
CHAPTER 8

**Technology Transfers in
Medical Services**

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Technology Transfers in Medical Services

INTRODUCTION

During the last 10 years, most Middle East countries and particularly those focused upon in this study, have placed increasing emphasis on improved health care. This emphasis has been reflected in both budgetary and public policy plans. The strides made in medical care during this period have been enormous, but much remains to be done. Some of the major health problems today involve diseases that have largely been conquered in the industrial countries, such as infectious and parasitic diseases, respiratory infections, problems related to childbirth, and diarrheal disease. Chronic diseases, such as heart disease, which have become common in the industrial countries and to which much of the newer medical technology is addressed, are, by many accounts, far down on the list of health problems in the Middle East. Many Middle Eastern countries need comprehensive public health programs to help meet their goals.

Of all the technology transfer sectors examined by OTA in this study, medical service transfers are those most likely to affect directly the quality and longevity of life of the average citizen in the Middle East. Since these transfers entail the promise of substantial improvement in local living conditions, U.S. Government programs supporting medical technology transfers are particularly prominent. However, medical services are also big business; U.S. firms have been important exporters of medical equipment and services, particularly in the hospital management area. Therefore, both the development assistance and commercial aspects of medical service technology transfers may have important implications for public policy.

The medical services sector covers a broad range of activities, from design and construc-

tion of medical facilities, to training of personnel, to management of varied types of health care. The large increase in petroleum revenues, the increased commitment to health care demonstrated in national development plans, and increased public health needs and expectations have converged to cause a rapid expansion in medical services technology transfers in the Middle East in the past decade. Saudi Arabia, for example, is one of the world's largest *importers* of medical equipment and hospital management services. Although decreased petroleum revenues may slow the region's pace of growth in this sector, increasing medical needs and the commitment to improve health care will continue, with effective technology transfer a major factor. Trends indicate an increased emphasis by recipients on local level preventive health care, as opposed to more costly, sophisticated curative care. Training of indigenous personnel at all levels and proper specification and maintenance of equipment will be the recipients' major concerns. Expatriate personnel may be required well into the future to fill personnel requirements in some medical services categories, particularly if the ambitious health care plans of some Middle Eastern countries are implemented.

An extremely significant aspect of medical technology absorption is the ultimate benefit to the patient. In the absence of direct indicators of this benefit, several dimensions of the health infrastructure in each country are used as proxies. A number of factors relevant to assessment of absorption of medical services technology are considered, including facility design and construction, equipment, staff, education and training, and research and development (R&D) programs. The number, quality, and capability of health personnel in-

volved in the five areas are investigated. The level of medical technology absorption in the Middle Eastern countries under study is found to vary widely by country and medical service category.

U.S. firms have established strong positions in medical services in the Middle East, but the U.S. market share may decline, particularly in the medical equipment field. This is primarily due to their poor reputation for after-the-sale maintenance and service. The U.S. position is expected to remain strong, however, in hospital management contracts, since U.S. firms have a reputation for efficient operation and U.S. medical practice is highly regarded in the Middle East. In the future, however, the

most pressing need will continue to be in the area of preventive and less sophisticated health care. U.S. development assistance programs have focused on health care of this type.

This chapter examines the nature and extent of technology transfer to the Middle East in the medical service sector. It examines the medical technologies and services involved and evaluates the development plans and strategies of various Middle East nations for improving medical services. It outlines the factors that influence sales of equipment and services, as well as the success of government-supported medical technology transfer. Finally, implications for U.S. policy are outlined.

MEDICAL SERVICES IN THE MIDDLE EAST

MEDICAL REQUIREMENTS AND FACILITIES

There are many types of "health care" and several ways to arrive at this care. Primary care is often associated with local village needs as well as preventive medicine. Secondary and tertiary care are more frequently associated with curative medicine and often comprise what is considered "modern" medicine. There is a need for proper integration of health care systems. Private medical care in developing countries usually comprises a small percentage of total health care. Government health ministries decide the countries' medical priorities and set the policy for the mix and emphasis to be placed on various types of health service.

Profile of Medical Services and the Medical Services Industry

Medical care is a large and diverse industry with no clear boundaries separating it from related sectors of the economy. In industrialized countries the health care system includes a wide variety of facilities and personnel totaling up to 10 percent of the total economic activ-

ity of the society.¹ In developing countries, the delivery of health care interrelates strongly with other factors such as food and nutrition, sanitation, water supply, literacy, and income distribution. In general, government is the main provider of health care; social insurance schemes are viewed as a public responsibility.

In industrialized countries the health care sector relies heavily on highly trained professionals and sophisticated facilities, although more than half of the workers are support personnel with little or no advanced medical training. In developing countries, various options exist for developing a medical labor force that relies to varying degrees on highly trained professionals. Generally, developing countries rely less on advanced personnel and facilities, both because of the shortage of available personnel and capital and because of the urgent need to deliver basic primary health care (with an emphasis on prevention) to low-income groups.

¹U.S. Census of Service Industries, 1978; For discussions of measurement of health personnel, see Robert Kohn and Kerr L. White (eds.), *Health Care: An International Study* (London: Oxford University Press, 1976); Milton I. and Ruth J. Roemer, *Health Care Systems and Comparative Manpower Policies* (New York: Marcel Dekker Inc., 1981).

Thus, two models can be used to characterize this broad technology area: 1) the “developed” country model, which relies heavily on hospital care, fully trained doctors, and an extensive pharmaceutical industry; and 2) the “basic health care” model (as in China), which relies heavily on larger numbers of health care workers with minimal training. A “mixed model” is prevalent in many developing countries.

Medical Service Categories

Medical services include the following categories, which may be emphasized to different extents in various countries:

1. *Hospitals.* Specialized facilities for health care, including physician and nursing services.
2. *Specialized clinics.* Dental, vision, and mental health services, in addition to other nonphysician services such as care of patients by midwives.
3. *Special health programs.* Examples include public health education, nutrition programs, sanitation programs, birth control campaigns, environmental health programs, and immunization programs.
4. *Medical training and education.* Training of health personnel, ranging from short training programs to the operation of medical schools and teaching hospitals.
5. *Pharmaceuticals.* Includes the distribution of medicines to patients and in some cases the manufacture of those medicines, and possibly R&D of new medicines. (This chapter does not deal extensively with the pharmaceutical industry, but treats it where necessary to understand the quality of services provided through medical facilities and personnel.)
6. *Administration.* Management for health facilities and administration of health programs.

Manpower Characteristics

As a point of reference, medical services in the United States illustrate the characteristics of health personnel in an industrialized country. It should be noted that exact definitions

of these characteristics are not possible because there is no agreement as to exactly which personnel should be included in the category “health personnel” (i.e., those actually trained in medical work, those performing supporting roles, etc.).

In the United States, total expenditures for health services represent a considerable portion (about 10 percent) of GNP, with these expenditures concentrated in labor inputs. Of the total value of health services, about two-thirds represents labor input, one-sixth inputs of physical capital, and the remaining, one-sixth, goods and services purchased from other industries.² Among health care personnel in the United States, physicians and nurses make up the largest contingent of professional workers, together accounting for almost 40 percent of the total. In contrast to the situation in many developing countries, the majority of physicians work outside the hospital. Nurses make up by far the largest single group of U.S. health personnel, or about 30 percent of the total. Nursing aides and orderlies constitute nearly one-fourth of the direct health care workers in the United States.³ Improvements in health technology have also necessitated an expansion of “allied health personnel, such as pharmacists and technicians.

In order to compare the situation in the United States and other industrial nations to that in the Middle East, several measures can be used to assess the amount and type of health personnel in a country. One measure is the number of physicians per capita. Although this measure only one component of the health system, it is generally available and gives a first approximation of health resources. Care must also be exercised in that definitions of what constitutes a “physician” in various countries may differ. Typical levels of “population per physician” (and the equivalent measure of physical infrastructure, population per

²In fiscal year 1974-75, it was calculated that total U.S. expenditures for health services reached \$118 billion, or about 8 percent of GNP. See Alan L. Sorkin, *Health Manpower* (Lexington, Massachusetts: Lexington Books, 1977), p. 1.

³Ibid., p. 6.

hospital bed) for six Middle Eastern countries and representative developing and industrialized countries are presented in table 71.

As the data indicate, there is over a hundred-fold variation between levels of physicians per capita in the richest and poorest countries. In the Islamic Middle East, only Kuwait approaches the "level" of health care of industrialized countries. (However, there are also substantial variations within industrialized countries, which do not necessarily correlate with health levels of the population.⁴) Measures such as population per physician or per hospital bed have been criticized as inadequate for assessing health care delivery. In the considerable literature on the measurement of health personnel resources⁵ are studies that have measured the use of health resources (e.g., frequency of visits to physician) or the actual levels of health of the population (e.g., longevity and mortality data) rather than

⁴Milton I. Roemer and Ruth J. Roemer, *Health Care Systems and Comparative Manpower Policies* (New York: Marcel Dekker, Inc., 1981).

⁵See, for example: Brian Abel-Smith, *Value for Money in Health Services* (New York: St. Martin's Press, 1976); Eli Ginzberg, *Health Manpower and Health Policy* (Montclair, N. J.: Allanheld, Osmun & Co., 1978); Milton I. Roemer, *Health Care Systems in World Perspective* (Ann Arbor, Mich.: Health Administration Press, 1976); U.S. Department of Health, Education, and Welfare (Office of International Health), *Guidelines for Analysis of Health Manpower Planning*, prepared by E. H. White Co., San Francisco, Calif. (Rockville, Md.: Office of International Health, 1979).

Table 71.—Population Per Physician and Per Hospital Bed

Country	Year	Population/ physician	Population/ hospital bed
Algeria	1977	5,592	387 ^a
Egypt	1976/77	1,043 ^a	479
Iran	1974	2,586	650
Iraq	1977	2,250	496
Kuwait	1977	784	257
Saudi Arabia	1977	1,641	647
Peru	1977	1,556	547
China	1978	2,602	503
Nigeria	1976/77	14,344	1,248
Ethiopia	1977	73,191	3,314
United States	1977	569	159
Japan	1976/77	845	94
Sweden	1976	561	67

^aEstimates based on latest available data.

SOURCE: United Nations, *Statistical Yearbook, 1979/80*, pp. 843-851. Population/physician is based on total (indigenous plus expatriate) physicians practicing in the country.

number of physicians.⁶ The socioeconomic standards are also important determinants of health care. Basic availability data such as that in table 71, however, continue to be the most widely used measurements of health personnel and facilities.

Types of Technology Transfers

For Middle Eastern countries, the most important types of technology transfers involve imports of medical hardware and supplies, imports of services needed for construction, and staffing and management of hospitals. In the Gulf States, where there is limited local production of medical equipment and shortages of skilled medical personnel, turnkey hospital construction and the purchase of hospital management services have been utilized. One important facet of technology transfer involves training of local professional staff; another involves assistance in health care planning. In contrast, in Egypt there has been little use of international hospital management firms, extensive participation of domestic firms in hospital construction, and reliance on bilateral foreign aid and technical assistance projects in the health field. Thus, there is a wide variety of types of technology transfers in the medical service sector in Middle Eastern countries. While government health ministries are everywhere central actors on the recipient side, supplier firms independently transfer technology to Gulf States. Assistance programs are also a major mechanism in Egypt and Algeria. In all of these countries, medical services technology transfer spans those needed for small-scale rural clinics to the most technologically advanced hospitals, as the next section indicates.

THE STATE OF MEDICAL CAPABILITIES IN THE MIDDLE EAST

Judging by factors that affect medical technology transfer, the six countries under study

⁶Robert Kohn and Kerr L. White (eds.), *Health Care: An International Study*—Report of the World Health Organization (London: Oxford University Press, 1976).

Table 72.—Summary of Health Indicators and Health Sector Organization

Country	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Saudi Arabia	1.1	\$12,600	\$117	25	120	7.3	111	85	64 ^d	860	74	1,640	8	Blindness (trachoma), diabetes, polio, lung and breast cancer, TB, malaria, cholera, maternal and infant mortality	MOH, MODA, National Guard, ARAMCO, private
Kuwait	1.6	20,900	154	88	over 100	6.9	33	70	89	230	77	590	16	TB, infectious hepatitis, gastroenteritis, bilharzia, heart disease, cancer	Ministry of Public Health, Ministry of Defense, Ministry of Interior, private
Egypt	2.2	650	6	11	117	4.8	110	57	66	470	83	970	90	Diarrheal disease, bilharzia, polio, respiratory disease	Ministry of Health, other Ministry and Universities, Public and Private sectors
Algeria	1.3	2,140	13	35	101	7.3	114	56	77	340	85	2,650	60	Infant mortality, diarrheal disease	3 Government Ministries, MOH (85%) (31 Wilayas), Ministry of Defense (16 Dairas), Ministry of Higher Education, Also Social Security Organization, National Health Institute, Sonatrach and other state-owned corporations have their own
Iran	1.5	2,160 ^a	23	50	81	6.0	105	58	51	650	41	2,320	65	Dysentery, TB, whooping cough, measles, malaria	Ministry of Health (over 50%), University Police, Military Social insurance, private
Iraq	0.6	1,550 ^a	8	26	111	7.0	76	57	62	480	94	1,790	40	Malaria, trachoma, bilharzia, TB, whooping cough, chicken pox	MOH-5 departments, 18 Governorates handle all but military, small, private
United States	33	12820	259	99 ^b	139	1.8	12	75	100	150	36	520	77 ^c	Chronic disease	Many variations

¹ Percent of GNP on public health expenditures
² GNP per capita, 1981
³ Per capita public health expenditures
⁴ Adult literacy percent
⁵ Percent (range) supply as percent of requirement
⁶ Total fertility rate (average number of births per woman over her lifetime)
⁷ Infant mortality rate per thousand (aged 0-1)
⁸ Life expectancy at birth
⁹ Percent of population with access to safe drinking water
¹⁰ Population per hospital bed
¹¹ Percent Government hospitals
¹² Medical density (people/physician)
¹³ Percent indigenous physicians
¹⁴ Medical problem areas
¹⁵ Health sector organization

SOURCE: The World Bank, *Health Sector Policy Paper*, February, 1989; *World Development Report*, 1982 and 1983

^a 1977 figures
^b Care must be exercised in defining literacy. For example, in the U.S., experts state that 1 percent of the population is completely illiterate but that up to 20 percent are functionally illiterate, i.e., not having the reading and writing skills necessary to function adequately in our complex society
^c 1981 figure which is based on active foreign medical school graduates in the United States versus total active doctors of medicine in the United States. Foreign medical graduates excludes graduates of Canadian schools. Total active excludes Federal service. Note that foreign medical school graduates may be U.S. citizens. In 1981, 16.6 percent of newly licensed physicians in the U.S. were graduates of foreign medical schools. See *Statistical Abstract of the United States, 1984*, U.S. Dept. of Commerce, Bureau of the Census, Washington, D.C., 102th edition, 1984, p. 109

can be broadly categorized into three groups: 1) countries typified by substantial capital, rapid development, and a small indigenous population, such as Saudi Arabia and Kuwait; 2) countries with less capital, more population, and quantitatively larger trained medical cadres and infrastructure, such as Egypt and Algeria; and 3) countries whose extensive medical services plans have been halted or greatly decreased in scope because of civil strife or war, such as Iraq and Iran.

Table 72 summarizes the health status of the six countries and gives information on the United States for comparison. The brief descriptions presented next on the medical sector organization and health status of the six countries are not meant to be all-inclusive. They do demonstrate, however, the diversity of health sector organization, medical personnel resources, facilities, and types of health care in the Middle East. They also show that, given these differences, there is no preferred avenue toward improved health. Although many problem areas remain, great strides have been made in medical services in the last decade in most of the countries—partly due to increased oil revenues, but especially due to an increased commitment to improved health care, education, and living conditions by the respective governments.

Saudi Arabia

The development of modern hospitals and other medical facilities was among the most outstanding achievements of the second plan covering 1975-80. Saudi Arabia differs from most Western markets in that it has no medical equipment production of its own, is far away from medical supply and instrument producers, is a large country with a low population density, and has a small indigenous manpower force to draw on.

In Saudi Arabia various organizations are independently involved in health care services. They each have their own financial appropriations, staff, and facilities. At present, there is little coordination of their respective activities. The greatest responsibility for health orga-

nization and for the improvement of health in the Kingdom rests largely, but not completely, with the Ministry of Health (MOH), which operates 65 hospitals and about 1,000 dispensaries, health centers, and specialized facilities. In addition, 13 agencies (plus the private sector) offer health services for their employees and their dependents or are responsible for specialized health services. Among the most important of these are the Ministry of Higher Education, with responsibility for the medical colleges and teaching hospitals; the Ministry of Interior, for medical service for the police force, and the Ministry of Defense and Aviation (MODA). In addition, the National Guard has more than 10 hospitals and several clinics.

The majority of hospital beds are concentrated in the large cities, particularly Jeddah and Riyadh; preventive care is inadequate in many more remote communities. One of the aims of the third plan is therefore to provide the population in every region with improved facilities and medical service. Preventive health care is still largely neglected, especially away from the large towns. This lack of preventive care is one of the factors leading to an overload of the MOH hospitals.

