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68th Meeting
Washington, D. C.
July 1972

Provisional Agenda Item 14

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27 June 1972
ORIGINAL: SPANISH

ENGINEERING AND MAINTENANCE OF HOSPITALS AND OTHER HEALTH SERVICES

Item proposed by the Government of Venezuela in correspondence
to the Director of the Bureau dated 20 April 1972

(TRANSLATION)

Republic of Venezuela
Ministry of Public Health and Social Welfare
Office of International Public Health

No. SI-768-72

Caracas, 20 April 1972

Dr. Abraham Horwitz
Director of the Pan
American Sanitary Bureau
525 - 23rd Street, N. W.
Washington, D. C.
USA

Dear Dr. Horwitz:

In accordance with the pertinent regulations I wish to propose, on behalf of my Government, that an item entitled "Hospital Maintenance" be included in the agenda for the 68th Meeting of the Executive Committee of the Organization to be held in Washington in July of this year.

In the opinion of this Ministry the problem of the maintenance of the facilities and equipment of the health services in the Continent is daily becoming more serious and more important in proportion as these services develop. This justifies a discussion of this subject at the high level of the Governing Bodies of the Pan American Health Organization with a view to finding solutions for the immediate future.

I am submitting together with this request a preliminary document for the discussion of the item which the Organization may wish to supplement in such a way as it deems necessary.

Accept, Sir, the expression of my highest consideration.

(Signed)
J. J. Mayz Lyon
Minister of Public Health
and Social Welfare

ENGINEERING AND MAINTENANCE OF HOSPITALS AND OTHER HEALTH SERVICES

(Document submitted by the Government of Venezuela)

I. The Problem and its Causes

In most of the countries in the Region the maintenance of medical care centers is clearly a serious problem, the main causes of which are as follows:

1. The rapid expansion in recent decades of medical care services, which in some countries account for as much as 10% of their annual budgets.
2. The increase in the investments of new capital for hospital constructions at a cost of US\$15,000-\$25,000 per bed.
3. Population growth at a rate exceeding 3%, and an increase in demand in direct relation to the cultural evolution of the population.
4. Improvement in the quality of the services rendered as a result of scientific and technological progress which is reflected in better medical care.
5. The absence of a parallel development of technical and administrative maintenance capacity compatible with the growth in the size and complexity of demand, which has resulted in an accelerated deterioration of the service capacity of medical care centers and sizable losses in invested capital.
6. Losses of invested capital in the order of 30% or more have led to continuing crises in the financing of health services.
7. The peremptory need for the premature reinvestment of large amounts of money in medical care centers, which ties up the sources that could otherwise be devoted to expanding or improving the services or meeting other development needs.

These factors, whose effects have been steadily accumulating in recent decades, have created a true crisis in maintenance, the solution of which calls for the urgent development of systems adapted to the particular features, needs, and resources of each country. This will make it possible to promptly interrupt this circle of conditions that directly and adversely affect the service capacity of the institutions.

To ensure success, a systematic attack should be directed at all the well known aspects of the problem, and factors likely to give rise to new problems in the future should be studied. The efforts of each country, in accordance with its own conditions, should be aimed at developing a national system around which can be established the instruments, policy, and necessary mechanisms for putting short and long-term solutions into practice.

II. Possibilities of a Regional Hospital Maintenance Program

The efforts being made in some countries (the Venezuelan program is described in the Annex) can stimulate the planning of an expanded regional hospital maintenance program under the technical direction of the Pan American Health Organization and with the financial support of the United Nations Development Program.

The problems of medical care center maintenance are more or less similar in most of the countries of the Hemisphere. However, the common factors are modeled and affected in various ways by the characteristics of each country and the methods should therefore vary in accordance with the characteristics of each country. The program that has been successfully initiated in Venezuela could serve as a basic nucleus for the development of a regional program, for which the information and experience so far gained could be of use.

