawback. During the "trial" period, triage was instituted, so many deserving candidates for coronary bypass surgery were not given treatment or put on waiting lists. The success of Sweden's limited approach to coronary bypass surgery, therefore, was very dependent on Swedish citizens' acceptance of rationalization. The "collectivism" orientation that underlies Swedes' willingness to wait their turn has already been noted previously in this chapter. The experience with coronary bypass surgery does not shed additional light on the roots of Swedes' "collectivism" orientation, but does demonstrate how it facilitates the efforts of Swedish planners. Had patients felt they were being denied a lifesaving service and rebelled, the "wait and see" approach might have failed.

Swedish citizens did not feel that a vital service was being denied to them for two reasons. First, the Swedish medical system previously had avoided implementing an innovation—namely, heart transplantation [17]—without disastrous results, perhaps establishing a precedent of good judgment in controlling the diffusion of new operations. Second, definitively lifesaving technologies have not been withheld from Swedish patients—only questionable ones have. A good example of a clearly vital innovation that was not restrained by Swedish planners is that of kidney dialysis.

Renal Dialysis

For examining the diffusion of an innovation, renal dialysis is not as good a specific case study as CT scanners and coronary bypass surgery. CT of the head and the coronary bypass surgery arrived as state-of-the-art technologies at definite times, and few fundamental theoretical improvements on these technologies have been made since. Renal dialysis evolved more slowly, and its gradual diffusion since the late 1940's has been controlled as much by advances in equipment as by specific policies and their effects (19).

Dialysis machines function as kidney substitutes in cases of chronic renal failure. This disorder, when untreated, quite predictably leads to death from uremic poisoning. Demand for dialysis is therefore linked more closely to urgent need and less to subjective medical referrals than are CT and coronary bypass surgery. As a lifesaving technology for which demand originates largely from objectively rather than subjectively determined need, renal dialysis is a valuable reference point.

Swedish planners made this technology readily available to individuals that needed it (5). The planners' policy of meeting the demand for this clearly lifesaving technology contributes to the confidence citizens have in their judgment. This faith in turn allows rationalization of more questionable technologies without major objections by Swedish patients.

Table 5 shows the number of Swedish patients receiving renal dialysis and kidney transplants by region in 1978. Reliable statistics on renal dialysis for identical years in the United States and Sweden are difficult to obtain, but during the year 1977, both countries had roughly 100 persons per 1 million population on dialysis (39,55). The fact that the rates for dialysis in the countries are comparable suggests that when Sweden does not make attempts to restrain technologies, dialysis being a case in point, they proliferate to a similar extent as in the United States. Using the dialysis baseline, it is justifiable to attribute at least some cross-national discrepancy in the levels of CT and coronary bypass surgery in Sweden and the United States to Swedish planners' success in actively seeking to restrain the influx of these two technologies.

Cobalt Therapy

Cobalt therapy units are rationalized in Sweden through the hospitaI regionalization planning mechanism. The decision to have such a unit requires national approval of the physician staffing at the hospital and local approval for construction and operating costs. This mechanism for rationalizing cobalt therapy fits well into the regionalized structure of hospital care in Sweden. There are 28 cobalt machines in Sweden, about 3 per 1 million population.

[17] It must be added that the decision against beginning with heart transplantation hinged on Sweden's definition of brain death (which is uniquely stringent), not on a socioeconomic opinion that the operation would be unrewarding.

Table 5.—Number of Renal Dialysis and Renal Transplant Patients in Sweden by Region (Oct. 31, 1978)

Region and population (in millions)	Renal dialysis patients		Kidney transplant patients	
	Number	Number per million population	Number	Number per million population
Stockholm (1.568)	137	87	180	115
Linköping (0.6)	86	136	41	65
Lund (1.524)	140	92	80	52
Malmö (0.250)	27	108	19	76
Göteborg .. Vanersborg (1.499)	57	38	116	77
Örebro (0.810)	43	53	36	44
Uppsala (1.075)	69	64	71	66
Umea (0.908)	43	47	75	83
Total	602	73	618	75

SOURCE: J. Allmén, Section of Nephrology, Medical Clinic I, Sahlgren's Hospital, University of Göteberg, Sweden, personal communication, January 1979 (6)

Automated Clinical Laboratories

Decisions regarding automated laboratory testing in Sweden have been left up to local county councils as part of the capital equipment budgeting process. There are no specific national guidelines.

CONCLUDING REMARKS

Unique features of Swedish culture, history, and the organization of medical care have set the stage for careful and systematic evaluation of new medical technology. The regionalization of hospital services, the respect for government planners, the county and national control of medical care costs, the homogeneity of Swedish culture, and the existence of SPRI, a central advisory group, make possible in Sweden the timely review of new medical technology.

Decisions concerning automated laboratory testing have been made at the local (county) level. The control of cobalt therapy and coronary bypass surgery was achieved through the regionalized hierarchy of hospitals. A new departure from the control of medical technologies through the budgetary, staffing, and regionalization processes was SPRI'S systematic and timely analysis of costs and benefits of the CT scanner. SPRI'S evaluation of that new medical technology provides an example worthy of emulation.