The small number of nursing staff, medical administrators, and technicians together with the limited number of doctors constitutes an acute shortage of staff. The most serious problem is the low percentage of Saudi medical staff: according to some experts only 8 percent of the physicians and some 5 percent of the allied health personnel are Saudis—and most are naturalized Saudis.⁷ The policy of the Saudi Government to decrease the dependence on expatriate medical staff and administrators has led to a shortage of personnel in several hospitals. The shortage of indigenous staff will no doubt slow the pace of hospital construction and staffing and will lengthen the time

⁷Estimates of numbers of Saudis and non-Saudis vary. The 8 percent figure is based on combined estimates of U.S. experts in the medical services field. Saudi estimates for 1980 for numbers of non-Saudi physicians working in the Ministry of Health were considerably higher. See Ministry of Health, Saudi Arabia, Statistics Department, *Statistical Review* (1971-80).

before Saudis can effectively take over their medical systems. This manpower shortage constitutes one of the most important constraints on medical technology transfer in Saudi Arabia.

Recently, Saudi health care standards have greatly improved, but the country still clearly faces a number of medical problems that are not unusual for a rapidly developing country.⁸ The most prevalent problems are high rates of diabetes, polio, and blindness. Tuberculosis is also a problem, and maternity and infant mortality rates are unacceptably high. There have been a few cases of leprosy reported each year, and malaria exists. In both cases the trend has been significantly downward in recent years. Recurrent outbreaks of cholera are swiftly checked, and some believe that cholera and malaria can be eradicated in 10 years. Finally, both traffic and work accidents are numerous.⁹

The status of medical services and its accessibility, as viewed by the Saudis themselves, depends on who is asked and where they live. Differences exist in staff and equipment standards between the specialist hospitals and the public hospitals run by the MOH, which are normally attended by the average citizen. King Faisal Specialist Hospital—where operating a bed costs \$300,000 annually—is probably the best hospital in the Kingdom, with the best and most experienced staff and comprehensive medical equipment and systems. This institution admits all patients and works through regional medical committees, which refer serious cases. Nevertheless, there has been a widespread view that those who are not rich do not have the means to receive the best medical care the Kingdom has to offer.

⁸This statement is based on interviews conducted for OTA in 1983 with U.S. and British physicians in Saudi Arabia, and on WHO data (1978). In interviews with representatives from the major U.S. health care management firms, it was claimed that the major medical need in Saudi Arabia is preventive care and improvement of public health, including social and living conditions, education, and nutrition.

⁹The numerous work accidents (no statistics available) are probably due to a combination of factors such as the high rate and speed of construction, fines if the work is not ready on time, and problems with on-the-job safety.



Photo credit: Saudi Arabian Ministry of Commerce

Neonatal care in Saudi Arabia

Besides poorer Saudis, three minority groups have had, and in some cases still have, problems obtaining adequate health care. The large group of foreign workers are sometimes admitted to the older, lower-standard hospitals or clinics unless special arrangements can be made. The more than 1 million pilgrims who flood into Mecca each year have received poor care in Saudi Arabia in years past, but this situation has been improving. The Bedouins are gradually being drawn into the health systems of MODA and the National Guard via their sons who join the armed forces.

The MOH is well aware of the availability of hospital beds in Riyadh and Jeddah and the lack of proper health care in other parts of the country. Its plans, which are slowly being implemented, include the establishment of regional hospitals that will function as centers of a widespread network of local health centers and clinics. Some of the newly constructed, highly sophisticated MOH hospitals are situated in areas previously least-served. If the manpower situation can be improved, it is expected that many of the more obvious regional and population differences in medical care will be greatly reduced in the next 10 to 15 years. The Ministry of Health has developed an ambitious plan to build 36 new hospitals (with

7,000 beds) and to add 2,000 beds in existing hospitals.

Kuwait

Kuwait probably has the best medical services of any of the countries under review. Swift socioeconomic development has brought improved health status and an expanding health care system. Kuwait medical facilities have expanded from 100 hospital beds in 1949 to 6,400 in 1982. There are, however, some health problems related to the growing population, urbanization, the changing patterns of disease, overuse of health services, and dependence on an expatriate health work force.

The Ministry of Public Health is responsible for the overall control of all health services in Kuwait, including both the public and private sector. There is little delegation of authority to the individual public sector hospitals as all planning, budgeting, administration, organization of domestic and technical services, staffing, and procurement remain under ministry control. Ministerial authority over the private hospitals is less direct, being exercised only through its licensing authority and supervision of standards. In 1982, of the 6,400 hospital beds in Kuwait, about 5,000 were in Ministry of Public Health hospitals.

All medical treatment, including prescribed medicines, dental treatment, and provision of eyeglasses, is free of charge in the public sector clinics, polyclinics, and hospitals, which serve all residents regardless of nationality. The basis of the Kuwaiti health service is a primary care network of clinics and polyclinics. These, in turn, are subordinate to preventive health centers. Everyone is required to register with the nearest clinic, which is usually staffed by both male and female general practitioners and sometimes a pediatrician. The clinics usually have a small pharmacy and are open 8 hours a day. Some clinics, usually attached to one of the hospitals, specialize in maternity, dental, or child care. For more specialized treatment, patients are referred to one of these or to one of the collective health centers.

In spite of the ambitious health care program, pressures continue on the public sector hospitals and clinics. Many wealthy Kuwaitis still seek consultations and treatment in Europe. Even less wealthy Kuwaitis often prefer private sector facilities, because of the delays and problems in liaison between public hospitals and out-patient clinics.

The present population of 1.4 million has more than doubled in the last 10 years and is expected to double again by 2000. This rapid population expansion has overwhelmed the health care system, despite the program for 3,000 new beds initiated in the second half of the 1970's. Each person averages five to six visits to a clinic each year. Many of the visits are for social rather than medical purposes, but it is nevertheless policy that each patient must be seen by a doctor. As a result, each of the 251 doctors, supported by 582 nursing staff in the primary care network, sometimes sees more than 100 patients per day.¹⁰

Kuwait has a falling death rate and a decrease in new cases of tuberculosis. Tuberculosis used to be one of the major problems in Kuwait, but a compulsory screening program of all school children and newcomers to Kuwait and wide-reaching health education have significantly reduced the incidence of tuberculosis. The major causes of death for adults in Kuwait are traffic accidents, heart disease, and cancer—all associated more with the industrialized world than with developing countries.

Kuwait is already heavily dependent on expatriate skills and administrative ability throughout its health service and will remain so for many years to come. When the current hospital building program is complete, it is estimated that Kuwait will have to recruit 15,000 extra staff. Kuwaiti doctors enjoy a privileged status and therefore tend to remain in Kuwait. Expatriate doctors, particularly those from Western countries, often find the social structure and living conditions difficult to adjust to.¹¹ Kuwait's shortage of doctors

¹⁰*World Medical Markets* (West Sussex, U.K.: Kuwait, 1983).

¹¹*Ibid.*, p. 5.

has also been accentuated by a tendency of expatriate doctors, both Arab and non-Arab, to go to Kuwait's neighbors, especially Saudi Arabia and the Emirates, where salaries and status are higher.

Egypt

Egypt has a fairly well-developed health care system, but it also faces serious problems. Free medical care is provided through the Ministry of Health's network of hospitals, district health centers, and rural health units. A private health care sector also exists, with some outstanding facilities for those who can afford their services. Thus, the Egyptian health care sector is now moving along two distinct tracks. One is for the basically healthy, wage-based employee, who lives in an urban area and pays for services through socially financed health insurance or fee-for-service payments. The other track is for the low-income, unskilled worker in rural and suburban areas, who relies on traditional medicine, pharmacists, or the Ministry of Health system for services.

The Ministry of Health (MOH), which is charged with the promotion and protection of the health of the entire population, is underfinanced and overextended. Its current infrastructure does not permit it to conduct efficient operations to serve the group that is least able to pay for health services of any kind. Nevertheless, in attempting to compete with the emergent public/private sector, it has opted for additional investments in high-cost curative care services (hospitals and emergency medical services) that offer visibility and professional satisfaction to an expanding group of physicians.¹³

The health portion of the national budget has decreased substantially in recent years. Egypt spent approximately 5.6 percent of its total budget on health care in 1976. By 1979 the figure fell to 4.0 percent, and the estimate for 1980-81 was 3.6 percent. This budget de-

crease must be viewed in light of the fact that the personnel side of that account is increasing at an average rate of 11.4 percent per year. Thus, salaries consume an ever-increasing share of a shrinking resource base.

In spite of its fairly well-developed health care system and relative abundance of doctors, Egypt has several problems related to sanitary facilities, water supply, housing, and population growth. Family planning programs have not prevented a rise in the Egyptian birth rate in the 1970's; poverty and inadequate sanitary facilities result in a large number of pre-school deaths from diarrheal disease; there is a high incidence of bilharziasis, respiratory diseases, and other enteric diseases. Perhaps two-fifths of the country's 43 million people now harbor the bilharzia parasites—a public health burden of staggering proportions.

Egypt's nine state medical schools graduate about 3,500 new physicians each year. With the present structure and scope of the governmental and private sector health system, this number more than fulfills the national demand for doctors. There is, however, a drain on the supply of doctors due to a substantial emigration to other Arab states, Africa, the United States and the United Kingdom. New physicians emigrate because of their dissatisfaction with low salaries and limited opportunities for postgraduate work. According to the view of the Medical Union, Egypt produces but does not have an overabundance of doctors. Egypt is also chronically short of well-trained nurses and other essential backup personnel.

Another problem is the concentration of qualified physicians in the urban areas and the corresponding shortage in the more remote parts of the country. Medical graduates are expected to spend their first 4 years of obligatory service to the MOH in rural health services, but the majority of doctors leave in less than half that time. In order to change this imbalance in health services, a community medicine element has been introduced into all medical courses at the state-run teaching hospitals, and greater emphasis has been placed on practical skills than on acquisition of theo-

¹² U.S. Agency for International Development, "A Report on Health Development in the Arab Republic of Egypt: A Sector in Transition," May-June, 1982.

¹³ *Ibid.*

retical skills. With assistance from the U.S. Agency for International Development (AID), the curriculum has been upgraded at the medical college of Suez Canal University to emphasize a community-oriented approach to medicine.

Algeria

Although impressive gains were made in the development of Algeria's heavy industry under past development plans, conditions in housing, health, and other social sectors tended to deteriorate. Rapid population growth and heavy rural-urban migration expanded needs for social services, but the low level of investments in social sector infrastructure failed to keep pace with the expansion of needs. The current Algerian plan, 1980-84, seeks to redress the imbalance of past development plans by reorienting investment toward social sectors, particularly medical care.

Three governmental ministries have the main responsibility for health care services in Algeria. The most important of these is the Ministry of Health (MSP, *Ministère de la Sante Publique*), responsible for some 85 percent of all health care establishments in the country. The other two are the Ministry of Defense and the Ministry of Higher Education responsible for the planned university medical centers but not for the existing ones.

Several other organizations are also involved in health care activities. The Social Security Organization is responsible for mother and child care, for care of the handicapped, and for establishing sociomedical centers in residential areas. The National Health Institute is responsible for the training of health personnel other than physicians. In addition to these, state-owned corporations (practically all medium-sized and large corporations are state-owned) often have their own health care. The largest corporations are Sonatrach and SNS, dealing in petroleum and steel, respectively. These corporations are responsible to various ministries, often the Ministries of Heavy and Light Industry. The private sector is insignificant and consists mainly of private practi-

tioners working half-time in their own practice and the rest of the time in MSP hospitals.

While resident population increased by 32 percent between 1969 and 1978, the number of hospital beds increased by only 12 percent over the same period. The increasing density of population per health facility in Algeria during the last decade reflects the low level of investments in health infrastructure during the period. This slow growth of health infrastructure has led to a serious shortage and crowding of health facilities. The current health plan aims to improve the overall availability and regional distribution of health facilities through an ambitious program of health sector investment.

The most striking increase in programmed health facilities is planned for health centers, which are seen as the basic outlet for provision of primary health care in the country and as a "filter" to control the use of more specialized health facilities, such as hospitals, polyclinics, and maternity centers. Thirty-nine new general hospitals are planned, and seven new specialized hospitals for psychiatric care, pediatric care, burn care, cancer treatment, and treatment of cardiovascular disorders are scheduled to be completed in 1984.

Better health requires environmental improvements affecting water supply, sanitation, and nutrition. Evidence from other settings has shown that improvements in these areas often do more to promote health by reducing exposure and susceptibility to disease than do health efforts in treating illness and disease. One area where potential progress is possible in Algeria is in improved supplies of drinking water for newly weaned children. An experimental program of dehydration therapy has recently been undertaken by the MSP to determine the most efficient approach for reducing the incidence of infant death from diarrhea. An important part of this program is the provision of information to mothers about the necessity of maintaining fluid intake for children. Such efforts may lead to important benefits in reducing deaths from diarrhea, but further improvements will depend on improved water

supplies and sanitation to control the transmission of diarrheal organisms.

One of the specific areas of health intervention which is clearly given priority in the current Algerian health plan is the government newly adopted population policy, which calls for lowering the overall rate of population growth through a vigorously expanded birth-spacing program. Further increases in female school enrollments and female employment are also expected to decrease the rate of population growth.

Iraq

Since 1978, Iraq's rulers have become much more concerned about the welfare sector. With the rise to power of Saddam Hussein in 1980 came stress on mobilizing the masses, and a clear commitment by the government to expand the scale and scope of the welfare state.

All hospitals *in* Iraq with the exception of military facilities are managed by the Ministry of Health (MOH). The MOH is divided into five departments; the country is divided administratively into 18 governorates, each with a chief medical officer responsible for all health services and institutions in the governorate. In 1980, there were 200 hospitals with 30,000 beds.

Health conditions in Iraq gradually improved over the last few decades as hospital services were introduced. In 1978, the government initiated a substantial hospital and health care development program, but this was scaled down considerably in recent years.

Medical personnel, particularly nursing staff, remain in short supply, despite the expansion of medical schools, and support services are inadequate. A rural health program, begun in 1963 to assist in the elimination of chronic disease, including malaria, trachoma, and bilharziasis, has met with mixed success. Parallel construction of new and improved rural water supplies and the spread of education has helped to bring better standards to most, although not all, regions.

In 1981, a foreign consultant was commissioned to study long-term health care development for the MOH. Because of the war, this work has been postponed, as were most of the projects in Iraq that are not considered essential. The president of the State Organization of Buildings said in 1981 that the organization was engaged in carrying out hospital development projects valued at \$800 million. The largest projects were the expansion of a huge Medical City, five general hospitals, and six pediatric and maternity hospitals. Early in 1982 ongoing health care projects included some 25 MOH projects and 15 military hospitals, all in different stages of development. Several of these projects have been terminated, however, owing to the changed wartime priorities.

In 1981, Iraq ranked as one of the largest Middle East importers of medical products, comparable with if not equal to Saudi Arabia. The continuing war with Iran and the reduction in oil exports from 3.3 million barrels per day (b/d) in 1980 to 0.7 million b/d in early 1983 sharply reduced oil revenues. With war expenditures escalating, Iraq has had to slow down the pace of its vast economic development plans and concentrate its financial and human resources instead on support of the war. Health care now ranks behind the war, war-related projects, energy, and industry in priority. The military, however, whose health care expenditure comes out of its own budget, continues to spend on an increasing scale, owing to war casualties.

Iran

Little authoritative information is available concerning the present state of health care and health care facilities in Iran. In prerevolutionary Iran, however, the system of health care delivery was relatively extensive. The government health care budget in 1978 totaled \$950 million, over half of which was administered by the Ministry of Health (MOH). A large majority of the 50,000 hospital beds were operated by government agencies or univer-

sities. Thirty-eight hospitals were affiliated with universities throughout Iran, seven of which provided training for students at medical colleges. The 125 private hospitals in Iran were mostly small but provided better treatment than the government facilities. In 1978, there were about 3,000 clinics, run mainly by the government through the MOH or special health corps.

At the time of the revolution, the government had drawn up a much-publicized master health care plan designed to provide the country with 15 regional hospitals, 130 smaller hospitals, some 2,000 new health clinics, and 10 other medical projects, including extensions of 6 existing specialist hospitals. A few of these projects were under construction, and several were in an advanced design stage in 1979.

There is no doubt that Iran had made significant progress in its medical services up until 1978. Several problem areas remained, however, particularly with manpower allocation. People outside of Teheran, and especially the more remote populations, received treatment significantly poorer than that given residents of the capital. Some 45 percent of the hospital beds and about 60 percent of the doctors were located in Teheran, which had only an estimated 10 percent of the total population. Imports of physicians did improve health care standards in the provincial areas, but the growth rate in the number of Iranian doctors per hospital decreased in the latter part of the 1970's when the number of foreign-trained, homecoming Iranian physicians could not match the number of doctors leaving the country. It was estimated that some 60 percent of Iranian medical staff training abroad would not return home, and that about 15,000 Iranian doctors were living abroad in 1978.

The Iranian revolution apparently led to drastic changes in health care and in medical education.¹⁴ There is reason to believe that the new government has not yet been able to take active measures in the health care sector. Ira-

¹⁴The information on present Iranian health care is based on interviews conducted for OTA during 1983.

nian revolutionary leaders emphasized the need to improve health care in remote areas, and health ministers called for importing foreign physicians to serve the villages. The new government initially closed down all medical schools, however, and projects for auxiliary health worker training reportedly ended. Female students were not encouraged to go on with their studies. A large number of physicians were expelled from the university hospitals, and many Teheran University Medical School faculty members were dismissed or forced to leave the country. During the reign of the Shah, 2 years of health corps work was mandatory for all medical graduates; currently 5-year compulsory service in the rural areas is recommended. As a result of deteriorating capabilities in the public health departments, vaccinations reportedly have declined and epidemics of infectious diseases have risen. The only school of public health, in Teheran, was closed.