Today there is clearly considerable interest and concern in the countries of the Region about this problem, and the establishment of a regional program to increase activities and measures designed to solve it would be enthusiastically welcomed. The interest of the Pan American Health Organization and of the United Nations Development Program is also well known, and it would therefore be advisable for the Executive Committee to transmit to the next Directing Council an expression of its interest in this subject so as to obtain the support of all countries for initiating a regional program in this field.

Annex

HOSPITAL MAINTENANCE PROGRAM IN VENEZUELA

I. Summary of the Situation up to 1968

All the causative factors of the serious problem of hospital maintenance came together in Venezuela in the last 25 years and created a crisis situation in the second half of the 1960's. These factors may be summarized as follows:

1. An annual 10% growth in the investment of capital in the health services, and a rapid decapitalization of those investments at a rate of 33% of their useful life. The process culminated during this period in virtually new institutions facing critical situations with respect to their facilities and equipment after one or two years of operation.
2. The National Plan, 1970-74, provides for the investment in medical care centers of more than 400 million bolivars, to which should be added the need to replace capital in existing hospitals.
3. Simultaneously, a sizable group of hospitals had reached the critical age of 12 to 18 years of service, and operating conditions there were precarious.
4. It was also recognized that it would not be possible to sustain a situation in which after 20 to 25 years of service the hospital would be in ruins.
5. Current maintenance expenses, which represent, as a minimum, 2.5% per annum of the initial investment, did not exceed 1% per annum and were being used ineffectively.

All these factors gave rise to a situation which called for urgent action, the more so since at that time a large number of hospitals were already included in the critical group which had 12 to 18 years of service or partial provisions of mobile equipment, materials, and working instruments had practically disappeared, affecting a considerable number of basic services and installations.

The investments already made amounted to 1,200 million bolivars, and provision was also made for further investments in the amount of more than 350 million bolivars up to 1972 and the total duplication of the system by 1985. These facts would tend to aggravate the situation.

II. The National Program from 1969 Onwards

In view of this situation the Government of Venezuela, through the Ministry of Public Health and Social Welfare, established a Hospital Maintenance and Engineering Center in 1968, with the following objectives:

1. To make a thorough study of the maintenance problem, to identify the main factors, and to study possible courses of action for dealing with them.
2. To formulate the fundamental components of a national policy for the maintenance of medical care centers.
3. To create or develop the instruments for applying this policy, giving special attention to the establishment of a pilot maintenance area in one of the states of the country.
4. To establish an organization for the training of technical maintenance personnel, in particular personnel already in the services.
5. To undertake special studies and to draw up technical assistance programs, both managerial and technical, for dealing with the fundamental factors of the problem.

These objectives were not completely reached during the short period 1968-69; however, the necessary infrastructure for attaining them was established, with the result that the international assistance obtained shortly afterwards was devoted to a viable agency, with concrete objectives and activities, already integrated into the structure of the Ministry of Public Health and Social Welfare.

III. The International Program from 1970 Onwards

Beginning in 1970 the direct participation of the United Nations Development Program was obtained for a period of two years, and also a grant of \$400,000. PAHO/WHO was designated the executing agency of the project. This enabled the Pan American Health Organization to provide intensive technical support in the period 1970-71. The progress made by the project up to September 1971 includes:

1. The formulation of a national policy for the maintenance of medical care centers and its inclusion in the National Plan, 1970-74.
2. The establishment of an agency for the education and training of professional and technical personnel, which is capable of training all the personnel involved in this activity in the system.

3. The identification of all the factors affecting the problem of maintenance, and the establishment of the necessary courses of action.
4. The preparation of more than 60 special technical assistance studies and papers.
5. The preparation of 18 maintenance manuals.
6. The establishment and operation of a regional pilot maintenance area in the State of Carabobo and its extension to the State of Zulia, where the organization, technology, and maintenance procedures for dealing with the problem on a national scale have been successfully tested.

In the light of the positive results obtained in the period 1970-71, a project for the second phase was drawn up and approved. It is at present in its initial stage and is intended in a period of three years, that is, until 1975, to develop a national system for the maintenance of medical care centers based on the results obtained in the earlier project. This second phase will receive \$400,000 from the United Nations Development Program and PAHO/WHO will continue to serve as the executing agency of the project.

