Korea

Medical Facilities Expansion Project (2)

Field Survey: August 2003

1. Project Profile and Japan's ODA Loan

Project Site

Anesthesia machine procured under the project

1.1 Background

As of 1982, medical services in South Korea relied heavily on the private sector, with private hospitals and clinics making up 95% of all medical facilities. These private hospitals and clinics concentrated in urban areas where they could easily make a profit. 84.8% of all medical institutions and 80.1% of total number of hospital beds in South Korea were located in urban areas, where 60.5% of the population was living. The regional gap in medical services was considered a problem that needed to be addressed.

The number of doctors per 10,000 people in South Korea was 7.5 (1983), lower than in other NICs[*1] (as of 1977, 8.9 for Singapore and 8.8 for Hong Kong).

The number of mental health facilities especially was insufficient. The number of mental hospital beds per 10,000 people was 1.1, lower than 14.1 for Greece (1975), 5.1 for Panama (1975) and 1.7 for the Philippines (1973). Also, more medical equipment to treat special diseases (adult diseases) was necessary as the number of patients with these diseases was steadily increasing with the aging of the population, increase in meat intake and more stress due to social and economic development.

1.2 Objectives

The objective was, by providing medical equipment to the existing hospitals, to expand treatment facilities, and to correct the regional gap in the medical system, and thereby contribute to the development of advanced and regional medical care, keeping pace with the economic growth of South Korea.

1.3 Output

Provision of medical equipment to the following hospitals and civil works to increase the number of

[1] NIC: Newly Industrialized Country

beds (total: 34 hospitals, 3,500 beds)

a) Mental hospitals (10 hospitals, 2,000 beds in total)

b) Medical centers for special diseases[*2] (4 centers, 1,000 beds in total)

c) National and public hospitals (10 hospitals, 500 beds in total)

d) Private hospitals (10 hospitals, installation of equipment only)

1.4 Borrower/Executing Agency

Government of the Republic of Korea/Ministry of Health and Social Affairs (as of appraisal, currently Ministry of Health and Welfare)[*3]

1.5 Outline of Loan Agreement

Loan Amount / Disbursed Amount	12,300 million yen / 7,580 million yen
Exchange of Notes / Loan Agreement	September 1985 / December 12
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	 5.0% 25 years (7 years) General untied
Final Disbursement Date	December 1993

2. Results and Evaluation

2.1 Relevance

The South Korean Government had a policy of emphasizing on economic development for years after war. In the 4th Five Year Plan (1977-1981), improvement of health and hygiene, including medical services, was among the major objectives along with the trade balance. The 5th Five Year Plan (1982-1986) also set the goal of well-balanced social and economic development, including further improvement of health and hygiene. However, national hospitals were not able to expand medical equipment to a satisfactory level due to the strictly limited budget. In the case of private medical facilities that were playing a leading role in South Korea's medical sector, too, it was difficult for most hospitals to upgrade medical equipment due to lack of funds. The South Korean Government requested the project as measures to improve the situation. Therefore, this plan was considered relevant as it was consistent with the government policy of improving medical services.

The government budget for health and welfare has increased substantially from 2.8% in 1985, when the project appraisal took place, to 7.3% in 2002, indicating that the health sector remains important to government policy.

The Ministry of Health and Welfare (MOHW) thinks that the level of medical service in the country

[2] Special diseases means adult diseases that persons over 40 years old are likely to suffer from, including diabetes, hypertension, heart disease, cancer, etc.

[3] In this report, the current name, Ministry of Health and Welfare, is used.

has been enhanced remarkably with rapid economic growth and medical equipment at hospitals in urban areas has reached an almost satisfactory level. Given this situation, the South Korean Government since 1999 has been limiting borrowers of the low-interest loans for the purchase of medical equipment and expansion of medical facilities, which used to be extended all over the country, to those in rural areas where sufficient medical services are not available and it is difficult to run hospitals. Although strengthening the treatment system for adult and mental diseases, which was a priority of this project, is still regarded as important today, the government began to shift its first priority to the improvement of medical services for the elderly mainly in rural areas after July 1997.