Regional Efforts

Attempts at regional cooperation among Middle Eastern countries in health care, medical products manufacturing, or disease eradication have been largely unsuccessful, partly because, even within countries, conflicting goals exist among the different ministries and organizations responsible for health care. Other reasons include: 1) the relatively recent stress on improved health, 2) the diversity of health problems and financial and manpower resources available to deal with them, and 3) large political differences separating countries in the region. Attempts have been made to produce medical disposable (syringes, gauze, etc.) and pharmaceuticals regionally, since the market in just one country would often not justify establishment of production facilities. Kuwait is establishing a syringe factory, and Egypt produces several medical products (pharmaceuticals, in particular). Egypt also has plans for production of medical furniture. Extensive plans for regional distribution are, however, still far in the future.

The Arabian Gulf University's medical school in Bahrain is today the only regional medical

cooperation project initiated and administered by the countries themselves. It is being cofinanced by Bahrain, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. The school, which will form an extension to the Salmaniya Hospital Complex in Manama, is scheduled for completion in 1984, enrolling 50 students from the participating countries, with a majority from Saudi Arabia, Kuwait, and Iraq.

Although highly unstructured, medical training and physician emigration probably most closely approximate "regional cooperation. As often occurs in scientific endeavors in the civilian sector, medical training and information is freely exchanged among the medical communities of the Middle East. Most hospitals in the Middle East have a staff composed of diverse nationalities with a large regional contingent. Transfer of medical skills from country to country also occurs through emigration for financial or political reasons, although sometimes to the detriment of the training country, which has spent years and substantial public resources on their training.

Efforts in the Middle East by outside organizations such as the World Health Organization (WHO) and Project HOPE have met with substantial success, particularly in control of infectious diseases and training of preventive care personnel. Both organizations emphasize effective training and technology transfer in the medical sector.

WHO sponsors medical projects in the region through the Eastern Mediterranean Regional Office (EMRO) in Alexandria, Egypt, which covers all countries under study except Algeria. It has initiated and carried out a substantial number of health care projects in the region despite a background of repeated changes and frequent realignment of policies by the member countries. A few of the most ambitious projects are:

1. *Maintenance and repair of medical equipment.* WHO is taking a multiphase approach, which includes services of consultant engineers and activities in the Regional Training Center for Maintenance



Photo credit: Aramco World Magazine

Preventive medicine has made important contributions to public health in the Eastern Province of Saudi Arabia

and Repair of Medical Equipment in Cyprus. This involves technician training, including specialized courses on medical equipment, and training of biomedical engineers.

2. *Expanded program of immunization.* All member countries collaborate with EMRO—mainly in interregional training activities, but also in implementation, evaluation, and program reviews.
3. *Promotion of environmental health.* This includes establishment of sanitary engineering laboratories, assignment of sanitary engineers in Iraq, Egypt, and the UAE, and establishment of a Regional Center for Environmental Health Activities. This center will assist in developing training capabilities, will develop a re-

gional information and reference center for environmental health, and will provide a means for technology transfer within the region.

U.S. efforts in foreign assistance in the countries under study have centered on AID programs in Egypt, rather than on regional efforts in the health care field. Typical programs

affecting medical services and general health have focused on agricultural production, hospital administration, health service delivery systems, nutrition survey techniques, public administration, and foreign investment promotion and negotiation procedures. AID programs are discussed in more detail below.

PERSPECTIVES OF RECIPIENT COUNTRIES AND FIRMS

PLANS FOR DEVELOPMENT OF MEDICAL SERVICES

In order to assess the perspectives of the recipient countries with regard to utilization of medical technologies, a brief review of government health policy is presented in this section. Great diversity in emphasis is noted among the countries under study. For example, Saudi Arabia and Kuwait now have well-developed medical infrastructures and are thus redirecting their efforts toward preventive health care and indigenous manpower training. At the other extreme, Iran and Iraq, torn by war and internal strife, have had to postpone many of their plans for the medical services sector. Future developments in their health sectors will depend on the duration and severity of the war.

Saudi Arabia

Vast oil wealth combined with a strong commitment to provide free health care services to Saudi Arabia's inhabitants has sustained a striking growth in medical services in the last 10 years. Table 73 shows the budget of the MOH as compared to the general budget of Saudi Arabia from 1970 to 1981. In this time period, the MOH budget increased almost forty fold, staying at a relatively constant percentage of about 2.5 percent of the total Saudi budget. Much of the increased expenditure went to infrastructure construction, rather than to programs designed to upgrade the

quality and distribution of health care. Hospitals using very sophisticated technology were built in the public and private sectors.

In the past the concentration has been on curative medical services and on secondary care through hospitals rather than on preventive medicine and primary care. This was seen as the most appropriate way to provide for immediate treatment of disease and has been reflected in budgetary allocations. Even today the legacy of the ambitious hospital building program promoted in the mid and late 1970's commands the major share of the health budget, with a further 36 MOH hospitals providing 7,500 additional beds scheduled for completion in the 1983-90 period.

The third national development plan, however, attaches a high priority to the restructuring of health care. A fully integrated and comprehensive system is planned for every region, with emphasis on preventive health measures that include vaccination programs, environmental health, early screening, and mother and child care programs. This goal will be achieved by expanding and reorganizing the system of dispensaries and health centers to meet local population requirements. More than 300 health centers are to be established.

Through the establishment of a National Health Council, the government hopes to guide the development and improvement of all health services. One goal is to delineate the responsibility between the government health

Table 73.— Budget of the Ministry of Health as Proportion of Total Budget, Saudi Arabia, 1970/71-1981/82

Years	General Budget (millions S. R.)	Ministry of Health Budget (millions S, R.)	Percentage
1970/71	6,380	117	2.8
1971/72	1,078	279	2.6
1972/73	13,200	420	3.2
1973/74	22,810	582	2.5
1974/75	45,743	1,162	2.5
1975/76 : : : :	110,935	3,197	2.9
1976/77	131,296	2,972	2.3
1977/78	134,253	3,384	2.5
1978/79	144,558	4,040	2.8
1979/80	185,820	4,177	2.2
1980/81	245,000	5,656	2.3
1981/82	298,000	6,831	2.3

NOTE: 3.4 Saudi riyal (S.R.) \$1.00

SOURCES: Ministry of Health Saudi Arabia Statistics Department Statistical Review 1391-1300 A.H. (1971-80) pp 162-164
Business International Middle East Market Opportunities May 1982 pp 14 15

agencies and the private sector and coordinate their activities. Whether the council will be able to reign over the independent MOH, the powerful military health organization, and the private sector remains to be seen.

Training is a central feature of Saudi health care plans.¹⁵ Present government plans envisage a 90 percent increase in the number of physicians over the next 5 years. According to the previous Health Minister, Saudi doctors will comprise half of all physicians by 1995. Outside observers judge this to be overly optimistic. While the large increase in student numbers is consistent with that objective, expansion will be limited by high dropout rates and some migration to the West of newly qualified doctors seeking higher training.

A fourth medical school was scheduled to open in 1983, with a philosophy based on increased community orientation and a balanced exposure to clinical medicine and health ecology. Five nursing training institutes are also planned, although the number of graduates in the years up to 1990 is not expected to rapidly increase the share of Saudi nurses. Large-scale training of technicians and administrators is not being planned. It is difficult to anticipate supply and demand for medical manpower, but estimates have been made that during the

next decade the government—without counting the other health care agencies—could need an additional 20,000 medical, paramedical, and ancillary staff,

Kuwait

With a small, geographically concentrated population and a fairly good medical facilities infrastructure in place, Kuwait did not pursue as vigorous a hospital building program as Saudi Arabia. Government health expenditures have nevertheless grown recently. Health ministry expenditures grew 11.5 percent between the two last budgets, from 171.7 to 191.5 million Kuwaiti dinars, while the ministries' budgets grew by 5.3 percent.¹⁶

In Kuwait's National Health Plan of 1981, emphasis is placed on development of manpower as well as facilities, medical education and disease prevention. Kuwait plans to build three new regional hospitals, extend four, and provide 40 district health centers, 22 of which will be new facilities and the rest replacements. Health promotion measures span the fields of health education, mental health measures, social security, improved housing, and sanitary waste disposal. Immunization, maternal and child health, and control of communicable diseases are stressed under disease prevention.

¹⁵ Ministry of Planning, Saudi Arabia, Third Development Plan, 1980-85.

¹⁶National Bank of Kuwait, Vol. 1, No. 2, October 1982. (1 Kuwaiti dinar = \$3.40)

Plans emphasize early diagnosis and prompt treatment of disease through health registration, screening, and community-based medical care.

Manpower is a major problem since in 1980 over 75 percent of Kuwait's medical personnel were expatriate. Total medical staff are expected to increase from 26,000 in 1980 to 41,000 in 1990 to 58,000 in 2000 (at least 50 percent of whom, it is hoped, will be Kuwaiti). Key elements in Kuwait's manpower strategies include training programs for senior and mid-level administrators, which provide incentives for Kuwaitis in health careers through community education, salary and other incentives, and career development. Community health-oriented teams consisting of a general practitioner, nurse, and social worker are planned. In addition, measures have been introduced to promote postgraduate training in public health, and to increase medical school annual enrollment from 50 to 150 students as quickly as possible. The number of Kuwaiti nurses is to be expanded by enhancing the prestige of nursing and by providing exposure to a nursing career through educational programs in schools and on television. "

¹⁷The manpower plans may be difficult to achieve. The practical plans for implementation since the 1981 proposals were made, however, include:

1. The Medical School will increase enrollment to between 150-200,
2. The jointly founded Gulf University in Bahrain is expected to meet some of the manpower demand.
3. The policy of overseas training—including postgraduate training—will be continued.
4. Increased and improved employment incentives are planned.
5. Recruitment is being tried through contracts with foreign medical institutions, which may produce better results than through the individual contract approach used in the past.
6. Health accords will be made with countries like Great Britain, Pakistan, Sweden, and Denmark, mostly involving exchange of expertise and training of doctors.
7. The Nursing Institute will be expanded.
8. A 5-year program has started in schools and through television and other media to convince Kuwaiti families that nursing is a respectable profession.
9. Productivity is given special attention in ongoing hospitals. See Ministry of Public Health, Kuwait, Kuwait Health Plan (1981).

Egypt

Reducing the rate of population growth in Egypt is an important goal of the Egyptian government. In a 1982 speech, President Mubarak called on the Egyptian people for "hard work to reach a more balanced relation between the number of population and the volume of gross national production," and asked the nation to "attentively consider the rate of population growth."

The Minister of Health, Dr. Zaki, has outlined the general strategy for the health sector. Health insurance is considered the cornerstone of health care, and the number of beneficiaries should be increased each year to provide complete coverage of the population by 1990. Emergency medical care services and first aid services are to be developed and expanded. The public sector will ensure a large portion of the drug supply. In the meantime the private sector should be encouraged to contribute toward completing the ministry's plan for providing drugs to the population at reasonable costs.¹⁸ In addition, the government hopes to improve the efficiency of preventive health services, with emphasis on given to immunization, environmental sanitation, food control, and early detection and treatment of endemic diseases (particularly bilharziasis). Health manpower resources will be upgraded through education and training for medical and paramedical personnel. The pressing problem of improving water and sanitation will be seriously addressed.

¹⁸Key ingredients of the Egyptian drug plan are:

1. a commitment to provide drugs to the population at reasonable costs;
2. continued subsidies of imported products not produced in the country;
3. a prescription system that will continue to allow people to buy whatever drugs they like from the pharmacist;
4. increased protection of locally made drugs against foreign competition;
5. encouragement of joint ventures between foreign and local companies to increase technology transfer; and
6. improved health education in order to reduce misuse of drugs.

Middle East Health Magazine, Great Britain, March 1982; American Public Health Association: "A Report on Health Development in the ARE (Arab Republic of Egypt), 1982.

Algeria

The policy guidelines for the 5 years covered by the latest plan include emphasis on investment in health care infrastructure, featuring an increase in hospital beds from 45,000 in 1979 to 64,000 in 1984, 1,000 new health centers and dispensaries, and over 100 maternity centers. However, in the past, plan targets have not been achieved: only 19 percent of the number of hospitals and about 30 percent of the health centers planned under the previous plan were actually constructed. The expansion of training of health manpower of all kinds remains a major priority. In addition, environmental health, water supply, sanitation, nutrition and birth control are important areas.

Several measures are included which are aimed at lowering the infant mortality rate: 1) from 1979 to 1984 the number of maternity centers will be increased from 58 to 172, 2) two new hospitals for pediatric care will be established, 3) sufficient maternity facilities will be established to assure that more than 50 percent of deliveries are assisted in health facilities by 1987 (in 1982 only 40 percent of the births—10 percent in rural areas—occurred in a medical facility), and 4) water supplies and sanitation will be improved to control the transmission of diarrheal organisms, and programs of dehydration therapy will be instituted.

Iraq

In the early 1980's Iraq began to study long-term health care needs. The government prepared a long-term health plan for the 1980-95 period, with the ultimate goal being health care for all by the year 2000. This plan embraced the primary health care (PHC) approach. It reflected a change from the traditional curative approach of the health services to one based on preventive public health. This was to include strengthening of mother and child health care, including the promotion of breastfeeding, reinforcing environmental health activities, and an expanded program of immu-

nization and tuberculosis control. The plan called for local production of essential drugs and quality control of imported pharmaceutical products.²⁰ Also included were improving existing health care facilities with a special emphasis on basic health care provided in medical centers and clinics in both urban and rural areas and an increase in the number of regional multidisciplinary hospitals. Tertiary care in new specialized hospitals in the major cities was also to be provided with the focus of investment on the Medical City in Baghdad, the largest medical complex in the Middle East.²¹ However, due to the war with Iran, these plans have been postponed.

Iran

Iran's government has made few statements to clarify plans for health sector development in the past 5 years. Before 1979, the fifth development plan emphasized the following: 1) health services, with a special focus on control of infectious diseases through immunization, mother and child health and environmental sanitation; 2) birth control, (in 1978 net population growth was 3.1 percent); 3) health facilities, with a target of increasing the ratio of hospital beds to 10,000 people from 15 (in

²⁰Quality control of imported pharmaceutical products is a problem in Iraq, as well as in other Middle Eastern countries. Imports of pharmaceuticals to Iraq come from 400 foreign companies, with few restrictions. Iraq's limited capacity to regulate drug imports and its badly organized distribution system make it difficult to prove accusations that low-quality pharmaceuticals have been directed to this market.

Imports of illegal drugs do take place in these countries. In 1982, Kuwait drafted stiff laws aimed at ending drug trafficking and abuse. Trading in drugs was restricted, and only qualified doctors were allowed to prescribe drugs.

See: U.S. Department of Health, Education and Welfare "Iraq Health Sector Plans," 1977; Middle East Health *Magazine*, West Sussex, Great Britain, May 1982.

2. In 1979, the Medical City consisted of an 800-bed teaching and general hospital. In 1980 a contract was signed with South Korean contractor Hyundai to build phase 2 over a period of 4 years. This was to include a 650-bed surgical hospital, a 250-bed private nursing home, a 200-bed children's hospital, a conference center, and administration and service buildings. This second stage of development has fallen well behind schedule. Also, the existing complex is said to be serving fewer patients than anticipated because of the shortage of medical staff. See World Medical Markets Iraq, Great Britain, October 1982; *Middle East Health Magazine*, Great Britain, May 1982; U.S. Department of Health, Education and Welfare, "Iraq Health Sector Plans," 1977,

¹⁹World Bank, "The Five-Year Development Plan 1980-84," June 1982.

1978) to 20 (in 1984); 4) rural medical and health services, with a major objective being to add 600 new medical and health centers with responsibility for outpatient treatment, immunization, birth control, and nutrition information at the village level; 5) training, with the establishment of 2 new medical faculties, 3 schools for auxiliary health workers, and 26 nursing schools; and 6) research, with emphasis on fields related to birth control, environmental sanitation, development and production of vaccines, and nutritional problems.

ASSESSMENT OF THE ABSORPTION OF MEDICAL TECHNOLOGIES

In order to evaluate the use of medical facilities and technologies in the Middle East, this section deals with the following medical services categories: 1) health care planning, 2) use of medical equipment and systems, 3) servicing and maintenance, 4) local production of medical equipment and supplies, 5) hospital design and construction, 6) hospital management, and 7) training of local personnel. Key problems are identified in training of local personnel and servicing and maintenance of equipment.

Health Care Planning

Technology transfer occurs through foreign assistance in medical education and health



Photo credit Middle East Economic Digest

Nursing training in Iran

planning. As teachers and curricula from the United States and the United Kingdom have been incorporated into Saudi Arabia's medical education, and as Saudi students have pursued postgraduate studies abroad, the professional skills of Saudi medical personnel have been improved and preferences for medical systems and equipment developed. Foreign advisors together with a group within the Kingdom, have reappraised Saudi achievements in the health care sector. The result is shown in the priorities of the current 5-year plan, which represents a departure from earlier preoccupation with hospitals and curative-based services. Such services are said to have done relatively little to redress the underlying health problems, especially at the local level. Instead, the importance of preventive medicine, primary care, environmental health, and coordinated health planning is recognized, and they are becoming components of the national health policy of Saudi Arabia.