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ENGINEERING AND MAINTENANCE OF HOSPITALS AND OTHER HEALTH SERVICES

UNITED NATIONS DEVELOPMENT PROGRAM

Official Request from the Governments of the Americas
for an International Assistance Project in Maintenance,
Engineering, Planning Design, and Engineering Operations
of Health Care Facilities*

* Document submitted by PASB

UNITED NATIONS DEVELOPMENT PROGRAM

Official Request from the Governments of the Americas for an International Assistance Project in Maintenance, Engineering, Planning Design, and Engineering Operations of Health Care Facilities

SUMMARY

Date Request Received:	Multi-request received
Proposed Duration:	Five years
Proposed Government Counterpart Contribution:	To be determined
Proposed Government Cooperating Agency:	Health authorities
Amount Requested from the UNDP:	

I. BACKGROUND

A. Problem

In Latin America there are 14,589 hospitals with a bed capacity in excess of 813,699. If we estimate each bed at a cost of \$12,000, we will note that an investment of over \$9.6 billion has been made. Planning in the health care area indicates that 200,000 additional beds will be needed during the next 10 years. This will increase the real property investment to \$12 billion. To maintain and protect this staggering investment, less than one half per cent of the health care facilities employ qualified hospital engineers or technicians. This problem increases when we consider that this meager number of personnel will become obsolete unless their skills continue to increase with the advances of medical technology. We know that the most expensive element of health care facilities is neglect. A minor maintenance problem today becomes a major repair problem tomorrow, resulting in a shutdown for rehabilitation shortly thereafter. We have seen case after case of well-designed and constructed hospitals which have become practically useless through improper upkeep.

More important than the investment, however, is the irretrievable loss of life-giving services these facilities were designed to produce. No money value can be placed upon the loss of life experienced because of a malfunctioning dialysis machine or an oxygen system that failed. Protection of the huge investment is important, but the assurance that health care facilities are available when required is infinitely more so.

B. Facts Bearing on the Problem

1. A maintenance policy does not exist in most countries. Therefore, ad hoc programs have been the answer, resulting in repair by crisis instead of preventive maintenance by program. Health care managers are not aware of the potential benefits of programmed maintenance planning.
2. In most countries, funds for health facilities are available within the budget. No specific provision, however, is made within that budget for maintenance purposes.
3. Education and training programs exist in all countries. These resources, however, have not been thoroughly used and coordinated in the training of hospital engineers, biomedical engineers, and maintenance technicians.
4. Medical equipment is purchased from the world market with installation, operation, and maintenance procedures manuals written in languages foreign to the purchasers.
5. The maintenance engineer's opinion is not considered in the planning of hospitals. The selection of equipment that is difficult to maintain hampers the effectiveness of a preventive maintenance program.

C. Previous Experience

To solve a similar problem, the Venezuelan Government initiated during 1967 a pilot program, which is at present carried out with UNDP and PAHO/WHO collaboration. Within this project, the Center for Hospital Maintenance and Engineering as an entity of the General Services Department of the Ministry of Health was established.

To achieve the country's long-range goal for a national system for maintenance and engineering of health care facilities, the Center organized a staff of capable engineers and administrative and technical personnel to organize services in Management, Education and Training, Technical Assistance, and Special Studies. A national maintenance policy was instituted; budgetary and human administrative reforms were made; and a working association was established with the medical schools (public health, nursing, and dietetics and nutrition), the vocational school (INCE), the Central University and Polytechnic Institute, and international agencies such as the International Labour Office and the Productivity Center for Management Training.

The Venezuelan Government, during the foregoing period, also created a fellowship program for local training of engineers, established centralized

technician training and advanced degree education for engineers, instituted a special studies program required to investigate unique problems encountered in hospital maintenance and engineering, and organized a technical assistance committee, which helps to implement the recommendations set forth by the special studies program.