CHAPTER 10 REFERENCES

1. Aberg, T., Professor of Thoracic Surgery, The Academic Hospital, Uppsala, Sweden, personal communication, Feb. 1, 1978.
2. _____ personal communication, December 1979.
3. _____ "Aorto-Coronar Bypass," *Lakartidningen 75:3770, 1978.*
4. Abrams, H., and McNeil, B., "Medical Implications of Computed Tomography," N. Eng. J. Med. 298:255, 1978.
5. Allmén, J., Professor of Nephrology, University of Gothenberg, Sweden, personal communication, Jan. 12, 1979.
6. Allmén, J., Section of Nephrology, Medical Clinic I, Sahlgren's Hospital, University of

Göteberg, Sweden, personal communication, January 1979.
7. Anderson, O., *Health Care: Can There Be Equity? (New* York, N. Y.: John Wiley and Sons, 1972).
8. Banta, D., "The Diffusion of the Computed Tomography (CT) Scanner in the United States, " *Int. J. Hlth. Serv.* 10(2):251, 1980.
9. Biorck, G., "Skall vi transplantera hjärtan?" *Läkartidningen* 66:1745, *1969.*
10. Björk, V. O., "Hjarttransplantation som behandlingsmetod," *Läkartidningen* 66:5487, *1969.*
11. Borgenhammer, E., "Cost Containment in Swedish Medical Care, " paper presented at the Arthur D. Little Executive Forum, "The Health Care Industry: The Impact of Voluntary Cost Containment," L'Enfant Plaza, Washington, D, C., Nov. 5-7, 1978.
12. Cooper, J. K., "Sweden's No-Fault Patient-Injury Insurance, " N. *Eng. J.* Med. 294:1268, 1976.
13. Dreborg, S., "Ett Boden-försök att öka patient-Lakarkontinuiteten, " *Läkartidningen* 75:901, 1978.
14. Engel, A., *Perspectives in Health Planning,* University of London Heath Clark Lectures, 1967 (London: Althone Press, 1968).
15. _____, "Planning and Spontaneity in the Development of the Swedish Health System, " *6th Michael M. David* Lecture (Chicago, 111.: University of Chicago, 1968.
16. Enthoven, A. C., "The Consumer Choice Health Plan: An Alternative Approach to NHI," in The *Carter Administration and Health Policy* (Washington, D. C.: National Journal, 1978).
17. Folksams Sociala Råd, *Vår Trygghet* (Stockholm: Tiden-Barnangen Tryckerier, 1978).
18. Forsarkringskasseforbundet, *Information for Immigrants: Social Insurance in Sweden* (Stockholm, 1973).
19. Gelin, L. E., "Renal Transplantation as the Treatment of Choice for Terminal Renal Failure, " *Scand. J. Urol. Nephrol.* 38 (Suppl.):7, 1976.
20. Hancock, M. D., *Sweden: The Politics of Post-Industrial Change* (Hinsdale, 111.: Dryden Press, 1972).
21. Heidenheimer, A., "An Exploratory Analysis of Patterns in Swedish Health Politics, 1947-1952, " paper presented at Sigtuna Health Policy Conference, Sigtuna, Sweden, August 1978.
22. Hjelt, O., *Svenska och finska medicinalverkets Historia 2663-2822* (vol. II, Helsingfors, Sweden: Central Tryckeri, 1891-1893).
23. Holmdahl, M., "Medicine Views the Swedish Hospital System, " in *The Swedish Health Service System* (Chicago, Ill.: American College of Hospital Administrators, 1971).
24. Huntford, R*., *The New Totalitarians* (London: Penguin Books, 1971).
25. Iglehart, J., "Controlling the M.D. Spiral," in *The Carter Administration, Congress, and Health Policy* (Washington, D. C.: National Journal, 1978).
26. Johansson, L., "Kirurgisk behandling av koronarskleros—synpunkter på resursbehovet, " *Läkartidningen* 75:4486, *1978.*
27. Jonsson, E., Swedish Planning and Rationalization Institute (SPRI), Stockholm, personal communication, February 19 0.
28. _____, and Markē, L. f ., "CAT Scanners: The Swedish Experience, " *Health Care Mgt. Review* 2:37, *197.*
29. _____, and Neuhauser, D., "Hospital Staffing Ratios in the United States and Sweden, " *Inquiry* 12 (Suppl.):128, 1975.
30. _____, and Neuhauser, D., "Medical Malpractice in Sweden, " N. *Eng. J. Med.* 294:1276, *1976.*
31. Kelman, S. J., "Regulating Job Safety and Health: A Comparison of the U.S. Occupational Safety and Health Administration and the Swedish Workers Protection Board, " Ph. D. dissertation, Harvard University, Cambridge, Mass., 1978.
32. Knutson, D.,. "Läkarkårens fackliga organization, " *Läkartidningen 39: 2786, 1942.*
33. Landstingsforbundet (Federation of County Councils), *County Council Plans 1975-1981* (Stockholm, 1975).
34. _____ *Från Sjukvårdspolitik till Hälsopolitik* (Stockholm, 1977).
35. Lindberg, G., *Den Svenska Sjukkasserörelsens Historia* (Lund, Sweden: Carl Bloms Boktryckeri, 1949).
36. Lindgren, I., "Angina Pectoris: A Clinical Study With Special Reference to Neurosurgical Treatmerit, " *Acta Medica Scand.* (Suppl.), 1950.
37. Maxwell, R., *Health Care: The Growing Dilemma (New* York, N. Y.: McKinsey & Co., 1975).
38. Murphy, M. L., et al., "Treatment of Chronic Stable Angina, " *N. Eng.]. Med.* 297:621, 1977.
39. National Kidney Foundation, New York, N. Y., personal communication, Mar. 9, 1979.
40. Nillson, G. B., *100 Års landstingspolitik: Västmanlands Länslansting 1863-1963* (Uppsala, Sweden: Almquist & Wiksell, 1966),
41. Nordenström, B., Professor and Chairman, Department of Radiology, Karolinska Hospital, Stockholm, personal communication, Dec. 5, 1977.