Use of Medical Equipment and Systems

Simple equipment can be rendered useless when local needs and customs are not considered in technology transfer. For example, in a prerevolutionary Iranian health project, elaborate fiberglass chairs were purchased for a mother and child center in a rural area. Assuming that the chairs were put there for decorative purposes, the mothers refused to use them, preferring to sit on the floor with their children as they were accustomed to doing. In Iraq, scissors imported from the West for use in cutting plasters were found to be useless because the plaster casts used in Iraqi hospitals were harder than those used in Europe. In both cases, the purchase decision was made by people who did not have the necessary knowledge of local conditions.

A member of the Faculty of Engineering at Cairo University has furnished some detailed examples of successful and less successful transfers of medical equipment and systems in Egypt.²² An example of a successful trans-

²² Ahmad Gaber, "Appropriate Health Care Technology Transfer to Developing Countries," Project HOPE Conference, Millwood, Va., April 1982.

fer to Egypt is the Diagnostic Ultrasound Center, established at Cairo University Hospital with the assistance of the U.S. National Science Foundation and the Alliance for Engineering in Medicine and Biology. This project, operating since 1976, was established as a nucleus for the development and diffusion of such services. The development of ultrasound diagnostic services was a high medical priority, but the technology was complex and “transferability, in terms of local ability to maintain the systems in operation, was difficult. Many factors contributed to the success of this transfer:

1. Excellent cooperation between “donors” and the “receiver.
2. Sound planning at all stages—e.g., equipment specification, procurement, relations with manufacturers, staff training, and supporting services.
3. Adequate training of sufficient numbers of all types of staff: medical, operating, and maintenance.
4. Good routine management, with regular coordinating meetings between all involved groups, progress evaluation, and educational workshops.
5. Adequate budgetary allocations, which covered staff incentives and technical support needs.
6. Ample provision of maintenance facilities and commitment to this work.

An example of a relatively unsuccessful transfer of medical technology to Egypt concerns Neonatal Intensive Care Centers.²³ These were established in eight Egyptian University hospitals with assistance from the U.S. Department of Health, Education, and Welfare. The three units opened so far have experienced great difficulties in various stages of their development. In one hospital none of the more than 20 incubators functioned satisfactorily. Reasons cited were:

1. Poor initial specification of equipment to be procured. Many incubators were supplied with the wrong main voltage characteristics.

²³Ibid..

2. Faulty installation and commissioning by the manufacturers’ agents. In many cases the operating temperatures of the incubators could not be set above 901 F.
3. Inadequate provisions for preventive maintenance or repairs. No available in-house staff had the technical competence for this job, and there was inadequate distribution of spare parts ordered with the initial purchase. No technical service manuals were provided.
4. Lack of any engineering “voice” in the management of the technology. No arrangements were made for technical advice or support.
5. Inadequate training of nurses. Only the senior staff had received useful training, and they were not involved in the day-to-day control and operation of equipment.
6. Poor relationships between hospitals, manufacturers, and their agents.

Effective use of medical equipment and systems requires sound planning and initial specification, adequate training, and good day-to-day management and maintenance.

Servicing and Maintenance

The problem most frequently discussed in connection with transfer of medical equipment and systems is not the question of appropriateness of the technology, but that of servicing and maintenance. Servicing and maintenance are considered crucial in the analysis of technology absorption, since, 20 to 60 per-cent of existing medical equipment in the Middle East may be out of order at any given time.²⁴ Thus, successful future transfers of medical technology will require substantial improvements in this area. Some key aspects of this problem and examples of ways of dealing with it are discussed below.

EMRO states that the availability of diagnostic and therapeutic services is substantially lower than might be indicated from trade and

²⁴World Health organization, Eastern Mediterranean Region office, “Biennial Report of the Director, 1979-1981,” Alexandria, p. xxiv. Unfortunately, this report gives no figures for types or categories of equipment most prone to difficulties.

statistical sources, owing to the large quantity of equipment which has not been properly serviced or repaired. With the rapid expansion of health services in this area in recent years, there has been a large accumulation of equipment. This equipment, purchased from widely different sources and with a wide range of sophistication and complexity, must be continuously repaired and maintained if it is to be used effectively. Generally speaking, tremendous expenditures have been made for purchase of equipment and supplies, while comparatively little budgeted for effective maintenance.²⁵ As a result, medical equipment, even with minimum damage, may be out of service for extended periods, or even permanently.

WHO believes that the major reasons for these problems are: 1) lack of understanding of the need to plan and budget for maintenance and repair, 2) inadequate administrative mechanisms to ensure prompt and regular delivery of spare parts and expendable supplies, 3) failure of maintenance and repair services to reach peripheral areas, and 4) competition between the various suppliers and agencies sometimes selling equipment without guarantee of spares or service. Until recently, Saudi Arabian buyers reportedly rejected maintenance contracts. Increasing awareness of the maintenance problem is also apparent in Iraq

²⁵According to a representative of Hospitalia International—a company which has established some 400 hospitals in LDC's—a hospital in Saudi Arabia should budget between 15 to 20 percent of its medical expenditures for effective maintenance of equipment, compared to about 5 percent in a Western hospital. This 15-20 percent figure could be reduced if the hospital were to follow some of these suggestions:

- Make serviceability an important criterion for selection of equipment.
- Understand the importance of standardization, which not only reduces the cost of basic equipment, but also permits staff to move around among various clinics and provides the opportunity to improve service since consumables, reagents, and spare parts can be obtained in quantity and stored centrally at lower costs.
- Allow the installation personnel stay on the job to train staff in appropriate utilization.
- Include a spare parts package included in the original contract.
- Establish a preventive maintenance schedule for the technical maintenance team.
- Make sure that all documents and manuals are onsite and in the proper language.

and Algeria, where government decrees insist that a training component be included in contracts signed with foreign companies, and also that suppliers be held responsible for service and spare parts for up to 3 years after delivery.

Most foreign suppliers of medical equipment are prepared to provide service and maintenance packages and training of local technical personnel, when compensation for these efforts is seen as adequate. One approach is to offer a service and training package in the equipment purchase price or as a related contractual arrangement. The hospital equipment company Hospitalia International warrants all equipment for 12 months, making service an important component. The products of Warner-Lambert Company (medical diagnostics) also carry warranties; the company does not introduce a product unless it has established mechanisms for full service.

Two examples of training local manpower in operation, maintenance, and service are noted. One is the Regional Training Centre for Maintenance and Repair of Medical Equipment in Cyprus (funded by WHO), which has already been briefly described under regional medical cooperation projects. The other is the Department of Medical Equipment at Abbassia, Cairo, established by the Ministry of Health with assistance from the Great Britain Overseas Development Administration and the Department of Clinical Physics and Bioengineering in Glasgow. The latter project, successfully progressing since 1978, was designed primarily to provide manpower development facilities and to build a service organization for using medical equipment maintenance engineers and technicians. The project was given high priority, since it was recognized that much existing equipment was ineffectively used or inoperable for lack of engineering staff, and that successful future technology transfers would require the presence of a skilled and well-organized group of such personnel.

In this case the "model" adopted by the Egyptian Department was based on one developed in Glasgow, but many modifications

were required to adapt it to local circumstances. The following elements were crucial:

- The close coupling of manpower development activities to the needs of the health services, thus ensuring that training was relevant to the needs and also attracting user support.
- Ongoing institution-to-institution links between the Abbassia and Glasgow Departments. This involved long-term exchanges of staff which helped keep objectives on target, gave continuity, and built mutual trust and respect.

Local Production of Medical Equipment and Supplies

Local production of medical supplies and equipment is very limited in the six countries under study. More than 90 percent of their medical equipment is imported.

Prospects for local production vary. Currently, local production is negligible in Saudi Arabia and Kuwait. In both cases, the domestic markets are comparatively small and scarce labor resources are committed to other types of manufacturing operations. In neither case is it likely that local production will substantially displace imports of medical equipment and supplies during the next 10 to 15 years.

Prospects for local production are much better in Egypt and Algeria. Egypt has plans to locally design and assemble more sophisticated medical equipment. To date, however, production has been limited to supplies of non-chemical consumables, and custom-built items such as prostheses used in rehabilitation. Many firms are also involved in manufacturing beds, chairs, and kitchen and laundry equipment used in medical facilities.

Algeria did not produce medical equipment or disposable locally in 1980. Although the current 5-year plan stresses the importance of a domestic industry in this sector, implementation of these plans by 1990 is uncertain. Any manufacturing unit established is likely to produce initially simpler kinds of equipment and disposable articles. The Algerian national steel

industry is working on a project to produce simple medical equipment. This project will probably not materialize until after 1985, if at all. Even if domestic production of medical equipment does begin in the next few years, Algeria will probably remain strongly dependent on imports of medical equipment for the next decade.

Iraq's local production of medical equipment and supplies is limited, and imports accounted for approximately 90 percent of the market in 1980. There are no plans to produce medical equipment locally. West German, Japanese, and French equipment constituted about 70 percent of total medical equipment imports in 1980.

Iran produced no medical equipment and only limited medical supplies in 1978. Total imports of medical equipment and supplies in 1978 were \$50 million, with West Germany, the United States, Japan and the United Kingdom as the main exporting countries, in that order. Almost 80 percent of the imports were channeled through local dealers. Most foreign suppliers were on contract to install and maintain their equipment, and in the latter half of the 1970's several joint venture companies were established to service government medical facilities.

Despite the fact that local production of medical equipment is limited, there is a strong rationale for it in Middle Eastern countries. The forms of local production theoretically feasible are design of basic medical equipment systems, local assembly of instruments and apparatus under license agreements, and design and assembly of medical equipment from locally manufactured or imported subsystems. The major reason for local involvement would be to produce simpler and cheaper equipment, which may be more appropriate to local needs. This is especially true since many users in the region feel that the imported equipment is often overengineered.²⁶ Local production also

²⁶Of the countries of concern in this report, a debate on the question of local production and on appropriate medical technology is going on only in Egypt. Several persons interviewed at Egypt's MOH and Cairo University felt that most imported

promotes technology transfer and saves foreign exchange. In the future, Middle Eastern countries such as Egypt, Algeria (and Iran and Iraq) may significantly expand local production of medical supplies and equipment, but imports will remain significant for many years.

Hospital Design and Construction

Capabilities in hospital design and construction in the Middle East vary widely. In Saudi Arabia, turnkey hospital construction has been dominated by Western contractors, who still have a competitive edge over their Far Eastern competitors. Consultants, mostly from Western Europe and the United States, often do feasibility studies, design, and planning. In turnkey hospital construction, the contractor is responsible for all parts of the project. Equipping and supplying the hospital can be performed by the original company or can be subcontracted to a medical equipment company or a consultant. The largest hospital constructor in Saudi Arabia, Philip Holzmann, has several arrangements for equipping hospitals, depending on the project. If the firm does not itself provide equipment, it may use the services of an international turnkey hospital subcontractor such as Hospitalia, or international equipment firm such as Labsco, or a Saudi equipment agent such as Dallah Medcenter.

In Egypt, owing to the limited allocations for new hospital construction in the last few years, the activities of foreign firms have been limited. Domestic firms carried out a major share of the construction, while European (mostly British) and some U.S. firms are cooperating with Egyptian counterparts in hospital design and civil engineering,

medical equipment was "over-engineered" for a country—like Egypt—which has limited financial resources available to finance imports and wants to extend health coverage more widely.

One example of adapting medical technology to specific markets is Johnson & Johnson Co., Ortho Diagnostics Division, which assesses appropriate technology and product use for each potential foreign market. The potential user has the option to choose the level of technology which is right for him. See "Appropriate Health Care Technology Transfer to Developing Countries" (Millwood, Va.: Project 1 of OPE, 1982).

in Algeria, the more comprehensive hospital construction projects are the university hospitals, with the current plan calling for seven new university centers, all designed by foreign consultants from Great Britain, Sweden, Finland, Japan, and the United States.²⁷ The construction is a cooperative effort between foreign and local contractors.

In both Iraq and Iran hospital design and construction have been carried out by both local and foreign companies. Iran had quite a few good consulting architects who were able to work with or without their Western counterparts. Present efforts, owing to the war, are directed at maintaining existing infrastructure.

Hospital Management

Another prominent type of medical technology transfer in certain countries in the Middle East, particularly Saudi Arabia, has been staffing and management of hospitals. Companies like Hospitalia (a West German/Dutch joint venture) or Hospital Corporation of America (HCA) of the U.S. offer complete consulting, supply, installation, and maintenance services, but not construction.

To date, only the MODA and the National Guard have contracted out the running of hospitals to foreign companies. MOH has not followed their lead, on the grounds that such a policy might inhibit development of Saudi expertise. Others say that hospital management can be carried out in such a way as to promote indigenous medical expertise. With several constructed hospitals not operating because of insufficient staff, and in view of the ongoing hospital building program, the Ministry's stance on foreign contractors may change.

In the last 5 years, Kuwait has been reluctant to become involved in the turnkey ap-

²⁷The foreign consultants are Devecon Arkitekter, Helsinki, Finland, for the University Hospitals of Annaba and Setif; Uniconsult Arkitekt, Stockholm, Sweden, for the University Hospitals of Constantine and Alger; Kenzo Tange, Tokyo, Japan, for the University Hospital of Oran; Skidmore, Owens, and Merrill, U. S., for the University Hospital of Blida; W. S. Atkins Architects, London, Great Britain, for the University Hospital of Tlemcen. *World Health Markets, Algeria* (Wrest Sussex Great Britain, 1982).

preach to hospital construction, staffing, and administration.²⁸ Therefore, the new public health hospitals were specified, equipped, and commissioned by MOH. The original designs by Western consultants were redrawn with the consultation of WHO specialists. These hospitals will be among the best equipped in the world.²⁹ All equipment for government facilities must be purchased through Kuwaiti agents.

Kuwait has recruited mainly in the East, to attract medical staff. Agreements with foreign universities and governmental agencies have also been made in order to improve administrative and planning capacity. One such example is an agreement with the Johns Hopkins University to provide assistance in a new 20-year plan for Kuwait's health services.

A few international companies have been involved in private Egyptian hospital projects, but on a limited scale. The U.S.-based American Medical International (AMI), terminated its management and staff contract in 1982 with the prestigious private 300-bed As Salam hospital.³⁰

²⁸One of the reasons for Kuwait's reluctance to become involved in turnkey hospital construction is the relatively high level of competence of their Ministry of Public Health. There are also agreements between the Health Ministry and WHO and between the ministry and Great Britain Regional Health Authority, whereby both organizations supply consultation services in training, design, and equipping. Also there are several competent joint venture construction firms based in Kuwait which are able to build hospitals with assistance from the European joint venture partners.

²⁹The K D 10,000 budget is for equipment and supplies. It is estimated (*Kuwait Times*, Feb. 24, 1982) that the annual operating cost for the 500-bed Al-Adan Hospital will be in the region of K I) 16 million—about \$53 million—corresponding to an annual cost per bed of about \$ 106,000, which is comparable to (or even above) expenditures for a Western hospital.

³⁰According to an interview in *Middle East Health Magazine*, Great Britain, September 1982, a representative of AMI Overseas Operations explained the major reasons for AMI's termination of the contract as being:

1. The costs ran far over budget and substantial payments were not honored;
2. Changes in AMI's contract were made that reduced the company's degree of control over the hospital management (mainly the right to select and hire key staff);
3. The excessive time taken to supply water, electricity, and sewerage service;
4. The failure to release hospital equipment through customs; and
5. As a result of the above, expatriate administrative staff spent 9 months doing very little

The need for additional hospital management expertise in Egypt has not been adequately addressed. A report on Egyptian health care noted that there is a desire for such training on the part of physicians serving as administrators in rural health work, as well as on the part of supervising nurses in hospitals.³¹

In both Iraq and Algeria, the turnkey approach to hospital design, construction and management has not been popular. Algeria has attempted to limit involvement of foreign medical personnel. The Iraqi Health Ministry is apparently confident enough in its staffing and managerial skills to organize the second phase of the Baghdad Medical City project itself. The South Korean firm Hyundai was awarded a contract for construction, but the Iraqis themselves are coordinating the project. In Iran management and staffing were largely taken care of by the Iranians themselves in the late 1970's.

Training of Local Personnel

Medical Manpower Development Plans.—Saudi Arabia is overwhelmingly reliant on expatriates to run its hospitals. Saudis make up only 5 to 8 percent of the doctors and about 10 to 15 percent of the nursing staff, with most of these being naturalized citizens.

The ratio of physicians to beds in Saudi Arabia should rise, considering the number of students currently studying in the four medical schools or abroad, but it will not rise significantly, since the number of hospital beds is also increasing. By 1986, MOH will be responsible for some 20,000 beds, compared to the present 13,000. The number of doctors, nurses, and technicians is projected to increase by more than 60 percent. Medicine is a popular curriculum among Saudi students, many of whom study abroad. When the Saudi students

³¹A ID, "A Report on Egyptian Health Care: A Sector in Transition," May-June, 1982.

return,³² they generally need additional special training to practice in the Kingdom.³³

Traditional attitudes affect manpower in medical services. The role of women, for example, is limited by a tradition that male patients should not be cared for by women from outside the immediate family. The nursing profession is also considered low in prestige even among women who have few other work opportunities open to them. These attitudes are being relaxed to allow Saudi women to train and work as nurses, although facilities and staff are still extremely limited.

Kuwait also has a large expatriate work force in the medical service sector. Table 74 disaggregates the medical labor force, by sex and by occupational groups. The Kuwaiti health work force increased substantially over the 10-year period. As in Saudi Arabia women represent a low proportion of the total work force, particularly in nursing. According to the Kuwaiti census, the largest number of non-Kuwaiti physicians were Egyptians, Jordanians, Palestinians, and Indians, representing approximately 45 percent, 21 percent, 7 percent, respectively, of the total number of government physicians (2, 102) in 1980. Kuwaitis

³²Saudi students have always had a relatively high return rate compared to other Middle Eastern countries. In addition, in the United States at least, new immigration laws targeted at medical students make staying in the host country difficult.