By 6 February 1970, the Government of Venezuela, with UNDP and PAHO/WHO assistance, had attained the planning and programming stages required to implement an effective maintenance and engineering program. Because of the initial success of the first phase of the project, which expired on 31 December 1971, the Venezuelan Government requested a second phase project to the UNDP, covering four additional years, to positively establish a nationwide system of engineering and maintenance.

Through verbal requests and official correspondence, it has been noted that a significant number of Latin American countries desire similar assistance and guidance in establishing effective maintenance and engineering programs for health care facilities.

II. THE PROJECT

A health facility maintenance project must insure that health facilities are kept in ready condition, consistent with patient care, and fulfill its designed purpose to the optimum, thus protecting the investment of the government and the health and lives of its citizens.

A. Purposes

1. The project will establish the International Hospital Maintenance and Engineering Center (IHMEC) of the Americas, capable of rendering consultation, guidance, information, and assistance in the areas of engineering and maintenance of health care facilities to the countries desiring such aid. The organization will be made up of nationals and PAHO/WHO advisory staff. The project will be designed to strengthen the organization of programs for maintenance and engineering of health care facilities patterned after the programs and materials developed by the Center of Hospital Maintenance and Engineering of Caracas, Venezuela (Project VEN-24 VEN-4802).

2. The basic concept of this project is that all assistance to the countries will be provided with the objective of developing the individual countries' own capabilities and resources, to obtain their own results, and to determine the methods of application of the existing technology which will meet each country's needs.

3. IHMEC will form teams of international consultants to visit the countries which request help. Their objectives will be to:

- (a) identify the problems related to hospital maintenance;

- (b) investigate the resources available in the country;
- (c) design a project for technical assistance;
- (d) select a small number of national professionals who could be given fellowships either at the Center for Hospital Maintenance and Engineering in Caracas or at universities to acquire specialized knowledge on maintenance and engineering of hospitals.

B. Methodology

IHMEC will assist each nation to develop and establish a national maintenance policy for health care facilities which could integrate relevant concepts and information on the present system and the actual conditions into a coordinated policy. The policy should have as its objective the implementation of effective programmed solutions to the maintenance problems at the local, state, regional, and national levels. This will be achieved by the governments concerned, with the guidance and assistance of the Center in the following subject areas:

1. Regionalization of maintenance and engineering services, where applicable.
2. Education of executive and managerial personnel at all levels, and training of all related personnel in the importance and benefits of effective maintenance.
3. Training of maintenance technicians and equipment operators.
4. Technical assistance to the institutions.
5. Managerial and administrative improvements.
6. Problems research and analysis.
7. Financial and budgetary actions and possible project development for UNDP assistance.
8. Planning and programming for the total integration of the concept of planning, design, construction, operation, and maintenance of health care facilities.

C. Plan of Operations

IHMEC will assist each nation, upon request, to establish an all-inclusive and effective plan of operations. International assistance may include one or more of the following principal elements:

1. Hold conferences of government officials and international experts to review and recommend the national policy on maintenance, engineering, planning, hospital planning and design.
2. Establish the medium- and long-range plans for the development of an effective hospital maintenance and engineering policy.
3. Advise the Ministry of Health in the administrative, budgetary, and managerial fields related to the engineering and maintenance operations of health care facilities.
4. To satisfy the needs of each country, determine the number of maintenance engineers and technicians requiring education and/or training in the engineering, maintenance, and repair of health care facilities and to propose the methods required for the education and training programs.
5. Assist each nation to establish a pilot zone, as deemed necessary, to put into practice the basic concepts of a national maintenance program, and to determine the most effective methods required.
6. Initiate special studies and engineering assistance for each nation's requirements, which would provide relevant data systems on health care facilities and analyze the information obtained.
7. Establish a central focal point within the nation to provide direction and guidance in all aspects of maintenance standardization and operation for all health care facilities in the country.
8. Assist in the development and publication of manuals and criteria on the maintenance, repair, engineering, and operation of medical facilities and equipment.