42. _____, "Nytt 'sabotage' mot röntgendiagnostiken," *Lakartidningen* 74:627, *1977.*
43. Posner, J., "The Other Side of Swedish Medicine, Part II: There's a Long Wait Ahead for Astrid . . ." Prism, September/October 1974.
44. Rexed, B., "Public Policy and Medicine," in *The Swedish Health Services System* (Chicago, Ill.: American College of Hospital Administrators, 1971).
45. Rest%, J., *Svensk Historia Z: tiden fore 1718 (Stockholm:* Svenska Bökforlaget, 1963).
46. Ryden, B., "The Swedish Economy," in *Sweden in the Sixties*, edited by I. Wizelius (Uppsala, Sweden: Almquist & Wiksell, 1967).
47. Shapiro, S. and Wyman, W. M., "CAT Fever," N. *Eng. J. Med.* 294:955, 1976.
48. Spek, J. E., "Swedish Medical Care in Economic Crisis," paper presented at the Sigtuna Health Policy Conference, Sigtuna, Sweden, August 1978.
49. Ståhl, I., Department of Economics, Lund University, Sweden, "Can We Control Health Care Costs," mimeographed report, 1978.
50. Statens Offentliga Utredninga, SOU (Reports of Swedish Royal Co missions), *Forslag till allman sjukhusstadgaYr*, 43, 1922.
51. _____ *Den öppna läkarvarden I Riket*, 14, 1948.
52. _____, *Riksplan for samarbete inom specialiserad sjukhusvård av särskilt tillkallad utredningsmän*, 26, 1958.
53. _____, *Om läkarbehov och läkartillgång, betankande au läkarprögnos utredningen*, 8, 1961.
54. _____, *Regionsjukvården, 70, 1978.*
55. _____, *Regionsjukvården, 71, 1978.*
56. Statistiska Centralbyrån (National Bureau of Statistics), *Sweden* 78, (Stockholm, 1978).
57. _____ *Historisk Statistik för Sverige (Stockholm,* 1960).
58. *Svensk Författningssamling, SFS* (Swedish Statutory Codes), Law No. 77, 1864.
59. _____, Law No. 24, 1897.
60. _____, Law No. 1, 1947.
61. Sveriges Läkarforbund (Swedish Medical Association), *Läkar fakta '77* (Stockholm, 1977),
62. The Swedish Institute, "The Organization of Medical Care in Sweden," *Fact Sheets on Sweden* (Stockholm, 1976).
63. Swedish Planning and Rationalization Institute (SPRI), *SPRI* 1978-80: *Viktiga utgångspunkter* (Stockholm, 1977).
64. Thyselius, P. E. I., *Handlingar till Sveriges reformation och Kyrko historia*, Bd. I. (Stockholm, 1841-45).
65. Tomasson, R. F., "The Extraordinary Success of the Swedish Social Democrats," *J. Polit.* 31:772, 1969.
66. Varnauskas, E., "WHO's arbetsgrupp om koronar-bypass kirurgi," *Läkartidningen* 75:1917, 1978.
67. Wawrinsky, R., *Sveriges Lasarettsväsande förr och nu* (Stockholm: Författarens Förlag, 1906).
68. Wennström, G., Director of Planning, Socialstyrelsen (National Board of Health and Welfare), Stockholm, personal communication, Oct. 24, 1977.
69. Werkö, L.; "Swedish Medical Care in Transition," *N. Eng. J.* Med. 284: 360, 1971.
70. Wistrand, B., *The Medical Responsibility Board and the Patient Ombudsmen in Sweden* (Stockholm: Socialstyrelsen (National Board of Health and Welfare), 1975).
71. World Health Organization (WHO), *Long-Term Effects of Coronary Bypass Surgery*, report of a working group, The Hague, Nov. 1-4, 1977 (Copenhagen: WHO Regional Office for Europe, 1978).