³³From interviews with U.S. physicians with experience in Saudi Arabia, the students will need further training in three specific areas, namely: 1) experience with treatment of specific Saudi or Middle Eastern diseases; 2) experience with different attitudes of Saudi patients, who sometimes view the doctor with skepticism; 3) experience in operating independently of the professor and others from whom the student learned.

comprise approximately 16 percent of the physicians.

The Kuwait Health Plan specifies future manpower requirements, as seen in table 75. The largest percentage increases will be among dentists (400 percent), technicians (211 percent), pharmacists (193 percent), and nurses (157 percent). Except for dentists, Kuwaiti nationals will continue to make up a small share of these medical professionals.

In contrast to the modest expansion of health facilities during the past decade, Algeria's performance in training health personnel has been impressive. Table 76 shows the increase in medical and paramedical personnel from 1969 to 1978. The greatest gains in this area have been made in the training of paramedical staff, who are well suited to preventive rather than curative care, which is emphasized in Algeria. Between 1969 and 1978, the number of Algerian physicians in the country increased more than sixfold—from 521 in 1969 to 3,156 in 1978. As a result, the country's reliance on expatriate physicians was substantially reduced. Paramedical personnel increased from a total of 6,377 in 1969 to 23,658 in 1978. The very rapid increase achieved in paramedical personnel during the past decade is projected to continue with even greater strength: 4,000 paramedical technicians and 26,000 paramedical agents are scheduled to complete training between 1980 and 1984. If this very ambitious training goal is attained, it will lead to a more than doubling of the nation's paramedical personnel. To meet these goals, Algeria has signed several bilateral

Table 74.— Labor Force in Kuwait by Sex and Occupation Groups: Census of 1965, 1970, 1975

Occupation groups and sex	Censuses					
	1965-		1970		1975	
	Non- Kuwaiti	Kuwaiti	Non Kuwaiti	Kuwaiti	Non-Kuwaiti	Kuwaiti
Physical scientists and related technicians	M 193	13	251	47	538	95
	F 3	—	36	6	183	54
Physicians, dentists, and veterinarians	M 473	23	609	44	820	76
	F 70	1	111	3	182	27
Professional nurses	M 952	49	176	—	1,626	334
	F 1,185	23	1,639	57	2,703	178
Pharmacists and other medical related workers	M 501	207	1,287	289	486	107
	F 37	25	98	9	51	15

SOURCE: Kuwait Ministry of Planning Annual Statistical Abstract 1981 (Edition XVIII), Kuwait Central Statistical Office, 1981, pp. 10811

Table 75.—Total Kuwaiti Manpower Requirements for 1985, 1990, and 2000 Compared With December 1980 Staff in Post^a

Staff group	December 1980 staff in post		1985		1990		2000	
	Number	Percent change from 1980	Number	Percent change from 1980	Number	Percent change from 1980	Number	Percent change from 1980
Physicians	1,918	(14 %) ^b	2,411	25.7	3,017	57.3	4,136	115.6
Dentists	182	(43%)	393	115.9	525	188.5	911	400.0
Pharmacists	272	(18%)	476	75.0	579	112.9	798	193.4
Administrative	3,688	(52%)	4,452	20.7	5,883	46.0	7,383	100.2
Technicians	3,156	(27%)	5,594	77.2	6,867	117.6	9,806	210.7
Nursing staff	6,881	(7%)	9,449	37.3	11,898	72.9	17,648	156.5
Vocational workers	5,100	(42%)	6,223	22.0	6,501	27.5	7,432	45.7
Laborers	4,906	(8%)	6,021	20.8	7,023	40.9	9,443	89.4
Total	26,183	(24%)	35,019	33.7	41,793	59.6	57,557	119.8
Population (000's)	1,355.8	(41%)	1,728.9	27.5	2,098.3	54.8	2,891.5	113.3

NOTE: Manpower Requirements do not include staff numbers to replace resignations.
^aBy main staff group with percent increase for each year from the December 1980 figures.
^bFigures in brackets for December 1980 show percent Kuwaiti.
 SOURCE: Kuwait Health Plan 19822000 vol. 4. Executive Summary p. V-12.

Table 76.—Algerian Medical and Paramedical Personnel

	1969	1972	1974	1975	1976	1977	1978
<i>Physicians</i>							
Algerian.	521	784	1,125	1,420	2,027	2,726	3,156
Foreign.	1,179	1,201	1,253	1,392	1,448	1,295	1,752
<i>Pharmacists</i>							
Algerian	206	317	341	549	664	666	708
Foreign	59	38	101	52	41	40	41
<i>Dentists</i>							
Algerian.	142	211	350	469	553	713	813
Foreign	80	97	84	88	90	120	138
<i>Paramedical technicians</i>	477	667	917	1,098	1,167	1,233	1,922
<i>Specialized paramedical agents</i>	460	342	426	620	696	743	432
Paramedical agents (nurses)	1,634	3,088	4,672	6,056	7,857	9,719	11,040
<i>Paramedical aides</i>	3,806	6,271	8,355	9,008	9,092	9,789	10,264
<i>Total paramedical personnel</i>	6,377	10,368	14,370	16,782	18,812	21,484	23,658

SOURCE World Bank Algeria The Five-Year Plan, 1980-84 Washington D.C. 1980.

agreements for medical service training especially with France.³⁴

Table 77 shows the demand and supply of manpower by occupation during the Fifth Plan of Iran. A shortage of 1,300 people was predicted for senior medical personnel, while the shortage of other medical personnel was predicted to be as high as 21,300. In the past, most Iranian medical students went abroad for their postgraduate training.

Training Experiences of Hospital Management Corporations.—Both former Saudi Ministers of Health, Drs. Jazairi and Algosaibi, have expressed concern that foreign firms have been more worried about profits than about technology transfer. "U.S. management firms, for their part, say that training local staff is the only viable long-term means for promoting technology transfer, and that it is consistent with their strategies.

All U.S. hospital management firms working in the Middle East train local professional staff. This is a contractual duty in Saudi

"Algeria and France have signed several agreements in the past 10 years primarily involving exchange of teachers and students. In conjunction, French firms have won contracts for design and construction of medical facilities.

³⁴Dr. Ghazi Algosaibi became Ministry of Health in October 1983 after several months in the position of acting minister. He was dismissed in late April 1984 after incurring the disfavor of senior members of the Saudi royal family. See Michael Field, "Controversy on Dismissal of Saudi Minister," *Financial Times*, Apr. 25, 1984, p. 1.

Arabia, where specific requirements include numbers or percentages for local staff. Large U.S. hospital management firms operating in Saudi Arabia employ as many as 3,000 personnel, of which about 10 percent have been Saudi nationals in recent years. In one instance, the majority of the local staff held positions as drivers, but in another instance the chiefs of medicine, pediatrics, and the hospital director were all Saudi nationals.

Evaluations of experiences with training differ, but U.S. firms have been skeptical about achievements. In one case, a U.S. firm maintained that it was difficult to fill required positions with Saudi trainees, because most candidates prefer to enter a business profession. Another company reported that, despite its efforts to recruit Saudis and its arrangements to facilitate their enrollment in U.S. institutions, success has been minimal. In both cases, on-the-job training techniques are stressed, and new curricula have been designed which include instruction in Arabic as well as English. To summarize, both Saudi Arabian officials and U.S. firms express their belief that goals have not been achieved.

Training at a U.S. University. — One example of an assistance program between a Middle Eastern medical school/university hospital and a U.S. medical school was the project between the King Saud University Hospital in Riyadh and the University of Colorado

Table 77.—Demand and Supply of Manpower by Occupation During the Fifth Plan for Iran (1,000 persons)

Category	Demand ^a	supply	Shortage
Architects, town planners, and civil engineers	7.8	4.0	3.8
Electrical and electronic engineers	5.5	2.8	2.7
Mechanical engineers	6.9	4.2	2.7
Chemical, mining, and metallurgical engineers	2.0	1.0	1.0
Other engineers	14.2	8.3	5.9
Senior medical personnel	8.5	7.2	1.3
Other medical personnel	35.6	14.3	21.3
Educational personnel	287.4	230.0	57.4
Higher educational personnel	22.5	2.1	15
Technicians	116.6	75.0	41.6
Other technical and vocational personnel	8.0	4.0	4.0
Managerial, administrative, and sales personnel	185.0	185.0	—
Mining, drilling, and extractive workers	23.0	15.0	8.0
Transport workers	41.0	41.0	—
Skilled and semiskilled industrial workers	520.0	230.0	290.0
Skilled construction workers	290.0	20.0	270.0
Unskilled workers	538.0	528.0	10.0
Total	2,112.0	1,390.0	722.0

^aDemand for additional workers in each category to enter the work force during the 1973/74-1977/78 period

SOURCE Plan and Budget Organization of Iran and Fifth National Development Plan, as reported by the US Department of Commerce 1978.

School of Medicine in the United States. The contract was signed in 1981, but the Saudis requested that it not be continued beyond February 1984. The program included advice on curricula and faculty facilities in Saudi Arabia, supply of U.S. hospital administrators and faculty members for periods of a few months to up to 2 years, and teaching of Saudi students in their last year of education.

By the beginning of 1983, the university had supplied 35 administrators and 10 faculty members, including two groups in oncology and one group in pediatrics, for 3 to 6 months. One problem was difficulty in recruiting U.S. faculty members to the program. According to a university representative, faculty members were reluctant to leave the research program at Colorado, and their families were hesitant to move to Saudi Arabia.

Only three Saudi students (all female) were sent to Colorado. They arrived with limited knowledge of English, and eventually decided to return to Saudi Arabia before completing their training. This was the result of a number of problems, the fundamental one being that Saudi medical students do not gain clinical experience in their course of study in Saudi Arabia, and therefore find it difficult to make the transition to the U.S. program, which strongly emphasizes hospital experi-

ence. In this case, there was limited space at the university and the hospital for additional students, and the foreign students needed special individual training. The Saudi students had difficulties in meeting the stiff U.S. requirements for both residency and examination." This experience indicates the importance of careful preparation, both in the U.S. organization and in the Middle East country, prior to beginning training. According to U.S. participants, this experience should not be taken to indicate that such programs cannot succeed, but rather that special preparation in clinical experience must be provided. This means that Saudi medical training must be augmented with special courses in order for such student exchange programs to function effectively.

Experiences From U.S.-Sponsored Health Care Activities in Egypt.—Cooperation between Egypt and the United States in training and educational activities occurs mainly through AID programs. These projects have included some funded under the Special For-

"Foreigners who want to come to the United States to study medicine or to practice medicine must pass the Visa Qualification Examination. The tests are closely related to the regular examination of U.S. medical students administered by the National Board of Education. The VQE is a difficult examination, and the percentage of those passing is about 20 percent. Source: American Medical Association, Chicago, Ill.

eign Currency Program.³⁷ Nonprofit private organizations like Project HOPE are also involved.

Health has been a priority area for AID programs. AID-sponsored health programs, which currently involve 35 different projects, concentrate on preventive medical services such as oral dehydration, family planning, mass immunizations, and school health. Appendix A includes a list of major AID projects in the health field in Egypt. The total funding for the entire life of these projects initiated over the past 8 years is \$261 million. In addition, \$24 million has been allocated under the Commodity Import Program for procurement of medical equipment.

One example of an AID program is the Suez Canal University Community Health Personnel Training Project, which includes cooperation between Boston University, the Egyptian MOH, and the Suez Canal University. The project was initiated in 1980 with the objective of establishing an integrated medical education and health services program for five governorates bordering the Suez Canal. The project assists in developing a new curriculum and a new mode of teaching physicians, and provides preventive and community-based primary health services. One unique aspect of the training is the involvement of students with care of patients. Another is the training in the United States of up to 50 junior and senior faculty members each year in primary health service courses that are not available in Egypt. Through group practice, the program emphasizes bringing needed primary health care to the surrounding community. The project was established in 1980, and was given high marks in an evaluation carried out in late 1982.³⁸ As the program becomes more complex with the addition of new courses, one central challenge

³⁷No new funds have been allocated to the SFC since October 1981. This fund is part of the Public Law 480 program, which involves assistance projects payable in foreign currency. Projects in the health field supported by these funds have mostly included research and provision of equipment for laboratories. Some of the projects may be continued through funding from AID.

³⁸See "Evaluation Report of the Suez Community Health Personnel Training Project (Cairo: AID, Oct. 12, 1982).

will be for the Faculty of Medicine to effectively coordinate efforts with the Ministry of Health. This specialized training program represents an example of U.S. assistance contributing to the upgrading of health manpower skills in a focused way to meet the needs of the community.

The U.S.-Egypt Special Foreign Currency Health Program has concentrated on improving local research capabilities, mainly in treating epidemiological diseases, in environmental health and health services. The program has included some 400 projects, running from 1 to 5 years (sometimes more) with total budgets ranging from \$10,000 to several million dollars. These normally involve a U.S. funding institution (often the Department of Health and Human Services), a U.S. project officer either from the funding institution or from a university, and an Egyptian counterpart from a university or from MOH. Collaborative research designed either to advance knowledge or solve development problems has been the central focus. Successful projects have involved capable researchers in well-run laboratories, adequate salaries, and an American research partner.

One program jointly financed by AID and the Special Foreign Currency Program is an Emergency Medical Services (EMS) system. This project was started in 1976 at the strong recommendation of the Egyptian Ministry of Health, with specific objectives to:

- Establish a viable EMS entity in the MOH and an appropriate organization in each of the designated governorates.
- Train physicians, nurses, and technicians in basic and advanced life support treatment.
- Establish national standards for EMS in manpower, communications, critical case units, disaster planning, emergency departments, and public information.

Most of the objectives of the EMS system were attained. Key accomplishments were the establishment of five EMS training centers, purchase of over 600 ambulances, updating of emergency departments in the demonstration project hospitals, successful training of over

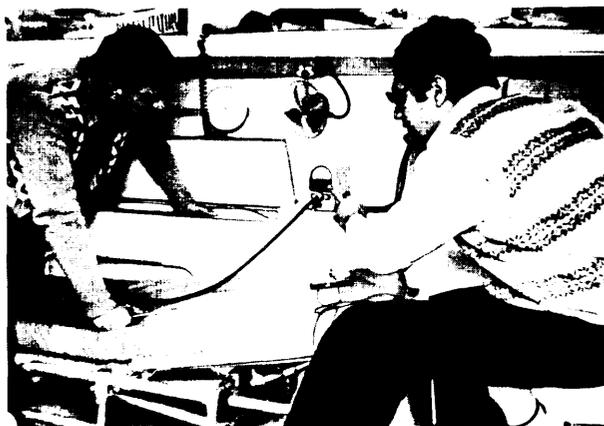


Photo credit: U.S. Agency for International Development

Emergency medical services in Egypt

2,400 students and nurses in basic life support, U.S. training of physicians, and recruitment and training in basic life support of 850 ambulance attendants. Communication equipment was installed in 15 MOH hospitals. However, despite the fact that the project met many of its goals, it was criticized as too costly and dependent on high technology. The primary beneficiaries of the project were an elite group who have telephones and are able to use the service.³⁹ For these reasons, an assessment team recommended that the project not be funded further. Although the EMS project was a program which the Egyptian government viewed as a high priority and one which achieved many of its goals, it was evaluated quite differently by observers who emphasized provision of basic health services to the average citizen.

Overall, AID's health programs have made an important contribution to improving health care in Egypt, with a special emphasis on projects that involve direct and high-impact medical services to the population. These programs generally have been distinguished by their broad coverage and emphasis on provision of medical services needed by the average Egyptian Citizen.

³⁹See AID, "A Report on Health Development in the Arab Republic of Egypt," May 7-June 10, 1982, pp. 36 and 61.

A third area for U.S.-sponsored health care transfer is the HOPE-sponsored activities in Egypt. These have concentrated on three major areas: biomedical engineering, nursing education and scientific exchange. HOPE works jointly with Cairo University, MOH, the Ministry of Higher Education, and the National Academy of Science, with the objective of giving Egypt self-sufficiency in biomedical engineering. HOPE is involved in developing a new Institute of Nursing at Assiut University. Currently, 50 U.S. student nurses are being recruited for teaching positions. The nursing program emphasizes clinical training and preventive health practice in a densely populated but rural part of Egypt. More than 200 Egyptian and U.S. health scientists have participated in HOPE's Scientific Exchange Program since 1975,

Major reasons given for HOPE success include concentration on high-quality teaching activities and on health areas which have a high priority in Egypt, its status as a small but effective organization without any political attachments, and a strong feeling of commitment on the part of HOPE personnel.

Evaluation of the Level of Medical Technology Absorption

While there are no accepted measures of technology absorption, a number of factors can be used to gauge the overall quality of medical technology and local capability to use it: 1) facility design and construction, 2) equipment, 3) staff, 4) education and training, 5) R&D programs, and 6) the ultimate benefit to the respective patient.

An evaluation of the level of medical technology absorption based on these indicators must be used cautiously—partly because the information available is not complete, and partly because the available indicators are not comparable in quantity or quality.