2.2 Efficiency

2.2.1 Output

The planned output of this project at appraisal time was the procurement and installation of medical equipment at a total of 34 hospitals, including 10 mental hospitals, 4 medical centers for special diseases, 10 national hospitals and 10 private hospitals. Also planned was the building of branch mental hospitals and civil works to increase the number of beds along with the installation of additional equipment at medical centers for special disease and national hospitals. The target hospitals had not been selected at that time, and MOHW, the executing agency, intended to select them after the signing of the Loan Agreement.

In response to the increase in demand during implementation, the number of target hospitals and beds expanded to 45 hospitals and 4,900 beds from the originally planned 34 hospitals and 3,500 beds. Subsequently, one mental hospital was excluded because of oppositions by local residents. As a result, 44 hospitals were covered by the project and the total number of additional beds was some 4,500, well above the initial target.

Table 1: Comparison of Planned and Actual Project Scope

	Appraisal Plan (December 1985)	Modified Plan (July 1988)	Results
- Mental Hospital	10 hospitals, 2,000 beds in total	12 hospitals, 2,400 beds in total	11 hospitals, 2,789 beds in total
- Medical Center for Special Diseases	4 centers, 1,000 beds in total	9 centers, 1,000 beds in total	9 centers, no. of beds is unknown
- National Hospital	10 hospitals, 500 beds in total	9 hospitals, 500 beds in total	9 hospitals, no. of beds is unknown
- Private Hospital	10 hospitals (installation of equipment only)	15 hospitals (installation of equipment only)	15 hospitals (installation of equipment only)
- Total	34 hospitals, 3,500 beds in total	45 hospitals, 4,900 beds in total	44 hospitals, more than 4,500 beds

2.2.2 Project Period

The project was completed in December 1993, 6 years after the target date of December 1987. Completion was delayed because of 1) oppositions against the building of 3 branch mental hospitals by residents living near the sites, and 2) shortage of funds of private hospital selected as medical centers for special diseases.

2.2.3 Project Cost

According to the estimate at appraisal, the ODA loan was to finance the entire foreign currency portion, which accounted for 37.3% of the total project cost. The foreign currency portion was to cover the cost of purchasing equipment to be installed. The South Korean side was to cover the local currency portion for miscellaneous expenses associated with the purchase of equipment, such as customs duties, and civil works cost for the construction of additional wards.
The project cost totaled 11,745 million yen, less than estimated (32,984 million yen) as a result of efficient contracting though competition.

2.3 Effectiveness

Under this project, hundreds of medical equipment was installed to 44 hospitals in South Korea. However, as 12 years have passed since the project completed, it is difficult to survey how these equipment have been used in all cases. This time, 8 hospitals were surveyed where the staff members who knew the situation at project implementation are still working today and the equipment procured under the project are still in use. In this section, the effects and impact of the project is described in this section by presenting examples of how the procured equipment is being used at these hospitals.

2.3.1 Strengthening Treatment System for Special Diseases (Adult Diseases)

Under this project, medical equipment worth 2.35 billion yen was procured for 9 medical centers for special diseases at hospitals (4 cancer treatment centers, 3 adult disease treatment centers, 1 cardiovascular disease treatment center, and 1 heart disease and hypertension treatment center). This equipment includes an angiography system, hemodialysis system, a cobalt therapy unit, an ultrasound scanner, and automated hemanalysis system.

Photo 1: Cardiovascular Center

At Severance Hospital of Yonsei University (private) in Seoul, 11 items of medical equipment worth 279 million yen, including a biplane cardiovascular angiography system, a 35mm cine film projector for the above system, a chest X-ray system and cryosurgery equipment were procured for a newly constructed 238-bed ward specializing in the treatment of cardiovascular diseases. The new ward opened on May 1, 1991, 3 departments provide treatment: cardiac internal medicine, pediatric cardiac internal medicine and cardiovascular surgery. As of 2002, it had 142,001 outpatients and 48,656 inpatients. The medical equipment procured under the project was the most-up-to-date ones at that time.
In the field survey for the evaluation, it was observed that among this equipment, the biplane cardiovascular angiography system and chest X-ray machine have been used for over 13 years. The chest X-ray machine is originally designed to use silver salt film. The center updated the detector mechanism to accommodate the digital data management system using a computer in 1997 and still uses the machine 70-80 times a day.
The biplane cardiovascular angiography system takes moving images of contrast medium infused in