D. Preparatory Assistance Missions

It is recommended that the following approach be utilized in the preparatory assistance mission:

Phase I - Policy: For the initial contact with a specific country, send a top level team of four advisers (PAHO member, national director, project manager, and hospital director) to meet with officials of the Ministry of

Health to set forth the general concept, and to lay the groundwork for establishing a national maintenance policy for health care facilities, as required by the requesting country. Time duration: Two weeks.

Phase II - Planning and Programming: Follow up with a team of four experts (national and international) who will assist in the development of the maintenance program. This phase should only be considered when the country has officially supported a maintenance policy. Objectives of this phase are as follows:

1. Establish a planning base by:
 - (a) determination of requirements;
 - (b) evaluation of existing assets;
 - (c) determination of deficiencies.
2. Propose a program to correct deficiencies.
3. Work with national staff (see E.1. below) during initial implementation.
Time duration: As required.

Phase III: Semi-permanent international staff in the country to advise national staff on day-to-day problems. Time duration: Two years (if requested it could be extended.)

Phase IV - Procedures: Return the Phase II team to the same country, on a follow-up basis, to evaluate progress and render further assistance. Time duration: Three weeks every six months during Phase III.

E. Government Contribution

To realize an effective program in a country requiring assistance it is imperative that:

1. The country assign the professional and administrative staff required, as counterparts to the international staff, to set up the country's program.
2. The country provide the necessary facilities, furnishings, equipment, transportation, and other logistic support to accommodate the international staff.
3. The country make decisions and commit resources, as required, to implement plans and programs approved by the government, PAHO/WHO, and UNDP.

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ENGINEERING AND MAINTENANCE OF HOSPITALS
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* Document submitted by PASB

Introduction

The Pan American Health Organization is presently engaged in the development of a regional system for hospital maintenance and engineering for the Americas, with a view towards improving the operation of health care facilities. The proposed regional system would cover maintenance, engineering, planning design, and engineering operations.

To inform Member Governments of the regional system proposed, expert consultants were sent to Argentina, Barbados, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Guyana, Jamaica, Mexico, Nicaragua, Paraguay, Peru, Trinidad and Tobago, and Venezuela. Each country was informed of the program being carried out at present in Venezuela with the collaboration of PAHO/WHO and UNDP. The importance of an early submittal of a "letter of intent" to the local UNDP Representative for a similar program in each country was emphasized.

Of primary importance is the establishment in each country of a national policy for maintenance of health care facilities. This policy allows the program to receive support from the health authorities and lays the foundation for the regionalization of the maintenance program within the country. The primary objectives of the national policy are:

1. To provide, at the country level, the human and economic resources required for the proper maintenance and repair of buildings, installations, and equipment in health care facilities. Special attention should be given to local units, which, because of their size or other reasons, do not have their own maintenance service.
2. To manage efficiently, at the country level, the human and economic resources provided for maintenance and repair, in such specific technical areas as X-ray equipment, elevators, electronic equipment, dental equipment, telephone equipment, air conditioning and refrigeration equipment, and others.
3. To channel, through centralization of maintenance and engineering technology, the use of technical resources provided to the countries.

Once the national policy for maintenance of health care facilities has been formulated, specific actions are required to ensure that the investment made in health care facilities is protected and that an optimum level of operation effectiveness of the facilities is maintained. The actions needed to accomplish the foregoing are:

1. Education

The main objective is to achieve a better level of understanding of the maintenance problems in technical and professional groups, with

specific emphasis on the managerial sector. This includes attitude changes towards the problem.

2. Training

This component focuses on the training and development of the necessary human resources at a technical level. It includes training of operators directly related to the proper and effective use of the buildings, installations, and equipment.

3. Technical Assistance

This element is directed towards establishing a priority program for health care facilities and involves setting up programs for effective assistance at the regional and/or country levels in the "problem-solving" process of maintenance of health care facilities.

4. Management, Budgeting, and Administration

This component will promote the development of the proper managerial and administrative structure designed to work at three basic levels:

- (a) Central maintenance and engineering (national level)
- (b) Regional maintenance and engineering (state or provincial level)
- (c) Local unit maintenance and engineering (local level)

Special emphasis will be placed on developing the decision-making capabilities at the different levels of organization, and to provide the administrative tools and the budgetary allocations required, so that the program can be implemented effectively.