Table 78 summarizes OTA's estimates of the extent and use of medical technology in the Middle Eastern countries under study

Table 78.—Estimated Level of Medical Technology Absorption in the Middle East Countries Under Study^a

Individual factors	Countries				
	Saudi Arabia	Kuwait	Iraq	Egypt	Algeria
(1) Facility design and construction					
Overall quality	H	H	M	L	L
Local capability to design and construct	L	VL	L	M	L
(2) Equipment					
Overall quality	H	H	M	L	L
Local production capability	VL	VL	VL	L	VL
Overall operability and serviceability	L	M	L	L	L
Local capability to operate and maintain	VL	VL	L	M	L
(3) Personnel					
(a) Physicians					
Total number/0000 population	L	H	L	M	VL
Percent local	VL	VL	L	VH	H
Overall quality	H	H	M	M	M
Local quality	L	L	L	M	L
(b) Nurses					
Total number/0000 population	L	M	L	L	L
Percent local	VL	VL	L	VH	H
Overall quality	M	M	M	M	L
Local quality	VL	VL	L	M	L
(c) Technicians					
Total number/0000 population	VL	L	L	M	VL
Percent local	VL	VL	VL	VH	L
Overall quality	M	M	L	M	L
Local quality	VL	VL	L	M	VL
(d) Administrators					
Total number/0000 population	M	M	L	L	M
Percent local	L	M	M	VH	M
Overall quality	M	M	M	L	L
Local quality	L	M	M	L	L
(4) Education, training					
(a) Physicians					
Number of students and funding	H	M	M	H	L
Quality	M	M	M	H	M
(b) Nurses					
Number of students and funding	VL	L	M	M	L
Quality	VL	L	L	M	L
(c) Technicians					
Number of students and funding	VL	VL	L	M	L
Quality	VL	VL	VL	M	L
(d) Administrators					
Number of students and funding	L	M	L	L	L
Quality	L	M	L	L	L
(e) On-the-Job Training					
Overall scope	L	L	VL	M	L
Quality	VL	VL	VL	M	L
(5) R&D programs					
(a) Overall scope	VL	L	VL	M	L
(b) Local capability	VL	L	L	M	L
(6) Extent of use of medical technology among patients					
	L-VH	M-VH	L-H	VL-H	VL-M

KEY VH— Very High, H—High, M—Moderate, L—Low, VL— Very Low when compared to U S or European standards

NOTE These estimates are based on expert judgments and are presented as illustrative of variation The estimates should be used only as general references

^aIran is excluded due to lack of current information

SOURCE Office of Technology Assessment

(Iran is excluded, owing to lack of relevant, recent information). A very high (VH) notation indicates that the facility or personnel are on a par with those in the United States or Europe. Overall, medical technology absorption has been limited in the Middle East. Kuwait and Saudi Arabia have the highest overall range and quality of available medical technology, but absorption has been very limited. This is the case because much of their medical service is, and will continue to be, provided by expatriates at least for the mid-term. Egypt presently has the highest level of absorption in medical services owing to its large, trained, medical personnel base. Egypt, among the countries studied, has the greatest indigenous capability to operate and maintain medical

equipment. The quality of indigenous Egyptian medical personnel is comparatively good; infrastructure and poor administration are major obstacles. Algeria has, until now, been relatively successful in training indigenous medical personnel. Its ambitious social plans, however, coupled with weak medical education and training programs, strained ability to maintain large gains in training nationals in the past few years. In this regard, Iraq falls somewhere between Saudi Arabia and Kuwait on the low end and Egypt and Algeria on the high end. Iraq's strongest suit is in administration, but the country's civilian medical programs have been constrained by the Iran-Iraq war.

PERSPECTIVES OF SUPPLIER COUNTRIES AND FIRMS

Judging from the state of health care and health care facilities in the Middle East and government policy statements, the general needs and specific requirements for medical services technology in the Middle East are substantial, diverse, and changing. The prospective commercial supplier of medical technology services must be aware of the distinction between the need for medical technology and the effective demand for it, which could be defined as the ability and willingness to purchase the technology at a given price.

In this section, characteristics of the market for medical equipment and services are briefly reviewed. Dissimilarities in technology transfer and market approaches taken by firms from various supplier nations are identified. The competitive position of U.S. firms is then analyzed; their advantages and disadvantages in promoting technology transfers in the medical sector are identified. U.S. firms are on a technological par with other foreign supplier firms, but poor after-the-sale service is one factor limiting U.S. sales. Finally, incentives and objectives of noncommercial suppliers are reviewed.

THE MIDDLE EAST MARKET FOR MEDICAL EQUIPMENT AND SERVICES

Hospital design and construction, equipping medical facilities, and hospital management are the dominant types of commercial transfers of medical technologies in the Middle East.

Medical Equipment and Supplies

The market for medical equipment and supplies—excluding pharmaceuticals—in the six countries concerned plus the three small Gulf States of Qatar, Oman, and the UAE, was estimated at approximately \$250 million in 1980.⁴⁰ The corresponding market in 1975 was estimated to be about \$95 million. The Middle East medical equipment market grew rapidly; at a rate of 20% annually in recent years. Nevertheless, imports of medical equipment were valued much lower than imports of construction and technical services, discussed below.

⁴⁰U.S. Department of Commerce, Washington, D. C. "Market Surveys—Medical Equipment," 1981.

Table 79 shows total imports of medical equipment and supplies for the six countries of this study, and the market shares of the major supplying countries. In Kuwait, U.S. firms held the greatest market shares and they earned the second-largest market share in Saudi Arabia in 1980. In addition, combined total imports of medical equipment and supplies in Qatar, Oman, and the UAE were \$17 million in 1980. The United Kingdom was the dominant supplying nation for this group (with almost 35 percent of total imports), with the United States having a market share of approximately 12 percent.

Care should be taken in reviewing statistical information on medical equipment imports, because substantial shifts in the total market and in the ranks of the suppliers can occur from one year to the next. This has been the

case for Algeria, owing to bulk purchases and/or specific requirements for one or two large hospital complexes.

U.S. exports⁴¹ of medical equipment to the world in 1980, excluding Canada,⁴² totaled \$1.7 billion, of which approximately 3 percent went to the Middle East (\$60 million). See table 80.⁴³ The large domestic (and Canadian) market for U.S. medical equipment and the relatively small Middle Eastern portion of such U.S. exports has been cited as one reason why U.S.

⁴¹Data collected by U.S. Bureau of the Census, Washington, D. C., in U.S. *Exports Schedule B Commodity by Country*. Report FT 446, published annually.

⁴²The U.S. export market to Canada in this sector is large and would add approximately 20 percent to the world total exports.

⁴³The \$60 million export figure does not match the total of \$45.8 million of imports from the United States from the preceding table, owing to different data sources and different medical supplies which are included in the tabulations.

Table 79.— Imports of Medical Equipment and Supplies, 1980

	Imports (million)	Market share (percent)
Saudi Arabia—Total Imports	\$84 million	
West Germany	\$30	36
United States	\$20	24
United Kingdom	\$11	13
J a p a n	\$ 7	8
Kuwait—Total imports	\$30 million	
United States	\$10	33
West Germany	\$ 4	13
Italy	\$ 3	10
United Kingdom	\$ 3	10
Egypt—Total imports	\$40 million	
France	\$10	25
West Germany	\$ 6	15
United States	\$ 5	12.5
United Kingdom	\$ 5	12.5
East Germany	\$ 3	7.5
Algeria—Total imports	\$18 million	
F r a n c e	\$ 8	48
West Germany	\$ 4	21
Belgium.....	\$ 2	10
United States	\$ 08	4
Iraq —Total imports	\$28 million	
West Germany	\$ 8	29
United Kingdom	\$ 4	14
F r a n c e	\$ 4	14
J a p a n	\$ 3	11
United States	\$ 2	7
Iran (1978)—Total imports	\$41 million	
West Germany	\$125	30
United States	\$ 8	20
J a p a n	\$ 5	12
United Kingdom	\$ 4	10

SOURCE: Compiled for Office of Technology Assessment, based on data collected by Middle Eastern countries.

Table 80.—U.S. Exports by Industry Sector and Subgroup to the World (excluding Canada) (value in \$000)
Industry Sector: Medical Instruments, Equipment, and Supplies

SITC Number	Product Description	1978	1979	1980
<i>Medical instruments</i>				
7741010	P a c e m a k e r s	39,847	41,006	46,447
7741020	Diathermy units.	417	450	760
7741030	Ultrasound therapeutic devices.	7,969	6,624	8,056
7741040	Other therapeutic apparatus	40,216	59,704	74,027
7741050	Electrocardiographs,	7,074	8,687	8,621
7741060	Electroencephalographs	1,415	2,056	1,226
7741070	Complete patient monitoring systems	29,153	34,050	53,449
7741080	Electro-medical apparatus, NSPF (not specifically provided for)	153,463	193,030	238,742
7741090	Electro-medical apparatus parts.	55,772	97,003	103,111
7742010	X-ray tubes	4,350	5,717	8,214
7742020	Parts for X-ray tubes	1,157	1,521	3,618
7742030	X-ray apparatus and parts for medical or dental use	97,357	145,029	153,043
7742050	Radiological apparatus and parts for medical or dental use . .	17,251	22,000	17,713
8720405	Ophthalmic instruments and appliances and parts	23,745	28,450	29,360
8720410	Anesthetic apparatus and instruments and parts (except syringes)	7,955	8,889	10,670
8720415	Bougies, catheters, drains, and sondes and parts	38,367	51,335	63,103
8720420	Basal metabolism and blood pressure apparatus and parts	17,054	20,167	23,430
8720425	Hypodermic syringes and parts	11,050	16,034	20,221
8720430	Other syringes and parts. NSPF	3,380	5,826	7,963
8720450	Other medical, etc. Instruments and apparatus and parts, NSPF	149,416	159,521	179,584
Total for Industry subgroup— Medical instruments		706,436	908,867	1,051,374
<i>Medical and hospital appliances and equipment</i>				
7416016	Sterilizers and autoclaves and parts	14,818	16,161	18,549
7853020	Wheelchairs and parts	2,730	2,649	3,135
8212100	Other hospital, medical, dental, etc., furniture, NSPF	35,334	38,689	53,249
8720320	Mechano-therapy appliances and massage apparatus and parts	8,000	6,457	8,299
8720340	Artificial respiration, ozone, oxygen, aerosol therapy, etc.	50,391	60,143	77,928
8996100	Hearing aids and parts, NSPF	6,383	7,899	9,645
8996250	Bone and joint prosthesis, plates, screws, nails, etc.	26,168	31,751	36,588
8996280	Other orthopedic appliances	20,938	21,117	26,292
Total for industry subgroup— Medical and hospital appliances and equipment		164,762	184,866	233,685
<i>Dental instruments and equipment</i>				
5419060	Dental cements and filling (except alloys)	14,279	13,513	22,798
5988025	Dental impression plates	3,519	3,977	5,304
8720440	Dental hand Instruments and parts	13,766	19,184	23,279
8720445	Other dental and instruments, NSPF	24,002	34,202	41,853
8996225	Artificial teeth and dentures of plastic	2,726	4,725	6,092
8996240	Other artificial teeth and dentures, NSPF	6,155	7,898	9,048
Total for industry subgroup— Dental Instruments and equipment.		64,387	83,499	108,374
<i>Medical supplies</i>				
5419010	Opacifying preparation for radiological examination	6,041	8,124	10,252
5419020	Other diagnostic agents (except biological), NSPF	39,839	52,154	53,650
5419030	Waddings, gauze, dressings, etc. with medicinals	6,405	5,594	5,099
5419040	Other waddings, etc., NSPF	19,455	24,198	30,845
5419050	Surgical sutures and materials, etc., sterile	32,320	36,600	36,845
8482020	Surgical and medical gloves	14,642	19,427	29,189
8720435	Hypodermic needles	7,071	7,700	10,617
8822620	X-ray film, medical, ex dental	35,900	45,803	72,720
8822625	Other X-ray film	10,953	11,623	23,511
8841120	Contact. ophthalmic lenses not mounted	4,004	8,193	12,343
8841140	Other ophthalmic lenses	16,305	20,086	24,617
8842100	Eyeglasses, etc., frames, mountings, and parts	10,273		
8842120	Eyeglass fronts and temples		3,176	4,883
8842140	Parts, NSPF, for eyeglasses, lorgnettes, goggles, and similar items		7,963	7,244
Total for industry subgroup—Medical supplies		203,216	250,729	321,616
Industry sector total		1,138,801	1,427,961	1,715,049

SOURCE U S Bureau of the Census U S Exports Schedule B Commodity by Country Report FT 446 Annual 1978, 1979 1980

companies have not emphasized Middle Eastern sales. As shown in table 81, U.S. exports to Saudi Arabia (the largest Middle Eastern importer of U.S. medical equipment) have been overshadowed by such exports to other parts of the world.

The trend for U.S. exports was upward from 1978 to 1980 in most categories of medical equipment. The exception was Iran where total medical equipment exports from the United States fell 80 percent between 1978 and 1982. Algeria's imports from the United States (\$262,000 in 1980) were very limited, most hospital appliances and equipment.⁴⁴

⁴⁴See United States Department of Commerce, Washington, D.C., *Medical Equipment - Saudi Arabia* (Country Market Survey), CMS 77-022, November 1977, for forecasts of Middle East markets.

Saudi Arabia and Kuwait have maintained their significant levels of imports of medical equipment, even in the recent period of reduced revenues. The ambitious government hospital construction programs in both countries and the upgrading of some substandard equipment in existing MOH hospitals should boost sales of cardiology equipment, operating room equipment, pediatric equipment, and rehabilitation products. Automated monitoring systems are increasingly being used to counter staff shortages, and a rapid increase in the use of disposable is expected, owing to staff scarcity, high labor costs, mounting awareness of the need for hygiene, and a limited concern over price.

Table 81 ,—Representative U.S. Exports of Medical Instruments, Equipment, and Supplies to Saudi Arabia (value in \$000)

SITC Number	Product Description	1978	1979	1980
7741050	Electrocardiographs	40	13	46
7741070	Complete patient monitoring systems	1,514	153	325
7741080	Electro-medical apparatus, NSPF (not specifically provided for)	1,082	2,069	5,832
7741090	Electro-medical apparatus parts	424	748	686
7742030	X-ray apparatus and parts for medical or dental use	1,427	448	826
7742050	Radiological apparatus and parts for medical or dental use	473	31	323
8720405	Ophthalmic instruments and appliances and parts	349	75	646
8720410	Anesthetic apparatus and instruments and parts (except syringes)	221	60	491
8720415	Bougies, catheters, drains, and sondes and parts	724	647	932
8720420	Basal metabolism and blood pressure apparatus and parts	176	172	39
8720425	Hypodermic syringes and parts	143	196	350
8720430	Other syringes and parts, NSPF	196	243	298
8720450	Other medical, etc., instruments and apparatus and parts, NSPF	4,473	4,638	5,345
7416016	Sterilizers and autoclaves and parts	532	408	241
7853020	Wheelchairs and parts	39	221	222
8212100	Other hospital, medical, dental, etc., furniture, NSPF	5,347	5,320	14,980
8720320	Mechano-therapy appliances and massage apparatus and parts	739	1,144	1,172
8720340	Artificial respiration, ozone, oxygen, aerosol therapy, etc.	1,665	1,206	1,978
8996100	Hearing aids and parts, NSPF	84	4	43
8996250	Bone and joint prosthesis, plates, screws, nails, etc.	19	31	27
8996280	Other orthopedic appliances	193	231	893
8720440	Dental hand instruments and parts	210	137	311
8720445	Other dental and Instruments, NSPF	397	400	1,792
8996225	Artificial teeth and dentures of plastic	19	17	25
8996240	Other artificial teeth and dentures, NSPF	10	30	97
5419010	Opacifying preparation for radiological examination	6	8	17
5419020	Other diagnostic agents (except biological), NSPF	313	531	837
5419030	Waddings, gauze, dressings, etc. with medicinals	655	475	445
5419040	Other waddings, etc., NSPF	196	363	444
5419050	Surgical sutures and materials, etc., sterile	142	163	378
8482020	Surgical and medical gloves	59	254	222
8720435	Hypodermic needles	15	52	160
8822620	X-ray film, medical, ex dental	858	128	252
8822625	Other X-ray film	56	31	167

SOURCE U S Bureau of the Census U S Export/Schedule B Commodity by Country Report = T 446 Annual 1978 1979 1980

While countries such as Saudi Arabia and Kuwait have installed the best possible medical equipment in several of their hospitals, countries like Algeria and Egypt have avoided the overly sophisticated equipment and systems that are not considered appropriate for their facilities at this stage. The majority of the existing health care facilities in these two countries operate with much older equipment.

The current situation in Iraq and Iran makes projections on medical equipment market development difficult. Once the war has ended, however, both countries may emerge as strong import markets for medical equipment and supplies.

Major U.S. suppliers of medical equipment in Saudi Arabia are listed in table 82. Major non-U. S. medical equipment suppliers in Saudi Arabia are given in table 83. Health care equipment suppliers and consumers interviewed in the Middle East stated that medical equipment from countries like the United States, West Germany, Sweden, and the Netherlands could generally be considered equal in quality. The United States has for many years been the world leading supplier of advanced medical equipment, but those interviewed felt that the technological advantage once held by the United States over Europe no longer exists. However, several firms, of which many are U.S. firms, are considered technologically outstanding in their specific fields.⁴⁵

Price has not been a major competitive issue in Saudi Arabia, Kuwait, and prewar Iraq. This is now slowly changing. Price has been one of the most important competitive factors in the other countries, where U.S. exports—especially in the last 2 to 3 years—have been affected negatively due to the strength of the dollar.