blood vessels in the cardiac wall from two directions. It was expensive equipment, worth 124 million yen at that time. This equipment is indispensable for examining patients with heart disease and is used for 3,000-4,000 patients a year. Images on the film can be examined using the special film projector[*4] (Photos 2 and 3).

The equipment procured under the project is mostly used for examination, not treatment. Correct evaluation of the patient's condition by accurate diagnosis is indispensable for appropriate and effective treatment. The medical equipment procured under the project is thought to have contributed greatly to the treatment of special diseases.

Photo-2: Biplane cardiovascular angiography system

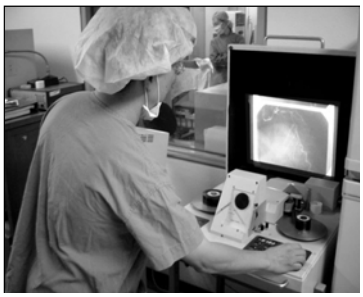


Photo -3: Special film projector

2.3.2 Increase in Number of Beds and Strengthening Treatment System of Mental Hospitals

Under this project, 11 branch mental hospitals were constructed (with 2,789 beds in total) with 1.5 billion yen of the ODA loan and 20 billion won disbursed by the South Korean side. For the constructed hospitals, medical equipment worth 1.11 billion yen including electroencephalograph, X-ray machine, electroconvulsive therapy equipment, automated electrocardiogram analyzer and patient monitoring system, were procured with the ODA loan. The number of beds in mental hospitals has doubled from 14,456 in 1984 when project appraisal took place to 34,615 in 1993 when the project was completed. Under the project, 2,789 beds were added, accounting for 13.8% of the total number of beds added during the same period. Afterwards, the number of beds in mental hospitals increased rapidly to reach 61,039 in 2001. As a result, the number of hospital beds per 10,000 people has increased from 0.36 at appraisal time (1984) to 1.28 (2001). The number of mental hospital beds per 10,000 people[5], which used to be the lowest among OECD countries, has increased to the average of other countries (Fig.1).

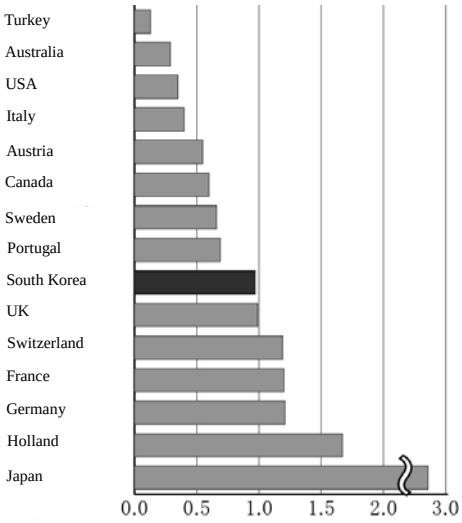
[4] The projector in the photo is the same type as the one procured under the project which ceased to be used after 12 years and was kept in the hospital as a spare part of the same type of equipment.

[5] Based on OECD's standard and not including sanatoriums and social rehabilitation facilities

Table 2: Number of Mental Hospital Beds

		1984	1993	2001
Mental Hospitals	National/Public	1,930	4,284	7,551
	Private	1,022	5,763	20,640
Psychiatry Departments of General Hospitals		3,155	6,872	18,587
Sanatoriums		8,349	17,696	13,960
Social Rehabilitation Facilities		0	0	301
Total		14,456	34,615	61,039
No. of Beds per 10,000 People		0.358	0.786	1.280

Source: Ministry of Health and Welfare, Yearbook of Health and Welfare Statistics



Source: OECD Health Data

*Data are for 2001 for South Korea, 1997 for Austria, Italy, Germany and Canada, and 1998 for other countries