5. Research and Problem Analysis

This activity will be focused towards improving the organization and structures for the operation and maintenance of health care facilities in the following areas:

- (a) Operational cost reduction
- (b) Maintenance cost reduction
- (c) Productivity improvements
- (d) Logistic and supply systems
- (e) Others as required

6. Finance

The finance component is intended to provide programmed increase of economic resources for maintenance and engineering compatible with the gradual development of the national maintenance system, as well as with the development of specific levels, such as the regional level systems.

In summary, operating costs of health care facilities will equal construction costs every five years, if we consider that the normal life span for a facility is 40 years. Governments must expect to expend over 130% of their initial investment in the replacement of equipment. If full use and optimum operation of the facility is to be achieved, an annual expenditure of 6% is to be expected for maintenance.

Situation of Maintenance of Health Facilities in the Americas and the Caribbean Area

A study made by the PAHO Advisory Team, which recently visited several countries of the Region, indicates that the present situation in several countries of Latin America and the Caribbean area is as follows:

Argentina: There is no specific division of maintenance at the government level, but the Departamento de Programación Física y Arquitectura is presently working on a maintenance program.

Barbados: Responsibility for major repair and modifications of health facilities is entrusted to an executive engineer. The Queen Elizabeth Hospital is presently developing its maintenance program and two engineers have been assigned to plan it.

Bolivia: No maintenance program has yet been set up. A course for maintenance engineers and technicians is programmed.

Brazil: There is no national maintenance program. At present, however, an engineer has been assigned by the Government to institute a program in the State of São Paulo.

Chile: Advisory services were rendered during 1971 to develop a national maintenance program and to train adequate personnel to carry it out. However, the program has not yet been instituted.

Colombia: A maintenance program is now being developed using the Corporación Proveedora de Instituciones de Asistencia Social (CORPAL) and the Servicio Nacional de Aprendizaje (SENA).

Costa Rica: At present, there is no specific program for maintenance at the government hospital level. There is however, a working maintenance program in the social security system.

Ecuador: There is no current maintenance program, but a maintenance division, at government level, is now being organized.

Guatemala: No maintenance program at the government level exists, and there are no engineers available who could be trained to carry it out.

Guyana: At the present time, the maintenance program is under the responsibility of the Ministry of Public Works. It has been suggested that the maintenance program be transferred to the Ministry of Health and that economic resources and personnel be assigned to it.

Jamaica: The maintenance program is under the authority of the Ministry of Public Works. The engineers assigned to the Montego Bay Hospital were trained at the University of Michigan.

Mexico: Maintenance awareness was brought into focus by the establishment of a mixed commission with representatives from all three health sectors. The Instituto Mexicano del Seguro Social has developed a maintenance program for all its hospitals, and centralized training in this field is available for maintenance engineers and technicians. Programs and manuals have been developed and made available to all countries.

Nicaragua: An engineer in charge of maintenance problems has been assigned specifically to one hospital. The rest of the health institutions remain without maintenance due to the lack of qualified personnel.

Paraguay: The program for maintenance is being developed by the social security system. There is no established capability for the maintenance of health facilities at the government level.

Peru: The program of maintenance at the Hospital del Empleado is outstanding. A national maintenance program is under way at the government level.

Trinidad and Tobago: A qualified engineer has been assigned by the Government to coordinate a maintenance program, utilizing the Vocational School and the Engineering Faculty of the University. It can be expected, therefore, that progressive results will be forthcoming in the near future. The Vocational School will be responsible for identifying the work task and the training of technicians. The University, utilizing undergraduates, will investigate the improvement of facilities and management of methods.

Venezuela: A department of general services, including an architectural and construction maintenance section, was created. This led to the formation of a training center for personnel assigned to maintenance of health facilities. Manuals have been written and studies carried out and are available. (A more detailed description is presented in Document CE68/15, Rev. 1.)