A major finding of interviews with industry experts in the Middle East is that service

⁴⁵ These include: Air Shields (U.S.)—pediatric equipment; Amisco (U.S.)—operating room equipment; Coulter (U.S.) analyzers; Beckton & Dickerson (U.S.)—disposables; Siemens, (West Germany)—X-ray; Hellige (W.G.)—cardiology equipment; Draeger (W.G.)—anesthetic equipment; and Gambro (Sweden) dialysis equipment.

is probably the most important single factor influencing competitiveness in all countries. Service could include delivery, set-ups, testing (when necessary), provision of manuals, provision of spare parts and continuing maintenance or calibration. West Germany is unanimously considered to offer the best services, followed by Japan. U.S. suppliers are generally not considered to put as much emphasis on service as they do on developing new medical technology.

West Germany is the leading supplier of medical equipment to the Middle East, with about 25 percent of the total import market. German companies have combined quality products with an aggressive marketing approach, including excellent after-sales services. West German strongholds are X-ray equipment, electrocardiogram equipment, patient monitoring systems, microsurgery equipment, and microscopes.

The United States is the second largest supplier to this region, with some 18 percent of total imports in 1980. Sales are concentrated in clinical laboratory equipment, electromedical equipment, computerized medical services, disposable, and nearly all types of advanced instrumentation requiring a high degree of accuracy. U.S. products are generally considered competitive in terms of technology, quality, and reliability, but U.S. firms supplying medical equipment are not known for their after-sale service.

The United Kingdom, as the third largest supplying nation to this region, had about a 12-percent market share, an almost 50 percent drop from the mid-1970's. The British are still competitive in some product areas like anesthetic equipment, X-ray equipment, and surgical instrumentation. Their lack of competitiveness has been attributed to failure to develop new products in the fastest growing product areas, among other factors.

France ranks as the fourth largest supplier country to this region, with a 10-percent market share, owing mainly to the strong French position in Algeria and Egypt.

Table 82.—Major U.S. Suppliers of Medical Equipment in Saudi Arabia and Relative Market Position

Supplier/equipment	Relative Position	Supplier/equipment	Relative position
Cardiology equipment			
Hewlett-Packard	Good	Operating room equipment	
Ohio Medical	Good	Amsco/tables, lighting	Dominant
Air Shields	Marginal	Air Shields/vacuum	Good
Pulmonary equipment			
Hewlett-Packard	Dominant	American Optical/defibrillators, blood pressure, monitors	Good
Ohio Medical	Good	Castle/autoclaves, lighting	Good
Renal equipment			
Cordis Dow	Good	Ohio Medical/anesthesia	Good
Travenol	Marginal	Narco Pilling/instruments	Marginal
Pediatric equipment			
Air Shields	Dominant	Clinical laboratory equipment	
Ohio Medical	Good	Beckman/automatic analyzers	Dominant
Gamco	Marginal	Coulter/blood analysis equipment	Dominant
Ivac	Marginal	American Optical/microscopes, pH	Good
Ophthalmological equipment			
American Optical	Good	Corning/pH	Good
Bausch & Lomb	Good	Cutler/solutions	Good
Welch Allyn	Marginal	Hewlett-Packard/chromatography	Good
General hospital equipment			
American Optical/monitors	Good	Bausch & Lomb/microscopes, solutions	Marginal
Digital Equipment/computers	Good	Chicago Surgical/centrifuges	Marginal
Hewlett-Packard/monitoring systems	Good	Disposable	
IBM/computers	Good	Beckton & Dickenson	Dominant
Kodak/X-ray supplies	Good	American Hospital Supply Co.	Good
Physio Control/X-ray monitoring	Good	Ethicon	Good
Searle Medical/nuclear	Good	Johnson & Johnson	Good
General Electric/X-ray, computers	Marginal	Stryker	Good
Honeywell/computers	Marginal	Kendall	Marginal
Picker/nuclear	Marginal	Rehabilitation products suppliers	
		Birdick/artificial organs, therapy	Good
		Franklin/hearing aids	Good
		Stryker/therapy equipment	Good
		Cordis DOW/artificial organs	Marginal
		Metler/diathermy equipment	Marginal

SOURCE: U.S. Department of Commerce, Market Research Division, Medical Equipment Market, Saudi Arabia 1981

Japan is quietly but efficiently increasing its market share in every country in the region. Spectrophotometers, X-ray equipment, medical supplies (including disposable), surgical instruments, and a broad range of optical products are some of the Japanese strengths. Japan's 7 percent market share was expected to grow.

Design and Construction of Health Care Facilities

Hospital design in the Middle East is a field where European firms especially British and French—firms have been successful. Some U.S. companies are active in the area, but their activities are limited almost exclusively to Saudi Arabia.

The value of hospital and medical facility construction contracts far exceeds that of equipment imports to the Middle East. The

Middle East hospital design market was estimated at \$770 million in 1981.⁴⁶ As table 31 in chapter 4 shows, construction contracts have been the largest component of medical service exports to the region in recent years.

The design of a hospital in the Middle East requires substantial knowledge of local disease patterns, climatic conditions, social mores, and socioreligious customs. For example, the climatic conditions require special arrangements for ventilation and cooling and protection against damage from sand and dust. In addition, planning must take account of a higher relative share of burns, infectious and parasitic

⁴⁶ No official market magnitude or market share data in hospital design in the Middle East are available. European experts associated with *Middle East Construction* (a monthly U.K. magazine) estimate that the total Middle Eastern hospital design market was valued at about \$770 million in 1981, and that the U.S. share was 8 percent, Great Britain, 30 percent, France, 15 percent, Italy, 10 percent, and West Germany, 10 percent.

Table 83.— Major Third-Country Medical Equipment Suppliers in Saudi Arabia

Hellige	West Germany	- Cardiology equipment
Zeiss	West Germany	- Microscopes
Heine	West Germany	- Microsurgery
Siemens	West Germany	- X-ray equipment
Draeger	West Germany	- Anesthesia equipment
Storz (U. S. subsidiary)	West Germany	- Endoscopes
Cambridge	United Kingdom	- Electrocardiographs (ECG)
Zimmer Orthopaedic	United Kingdom	- Rehabilitative equipment
Downs Surgical	United Kingdom	- Surgical instruments
GEC Medical Equipment	United Kingdom	- X-ray equipment
Daikyo	Japan	- Supplies
Shimadzu	Japan	- X-ray equipment
Nagashima	Japan	- Surgical instruments
Olympus	Japan	- General medical equipment
CGR	France	- X-ray equipment
Reichert	Austria	- Laboratory equipment
Philips	Netherlands	- X-ray equipment

SOURCE: U.S. Department of Commerce, Market Research Division, *Medical Equipment*, Vol. 1, No. 1, 1981

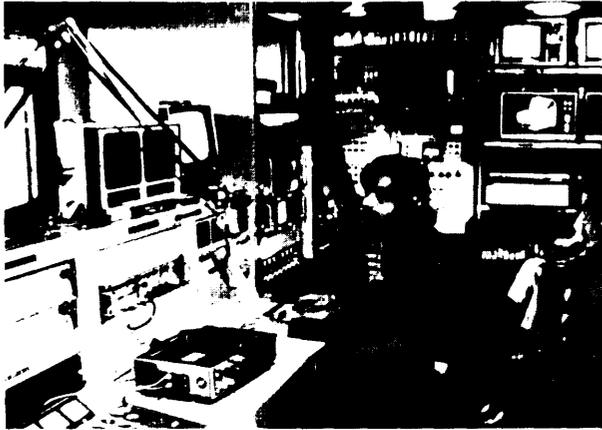


Photo credit: *Aramco World Magazine*

Control room of the King Faisal Specialist Hospital's two-channel closed-circuit television broadcast system serving patients and staff

diseases, and diseases of the digestive system. The facilities must have a high degree of flexibility to keep abreast of constantly changing methods of treatment and teaching. (Part of a newly constructed hospital in Baghdad, is planned to function independently in case of war.) In planning, consideration must be taken of the large number of outpatient treatments and in many countries the limited number of staff, which makes it vital to promptly treat patients. In some of the countries a strict separation of male and female patients is required, In Saudi Arabia separation is required between administrative staff and nurses. In many

countries, the waiting room facilities have to be very spacious in order to make room for the rest of the family and accompanying relatives and to use these facilities for demonstrations and teaching activities. Also, separate waiting rooms for males and females must often be provided."

One example of U.S. participation in hospital design and planning is the \$2 billion medical city project on the site of Jeddah's old international airport, where the proposed complex will comprise an 800-bed hospital and colleges of dentistry, pharmacology, and other medical sciences. Henningson, Durham and Richardson Architects have the design sub-contract and Daniel International of Saudi Arabia, a subsidiary of the Fluor Corp. (U.S.), has the overall coordination responsibility. The hospital will be constructed according to U.S. standard specifications, but every attempt is being made in the design to adapt it to the local cultural environment. Special manuals both in English and Arabic have been prepared to brief staff and project members on local requirements. The programming element prior to the detailed design is the most expensive and specialized part of the project, and U.S. health care consultants are used for advice on special facility needs.

¹ Interview with officials of Henningson, Durham and Richardson Architects, Louisiana.

In the market for turnkey hospital construction, experienced Western contractors—primarily German and French—still have a competitive edge. Philip Holzmann of Germany is the leading hospital turnkey contractor, with seven completed projects totalling 3,400 beds in the area in the last 5 years. The major part of the Middle Eastern hospital contracting market is currently shared between West Germany, France, South Korea, Italy, and a growing number of local contractors in joint venture with foreign companies. Up until 1981, South Korean firms, so successful in other Middle Eastern infrastructure projects, were not invited to bid as general contractors on the Saudi hospital projects. This is now changing rapidly, and in 1982 South Korean firms were successful or low bidders on nine hospital projects in Saudi Arabia, Iraq, and Kuwait.

The respective governments' desire to increase the local share of public construction work is clear also in the health care sector. In Saudi Arabia, some of the local contractors in joint ventures, mainly with French and British firms, have been successful in winning contracts over foreign competitors. Two examples are Beta Construction and El Seif Engineering and Construction, locally owned Saudi contractors that have been approved to pre-qualify for the Health Ministry hospital program. In the last 2 years, the successful European companies have formed joint ventures to bid and carry out hospital contracting work. Joint venture arrangements will be used increasingly in the health care contracting field in order to secure government contracts. In Saudi Arabia, the Government has stated its intention to award the majority of contracts to Saudi companies.

U.S. companies are not active in the Middle Eastern hospital construction market. Only three U.S. firms are included in the list of over 40 contractors bidding for MOH projects in Saudi Arabia, and very few major hospital construction contracts have been awarded to U.S. companies in the Middle East since 1980. Observers cite a number of factors as reasons:

- The dominance of turnkey hospital contracting in Saudi Arabia, the largest and most lucrative market, where European contractors—especially German, French and Italian—have established themselves as leaders.
- The nonexistence of U.S. companies in the market specializing in hospital contracting work.
- The declining competitiveness of U.S. contracting services, partly due to the increased competition from European and Asian rivals, and the value of the dollar, which is reflected in lower bids by other contractors.⁴⁸
- The so-called disincentives for U.S. exporters in general, which mainly concern the overseas tax situation, and the laws on antitrust, antiboycott, and anticorruption activities.⁴⁹ Although being disincentives to U.S. companies, these do not appear to be as major a factor as the three factors listed above.

Hospital Management

Saudi Arabia is by all accounts the greatest importer of hospital management services, although management contracts have also been awarded in the UAE, Egypt, and North Yemen.⁵⁰ Whittaker Corp. has ongoing negotiations with Iraq's MOH for a management contract in Baghdad, which if it materializes,

⁴⁸For every \$1.25 bid by a Far East contractor, the U.S. firms will, on the average, bid \$ 1.70—a 37 percent variance. *Middle East Economic Digest*, quoting a U.S. Department of Commerce representative; *U.S.-Arab Trade*, October 1982.

⁴⁹USITC publication (September 1982) "The Relationship of Exports in Selected U.S. Service Industries to U.S. Merchandise Exports," pp. 246-247, gives three examples: 1) even in countries where U.S. health management companies are currently active, such as in Saudi Arabia, the Foreign Corrupt Practices Act was cited by a health care management company as being a major reason why the company failed to obtain more contracts; 2) U.S. antiboycott laws were also cited by several companies as constituting a barrier against foreign trade expansion; 3) U.S. antitrust laws were cited by some health industry representatives as inhibiting foreign trade expansion.

⁵⁰Ibid p. 257. The report states that U.S. hospital management firms held about 70 percent of the contracts awarded in Saudi Arabia in 1981, with the total Saudi hospital management market worth more than \$500 million.

will be the first of its kind in that country. Outside of Saudi Arabia and except for other scant examples, the predominant policy of the governments has generally been to administer the health care facilities themselves, and in case of foreign manpower needs, to establish health accords on a bilateral basis with foreign governments. Thus, in other parts of the region imports of other types of technical services (training, operation and maintenance, etc.) are the major types of imports, in addition to construction services. As shown in table 31, these service imports represent a large share of medical service sector imports.

HCA a strong presence in the Middle East since assuming management of the very modern King Faisal Specialist Hospital and Research Center in Riyadh when this complex opened in 1975. HCA is also managing the hospital at Al Batin, the King Khaled Military City. In 1982 HCA's local subsidiary, HCA Saudi Arabia, won the much sought-after contract for operation, maintenance, and management of the 500-bed Saudi Arabian National Guard (SANG) hospital complex in Riyadh.

Whittaker Corp. signed the first contract with Saudi Arabia in 1974 for management of MODA's three military hospitals at Jeddah, Tabuk, and Khamis Mushayt. This contract has been extended three times. Two more hospitals and a number of clinics have also been added, bringing Whittaker's current staff in the Kingdom to about 3,000. The corporation's emphasis is on basic medical and surgical treatment, including some preventive medicine and public health services. The recent decision of the Saudi Arabian Government to open these contracts to competitive bidding led to a shift in the firm's position.⁵¹ Whittaker also has two management contracts in neigh-

boring countries—for a 535-bed hospital in the UAE and a hospital in North Yemen (financed by Saudi Arabia).

National Medical Enterprises (NME) manages the 318-bed Al-Hada hospital in Taif for MODA; the 105-bed acute care hospital at King Abdul Aziz Airbase in Dhahran, also for MODA; and the 120-bed Public Security hospital in Riyadh. NME also has contracts to equip seven MOH hospitals, ranging from 50 to 300 beds, under construction throughout the Kingdom.

AM I is the only U.S. hospital management company that runs a MOH facility, the 355-bed general hospital at Al-Baha. AMI Saudi Arabia Ltd. has also signed a contract with the Ministry of Finance and National Economy for the full operation of a 263-bed specialist eye hospital in Riyadh, which will function as a leading referral center in the country for the treatment of eye disorders.

Other U.S. health care management firms in Saudi Arabia that have substantially smaller operations, mostly in the private sector, are Charter Medical, American Health Facilities International, International Medical Services, University Association for International Health, and Herman Smith Associates, International.

Based on the experience of U.S. firms contacted primarily in Saudi Arabia, factors affecting competitiveness on individual contract awards for hospital management are summarized below.⁵²

- performance track record and longevity of firm,
- effective use of local agent or joint venture relationship,
- political support of bidding government,
- prior experience and reputation in the Middle East,
- price,

⁵¹See *The Wall Street Journal*, November 1983 and Michael Petrie-Ritchie, "Allied Medical (Group) Re-enters Saudi Medical Scene," *Middle East Economic Digest*, March 16, 1984, p. 37. Whittaker—the present management contractor for the three MODA hospitals at Jeddah, Khamis Mushayt and Tabuk—was the highest bidder for the new three-year management contract at \$1,114.7 million when the bids were opened on March 11, 1984. The lowest of the nine bidders, at \$571.5 million, was the U. K. Allied Medical Group (AMG) which teamed with the local El-Seif Development Establishment. The

project was split into three packages, with AMG/Seif winning management contracts for two hospitals; a U.S.-Saudi joint venture (Fairview) won the other hospital management contract. See *Middle East Economic Digest Special Report-Saudi Arabia*, July 1984, p. 89.

⁵²Those firms include Whittaker-, HCA, and AMI.

- responsiveness to the request for proposal and tender specifications, and
- involvement of individuals from the higher echelons of the corporation.

U.S. firms have had an advantage over those of other countries because of the perceived superiority (especially in Saudi Arabia) of U.S. medicine. For sophisticated medical care, Middle Eastern countries have consistently looked to the United States. This technical advantage applies not only to medical practices but also to hospital administration. The major U.S. firms have established reputations for efficient, cost-effective hospital management, and expect the demand for such services to grow in countries such as Egypt and the Gulf States.⁵³

British firms are the major competitors in Middle East hospital management. The major British health care management firm is the Allied Medical Group. It is 70-percent owned by the British government through the National Enterprise Board and has the management contract for two MODA hospitals. The other major British health care management company is the International Hospitals Group (IHG), which is a consortium of health care companies organized on an ad hoc, project-by-project basis. The major IHG involvement in Saudi Arabia is the contract for managing the 500-bed SANG hospital in Jeddah. This contract was arranged through direct government-to-government negotiations.

In addition, countries like Denmark, Sweden, West Germany, and Taiwan have concluded agreements for management work in Saudi Arabia. In contrast to the U.S. and British contracts, which have been signed primarily with non-MOH agencies, the MOH has signed health agreements with the respective health ministry of each country concerned, thereby meeting its manpower needs through bilateral agreements rather than through private health care management contracts.