Fig.1: Number of Mental Hospital Beds per 10,000 People

In the case of Keyo Neuropsychiatric hospital, a mental hospital in a suburb of Anyang, the following equipment and items were purchased with 255 million yen of the ODA loan: 1) equipment specifically needed for mental hospitals such as a patient monitoring system, elevator access card key system, and a stage setting for group therapy, 2) equipment to diagnose patients' conditions such as an electroencephalograph, electrocardiograph system, and automated hemanalysis system, 3) ambulances, wheelchairs, beds, computers, air conditioners and office supplies. This equipment was delivered in May 1987 and November 1989 and was installed in the new ward with 300 beds completed in February 1987. The equipment has contributed to modernize the hospital and improve the treatment system. The hospital now has 800 beds and treated 1,889 inpatients and 24,997 outpatients in 2002.

Photo-4: Patient Monitoring System

The group therapy stage system (lighting, black-out curtain and sound system) procured under the project, for example, is used for dramas in which patients do a role-play. At present, it is used for a once a week, 1.5 hour therapy session for a group of around 50 patients. The patient monitoring system is composed of 15 cameras[*6], control device and monitors in the central control room (Photo 4). The elevator equipped with card key access system, the first of its kind in South Korea, is operating in good condition and prevents inpatients from going out without permission.

The electroencephalograph, which is used to examine if abnormal mental state or behavior is caused by a brain problem, an automated hemanalysis system to diagnose the condition of patients, electrocardiography equipment and liver function testing machine

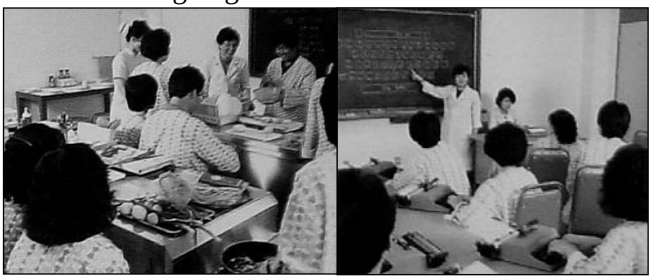


Photo 5: Kitchen appliances (left) and typewriters (right)

[6] All of the procured cameras were replaced with new ones 4 years ago (the above photo shows the old camera, which has been left.

are still used. Also, kitchen appliances and typewriters[*7] (Photo 5) to rehabilitate patients through cooking and occupational activities were procured under the project and have helped many patients return to society.

2.3.3 Strengthening Treatment System of National and Private Hospitals

Under this project, medical equipment was provided to 9 national hospitals and 15 private hospitals all over the country. This equipment was worth a total of 814 million yen for national and public hospitals and 1,809 million yen for private hospitals. It was procured for all types of medical activities and have contributed to various kinds of treatment.

One of the target private hospitals, Sungae Hospital, purchased a CT scanner, hemanalysis system, whole-body X-ray machine and defibrillator [*8]. President of the hospital says that, although the hospital was doing well at the time, it was very difficult to purchase expensive equipment such as a CT scanner due to the lack of funds. After various equipment was purchased using the project's low interest rate loan, the hospital was able to provide advanced diagnosis and treatment. As a result, it has more patients than before and its financial condition has improved, according to the hospital.

2.4 Impact

2.4.1 Contribution to Improving the Treatment System of the Medical Sector in South Korea

The above-mentioned Cardiovascular Center at the Severance Hospital of Yonsei University performed the first heart transplant operation in South Korea in 1994 using state-of-the-art equipment procured under the project. It also successfully performed the first cerebrospinal meningitis operation in the country in 2000. Thus the hospital is known as one of the most advanced treatment facilities for circulatory diseases in South Korea.

Sejong Hospital also has performed a large number of heart operations using the heart-lung machine[*9], intra-aortic balloon pump[*10], and echo-cardiography equipment procured under the project. During the 7 years from 1989, when the equipment was installed, to 1995, when major equipment was disposed of, the hospital performed 6,412 heart operations in total. In addition, it successfully performed 18 heart transplant operations. The hospital has carried out the largest number of heart operations and heart transplant operations in South Korea.