⁵³*Middle East Economic Digest*, "Health Contracts Test U.S. Responses," *U.S.-Arab Trade*, October 1982, p. 24. See also Michael Petrie-Ritchie, "Saudi Arabia's Healthcare Market—The Prognosis is Good," *Middle East Economic Digest*, November 1983, p. 38.

The management firms are also beginning to face increased competition from firms organized within the host countries. In Saudi Arabia, a 100-percent Saudi company has been formed which hires Westerners to staff and manage hospitals. U.S. health care management firms have prepared for the inevitable increased local involvement in Saudi Arabia by opening partially Saudi-owned subsidiaries or by organizing joint ventures.

Selected medical services contracts in Saudi Arabia, Egypt, Algeria, and Iraq are shown in appendix A, tables A1 through A4. These are not all-inclusive lists, but show the diversity in types of projects and costs, foreign involvement, and ownership structure.

U.S. firms will undoubtedly remain major suppliers of hospital management services in the Middle East. Recent experience in Saudi Arabia indicates that willingness to work with local companies and marketing will be increasingly important aspects of contract awards.

FACTORS INFLUENCING COMMERCIAL TECHNOLOGY TRANSFER IN THE MEDICAL SECTOR

Controls Regarding Medical Exports

U.S. manufacturers of medical equipment must comply with the reliability and efficiency regulations issued by the Bureau of Medical Devices of the U.S. Food and Drug Administration (FDA).⁵⁴ Some exporters say that controls on exports of some high-technology items involving computers and microprocessors have limited some medical equipment exports. Array processors, sometimes used in computerized tomographic (CT) scanners, are, for example, subject to export controls. There have been no cases where these regulations clearly constituted a disadvantage to U.S. firms in the Middle East region which OTA was able to document. But as medical tech-

⁵⁴(ITA forthcoming report on "Federal Policies and the Medical Devices Industry" will include review of various regulations affecting medical devices sales.

nology becomes increasingly sophisticated, concerns may grow if export controls are extended to cover many types of medical equipment involving optical equipment, electronic equipment, and computer hardware and soft ware.

Financing

In the Gulf States, supplier financing has been a minor ingredient in awards of contracts for health care projects. Saudi Arabia, Kuwait, the smaller Gulf States, prerevolutionary Iran and prewar Iraq have all been capable of providing financing and other factors such as quality, serviceability, speed, manpower, and training have been more important in contract decisions.

In Algeria and Egypt, foreign companies engaged in health care projects are required to conform to certain principles, including regulations concerning foreign exchange. The U.S. Export-Import Bank has supported exports to Algeria, but few in the medical equipment or hospital construction sector. French and Belgian firms, in contrast, have financed two Algerian hospital projects with government-backed soft loans.

In Egypt, financing arrangements strongly influence the competitive positions of suppliers. Many Western supplier countries have established government-to-government agreements with Egypt in the health care field in recent years. Under these agreements, large hospital projects have been undertaken by French, Belgian and Japanese firms with financing provided by respective supplier governments. There is no doubt that financing will continue to be of critical importance in determining the award of health care infrastructure contracts in Egypt and Algeria, and also in Iraq, if and when a resolution of the Iran-Iraq conflict occurs. Beginning in 1983, some Gulf countries also began to consider external financing for their planned health care projects.

Other Types of Foreign Government Involvement

There is a growing trend of bilateral agreements and health care accords in the region. Some bilateral health care cooperation projects in the region include:

1. Saudi Arabia-Taiwan. Signed in Riyadh in February 1983 with the following components: a) exchange of medical experts, b) training of Saudi Arabian students in the medical field, and c) administration and operation of King Fahd Hospital in Hofuf and King Fahd Hospital in Jeddah, and furnishing of physicians, nurses, and supporting staff for the two hospitals.⁵⁵
2. Kuwait-Sweden. Signed in Stockholm in October, 1981 with the following key provisions: a) Sweden to provide some 60 physicians and 40 senior technicians in 1982/83, b) exchange of expertise and further training of doctors who are practicing in Kuwaiti hospitals, and c) cooperation—mainly on curricula and training methods—between Kuwait Medical School and the Karoliaska Institute in Stockholm.”
3. Egypt-United Kingdom. Signed in Cairo in 1980, covering the following main fields of medical expertise exchange: a) pharmaceutical control experts, b) TB-screening experts, c) cancer diagnostic experts, and d) maternal and child health center experts.⁵⁷
4. Egypt-Belgium. Signed in Cairo on two occasions, in 1976 and in 1982, with some of the key areas of cooperation being: a) emergency facilities and procedures, b) pharmaceutical quality control, c) environmental medicine, d) dentistry, e) nursing, f) tropical medicine research, and g) research in pesticides and parasites.⁵⁸

⁵⁵*Arab News*, Saudi Arabia, Feb. 21, 1983.

⁵⁶*Arab Times*, Kuwait, October 1981.

⁵⁷British Overseas Trade Board, U.K.: Egypt, 1981.

⁵⁸*Ibid. Middle East Economic Digest*, Aug. 13, 1982.

5. Egypt-Japan. An agreement involving cooperation in health care infrastructure development. The only project so far consists of a Japanese grant for construction of a pediatric hospital at Cairo University.⁵⁹
6. Kuwait-United States. The U.S. Department of Health and Human Services is providing technical assistance in health to Kuwait's Ministry of Public Health under a Memorandum of Understanding signed in 1981. Technical assistance is provided for five projects: a) emergency medical services; b) hypertension control; c) reduction of infant morbidity and mortality; d) health manpower development and utilization; and e) vital and health statistics.⁶⁰

Some U.S. health care firms with experience in the highly competitive Middle Eastern region claim that these bilateral agreements provide entrees for foreign firms, since purchases of health care goods and services in these projects generally are made from firms in the donor country.⁶¹ The United States is involved in bilateral health agreements in the Middle East and AID programs provide commercial opportunities to U.S. and developing country suppliers of medical equipment and services.⁶² Supplier countries like France, Great Britain, West Germany, and Japan have been said to use cooperation in the health care field in the Middle East in a systematic way to support their respective commercial interests in areas such as hospital construction which are not central to AID program. In all cases, however, economic assistance programs in the health area provide commercial opportunities to donor country firms.

⁵⁹U.S. Embassy, Cairo, February 1983.

⁶⁰Science, *Technology, and American Diplomacy — 1983*, Fourth Annual Report Submitted to the Congress by the President, Washington, 1). C., September 1983.

⁶¹The health care accord reached between Egypt and Japan (number 5 in the list of bilateral health care cooperation projects) states that Japanese equipment should be used. In the agreements reached between Egypt and Algeria, on the one hand, and France, Belgium, and the United Kingdom, on the other, it is not stipulated that design, construction, and equipping of health facilities should be monopolized by the assisting country. But, according to the U.S. Embassy in Cairo and the British Overseas Trade Board, Great Britain, the services and equipment in the facilities come almost exclusively from the assisting country.

⁶²AID activities in Egypt have certainly provided commercial opportunities for U.S. firms, particularly through the Commodity Import Program.

U.S. health care suppliers sometimes claim that foreign firms involved in health care service exports to the Middle East are strongly assisted by the formal and informal sponsoring of their governments. When the International Hospitals Group of Great Britain was awarded the management contract for the Saudi Arabian National Guard 500-bed hospital in Jeddah, negotiations were reportedly handled by the British Ministry of Defense, supported by the Department of Health and Social Security. A visit by Prime Minister Margaret Thatcher to Saudi Arabia helped bring the negotiations to a close. During negotiations for health care contracts, especially in the Gulf countries, the foreign firm or consortium may be represented by a prestigious government official.

The U.S. Foreign Commercial Service provides routine representation of U.S. firms and has activities designed to assist trade promotion missions in the medical services field.⁶³ Nevertheless, U.S. health care exporters to the region argue that support provided by the government, through official U.S. commercial representation in the area, is not comparable to that of some other Western nations. The British, West German, and Scandinavian commercial representatives are said to maintain extensive direct contact with business at home and actively pursue and create business opportunities in the Middle East.⁶⁴ Data are not available that would allow for comparison of the dollar value of allocations for trade promotion in this area, but it does appear that in many cases non-U.S. suppliers recruit high-quality personnel to work in official trade promotion activities.

U.S.-Imposed Trade "Disincentives"

U.S. suppliers cite the FCPA and antiboycott regulations as barriers to foreign trade expansion because foreign competitors are not subject to equivalent regulations. As discussed in chapter 13, together such regulations present a disincentive for exporters to some degree, but OTA was not able to document specific cases where contracts were lost because of them.

⁶³U.S. Department of Commerce, March 1984.

⁶⁴Based on interviews held with U.S. health care exporters in 1983.

FUTURE PROSPECTS

This section discusses the potential political and social effects of medical technology transfer to the Middle East. U.S. policy options are also identified.

POTENTIAL POLITICAL AND SOCIAL DIMENSIONS OF HEALTH CARE

Developments in the health care sector contribute indirectly to social and political changes in recipient countries. While it is impossible to anticipate all the effects of health care development, it is important to identify several types of potential effects.

Increased Health Care Expectations

During the last decade, the expectations for improved health care have risen as allocations to the sector have been increased. As a result, health standards have improved and the effects on local living conditions have been generally stabilizing and beneficial. Public health education programs have also made people more aware of the potential benefits of health care. One potential problem could occur if a fall in oil revenues were to lead to a severe cut-back in allocations to the health care sector up to present, however, most of these countries have attempted to maintain their social investments.⁶⁵

Integration of the Health Care System into the Culture

Grassroots involvement is important to properly integrating health care into the society. For example, where the effort toward

⁶⁵ *Financial Times*, Apr. 26, 1982; Apr. 14, 1983. Human resources and labor development remained high priorities in the Saudi budget. The decline in allocations to health programs was about 20 percent in 1983-84 over the 1982-83 budget. See Edmund O' Sullivan, "Spending Squeeze Continues in 1983-84," *Middle East Economic Digest*, Apr. 15, 1983, p. 15. Spending in 1984-85 was projected to increase, however, by \$12 billion from the 1983-84 levels. The Ministry of Health was one of the few ministries to receive increased allocations in the 1984-85 Saudi budget. (See Michael Field and Finn Barre, "Saudi Arabia Boosts spending to \$75 billion," *Financial Times*, Apr. 2, 1984, p. 1.)

curative facilities is unmatched by an equivalent effort in preventive medicine, dissatisfaction may arise. This will be particularly evident when there is a lack of local involvement which results in the perception that health care is being "imposed" and not "integrated" into the cultural system, or that it is manned or managed exclusively by expatriates.

Role of Women

The future role of women in the work force is a crucial issue in some Middle Eastern countries. In light of the significant labor shortages in Saudi Arabia, the medical sector could be promising area to bring more women into the productive workforce. But so far, significant social barriers remain. In Algeria, Iraq, and pre-revolutionary Iran, on the other hand, change in this area has been more rapid.⁶⁶

Staffing

Plans already under way call for major expansions in staffing. Much of this expansion, it would appear at this time, cannot be met from the countries' internal resources. This means that in the medium-to-long term, expatriates will be required. If qualified personnel

⁶⁶ One indicator of the role of women is the number of females working in the medical sector in each country.

1. In Iran, of the total number of physicians in 1968, 7 percent were females. The first year of medical school sample contained 24 percent females, whereas the final year students' group had 10 percent females. There was an accelerating trend in the acceptance of female medical students in Iran in the 1960's. (A. Torab-Mehra "Orientation of Iranian Physicians," Iran Foundation, 1969.) In 1978, 25 percent of the medical students in Iran were female. Of an estimated 21,000 nurses in Iran in 1978, 82 percent were Iranian, and of these, over 90 percent were female. ("A Health Care Revolution," *Middle East Health Magazine*, October 1982,)

2. Out of 354 medical students in Iraq in 1976, 21 percent were female. Out of 4,500 nurses in 1976, an estimated 65 percent were Iraqi and of these over 70 percent were female. (U. S. Department of Health, Education, and Welfare: Iraq Health Sector, 1977,)

3. The total number of nurses in Algeria rose from 2,400 in 1972 to over 9,000 in 1978, and over 90 percent were Algerian women. (World Bank, "Algeria—The Five-Year Development Plan," 1982.)

cannot be recruited, standards may fall and facilities may not be effectively utilized. Underutilization of facilities due to staff shortages has indeed already occurred in Saudi Arabia.

Unless the number of technicians increases drastically, much of the equipment installed over the last decade may not be used properly. There are hopeful signs that the importance of maintenance is increasingly recognized, but it is unlikely that maintenance needs can be met from local resources for some time to come. Expatriates will remain critical in the intermediate phase, particularly to Saudi Arabia and Kuwait. In Egypt, future manpower development activities are expected to concentrate on improving the quality of education in all staff categories, expanding opportunities for continuing education, incentives to reduce the multiple employment (most government physicians also run a private practice), and increasing general management capabilities. Key areas for future transfers of technology in the manpower field will be foreign assistance in public health training, postgraduate education and training of biomedical engineers, and training of medical equipment maintenance engineers and technicians.

In the past, Middle Eastern countries have taken widely differing approaches in their selection of medical technologies and delivery systems. Countries like Saudi Arabia have worked to expand medical facilities that include extremely sophisticated and costly medical technologies; Egypt and Algeria, with larger populations and more limited resources, have placed more emphasis on community health programs involving simple technologies.

In the future, however, the most pressing need throughout the region will continue to be for less sophisticated medical technologies, used in preventive medicine. Even in the richer Gulf States, providing such health care to remote rural locations will remain imperative, if the benefits of medical technology transfers are to be spread more equally throughout society. Generally speaking, U.S. firms have not been major independent suppliers of less sophisticated medical equipment or staffing and servicing of small-scale clinics, outside their

involvement through AID programs. AID programs in the health sector will thus remain critical to meeting the most pressing basic requirements for medical services in the developing countries of the Middle East.

IMPLICATIONS FOR U.S. POLICY

Export Promotion/Export Regulation

In the Gulf countries, financing has been a minor determinant in the process of awarding contracts in the health care sector. It has become more important, however, for war torn Iran and Iraq, as well as other Gulf States whose revenues fell below expected levels during the oil glut. In countries like Egypt and Algeria, it will continue to be of decisive importance. Therefore, supplier government financing support may become an increasingly important influence on competition among suppliers. U.S. policy makers may wish to consider policy options to improve financing of medical equipment and services through the Export-Import Bank and through programs involving investment guarantees provided by the Overseas Private Investment Corp. One approach would be to extend international agreements among suppliers to reduce the use of mixed credits and tied aid; another would be to adopt such programs because our competitors have them. These issues are discussed more fully in chapter 11.

A different type of approach is to improve capacity of the U.S. foreign commercial service to provide assistance to firms interested not only in exporting medical equipment, but also in transferring technology through training and other specialized programs. Bilateral agreements to promote cooperation between the United States and Middle East nations in medical science and technology could be extended to facilitate such efforts.

Development Assistance and Foreign Policy Issues

One approach which could be considered would be to expand U.S. participation in mul-

tilateral assistance programs, such as those of the United Nations. EMRO promotes technical cooperation between the countries in the area in order to reduce the dependence on imported expertise and to enhance their self-reliance through training and research. The impact of EMRO's work has been limited, however, by political disagreements, restricted financing (with an annual budget of about \$20 million to cover activities in 22 countries), and differences in health care policy issues across the countries of the region. EMRO is promoting the use of intermediate level medical technology and is striving to limit the use of imported manpower, whereas the Gulf States emphasize the acquisition and use of a broad spectrum of medical technology and have accepted foreign personnel as a temporary solution to their manpower needs.

U.S. health care development assistance to the region is today concentrated in Egypt. U.S. projects focus on delivery of medicine and health care at the community level rather than larger infrastructure projects. For example, hospital construction is not a U.S.-assisted priority area, mainly because the cost-effectiveness of such ventures is considered to be low in view of Egypt's basic health needs. U.S. health assistance is apparently perceived as generally effective by both Egyptians and Americans. One of the reasons for this is cooperation between the respective U.S. organization and MOH in choosing the projects to be sponsored. MOH also cosponsors each project financially with at least 25 percent of the total cost. Another explanation is the high caliber of U.S. staff employed and otherwise engaged in the projects. Projects often stand or fall depending on the ability and commitment of the local counterpart, and local participation has contributed to successful projects.

Nevertheless, policymakers may wish to further direct AID policies in order to meet varying goals. One approach would be to expand commercial opportunities for U.S. firms through use of mixed credit and continuing procurement policies favoring U.S. firms. Another approach would be to emphasize more strongly programs which promote technology transfers in specialized areas such as upgrading health manpower, establishing centers of medical research excellence, and improving servicing and maintenance of medical equipment. AID is now studying ways to improve its science and technology programs in Egypt, and this effort can be expected to sharpen the focus of S&T programs in the medical field. OTA's research indicates the important role played by non-governmental organizations such as Project HOPE; expanded government support for such programs could also be considered.

Health care has been a foundation for U.S. assistance programs and will undoubtedly remain a priority area for AID. As overall U.S. economic assistance to Egypt increases, one question will be whether to promote programs involving medical technology transfers (which require considerable personnel and comparatively long time periods for completion), or rather to stress the expansion of commodity import and other programs supporting imports of medical equipment. OTA's research indicates that there is a clear need for specialized programs designed to upgrade the quality of medical manpower throughout the region, and that aid programs serve to meet needs for medical services and training that would probably not otherwise be filled independently by private U.S. firms.