Other than the cases described in this report, various kinds of treatment have become possible at 44 hospitals in the country for which materials and equipment were procured under the project, indicating that the project contributed to improve the treatment and diagnosis system.

2.4.4 Environmental Impact

The medical materials and equipment procured under the project had no impact on the environment

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[7] Some typewriters and kitchen appliances have exceeded their service life and were disposed of. The photos are taken from the hospital brochure.

[8] A defibrillator applies electric shocks to restore a heart that has stopped pumping blood.

[9] A heart-lung machine (pump oxygenator) is composed of a pump to circulate blood, an artificial lung to exchange gases, a heat exchanger to adjust the temperature of circulating blood and the circuit connecting these components. It substitutes for the heart and lungs of the patient during an operation.

[10] An intra-aortic balloon pump (IABP) is a type of rescue apparatus for patients with acute heart failure. It provides mechanical assistance to a failing heart due to myocardial infarction by inflating and deflating the balloon and thereby reduces the load on the heart.

because they were used inside the hospital. Blood samples, used injection needles and reagents are properly treated by specialized companies contracted by each hospital. Also, no specific environmental impact was caused by construction for expansion and renovation of hospitals.
In addition to the procurement of medical equipment, 11 mental hospital wards were constructed under the project. Some of them were built on the premises of existing hospitals and others were built on new sites. Relocation of residents was not necessary to acquire the construction sites, so there was no problem in this regard.

2.5 Sustainability

2.5.1 Executing Agency

(1) Technical Capacity and Operation and Maintenance System

(As already stated in "2.3 Effectiveness" and "2.4 Impact",) no problem was found in technical capacity and the operation and maintenance system.

(2) Financial Status

The funds provided under this project were subloaned to each target hospital via the Ministry of Finance and Economy (MOFE) and MOHW. Each hospital commenced repayment to MOHW in 1993.
Some hospitals are behind in repayment due to financial decline. MOHW repays the ODA loan via MOFE and uses MOHW's budget to make up for the shortage of repayment funds caused by the defaults. Although repayment of the ODA loan from MOFE to Japan was completed in December 2001, MOHW continues repaying MOFE with the funds repaid by each hospital. MOHW had repaid 4,907 million yen of the loan amount 7,580 million yen by the end of 2002. As of the end of 2002, the arrears owed to MOHW by each hospital totaled 1,022 million yen[*11].
This situation also occurs in other projects that procure medical equipment with foreign loans. According to MOHW, it spends 20-30% of its budget to make up for these arrears. In order to understand the actual situation, MOHW is now conducting a survey to analyze the conditions at the target hospitals of this project. Based on the result, MOHW is planning to take appropriate measures such as reducing the interest rate on arrears from 21% to 17%, providing financial assistance to hospitals in rural areas, or dispatching medical students in military service at no charge to hospitals with financial difficulty. Therefore, the current situation is expected to improve.

2.5.2 Operation and Maintenance of Medical Equipment

With regard to the operation and maintenance of medical equipment procured under this project, surface cleaning after use and a brief overhaul cleaning are performed by the users and medical technicians of each hospital. Repairs in the event of failure, procurement of spare parts and periodic inspection of large machines are conducted by companies contracted by each hospital or agents of the manufacturers. Thus, they are mostly maintained in good condition. However, as 10-17 years have passed since this equipment was purchased, production of spare parts has been discontinued so parts cannot be replaced in some cases. Considering that the service life of some medical equipment is 5-10

[11] Converted at an exchange rate of 1 yen= 9.79 won (August 2003)

years, this situation may be inevitable.

Regarding the situation concerning medical equipment in South Korea in general, the import dependency rate decreased from 77.8% in 1994 to 61.7% in 2001. In South Korea, domestic production of medical equipment has been increasing as technical level and production capacity improve. As a result, sustainability with respect to the operation and maintenance of medical equipment is gradually increasing.

3. Feedback

3.1 Lessons Learned

None

3.2 Recommendations

None

Comparison of Original and Actual Scope

Item	Plan	Actual
I. Output		
Provision of medical equipment to the following hospitals and civil works to increase the number of beds		
- Mental hospitals	10 hospitals, 2,000 beds in total	11 hospitals, 2,789 beds in total
- Medical centers for special diseases	4 centers, 1,000 beds in total	9 hospitals, No. of beds is unknown
- National hospitals	10 hospitals, 500 beds in total	9 hospitals, No. of beds is unknown
- Private hospitals	10 hospitals (installation of equipment only)	15 hospitals (installation of equipment only)
- Total	34 hospitals, 3,500 beds in total	44 hospitals, more than 4.500 beds
II. Project Period		
- Mental hospitals/medical centers for special diseases	May 1985 – Dec. 1987	Jan. 1986 – Dec. 1993
- National hospitals	May 1985 – Dec. 1987	Jan. 1986 – Feb. 1991
- Private hospitals	May 1985 – Dec. 1987	Jan. 1986 – May 1991
III. Project Cost		
Foreign Currency	10,800 million yen	7,580 million yen
Local Currency	22,184 million yen	4,165 million yen
(in terms of local currency)	(73,700 million won)	(30,400 million won)
Total	32,984 million yen	11,745 million yen
ODA Loan Portion	12,300 million yen	7,580 million yen
Exchange Rate	1 won＝0.301 yen (1984)	1 won＝0.137 yen (Dec.1993)

Third Party Evaluator's Opinion on
Medical Facilities Expansion Project (2)

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The main objective of medical facilities expansion project was to remedy the loophole that the market has not yet taken care of, which is also the aim that ODA has pursued. Therefore, it would be very difficult to be financially self-sustainable. Moreover, the mental hospitals were regarded as something that should not be in my backyard. Regardless of these difficulties, the project achieved the satisfactory level in ODA's contributing to Korean society.

Impacts

The Impacts of the project can be evaluated as successful. The number of mental hospital establishments under the project was 11, which was 24.4% of the total mental hospital establishment in 1997. Especially the average number of new mental hospital establishments in the rural area was 10.4 from 1997 to 2001. In total, the project helped 44 hospitals either in establishing or in improving facilities. Now the Ministry of Health and Welfare (MOHW) in Korea seems to think that the number of the mental hospitals is enough.

In terms of the quality improvement, the project can be evaluated as successful. With the help of the project, Cardiovascular Center of Severance Hospital of Yonsei University has been known as one of the leading centers in this area. The most-up-to-date equipments were procured under the project, which strengthened the treatment system in Korea.

Since 1999, the government has been limiting the use of the low interest policy loans for the balanced development of medical service. The rural area became one of the beneficiaries, which enhanced the appropriateness of the project.

Sustainability

The sustainability of this kind of projects is usually limited either in finance or in the continuity of development. However, this project can be evaluated as sustainable. As in the report, the procured medical equipments were well maintained. Whether the project enabled the beneficiaries to expand new facilities by their own funds is another issue. Severance Hospital case can be thought as successful, because Severance Hospital has maintained one of the best medical service quality, and still expands its own facilities. However, there were hospitals that had difficulties to pay the loans back. MOHW had paid only 4,907 million yen out of the loan amount 7,580 million yen by the end of 2002 because of the hospitals' financial difficulties.

This phenomenon can naturally arise because one of the objectives of ODA and the Korean government was to support the areas that lacked in the pecuniary incentives of the private sector. But also Korea has experienced severer competition among hospitals. The number of inpatient care beds per 1000 population has increased from 1.7 (28.3% of that of U.S.A.) in 1980 to 6.1 (169.4% of that of U.S.A.) in 2000.

The share of population in the rural area has decreased to 10% as of 2004 so that the profitability of the hospitals in the rural area has decreased. The sustainability of the funds that supported the rural areas is limited. There is a tradeoff between the strictness of the government policy goals and the sustainability of the project. Therefore these financial difficulties cannot be regarded as the failures of ODA's sustainability. Moreover, because the Korean government repaid the full amount, there is no problem from the ODA's perspective.